CA-IR-102

Please provide copy of all reports by rating agencies that evaluate HECO and/or HEI for the period 1999 to the present.

HECO Response:

Available reports by rating agencies that evaluate HECO and/or HEI for the period 2004 to the present are voluminous and therefore one copy each will be provided to the Consumer Advocate and Commission under separate transmittal. Available reports by rating agencies for the period 1999 to 2003 are too voluminous to reproduce but can be reviewed at HECO's office upon request. Please contact Irene Sekiya at 543-4778 to arrange for review.

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(SUPPLEMENT 4-22-05)

STANDARD & POOR'S

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Print

Hawaiian Electric Industries Inc. And Utility Units Ratings Affirmed; Outlook To Negative

Primary Credit Analyst(s):
Barbara A Eiseman, New York (1) 212-438-7666;
barbara_eiseman@standardandpoors.com

Publication date: 22-Apr-05, 09:38:12 EST
Reprinted from RatingsDirect

NEW YORK (Standard & Poor's) April 22, 2005--Standard & Poor's Ratings Services said today that it affirmed its 'BBB' corporate credit rating on Hawaiian Electric Industries Inc. (HEI) and its 'BBB+' corporate credit ratings on subsidiary Hawaiian Electric Co. Inc. and its units, Hawaii Electric Light Co. Inc. and Maui Electric Co. Ltd.

At the same time, Standard & Poor's revised its outlook on the companies to negative from stable.

As of Dec. 31, 2004, the Honolulu, Hawaii-based company had $1.2 billion of debt outstanding.

The outlook revision reflects a declining trend in HEI's consolidated financial condition, despite the strong Hawaii economy and the company's efforts in recent years to strengthen capital structure balance.

"The company's financial metrics have been pressured owing to rising operating expenses, yet to be recovered investments, and the long-term lack of rate relief," said Standard & Poor's credit analyst Barbara Eiseman.

"Absent a supportive rate decision in Hawaiian Electric's pending rate case, prospective key financial metrics may not support a financial profile that is commensurate for the current ratings," said Ms. Eiseman.

The ratings on HEI are based on the consolidated credit profile of HEI's family of companies, which include the regulated electric utility Hawaiian Electric and its two utility subsidiaries and the riskier financial services operations of subsidiary American Savings Bank FSB.

In 2004, the utilities contributed 81% of core revenues and 64% of operating income and American Savings Bank contributed 19% and 39%, respectively.

Complete ratings information is available to subscribers of RatingsDirect, Standard & Poor's Web-based credit analysis system, at www.ratingsdirect.com. All ratings affected by this rating action can be found on Standard & Poor's public Web site at www.standardandpoors.com; under Credit Ratings in the left navigation bar, select Find a Rating, then Credit Ratings Search.

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STANDARD & POOR'S UTILITIES

Publication date: 25-Jan-2005Primary Credit Analyst(s): Barbara A Eiseman, New York (1) 212-438-7666; barbara_eiseman@standardandpoors.com
Reprinted from RatingsDirect

BULLETIN: Hawaiian Electric Industries' Delayed 2004 Earnings Release Does Not Affect Rating

NEW YORK (Standard & Poor's) Jan. 25, 2005--Standard & Poor's Ratings Services said today that Hawaiian Electric Industries Inc.'s (HEI; BBB/Stable/A-2) postponement of its year-end and fourth quarter earnings release will not affect the rating or outlook on the company. HEI's subsidiary, American Savings Bank, recently became aware that the methodology it was using to amortize premiums and discounts on its mortgage-backed securities portfolio was not in strict conformance with SFAS No. 91. Although nonconformance with accounting standards is of concern, because the range of the after-tax net premium amortization is expected to be relatively small at $2 million to $4 million, the understatement of net income will not materially affect the company's creditworthiness. The matter is expected to be resolved during the next two weeks earnings will be reported on Feb. 7, 2005.

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STANDARD UTILITIES

as having equity-like characteristics, this ratio overstates, for analytical purposes, the company's debt leverage. In March 2004, HEI issued 2 million shares of common stock ($104 million) and $50 million of medium-term notes, and HECO issued $50 million of trust-preferred securities. The proceeds of the transactions were used to redeem $100 million of higher cost HEI trust-preferred securities and $100 million of HECO trust-preferred securities in April 2004.

Internal cash should continue to fund the bulk of the company's consolidated capital program for an extended period, despite projected increases in construction spending. The higher level of spending is mainly for transmission and generation projects, as well as energy solutions and customer-choice technologies.

As of Sept. 30, 2004, HEI's adjusted funds from operations (FFO) interest coverage was suitable for the ratings at about 3.4x, while FFO to total debt was very weak at roughly 18%. However, Standard & Poor's expects improvement in bondholder protection measures with adjusted FFO to total debt approaching 22% in nearby years owing to tight cost controls, rate relief, and impact on the company's earnings from continued expansion of Hawaii's economy.

Importantly, a responsive rate order from the Hawaii Public Utilities Commission with regard to HECO's pending rate case for a $98.6 million (9.9%) rate hike would help to lift the company's key financial measures to more appropriate levels for current ratings. Although there are no time restrictions for the commission to issue a final order, a interim decision is possible by the fourth quarter of 2005. Rate relief is needed to recover the costs of reliability investments made since 1995, which included a number of transmission upgrades, the costs associated with a purchased-power contract, a new fuel oil pipeline, and costs to ensure the continuation and expansion of energy efficiency and conservation programs.

Short-term credit factors.
The short-term corporate credit and commercial paper ratings on HEI and HECO are 'A-2', incorporating strong liquidity and the ability to internally fund dividends and capital expenditure requirements. HEI faces a manageable maturity schedule, with only $1 million maturing in 2004 and $37 million maturing throughout 2005. HECO has no maturing long-term debt until 2012. At Sept. 30, 2004, HEI had $13 million of cash and cash equivalents (excluding American Savings Bank's cash and cash equivalents). As of Sept. 30 , 2004, HEI and HECO had bank lines totaling $80 million and $90 million, respectively.

Covenants in HEI's and HECO's lines require HECO to maintain a consolidated capitalization ratio (exclusive of short-term debt) of at least 35%. At Sept. 30, 2004, HECO's consolidated common equity to capitalization ratio was 56%. Certain HEI lines of credit totaling $20 million and $30 million require the company to maintain a consolidated net worth, exclusive of intangible assets, of at least $900 million and $850 million

change clauses or rating triggers that affect access to the lines of credit.

In 2003, HEI's net cash flow of about $193 million (after dividends of $75 million) covered its $163 million construction program. Consolidated capital outlays are projected to hover around $213 million in 2004 and decline to $180 million in 2005. The higher expenditures are primarily for generation projects. However, the bulk of the construction program should continue to be funded internally. Importantly, ongoing modest growth in the Hawaii economy should allow the electric utility to generate relatively stable cash flows and the bank to maintain normal cash dividend levels (50% of its earnings) while still supporting its own business growth.

HEI has $150 million of debt capacity remaining under a Rule 415 shelf registration. As of Sept. 30, 2004, proceeds of approximately $13 million from a previous sale of special purpose revenue bonds issued by the State of Hawaii's Department of Budget and Finance for the benefit of HECO remained undrawn.

Outlook

The stable outlook on HEI reflects its limited competitive pressures, aggressive cost containment, steady banking operations, strong liquidity, and the expectation for gradual financial improvement. The economy continues to grow due to strength in nontourism sectors but may be affected by external conditions, such as the global economy and the threat of terrorist events in the U.S.

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The McGraw-Hill Companies

STANDARD & POOR'S UTILITIES

Publication date: 16-Sep-2004
Reprinted from RatingsDirect

Summary: Hawaiian Electric Industries Inc.

Credit Analyst: Barbara A Eiseman, New York (1) 212-438-7666

Credit Rating:
BBB/Stable/A-2

Rationale

Standard & Poor's Ratings Services bases its ratings on Hawaiian Electric Industries Inc. (HEI) on the consolidated credit profile of HEI's family of companies, which include the regulated electric utility Hawaiian Electric Co. Inc. (HECO) and its two utility subsidiaries (78% of core revenues and 66% of operating income as of Dec. 31, 2003) and the riskier financial services operations of subsidiary American Savings Bank FSB, which contributed 21% of core revenues and 34% of operating income as of Dec. 31, 2003.

HEI has an average business profile and somewhat weak, but gradually improving, financial measures. In March 2004, HEI issued 2 million shares of common stock. The net proceeds from the issuance were used in April 2004 to redeem $100 million of HEI-obligated trust preferred securities, to which Standard & Poor's gave only partial equity credit. The company's business position is characterized by limited competitive threats due to the utility's geographic isolation, nominal stranded-asset risk, modest rate-relief needs, an excellent fuel clause, and steady banking operations. American Savings Bank's consistent earnings are driven by net interest income from its low-cost deposit funding and low-risk earning-asset base. These strengths are tempered by Hawaii's tourism-driven economy, dependence on fuel oil, significant purchased-power obligations, and support of the somewhat riskier banking businesses.

Hawaii's economy has been growing modestly during the last several years and is expected to grow by 2.6% after inflation in 2004. The visitor industry remained relatively stable in 2003 as the weakness in the eastbound international sector was countered by the strength in the domestic market. Although total visitor arrivals were relatively stable (negative 0.8%), hotel occupancy rates were 3.0% higher and total visitor days and expenditures increased 2.9% and 4.7%, respectively. Furthermore, trends indicate an increase in both domestic and international arrivals with total visitor arrivals up 7.1% for the first four months of 2004 compared with the same period last year. Strength in key nontourism sectors, particularly real estate and the growing military commitment, coupled with low interest rates, have resulted in solid construction and real estate sales activity although future growth in real estate may slow with rising interest rates. Hawaii's future economic growth is expected to be tied primarily to the rate of expansion in the mainland U.S. and Japan economies and increased military spending, yet remains vulnerable to uncertainties in the world's geopolitical environment.

Total debt to capitalization (adjusted for off-balance-sheet obligations, such as purchased-power contracts, and including quarterly income and trust-originated preferred securities) was liberal at close to 57% at the end of

March 2004. However, because Standard & Poor's considers hybrid-preferred securities as having equity-like characteristics, this ratio overstates, for analytical purposes, the company's debt leverage. Furthermore, in March 2004, HEI issued 2 million shares of common stock ($104 million) and $50 million of medium-term notes and HECO issued $50 million of trust-preferred securities. The proceeds of the transactions were used to redeem $100 million of higher cost HEI trust-preferred securities and $100 million of HECO trust-preferred securities in April 2004.

Internal cash should continue to fund the bulk of the company's consolidated capital program through 2004, despite projected increases in construction spending. The higher level of spending is mainly for transmission and generation projects and energy solutions and customer choice technologies.

Although, as of June 30, 2004, funds from operations (FFO) interest coverage (adjusted for adjusted for off-balance-sheet obligations such as purchased-power commitments and hybrid-preferred stock) was suitable for the ratings at about 3.2x, FFO to total debt was very weak at roughly 17%. However, Standard & Poor's expects improvement in bondholder protection measures with adjusted FFO to total debt approaching 22% in nearby years owing to diminishing capital expenditures beginning in 2005, tight cost controls, and impact on the company's earnings from continued expansion of Hawaii's economy.

Short-term credit factors.
The short-term corporate credit and commercial paper ratings on HEI and HECO are 'A-2', incorporating strong liquidity and the ability to internally fund dividends and capital expenditure requirements. HEI faces a manageable maturity schedule, with only $1 million maturing in 2004 and $37 million maturing throughout 2005. HECO has no maturing long-term debt until 2012. At June 30, 2004, HEI had $25 million of cash and cash equivalents (excluding American Savings Bank's cash and cash equivalents). HEI and HECO have bank lines totaling $80 million and $90 million, respectively. Of HEI's facilities, $10 million matures in October 2004, $20 million matures in December 2004, $20 million matures in April 2005, and $30 million matures in June 2005. Of HECO's facilities, $50 million matures in April 2005, $10 million matures in May 2005, and $30 million matures in June 2005. At the end of June 2004, the lines were unused.

Covenants in HEI's and HECO's lines require HECO to maintain a consolidated capitalization ratio (exclusive of short-term debt) of at least 35%. At June 30, 2004, HECO's consolidated common equity to capitalization ratio was 55%. Certain HEI lines of credit totaling $20 million and $30 million require the company to maintain a consolidated net worth, exclusive of intangible assets, of at least $900 million and $850 million, respectively, which at the end of June 2004 was $1.077 billion. The covenants for the line of credit agreements do not contain interest coverage ratio requirements. None of HEI's or HECO's lines contains material adverse change clauses or rating triggers that affect access to the lines of credit.

In 2003, HEI's net cash flow of about $193 million (after dividends of $75 million) covered HEI's $163 million construction program. HECO outlays are projected to rise to $194 million in 2004 primarily due to rising expenditures

for generation projects. However, the bulk of the construction program should continue to be funded internally. Importantly, ongoing modest growth in the Hawaii economy should allow the electric utility to generate relatively stable cash flows and the bank to maintain normal cash dividend levels (50% of its earnings) while still supporting its own business growth.

HEI has $150 million of capacity remaining under a Rule 415 shelf registration covering debt transactions. As of June 30, 2004, proceeds of approximately $13 million from a previous sale of special purpose revenue bonds issued by the State of Hawaii's Department of Budget and Finance for the benefit of HECO remained undrawn.

Outlook

The stable outlook reflects limited competitive pressures, aggressive cost containment, steady banking operations, strong liquidity, and expectations for gradual financial improvement. The economy continues to grow due to strength in nontourism sectors but may be affected by external conditions, such as the global economy and the threat of terrorist events in the U.S.

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STANDARD &POOR'S UTILITIES

Publication date: 09-Jul-2004
Reprinted from RatingsDirect

Hawaiian Electric Industries Inc.

Credit Analyst: Barbara A Eiseman, New York (1) 212-438-7666

Major Rating Factors
Rationale
Outlook
Business Description
Rating Methodology
Business Profile
Financial Policy: Moderate
Financial Profile

Corporate Credit Rating

BBB/Stable/A-2

Business Profile

1 2 3 4 5 [6] 7 8 9 10

Financial policy:
Moderate

Debt maturities:
Hawaiian Electric Industries Inc.'s (parent company of Hawaiian Electric Co.) scheduled maturities of long-term debt are $1 million in 2004, $37 million in 2005, $110 million in 2006, $10 million in 2007, $50 million in 2008, $50 million in 2011, $7 million in 2012, $50 million in 2013, and $100 million due in 2014.

Hawaiian Electric Co. Inc. has no maturing long-term debt until 2012. Scheduled maturities are $57.5 million in 2012, $11.4 million in 2014, and $50 million in 2018. Remaining maturities of $599 million occur in 2020 and beyond.

Outstanding Rating(s)

Hawaiian Electric Industries Inc.	
Sr unsecd debt	
Local currency	BBB
CP	
Local currency	A-2
Pfd stk	
Local currency	BB+
American Savings Bank, FSB, Honolulu HI	
Corporate Credit Rating	BBB-/Stable/A-3
Certificate Of Deposit	
Local currency	BBB-/A-3
Hawaii Electric Light Company, Inc.	
Corporate Credit Rating	BBB+/Stable/--
Sr unsecd debt	
Local currency	BBB+
Hawaiian Electric Company, Inc.	
Corporate Credit Rating	BBB+/Stable/A-2
Sr unsecd debt	

Sr unsecd debt	
Local currency	BBB+

Corporate Credit Rating History

Nov. 16, 1990	BBB+/A-2
Feb. 9, 1993	BBB/A-2

Major Rating Factors

Strengths:

- Electric utility provides service to 95% of the state of Hawaii's population.
- Limited competitive threats due to the lack of interconnections and wheeling capability.
- Generally responsive regulatory climate with an excellent fuel clause.
- Cultivation of strong customer relationships.
- Little asset concentration risk.
- A moderating construction program after 2004.
- Exemption from acid rain provisions of the Clean Air Act.
- No nuclear exposure.
- Steady banking operations.

Weaknesses:

- High electric rates.
- A tourism-driven economy, which can be negatively affected by world events.
- Relatively heavy revenue reliance on the military.
- Large purchased-power obligations and dependence on imported fuel oil.
- Relatively weak, but improving, financial parameters.
- Ownership of somewhat riskier banking operations.

Rationale

The ratings on Hawaiian Electric Industries Inc. (HEI) are based on the consolidated credit profile of HEI's family of companies, which include the regulated electric utility, Hawaiian Electric Co. Inc. (HECO) and its two utility subsidiaries (78% of core revenues and 66% of operating income as of Dec. 31, 2003) and the riskier financial services operations of subsidiary American Savings Bank FSB (BBB-/Stable/A-3), which contributed 21% of core revenues and 34% of operating income as of Dec. 31, 2003.

HEI has an average business profile and somewhat weak, but gradually improving, financial measures. In March 2004, HEI issued 2 million shares of common stock. The net proceeds from the issuance were used in April 2004 to redeem $100 million of HEI-obligated trust preferred securities, to which Standard & Poor's gave only partial equity credit. The company's business position is characterized by limited competitive threats due to the utility's geographic isolation, nominal stranded-asset risk, modest rate-relief needs, an excellent fuel clause, and steady banking operations. American Savings Bank's consistent earnings are driven by net interest income from its low-cost deposit funding and low-risk earning-asset base. These strengths are tempered by Hawaii's tourism-driven economy, dependence on fuel oil, significant purchased-power obligations, and support of the somewhat riskier banking businesses.

Hawaii's economy has been growing modestly during the last several years and is expected to grow by 2.6% after inflation in 2004. The visitor industry remained relatively stable in 2003 as the weakness in the eastbound international sector was countered by the strength in the domestic market. Although total visitor arrivals were relatively stable (negative 0.8%), hotel

occupancy rates were 3.0% higher and total visitor days and expenditures increased 2.9% and 4.7%, respectively. Furthermore, trends indicate an increase in both domestic and international arrivals with total visitor arrivals up 7.1% for the first four months of 2004 compared with the same period last year. Strength in key nontourism sectors, particularly real estate and the growing military commitment, coupled with low interest rates, have resulted in solid construction and real estate sales activity although future growth in real estate may slow with rising interest rates. Hawaii's future economic growth is expected to be tied primarily to the rate of expansion in the mainland U.S. and Japan economies and increased military spending, yet remains vulnerable to uncertainties in the world's geopolitical environment.

Total debt to capitalization (adjusted for off-balance-sheet obligations, such as purchased-power contracts, and including quarterly income and trust-originated preferred securities) was liberal at close to 57% at the end of March 2004. However, because Standard & Poor's considers hybrid-preferred securities as having equity-like characteristics, this ratio overstates, for analytical purposes, the company's debt leverage. Furthermore, in March 2004, HEI issued 2 million shares of common stock ($104 million) and $50 million of medium-term notes and HECO issued $50 million of trust-preferred securities. The proceeds of the transactions were used to redeem $100 million of higher cost HEI trust-preferred securities and $100 million of HECO trust-preferred securities in April 2004.

Internal cash should continue to fund the bulk of the company's consolidated capital program through 2004, despite projected increases in construction spending. The higher level of spending is mainly for transmission and generation projects and energy solutions and customer choice technologies.

Although, as of March 31, 2004, adjusted funds from operations (FFO) interest coverage was suitable for the ratings at about 3.8x, FFO to total debt was very weak at roughly 19%. However, Standard & Poor's expects improvement in bondholder protection measures with adjusted FFO to total debt approaching 23% in nearby years owing to diminishing capital expenditures beginning in 2005, tight cost controls, paydown of $100 million of debt in April 2004 with proceeds from the recent common equity offering, and impact on the company's earnings from continued expansion of Hawaii's economy.

Short-term credit factors.
The short-term corporate credit and commercial paper ratings on HEI and HECO are 'A-2', incorporating strong liquidity and the ability to internally fund dividends and capital expenditure requirements. HEI faces a very manageable maturity schedule, with only $1 million maturing in 2004. HECO has no maturing long-term debt until 2012. At March 31, 2004, HEI had $169 million of cash and cash equivalents (excluding American Savings Bank's cash and cash equivalents). HEI and HECO have bank lines totaling $80 million and $90 million, respectively. Of HEI's facilities, $10 million matures in October 2004, $20 million matures in December 2004, $20 million matures in April 2005, and $30 million matures in June 2005. Of HECO's facilities, $50 million matures in April 2005, $10 million matures in May 2005, and $30 million matures in June 2005. At the end of March 2004, the lines were unused.

Covenants in HEI's and HECO's lines require HECO to maintain a consolidated capitalization ratio of at least 35%. At March 31, 2004, HECO's consolidated common equity to capitalization ratio was 52%. Certain HEI lines of credit totaling $20 million and $30 million require the company to maintain a consolidated net worth, exclusive of intangible assets, of at least $900 million and $850 million, respectively, which at the end of March 2004 was $1.135 billion. The covenants for the line of credit agreements do not contain interest coverage ratio requirements. None of HEI's or HECO's lines contains material adverse change clauses or rating triggers that affect access to the lines of credit.

In 2003, HEI's net cash flow of about $193 million (after dividends of $75 million) covered HEI's $163 million construction program. Outlays are projected to rise to $194 million in 2004

primarily due to rising expenditures for generation projects. However, the bulk of the construction program should continue to be funded internally. Importantly, ongoing modest growth in the Hawaii economy should allow the electric utility to generate relatively stable cash flows and the bank to maintain normal cash dividend levels (50% of its earnings) while still supporting its own business growth.

HEI has $150 million of capacity remaining under a Rule 415 shelf registration covering debt transactions. As of March 31, 2004, proceeds of approximately $14 million from a previous sale of special purpose revenue bonds issued by the State of Hawaii's Department of Budget and Finance for the benefit of HECO remained undrawn.

Outlook

Ratings stability for HEI reflects limited competitive pressures, aggressive cost containment, steady banking operations, strong liquidity, and expectations for gradual financial improvement. The economy continues to grow due to strength in nontourism sectors but may be affected by external conditions, such as the global economy and the threat of terrorist events in the U.S.

Business Description

HEI is a diversified holding company. Its core businesses are electric utilities (about 66% of operating income) and banking (34%). HECO and its subsidiaries Hawaii Electric Light Co. Inc. and Maui Electric Co. Ltd. provide electric service to 95% of Hawaii's population on the islands of Oahu, Maui, Hawaii, Lanai, and Molokai.

American Savings Bank, acquired by HEI in 1988 for a cash price of $115 million, is a federally chartered savings bank based in Honolulu, Hawaii. It operates 68 branches throughout Hawaii. As of March 31, 2004, American Savings Bank had assets of $6.5 billion and was the largest savings bank and third-largest financial institution in the state.

Rating Methodology

The corporate credit rating on HEI reflects the credit fundamentals of HECO as well as the higher-risk financial services operations of American Savings Bank. However, Standard & Poor's does not accord any credit uplift to American Savings Bank as a result of its affiliation with HEI.

In most circumstances, Standard & Poor's will not rate the debt of a wholly owned subsidiary higher than the rating of the parent. However, exceptions can be made on the basis of structural protections and/or regulatory insulation. In HECO's case, Standard & Poor's believes that there are adequate insulating conditions in Hawaii's statutory and regulatory framework, including orders issued by the Hawaii Public Utilities Commission (PUC) regarding the formation of the HEI's holding company structure, that insulate the utility from the parent's activities. The conditions imposed on HECO, and the PUC's ability, intent, and demonstrated willingness to protect HECO's creditworthiness provide Standard & Poor's with sufficient confidence to separate the corporate credit ratings of HEI and HECO by one notch.

Business Profile

Regulation.

The Hawaii PUC regulates HECO, Maui Electric, and Hawaii Electric Light separately. Allowed ROEs for each company were 11.4%, 10.94%, and 11.5%, respectively, which approximated industry averages. Automatic fuel adjustment clauses are adjusted monthly for changes in fuel and the fuel component of purchased power, and for variations from the projected generation mix. Purchased-power capacity and operation and maintenance expense costs are recoverable through base rates. In 1997, in approving fuel supply contracts, the PUC noted that the need for continued use of the energy cost adjustment clauses would be investigated, possibly in a generic docket or a future rate case. However, the clauses were continued in the most recent

Hawaii Electric Light and Maui Electric rate decisions in 2001 and 1999, respectively.

Rate case lag is offset partially by timely interim rate relief. Through March 31, 2004, HECO and its subsidiaries had recognized $17 million of revenues with respect to interim orders regarding certain integrated planning costs (including interest), which are subject to refund to the extent they exceed amounts allowed in final orders.

In October 2003, the PUC opened investigative dockets on competitive bidding and distributed generation to move toward a more competitive cost-based regulation. Given Hawaii's geographic isolation and separate island electric systems, Standard & Poor's expects the PUC and the state legislature to remain very conservative in any restructuring of the electric industry; and the PUC been very slow and deliberate in its investigation to date.

While there are no rate cases pending, HECO has committed to file a rate increase application with the PUC in the second half of 2004, using a 2005 test year. Higher rates are necessary to recover investments made in HECO's system since 1995. The timing of a prospective rate case filing for Hawaii Electric Light to recover costs relating to the delayed Keahole power plant expansion will depend on future circumstances.

Markets.
HECO (about 63% of consolidated utility net income) provides electricity on Oahu to about 287,000 customers. Maui Electric (23%) provides electricity on Maui, Molokai, and Lanai to nearly 61,000 customers. Hawaii Electric Light (14%) sells electricity on the island of Hawaii to about 69,000 customers. On a consolidated basis, the utility provides electric service to 95% of the state's 1.2 million residents. The service territories include numerous suburban communities, resorts, U.S. armed forces installations, a variety of federal and state complexes, and agricultural operations.

The company's operating results are significantly influenced by the Hawaii economy, which in turn is influenced by economic conditions in the mainland U.S. (particularly California) and Asia (particularly Japan). Growth in real gross state product was 2.7% and 2.8% in 2002 and 2003, respectively, and is expected grow by 2.6% in 2004.

The visitor industry is Hawaii's largest economic driver, and it has recovered from the adverse effects of the 2001 terrorist attacks. In 2002, tourism accounted for about 17% of 2002 gross state product, 22% of civilian jobs, and 26% of state and local taxes based on a study conducted by the State of Hawaii Department of Business, Economic Development, and Tourism (DBEDT). Through the end of April 2004, visitor arrivals were up 7.1% compared with the same period in 2003. DBEDT's 2004 forecasts visitor arrivals to rise 5.2%, visitor expenditures to increase 6.5%, and visitor days, which considers lengths of stay, to be up 4.0%. Key to tourism growth is the return of Japanese visitors to pre-Sept. 11, 2001 levels. In

Other signs of a strengthening Hawaii economy include growing employment and personal income and declining unemployment rates and bankruptcy filings. The state's unemployment rate was 3.5% at the end of March 2004, well below the national average of 6.0%. In light of positive trends in nontourism sectors and overall economic indicators, the DBEDT expects the Hawaii economy to grow by 2.6% in 2004, excluding inflation. Future growth in Hawaii is expected to be tied largely to the rate of expansion in the mainland U.S. and Japan economies, continued strength in real estate and construction and increased military spending, but remains vulnerable to uncertainties in the world's geopolitical environment.

Warm weather and increased usage by residential and commercial customers resulted in electricity sales growth of 2.4% in 2003 with a robust increase on the island of Hawaii of 5.1%. In light of continuing strength in the U.S. and Hawaii economies, kWh sales are expected to grow by 2.5% in 2004.

Operations.
The consolidated generation mix for 2003 was 78% fuel oil, 16% coal, 3% solid waste, and 3% geothermal and other. The system's purchased-power contracts for 531 MW of firm capacity accounted for about 39% of generation. The purchased-power contracts have been approved by the PUC, are dispatchable, contain minimum performance standards, and are recoverable through rates (energy price changes are passed on to customers monthly through the fuel adjustment mechanism; base energy charges and capacity payments are recovered through base rates).

HECO owns and operates three generating stations (16 units), with an aggregate net capability of 1,209 MW. The company's ownership of numerous small generating units diffuses asset concentration risk. Kahe is HECO's largest station and consists of six oil-fired facilities totaling 650 MW. Overall, Kahe has been a good performer, with availability factors in excess of 90%. To ensure service reliability, HECO supplements its own capacity with long-term power purchases of 180 MW from AES Barbers Point, 180 MW from Kalaeloa Partners L.P., and 46 MW from the city of Honolulu. Total generating capacity of 1,615 MW provided a 30% reserve margin over HECO's 2003 peak load of 1,242 MW.

Maui Electric has a net generating capability of 229 MW on Maui and a total of 22 MW on Lanai and Molokai. Maui Electric has a purchased-power contract with Hawaiian Commercial & Sugar Co. for 16 MW of capacity. A small steam turbine scheduled to come on line within the next five years will help boost the company's 24% reserve margin on the island of Maui.

Hawaii Electric Light has an aggregate net capability of 245 MW. The company has purchased-power arrangements with Puna Geothermal Ventures for 30 MW and Hilo Coast Processing Co. for 22 MW. Given recent expansion of the company's Keahole power plant, the contract with Hilo Coast will not be renewed following its expiration in December 2004.

After significant delays and litigation, Hawaii Electric Light reached a conditional settlement with virtually all of the project opponents and the state, paving the way for completion of the Keahole plant expansion. Construction resumed in November 2003. Two 20 MW combustion turbines (CT-4 and CT-5) were made available to Hawaii Electric Light's grid in the second quarter of 2004. In May 2004, one of the nominal 20 MW combustion turbines, CT-4, was installed and put into limited commercial operation. CT-5 is subject to ongoing testing, and both CT-4 and CT-5 are expected to be fully operational by year-end 2004. This is a major positive development since generation was needed to serve the fast-growing communities in west Hawaii.

An 18 MW heat steam recovery generator (HSRG) is slated to be installed following completion of the combustion turbines, all of which will be converted to a 56 MW (net) combined-cycle facility. According to the settlement agreement, the company will move expeditiously to install

the HSRG. Conditioned in part upon the reclassification of the site through the State Land Use Commission, the HSRG is expected to be installed outside the near-term planning horizon.

As of the end of March 2004, Hawaii Electric Light had expended $88 million on the Keahole project (excluding costs the PUC permitted to be transferred to plant-in-service for pre-air permit facilities). In May 2004, one of the nominal 20 MW combustion turbines, CT-4, was installed and put into limited commercial operation. Hawaii Electric Light reclassified $40 million

of capital costs for CT-4, related to pre-air permit facilities, from construction work in progress to plant and equipment. An additional $14 million will be required to complete the installations. The PUC has allowed the company to commit outlays for the project, but stated that the facility may not be included in its rate base until it is used and useful. If it becomes probable that the PUC will disallow some or all of the incurred costs for rate making, Hawaii Electric Light may be required to write off a material portion of the costs incurred.

In December 2003, the company filed with the PUC for approval of its new plan for the East Oahu transmission project (estimated at $55 million, including $20 million of costs incurred as of March 31, 2004). The project involves a series of 46 kV underground connections that will increase transmission reliability to an area representing 56% of Oahu electricity demand

combined heat and power systems.

Although HECO is spared the threat of wholesale power wheeling, it continues to concentrate on strengthening its utility franchise and capitalizing on evolving opportunities in various market segments. The company emphasizes cost control of capital projects and operations and maintenance expenses. Improved productivity, implementation of new technologies, and tighter construction schedules are lowering costs, reducing HECO's rate relief requirements, and reliance on outside capital.

Diversified activities.
American Savings Bank is a federally chartered savings bank based in Honolulu, Hawaii. HEI acquired American Savings Bank in 1988 from American Savings & Loan Association of Salt Lake City, Utah, for about $115 million. In December 1997, American Savings Bank acquired the Hawaiian operations of Bank of America Corp. American Savings Bank operates 68 branches throughout Hawaii and it has the third-largest deposit share in the state with approximately 16%. It has a solid retail deposit base, and single-family mortgages account for 77% of the loan portfolio. Although much energy has been expended to build a business-banking franchise over the last few years, its business-banking and commercial real estate portfolios remain a small percentage of total loans. American Savings Bank is also the parent of a REIT that holds $1.4 billion of loans and securities, primarily in mortgages and mortgage-related securities as of Dec. 31, 2003.

American Savings Bank has been involved in a tax dispute with the State of Hawaii Department of Taxation regarding the treatment of dividends American Savings Bank received from the REIT. As required under Hawaii law, American Savings Bank paid the disputed bank franchise taxes and interest ($17 million) in 1999, 2000, and 2001, but recorded this payment as a deposit rather than an expense. On June 7, 2004, the Hawaii Tax Appeals Court orally announced a decision in favor of the Department of Taxation and against American Savings Bank. American Savings Bank continues to believe that its tax position is proper, and it plans to appeal this decision. In the meantime, American Savings Bank will write off the $17 million deposit and expense the related bank franchise taxes and interest for subsequent periods. This will result in a charge to net income in the second quarter of 2004 of approximately $24 million (amounts through March 31, 2004), plus amounts for the second quarter of 2004. In future periods, bank franchise taxes will be recorded and expensed in that period.

The ratings on American Savings Bank reflect the consolidated savings bank's solid capitalization and its decent earnings dynamic derived from low-cost deposit funding and adequate earning-asset base. Other rating factors include American Savings Bank's competitive position and good asset quality. Interest rate risk management is much better than in the past but, given the current rate environment, interest rate risk exposure is a concern. The tax dispute involving the REIT dividends is not expected to have a significant adverse impact on future earnings. The bank is well positioned to take advantage of continued improvement in the Hawaiian economy that has been growing for the last several years; however, the bank lacks geographic diversity as it operates only in the very consolidated Hawaiian market. American Savings Bank has a solid position as the third-largest bank, but the top two banks hold dominant positions in the marketplace.

A low-cost deposit base has supported American Savings Bank's net interest margin, which remained over 3% despite a lower-yielding single-family emphasis within the loan portfolio. This, along with lower provision for loan loss and improving fee income, offset earnings pressure during 2003 from decreasing interest rates and increased overhead. Satisfactory earnings have allowed equity growth to outpace asset growth despite the normal 50%-of-earnings dividend payment to HEI. This has led to greatly improved leverage, which is quite strong on a risk-adjusted basis. Interest rate risk management has historically been complicated by the preponderance of fixed-rate assets caused by the Hawaiian single-family mortgage market being almost exclusively a fixed rate market. Management has invested heavily in people and systems to build a proper interest rate risk management capability;

however, interest rate risk is a concern given the potential for a return of rising rates after the prolonged falling rate environment.

The outlook for the bank remains stable, as a good Hawaiian economy should allow American Savings Bank to leverage its strong deposit franchise and grow the business as well as support continued improvement in capitalization and good asset quality. Returns will be affected as the bank continues to invest in operations, but underlying profitability remains solid and should support the continuation of normal cash dividend levels (50% of earnings) while still supporting the bank's own expected business growth.

Financial Policy: Moderate

HEI's financial policy has been moderate with respect to credit quality. Consolidated debt leverage is relatively high at about 57%, adjusted for off-balance-sheet obligations such as purchased-power commitments and hybrid-preferred stock. However, management is taking steps to strengthen its capital structure balance. In March 2004, HEI issued $104 million of common stock; net proceeds were used to redeem HEI-obligated trust-preferred securities, to which Standard & Poor's gave partial equity credit. Also, in late 2001, HEI issued $57 million of common equity with proceeds being applied toward paring debt levels.

At Dec. 31, 2003, HEI's common dividend payout ratio from continuing operations to shareholders was about 81%. Management intends to moderate its payout ratio in coming years by holding dividends flat and achieving greater earnings contributions from its utilities and bank.

Management has been committed to maintaining and improving HECO's capital structure balance. In the past, large amounts of equity have been infused into the utilities, in addition to HECO historically retaining about 25% of its earnings annually. In 2004, HECO's dividend to HEI will be reduced significantly, to about 15% of earnings. In 2005 and beyond Standard & Poor's expects HECO's dividend to HEI to be approximately 75% of its earnings.

Financial Profile

Profitability and cash flow.
Earnings protection measurements at the utility have been fairly consistent in recent years. When factoring in off-balance-sheet liabilities associated with purchased-power contracts, consolidated pretax interest coverage hovers around 3.0x. Although the current growth in the Hawaii economy may lead to modest financial gains, the company will have to continue to control expenses rigorously and pare debt levels to meaningfully lift bondholder protection parameters.

Construction expenditures, net of about $42 million in allowance for funds used during construction and $68 million in cash contributions in aid of construction for the five years through 2008, are projected to total $760 million, of which $194 million is slated for 2004. Depreciation and amortization over the same period are forecast at roughly $700 million. Despite accelerating capital outlays in 2004, the bulk of the construction program should continue to be funded internally. Importantly, continued growth in the Hawaii economy should allow the electric utility to generate relatively stable cash flows and the bank to maintain normal cash dividend levels (50% of earnings) while still supporting its own business growth.

Adjusted FFO interest coverage is suitable for current ratings at about 3.4x and FFO to total debt is marginally adequate at about 17%. Modest improvement in these ratios are expected due to a diminishing capital program, recent debt repayments, and tight cost controls. Realization of rate relief in later years may also help boost the financial metrics.

Capital structure and financial flexibility.

At the end of March 2004, HEI's total debt to capital (adjusted for purchased-power commitments and including $250 million trust-preferred securities was a liberal 56.9%). However, in March 2004, HEI issued 2 million shares of common stock and in April redeemed $100 million of higher cost HEI-obligated trust preferred securities, which modestly improved its capital structure. In addition, Standard & Poor's gives a certain amount of equity treatment to HECO's remaining quarterly income preferred securities (currently $50 million). Hence, the debt ratio overstates, for analytical purposes, the company's consolidated debt leverage. Prospectively, more balance should be restored to the capital structure from gradual debt reduction and growth in retained earnings.

HEI has adequate financial flexibility to meet its projected needs, as demonstrated by a market-to-book ratio of 169% as of March 31, 2004, and adequate bank lines. HEI faces a manageable near-term maturity schedule, with only $1 million maturing in 2004 and $37 million in 2005.

HECO has an appropriate level of financial flexibility to meet its construction requirements, sufficient short-term credit facilities, and a very manageable debt maturity schedule with no long-term debt coming due until 2012.

At March 31, 2004, HEI had $169 million of cash and cash equivalents (excluding American Savings Bank's cash and cash equivalents). HEI and HECO have bank lines totaling $80 million and $90 million, respectively, all of which were unused at the end of March 2004.

HEI has $150 million of capacity remaining under a Rule 415 shelf registration covering debt transactions. As of March 31, 2004, proceeds of approximately $14 million from a previous sale of special purpose revenue bonds issued by the State of Hawaii's Department of Budget and Finance for the benefit of HECO remained undrawn.

Table 1 Hawaiian Electric Industries Inc. -- Financial Summary

Industry Sector: Integrated Electric

	--Year ended March 31--	--Years ended Dec. 31--			
Rating history	BBB/Stable/A-2	BBB/Stable/A-2	BBB/Stable/A-2	BBB/Negative/A-2	BBB/Negative/A-2
	2004	**2003**	**2002**	**2001**	**2000**
(Mil. $)					
Sales	1,793.8	1,781.3	1,653.7	1,727.3	1,732.3
Net income from cont. oper.	124.7	118.0	118.2	107.7	109.3
Funds from oper. (FFO)	274.2	268.2	302.8	258.5	245.9
Capital expenditures	177.2	162.9	128.1	126.3	134.6
Total debt	1,389.5	1,264.4	1,306.3	1,345.8	1,393.1
Preferred stock	34.4	34.4	34.4	34.4	34.4
Common equity	1,228.0	1,089.0	1,046.3	929.7	839.1
Total capital	2,651.9	2,387.9	2,387.0	2,309.8	2,267.4
Ratios					

Hawaiian Electric Industries Inc.

Adj. EBIT interest coverage (x)	2.9	2.8	2.7	2.5	2.5
Adj. FFO interest coverage (x)	3.8	3.7	4.0	3.3	3.2
Adj. FFO/avg. total debt (%)	18.7	18.8	20.7	17.2	16.5
Net cash flow/capital expenditures (%)	112.1	118.5	179.1	151.6	113.6
Adj. total debt/capital (%)	54.8	55.5	57.3	60.5	63.5
Return on common equity (%)	10.2	10.5	11.4	11.4	9.1
Common dividend payout (%)	60.6	63.6	62.1	62.2	80.8

Table 2 Hawaiian Electric Co. -- Financial Summary

Industry Sector: Integrated Electric

	--Year ended March 31--	--Years ended Dec. 31--			
Rating	BBB+/Stable/A-2	BBB+/Stable/A-2	BBB+/Stable/A-2	BBB+/Negative/A-2	BBB+/Negative/A-2

	2004	2003	2002	2001	2000
(Mil. $)					
Sales	1,411.0	1,393.0	1,252.9	1,284.3	1,270.6

Hawaiian Electric Industries Inc.

Adj. FFO interest coverage (x)	4.1	4.0	4.3	4.0	3.7
Adj. FFO/avg. total debt (%)	21.4	21.9	22.8	21.1	20.6
Net cash flow/capital expenditures (%)	96.9	100.0	149.2	150.0	98.1
Adj. total debt/capital (%)	51.1	49.2	49.5	51.3	54.1
Return on common equity (%)	7.8	7.8	9.4	9.6	9.7
Common [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 3 Hawaiian Electric Co. -- Competitors

Industry Sector: Integrated Electric

	--Average of past three fiscal years--			
	Hawaiian Electric Co.	**Portland General Electric Co.**	**Pacificorp**	**Empire District Electric Co.**
Business Profile Score	6	5	5	6
Rating	BBB+/Stable/A-2	BBB+/Watch Neg/A-2	A-/Negative/A-2	BBB/Stable/A-2
(Mil. $)				
Sales	1,310.1	2,218.0	3,674.4	298.6
Net income from cont. oper.	87.8	47.1	238.5	23.0
Funds from oper. (FFO)	210.6	248.8	531.7	63.1
Capital expenditures	124.9	176.3	579.6	72.7
Total debt	816.6	1,039.3	4,073.2	419.8
Preferred stock	34.3	18.7	41.3	0.0
Common equity	915.0	1,134.3	3,121.8	325.5

Adj. FFO/avg. total debt (%)	21.9	19.2	11.0	13.1
Net cash flow/capital expenditures (%)	130.1	132.2	64.0	48.7
Adj. total debt/capital (%)	50.0	52.9	61.2	57.2
Return on common equity (%)	8.9	3.8	6.9	8.1
Common dividend payout (%)	53.7	29.6	66.5	121.9

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Hawaiian Electric Company, Inc.

Credit Analyst: Barbara A Eiseman, New York (1) 212-438-7666

Major Rating Factors
Rationale
Outlook

Corporate Credit Rating BBB+/Stable/A-2

Business Profile

Corporate Credit Rating	BBB+/Stable/--
Sr unsecd debt	
Local currency	BBB+

Corporate Credit Rating History

Nov. 16, 1990	A-/A-2
Feb. 9, 1993	BBB+/A-2

Company Contact
Lori Ann Nagata 1-808-543-7893

Major Rating Factors

Strengths:

- Electric utility market share of 95% in Hawaii.
- Limited competitive threats, no interconnections, and no wheeling.
- Generally responsive regulatory climate with an excellent fuel clause.
- Little asset concentration risk.
- A moderating construction program.
- Exempt from acid rain provisions of the Clean Air Act.
- No nuclear exposure.
- Nominal rate relief needs.

Weaknesses:

- High electric rates.
- A tourism-dependent economy.
- Relatively heavy revenue reliance on the military.
- Large purchased-power obligations.
- Little fuel diversity and dependence on fuel oil.
- Relatively weak, but improving financial parameters.
- Uncertainty regarding completion and recovery of costs associated with the Keahole plant expansion on the Big Island of Hawaii.
- Parent support of somewhat riskier banking operations.

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Rationale

The ratings on Hawaiian Electric Co. Inc. (HECO) are based on the consolidated credit profile of Hawaiian Electric Industries Inc. (HEI), which includes the electric utility operations of HECO and its two island utility subsidiaries (76% of core revenues) and the banking operations of HEI subsidiary American Savings Bank FSB (ASB; 24% of core revenues). The ratings on the company reflect an average business profile and somewhat weak, but gradually improving, financial measures.

In most circumstances, Standard & Poor's will not rate the debt of a wholly owned subsidiary higher than the rating of the parent. However, exceptions can be made on the basis of structural protections and/or regulatory insulation. In HECO's case, Standard & Poor's believes that there are adequate insulating conditions in Hawaii's statutory and regulatory framework, including orders issued by the Hawaii Public Utilities Commission (PUC) regarding the formation of the holding company structure, that isolate the utility

from the parent's activities. The conditions imposed on HECO and the PUC's ability, intent, and demonstrated willingness to protect the creditworthiness of HECO provide Standard & Poor's with sufficient comfort to separate the corporate credit ratings on HEI and HECO.

HECO's average business position is a function of high electric rates, Hawaii's tourism-dependent economy, significant reliance on fuel oil, large purchased-power obligations, and heavy revenue dependence on the military. These weaknesses are only partly offset by limited competitive threats because of the utility's geographic isolation, nominal stranded asset risk, and a generally supportive regulatory environment with an excellent fuel clause. HECO is spared the competitive threat of wholesale wheeling, but its market share for direct kWh sales could erode over time because of inroads from demand-side management (DSM), energy services companies, and nonutility generators.

Construction spending has moderated, with net outlays averaging about 7% of total capital and internal cash flow generously covering HECO's construction program. Total debt to capital (adjusted for off-balance-sheet obligations, such as purchased power contracts) has shown modest improvement and now stands at about 45%. Total debt to capital including $100 million of fixed-rate quarterly income-preferred securities is nearly 50%. However, because Standard & Poor's generally gives a certain amount of equity treatment to hybrid preferred securities, this ratio overstates, for analytical purposes, the company's leverage.

While adjusted funds from operations (FFO) interest coverage is strong for the ratings at 4.7x, other key measures of bondholder protection are subpar with pretax interest coverage and FFO to total debt at about 3.6x and 25.1%, respectively. Yet, Standard & Poor's envisions improvement in bondholder protection due to the diminishing capital program, tight cost controls, gradual paydown of debt, and continued recovery of Hawaii's economy. However, the war with Iraq and any other future global developments that would heighten international security concerns are likely to harm Hawaii's visitor industry. Any military troop deployment out of Hawaii would also have a negative economic impact.

Liquidity

Liquidity should continue to be solid. HECO has no maturing long-term debt until 2012 and faces a period of moderate capital spending. At Dec. 31, 2002, HEI had $30 million of cash and cash equivalents (excluding ASB's cash and cash equivalents). At Dec. 31, 2002, HEI and HECO had bank lines totaling $70 million and $100 million, respectively. Of HEI's facilities, $30 million matures in April 2003, $30 million matures in June 2003, and $10 million matures in October 2003. HECO's lines mature as follows: $20 million in March 2003, $30 million in April 2003, $10 million in May 2003, and $40 million in June 2003. On Jan. 1, 2003, HECO reduced its total bank credit lines to $90 million; HECO requested that the $40 million line of credit maturing in June 2003 be reduced to $30 million. At the end of December 2002, the lines were unused.

In order to comply with the covenants in these facilities, HECO must maintain a consolidated capitalization ratio of at least 35%. The common equity to capitalization ratio is calculated as consolidated common equity divided by the sum of consolidated long-term debt, consolidated co-obligated trust securities, consolidated preferred stock, and consolidated common equity. HECO's consolidated entities are HECO, Hawaii Electric Light Co. Inc., Maui Electric Co. Ltd., and HECO Capital Trust I and II. At Dec. 31, 2002, HECO's consolidated common equity to capitalization ratio was 52%. The covenants for the line of credit agreements do not contain interest coverage ratio requirements. None of HEI's or HECO's lines contain material adverse change clauses or ratings triggers. Following HEI's $100 million debt issuance in March 2003, HEI has $200 million of shelf

capacity under a Rule 415 shelf registration covering debt transactions. As of Dec. 31, 2002, $16 million of proceeds from previous sales of special purpose revenue bonds by the State of Hawaii's Department of Budget and Finance issued for the benefit of HECO remained undrawn.

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Outlook

The stable outlook for HECO mirrors that of its parent HEI and reflects continued recovery in the Hawaii economy, moderate construction spending, aggressive cost containment, limited competitive pressures, steady banking operations, and expectations for continued gradual financial improvement. However, the war with Iraq, tensions with North Korea, and the threat of terrorist events in the U.S. are risks to Hawaii's economic growth and the company's financial profile.

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Business Description

HECO, Maui Electric, and Hawaii Electric Light provide electric service to 95% of the population on the islands of Oahu, Maui, Hawaii, Lanai, and Molokai. ASB, acquired by HEI in 1988, is the third-largest financial institution in Hawaii.

Parent holding company HEI's core businesses include HECO's electric utility operations and its utility subsidiaries, Maui Electric and Hawaii Electric Light (76% of core revenues), and banking (24%).

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Rating Methodology

In most circumstances, Standard & Poor's will not rate the debt of a wholly owned subsidiary higher than the rating of the parent. However, exceptions can be made on the basis of structural protections and/or regulatory insulation. In the case of HECO, Standard & Poor's believes that there are adequate insulating conditions in the statutory and regulatory framework in Hawaii, including orders issued by the PUC with regard to the formation of the HEI holding company structure that isolate the utility from the parent's activities. The conditions imposed on HECO and the PUC's ability, intent, and demonstrated willingness to protect the creditworthiness of HECO provide Standard & Poor's with sufficient comfort to separate the corporate credit ratings of HEI and HECO by one notch.

HECO's senior unsecured debt is rated 'BBB+', the same as the corporate credit rating, because it is the senior debt type.

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Business Profile

Regulation.

The Hawaii PUC regulates HECO, Maui Electric, and Hawaii Electric Light separately. Allowed ROEs for each company were 11.4%, 10.94%, and 11.5%, respectively, which is in line with the industry average. Rate case lag is offset partially by timely interim rate relief. In early 2001, the PUC dismissed the company's application for performance-based ratemaking, indicating its intention to retain its current cost of service/rate of return methodology for determining rates.

With regard to competition, the collaborative proceeding that was initiated several years ago to determine whether changes should be made in Hawaii's electric utility infrastructure has been dormant. Given Hawaii's geographic isolation and separate island electric systems, Standard & Poor's expects the PUC and the legislature to remain very conservative in any restructuring of the electric industry.

Because the utility's construction program is diminishing and with the continuing success of programs to cut costs and improve productivity and efficiency, less rate relief will be needed in the future. The timing of a prospective rate case filing for Hawaii Electric Light to recover costs relating to the suspended Keahole power plant expansion, including the remaining costs of pre-air permit facilities, will depend on future circumstances.

Markets.
HECO (66% of consolidated utility net income) provides electricity on Oahu to about 283,000 customers. Maui Electric (20%) renders electric service on Maui, Molokai, and Lanai to nearly 60,000 customers. Hawaii Electric Light (14%) sells electricity on the island of Hawaii to about 66,000 customers. On a consolidated basis, the utility provides electric service to 95% of the state's 1.2 million residents. The service territories include numerous suburban communities, resorts, U.S. armed forces installations, a variety of federal and state complexes, and agricultural operations.

The company's operating results are significantly influenced by the Hawaii economy, which in turn is influenced by economic conditions in the mainland U.S. (particularly California) and Asia (particularly Japan). The Hawaii economy continues to rebound from the negative effects of the Sept. 11, 2001 terrorist attacks and the weak economic performances in the U.S. mainland and Japan. However, the war with Iraq, tensions with North Korea, and the threat of terrorist events in the U.S. are risks to Hawaii's economic growth.

Hawaii's real gross state product grew by an estimated 2.1% in 2002, owing to a moderate recovery in tourism and continued strength in the local construction and real estate industries. Notwithstanding the lagging international market, total visitor arrivals grew 0.9% in 2002 due to strong recovery in the domestic market. Domestic visitor days grew 5% to a record high in 2002 and hotel occupancy increased 1.1% in 2002 over 2001.

Other signs of a recovering economy include growing employment and personal income and declining unemployment rates and bankruptcy filings. The unemployment rate was 3.8% in December 2002, lower than the national average of 5.7%.

Local economists forecast moderate growth for the Hawaii economy in 2003. The State of Hawaii Department of Business, Economic Development and Tourism (DBEDT) forecasts total visitor arrivals to grow over 5% in 2003 as a result of expected recovery in the Japan market as well as continued growth from key U.S. mainland areas. The local construction and real estate industries are expected to continue to thrive due to low interest rates. Construction spending increased over 10% in 2002, and private building permits, an indicator of future construction activity, increased almost 12% in 2002 over 2001. Residential real estate sales improved in 2002, with Oahu home sales up nearly 15% and resale prices up over 117% from 2001. Under this scenario of recovery in the visitor industry and continued strength in key local industries, DBEDT expects the Hawaii economy to grow 1.7% after inflation in 2003 and the job count to increase 1.4%. However, the war with Iraq, increasing tensions with North Korea, and the threat of terrorist events in the U.S. are key uncertainties and risks to Hawaii's economic growth. The actual impact of the war depends on the duration and how successfully it is

conducted. If the war is short and concluded successfully, the impact on Hawaii's economy would be partially offset by a corresponding recovery in arrivals.

The defense industry is also an important component of Hawaii's economy, accounting for about 16% of kWh sales on Oahu and 9% of consolidated total kWh sales. Any military troop deployments out of Hawaii will also have a negative economic impact.

The five-year average annual growth rate for electricity sales, net of the effects of DSM programs, is projected to be 1.8% through 2007.

Operations.
The consolidated generation mix for 2002 was 79% fuel oil, 16% coal, 3% solid waste, and 2% geothermal and other. The system's purchased-power contracts for 510 MW of firm capacity accounted for about 38% of generation. HECO's contracts have been approved by the PUC, are dispatchable, contain minimum performance standards, and are recoverable through rates (energy price changes are passed on to customers through the fuel adjustment mechanism; base energy charges and capacity payments are recovered through base rates).

HECO owns and operates three generating stations (16 units), with an aggregate gross capability of 1,263 MW. The company's ownership of numerous small generating units diffuses asset concentration risk. Kahe is HECO's largest station and consists of six oil-fired facilities totaling 650 MW. Overall, Kahe has been an excellent performer, with availability factors in excess of 90%. To ensure service reliability, HECO supplements its own capacity with long-term power purchases of 180 MW from AES Barbers Point, 180 MW from Kalaeloa Partners L.P., and 46 MW from the city of Honolulu. Total generating capacity of 1,669 MW provided a 34% reserve margin over HECO's 2002 peak load of 1,250 MW.

Maui Electric has a generating capability of 250 MW on Maui and a total of 22.5 MW on Lanai and Molokai. Maui Electric has a purchased-power contract with Hawaiian Commercial & Sugar Co. for 16 MW of capacity. A small combustion turbine scheduled to come on line within the next five years will help boost the company's 33% reserve margin on the island of Maui.

Hawaii Electric Light has an aggregate capability of 178 MW. The company has purchased-power arrangements with Puna Geothermal Ventures (PGV) for 30 MW (currently PGV has been derated to about 5 MW) and Hilo Coast Processing Co. for 22 MW. More capacity is needed to enhance service reliability and to strengthen Hawaii Electric Light's slim reserve margin.

A continuing concern has been securing adequate generating capacity on the island of Hawaii. Hawaii Electric Light needs capacity and has been trying to install two 20 MW combustion turbines (CT-4 and CT-5), followed by an 18 MW heat steam recovery generator, all of which would be converted to a 56 MW (net) combined-cycle facility. Yet, installation at its Keahole power plant site has been delayed by difficulties in obtaining an air permit (no longer an issue, as the air permit became final in November 2001) and by lawsuits, claims, and petitions filed by opponents of the project.

As a result of a Sept. 19, 2002 decision by the Third Circuit Court of Hawaii reversing an extension of a construction deadline, which had been granted by the Board of Land and Natural Resources, the construction of CT-4 and CT-5, which had re-commenced in April 2002 after the circuit court lifted a stay on construction, has been suspended. The

company has appealed this ruling to the Hawaii Supreme Court and is considering other options that may allow completion of the turbines (including seeking a land-use reclassification of the site). However, at this time neither the likelihood of success nor the timing of any successful effort can be ascertained. The company has deferred plans for the 18 MW heat recovery steam generator to a date outside the near-term planning horizon, conditioned in part upon reclassification of the site through the State Land Use Commission.

The PUC has allowed the company to commit outlays for the project, but stated that the facility may not be included in the rate base until it is used and useful. If none of the company's options to complete construction are successful, Hawaii Electric Light may be unable to complete installation of the turbines and may be required to write off a material portion of the costs incurred; as of Dec. 31, 2002, $82 million had been expended on the combustion turbines and associated equipment and costs.

Meanwhile, Hawaii Electric Light has contracted with Hamakua Energy Partners for 60 MW of firm capacity, which has been in service since December 2000.

HECO is also facing several challenges regarding its proposed Kamoku to Pukele 138 kv transmission line project that would close the gap between the southern and northern corridors on Oahu. The company is evaluating alternative ways to accomplish the project and possible future actions to expedite PUC review of the alternatives (and need for the project). Until this evaluation of alternatives is completed, an estimated project completion date cannot be determined. Ultimately, if it becomes probable that the PUC will disallow some or all of the costs for rate-making purposes, the company may be required to write off a material portion of the costs incurred; as of Dec. 31, 2002, $17 million had been incurred in efforts to put the line into service.

A higher level of generating reserves is needed in Hawaii because HECO's generating plants are not interconnected with those of its subsidiaries. However, with expectations of modest customer demand, conservation and load management measures, the need for major generating additions is diminishing. As a result, about 53% of consolidated construction expenditures for the next five years are for transmission and distribution projects; 47% is mainly for generation and other projects.

HECO is exempt from the Clean Air Act's acid rain provisions, which is an important strength for the utility.

Competitive position.
HECO's total cost of production and rates are significantly greater than those of other utilities. This high cost structure stems from the company's lack of interconnections, which cause the company to require hefty reserve margins, and its significant dependence on fuel oil. However, HECO is not adversely affected by the National Energy Policy Act of 1992. The company has no wholesale load, and its utility systems do not interconnect with any other utility. Therefore, there is no risk of a competitor wheeling in low-cost power from across state lines. Furthermore, the company's geographic isolation and absence of nuclear generating units reduce the risk of stranded investment. Yet, to remain competitive, the company continues to focus on improving customer satisfaction and productivity, partnering with customers, containing costs, and finding new revenue

customer retention by developing partnership projects with key customers to better understand and meet their needs.

Independent power projects are well established in HECO's service area and continue to go after new projects. Prospectively, HECO's market share for direct electric sales could contract because of customer self-generation with or without cogeneration and inroads from DSM, energy service companies, and new technologies. Competition in the generation sector in Hawaii is moderated, however, by the scarcity of sites, various permitting processes, and lack of interconnections to other utilities. Moreover, HECO has been able to compete successfully by offering customers economic alternatives that, among other things, employ energy-efficient electrotechnologies, such as heat pump water heaters, and distributed generation energy options, such as combined hear and power systems.

Although HECO is spared the threat of wholesale power wheeling because of its freestanding power grid, it continues to concentrate on strategies to strengthen its utility franchise and capitalize on evolving opportunities in various market segments. The company emphasizes cost control of capital projects and operations and maintenance expenses. Improved productivity, implementation of new technologies, and tighter construction schedules are lowering costs, reducing HECO's rate relief requirements, and reliance on outside capital.

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Financial Policy: Moderate

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Financial Profile

HEI's financial policy has been moderate with respect to credit quality. Consolidated debt leverage is relatively high at about 55%, including off-balance-sheet obligations such as purchased-power commitments, and the use of hybrid-preferred stock is liberal. However, management is taking steps to strengthen its capital structure balance. In late 2001, HEI issued $50 million of common equity with proceeds being applied toward paring debt levels. In addition, the dividend reinvestment and stock purchase plan contributes to enhancing shareholder equity.

At Dec. 31, 2002, HEI's common dividend payout ratio from continuing operations to shareholders was about 76%. Management intends to moderate its payout ratio in coming years by holding dividends flat and by achieving greater earnings contributions from its utilities and the bank.

Management has been committed to maintaining and improving HECO's capital structure balance. In the past, large amounts of equity have been infused into the utilities, in addition to the utilities retaining some 25% of their earnings annually.

Profitability and cash flow.
Earnings protection measurements at the utility have been fairly consistent in recent years. When factoring in off-balance-sheet liabilities associated with purchased-power contracts, pretax interest coverage hovers around 3.6x, which is a bit weak for the ratings. Although the current recovery in the Hawaii economy may lead to modest financial gains, the company will have to continue to control expenses rigorously and pare debt levels to meaningfully lift bondholder protection parameters. However, the war with Iraq, tensions

with North Korea, and the threat of terrorist events in the U.S. are risks to Hawaii's economic growth and the company's financial profile.

Construction expenditures--net of $31 million in allowance for funds used during construction and $62 million in cash contributions in aid of construction for the five years through 2007--are projected to total $700 million, of which $158 million is slated for 2003. Roughly 53% of the prospective capital program is for transmission and distribution facilities, with the remaining 47% mainly for generation and other projects. Depreciation and amortization over the same period are forecast at about $700 million.

Construction spending has moderated with cash flow after dividends covering HECO's capital program. Although adjusted FFO interest coverage is adequate for current ratings at about 4.7x, FFO to total debt is subpar at 25.1%. Modest improvement is expected due to the diminishing capital program and cost controls.

Capital structure and financial flexibility.
Management has been committed to maintaining capital structure balance at HECO. Total debt to capital (adjusted for off-balance-sheet obligations, such as purchased-power contracts) has shown modest improvement and now stands at about 45%, a level that is suitable for the current ratings. Total debt to capital, including $100 million of fixed-rate quarterly income-preferred securities, is nearly 50%. However, because Standard & Poor's generally gives a certain amount of equity treatment to hybrid preferred securities, this ratio overstates, for analytical purposes, the company's leverage.

HEI has adequate financial flexibility to meet its projected needs, as demonstrated by a market-to-book ratio of 155% as of Dec. 31, 2002 and adequate bank lines. HEI has $136 million of medium-term notes coming due in 2003, $1 million in 2004, $37 million in 2005, $110 million in 2006, $10 million in 2007, $7 million in 2012, and $100 million in 2014.

HECO has an appropriate level of financial flexibility to meet its moderating construction requirements, sufficient short-term credit facilities, and a very manageable debt maturity schedule with no long-term debt coming due until 2012.

At Dec. 31, 2002, HEI had $30 million of cash and cash equivalents (excluding ASB). At the end of 2002, HEI and HECO had bank lines totaling $70 million and $100 million, respectively. Of HEI's facilities, $30 million matures in April 2003, $30 million matures in June 2003, and $10 million matures in October 2003. HECO's lines mature as follows: $20 million in March 2003, $30 million in April 2003, $10 million in May 2003, and $40 million in June 2003. On Jan. 1, 2003, HECO reduced its total bank credit lines to $90 million; HECO requested that the $40 million line of credit maturing in June 2003 be reduced to $30 million. At the end of December 2002, the lines were unused.

In order to comply with the covenants in these facilities, HECO must maintain a consolidated capitalization ratio of at least 35%. The common equity to capitalization ratio is calculated as consolidated common equity divided by the sum of consolidated long-term debt, consolidated co-obligated trust securities, consolidated preferred stock, and consolidated common equity. HECO's consolidated entities are HECO, Hawaii Electric Light, Maui Electric, and HECO Capital Trust I and II. At Dec. 31, 2002, HECO's consolidated common equity to capitalization ratio was 52%. The covenants for the line of credit agreements do not contain interest coverage ratio requirements. None of HEI's or HECO's lines contain material adverse change clauses or ratings triggers. Following HEI's $100 million debt issuance in March 2003, the company has $200 million of shelf capacity under a Rule 415 shelf registration covering debt transactions. As of Dec. 31, 2002, $16 million of proceeds from previous sales of special purpose revenue bonds by the State of

Hawaii's Department of Budget and Finance issued for the benefit of HECO remained undrawn.

At the end of 2002, HEI's common dividend payout ratio from continuing operations was 76%. Management intends to lower its payout ratio over time, owing largely to expectations of greater profits from the utility and bank operations and holding dividends flat. The ability to achieve a more moderate payout ratio will depend on continued strength in the Hawaii economy.

Hawaiian Electric Co. Inc. Financial Statistics

	--12 months ended Sept. 30--	--Fiscal years ended Dec. 31--			
(Mil. $)	**2002**	**2001**	**2000**	**1999**	**1998**
Rating	BBB+/Stable/A-2	BBB+/Negative/A-2	BBB+/Negative/A-2	BBB+/Stable/A-2	BBB+/Stable/A-2
Sales	1,230.7	1,284.3	1,270.6	1,050.3	1,008.9
Net income from cont. operations	89.4	89.4	88.4	76.4	84.2
Funds from operations (FFO)	214.2	207.4	194.3	173.6	165.7
Capital expenditures (capex)	114.4	113.3	127.2	105.6	126.0
Total debt	718.8	733.6	780.9	753.0	808.5
Preferred stock	134.3	134.3	134.3	134.3	134.3
Common equity	915.6	877.2	825.0	806.1	786.6
Total capital	1,768.7	1,745.1	1,740.2	1,693.4	1,729.4
Ratios					
Adjusted EBIT interest coverage (x)	3.6	3.5	3.3	3.0	3.1
Adjusted FFO interest coverage (x)	4.7	4.4	4.1	3.8	3.5
Adjusted FFO/average total debt (%)	25.1	23.4	21.6	18.8	18.1
NCF/capex (%)	142.0	150.1	98.0	110.3	79.2
Adjusted total debt/capital (%)	44.6	46.0	48.7	48.5	51.0

Return on common equity (%)	9.2	9.6	9.7	8.6	8.3
Common dividend payout (%)	57.3	41.1	78.5	74.3	77.4

NCF--Net cash flow.

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STANDARD & POOR'S UTILITIES

ıblication date: 16-Mar-2004
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lawaiian Electric's $50 Million Medium-Term Notes Rated 'BBB'

ɜdit Analyst: Barbara A Eiseman, New York (1) 212-438-7666

NEW YORK (Standard & Poor's) March 16, 2004--Standard & Poor's Ratings Services said today that it assigned its 'BBB' rating to Hawaiian Electric Industries Inc.'s (HEI; BBB/Stable/A-2) $50 million medium-term notes due 2011. The outlook is stable.

Net proceeds will be used to make short-term loans to electric utility subsidiary Hawaiian Electric Co. Inc. (HECO; BBB+/Stable/A-2), principally to assist the company in redeeming trust preferred securities and/or for working capital and other general corporate purposes.

"Ratings stability for HEI reflects limited competitive pressures, aggressive cost containment, steady banking operations, strong liquidity, and expectations for gradual financial improvement," said Standard & Poor's credit analyst Barbara Eiseman.

"The economy continues to grow due to strength in nontourism sectors, but may be impacted by external conditions, such as the global economy and the threat of terrorist events in the U.S.," added Ms. Eiseman.

The ratings on HEI are based on the consolidated credit profile of HEI's family of companies, which include the regulated electric utilities HECO and its two utility subsidiaries and the riskier financial services operations of subsidiary American Savings Bank FSB (BBB-/Stable/A-3).

During 2003, the utility operations contributed 78% of core revenues and 67% of operating income, and the financial services operations contributed 21% of core revenues and 35% of operating income.

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STANDARD & POOR'S UTILITIES

ıblication date: 10-Mar-2004
ɜprinted from RatingsDirect

lawaiian Electric's $50 Million Preferred Stock Rated 'BBB-'

edit Analyst: Barbara A Eiseman, New York (1) 212-438-7666

NEW YORK (Standard & Poor's) March 10, 2004--Standard & Poor's Ratings Services said today that it assigned its 'BBB-' rating to HECO Capital Trust III's $50 million cumulative quarterly income preferred securities series 2004. HECO Capital Trust III is a statutory trust of Hawaiian Electric Co. Inc. (HECO; BBB+/Stable/A-2). The outlook is stable.

Proceeds will be used to redeem junior subordinated deferrable interest debentures that were issued to HECO Capital Trust I in 1997, and HECO Capital Trust I will in turn redeem its outstanding trust preferred and common securities.

"Ratings stability for HECO mirrors that of parent Hawaiian Electric Industries Inc. and reflects limited competitive pressures, aggressive cost containment, steady banking operations, strong liquidity, and expectations for gradual financial improvement," said Standard & Poor's credit analyst Barbara Eiseman.

"The economy continues to grow due to strength in nontourism sectors, but may be impacted by external conditions, such as the global economy and the threat of terrorist events in the U.S.," added Ms. Eiseman

The ratings on HECO are based on the consolidated credit profile of its parent, Hawaiian Electric Industries, which includes HECO's electric utility operations and its two island utility subsidiaries and the riskier financial services operations of HEI subsidiary, American Savings Bank FSB.

During 2003, the electric utility operations contributed 78% of core revenues and 67% of operating income, and the banking operations contributed 21% of core revenues and 35% of operating income.

Complete ratings information is available to subscribers of RatingsDirect, Standard & Poor's Web-based credit analysis system, at www.ratingsdirect.com. All ratings affected by this rating action can be found on Standard & Poor's public Web site at www.standardandpoors.com; under Credit Ratings in the left navigation bar, select Find Ratings, then Credit Ratings Search.

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ublication date: 10-Mar-2004
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;ummary: Hawaiian Electric Company, Inc.

redit Analyst: Barbara A Eiseman, New York (1) 212-438-7666

Credit Rating:
BBB+/Stable/A-2

Rationale

On March 10, 2004, Standard & Poor's Ratings Services assigned its 'BBB-' rating to HECO Capital Trust III's $50 million cumulative quarterly income preferred securities series 2004. HECO Capital Trust III is a statutory trust of Hawaiian Electric Co. Inc. (HECO; BBB+/Stable/A-2). The outlook is stable.

Proceeds will be used to redeem junior subordinated deferrable interest debentures that were issued to HECO Capital Trust I in 1997, and HECO Capital Trust I will in turn redeem its outstanding trust preferred and common securities.

The ratings on HECO are based on the consolidated credit profile of its parent, Hawaiian Electric Industries Inc. (HEI), which includes the electric utility operations of HECO and its two island utility subsidiaries (78% of core revenues and 67% of operating income in 2003) and the riskier financial services operations of HEI subsidiary American Savings Bank FSB (BBB-/Stable/A-3), which contributed 21% of core revenues and 35% of operating income in 2003. The ratings on HEI reflect an average business profile and somewhat weak, but gradually improving, financial measures.

HECO's average business position is a function of limited competitive threats because of the utility's geographic isolation, nominal stranded asset risk, and a generally supportive regulatory environment with an excellent fuel clause. These strengths are offset by high electric rates, Hawaii's tourism-driven economy, heavy revenue dependence on the military, significant reliance on fuel oil, and large purchased-power obligations. HECO is spared the competitive threat of wholesale wheeling, but its market share for direct kilowatt-hour sales could erode over time because of inroads from demand-side management, energy services companies, and nonutility generators.

Hawaii's economy has been growing modestly and is expected to grow by 2.8% after inflation in 2004. The visitor industry remained relatively stable in 2003 as the weakness in the eastbound international sector was countered by the strength in the domestic market. Although total visitor arrivals were relatively stable (negative 0.7%), occupancy rates were 2.7% higher and tota visitor days and expenditures increased 3.0% and 4.8%, respectively. Strength in key nontourism sectors, particularly real estate and the growing military commitment, have resulted in solid construction activity. Future growth in Hawaii's economy is expected to be tied primarily to the rate of expansion in the mainland U.S. and Japan economies and increased military spending and, furthermore, remains vulnerable to uncertainties in the world's geopolitical environment.

HEI's consolidated total debt to total capitalization (adjusted for off-balance-sheet obligations, such as purchased power contracts, and including quarterly income preferred securities and trust originated preferred securities) is liberal at about 55%. However, because Standard & Poor's considers hybrid preferred securities as having equity-like characteristics, this ratio overstates, for analytical purposes, the company's debt leverage.

Internal cash should continue to fund the bulk of the company's capital program through 2004, despite projected increases in construction spending. The higher level of spending is mainly for transmission and generation projects and energy solutions and customer choice technologies.

Although consolidated adjusted funds from operations (FFO) interest coverage is appropriate for the ratings at about 3.7x, pretax interest coverage is marginally adequate at close to 3.0x, and FFO to total debt is subpar at roughly 19%. However, Standard & Poor's envisions improvement in bondholder protection measures with adjusted FFO to total debt approaching 23% and pretax interest exceeding 3.5x in nearby years owing to the diminishing capital program after 2004, tight cost controls, gradual paydown of debt, and the continued recovery of Hawaii's economy.

HECO's balance sheet is stronger than HEI's with total debt to total capitalization at about 49%, including HECO's hybrid preferred securities. The utility's pretax interest coverage, FFO interest coverage, and FFO to total debt stands at about 2.7x, 4.0x, and 22%, respectively.

Outlook

Ratings stability for HECO mirrors that of parent HEI and reflects limited competitive pressures, aggressive cost containment, steady banking operations, strong liquidity, and expectations for gradual financial improvement. The economy continues to grow due to strength in nontourism sectors, but may be impacted by external conditions, such as the global economy and the threat of terrorist events in the U.S.

Ratings List

New Rating

HECO Capital Trust III

$50 mil cum quarterly income pfd series 2004 BBB-

Rating

Hawaiian Electric Co. Inc.

Corporate credit rating BBB+/Stable/A-2

Senior unsecured debt BBB+

Preferred stock BBB-

Commercial paper A-2

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STANDARD & POOR'S UTILITIES

ublication date: 16-Mar-2004
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;ummary: Hawaiian Electric Industries Inc.

redit Analyst: Barbara A Eiseman, New York (1) 212-438-7666

Credit Rating:
BBB/Stable/A-2

Rationale

On March 16, 2004, Standard & Poor's Ratings Services assigned its 'BBB' rating to Hawaiian Electric Industries Inc.'s (HEI; BBB/Stable/A-2) $50 million medium-term notes due 2011. The outlook is stable.

Net proceeds will be used to make short-term loans to electric utility subsidiary Hawaiian Electric Co. Inc. (HECO; BBB+/Stable/A-2), principally tc assist the company in redeeming trust preferred securities and/or for working capital and other general corporate purposes.

The ratings on HEI are based on the consolidated credit profile of HEI's family of companies, which include the regulated electric utilities HECO and its two utility subsidiaries (78% of core revenues and 67% of operating income as of Dec. 31, 2003) and the riskier financial services operations of subsidiary American Savings Bank FSB (BBB-/Stable/A-3), which contributec 21% of core revenues and 35% of operating income as of Dec. 31, 2003. HEI's business profile has benefited from the late 2001 decision to discontinue the international independent power and integrated energy projects business.

HEI has an average business profile and somewhat weak, but gradually improving, financial measures. The business position is characterized by limited competitive threats due to the utility's geographic isolation, nominal stranded-asset risk, modest rate-relief needs, an excellent fuel clause, and steady banking operations. American Savings Bank's good earnings dynamic is derived from its low-cost deposit funding and adequate earning-asset base. These strengths are offset by Hawaii's tourism-driven economy, dependence on fuel oil, significant purchased-power obligations, and support of the somewhat riskier banking businesses.

Hawaii's economy has been growing modestly and is expected to grow by 2.8% after inflation in 2004. The visitor industry remained relatively stable in 2003 as the weakness in the eastbound international sector was countered by the strength in the domestic market. Although total visitor arrivals were relatively stable (negative 0.7%), occupancy rates were 2.7% higher, and total visitor days and expenditures increased 3.0% and 4.8%, respectively. Strength in key nontourism sectors, particularly real estate and the growing military commitment, have resulted in solid construction activity. Future growth in Hawaii's economy is expected to be tied primarily to the rate of expansion in the mainland U.S. and Japan economies and increased military spending and remains vulnerable to uncertainties in the world's geopolitical environment.

Total debt to capitalization (adjusted for off-balance-sheet obligations, such as purchased power contracts, and including quarterly income preferred securities and trust originated preferred securities) is liberal at about 55%. However, because Standard & Poor's considers hybrid preferred securities as having equity-like characteristics, this ratio overstates, for analytical purposes, the company's debt leverage. Internal cash should continue to generously fund the company's consolidated capital program through 2004, despite projected increases in construction spending. The higher level of spending is mainly for transmission and generation projects and energy solutions and customer choice technologies.

Although adjusted funds from operations (FFO) interest coverage is suitable at about 3.7x and pretax interest coverage is marginally adequate at about 3.0x, FFO to total debt is very weak at roughly 19%. However, Standard & Poor's envisions improvement in bondholder protection measures with adjusted FFO to total debt approaching 23% and pretax interest exceeding 3.5x in nearby years owing to the diminishing capital program, tight cost controls, gradual paydown of debt with proceeds from a recent common equity offering, and the continued recovery of Hawaii's economy.

Liquidity.
Liquidity should continue to be strong. HEI faces a very manageable maturity schedule with $1 million maturing in 2004. HECO has no maturing long-term debt until 2012. At Dec. 31, 2003, HEI had $14 million of cash and cash equivalents (excluding American Savings Bank's cash and cash equivalents) HEI and HECO each have bank lines totaling $90 million. HEI's facilities have maturities of $30 million in April 2004, $30 million in June 2004, $10 million in October 2004, and $20 million in December 2004. HECO's lines have maturities of $50 million in April 2004, $10 million in May 2004, and $30 million in June 2004. At the end of December 2003, the lines were unused.

In order to comply with the covenants for all of HEI's lines and for two of HECO's lines totaling $60 million, HECO must maintain a consolidated capitalization ratio of at least 35%. At Dec. 31, 2003, HECO's consolidated common equity to capitalization ratio was 53%. Several lines of credit totaling $60 million for HEI requires HEI to maintain a consolidated net worth, exclusive of intangible assets, of at least $850 million. For HECO, a $30 million line of credit requires HECO to maintain a minimum consolidated net worth, exclusive of intangible assets, of $825 million. The covenants for the line of credit agreements do not contain interest coverage ratio requirements. None of HEI's or HECO's lines contain material adverse change clauses or ratings triggers that affect access to the lines of credit.

HEI has $150 million of capacity remaining under a Rule 415 shelf registration covering debt transactions As of Dec. 31, 2003, proceeds of $14 million from a previous sale of special purpose revenue bonds issued by the State of Hawaii's Department of Budget and Finance for the benefit of HECO remained undrawn.

Outlook

Ratings stability for HEI reflects limited competitive pressures, aggressive cost containment, steady banking operations, strong liquidity, and expectations for gradual financial improvement. The economy continues to

grow due to strength in nontourism sectors, but may be impacted by external conditions, such as the global economy and the threat of terrorist events in the U.S.

Ratings List
New Rating

Hawaiian Electric Industries Inc.

$50 mil medium-term notes due 2011 BBB

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ıblication date: 09-Mar-2004
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;ULLETIN: Hawaiian Electric Industries' Stock Issuance Is Supportive of ;redit Quality

'edit Analyst: Barbara A Eiseman, New York (1) 212-438-7666

NEW YORK (Standard & Poor's) March 9, 2004--Standard & Poor's Ratings Services said today that the expected common stock issuance by Hawaiian Electric Industries Inc. (BBB/Stable/A-2) will slightly enhance the company's somewhat subpar financial profile. The company plans to offer two million shares (or 2.3 million if the underwriters' overallotment is exercised in full) for a total of approximately $110 million. The proceeds will be used to redeem the existing 8.36% trust preferred securities to which

STANDARD &POOR'S UTILITIES

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ıawaiian Electric's New Shelf Issuance Rated; Outlook Stable

redit Analyst: Barbara A Eiseman, New York (1) 212-438-7666

NEW YORK (Standard & Poor's) March 5, 2004--Standard & Poor's Ratings Services said today that it assigned its 'BBB/BBB-/BB+' preliminary rating to Hawaiian Electric Industries Inc.'s (HEI) $200 million Rule 415 shelf registration, covering senior and subordinated debt securities, preferred and common stock, stock purchase contracts and stock purchase units.

Standard & Poor's also assigned its 'BB+' preliminary rating to Hawaiian Electric Industries Capital Trust II's and Hawaiian Electric Industries Capital Trust III's (special purpose trusts of Hawaiian Electric Industries) trust preferred securities.

Net proceeds will be used to repay outstanding debt, including previous issuances of trust preferred securities and medium-term notes, invest in and make loans to subsidiaries, finance strategic investments or future acquisitions, or for working capital and other general corporate purposes.

"Ratings stability for HEI reflects limited competitive pressures, aggressive cost containment, steady banking operations, strong liquidity, and expectations for gradual financial improvement," said Standard & Poor's credit analyst Barbara Eiseman.

"The economy continues to grow due to strength in nontourism sectors, but may be impacted by external conditions, such as the global economy and the threat of terrorist events in the U.S.," added Ms. Eiseman.

The ratings on HEI are based on the consolidated credit profile of HEI's family of companies, which include its regulated electric utilities, Hawaiian Electric Co. Inc. (BBB+/Stable/A-2) and its two utility subsidiaries, and the riskier financial services operations of subsidiary American Savings Bank FSB (BBB-/Stable/A-3)

During 2003, the electric utilities contributed 78% of core revenues and 67% of operating income, and the financial services operations contributed 21% of core revenues and 35% of operating income.

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The McGraw-Hill Companies

Moody's Investors Service

Global Credit Research
Credit Opinion
13 SEP 2004

Credit Opinion: Hawaiian Electric Company, Inc.

Hawaiian Electric Company, Inc.

Honolulu, Hawaii, United States

Ratings

Category	Moody's Rating
Outlook	Stable
Issuer Rating	Baa1
Preferred Stock	Baa3
Bkd Commercial Paper	P-2
Parent: Hawaiian Electric Industries, Inc.	
Outlook	Stable
Senior Unsecured	Baa2
Bkd Commercial Paper	P-2

Contacts

Analyst	Phone
A.J. Sabatelle/New York	1.212.553.1653
Daniel Gates/New York	

Key Indicators

Hawaiian Electric Company, Inc.

	2Q04 LTM	2003	2002	2001
Adjusted Funds from Operations / Adjusted Debt [1][2]	20.7%	22.0%	22.3%	21.2%
Retained Cash Flow / Adjusted Debt [2]	16.4%	15.5%	17.3%	16.9%
Common Dividends / Net Income Available for Common	48.3%	73.1%	48.9%	41.1%
Funds from Operations - Capitalized Interest + Adjusted Interest / Adjusted Interest [1][3]	4.70	4.55	4.58	4.08
Adjusted Debt / Adjusted Capitalization [2][4]	48.7%	47.3%	47.6%	47.8%
Net Income Available for Common / Common Equity	8.6%	8.4%	9.8%	10.1%

[1] Preferred dividends have been deducted from FFO [2] Adjusted debt includes quarterly income preferred securities (QUIPS) [3] Interest is adjusted to include preferred dividends [4] Adjusted capitalization reflects the adjustments made to debt

Note: For definitions of Moody's most common ratio terms please see the accompanying User's Guide.

Opinion

Credit Challenges

The challenges facing HECO include:

The cash flow volatility that is associated with an economic base that has a significant reliance on tourism for incremental growth.

A strong environmental lobby that not only extends the time frames over which large scale construction projects can be completed but leads to increased costs.

The growth in distributed generation alternatives increases the competitive environment particularly for large, geographically concentrated customers, such as hotels.

The potential for the company's parent, Hawaiian Electric Industries (HEI: Baa2 Senior Unsecured Debt; Stable Outlook), to reconsider diversification opportunities outside of the existing portfolio along with the potential for matieral changes to HECO's dividend requirement.

Credit Strengths

Support for HECO's rating includes:

The company's role as the predominant provider of electricity within the state of Hawaii.

The company's emphasis on relationship building particularly with the large customer segment such as the military.

A stable regulatory environment that emphasizes traditional cost of service techniques.

Strong cash flows and a manageable level of capital expenditures.

Rating Rationale

Hawaiian Electric Company's (HECO) Baa1 senior unsecured rating reflects the evolution of the major competitive threats to the company's business and the generally supportive regulatory environment it works to maintain. The rating also considers the company's high electric rates due to the environmental challenges of construction and operations in Hawaii as well as the rising cost of imported fuel.

Although the Hawaiian Islands' geographic isolation provides a barrier to entry for mainland utilities, HECO does face competition from independent power producers and self-generation, particularly for large customers. To date, HECO has sought to offset the financial impact of competition by working closely with its major customers, such as the US military, as the end-user seeks to reduce overall energy costs.

While impacted by world events of the past few years, economic conditions in the Hawaiian Islands have generally stabilized. As a result, so has the company's financial performance. Importantly, the company's financial profile reflects a strong commitment to cost control and productivity enhancements. We expect that as growth accelerates, HECO will need to add generation and transmission facilities to meet demand and to prepare for future needs. Management expects to finance their 5-year capital plan largely with internally generated cash flow.

Rating Outlook

HECO's stable rating outlook reflects the expectation that over the longer-term, improved fundamentals due to strong operating performance, favorable economic conditions, and the parent's reduced emphasis on overseas investments will sustain the company's credit profile.

What Could Change the Rating - UP

A series of regulatory decisions that result in substantially improved credit metrics coupled with a continuation of a generally improving local economy.

What Could Change the Rating - DOWN

Weaker than expected regulatory support causing both earnings and sustainable cash flow to suffer.

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Moody's Investors Service

Global Credit Research
Credit Opinion
13 SEP 2004

Credit Opinion: Hawaiian Electric Industries, Inc.

Hawaiian Electric Industries, Inc.

Honolulu, Hawaii, United States

Ratings

Category	Moody's Rating
Outlook	Stable
Senior Unsecured	Baa2
Bkd Commercial Paper	P-2
American Savings Bank, FSB	
Outlook	Stable
Bank Deposits	Baa2/P-2
Issuer Rating	Baa3
Hawaiian Electric Industries Capital Trust I	
Outlook	Stable
Bkd Preferred Stock	Ba1
HEI Preferred Funding, L.P.	
Outlook	Stable
Bkd Jr Subordinate Shelf	(P)Ba1
Hawaiian Electric Industries Capital Tr. III	
Outlook	Stable
Bkd Preferred Shelf	(P)Ba1

Contacts

Analyst	Phone
A.J. Sabatelle/New York	1.212.553.1653
Daniel Gates/New York	

Key Indicators

Hawaiian Electric Industries, Inc.

	2Q04 LTM	2003	2002	2001
Funds from Operations / Adjusted Debt [1]	25.0%	19.4%	21.5%	18.4%
Retained Cash Flow / Adjusted Debt [1]	14.9%	13.5%	15.8%	13.5%
Common Dividends / Net Income Available for Common	99.0%	65.8%	62.1%	80.1%
Funds from Operations - Capitalized Interest + Adjusted Interest / Adjusted Interest [2]	4.48	3.79	4.08	3.54
Adjusted Debt / Adjusted Capitalization [1][3]	49.5%	53.0%	54.7%	58.3%
Net Income Available for Common / Common Equity	10.3%	10.5%	11.3%	9.0%

[1] Adjusted debt includes trust originated and quarterly income preferred securities (TOPrS and QUIPS) [2] Interest is adjusted to include preferred dividends [3] Adjusted capitalization reflects the adjustments made to debt

Note: For definitions of Moody's most common ratio terms please see the accompanying User's Guide.

Opinion

Credit Challenges

The challenges facing HEI that could impact our view of credit include:

The cash flow volatility that can surface at the company's principal subsidiary, Hawaiian Electric Company (HECO), that is associated with an economic base that has a significant reliance on tourism for incremental growth.

A strong environmental lobby that not only extends the time frames over which large scale construction projects planned by HECO can be completed but leads to increased costs.

Above average interest rate sensitivity at American Savings Bank (ASB) as a result of it carrying a high proportion of fixed rate loans and mortgage backed securities funded with liabilities of a shorter maturity.

Concentration risk given both the utility's and bank's dependence on the Hawaiian economy.

Material credit deterioration in ASB's loan portfolio

Credit Strengths

Factors supporting the HEI rating is:

The generally predictable cash flow largely provided in the form of dividends from HECO.

HECO's emphasis on relationship building throughout the local economy particularly with the large customer segment such as the military.

Solid #3 market share in low coupon deposits in Hawaii, a geographically isolated market dominated by two banks and ASB.

March 2004 issuance of nearly $100 million in common stock has stengthened credit metrics at HEI

Management's decision to exit the non-regulated international business.

ASB's below-average reliance on CDs compared to most thrifts underpins its liquidity profile and supports its net interest margin.

Rating Rationale

The Baa2 senior unsecured rating for Hawaiian Electric Industries (HEI) reflects the cash flows provided by the company's two principal operating subsidiaries and the exit from the international power business.

HEI is a holding company with core businesses in energy and financial services. Hawaiian Electric Company, Inc. (HECO: Baa1 senior unsecured debt; stable outlook) is the company's largest subsidiary and accounts for the large majority of cash flow and corporate profitability. HECO's ratings incorporate the relative protection from competition that is provided by the utility's geographic isolation, a generally supportive regulatory environment, and a largely predictable source of cash flow derived from the utility business. These benefits are partially offset by relatively high rates, a slowly evolving competitive environment, and the company's dependence on imported fuel oil.

Like most traditional thrifts, American Savings Bank (ASB) is primarily reliant upon residential mortgage lending funded with a mix of deposits and other borrowings. ASB has been able to take advantage of favorable economic conditions and competitive opportunities to substantially grow its customer base and increase the scope of its loan portfolio.

HEI's credit profile has also benefited from the company's decision to reduce its overseas exposure. Going forward, HEI's strategic focus will revolve around managing its core electric and financial services businesses, thus significantly lowering its risk profile.

Rating Outlook

HEI's stable rating outlook reflects an improved economic base, the resulting strong financial performance of the company's main operating subsidiaries, and the reduced risk stemming from the end of the international strategy.

What Could Change the Rating - UP

HEI's rating is highly dependent upon the financial and operating performance at the utility. As such, improved financial results at the utility caused by better than expected regulatory support and a growing economyu could strengthen the utility and the holding company rating.

What Could Change the Rating - DOWN

Substantially weaker financial results at the utility and the bank caused by a severe downtown in the economy, an adverse regulatory decision, or a substantial deteriation in the asset quality of ASB's loan portfolio or the asset/liability management at the bank.

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Global Credit Research
Opinion Update
11 SEP 2003

Opinion Update: Hawaiian Electric Company, Inc.

Hawaiian Electric Company, Inc.

Honolulu, Hawaii, United States

Ratings

Category	Moody's Rating
Issuer Rating	Baa1
Preferred Stock	Baa3
Bkd Commercial Paper	P-2
Parent: Hawaiian Electric Industries, Inc.	
Senior Unsecured	Baa2
Bkd Commercial Paper	P-2
HECO Capital Trust I	
Bkd Preferred Stock	Baa2

Contacts

Analyst	Phone
Stephen J. Gutkowski/New York	1.212.553.1653
A.J. Sabatelle/New York	
Daniel Gates/New York	

Opinion

Rating Rationale

Hawaiian Electric Company's (HECO) Baa1 issuer rating reflects the evolution of the major competitive threats to the company's business and generally supportive regulation it works to maintain. The rating also considers the company's high electric rates from imported fuel and the environmental challenges of construction and operations on Hawaii.

Although the Hawaiian Islands' geographic isolation provides a barrier to entry for mainland utilities, HECO does face competition from independent power producers and self-generation, particularly for large customers. To date, HECO has sought to offset the financial impact of competition by working closely with its major customers, such as the US military, as the end-user seeks to reduce overall energy costs.

While impacted by world events of the last year, economic conditions in the Hawaiian Islands have generally improved. As a result, so has the company's financial performance. Importantly, the company's financial profile reflects its impacted strong commitment to cost control and productivity enhancements. We expect that as growth is sustained, HECO will need to add generation and transmission facilities to meet demand and to prepare for future needs. Accordingly, an external financing requirement is indicated which could affect the need for rate relief.

Recent Developments

HECO, through its Renewable Hawaii subsidiary, is seeking investment opportunities in projects designed to supply renewable energy on Oahu on a passive, minority ownership basis to help stimulate commercially viable generation in the state.

Rating Outlook - Stable

HECO's rating outlook reflects long-term improved fundamentals due to strong operating performance, favorable economic conditions, and the parent's reduced emphasis on overseas investments.

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Global Credit Research
Financial Statement Ratios
6 AUG 2004

Financial Statement Ratios: Hawaiian Electric Company, Inc.

Hawaiian Electric Company, Inc.

Download Financial Statement Ratios in .csv format

Note:
This data does not reflect adjustments made by Moody's analysts as part of the rating process. The financial statistics shown below are taken directly from public financial statements. For an explanation of how these ratios are calculated, please refer to Moody's Research Guides.

(US$ mil.)	2003	2002	2001	2000	1999
INCOME STATEMENT ($ millions)					
Revenue	1,393	1,253	1,284	1,271	1,050
Operating Expense	1,218	1,061	1,094	1,082	879
Earnings Before Interest, Taxes, Depr. & Amort.	286	297	291	287	264
Depreciation and Amortization	111	105	101	99	93
Earnings Before Interest & Taxes	175	192	191	188	171
Other Income	6	7	7	10	8
Gross Interest Expense	44	44	47	49	48
Pretax Income	89	100	98	97	85
Income Taxes	50	57	55	55	48
Preferred Dividends	10	10	10	10	10
Net Income Available for Common Stock	79	90	88	87	75
Coverage Analysis					
EBITDA Interest Coverage	6.4	6.7	6.2	5.8	5.5
EBITDA Interest Coverage(Incl. Other Income)	6.6	6.9	6.4	6.1	5.6
EBIT Interest Coverage	3.9	4.3	4.1	3.8	3.5
EBIT Interest Coverage(Incl. Other Income)	4.1	4.5	4.2	4.0	3.7
Pretax Interest Coverage	4.0	4.4	4.1	3.9	3.6
FFO Interest Coverage	5.7	5.9	5.5	5.0	4.6
(FFO-Gross Capital Expenditures) Interest Coverage	2.4	3.3	3.0	2.4	2.4
Fixed Charge Coverage	3.5	3.9	3.6	3.5	3.2
Earnings Analysis					
Operating Margin	9.0	10.8	10.5	10.5	11.7
Return on Equity	8.5	10.0	10.4	10.7	9.4

Return on Asset	3.1	3.7	3.7	3.7	3.3
Return on Capital	6.8	7.5	7.6	7.8	7.2
AFUDC % Net Income	7.8	6.4	7.4	9.5	9.0
BALANCE SHEET ($ millions)					
Cash and Equivalents	0	2	2	2	2
Net Plant and Equipment	2,240	2,013	2,005	1,993	1,958
Goodwill	0	0	0	0	0
Total Assets	2,581	2,436	2,390	2,369	2,303
Current Portion of LT Debt, Leases & Pref.	0	0	15	0	0
Short-Term Debt	6	6	48	113	107
Long-Term Debt	699	705	771	768	646
Total Debt	705	711	834	881	753
Preferred Equity	134	134	34	34	134
Common Equity	944	923	877	825	806
Total Capitalization	1,784	1,768	1,745	1,740	1,693
Tangible Capitalization (net worth)	1,784	1,768	1,745	1,740	1,693
Market Capitalization (ending period)	0	0	0	0	0
Capital Structure					
Retained Earnings	563	542	0	0	425
Total Debt - Cash and Equivalents	705	709	832	879	751
Deferred Charges % Common Equity	3.6	15.3	16.9	19.1	19.6
STD + Curr. Portion of LTD, Leases & Pref. % Capitalization	0.3	0.3	3.6	6.5	6.3
Total Debt % Capitalization	39.5	40.2	47.8	50.6	44.5
Asset Composition					
Net Plant and Equipment % Total Assets	86.8	82.6	83.9	84.1	85.0
Investments % Total Assets	0.0	0.0	0.0	0.0	0.0
Current Assets % Total Assets	11.9	11.6	9.9	9.2	8.1
Deferred Charges % Total Assets	1.3	5.8	6.2	6.7	6.9
CASH FLOW STATEMENT ($ millions)					
Funds From Operations	208	218	210	197	176
Preferred Dividends	10	10	10	10	10
Common Dividends	49	36	28	68	47
Retained Cash Flow	149	173	172	120	119
Gross Capital Expenditures	147	115	116	130	108
Free Cash Flow	2	58	57	-10	10
Issuance of Long-Term Debt	68	35	17	88	105
Issuance of Preferred Equity	0	-8	0	0	0
Debt Retirement & Sink Fund	-82	-5	-8	-74	-136
Net Change in LTD & Pref. Equity	-14	23	10	14	-31
Change in Working Capital	4	50	15	25	-45

Cash Flow Analysis					
FFO % Gross Capital Expenditures	141.3	190.3	181.4	151.6	162.4
FFO % Total Debt	29.4	30.7	25.1	22.4	23.3
Total Debt / FFO	3.4	3.3	4.0	4.5	4.3
Total Debt / (FFO - Gross Capital Expenditures)	11.6	6.9	8.9	13.1	11.2
RCF % Gross Capital Expenditures	101.3	150.8	149.1	92.2	109.7
RCF % Total Debt	21.1	24.3	20.7	13.6	15.7
Construction Analysis					
Gross Capital Expenditures % Capitalization	8.2	6.5	6.6	7.5	6.4
CWIP % Common Equity	20.7	17.8	19.4	19.1	18.9

OPERATING STATISTICS

Market Analysis					
Electric % Total Revenue	100.0	100.0	100.0	100.0	100.0
Gas % Total Revenue	0.0	0.0	0.0	0.0	0.0
Other % Total Revenue	0.0	0.0	0.0	0.0	0.0
Residential % Electric Revenue	0.0	22.2	21.4	21.6	22.4
Commercial % Electric Revenue	0.0	22.5	22.4	22.2	21.9
Industrial % Electric Revenue	0.0	24.0	24.5	25.0	24.6
Wholesale % Electric Revenue	0.0	0.0	0.0	0.0	0.0
Residential % Kwh Sales	—	28.1	26.4	26.3	26.4
Commercial % Kwh Sales	—	28.6	31.2	30.7	30.1
Industrial % Kwh Sales	—	42.6	41.7	42.4	42.9
Wholesale % Kwh Sales	—	0.0	0.0	0.0	0.0
Residential Price per Kwh	—	13.9	14.3	14.5	12.7
Commercial Price per Kwh	—	13.8	12.7	12.8	11.0
Industrial Price per Kwh	—	9.9	10.4	10.4	8.6
Total Price per Kwh	—	17.6	17.6	17.6	15.0
Competitive Position					
Fuel Per Mwhr	0.0	0.0	52.0	52.0	0.0
Non-Fuel Per Mwhr	0.0	0.0	9.0	10.0	0.0
Investment Per Mwhr	0.0	0.0	3.0	4.0	0.0
Total Cost Per Mwhr	0.0	0.0	66.0	67.0	0.0

Note:
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Moody's Investors Service

Global Credit Research
Financial Statement Ratios
5 AUG 2004

Financial Statement Ratios: Hawaiian Electric Industries, Inc.

Hawaiian Electric Industries, Inc.

Download Financial Statement Ratios in .csv format

Note:
This data does not reflect adjustments made by Moody's analysts as part of the rating process. The financial statistics shown below are taken directly from public financial statements. For an explanation of how these ratios are calculated, please refer to Moody's Research Guides.

(□Œ)	2003	2002	2001	2000	1999
INCOME STATEMENT ($ millions)					
Revenue	1,781	1,654	1,727	1,719	1,523
Operating Expense	1,518	1,387	1,471	1,564	1,289
Earnings Before Interest, Taxes, Depr. & Amort.	264	266	256	155	234

Return on Asset	1.3	1.4	1.0	0.5	1.1
Return on Capital	7.8	8.0	7.1	3.8	5.2
AFUDC % Net Income	5.4	4.9	7.8	18.1	7.0
BALANCE SHEET ($ millions)					
Cash and Equivalents	280	245	451	215	200
Net Plant and Equipment	2,312	2,079	2,068	2,091	2,066
Goodwill	94	98	102	99	0
Total Assets	9,201	8,877	8,518	8,469	8,291
Current Portion of LT Debt, Leases & Pref.	0	0	0	0	0
Short-Term Debt	0	0	0	104	2,002
Long-Term Debt	1,099	1,106	1,146	1,089	978
Total Debt	1,099	1,106	1,146	1,193	2,980
Preferred Equity	234	234	234	234	235
Common Equity	1,055	1,046	930	840	848
Total Capitalization	2,388	2,387	2,310	2,267	4,062
Tangible Capitalization (net worth)	2,294	2,289	2,208	2,168	4,062
Market Capitalization (ending period)	1,796	1,628	1,451	1,240	930
Capital Structure					
Retained Earnings	198	176	148	147	182
Total Debt - Cash and Equivalents	819	862	695	978	2,780
Deferred Charges % Common Equity	341.2	338.5	363.7	691.4	58.8
STD + Curr. Portion of LTD, Leases & Pref. % Capitalization	0.0	0.0	0.0	4.6	49.3
Total Debt % Capitalization	46.0	46.3	49.6	52.6	73.3
Asset Composition					
Net Plant and Equipment % Total Assets	25.1	23.4	24.3	24.7	24.9
Investments % Total Assets	30.7	31.9	28.8	1.9	64.8
Current Assets % Total Assets	5.1	4.7	7.2	4.8	4.3
Deferred Charges % Total Assets	39.1	39.9	39.7	68.6	6.0
CASH FLOW STATEMENT ($ millions)					
Funds From Operations	270	305	246	227	198
Preferred Dividends	18	18	18	18	18
Common Dividends	57	55	49	51	62
Retained Cash Flow	195	231	179	159	118
Gross Capital Expenditures	163	128	126	135	134
Free Cash Flow	32	103	53	24	-16
Issuance of Long-Term Debt	2,134	1,122	942	865	1,101
Issuance of Preferred Equity	0	0	0	-16	0
Debt Retirement & Sink Fund	-2,036	-1,197	-821	-76	-949
Net Change in LTD & Pref. Equity	98	-75	121	773	152
Change in Working Capital	62	-285	181	-79	-219

Cash Flow Analysis					
FFO % Gross Capital Expenditures	165.8	237.9	194.7	168.8	147.5
FFO % Total Debt	24.6	27.5	21.5	19.0	6.7
Total Debt / FFO	4.1	3.6	4.7	5.3	15.0
Total Debt / (FFO - Gross Capital Expenditures)	10.3	6.3	9.6	12.9	46.7
RCF % Gross Capital Expenditures	119.7	180.6	141.7	117.9	88.1
RCF % Total Debt	17.7	20.9	15.6	13.3	4.0
Construction Analysis					
Gross Capital Expenditures % Capitalization	6.8	5.4	5.5	5.9	3.3
CWIP % Common Equity	19.0	16.6	19.0	18.8	10.7
OPERATING STATISTICS					
Market Analysis					
Electric % Total Revenue	78.4	76.0	74.6	73.6	69.3
Gas % Total Revenue	0.0	0.0	0.0	0.0	0.0
Other % Total Revenue	21.6	24.0	25.4	26.4	30.7
Residential % Electric Revenue	0.0	0.0	21.3	27.2	27.7
Commercial % Electric Revenue	0.0	0.0	22.3	27.6	27.0
Industrial % Electric Revenue	0.0	0.0	24.4	29.6	28.8
Wholesale % Electric Revenue	0.0	0.0	0.0	0.0	0.0
Residential % Kwh Sales	—	—	26.4	27.3	27.4
Commercial % Kwh Sales	—	—	31.2	30.9	30.3
Industrial % Kwh Sales	—	—	41.7	41.2	41.7
Wholesale % Kwh Sales	—	—	0.0	0.0	0.0
Residential Price per Kwh	—	—	14.3	15.1	13.2
Commercial Price per Kwh	—	—	12.7	13.6	11.7
Industrial Price per Kwh	—	—	10.4	10.9	9.0
Total Price per Kwh	—	—	17.7	15.2	13.1
Competitive Position					
Fuel Per Mwhr	0.0	0.0	0.0	0.0	0.0
Non-Fuel Per Mwhr	0.0	0.0	0.0	0.0	0.0
Investment Per Mwhr	0.0	0.0	0.0	0.0	0.0
Total Cost Per Mwhr	0.0	0.0	0.0	0.0	0.0

Note:
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Moody's Investors Service

Global Credit Research
Liquidity Risk Assessment
14 JUL 2004

Liquidity Risk Assessment: Hawaiian Electric Company, Inc.

Hawaiian Electric Company, Inc.

Honolulu, Hawaii, United States

Broad Industry:	Public Utility
Specific Industry:	Integrated Electric Utility
Short Term Rating:	P-2 (Backed)

Contacts

Analyst	**Phone**
A.J. Sabatelle/Jersey City	1.212.553.1653
Daniel Gates/New York	

Opinion

Support for Hawaiian Electric Company Inc.'s (HECO) Prime-2 short-term rating for commercial paper program is primarily derived from the stability of the company's business as well as the strategic emphasis at both the company and its parent, Hawaiian Electric Industries (HEI), on cost controls and capital management.

HECO's utility operations have traditionally benefited from the relative absence of competition due to Hawaii's geographic isolation as well as a generally supportive regulatory environment that is cognizant of the importance of a financially viable utility base. While revenues continue to expand in 2003, rising pension expenses reduced margins with a corresponding impact on cash flows. Net income was $79 million in 2003 compared with $90 million in 2002. Even with this pressure, cash from operations in 2003 at $206 million was 20% higher than the year earlier figure. There are no mandatory debt redemptions at HECO through 2011.

HEI and HECO utilize short-term debt, principally commercial paper, to support normal operations and for other temporary requirements, and from time to time, HECO also borrows short-term from HEI for itself and on behalf of its subsidiary utility company, Hawaiian Electric Light Company, Inc. (HELCO) and Maui Electric Company (MECO). Under the intercompany arrangements, HECO can also borrow from or loan to HELCO and MECO on a short-term basis. At March 31, 2004, HECO had $16 million and $18 million of short-term borrowings from HEI and MECO, respectively, and HELCO had $16 million of short-term borrowings from HECO. HEI had no commercial paper borrowings during the first three months of 2004. HECO had an average outstanding balance of commercial paper for the first three months of 2004 of $13 million and had $23 million of commercial paper outstanding at March 31, 2004.

HECO maintains bank lines of credit totaling $90 million. None of the lines of credit at HECO have rating triggers or provisions which would cause borrowing costs to change in the event of a rating change. Further, none of HECO's line of credit agreements contain "material adverse change" clauses that would affect access to the lines of credit in the event of a ratings downgrade or other material adverse events. At March 31, 2004, the lines were unused.

On March 16, 2004, HEI completed the sale of 2 million shares of common stock. The net proceeds from the sale of approximately $99 million were ultimately used, along with other corporate funds, to effect the redemption of $100 million aggregate principal amount of 8.36% Trust Originated Preferred Securities of Hawaiian Electric Industries Capital Trust I on April 16, 2004. At March 31, 2004, an additional $96 million of debt, equity and/or other securities were available for offering by HEI under the omnibus shelf registration.

On March 17, 2004, HEI completed the sale of $50 million of 4.23% notes, due March 15, 2011 under its registered medium-term note program. The net proceeds from this sale were ultimately used to make short-term loans to HECO, to assist the utility subsidiary in redeeming $50 million aggregate principal amount of 7.30%

Cumulative Quarterly Income Preferred Securities and for other general corporate purposes. It is anticipated that HECO will repay the short-term loans by the end of 2004.

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Moody's Investors Service

Global Credit Research
Liquidity Risk Assessment
19 MAR 2004

Liquidity Risk Assessment: Hawaiian Electric Company, Inc.

Hawaiian Electric Company, Inc.

Honolulu, Hawaii, United States

Broad Industry:	Public Utility
Specific Industry:	Integrated Electric Utility
Short Term Rating:	P-2 (Backed)

Contacts

Analyst	**Phone**
Stephen J. Gutkowski/New York	1.212.553.1653
A.J. Sabatelle/Jersey City	
Daniel Gates/New York	

Opinion

Support for Hawaiian Electric Company's (HECO) Prime-2 Commercial Paper program is primarily derived from the stability of the company's business as well as the strategic emphasis at both the company and its parent, Hawaiian Electric Industries (HEI), on cost controls and capital management. External alternate liquidity support for the company's short-term borrowing program is viewed as acceptable.

HECO's operations have traditionally benefited from the relative absence of competition due to Hawaii's geographic isolation as well as a generally supportive regulatory environment that is cognizant of the importance of a financially viable utility base. While revenues continue to expand, rising pension expenses have eaten into [illegible] with a corresponding impact on cash flows. Net income was $79 million in 2003 compared with $90

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Moody's Investors Service

Global Credit Research
Liquidity Risk Assessment
18 MAR 2004

Liquidity Risk Assessment: Hawaiian Electric Industries, Inc.

Hawaiian Electric Industries, Inc.

Honolulu, Hawaii, United States

Broad Industry:	Public Utility
Specific Industry:	Utility/Diversified Holding Company
Short Term Rating:	P-2 (Backed)

Contacts

Analyst	**Phone**
Stephen J. Gutkowski/New York	1.212.553.1653
A.J. Sabatelle/Jersey City	
Daniel Gates/New York	

Opinion

Hawaiian Electric Industries' internal liquidity for its Prime-2 rated commercial paper rating is primarily derived from the strength of the cash flows provided by its two principal operating subsidiaries, Hawaiian Electric Company, Inc. (HECO) and American Savings Bank, F.S.B. (ASB). The company did not access the commercial paper market in 2003.

Fundamental elements in the company's strategy to sustain operational cash flows emphasize cost controls and capital management. HEI's cash flows are accorded a large measure of stability by the predictable financial and operating performance of HECO, which accounts for the majority of HEI's consolidated earnings. ASB's contribution is growing as it rapidly expands its customer base and the scope of its loan portfolio. For 2003, HEI's revenues grew by 8% to $1.78 billion versus the year earlier period. However, margin contraction at both subsidiaries resulted in an 1% reduction in operating income. Cash from operations at $238 million was off slightly from the $244 million in 2002 principally because of the negative effect of an increase in deposits for disputed Hawaii franchise taxes at $16.5 million. HEI's consolidated gross capital expenditures, at $162.9 million for 2003, were about 27.3% higher than the year before. The vast majority of the increase was attributed to a network reliability initiative and new customer growth at HECO. Cash flow was sufficient to internally fund both the capex requirement and the common stock dividend. Going forward, we expect HEI to actively manage its consolidated capital budget with the goal of minimizing external financing requirements.

In addition to its internal liquidity resources, HEI maintains alternate external liquidity for its authorized $70 million commercial paper program in the form of $90 million in backup bank facilities. Three agreements are in place for shorter than a one year period. The facilities, through bi-lateral lines, are provided by three banks, two of which are rated Aa3/P-1 and one is rated A3/P-2. The agreements currently expire in April, June, and October 2004. They do not include any MAC clause provisions or ratings triggers that would limit availability. A line of credit totaling $30 million has a financial covenant that requires HEI to maintain a consolidated net worth, exclusive of intangible assets of at least $850 million. The three agreements also include a HECO capital structure test requiring common stock equity to be not less than 35% of total capital. At year end, 2003, HECO's common stock equity level was well above the financial covenant requirement at 53%. In the future, we anticipate that HEI and its subsidiaries' operational and financial stability will likely preclude the extensive use of any new external debt facilities over the intermediate term. HEI's long term debt maturity schedule totals $1 million in 2004, $37 million in 2005, $110 million in 2006 and $10 million in 2007.

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Moody's Investors Service

Global Credit Research
Credit Opinion
2 MAR 2004

Credit Opinion: Hawaiian Electric Company, Inc.

Hawaiian Electric Company, Inc.

Honolulu, Hawaii, United States

Ratings

Category	Moody's Rating
Outlook	Stable
Issuer Rating	Baa1
Preferred Stock	Baa3
Bkd Commercial Paper	P-2
Parent: Hawaiian Electric Industries, Inc.	
Outlook	Stable
Senior Unsecured	Baa2
Bkd Commercial Paper	P-2
HECO Capital Trust I	
Outlook	Stable
Bkd Preferred Stock	Baa2

Contacts

Analyst	Phone
Stephen J. Gutkowski/New York	1.212.553.1653
A.J. Sabatelle/New York	
Daniel Gates/New York	

Key Indicators

Hawaiian Electric Company, Inc.

	Q3 2003 LTM	2002	2001	2000
Adjusted Funds from Operations / Adjusted Debt [1][2]	24.5%	23.7%	21.3%	17.5%
Retained Cash Flow / Adjusted Debt [2]	17.7%	18.4%	17.0%	10.7%
Common Dividends / Net Income Available for Common	71.8%	52.6%	44.4%	51.5%
Adjusted Funds from Operations - Capitalized Interest + Adjusted Interest / Adjusted Interest [3]	4.81	4.61	4.15	3.93
Adjusted Debt / Adjusted Capitalization [2][4]	46.1%	47.3%	49.2%	54.7%
Net Income Available for Common / Common Equity	8.1%	9.6%	9.9%	10.4%

[1] FFO is after preferred stock dividends [2] Debt is adjusted to reflect the inclusion of trust preferred securities [3] Interest is adjusted to include preferred stock dividends [4] Adjusted Capitalization reflects the adjustments to debt

Note: For definitions of Moody's most common ratio terms please see the accompanying User's Guide.

Opinion

Credit Challenges

The challenges facing the company include:

The cash flow volatility that is associated with an economic base that has a significant reliance on tourism for incremental growth.

A strong environmental lobby that not only extends the time frames over which large scale construction projects can be completed but leads to increased costs.

The growth in distributed generation alternatives increases the competitive environment particularly for large, geographically concentrated customers, such as hotels.

The impact of decisions by the company's parent, Hawaiian Electric Industries, to reconsider diversification opportunities outside of the existing portfolio and changes to HECO's dividend requirement.

Credit Strengths

Support for the rating includes:

The company's role as the predominant provider of electricity within the state of Hawaii.

The company's emphasis on relationship building particularly with the large customer segment such as the military.

A stable regulatory environment that emphasizes traditional cost of service techniques.

Strong cash flows and a manageable level of capital expenditures.

Rating Rationale

Hawaiian Electric Company's (HECO) Baa1 issuer rating reflects the evolution of the major competitive threats to the company's business and the generally supportive regulatory environment it works to maintain. The rating also considers the company's high electric rates due to the environmental challenges of construction and operations in Hawaii as well as imported fuel. The average fuel cost per barrel increased in 2003 to $36.23 compared to $29.10 in 2002.

Although the Hawaiian Islands' geographic isolation provides a barrier to entry for mainland utilities, HECO does face competition from independent power producers and self-generation, particularly for large customers. To date, HECO has sought to offset the financial impact of competition by working closely with its major customers, such as

A rate case will be filed during the summer of 2004 for Oahu with a 2005 test year. Still to be determined is whether a rate case will be filed for the island of Hawaii.

HECO, through its Renewable Hawaii subsidiary, is seeking investment opportunities in projects designed to supply renewable energy on Oahu on a passive, minority ownership basis to help stimulate commercially viable generation in the state.

Rating Outlook

HECO's rating outlook reflects the expectation that over the longer-term, improved fundamentals due to strong operating performance, favorable economic conditions, and the parent's reduced emphasis on overseas investments will sustain the company's credit profile.

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Moody's Investors Service

Global Credit Research
Credit Opinion
2 MAR 2004

Credit Opinion: Hawaiian Electric Industries, Inc.

Hawaiian Electric Industries, Inc.

Honolulu, Hawaii, United States

Ratings

Category	Moody's Rating
Outlook	Stable
Senior Unsecured	Baa2
Bkd Commercial Paper	P-2
American Savings Bank, FSB	
Outlook	Stable
Bank Deposits	Baa2/P-2
Hawaiian Electric Industries Capital Trust I	
Outlook	Stable
Bkd Preferred Stock	Ba1
HEI Preferred Funding, L.P.	
Outlook	Stable
Bkd Jr Subordinate Shelf	(P)Ba1
Hawaiian Electric Industries Capital Tr. III	
Outlook	Stable
Bkd Preferred Shelf	(P)Ba1

Contacts

Analyst	Phone
Stephen J. Gutkowski/New York	1.212.553.1653
A.J. Sabatelle/New York	
Daniel Gates/New York	

Key Indicators

Hawaiian Electric Industries, Inc.

	Q3 2003 LTM	2002	2001	2000
Funds from Operations / Adjusted Debt [1]	18.7%	21.6%	18.5%	18.1%
Retained Cash Flow / Adjusted Debt [1]	12.8%	15.9%	13.5%	12.7%
Common Dividends / Net Income Available for Common	72.4%	62.1%	62.2%	62.8%
Funds from Operations - Capitalized Interest + Adjusted Interest / Adjusted Interest [2]	3.62	4.08	3.54	3.40
Adjusted Debt / Adjusted Capitalization [1][3]	53.7%	55.0%	58.6%	59.9%
Net Income Available for Common / Common Equity	9.3%	10.9%	11.1%	12.4%

[1] Debt is adjusted to reflect the inclusion of trust preferred securities [2] Interest is adjusted to include preferred stock dividends [3] Adjusted Capitalization reflects the adjustments to debt

Opinion

Credit Challenges

The challenges facing the company that could impact our view of credit include:

The cash flow volatility at the company's principal subsidiary, Hawaiian Electric Company (HECO), that is associated with an economic base that has a significant reliance on tourism for incremental growth.

A strong environmental lobby that not only extends the time frames over which large scale construction projects planned by HECO can be completed but leads to increased costs.

Above average interest rate sensitivity at American Savings Bank (ASB) as a result of it carrying a high proportion of fixed rate loans and mortgage backed securities funded with liabilities of a shorter maturity.

The need for ASB to improve personnel expertise and establish deeper customer relationships as the thrift attempts to broaden its mortgage business model and increase its presence in commercial banking.

Credit Strengths

Supporting the rating is:

The role that HECO plays as the predominant provider of electricity within the state of Hawaii.

HECO's emphasis on relationship building particularly with the large customer segment such as the military.

Solid #3 market share in low coupon deposits in Hawaii, a geographically isolated market dominated by two banks and ASB.

ASB's below-average reliance on CDs compared to most thrifts underpins its liquidity profile and supports its net interest margin.

Rating Rationale

The Baa2 ratings assigned to Hawaiian Electric Industries' debt reflect the cash flows provided by the company's two principal operating subsidiaries and the exit from the international project business.

HEI is a holding company with core businesses in energy and financial services. Hawaiian Electric Company, Inc. (HECO) is the company's largest subsidiary and accounts for the large majority of cash flow and corporate profitability. HECO's ratings incorporate the relative protection from competition that is provided by the utility's geographic isolation and a generally supportive regulatory environment. These benefits are partially offset by relatively high rates, an evolving competitive environment, and the company's dependence on imported fuel oil.

Like most traditional thrifts, American Savings Bank (ASB) is primarily reliant upon residential mortgage lending funded with a mix of deposits and other borrowings. In recent months, ASB has been able to take advantage of favorable economic conditions and competitive opportunities to substantially grow its customer base and increase the scope of its loan portfolio.

HEI's credit profile has also benefited from the company's decision to reduce its overseas exposure. Going forward, HEI's strategic focus will revolve around managing its core electric and financial services businesses, thus significantly lowering its risk profile.

What Could Change the Rating - DOWN

A decision to reconsider diversification opportunities outside of the existing portfolio that could lead to an increase in the company's business risk profile without a counterbalance reduction in financial risk.

What Could Change the Rating - UP

A series of regulatory decisions at the utility that provide for higher than traditional rates of return and a demonstrated ability to take advantage of the opportunity.

Recent Developments

Net income for 2003 fell $4.0 million from 2002 to $114.2 million. Increased kilowatt hours at the utility helped to offset some of the $23.9 million increase in retirement benefit expenses.

HEI contributed $48 million in cash to its retirement benefit plans in 2003 and was able to avoid a potential charge to Other Comprehensive Income. At 2003 year-end, there was a 25% return on the pension plan assets. HEI expects a long-term return of 9%.

Rating Outlook

HEI's rating outlook reflects an improved economic base, the resulting strong financial performance of the company's main operating subsidiaries, and the reduced risk stemming from the end of the international strategy.

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Please provide copy of all reports by security analysts that evaluate HECO and/or HEI for the period 1999 to the present.

HECO Response:

HECO's common stock is not publicly traded therefore security analysts do not separately report on HECO. Reports by security analysts that evaluate HEI for the period 2004 to the present that we are aware of are voluminous and therefore one copy each will be provided to the Consumer Advocate and the Commission under separate transmittal. Security analyst reports for the period 1999 to 2003 that we are aware of are too voluminous to reproduce but can be reviewed at HECO's office upon request. Please contact Irene Sekiya at 543-4778 to arrange for review.

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Hawaiian Electric Industries

Equity Research Recent Development Report

October 29, 2004

Hold/Conservative

Analyst: Douglas A. Fischer, CFA 314-955-3501
Associate: Michael Doyle

Symbol: **HE**
Exchange: **NYSE**
Recent Price: **28.04**

Electric Utilities

			Fiscal Year Ends Dec		
			2003A	*2004E*	*2005E*
Dividend:	$1.24	**EPS:**	$1.57	$1.66	$1.58
Yield:	4.4%	**P/E:**	NA	16.9X	17.7X
		ROE:	11.0%	10.9%	10.1%

Fundamental Data

HE Beats Our and Average Analyst 3Q Estimates; 2004 EPS Estimate Raised

- **We calculate 3Q ongoing EPS of $0.44 after removing a $0.07 per share gain from the sale of its remaining collateralized debt obligations (CDO).**
- **We are raising our 2004 EPS estimate to $1.66 from $1.62 to reflect HE's better than expected third quarter.**
- **Our 2005 EPS estimate of $1.58 remains unchanged.**
- **Shares rate Hold.**

Company Description: Holding company whose principal businesses are electric utility operations, which provided 67% of income from continuing operations in 2003, and a bank, which provided 48%. Holding company and other segment lost money due to debt and preferred.

Disclosure Information: Please refer to the last two pages of this report for important disclosure information.

HE Beats Our and Average Analyst Third Quarter Estimates

On October 25, HE reported third quarter earnings of $0.51 per share. We calculate ongoing EPS of $0.44 after removing a $0.07 per share gain from the sale of its remaining collateralized debt obligations (CDO). Earnings were above our estimate of $0.40 and the average analyst estimate of $0.42. In the third quarter of 2003, HE earned $0.41 per share. The company beat our estimate on materially more favorable than normal weather (there were 10% more cooling degree days in the third quarter than normal) and a $3.8 million (pre-tax) release of reserves at American Savings Bank (ASB). We include the release of reserves in our ongoing EPS

2004 EPS Estimate Raised; 2005 Maintained

We are raising our 2004 EPS estimate to $1.66 from $1.62 to reflect HE's better than expected third quarter. However, because we assume a return to normal weather in 2005 (every quarter of 2004 has been weather favorable versus normal for HE so far), margin compression at the bank as the yield curve flattens and because we cannot anticipate whether HE will continue to release reserves at ASB, we are not raising our 2005 EPS estimate of $1.58.

Investment Appraisal

We estimate the fair value of HEI's shares at $24-25 using an average of: (1) our sum-of-the-parts valuation of $24 based on P/E ratios of comparable utilities and banks and (2) our dividend discount model (DDM) valuation of approximately $25 per share. Though we believe HEI shares are priced on the rich side at current levels, our HOLD rating reflects our projection that HEI shares could post a 12-month total return within a range of plus or minus 10%, thus qualifying under our hold rating definition. Given the 4.4% dividend yield, HEI shares would have to fall to below

Summary of EPS Changes

Fiscal Year Ends Dec

$40.00 [redacted]

			Past 12 months	
Rating	Master List Companies	Current Rating Distribution	Investment Banking Clients	% of Investment Banking Clients *
Buy	212	32%	39	18%
Hold/Neutral	434	65%	61	14%
Sell	19	3%	1	5%

* Percentage of Investment Banking Clients on Master List by rating.

OUR 3-TIER RATING SYSTEM (12-18 month time horizon)
Buy: A total return is anticipated in excess of the market's long-term historic rate (approximately 10%). Total return expectations should be higher for stocks which possess greater risk.
Hold: Hold the shares, with neither a materially positive total return nor a materially negative total return is anticipated.
Sell: Stock should be sold, as a materially negative total return is anticipated.

RISK SUITABILITY (Relates to fundamental risk, including earnings predictability, balance sheet strength and price volatility)
Conservative: Fundamental risk approximates or is less than the market.
Aggressive: Fundamental risk is higher than the market.
Speculative: Fundamental risk is significantly higher than the market.

On 9/28/01 AGE changed its rating system from 5 tiers to 4 tiers. "Strong Buy" replaced the previous "Buy" rating, "Buy" replaced the previous "Accumulate" rating, and "Hold" replaced the previous "Maintain" rating. We compressed the previous ratings of "Reduce" and "Sell" into one rating, "Sell".

On 9/13/02 AGE changed its rating system from 4 tiers to 3 tiers. We eliminated the "Strong Buy" rating, and we changed the rating on all stocks with that rating to "Buy". All other ratings and their definitions remained in place.

COMPANY SPECIFIC DISCLOSURES:
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AGE has managed/co-managed a public offering within the past three years.
AGE has received compensation for investment banking services within the past 12 months.
AGE expects to receive or intends to seek compensation for investment banking services within the next three months.
The subject company is or was a client of AGE during the past 12 months for investment banking services and analyst is aware of same.

The views expressed in this research report accurately reflect my personal views about the subject company and its securities.

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Hawaiian Electric Industries

OCTOBER 4, 2004

Hold/Conservative

Douglas A. Fischer, CFA (314) 955-3501
Michael Doyle, *Associate Analyst*

Symbol: **HE**
Exchange: **NYSE**
Recent Price: **26.68**

52-Week Price Range	26.87—20.63
Dividend	$1.24
Yield	4.6%

Year Ends December 31

	2004E	*2005E*	*2006E*
EPS	$1.62*	$1.58	$1.80
P/E	16.5X	16.9X	14.8X
ROE	10.9%	10.1%	11.2%

**Excludes non-recurring charge.*

Fundamental Data

1999-2003 EPS CAGR	1.3%
1999-2003 Div. Per Share CAGR	0.0%

Coverage Initiated with Hold Rating

- **Shares provide 4.6% yield on dividend we consider secure**

Investment Appraisal

We have initiated coverage of Hawaiian Electric Industries (HEI) common shares with an investment rating of HOLD and a suitability rating of CONSERVATIVE.

HEI's electric utility unit, Hawaiian Electric Company (HECO), provides relatively stable earnings power with the potential for moderate growth primarily as a result of projected utility rate increases. We project 2004 ongoing EPS of $1.62, an increase from the $1.57 earned in 2003. We forecast a modest decline to $1.58 in 2005 reflecting lower earnings from the bank unit, American Savings Bank (ASB), as a result of a flatter yield curve and other factors. In 2006, we project EPS growth to $1.80 assuming electric rate increases and a rebound in the net interest rate spread at the bank.

A key investment feature is HEI's $1.24 dividend, which provides a 4.6% yield on the recent price of $26.68.

We estimate the fair value of HEI's shares at approximately $23-24 using an average of: (1) our sum-of-the-parts valuation of approximately $22 based on P/E ratios of comparable utilities and banks and (2) our dividend discount model valuation (DDM) of approximately $25 per share. Though we believe HEI shares are priced on the rich side at current levels, our HOLD rating reflects our projection that HEI shares could post a 12-month total return within the range of plus or minus 10%. Given the 4.6% dividend yield, HEI shares would have to fall to below $22.75 to post a 12-month total return worse than a negative 10%.

The chief investment risks are related to interest rates, in our view. A sustained flatter yield curve would likely hurt bank earnings and higher interest rates, especially higher long-term rates, could reduce the relative attractiveness of HEI's dividend to investors.

Attractive Investment Features

Regulated Utilities Provide Relatively Stable Earnings Base

The majority of HEI's earnings, 67% in 2003 and an estimated 70% in 2004, are derived from regulated electric utility operations that are quite likely to remain rate-regulated for the foreseeable future given the geographic isolation of the islands. The underlying earnings power and cash flow generation of this business is relatively stable, though weather, the economy and rate cases, among other things, can provide fluctuations year to year.

Rate Increases Likely to Boost Utility Earnings

Electric utility earnings are likely to improve over the next several years as a result of expected rate increases. We expect a rate increase to be granted for electric operations on Oahu in mid-2005 and we see the potential for a rate increase for Big Island (Hawaii) operations in late 2006. The utility on the island of Oahu provides the bulk of electric revenues, 69% in 2003. The consolidated electric operations earned an 8.5% financial statement return on common equity in 2003, below the 10.9% to 11.5% range of authorized returns on equity (ROEs) in the most recent round of rate orders for each of the three utilities. The average electric utility authorized return on equity was 10.6% in the eight rate decisions in the U.S. in the first half of 2004 according to Regulatory Research Associates.

Transformation of Bank Could Improve Its Long-Term Earnings Power

American Savings Bank (ASB), acquired in 1988, is in the midst of a multi-year transformation from a traditional thrift (home mortgage lender) to a full service community bank with both individual and business customers. ASB is striving to diversify its loan portfolio from home mortgages to high-yielding, shorter-duration consumer, business and commercial real estate loans. However, this transition is expected to take a number of years. Residential loans still composed 78% of the total loan portfolio as of June 30, 2004. We do project a decline in bank ongoing earnings in 2005 as a result of a flatter yield curve and other factors, but project a recovery in 2006.

High Dividend Yield

HE has paid a $1.24 per share (split-adjusted) common dividend since 1998 and plans to maintain that dividend rate for the foreseeable future. This rate provides a high 4.6% yield on the recent price of $26.68. This compares with a peer group (integrated, regulated power companies) yield of 4.3%.

Investment Risks

Potential for Relatively Flat Near-Term EPS

We project ongoing EPS will rise 3% in 2004, to $1.62 from the $1.57 earned in 2003. However, we see the potential for a decline to $1.58 in 2005 as a result of lower bank earnings. We do project a recovery and growth to $1.80 in 2006 due to higher electric rates and a rebound in bank results. Over the 2000 through 2003 period, HEI diluted EPS from continuing operations were $1.67, $1.59, $1.62 and $1.57. This lack of sustained EPS growth is not unique to HEI. Many other electric utilities had similar earnings records over this period, reflecting a decline in return on equities authorized by state

July and early August 2004. Most notably, HEI Chairman and Chief Executive Officer (CEO), Robert F. Clarke, recently exercised options on 100,000 shares and sold approximately 117,900 shares between July 15 and 26 at prices ranging from $25.52 to $26.02 per share. We believe that the options exercised were those that recently vested. HEI officers and directors have a strong financial incentive to exercise their stock options as soon as they vest because dividend equivalent shares are no longer granted once the options vest. The stock sales were approximately 48% of Mr. Clarke's combined stock and vested stock options (exercisable within 60 days after February 11, 2004) listed in the 2004 annual proxy filing; however, we estimate that Mr. Clarke has options

sufficient information, especially the tax basis, to fully evaluate the above variables. It appears that it would take a highly attractive offer for ASB to yield high enough after-tax proceeds for the transaction to be neutral or accretive to HEI's EPS.

As to whether HEI is willing to consider a sale, HEI management has consistently stated that it intends to retain ownership of the bank. We believe it would take either a highly attractive offer or an outlook for sustained poor profitability for HEI to consider selling the bank to another financial institution.

Valuation

We estimate the fair value of HEI shares to be 23-24. This estimate is the result of averaging the valuation estimates derived by our peer group comparison and dividend discount model (DDM) as detailed below. The midpoint of this fair value range is 12% below the recent $26.68 market price for HEI shares.

Though we believe HEI shares are priced on the rich side at current levels, our HOLD rating reflects our projection that HEI shares could post a 12-month total return within the range of plus or minus 10%. Given the 4.6% dividend yield, HEI shares would have to fall to below $22.75 to post a 12-month total return worse than a negative 10%.

Our fair value estimate is an average of estimates of value derived from our sum of the parts and DDM valuations. Our sum of the parts model considers the electric utility, the savings bank and the holding company and other investments separately to arrive at a value for HEI shares as detailed in Figure 1. Details of our DDM valuation are shown in Figure 2.

In our sum of the parts work, we value the electric utility and holding company and other segments using the median P/E multiple on 2005 EPS estimates of utilities we consider close peers to HECO. We use our 2005 EPS projection of $1.24 for the utility and our estimate of a $0.24 per share loss for the holding company and other segment. We multiply each by the 13.9X median 2005 estimated P/E of the peer group detailed in Figure 3. Using these figures, we arrive at a value of $17.46 per share for the electric utility offset by a negative

FIGURE 1 **Sum of the Parts Valuation**

	$ in Millions		Per Share
Utility			
Earnings, 2005E	100.7		
Assumed multiple	13.9		
	1,403.6	$	17.46
Bank			
Earnings, 2005E	46.8		
Assumed multiple	13.4		
	628.5	$	7.82
Holding company & other			
Earnings, 2005E	(19.5)		
Assumed multiple	13.9		
	(272.6)	$	(3.39)
Shares outstanding in mil., 6/30	80.4		
Est. value per HEI share		**$**	**21.89**

Source: A.G. Edwards

$3.39 per share for the holding company and other segment, which has very little revenue and consists mainly of debt. We do not value the electric utility at the peer group price to book value multiple of 139% because HECO has often earned a below peer average return on equity and is projected, by us, to do so for the near future.

To value the savings bank, we use our 2005 EPS estimate of $0.58 and the 13.4X median P/E multiple on 2005 EPS estimates for banks/thrifts that fit two criteria: those with total assets of between $2 billion and $10 billion and one to four family home loans consisting of at least 50% of total loans (peer group is shown in Figure 4). Using these figures, we arrive at a value of $7.82 per share for ASB.

The sum of the values of the utility, ASB and the holding company and other segment results in a total value of $21.89 for HEI shares.

An alternative method for valuing HEI shares is to use a DDM, which estimates the present value of expected future common dividend payments. Our DDM assumes a risk free rate of return of 5.0%, near the current yield to maturity on 30-year U.S. Treasury bonds of 4.9%, and an equity risk premium of 3.0%. We estimate a long-term EPS growth rate of 3.3% for HEI based on an assumed

(continued on page 7)

FIGURE 2 **Dividend Discount Model**

Required ROR, Stage 1 (ROR_1): 5.00% + 3.00% = 8.00%

Stage 1 Year	(1) Value of Dividends	(2) PV Factor	(1x2) PV of Dividends
0	$ 1.24		
1	1.24	0.926	$ 1.15
2	1.24	0.857	1.06
3	1.24	0.794	0.98
4	1.28	0.735	0.94
5	1.32	0.681	0.90
			$ 5.04

Stage 2	ROR_2=	5.00%	+	3.00% = 8.00%
	g_2=	3.30%		
	d_n=	$ 1.32		
	n=	5		
			$ 19.79	
Present value			**$ 24.83**	

Source: A.G. Edwards

FIGURE 3 **Utility Peer Group**

Company	Sym	10/4/04 Price ($)	Total Return (%) 2003	Total Return (%) YTD	Earnings Per Share ($) 2004E	Earnings Per Share ($) 2005E	Price/ Earnings (X) 2004E	Price/ Earnings (X) 2005E	BVPS 6/30/04 ($)	Price BVPS (%)	Common Equity/ Capital 6/30/04	S&P Corp. Debt Rating
Ameren	AEE	46.45	17	1	2.80	3.05	16.6	15.2	28.58	163	54	A-
Cinergy	CIN	39.68	21	2	2.75	2.90	14.4	13.7	20.80	191	42	BBB+
El Paso Electric	EE	16.45	21	23	0.80	1.04	20.6	15.8	10.74	153	46	BBB-
Empire District Electric	EDE	20.50	28	(7)	1.00	1.45	20.5	14.1	14.72	139	47	BBB
Idacorp	IDA	30.05	29	0	1.79	1.93	16.8	15.6	22.86	131	45	A-
PG&E Corp.	PCG	30.68	100	10	2.05	2.20	15.0	13.9	18.25	168	45	BBB-
Pinnacle West Capital	PNW	42.10	24	5	2.51	3.19	16.8	13.2	31.70	133	47	BBB
PNM Resources	PNM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Puget Energy	PSD	22.80	13	(4)	1.51	1.68	15.1	13.6	16.88	135	40	BBB-
SCANA	SCG	37.55	15	10	2.70	2.85	13.9	13.2	21.41	175	39	A-
Sierra Pacific Resources	SRP	9.08	13	24	0.45	0.55	20.2	16.5	11.48	79	26	B+
Southern Company	SO	30.34	12	0	1.97	2.05	15.4	14.8	13.43	226	41	A
Westar Energy	WR	20.47	114	1	1.44	1.68	14.2	12.2	14.75	139	38	BB+
Wisconsin Energy	WEC	32.28	37	(3)	2.32	2.40	13.9	13.5	20.33	159	37	BBB+
Xcel Energy	XEL	17.58	62	4	1.25	1.30	14.1	13.5	13.13	134	41	BBB

nk Peer Group

ame	Ticker	State	Price 10/4/04	2005 EPS Estimate	2005 Price/ Earnings	BVPS 06/30/04	Price/ Book 6/30/04	Total Assets (Billions) 06/30/04	Total Deposits (Billions) 06/30/04	Equity/ Assets 06/30/04	ROAA TTM as of 06/30/04	ROAE TTM as of 06/30/04	1-4 Family/ Total Loans
al Corp.	BKUNA	FL	$28.95	$1.78	16.3 X	$15.18	191%	$8.3	$3.4	5.6 %	0.65 %	11.2 %	82 %
l	WFSL	WA	25.54	1.90	13.4	13.98	183%	7.3	4.6	15.1	1.91	12.8	78
	MAFB	IL	43.98	3.60	12.2	27.74	159%	9.4	5.7	9.7	1.12	11.4	61
orp	HRBT	NY	19.45	1.22	15.9	9.36	208%	2.6	1.8	10.9	1.35	12.3	61
orp.	FED	CA	49.56	3.95	12.5	26.79	185%	5.5	2.8	8.0	1.24	14.9	59
					13.4 X		185%			9.7 %	1.24 %	12.3 %	61 %
Bank		HI		$0.58		$5.38		$6.5	$4.1	6.6 %	0.96 %	13.8 %	78 %

er Share
Months

s, SNL Financial, Company Filings
based on consensus.

(continued from page 4)

11% earned return on common equity. Our model results in a value of approximately $25 per share, moderately below the current share price.

Company Overview

Hawaiian Electric Industries, Inc. is a holding company whose principal businesses are electric utility operations, which provided 67% of income from continuing operations in 2003, and a bank, which provided 48%. Holding Company and Other activities provided a negative 15% of income, primarily reflecting financing expenses.

Hawaiian Electric Company, and its operating subsidiaries, Maui Electric Company and Hawaiian Electric Light Company, provide electricity to virtually all of the population of the state. American Savings Bank is the third largest financial institution in the state with assets of $6.5 billion.

Figure 5 provides financial highlights by business unit for the last three years.

Regulated Utility Operations

The electric utility business is the core business of HEI. Such operations are conducted through Hawaiian Electric Company (HECO) and its subsidiaries, Maui Electric Company (MECO) and Hawaiian Electric Light Company (HELCO). These regulated utilities generate electricity and move it to 93% of the Hawaiian market via transmission and distribution lines. The utilities serve approximately 417,000 residential, commercial and industrial customers on the islands of Oahu, Maui, Hawaii, Lanai and Molokai. The customer classes are balanced with 34% of 2003's revenues from residential customers, 34% from commercial customers, 31% from industrial customers and 1% from other customers. The utilities' 2003 fuel mix was 55% oil, 5% diesel and 39% purchased power.

Hawaiian Economy Has Improved

Hawaii's economic growth has improved since a dip after the September 11 terrorist attacks. Growth is expected to continue over the next several years. Real gross state product fell 0.5% in 2001 but rose 3.3% in 2002, 2.6% in 2003 and is projected to grow by 2.6% in 2004 and 2.3% in 2005.

The three largest components of Hawaii's economy are tourism, U.S. military bases and construction. Visitor days are forecast to rise 4.5% in 2004 aided by improving U.S. and Japanese economies with a further 2.4% increase projected for 2005. The military's presence on the islands is expected to grow as a result of several new military projects that are underway or expected.

Kilowatt-hour (kWh) sales grew at a compound annual rate of 2.1% from 1999 through 2003 and HEI projects 2.3% annual growth from the 2003 base through 2008 with stronger growth in the earlier years and slower growth in the out years.

FIGURE 5 **Earnings by Segment**

Earnings by Segment ($ millions)

	2001A	2002A	2003A	2004E	2005E	2006E
Utility	88.3	90.2	78.9	91.0	100.7	109.8
Bank	48.5	56.2	56.3	58.4	46.8	54.4
Parent and Other	(29.3)	(28.4)	(17.2)	(20.2)	(19.5)	(17.8)
Total	**107.5**	**118.1**	**117.9**	**129.2**	**127.9**	**146.4**

EPS by Segment ($)

	2001A	2002A	2003A	2004E	2005E	2006E
Utility	1.30	1.24	1.05	1.14	1.24	1.35
Bank	0.71	0.77	0.75	0.73	0.58	0.67
Parent and Other	(0.43)	(0.39)	(0.23)	(0.25)	(0.24)	(0.22)
Total	**1.58**	**1.62**	**1.57**	**1.62**	**1.58**	**1.80**

Sources: Company reports and A.G. Edwards' estimates.

PUC Investigates Competitive Bidding for New Generation

On the U.S. mainland, wholesale, and in a number of states, retail power generation markets have been at least partially deregulated. Deregulation is difficult in the state of Hawaii given the geographic isolation of the state and no interconnections between the islands. Further the siting and permitting process for additional generation capacity is difficult. HECO does purchase about 39% of its power supply, primarily under several firm contracts.

In October 2003, the Public Utilities Commission of Hawaii (PUC) opened investigative dockets on competitive bidding and distributed generation as potential ways to increase competition under cost-based regulation. The PUC is evaluating the use of competitive bidding as a means for acquiring or building new generating capacity. In this proceeding, testimony from the parties is due in January 2005 with hearings scheduled for July 2005.

Fuel and Purchased Power Adjustment Clauses

Electric utility fuel costs and the energy component of purchased power costs are passed directly through to customers via automatic adjustment clauses; therefore, fluctuations in these costs have no direct impact on utility earnings. The clauses are adjusted monthly to reflect changes in costs. Purchased power capacity costs are dealt with in base rate cases.

Most Recent Rate Decisions

MECO
In April 1999, the PUC authorized MECO to increase electric rates by $11.3 million, or 8.2%, annually based on a 10.94% allowed return on equity (ROE). MECO originally filed for a $22.4 million rate increase in January 1998, but at the end of the case supported a $16.4 million, or 11.9%, annual increase based on a 12.75% ROE. In December 1998, the PUC authorized an $11.7 million interim increase based on an 11.12% ROE. The lower authorized final increase required MECO to refund $0.2 million to customers. The equity ratio allowed in the final order was 48.84%.

HELCO
In February 2001, the PUC authorized HELCO to increase electric rates by $8.4 million, or roughly 4.5%, annually based on an 11.50% ROE. HELCO had requested a 13.25% ROE and 9.0% rate increase. The requested equity ratio of 49.69% was granted by the PUC.

HECO
The most recent rate order for Oahu was issued in December 1995 and incorporated an 11.4% ROE and 48.80% equity ratio. HECO had requested a 13.25% ROE and 48.80% equity ratio.

Capital Investment

HEI expects net capital expenditures at the three utilities to total $800 million for the period 2004 through 2008. Further, it expects 52% of these funds to be used for transmission and distribution related projects with the remaining 48% to be used for generation projects and general plant purposes. Importantly, HE has indicated that cash flow from operations should be nearly sufficient to cover both capital expenditures over the next five years with the slight gap being filled by issuance of long-term debt.

Several key projects are discussed below:

Keahole Expansion Near Completion
HELCO is nearing the end of what has been an arduous process, completing and putting into service two 20 megawatt (MW) combustion turbines (CT-4 and CT-5) at the Keahole Power Plant. Construction was delayed significantly by litigation, which has since been resolved. Construction at the plant resumed in November 2003, and the units are expected to be fully operational by year-end 2004. As of June 30, 2004, HELCO had invested approximately $93 million in CT-4 and CT-5 and to support existing units at the site. An additional $8 million is expected to be spent to complete the installation of the two units.

The delay in completing Keahole is depressing HELCO's earnings. The $93 million investment, which is 20% of HELCO net utility plant as of June 30, 2004, is not in rate base and is not earning a return. The utility stopped booking allowance for funds used during construction or AFUDC (non-cash credits to earnings representing capitalized interest expense and a return on equity capital) on Keahole after November 30, 1998 due to repeated delays of the project. As a result, HELCO's earned return on average common equity was a low 6.4% for 2003.

In our model, we assume HELCO will file for higher rates in early 2006 with an interim increase granted in late 2006. Since HELCO stopped

accruing AFUDC in late 1998, we project that no significant portion of Keahole's costs will be disallowed by regulators as imprudent, but we cannot entirely rule out this risk given the delays, controversies and cost increases incurred. HELCO

assume an interim decision is granted in mid-2005 with a final decision in late 2005 or early 2006.

HELCO

difference between the weighted-average yield on interest-bearing assets and the weighted-average rate on interest-bearing liabilities.

Balance Sheet and Credit Ratings

In March 2004, HEI sold 4 million (post-split) shares of its common stock, raising net proceeds of approximately $99 million. These funds, along with others, were eventually used to redeem $100 million of HEI's 8.36% trust preferred securities in April. Also in March, HEI sold $50 million of 4.23% medium-term notes. These proceeds were used to redeem $50 million of 7.30% Cumulative Quarterly Income Preferred Securities of the utility units in April. As a result of these transactions, HEI was able to strengthen its common equity ratio without diluting earnings per share.

HECO's consolidated capitalization was 53% common equity, 2% preferred stock, 41% long-term debt and 4% short-term debt as of June 30, 2004. The unit's revenue bonds are insured securities. Therefore they are rated AAA by S&P and Aaa by Moody's. HECO's commercial paper is rated A-2 by S&P and P-2 by Moody's.

ASB's common equity was 6.6% of total assets on June 30, 2004. The bank is considered well capitalized under Federal Deposit Insurance Corporation (FDIC) regulations. Per these regulations, ASB had a leverage ratio of 6.9%, as of June 30, versus the minimum requirement for being well capitalized of 5.0%. The Tier-1 risk-based capital ratio was 14.2% versus a 6.0% requirement and the total risk-based capital ratio was 15.3% versus a requirement of 10.0%.

Combining HECO, ASB and the Holding Company and Other segment results in consolidated HEI capitalization of $9.274 billion, 12.6% or $1.17 billion of which was common equity at June 30. HEI's commercial paper is rated A-2 by S&P and P-2 by Moody's. Medium-term notes are rated BBB/Baa2.

Earnings Discussion

Utility Earnings, Recent and Projected

Electric utility earnings are primarily a function of kilowatt-hour sales levels, prices established by the state utility regulators, other operating and maintenance expense levels and external financing needs which are driven by capital expenditures. Historic and projected HECO earnings are provided in Figure 6.

2003
In 2003, net income for common stock for HECO and its subsidiaries was $78.9 million, down from $90.2 million in 2002. The 13% decline was the result of a swing of $24 million in retirement benefits expense. This item was a $10 million credit in 2002 but slipped to a $14 million expense in 2003. The 2004 expense reflected losses on retirement plan benefits in recent years as a result of poor equity markets and a lower discount rate due to lower long-term interest rates. KWh sales rose 2.4% in 2004.

Six Months 2004
For the first half of 2004, HECO and its subsidiaries earned $41.8 million, a 15% increase from the $36.2 million earned in the prior year period. Revenues minus the cost of fuel and purchased power rose 3% or $9.5 million reflecting a 3.3% increase in kWh sales. The higher unit sales were a result of Hawaii's economic growth and weather that was 5.7% warmer than last year, as measured by cooling degree days.

Operating income at the utility increased 8% mainly due to higher KWh sales and lower other operation expense, including lower retirement benefits expense. Higher AFUDC and lower interest and other charges also contributed to the 15% rise in net income for common stock.

Projected Earnings
We project full year 2004 HECO net income of $91 million, a 15% increase over 2003, driven by 3% higher kwh sales and lower benefit plan expense. Retirement plan expenses are expected to fall by $4.6 million in 2004 because of strong investment returns in 2003 and contributions to the plans.

We project further net income growth beyond this year, to $100.7 million in 2005 and to $109.8 million in 2006. Kwh sales growth and a projected interim rate increase on Oahu in mid-2005 (with a final order in late 2005 or early 2006) and an interim rate increase for HELCO in late 2006 are key to our forecast.

Rate increases are critical to our earnings forecast. We believe our rate relief assumptions are conservative since we project allowed and earned

FIGURE 6 **HECO (Consolidated Utility) Income Statement**
(Dollars in Millions)

Revenues	2001	2002	2003	2004E	2005E	2006E
Electric	$ 1,284.3	$ 1,252.9	$ 1,393.0	$ 1,483.8	$ 1,533.1	$ 1,584.7
Expenses						
Purchased power and fuel	684.6	637.1	756.6	829.0	850.4	872.3
Other Operations	125.6	131.9	155.5	150.1	153.8	157.7
Maintenance	61.8	66.5	64.6	66.2	67.9	69.6
Depreciation	100.7	105.4	110.6	115.7	119.6	122.0
Other Taxes	120.9	120.1	130.7	139.2	143.8	148.6
Total	**1,093.5**	**1,061.0**	**1,218.0**	**1,300.2**	**1,335.6**	**1,370.2**
Operating Income	**190.8**	**191.9**	**175.0**	**183.7**	**197.6**	**214.5**
Total Other Income	**7.4**	**7.1**	**6.2**	**8.2**	**7.9**	**7.4**
Interest & Preferred						
Interest expense	47.1	44.2	44.3	44.2	44.2	44.2
Preferred stock dividends of subsidiaries	0.9	0.9	0.9	0.9	0.9	0.9
Preferred securities distributions of trust subs.	7.7	7.7	7.7	4.4	3.3	3.3
Allowance for borrowed funds UDC	(2.3)	(1.9)	(1.9)	(4.4)	(5.4)	(4.9)
Total Interest & Preferred	**53.4**	**51.0**	**51.0**	**45.1**	**43.0**	**43.5**
Income Taxes	**55.4**	**56.7**	**50.2**	**54.6**	**60.8**	**67.5**
Net Income	89.4	91.3	80.0	92.1	101.7	110.9
Preferred dividends of HECO	1.1	1.1	1.1	1.1	1.1	1.1
Earnings For Common	**88.3**	**90.2**	**78.9**	**91.0**	**100.7**	**109.8**
Average ROE (%)	10.4	10.0	8.5	9.2	9.6	10.1

Sources: Company reports and A.G. Edwards' estimates

returns on equity after rate increases for HECO-Oahu and HELCO in the area of 10%, a level that we believe will be exceeded if regulators treat the company's rate increase requests reasonably.

Bank Earnings, Recent and Projected

Historic and projected ASB earnings are provided in Figure 7.

2003
ASB characterized 2003 as a challenging year for savings banks given significant refinancing of mortgages in their portfolios. Net income for common stock of $56.3 million was basically flat with 2002 results of $56.2 million.

Net interest income declined to $189.5 million from $193.3 million in 2002. The 40-plus year low in interest rates compressed margins resulting in a net interest spread of 3.08% versus 3.24% in the prior year. ASB could not reduce further its already low cost of funds and the yields on assets continued to decline because of a high level of refinancings.

General and administrative expenses increased to $152.2 million from $143.7 million partly as a result of ASB's ongoing transformation to a full service community bank.

The lower net interest income and expenses were offset by a decline in the provision for loan losses, higher fee income and gains on securities sales. The loan loss provision dropped to $3.1 million from $9.8 million in 2002 reflecting improved credit quality of the loan portfolio due to a strong real estate market. Fee income and other income rose to $58.5 million from $53 million primarily due to a $4.1 million pre-tax gain on the sale of securities.

Six Months 2004
For the six months ended June 30, 2004, ASB's net income for common stock fell to $9.0 million from

(continued on page 13)

FIGURE 7 **American Savings Bank Income Statement**
(Dollars in Millions)

	2001A	2002A	2003A	2004E	2005E	2006E
Interest Income:						
Avgerage Earning Assets (mil)	$5,617.9	$5,745.0	$5,980.2	$6,125.9	$6,348.7	$6,573.7
Earning Asset Growth Rate	1.0%	2.3%	4.1%	2.4%	3.6%	3.5%
Average Interest Bearing Liabilities (mil)	5,416.9	5,488.4	5,739.4	5,933.2	6,205.8	6,490.9
Interest Bearing Liability Growth Rate	0.0%	1.3%	4.6%	3.4%	4.6%	4.6%
Yield on Earning Assets	7.11%	6.03%	5.23%	4.97%	5.07%	5.32%
Cost of Interest Bearing Liabilities	3.94%	2.79%	2.15%	1.97%	2.12%	2.17%
Net Interest Spread	**3.17%**	**3.24%**	**3.08%**	**3.00%**	**2.95%**	**3.15%**
Net Interest Margin	3.31%	3.37%	3.17%	3.01%	2.89%	3.11%
Total Interest Income	399.7	346.2	312.8	302.0	328.0	356.1
Total Interest Expense	213.6	152.9	123.3	117.5	144.8	151.5
Net Interest Income	186.1	193.3	189.5	184.5	183.2	204.6
Provision for Loan Losses	**(12.5)**	**(9.8)**	**(3.1)**	**2.7**	**0.7**	**(3.6)**
Net Interest Income after Provision	173.6	183.6	186.4	187.2	183.9	201.0
Other Income						
Fees from other Financial Services	17.2	21.3	22.8	22.4	22.1	21.7
Fee Income on Deposit Liabilities	9.4	15.7	17.0	18.5	20.0	21.5
Fee Income on other Financial Products	8.5	10.1	9.9	10.8	12.0	13.4
Fee Income on Loan Serviced for Others, net	2.5	-0.2	0.2	0.6	0.6	0.6
Gain on Sale of Securities	8.0	-0.6	4.1	0.0	0.0	0.0
Writedown of investment	-6.2	0.0	0.0	0.0	0.0	0.0
Other Income	5.6	6.8	4.5	4.5	4.5	4.5
Total Other Income	**45.0**	**53.0**	**58.5**	**56.9**	**59.2**	**61.7**
Total Core Revenue	**218.5**	**236.6**	**244.9**	**244.0**	**243.0**	**262.8**
General and Administrative Expenses						
Compensation and Employee Benefits	51.9	59.6	65.8	63.7	68.1	73.6
Occupancy and Equipment	28.6	30.1	30.5	31.4	32.2	32.9
Data Processing	10.4	11.2	10.7	11.1	11.4	11.7
Professional Services	5.5	9.4	7.1	7.5	7.8	8.1
Other	39.9	33.5	38.1	38.6	39.0	39.4
Total	**136.4**	**143.7**	**152.2**	**152.4**	**158.4**	**165.6**
Efficiency Ratio	**57%**	**58%**	**61%**	**62%**	**65%**	**62%**
Income before Minority Interests and Income Taxes	**82.1**	**92.9**	**92.8**	**91.7**	**84.7**	**97.1**
Minority Interests	0.2	0.2	0.1	0.1	0.1	0.1
Income Taxes	27.9	31.1	31.0	51.8	32.4	37.2
Tax Rate	34.0%	33.5%	33.4%	33.5%	33.5%	33.5%
Income before Preferred Stock Dividends	53.9	61.6	61.7	39.8	52.2	59.9
Preferred Dividends	5.4	5.4	5.4	5.4	5.4	5.4
Net Income for Common Stock, Reported	**48.5**	**56.2**	**56.3**	**34.4**	**46.8**	**54.4**
Non-Recurring Items (After Tax)	**-4.1**	**0.0**	**0.0**	**-24.0**	**0.0**	**0.0**
Net Income for Common Stock, Ongoing	**52.6**	**56.2**	**56.3**	**58.4**	**46.8**	**54.4**

Sources: Company reports and A.G. Edwards' estimates

(continued from page 11)

$27.0 million in the first half of 2002. Adjusted for an adverse tax ruling, net income was $32.2 million versus adjusted year ago results of $25.0 million primarily because of a reduction in the provision for loan losses.

(ASB recorded a $24 million after-tax charge in the second quarter due to a negative tax ruling related to a real estate investment trust (REIT) subsidiary established by ASB in 1998. The establishment of the REIT reduced Hawaii bank franchise taxes by $21 million. The reduction was a result of "dividends received deductions" taken by ASB for dividends paid to it by the REIT. In the second quarter, the Hawaii Tax Appeal Court ruled against these deductions. Therefore, ASB took a $21 million charge for bank franchise taxes and a $3 million charge for related interest for the cumulative impact of this ruling through March 31, 2004. ASB also expensed $0.8 million in the second quarter related to the second quarter impact of this decision. ASB continues to believe its tax position is justified and has appealed the matter to the Hawaii Supreme Court.)

In the first half of 2004, net interest income of $95.3 million was essentially flat with the year ago $95.0 million. The net interest spread declined slightly to 3.06% from 3.08%. A decrease in the weighted average yield on interest-earnings assets was largely offset by a decrease in the weighted average rate on interest bearing liabilities.

General and administrative expenses increased to $79.7 million from $76.4 million. These expenses would have declined absent a $5 million ($3 million after-tax) one-time expense for interest on the adverse tax ruling discussed above.

In the first half, ASB's reversed its provision for loan losses by $4.6 million, resulting in a $6.8 million positive swing in pre-tax earnings from the year ago $2.2 million increase in the provision. This was the second quarter of reversals in the provision, a trend that is likely not sustainable over the long-term given currently near ideal conditions for home mortgages.

Fee income and other income increased a modest 2%, to $29 million versus $28.2 million.

Projected Earnings
We project full year 2004 ASB net income of $58 million, excluding the $24 million charge for the adverse tax ruling. This would be a $2 million increase over 2003, less than the already reported $7 million increase over the first half of the year. We project a second half decline in net interest income as a result of the flattening yield curve and a related decline in the net interest rate spread in percentage terms. Our model assumes a full year 2004 net interest rate spread of 2.95%, down from 3.08% in 2003. We also do not assume any gains on sales of securities in our second half forecast versus $1.7 million in 2003. Further, the adverse tax ruling will result in a modestly higher tax rate beginning in the second quarter and going forward.

In 2005, we project a decline in net income, to $47 million reflecting a further reduction in the net interest rate spread assuming a continuation of a flatter yield curve. We also assume the loan loss provision reversals end and we move to a more normal position of an expense for this item, modestly growing the provision.

In 2006, we preliminarily project a rebound in ASB net income, to $54 million, due to a recovery in the net interest rate spread.

Holding Company & Other Losses, Recent and Projected

2003
The Holding Company and Other segment lost $17.2 million in 2003, down from the $28.4 million loss in 2002. The improvement was primarily due to a $6 million after-tax benefit from the settlement of lawsuits and lower interest expense.

Six Months 2004
For the six months ended June 30, 2004, the Holding Company and Other segment lost $8.6 million, an improvement from the year ago first half loss of $13.1 million. HEI attributed the improvement to higher income from investments, higher equity in earnings of unconsolidated subsidiaries and lower legal, stock option and charitable contribution expenses. Also, the redemption of a trust preferred issue reduced financing expenses.

Projected Results
For full year 2004, we project the Holding Company and Other segment loss will be in the

neighborhood of $20 million versus the $17.2 million loss in 2003. The larger loss reflects the absence of the year ago $6 million from lawsuit settlements and higher officer's insurance premiums partly offset by lower financing costs reflecting the redemption of a trust preferred issue.

For 2005 and 2006, we project losses of $20 million and $18 million, respectively.

Consolidated EPS, Recent and Projected

Historic and projected consolidated earnings, cash flow and balance sheet information is provided on pages 15-17.

2003

In 2003, the consolidated company Hawaiian Electric Industries, posted ongoing net income from continuing operations of $114.2 million or $1.57 per average diluted share. This was a decrease from $118.2 million or $1.62 per share in 2002. Reasons for the decline included a 2.7% increase in average diluted shares, from 73 million to 75 million, as well as the comments by segment provided earlier in this report.

Six Months 2004

For the six months ended June 30, 2004, HEI reported net income of $42.2 million or $0.53 per average diluted share. The figure rises to $66.2 million or $0.84 per average diluted share excluding the $24 million charge for the adverse tax ruling discussed earlier. These results compare with $50.1 million from continuing operations or $0.67 per average diluted share in the year ago first half. The count of average diluted shares increased 6.0%, to 79.8 million from 74.4 million, reflecting the March 2004 common stock issuance.

Projected Earnings

Combining our segment comments above, we project 2004 net income of $105 million or $1.32 per average diluted share. Ongoing net income is projected at $129 million or $1.62 per average diluted share as a result of excluding the tax ruling charge.

For 2005, we project net income of $127.9 million or $1.58 per average diluted share and, for 2006, we project a rebound to $146.5 million or $1.80 per average diluted share.

Consolidated Income Statement

(Dollars in Millions)

Revenues	2001	2002	2003	2004E	2005E	2006E
Electric	1,289.3	1,257.2	1,396.7	1,483.8	1,533.1	1,584.7
Bank	444.6	399.3	371.3	358.9	387.2	417.8
Other	(6.6)	(2.7)	13.3	4.0	4.0	4.0
Total	**1,727.3**	**1,653.7**	**1,781.3**	**1,846.7**	**1,924.3**	**2,006.5**
Expenses						
Electric utility expenses	1,095.4	1,062.2	1,220.1	1,300.2	1,335.6	1,370.2
Bank expenses	362.5	306.4	278.6	267.2	302.5	320.7
Other	13.2	18.7	19.1	20.2	20.5	20.9
Total	**1,471.1**	**1,387.3**	**1,517.7**	**1,587.5**	**1,658.6**	**1,711.7**
Operating Income	**256.2**	**266.4**	**263.6**	**259.2**	**265.7**	**294.8**
Total Other Income	**4.2**	**4.0**	**4.3**	**8.2**	**7.9**	**7.4**
Interest & Preferred						
Interest expense other than bank	78.7	72.3	69.3	70.8	71.3	67.5
Preferred stock dividends of subsidiaries	2.0	2.0	2.0	2.0	2.0	2.0
Preferred securities distributions of trust subs.	16.0	16.0	16.0	6.4	3.3	3.3
Allowance for borrowed funds UDC	(2.3)	(1.9)	(1.9)	(4.4)	(5.4)	(4.9)
Total Interest & Preferred	**94.5**	**88.5**	**85.4**	**74.8**	**71.1**	**67.9**
Income Taxes	**58.2**	**63.7**	**64.4**	**87.2**	**74.6**	**87.7**
Net Income From Continuing Operations	107.7	118.2	118.0	105.4	128.0	146.5
Discontinued Operations	(24.0)	0.0	(3.9)			
Non-Recurring Items				(24.0)	0.0	0.0
Ongoing Earnings For Common	83.7	118.2	114.2	129.3	128.0	146.5
Average shares (Diluted)	67.9	73.0	75.0	79.9	81.2	81.2
EPS From Continuing Operations, Diluted	1.59	1.62	1.57	1.32	1.58	1.80
Non-recurring, Diluted	0.00	0.00	0.00	(0.30)	0.00	0.00
Ongoing EPS (Diluted)	**1.59**	**1.62**	**1.57**	**1.62**	**1.58**	**1.80**
Dividend/Share Paid	1.24	1.24	1.24	1.24	1.24	1.24
Book Value/Share	13.06	14.21	14.36	15.46	15.80	16.38
Average ROE (%)	12.2	11.9	11.0	10.9	10.1	11.2

Sources: Company reports and A.G. Edwards' estimates

Consolidated Statement of Cash Flows

(Dollars in Millions)

Operating Activities	2001	2002	2003	2004E	2005E	2006E
Net income from continuing operations	107.7	118.2	118.0	105.4	128.0	146.5
Depreciation and amortization	129.5	141.0	150.4	148.8	154.3	158.4
Provision for loan losses	12.5	9.8	3.1	(2.7)	(0.7)	3.6
Writedowns of income notes	14.8	4.5	0.0	0.0	0.0	0.0
Deferred income taxes	0.4	35.2	2.8	0.0	0.0	0.0
AFUDC (equity)	(4.2)	(4.0)	(4.3)	(4.4)	(5.4)	(4.9)
Working Capital	(1.3)	(60.3)	(31.8)	2.5	(3.0)	(3.0)
Net Operating Cash flow	**259.4**	**244.4**	**238.3**	**249.6**	**273.1**	**300.6**
Investing Activities						
Available for sale investment & mortgage-related securities purchased	(1,190.1)	(1,605.7)	(2,156.0)	0.0	0.0	0.0
Principal repayments on available for sale investment & mortgage related securities	605.4	1,182.8	1,860.4	0.0	0.0	0.0
Proceeds from sale of available for sale investment & mortgage related securities	788.9	77.3	243.4	0.0	0.0	0.0
Loans receivable originated and purchased	(1,036.1)	(1,210.1)	(1,597.4)	0.0	0.0	0.0
Principal repayments of loans receivable	749.4	949.3	1,349.4	0.0	0.0	0.0
Proceeds from sale of loans	215.9	110.5	120.9	0.0	0.0	0.0
Proceeds from sale of real estate acquired in settlement of loans	9.8	12.0	7.7	0.0	0.0	0.0
Capital expenditures	(126.3)	(128.1)	(162.9)	(224.7)	(201.6)	(176.2)
Contributions in aid of construction	11.0	11.0	13.0	13.2	19.4	13.7
Other	(0.3)	(0.3)	(0.6)	0.0	0.0	0.0
Net Investing Cash Flow	**27.5**	**(601.3)**	**(322.1)**	**(211.5)**	**(182.2)**	**(162.5)**
Financing Activities						
Net increase in deposit liabilities	94.9	121.2	225.5	0.0	0.0	0.0
Repurchase of common	0.0	0.0	0.0	0.0	0.0	0.0
Issuance of common	78.9	32.5	29.8	126.8	0.0	0.0
Retirement of HEI preferred	0.0	0.0	0.0	(100.0)	0.0	0.0
Net retirement of HECO trust preferreds	0.0	0.0	0.0	(50.0)	0.0	0.0
Net decrease in ST borrowings with maturities 3 mos. or less	(101.4)	0.0	0.0	0.0	0.0	0.0
Repayment of other ST borrowings	(3.0)	0.0	0.0	0.0	0.0	0.0
Net increase in retail repo agreements	6.9	12.2	13.1	0.0	0.0	0.0
LT debt already issued in current year	0.0	0.0	0.0	50.0	0.0	0.0
Expected Issuance of LT Debt	117.3	35.3	167.9	0.0	0.0	0.0
Retirement of LT Debt	(60.5)	(64.5)	(210.0)	0.0	0.0	0.0
Proceeds from securities sold under repurchase agreements	824.7	1,086.5	1,965.6	0.0	0.0	0.0
Repayments of securities sold under repurchase agreements	(744.2)	(1,116.1)	(1,809.9)	0.0	0.0	0.0
Proceeds from advances under FHLB	214.1	350.1	373.5	0.0	0.0	0.0
Principal payments on advances from FHLB	(430.6)	(206.6)	(532.7)	0.0	0.0	0.0
Common Stock Dividends	(67.0)	(73.4)	(75.1)	(94.1)	(100.3)	(100.3)
Preferred securities distributions of trust subsidiaries	(16.0)	(16.0)	(16.0)	(6.4)	(3.3)	(3.3)

Consolidated Capital Structure

(Dollars in Millions)

	2001A	2002A	2003A	2004E	2005E	2006E
Common Equity	929.7	1,046.3	1,089.0	1,251.1	1,278.7	1,324.9
Long-Term Debt	1,145.8	1,106.3	1,064.4	1,114.4	1,114.4	1,114.4
Short-Term Debt	0.0	0.0	0.0	0.0	0.0	0.0
Preferred equity	234.4	234.4	234.4	84.4	84.4	84.4
Total Capitalization	2,309.8	2,387.0	2,387.9	2,449.9	2,477.5	2,523.7
% Equity	40	44	46	51	52	52
% Long-Term Debt	50	46	45	45	45	44
% Short-Term Debt	0	0	0	0	0	0
% Preferred	10	10	10	3	3	3

Sources: Company reports and A.G. Edwards' estimates

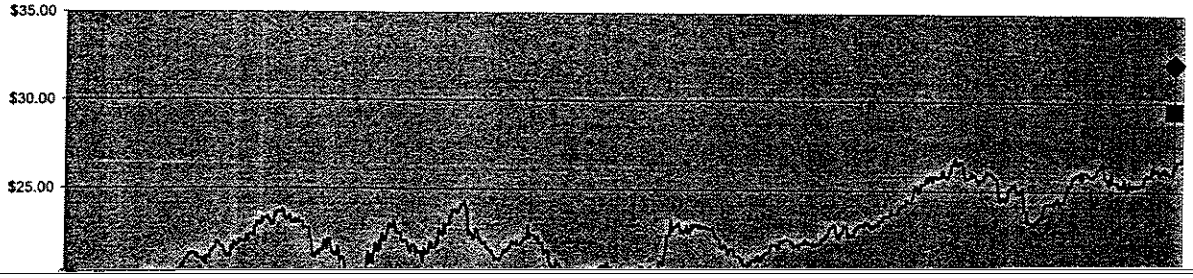
Selected Balance Sheet Data

(Figures in Millions)

	June 30, 2004	June 30, 2003
Cash and Equivalents	$192.5	$213.8
Receivables	184.3	178.5
Other Current Assets	2,890.9	2,751.6
Total Current Assets	**$3,267.7**	**$3,143.9**
Short-Term Debt	14.2	0.0
Payables	153.1	173.8
Other Current Liabilities	5,913.4	5,763.0
Total Current Liabilities	**$6,080.6**	**$5,936.8**
Working Capital	($2,813.0)	($2,792.9)
Property and Equipment	2,344.4	2,079.3
Other Assets	3,662.2	3,779.7
Total	**$3,193.6**	**$3,066.0**
Less:		
Long-Term Debt	1,166.6	1,063.5
Preferred Stock	34.4	234.4
Deferred Items/Other	822.6	707.0
Shareholders' Equity	**$1,170.0**	**$1,061.2**

Hawaiian Electric Industries

A.G. Edwards



Hawaiian Electric Industries

Rating	Master List Companies	Current Rating Distribution	Past 12 months: Investment Banking Clients	Past 12 months: % of Investment Banking Clients *
Buy	217	33%	38	18%
Hold/Neutral	424	64%	61	14%
Sell	20	3%	0	0%

* Percentage of Investment Banking Clients on Master List by rating.

OUR 3-TIER RATING SYSTEM (12-18 month time horizon)
Buy: A total return is anticipated in excess of the market's long-term historic rate (approximately 10%). Total return expectations should be higher for stocks which possess greater risk.
Hold: Hold the shares, with neither a materially positive total return nor a materially negative total return is anticipated.
Sell: Stock should be sold, as a materially negative total return is anticipated.

RISK SUITABILITY (Relates to fundamental risk, including earnings predictability, balance sheet strength and price volatility)
Conservative: Fundamental risk approximates or is less than the market.
Aggressive: Fundamental risk is higher than the market.
Speculative: Fundamental risk is significantly higher than the market.

On 9/28/01 AGE changed its rating system from 5 tiers to 4 tiers. "Strong Buy" replaced the previous "Buy" rating, "Buy" replaced the previous "Accumulate" rating, and "Hold" replaced the previous "Maintain" rating. We compressed the previous ratings of "Reduce" and "Sell" into one rating, "Sell".

On 9/13/02 AGE changed its rating system from 4 tiers to 3 tiers. We eliminated the "Strong Buy" rating, and we changed the rating on all stocks with that rating to "Buy". All other ratings and their definitions remained in place.

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AGE has received compensation for investment banking services within the past 12 months.
AGE expects to receive or intends to seek compensation for investment banking services within the next three months.
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The views expressed in this research report accurately reflect my personal views about the subject company and its securities.

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Hawaiian Electric Industries

Equity Research Recent Development Report

September 28, 2004

Hold/Conservative

Analyst: Douglas A. Fischer, CFA 314-955-3501
Associate: Michael Doyle

Symbol: **HE**
Exchange: **NYSE**
Recent Price: **26.48**

Electric Utilities

			Fiscal Year Ends Dec		
			2003A	*2004E*	*2005E*
Dividend:	$1.24	**EPS:**	$1.57	$1.62	$1.58
Yield:	4.7%	**P/E:**	NA	16.3X	16.8X
		ROE:	11.0%	10.9%	10.1%

Fundamental Data

Coverage Initiated With HOLD Rating

- **Shares Provide Approximately a 4.7% Yield on Dividend We Consider Secure.**
- **Share Price Is Moderately Higher Than Our Fair Value Estimate of $23-24.**
- **Chief Investments Risks Are Interest Rate-Related, In Our View.**
- **Both Utility and Bank Have Potential to Earn Higher ROEs Over Long-Term.**

Company Description: Holding company whose principal businesses are electric utility operations, which provided 67% of income from continuing operations in 2003, and a bank, which provided 48%. Holding company and other segment lost money due to debt and preferred.

Disclosure Information: Please refer to the last two pages of this report for important disclosure information.

Investment Appraisal

We have initiated coverage of Hawaiian Electric Industries (HEI) common shares with an investment rating of HOLD and a suitability rating of CONSERVATIVE. HEI is a holding company whose principal businesses are electric utility operations, which earned $79 million in 2003, and a bank, which earned $56 million. The holding company and other activities lost $17 million from continuing operations in 2003 primarily as a result of financing expenses. Hawaiian Electric Company (HECO) and its operating subsidiaries, Maui Electric Company and Hawaiian Electric Light Company, provide electricity to approximately 93% of the state's population. American Savings Bank (ASB) is the third largest financial institution in the state with assets of $6.5 billion.

The electric utility provides relatively stable earnings power with the potential for growth primarily as a result of projected rate increases. Bank earnings could come under some pressure given the current flatter yield curve. We project 2004 ongoing EPS of $1.62, an increase from the $1.57 earned in 2003. We project a modest decline in EPS in 2005, to $1.58, reflecting our expectation of lower bank earnings as a result of a flatter yield curve and other factors. In 2006, we project EPS growth to $1.80 due to assumed higher electric rates and a rebound in bank earnings assuming a recovery in the net interest rate spread. A key investment feature is HEI's $1.24 dividend, which provided a 4.7% yield on the September 28 intraday price of $26.34.

We estimate the fair value of HEI's shares at approximately $22-24 using an average

of: (1) our sum-of-the-parts valuation of approximately $22 based on P/E ratios of comparable utilities and banks and (2) our dividend discount model valuation (DDM) of approximately $25 per share. Though we believe HEI shares are priced on the rich side at current levels, our HOLD rating reflects our projection that HEI shares could post a 12-month total return within the range of plus or minus 10%. Given the 4.7% dividend yield, HEI shares would have to fall to below $22.50 to post a 12-month total return worse than a negative 10%.

The chief investment risks are related to interest rates, in our view. A sustained flatter yield curve would likely hurt bank earnings and higher interest rates, especially higher long-term rates, could reduce the relative attractiveness of HEI's dividend to investors.

three utilities. The average electric utility authorized return on equity was 10.6% in the eight rate decisions in the U.S. in the first half of 2004 according to Regulatory Research Associates.

Transformation of Bank May Improve Its Long-Term Earnings Power. ASB, acquired in 1988, is in the midst of a multi-year transformation from a traditional thrift (home mortgage lender) to a full service community bank with both individual and

mortgages to high-yielding, shorter-duration consumer, business and commercial real estate loans. However, this transition is expected to take a number of years. Residential loans still comprised 78% of the total loan portfolio as of June 30, 2004. We do project a decline in bank ongoing earnings in 2005 as a result of a flatter yield curve and other factors but project a recovery in 2006.

High Dividend Yield. HE has paid a $1.24 per share (split-adjusted) common dividend since 1998 and plans to maintain that dividend rate for the foreseeable future. This rate provides a high 4.7% yield on the recent price of $26.34. This compares to a peer group (integrated, regulated power companies) yield of approximately 4.3%.

Investment Risks

Potential for Relative Flat Near-Term EPS. We project ongoing EPS will rise 3% in 2004, to $1.62 from the $1.57 earned in 2003. However, we see the potential for a decline to $1.58 in 2005 as a result of lower bank earnings. We do project a recovery and growth to $1.80 in 2006 due to higher electric rates and a rebound in

July 15th and 26th at prices ranging from $25.52 to $26.02 per share. We believe

that the options exercised were those that recently vested. HEI officers and directors have a strong financial incentive to exercise their stock options as soon as they vest because dividend equivalent shares are no longer granted once the options vest. The stock sales were approximately 48% of Mr. Clarke's combined stock and vested stock options (exercisable within 60 days after February 11, 2004) listed in the 2004 annual proxy filing; however, we estimate that Mr. Clarke has options for 100,000 shares vesting each year, based on recent awards.

Valuation

We estimate the fair value of HEI shares to be approximately $23-24. This estimate is the result of averaging the valuation estimates derived by our peer group comparison and Dividend Discount Model (DDM) as detailed below.

In our sum of the parts work, we value the Electric Utility and Holding Company and Other segments using the median P/E multiple on 2005 EPS estimates of 15 electric utilities we consider close peers to HECO. We use our 2005 EPS projection of $1.24 for the utility and our estimate of a $0.24 per share loss for the Holding Company and Other segment. We multiply each by the 13.8X median 2005 estimated P/E of the peer group. Using these figures, we arrive at a value of $17 per share for the Electric Utility offset by a negative $3 per share for the Holding Company and Other segment, which has very little revenue and consists mainly of debt.

To value the savings bank, we use our 2005 EPS estimate of $0.58 and the 13.2X median P/E multiple on 2005 EPS estimates for five banks/thrifts that fit two criteria: those with total assets of between $2 billion and $10 billion and 1-4 family home loans consisting of at least 50% of total loans. Using these figures, we arrive at a value of $8 per share for ASB.

The sum of the values of the Utility, ASB and the Holding Company and Other segment results in a total value of approximately $22 for HEI shares.

An alternative method for valuing HEI shares is to use a DDM, which estimates the present value of expected future common dividend payments. Our DDM assumes a risk free rate of return of 5.0%, near the current yield to maturity on 30-year U.S. Treasury bonds of 4.8%, and an equity risk premium of 3.0%. We estimate a long term EPS growth rate of 3.3% for HEI based on an assumed 11% earned return on common equity. Our model results in a value of approximately $25 per share, moderately below the current share price.

Kilowatt-hour (kWh) sales grew at a compound annual rate of 2.1% from 1999 through 2003 and HEI projects 2.3% annual growth from the 2003 base through 2008 with stronger growth in the earlier years and slower growth in the out years.

Electric utility fuel costs and the energy component of purchased power costs are passed directly through to customers via automatic adjustment clauses; therefore, fluctuations in these costs have no direct impact on utility earnings. The clauses are adjusted monthly to reflect changes in costs. Purchased power capacity costs are dealt with in base rate cases.

Most Recent Rate Decisions

In April 1999, the PUC authorized MECO to increase electric rates by $11.3 million, or 8.2%, annually based on a 10.94% allowed return on equity (ROE). In December 1998, the PUC authorized an $11.7 million interim increase based on an 11.12% ROE. The lower authorized final increase required MECO to refund $0.2 million to customers. The equity ratio allowed in the final order was 48.84%. In February 2001, the PUC authorized HELCO to increase electric rates by $8.4 million, or roughly 4.5%, annually based on an 11.50% ROE. The requested equity ratio of 49.69% was granted by the PUC. The most recent rate order for Oahu was issued in December 1995 and incorporated an 11.4% ROE and 48.80% equity ratio.

Capital Investment

HEI expects net capital expenditures at the three utilities to total $800 million for the period 2004 through 2008. Further, it expects 52% of these funds to be used for transmission and distribution related projects with the remaining 48% to be used for generation projects and general plant purposes. Importantly, HEI has indicated that cash flow from operations should be nearly sufficient to cover both capital expenditures over the next five years with the slight gap being filled by issuance of long-term debt.

Keahole Expansion Near Completion

HELCO is nearing the end of what has been an arduous process, completing and

the Keahole Power Plant. Construction was delayed significantly by litigation, which has since been resolved. Construction at the plant resumed in November 2003

Expected Rate Increase Requests

HECO is expected to file a general rate case in the second half of 2004 for its Oahu service territory. The utility expects to use 2005 as the test year. We assume an interim decision is granted in mid-2005 with a final decision in late 2005 or early 2006. Upon completion of HECO's rate case, we believe HELCO is likely to file for rates that incorporate the additional costs of the new Keahole units (CT-4 and CT-5).

American Savings Bank

American Savings Bank, a federally chartered savings bank, was acquired by HEI in 1988. ASB had total assets of $6.5 billion and deposits of $4.1 billion as of June 30, 2004. It is the third largest financial institution in the state of Hawaii, behind two large commercial banks.

ASB's main business continues to be residential mortgage lending funded to a large extent by low-cost, core checking and savings deposits. However, ASB is in the midst of a multi-year transformation from a traditional thrift to a full service community bank with both individual and business customers. ASB is striving to diversify its loan portfolio from home mortgages to high-yielding, shorter-duration consumer, business and commercial real estate loans. This transition is expected to take a number of years. Residential loans still comprised 78% of the total loan portfolio as of June 30, 2004. Business loans were 9% of ASB's loan portfolio, with commercial loans 7% and commercial real estate loans 6%. ASB's costing liabilities consisted of 50% core deposits, 19% term certificates and 31% Federal Home Loan Board (FHLB) advances and other borrowings as of June 30, 2004.

ASB's earnings depend primarily on net interest income—the difference between the income earned on interest-earning assets (loans receivable, mortgage-backed securities and investments) and the expense incurred on interest-bearing liabilities (deposit liabilities and borrowings). Interest income, in turn, is a function of the amount of interest-earning assets (and interest-bearing liabilities) and the interest rate spread- the difference between the weighted-average yield on interest-bearing assets and the weighted-average rate on interest-bearing liabilities.

Balance Sheets and Credit Ratings

In March 2004, HEI sold 4 million (post-split) shares of its common stock, raising net proceeds of approximately $99 million. These funds, along with others, were eventually used to redeem $100 million of HEI's 8.36% trust preferred securities in April. Also in March, HEI sold $50 million of 4.23% medium-term notes. These proceeds were used to redeem $50 million of 7.30% Cumulative Quarterly Income Preferred Securities of the utility units in April. As a result of these transactions, HEI was able to strengthen its common equity ratio without diluting earnings per share.

HECO's consolidated capitalization was 53% common equity, 2% preferred stock, 41% long-term debt and 4% short-term debt as of June 30, 2004. The unit's revenue bonds are insured securities. Therefore they are rated AAA by S&P and Aaa by Moody's. HECO's commercial paper is rated A-2 by S&P and P-2 by Moody's.

ASB's common equity was 6.6% of total assets on June 30, 2004. The bank is considered well- capitalized under FDIC regulations. Per these regulations, ASB had a leverage ratio of 6.9%, as of June 30, versus the minimum requirement for

being well-capitalized of 5.0%. The Tier-1 risk-based capital ratio was 14.2% versus a 6.0% requirement and the total risk-based capital ratio was 15.3% versus a requirement of 10.0%.

Combining HECO, ASB and the Holding Company and Other segment results in consolidated HEI capitalization of $9.274 billion, 12.6% or $1.17 billion of which was common equity at June 30. HEI's commercial paper is rated A-2 by S&P and P-2 by Moody's. Medium-term notes are rated BBB/Baa2.

Earnings, Recent and Projected

Utility

For the first half of 2004, HECO and its subsidiaries earned $41.8 million, a 15% increase from the $36.2 million earned in the prior year period. Revenues minus the cost of fuel and purchased power rose 3% or $9.5 million reflecting a 3.3% increase in kWh sales. The higher sales units were a result of Hawaii's economic growth and weather that was 5.7% warmer than last year, as measured by cooling degree-days.

Operating income at the utility increased 8% mainly due to higher KWh sales and lower other operation expense, including lower retirement benefits expense. Higher AFUDC and lower interest and other charges also contributed to the 15% rise in net income for common stock.

We project full year 2004 HECO net income of $91 million, a 15% increase over 2003, driven by 3% higher kWh sales and lower benefit plan expense. Retirement plan expenses are expected to fall by $4.6 million in 2004 because of strong investment returns in 2003 and contributions to the plans.

We project further net income growth beyond this year, to $100.7 million in 2005 and to $109.8 million in 2006. KWh sales growth, a projected interim rate increase on Oahu in mid-2005 (with a final order in late 2005 or early 2006) and an interim rate increase for HELCO in late 2006 are key to our forecast.

Rate increases are critical to our earnings forecast. We believe our rate relief assumptions are conservative since we project allowed and earned returns on equity

after rate increases for HECO-Oahu and HELCO of approximately 10%, a level that we believe will be exceeded if regulators treat the company's rate increase requests reasonably.

Bank

For the six months ended June 30, 2004, ASB's net income for common stock fell to $9.0 million from $27.0 million in the first half of 2002. Adjusted for an adverse tax ruling, net income was $32.2 million versus adjusted year ago results of $25.0 million primarily because of a reduction in the provision for loan losses.

(ASB recorded a $24 million after-tax charge in the second quarter due to a negative tax ruling related to a real estate investment trust (REIT) subsidiary established by ASB in 1998. The establishment of the REIT reduced Hawaii bank franchise taxes by $21 million as a result of dividends received deductions taken by ASB for dividends paid to it by the REIT. In the second quarter, the Hawaii Tax Appeal Court ruled against these deductions. Therefore, ASB took a $21 million

decision. ASB continues to believe its tax position is justified and has appealed the matter to the Hawaii Supreme Court.)

In the first half of 2004, net interest income of $95.3 was essentially flat with the year ago $95.0 million. The net interest spread declined slightly to 3.06% from 3.08%. A decrease in the weighted average yield on interest-earnings assets was largely offset by a decrease in the weighted average rate on interest bearing-liabilities.

General and administrative expenses increased to $79.7 million from $76.4 million. These expenses would have declined absent a $5 million ($3 million after-tax) one-time expense for interest on the adverse tax ruling discussed above.

In the first half, ASB reversed its provision for loan losses by $4.6 million, resulting in a $6.8 million positive swing in pre-tax earnings from the year ago $2.2 million increase in the provision. This was the second quarter of reversals in the provision, a trend that is likely not sustainable over the long-term given currently near ideal conditions for home mortgages.

Fee income and other income increased a modest 2%, to $29 million versus $28.2 million.

We project full year 2004 ASB net income of $58 million, excluding the $24 million charge for the adverse tax ruling. This would be a $2 million increase over 2003, less than the already reported $7 million increase over the first half of the year. We project a second half decline in net interest income as a result of the flattening yield curve and a related decline in the net interest rate spread in percentage terms. Our model assumes a full year 2004 net interest rate spread of 2.95%, down from 3.08% in 2003. We also do not assume any gains on sales of securities in our second half forecast versus $1.7 million in 2003. Further, the adverse tax ruling will result in a modestly higher tax rate beginning in the second quarter and going forward.

In 2005, we project a decline in net income, to $47 million reflecting a further reduction in the net interest rate spread assuming a continuation of a flatter yield curve. We also assume the loan loss provision reversals end and we move to a more normal position of an expense for this item, modestly growing the provision.

In 2006, we preliminarily project a rebound in ASB net income, to $54 million, due to a recovery in the net interest rate spread.

Holding Company & Other

For the six months ended June 30, 2004, the Holding Company and Other segment lost $8.6 million, an improvement from the year ago first half loss of $13.1 million. HEI attributed the improvement to higher income from investments, higher equity in earnings of unconsolidated subsidiaries and lower legal, stock option and charitable contribution expenses. Also, the redemption of a trust preferred issue reduced financing expenses.

For full year 2004, we project the Holding Company and Other segment loss will be in the neighborhood of $20 million versus the $17.2 million loss in 2003. The larger loss reflects the absence of a year ago $6 million from lawsuit settlements and higher officer's insurance premiums partly offset by lower financing costs reflecting the trust preferred redemption.

For 2005 and 2006, we project losses of $20 million and $18 million, respectively.

Consolidated

For the six months ended June 30, 2004, HEI reported net income of $42.2 million or $0.53 per average diluted share. The figure rises to $66.2 million or $0.84 per average diluted share excluding the $24 million charge for the adverse tax ruling discussed earlier. These results compare to $50.1 million from continuing operations or $0.67 per average diluted share in the year ago first half. The count of average diluted shares increased 6.0%, to 79.8 million from 74.4 million, reflecting the March 2004 common stock issuance.

Combining our segment comments above, we project 2004 net income of $105 million or $1.32 per average diluted share. Ongoing net income is projected at $129 million or $1.62 per average diluted share as a result of excluding the tax ruling charge.

For 2005, we project net income of $127.9 million or $1.58 per average diluted share and, for 2006, we project a rebound to $146.5 million or $1.80 per average diluted share.

Summary of EPS Changes

Fiscal Year Ends Dec

$35.00 [redacted]

			Past 12 months	
Rating	Master List Companies	Current Rating Distribution	Investment Banking Clients	% of Investment Banking Clients *
Buy	222	34%	42	19%
Hold/Neutral	422	63%	61	14%
Sell	17	3%	0	0%

* Percentage of Investment Banking Clients on Master List by rating.

OUR 3-TIER RATING SYSTEM (12-18 month time horizon)
Buy: A total return is anticipated in excess of the market's long-term historic rate (approximately 10%). Total return expectations should be higher for stocks which possess greater risk.
Hold: Hold the shares, with neither a materially positive total return nor a materially negative total return is anticipated.
Sell: Stock should be sold, as a materially negative total return is anticipated.

RISK SUITABILITY (Relates to fundamental risk, including earnings predictability, balance sheet strength and price volatility)
Conservative: Fundamental risk approximates or is less than the market.
Aggressive: Fundamental risk is higher than the market.
Speculative: Fundamental risk is significantly higher than the market.

On 9/28/01 AGE changed its rating system from 5 tiers to 4 tiers. "Strong Buy" replaced the previous "Buy" rating, "Buy" replaced the previous "Accumulate" rating, and "Hold" replaced the previous "Maintain" rating. We compressed the previous ratings of "Reduce" and "Sell" into one rating, "Sell".

On 9/13/02 AGE changed its rating system from 4 tiers to 3 tiers. We eliminated the "Strong Buy" rating, and we changed the rating on all stocks with that rating to "Buy". All other ratings and their definitions remained in place.

COMPANY SPECIFIC DISCLOSURES:
AGE has managed/co-managed a public offering within the past 12 months.
AGE has managed/co-managed a public offering within the past three years.
AGE has received compensation for investment banking services within the past 12 months.
AGE expects to receive or intends to seek compensation for investment banking services within the next three months.
The subject company is or was a client of AGE during the past 12 months for investment banking services and analyst is aware of same.

The views expressed in this research report accurately reflect my personal views about the subject company and its securities.

AGE's research analysts receive no compensation in connection with the firm's investment banking business. The analyst certifies that he/she receives no compensation that is directly or indirectly related to the specific recommendations or views contained within this report. Analysts may be eligible for annual bonus compensation based on the overall profitability of the firm, which takes into account revenues derived from all of the firm's business activities, including its investment banking business.

Price objectives and recommendations contained in this report are based on a time horizon of 12-18 months, but there is no guarantee the objective will be achieved within the specified time horizon. Price objectives are determined by a subjective review of fundamental and/or quantitative characteristics of the issuer and the security that is the subject of this report. Specific information is provided in the text of the research report.

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member SIPC

Institutional Equity Research

November 23, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

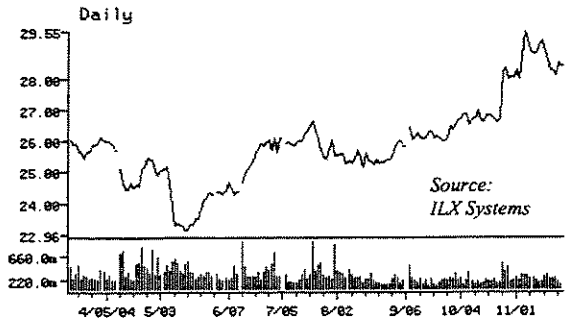
HE – NYSE – $28.63
(Price: 11/23/04)

FY: DEC	2003A[1]	*3/31/04A*	*6/30/04A*[2]	*9/30/04A*[3]	*12/31/04E*	2004E[2,3]	2005E
Revenue ($M)	$1,781.3	*$437.1*	*$461.8*	*$506.8*	*$495.4*	$1,901.1	$1,913.7
Year-over-year revenue growth	8%	*3%*	*3%*	*12%*	*9%*	7%	1%
Price/Revenue ratio	1.2x					1.2x	1.2x
EPS Revised	**$1.52**	***$0.40***	***$0.14***	***$0.53***	***$0.44***	**$1.49**	**$1.75**
EPS Previous					*NC*	NC	NC
Price/EPS ratio	18.8x					19.2x	16.3x
EBITDA ($M)	$414.0	*$104.0*	*$103.3*	*$117.4*	*$107.6*	$432.2	$437.2
EV/EBITDA ratio	8.5x					8.1x	8.0x

[1]Includes $0.05/sh. in charges for 2Q'03 write down and increased reserves for a Philippine utility investment; a $0.02/sh. charge for DOH settlement in 3Q'03 and $0.01/sh. reversal in 4Q'03; and a $0.03/sh. charge for the 4Q'03 Keahole settlement. [2] Includes 2Q'04 charge of $0.30/sh. for REIT tax ruling. [3] Includes 3Q'04 benefits of $0.04/sh. gain on sale of CDO investments and $0.02/sh. gain from discontinued operations related to sale of Chinese venture.

Valuation Data	
Long-term growth rate	3%
Debt/Cap	48.5%
Book value/ share (9/30/04)	$15.05
Dividend (yield)	$1.24 (4.3%)
12-18 month Target Price	$26
5-year Target Price	$29
Return on Equity	10.7%

Trading Data	
Shares outstanding (M)	80.6
Market Capitalization ($M)	$2,307
52-week low	$22.51
52-week high	$29.55
Average daily volume (3 mos.)	195,000
Float	99%
Index Membership	S&P 400 MidCap
Industry	Utilities



Company Description
Hawaiian Electric Industries, Inc. is a holding company engaged in the electric utility and banking businesses in the state of Hawaii. Hawaiian Electric Company, Inc. provides electric services on five islands, whose populations comprise 95% of the state's residents. American Savings Bank, FSB, is the state's third largest financial institution with $6.7 billion in assets.

Initiating Quarterly EPS Estimates for 2005. Maintaining UNDERPERFORM Rating.

- As shown on page four, we are introducing quarterly 2005 EPS estimates for Hawaiian Electric Industries, while maintaining our full year forecast of $1.75 per share. We believe that next year's results should be aided by the absence of an adverse bank franchise tax ruling, which reduced 2004 EPS by $0.30, and by higher electric rates starting sometime during 4Q'05. Likely offsets include higher retirement benefit expenses, which could rise to $10-$15 million from $7 million in 2004, based on various assumptions.

- Depending on 2004 investment returns and interest rates at year-end 2004, Hawaiian Electric Industries could be required to recognize a potential charge to accumulated other comprehensive income (AOCI) of $1-$98 million. While this potential charge would not affect 2004 net income or liquidity, it would reduce shareholders' equity. While the company awaits a decision from regulators on how this charge would be treated for ratemaking purposes, the worst case scenario is the electric utilities' returns on average rate base (RORs) could increase and exceed authorized RORs, which would result in reduced utility revenues and earnings.

- Hawaiian Electric Company has filed for a $74.2 million, or 7.3%, net increase in electric rates that are currently in effect for customers on Oahu. Using a 2005 test year, the application requests a 9.11% rate of return on an average rate base of $1.092 billion and a return on equity of 11.5%. A decision by regulators is likely by 4Q'05. We have assumed a 3% rate increase in our model.

- We are maintaining our target price of $26 or 15x our 2005 EPS estimate, which approximates the average multiple of electric utilities in our coverage universe. With the current share price above our near-term target price, we continue to maintain our **UNDERPERFORM** rating.

James L. Bellessa, Jr., CFA jbellessa@dadco.com Ph: (406) 791-7230

Please refer to page two of this report for detailed disclosure and certification information.

D.A. Davidson & Co.
Two Centerpointe Drive, Suite 400 • Lake Oswego, Oregon 97035 • (503) 603-3000 • (800) 755-7848 • www.dadavidson.com

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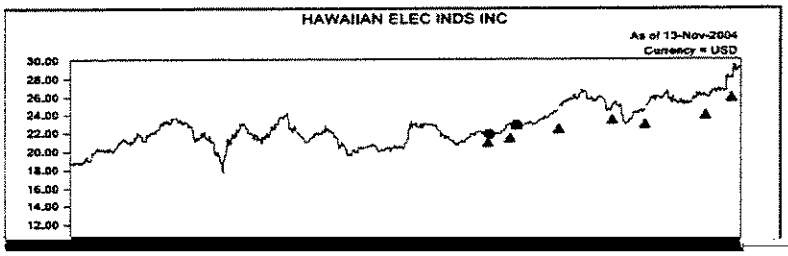
D.A. Davidson & Co. Ratings	Buy	Neutral	Underperform
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 9/30/04)	Buy	Hold	Sell
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
Distribution of Institutional Research Ratings	47%	48%	5%
Corresponding Retail Research Rating	Buy, Core/Buy	Hold, Core/Hold	Avoid
Distribution of Retail Research Ratings	84%	16%	0%
Distribution of combined ratings	54%	42%	4%
Distribution of companies from whom D.A. Davidson & Co. has received compensation for investment banking services in last 12 mos	8%	8%	0%



D.A. Davidson & Co. has made two changes to its institutional ratings scale. The first occurred on June 18, 2001 and the second occurred on July 9, 2002. The corresponding scales are reproduced below.

D.A. Davidson & Co. Institutional Research Rating Scale

Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands – Fiscal year ends 12/31

	2000	2001	2002	2003	3Q04
Cash and Equivalents (and Fed Funds Sold)	$ 212,783	$ 450,827	$ 244,525	$ 279,988	$ 247,572
Accts. Receivable and Unbilled Revenue, net	188,056	164,124	176,327	187,716	203,516
Available-for-Sale Securities	164,668	1,613,710	1,960,288	1,787,177	1,998,549
Securities Pledged for Repo. Agreements	657,371	756,749	784,362	941,571	916,592
Held-to-Maturity Investment Securities	1,448,466	84,211	89,545	94,624	97,365
Loans Receivable, net	3,211,325	2,857,622	2,993,989	3,121,979	3,126,277
Property, Plant and Equipment	2,054,474	2,067,503	2,241,943	2,311,888	2,372,884
Regulatory Assets	116,623	111,376	0	0	0
Other	363,447	309,867	345,002	382,228	405,954
Goodwill and Intangibles	101,481	101,954	97,572	93,987	92,185
Total Assets	8,518,694	8,517,943	8,933,553	9,201,158	9,460,894
Accounts Payable	$ 125,719	$ 119,850	$ 134,416	$ 132,780	$ 173,573
Deposit Liabilities	3,584,646	3,679,586	3,800,772	4,026,250	4,182,409
Short-Term Borrowings	104,398	0	0	0	8,392
Repurchase Agreements	596,504	683,180	667,247	831,335	790,699
FHLB Advances	1,249,252	1,032,752	1,176,252	1,017,053	1,020,053
Long-Term Debt	1,088,731	1,145,769	1,106,270	1,064,420	1,167,108
Deferred Income Tax	187,420	185,436	235,431	226,590	233,962
Contributions in Aid of Construction	211,518	213,557	218,094	233,969	231,118
Other	297,041	293,742	257,315	273,442	324,332
Regulatory liabilities			57,050	71,882	82,595
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	0
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406
Total Liabilities and Equity	8,518,694	8,517,943	8,933,553	9,201,158	9,460,894
Capital Structure (Excluding ASB's deposits, repos, and advances)					
Long-Term and Short-term Debt	$1,193,129	$1,145,769	$1,106,270	$1,064,420	$1,175,500
Trust Preferreds	200,000	200,000	200,000	200,000	0
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406

Hawaiian Electric Industries, Inc.
Consolidated Statements of Income
$$$ in thousands -- Fiscal year ends 12/31

	4Q03	2003	1Q04	2Q04	3Q04	4Q04E	2004E	1Q05E	2Q05E	3Q05E	4Q05E	2005E
Revenues:												
Electric Utility	$ 353,994	$ 1,388,685	$ 348,613	$ 370,605	$ 410,077	$ 402,156	$ 1,529,451	$ 359,124	$ 380,122	$ 394,280	$ 389,461	$ 1,522,998
Bank	89,745	371,320	89,258	89,982	90,298	92,039	361,575	93,732	95,567	97,528	99,110	385,936
Other	10,482	13,311	1,239	1,211	6,386	1,200	10,036	1,200	1,200	1,200	1,200	4,800
Total Revenues	454,221	1,781,316	437,110	461,798	506,759	495,396	1,901,063	454,056	476,889	493,018	489,770	1,913,734
Expenses:												
Electric Utility	307,625	1,220,120	302,473	324,691	357,384	353,204	1,337,732	317,172	334,019	345,412	336,733	1,333,336
Bank	66,893	278,565	63,150	66,971	63,765	67,388	261,274	68,428	69,479	70,546	71,629	280,079
Other	4,912	19,064	3,650	3,190	3,944	3,000	13,784	3,000	3,000	3,000	3,000	12,000
Total Expenses	379,430	1,517,749	369,273	394,852	425,073	423,592	1,612,790	388,598	406,497	418,958	411,362	1,625,415
Operating Income:												
Electric Utility	46,369	176,565	44,140	45,914	52,713	48,953	191,720	41,952	46,103	48,868	52,727	189,660
Bank	22,852	92,755	26,108	23,011	26,531	24,651	100,301	25,306	26,089	26,983	27,481	105,859
Other	5,570	(5,753)	(2,411)	(1,979)	2,442	(1,800)	(3,748)	(1,800)	(1,800)	(1,800)	(1,800)	(7,200)
Total Operating Income	74,791	263,567	67,837	66,946	81,686	71,804	288,273	65,458	70,392	74,060	78,408	288,319
Interest Expense-other than bank	(16,118)	(69,292)	(21,447)	(19,106)	(18,376)	(17,859)	(76,788)	(17,859)	(18,059)	(18,159)	(18,259)	(72,437)
Preferred Stock Dividends of Subsidiaries	(502)	(2,008)	(475)	(475)	(475)	(475)	(1,900)	(475)	(475)	(475)	(475)	(1,900)
Pref. Security Distributions of Trust Sub.	(4,009)	(16,035)										
AFUDC - Debt	529	1,914	644	733	859	850	3,086	850	850	850	850	3,400
AFUDC - Equity	1,192	4,267	1,449	1,673	1,934	1,900	6,956	1,900	1,900	1,900	1,900	7,600
Pre-Tax Income	55,883	182,415	48,008	48,771	65,628	56,219	219,626	49,774	54,607	58,176	62,424	224,982
Income Taxes	18,444	64,367	17,076	36,533	24,869	20,801	101,279	18,416	20,205	21,525	23,097	83,243
Income from Continuing Operations	37,439	118,048	30,932	11,238	40,759	35,418	118,347	31,358	34,403	36,651	39,327	141,738
Discontinued Operations, Net of Tax	0	(3,870)	0	0	1,913	0	1,913	0	0	0	0	0
Net Income	37,439	114,178	30,932	11,238	42,672	35,418	120,260	31,358	34,403	36,651	39,327	141,738
Applicable Shares	75,672	74,974	77,156	80,707	80,828	80,853	80,558	80,878	80,903	80,928	80,953	80,916
Earnings Per Share:												
Cont. Operations Bf. Non-Recurring Items	$0.49	$1.57	$0.40	$0.14	$0.50	$0.44	$1.47	$0.39	$0.43	$0.45	$0.49	$1.75
Non-Recurring Items												
Discontinued Operations	0.00	(0.05)	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00
GAAP EPS	$0.49	$1.52	$0.40	$0.14	$0.53	$0.44	$1.49	$0.39	$0.43	$0.45	$0.49	$1.75
Dividends Per Share	$0.31	$1.24	$0.31	$0.31	$0.31	$0.31	$1.24	$0.31	$0.31	$0.31	$0.31	$1.24
Dividend Payout Ratio of GAAP EPS	62.8%	81.4%	77.3%	222.8%	58.7%	70.8%	83.1%	80.0%	72.9%	68.5%	63.8%	70.8%
Tax Rate	33.0%	35.3%	35.8%	77.4%	36.0%	37.0%	46.1%	37.0%	37.0%	37.0%	37.0%	37.0%
Net Income by Segment (cont. ops.)												
Electric Utility	22,339	76,911	20,023	21,735	26,175	23,780	91,713	19,434	21,913	23,550	25,845	90,742
Bank	13,984	56,261	15,927	(6,949)	15,376	14,275	38,631	14,691	15,188	15,758	16,072	61,708
Other (operating income)	2,716	(8,607)	(2,411)	(948)	2,442							
Unallocated Parent Company	(1,600)	(6,517)	(2,607)	(2,600)	(3,238)							
Total	37,439	118,048	30,932	11,238	40,759	35,418	118,347	31,358	34,403	36,651	39,327	141,738
EPS by Segment (cont. operations)												
Electric Utility	$0.29	$1.05	$0.26	$0.27	$0.32	$0.29	$1.14	$0.24	$0.27	$0.29	$0.32	$1.12
Bank	$0.18	$0.75	$0.21	($0.09)	$0.19	$0.18	$0.48	$0.18	$0.19	$0.19	$0.20	$0.76
Other (operating income)	$0.04	($0.11)	($0.03)	($0.01)	$0.03							
Unallocated Parent Company	($0.02)	($0.11)	($0.03)	($0.03)	($0.04)							
Total	$0.49	$1.57	$0.40	$0.14	$0.50	$0.44	$1.47	$0.39	$0.43	$0.45	$0.49	$1.75

D.A. Davidson & Co.
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Institutional Equity Research

November 1, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

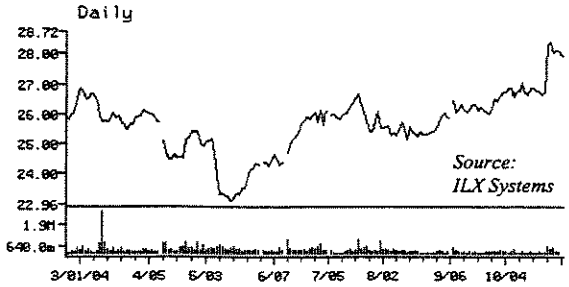
HE – NYSE – $28.11
(Price: 11/1/04)

FY: DEC	2003A[1]	*3/31/04A*	*6/30/04A*[2]	*9/30/04A*[3]	*12/31/04E*	2004E[2,3]	2005E
Revenue ($M)	$1,781.3	*$437.1*	*$461.8*	*$506.8*	*$495.2*	$1,900.8	$1,909.9
Year-over-year revenue growth	8%	*3%*	*3%*	*12%*	*9%*	7%	0%
Price/Revenue ratio	1.2x					1.2x	1.2x
EPS Revised	**$1.52**	***$0.40***	***$0.14***	***$0.53***	***$0.44***	**$1.49**	**$1.75**
EPS Previous				*$0.48*	*NC*	$1.44	NC
Price/EPS ratio	18.5x					18.8x	16.0x
EBITDA ($M)	$414.0	*$104.0*	*$103.3*	*$118.2*	*$108.6*	$434.1	$447.0
EV/EBITDA ratio	8.4x					8.0x	7.8x

[1]Includes $0.05/sh. in charges for 2Q'03 write down and increased reserves for a Philippine utility investment; a $0.02/sh. charge for DOH settlement in 3Q'03 and $0.01/sh. reversal in 4Q'03; and a $0.03/sh. charge for the 4Q'03 Keahole settlement. [2] Includes 2Q'04 charge of $0.30/sh. for REIT tax ruling.
[3] Includes 3Q'04 benefits of $0.04/sh. gain on sale of CDO investments and $0.02/sh. gain from discontinued operations related to sale of Chinese venture.

Valuation Data	
Long-term growth rate	3%
Debt/Cap	49.5%
Book value/ share (6/30/04)	$14.56
Dividend (yield)	$1.24 (4.4%)
12-18 month Target Price	$26 ↑
5-year Target Price	$29 ↑
Return on Equity	11.0%

Trading Data	
Shares outstanding (M)	80.4
Market Capitalization ($M)	$2,259
52-week low	$22.23
52-week high	$28.72
Average daily volume (3 mos.)	218,000
Float	99%
Index Membership	S&P 400 MidCap
Industry	Electric Utilities



Company Description
Hawaiian Electric Industries, Inc. is a holding company engaged in the electric utility and banking businesses in the state of Hawaii. Hawaiian Electric Company, Inc. provides electric services on five islands, whose populations comprise 95% of the state's residents. American Savings Bank, FSB, is the state's third largest financial institution with $6.5 billion in assets.

Raising Targets As Earnings Continue to Exceed Forecasts; Maintaining UNDERPERFORM Rating.

- Hawaiian Electric Industries reported 3Q'04 EPS of $0.53 versus $0.41. This result included the following three special items: a $0.04 benefit from the gain on the sale of all of the remaining collateralized debt obligations (CDO) acquired from the bank subsidiary in 2001; a $0.02 gain from discontinued operations relating to the sale of a Chinese joint venture; and a $0.03 benefit from the bank's reversal of $3.8 million in loan loss reserves. While our $0.48 estimate included the gain on the sale of the Chinese joint venture, we did not anticipate the CDO gain or the loan loss reversal.

- Electric utility EPS of $0.32 vs. $0.27 advanced due to a 3.6% increase in kilowatthour sales stemming from a strong economy and higher humidity levels that bolstered air conditioning demand. Additionally, the benefit of lower retirement benefit expenses and interest expenses more than offset the drag from higher operating costs. Bank EPS of $0.19 vs. $0.20 was down slightly as modestly higher net income was more than offset by an 8% increase in average diluted shares outstanding.

- We are raising our 2004 EPS forecast from $1.44 to $1.49 due to the positive 3Q'04 variance from forecast. Our 2005 EPS forecast of $1.75 remains unchanged.

- We are raising our target prices based on the company's earnings momentum. For 12-18 months, we are raising our target price from $24 to $26 or 15x our 2005 EPS estimate, which matches the average multiple of electric utilities in our coverage universe. We are raising our longer-term target price from $27 to $29. With the current share price above our near-term target price, we continue to maintain our **UNDERPERFORM** rating.

James L. Bellessa, Jr., CFA jbellessa@dadco.com Ph: (406) 791-7230

Please refer to page two of this report for detailed disclosure and certification information.

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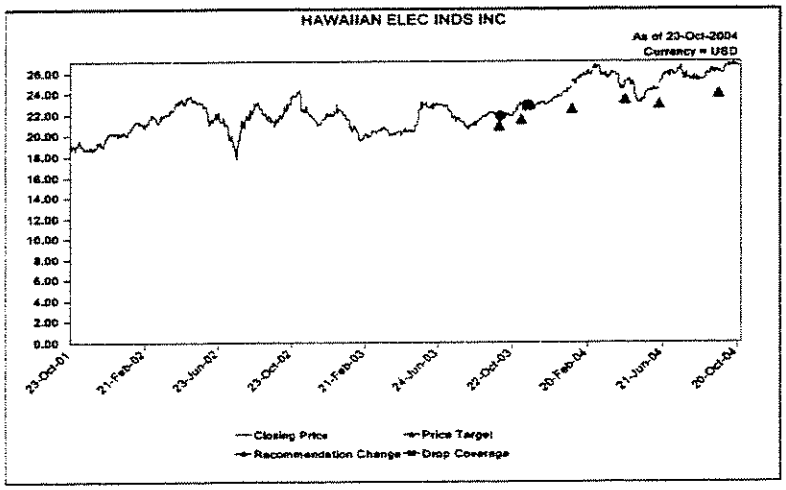
The research analyst responsible for this report, attests (i) that all the views expressed in this research report accurately reflect such analyst's personal views about the common stock of the subject company and (ii) that no part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by such analyst in this report.

D.A. Davidson & Co. Ratings	Buy	Neutral	Underperform
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 9/30/04)	Buy	Hold	Sell
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
Distribution of Institutional Research Ratings	47%	48%	5%
Corresponding Retail Research Rating	Buy, Core/Buy	Hold, Core/Hold	Avoid
Distribution of Retail Research Ratings	84%	16%	0%
Distribution of combined ratings	54%	42%	4%
Distribution of companies from whom D.A. Davidson & Co. has received compensation for investment banking services in last 12 mos	8%	8%	0%



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D.A. Davidson & Co. Institutional Research Rating Scale (beginning 7/9/02)
Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/18/01 – 7/9/02)
Strong Buy, Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/1/99 – 6/18/01)
Buy, Outperform, Neutral, Underperform, Sell

HAWAIIAN ELEC INDS INC

Currency = USD

Date	Closing Price	Recommendation Change	Date	Closing Price	Price Target
14-Nov-2003	22.93	UNDERPERFORM	20-Sep-2004	26.08	24.00
01-Oct-2003	21.90	NEUTRAL	14-Jun-2004	24.65	23.00
			22-Apr-2004	25.10	23.50
			21-Jan-2004	24.70	22.50
			03-Nov-2003	23.08	21.50
			30-Sep-2003	21.77	21.00

Target prices are our Institutional Research Department's evaluation of price potential over the next 12-18 months and 5 years based upon our assessment of future earnings and cash flow, comparable company valuations, growth prospects and other financial criteria. Certain risks may impede achievement of these price targets including, but not limited to, broader market and macroeconomic fluctuations and unforeseen changes in the subject company's fundamentals or business trends. Information contained herein has been obtained by sources we consider reliable, but is not guaranteed and we are not soliciting any action based upon it. Any opinions expressed are based on our interpretation of data available to us at the time of the original publication of the report. These opinions are subject to change at any time without notice. Investors must bear in mind that inherent in investments are the risks of fluctuating prices and the uncertainties of dividends, rates of return and yield. Investors should also remember that past performance is not necessarily an indicator of future performance and D.A. Davidson & Co. makes no guarantee, express or implied, as to future performance. Investors should note this report was prepared by D.A. Davidson & Co.'s Institutional Research Department for distribution to D.A. Davidson & Co.'s institutional investor clients and assumes a certain level of investment sophistication on the part of the recipient. Readers, who are not institutional investors or other market professionals, should seek the advice of their individual investment advisor for an explanation of this report's contents, and should always seek such advisor's advice before making any investment decisions. Further information and elaboration will be furnished upon request.

Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands -- Fiscal year ends 12/31

	2000	2001	2002	2003	2Q04
[illegible]	$ [illegible]	$ 450,827	$ 244,525	$ 279,988	$ 212,568
Accts. Receivable and Unbilled Revenue, net	188,056	164,124	176,327	187,716	184,300
Available-for-Sale Securities	164,668	1,613,710	1,960,288	1,787,177	1,870,117
Securities Pledged for Repo. Agreements	657,371	756,749	784,362	941,571	1,000,681
Held-to-Maturity Investment Securities	1,448,466	84,211	89,545	94,624	96,516
Loans Receivable, net	3,211,325	2,857,622	2,993,989	3,121,979	3,096,010
Property, Plant and Equipment	2,054,474	2,067,503	2,241,943	2,311,888	2,344,396
Regulatory Assets	116,623	111,376	0	0	0
Other	363,447	309,867	345,002	382,228	376,486
Goodwill and Intangibles	101,481	101,954	97,572	93,987	93,200
Total Assets	8,518,694	8,517,943	8,933,553	9,201,158	9,274,274
Accounts Payable	$ 125,719	$ 119,850	$ 134,416	$ 132,780	$ 153,071
Deposit Liabilities	3,584,646	3,679,586	3,800,772	4,026,250	4,078,228
Short-Term Borrowings	104,398	0	0	0	14,197
Repurchase Agreements	596,504	683,180	667,247	831,335	870,098
FHLB Advances	1,249,252	1,032,752	1,176,252	1,017,053	965,052
Long-Term Debt	1,088,731	1,145,769	1,106,270	1,064,420	1,166,602
Deferred Income Tax	187,420	185,436	235,431	226,590	209,805
Contributions in Aid of Construction	211,518	213,557	218,094	233,969	231,551
Other	297,041	293,742	257,315	273,442	304,072
Regulatory liabilities			57,050	71,882	77,191
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	0
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406
Stockholders' Equity	839,059	929,665	1,046,300	1,089,031	1,170,001
Total Liabilities and Equity	8,518,694	8,517,943	8,933,553	9,201,158	9,274,274
Capital Structure (Excluding ASB's deposits, repos, and advances)					
Long-Term and Short-term Debt	$1,193,129	$1,145,769	$1,106,270	$1,064,420	$1,180,799
Trust Preferreds	200,000	200,000	200,000	200,000	0
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406
[illegible]	839,059	929,665	1,046,300	1,089,031	1,170,001

D.A. Davidson & Co.

	2004E	2005E
,553	$ 1,529,648	$ 1,524,719
,420	380,956	380,380
,200	10,036	4,800
,173	1,900,640	1,909,899
,795	1,336,323	1,327,167
,541	282,427	281,794
,000	13,784	12,000
,336	1,612,534	1,620,961
,757	193,524	197,553
,880	98,530	98,586
,800)	(3,748)	(7,200)
,837	288,306	288,939
,859)	(76,788)	(72,637)
(475)	(1,900)	(1,900)
850	3,086	3,400
,900	6,956	7,600
,253	219,660	225,202
,814	101,292	83,325
,439	118,368	141,877
	1,913	0
,439	120,281	141,877
,878	80,558	81,803
$0.44	$1.47	$1.75
0.00	0.02	0.00
$0.44	$1.49	$1.75
$0.31	$1.24	$1.24
70.7%	83.0%	70.8%
37.0%	46.1%	37.0%
,884	92,844	95,572
,151	37,507	57,090
,439	118,368	141,877
$0.31	$1.15	$1.18
$0.16	$0.47	$0.70
$0.44	$1.47	$1.75

D.A. Davidson & Co.
member SIPC

Institutional Equity Research

September 20, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

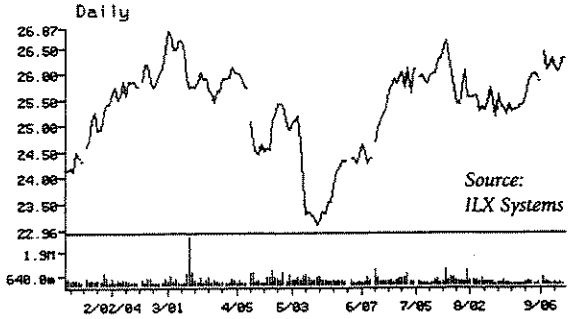
HE – NYSE – $26.18
(Price: 9/20/04)

FY: DEC	2003A[1]	*3/31/04A*	*6/30/04A*[2]	*9/30/04E*	*12/31/04E*	2004E[2]	2005E
Revenue ($M)	$1,781.3	*$437.1*	*$461.8*	*$473.2*	*$466.1*	$1,838.2	$1,863.4
Year-over-year revenue growth	8%	*3%*	*3%*	*4%*	*3%*	3%	1%
Price/Revenue ratio	1.1x					1.1x	1.1x
EPS Revised	**$1.52**	***$0.40***	***$0.14***	***$0.48***	***$0.44***	**$1.44**	**$1.75**
EPS Previous				*$0.42*	*$0.40*	$1.36	$1.67
Price/EPS ratio	17.2x					18.2x	15.0x
EBITDA ($M)	$414.0	*$104.0*	*$103.3*	*$111.2*	*$109.4*	$427.9	$449.0
EV/EBITDA ratio	8.0x					7.8x	7.4x

[1]Includes $0.05/sh. in charges for 2Q'03 writedown and increased reserves for a Philippine utility investment; a $0.02/sh. charge for DOH settlement in 3Q'03 and $0.01/sh reversal in 4Q'03; and a $0.03/sh charge for the 4Q'03 Keahole settlement. [2] Includes 2Q'04 charge of $0.30/sh. for REIT tax ruling.

Valuation Data	
Long-term growth rate	3%
Debt/Cap	49.5%
Book value/ share (6/30/04)	$14.56
Dividend (yield)	$1.24 (4.7%)
12-18 month Target Price	$24 ↑
5-year Target Price	$27 ↑
Return on Equity	9.9%

Trading Data	
Shares outstanding (M)	80.4
Market Capitalization ($M)	$2,104
52-week low	$21.66
52-week high	$26.87
Average daily volume (3 mos.)	259,000
Float	99%
Index Membership	S&P 400 MidCap
Industry	Electric Utilities



Company Description
Hawaiian Electric Industries, Inc. is a holding company engaged in the electric utility and banking businesses in the state of Hawaii. Hawaiian Electric Company, Inc. provides electric services on five islands, whose populations comprise 95% of the state's residents. American Savings Bank, FSB, is the state's third largest financial institution with $6.5 billion in assets.

Raising EPS Estimates and Targets as Fundamentals Improve; Maintaining UNDERPERFORM Rating.

- Following a thorough review of Hawaiian Electric Industries' detailed financial statements, we are raising our 2004 EPS estimate from $1.36 to $1.44 and our 2005 EPS estimate from $1.67 to $1.75. We note that electric usage is growing strongly, the community bank is achieving stable operating results, and the earnings drag from unregulated "other" businesses appears to be waning.

- Recent robust tourism growth has helped push up electric usage and the utility has had two record peak output days during 3Q'04, even though cooling degree days during the current quarter are about the same as a year ago. We also note there will be fewer shares outstanding than our forecast previously assumed for 3Q'04, due to the company's election to use open market purchases of stock (as opposed to new issuances) to fund HE's dividend reinvestment and employee retirement savings programs. The firm has also mentioned the likelihood it will post a 3Q'04 gain from discontinued operations, relating to the disposal of a Chinese joint venture. While the size of the prospective gain is undisclosed, our earnings estimate now assumes $1.5 million after tax, or $0.02 per share.

- For 4Q'04 and 2005, we are assuming higher electric earnings than we were previously forecasting, as well as fewer shares outstanding.

- We are raising our target prices due to our higher EPS forecasts. For 12-18 months, we are raising our target price from $23 to $24, or 13.7x our revised 2005 EPS estimate. Over the past decade, the stock of HE has been accorded a median multiple of 12.4x year-forward earnings. We are raising our longer-term target price from $26 to $27. With the current share price above our near-term target price, we continue to maintain our **UNDERPERFORM** rating.

James L. Bellessa, Jr., CFA jbellessa@dadco.com Ph: (406) 791-7230

Please refer to page two of this report for detailed disclosure and certification information.

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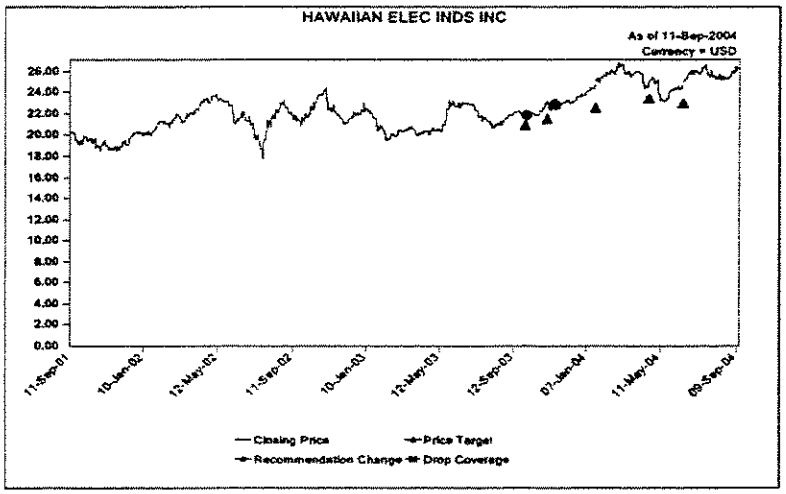
The research analyst responsible for this report, attests (i) that all the views expressed in this research report accurately reflect such analyst's personal views about the common stock of the subject company and (ii) that no part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by such analyst in this report.

D.A. Davidson & Co. Ratings	Buy	Neutral	Underperform
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 6/30/04)	Buy	Hold	Sell
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
Distribution of Institutional Research Ratings	48%	44%	8%
Corresponding Retail Research Rating	Buy, Core/Buy	Hold, Core/Hold	Avoid
Distribution of Retail Research Ratings	82%	18%	0%
Distribution of combined ratings	55%	39%	6%
Distribution of companies from whom D.A. Davidson & Co. has received compensation for investment banking services in last 12 mos	5%	6%	9%



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Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/18/01 – 7/9/02)
Strong Buy, Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/1/99 – 6/18/01)
Buy, Outperform, Neutral, Underperform, Sell

HAWAIIAN ELEC INDS INC

Currency = USD

Date	Closing Price	Recommendation Change	Date	Closing Price	Price Target
14-Nov-2003	22.93	UNDERPERFORM	14-Jun-2004	24.65	23.00
01-Oct-2003	21.90	NEUTRAL	22-Apr-2004	25.10	23.50
			21-Jan-2004	24.70	22.50
			03-Nov-2003	23.08	21.50
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Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands -- Fiscal year ends 12/31

	2000	2001	2002	2003	2Q04
Cash and Equivalents (and Fed Funds Sold)	$ 212,783	$ 450,827	$ 244,525	$ 279,988	$ 212,568
Accts. Receivable and Unbilled Revenue, net	188,056	164,124	176,327	187,716	184,300
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Securities Pledged for Repo. Agreements	657,371	756,749	784,362	941,571	1,000,681
Held-to-Maturity Investment Securities	1,448,466	84,211	89,545	94,624	96,516
Loans Receivable, net	3,211,325	2,857,622	2,993,989	3,121,979	3,096,010
Property, Plant and Equipment	2,054,474	2,067,503	2,241,943	2,311,888	2,344,396
Regulatory Assets	116,623	111,376	0	0	0
Other	363,447	309,867	345,002	382,228	376,486
Goodwill and Intangibles	101,481	101,954	97,572	93,987	93,200
Total Assets	8,518,694	8,517,943	8,933,553	9,201,158	9,274,274
Accounts Payable	$ 125,719	$ 119,850	$ 134,416	$ 132,780	$ 153,071
Deposit Liabilities	3,584,646	3,679,586	3,800,772	4,026,250	4,078,228
Short-Term Borrowings	104,398	0	0	0	14,197
Repurchase Agreements	596,504	683,180	667,247	831,335	870,098
FHLB Advances	1,249,252	1,032,752	1,176,252	1,017,053	965,052
Long-Term Debt	1,088,731	1,145,769	1,106,270	1,064,420	1,166,602
Deferred Income Tax	187,420	185,436	235,431	226,590	209,805
Contributions in Aid of Construction	211,518	213,557	218,094	233,969	231,551
Other	297,041	293,742	257,315	273,442	304,072
Regulatory liabilities			57,050	71,882	77,191
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	0
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406
Stockholders' Equity	839,059	929,665	1,046,300	1,089,031	1,170,001
Total Liabilities and Equity	8,518,694	8,517,943	8,933,553	9,201,158	9,274,274
Capital Structure (Excluding ASB's deposits, repos, and advances)					
Long-Term and Short-term Debt	$1,193,129	$1,145,769	$1,106,270	$1,064,420	$1,180,799
Trust Preferreds	200,000	200,000	200,000	200,000	0
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406

	1Q03	2Q03	3Q03	4Q03	2003	1Q04	2Q04	3Q04E	4Q04E	2004E	2005E
,176	$ 328,912	$ 354,529	$ 359,250	$ 353,994	$ 1,396,685	$ 346,613	$ 370,605	$ 381,346	$ 372,645	$ 1,471,210	$ 1,475,961
,255	95,102	92,703	93,770	89,745	371,320	89,258	89,982	90,608	92,297	362,146	362,612
,730)	622	1,524	683	10,482	13,311	1,239	1,211	1,200	1,200	4,850	4,800
,701	424,636	448,756	453,703	454,221	1,781,316	437,110	461,798	473,155	466,143	1,838,206	1,863,373
,220	287,937	311,944	312,614	307,625	1,220,120	302,473	324,691	328,854	322,437	1,278,454	1,276,342
,372	72,676	70,342	68,654	66,893	278,565	63,150	66,971	66,617	68,073	264,811	262,036
,676	4,935	5,017	4,200	4,912	19,064	3,650	3,190	3,000	3,000	12,840	12,000
,288	365,548	387,303	385,468	379,430	1,517,749	369,273	394,852	398,471	393,509	1,556,105	1,572,378
,956	40,975	42,585	46,636	46,369	176,565	44,140	45,914	52,493	50,209	192,755	197,619
,883	22,426	22,361	25,116	22,852	92,755	26,108	23,011	23,991	24,225	97,335	100,576
,406)	(4,313)	(3,493)	(3,517)	5,570	(5,753)	(2,411)	(1,979)	(1,800)	(1,800)	(7,990)	(7,200)
,433	59,088	61,453	68,235	74,791	263,567	67,837	66,946	74,684	72,633	282,100	290,995
,292)	(17,980)	(17,879)	(17,315)	(16,118)	(69,292)	(21,447)	(19,106)	(17,759)	(17,859)	(76,172)	(72,837)
,006)	(502)	(501)	(501)	(502)	(2,006)	(475)	(475)	(475)	(475)	(1,900)	(1,900)
,035)	(4,009)	(4,009)	(4,008)	(4,009)	(16,035)						
,855	443	446	496	529	1,914	644	733	700	700	2,777	2,800
,954	988	989	1,098	1,192	4,267	1,449	1,673	1,400	1,400	5,922	5,600
,909	38,028	40,499	48,005	55,883	182,415	48,008	49,771	58,549	56,399	212,728	224,658
,692	13,701	14,739	17,483	18,444	64,367	17,076	38,533	21,683	20,668	98,140	83,124
,217	24,327	25,760	30,522	37,439	118,048	30,932	11,238	36,866	35,531	114,588	141,535
0	0	(3,870)	0	0	(3,870)			1,500		1,500	0
,217	24,327	21,890	30,522	37,439	114,178	30,932	11,238	38,386	35,531	116,088	141,535
,954	74,172	74,754	75,032	75,872	74,974	77,156	80,707	80,757	80,807	80,558	80,932
$1.62	$0.33	$0.34	$0.41	$0.49	$1.57	$0.40	$0.14	$0.46	$0.44	$1.42	$1.75
0.00	0.00	(0.05)	0.00	0.00	(0.05)	0.00	0.00	0.02	0.00	0.02	0.00
$1.62	$0.33	$0.29	$0.41	$0.49	$1.52	$0.40	$0.14	$0.48	$0.44	$1.44	$1.75
$1.24	$0.31	$0.31	$0.31	$0.31	$1.24	$0.31	$0.31	$0.31	$0.31	$1.24	$1.24
76.5%	94.5%	105.9%	76.2%	62.8%	81.4%	77.3%	222.6%	65.2%	70.5%	86.0%	70.9%
35.0%	36.0%	36.4%	36.0%	33.0%	35.3%	35.6%	77.4%	37.0%	37.0%	46.1%	37.0%
$1.24	$0.24	$0.25	$0.27	$0.29	$1.05	$0.26	$0.27	$0.32	$0.30	$1.15	$1.16
$0.77	$0.18	$0.18	$0.20	$0.18	$0.75	$0.21	($0.09)	$0.17	$0.17	$0.46	$0.72
($0.29)	($0.06)	($0.05)	($0.05)	$0.04	($0.11)	($0.03)	($0.01)				
($0.09)	($0.03)	($0.04)	($0.02)	($0.02)	($0.11)	($0.03)	($0.03)				
$1.62	$0.33	$0.34	$0.41	$0.49	$1.57	$0.40	$0.14	$0.46	$0.44	$1.42	$1.75

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Institutional Equity Research

July 20, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

HE – NYSE – $26.50
(Price: 7/19/04)

FY: DEC	2003A[1]	*3/31/04A*	*6/30/04A[2]*	*9/30/04E*	*12/31/04E*	2004E	2005E
Revenue ($M)	$1,781.3	*$437.1*	*$461.8*	*$475.6*	*$468.8*	$1,843.4	$1,876.7
Year-over-year revenue growth	8%	*3%*	*3%*	*5%*	*3%*	3%	2%
Price/Revenue ratio	1.1x					1.2x	1.2x
EPS Revised	**$1.52**	***$0.40***	***$0.14***	***$0.42***	***$0.40***	**$1.36**	**$1.67**
EPS Previous			*$0.08*	*NC*	*NC*	$1.30	NC
Price/EPS ratio	17.4x					19.5x	15.8x
EBITDA ($M)	$414.0	*$104.0*	*$105.3*	*$111.6*	*$112.1*	$432.9	$495.3
EV/EBITDA ratio	8.6x					8.3x	7.2x

[1]Includes $0.05/sh. in charges for 2Q'03 writedown and increased reserves for a Philippine utility investment; a $0.02/sh. charge for DOH settlement in

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2Q'04 EPS Drops 53%

Hawaiian Electric Industries reported 2Q'04 EPS of $0.14. These results compare to $0.29 per share a year ago and our forecast of $0.08. Results for the company's electric business were generally in line with our expectations. Savings bank results, after excluding a $0.30 per share charge, were ahead of our forecast, due to a lower tax rate than we expected and a $3.0 million reversal of the allowance for loan losses. This revision in loan loss reserves added $0.02-$0.03 per share.

Consolidated 2Q'04 revenues of $461.8 million rose $13.0 million, or 3%, from $448.8 million in 2Q'03. Operating income of $66.9 million climbed $5.5 million, or 9%, from $61.5 million. Net income of $11.2 million declined $10.7 million, or 49%, from $21.9 million. Per share results dropped 53%, as average shares outstanding climbed 9%.

Utility Business Advance Helped by Stronger Economy and Higher Temperatures

Electric utility revenues in 2Q'04 of $370.6 million rose $16.1 million, or 5%, from $354.5 million in 2Q'03. Temperatures that were 3% warmer than the same period a year ago, as measured by cooling degree days in Oahu, as well as an undisclosed level of customer growth, produced a 3% climb in kilowatt-hour sales. Additionally, higher rates passed higher fuel and power costs through to ratepayers.

Utility expenses in the most recent quarter of $324.7 million rose $12.7 million, or 4%. Increases in fuel oil, maintenance, depreciation and property tax expenses were partially offset by expense declines for purchased power and "other operation." $2.3 million of the decline in "other operation" expenses was due to a decrease in retirement benefits expenses, primarily due to an increase in the value of plan assets. The utility's net income also benefited from a $0.5 million reduction in interest expenses and preferred securities distributions of trust subsidiaries, related to the recent refinancings of higher-costing debt.

Electric utility net income in 2Q'04 of $21.7 million rose $3.2 million, or 17%. This increase stemmed from a $3.2 million climb in utility operating income, a $0.9 million rise in other income, a $1.2 million decline in utility net interest expenses and other charges, and a $2.1 million increase in utility net income taxes. On a per share basis, utility net income was $0.27 versus $0.25.

Bank Results Advance Due to Reversal of Allowance for Loan Losses

Bank revenues in 2Q'04 of $90.0 million dropped $2.7 million, or 3%, from $92.7 million in 2Q'03. Bank expenses in 2Q'04 of $67.0 million dropped $3.4 million, or 5%, from $70.3 million in 2Q'03. The drop in expenses included a $4.1 million decline in interest expenses, and a $3.0 million reduction in loan loss provisions, which were offset by a $4.7 million increase in general and administrative expenses. The increase in G&A occurred largely to a $5.1 million increase in interest on income taxes due to an unfavorable tax ruling involving American Savings Bank's real estate investment trust subsidiary.

Bank operating income of $23.0 million rose $0.6 million, helped by the $3.0 million allowance for loan losses reversal. The 1Q'04 interest rate spread of 3.08% compared to 3.02% a year earlier.

The bank loss in 2Q'04 of $6.9 million compared to a profit of $13.5 million a year earlier. This drop stemmed from a $0.6 million climb in bank operating income, and a $21.1 million increase in bank net income taxes, due to a cumulative $24 million charge, or $0.30 per share, in June 2004, related to the aforementioned unfavorable tax court ruling. On a per share basis, the bank loss was $0.09 versus a profit of $0.18.

Drag from "Other" Continues to Decline

The holding and other companies' 1Q'04 net loss of $3.5 million compared to a loss of $6.3 million a year earlier. The net loss decreased primarily due to the impact of lower interest rates and lower legal expenses. On a per share basis, "other" net loss was $0.04 versus a loss of $0.09 a year earlier.

Raising EPS Estimates

We are raising our 2004 EPS estimate from $1.30 to $1.36, due to the second quarter's positive variance of $0.06 from our forecast.

Maintaining Rating

Our 12-18 month target price is set at $23, or 13.8x our 2005 EPS estimate. Over the past decade, the stock of HE has been accorded a median multiple of 12.3x year-forward earnings. Given our forecast of 3% annual earnings growth, we are setting our 5-year target price at $26.

With the current share price above our target price of $23, we continue to maintain our **UNDERPERFORM** rating. At a current 15.8x our 2005 earnings estimates, we believe the company's shares are overvalued.

We view the annual dividend of $2.48 per share, representing a 4.7% current yield, as relatively safe.

James L. Bellessa, Jr., CFA
Vice President; Senior Research Analyst
Ph: (406) 791-7230

Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands -- Fiscal year ends 12/31

	2000	2001	2002	1Q03	2003	1Q04
Cash and Equivalents (and Fed Funds Sold)	$ 212,783	$ 450,827	$ 244,525	$ 316,481	$ 279,988	$ 373,172
Accts. Receivable and Unbilled Revenue, net	188,056	164,124	176,327	171,747	187,716	221,681
Available-for-Sale Securities	164,668	1,613,710	1,960,288	1,799,368	1,787,177	1,836,455
Securities Pledged for Repo. Agreements	657,371	756,749	784,362	989,745	941,571	981,631
Held-to-Maturity Investment Securities	1,448,466	84,211	89,545	91,035	94,624	95,566
Loans Receivable, net	3,211,325	2,857,622	2,993,989	3,038,671	3,121,979	3,075,478
Property, Plant and Equipment	2,054,474	2,067,503	2,241,943	2,075,007	2,311,888	2,324,270
Regulatory Assets	116,623	111,376	0	104,558	0	0
Other	363,447	309,867	345,002	345,858	382,228	417,918
Goodwill and Intangibles	101,481	101,954	97,572	95,514	93,987	93,114
Total Assets	8,518,694	8,517,943	8,933,553	9,027,984	9,201,158	9,419,285
Accounts Payable	$ 125,719	$ 119,850	$ 134,416	$ 142,565	$ 132,780	$ 143,583
Deposit Liabilities	3,584,646	3,679,586	3,800,772	3,815,201	4,026,250	4,022,367
Short-Term Borrowings	104,398	0	0	0	0	22,992
Repurchase Agreements	596,504	683,180	667,247	845,959	831,335	851,331
FHLB Advances	1,249,252	1,032,752	1,176,252	1,057,252	1,017,053	935,052
Long-Term Debt	1,088,731	1,145,769	1,106,270	1,189,265	1,064,420	1,389,510
Contributions in Aid of Construction	211,518	213,557	218,094	220,340	233,969	232,642
Other	297,041	293,742	257,315	239,641	273,442	249,701
Regulatory liabilities			57,050		71,882	76,090
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	200,000	0
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406	34,406
Stockholders' Equity	839,059	929,565	1,046,300	1,052,666	1,089,031	1,228,004
Total Liabilities and Equity	8,518,694	8,517,943	8,933,553	9,027,984	9,201,158	9,419,285
Capital Structure (Excluding ASB's deposits, repos, and advances)						
Long-Term and Short-term Debt	$1,193,129	$1,145,769	$1,106,270	$1,189,265	$1,064,420	$1,412,502
Trust Preferreds	200,000	200,000	200,000	200,000	200,000	0
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406	34,406
Common Stock Equity	839,059	929,665	1,046,300	1,052,666	1,089,031	1,228,004
	$2,266,594	$2,309,840	$2,386,976	$2,476,337	$2,387,857	$2,674,912
% Weighting of Capital Structure						

Hawaiian Electric Industries, Inc.
Consolidated Statements of Income
$$$ in thousands -- Fiscal year ends 12/31

	2002	1Q03	2Q03	3Q03	4Q03	2003	1Q04	2Q04P	3Q04E	4Q04E	2004E	2005E
Revenues:												
Electric Utility	$ 1,257,176	$ 328,912	$ 354,529	$ 359,250	$ 353,994	$ 1,396,685	$ 346,613	$ 370,605	$ 381,346	$ 372,645	$ 1,471,210	$ 1,476,008
Bank	399,255	95,102	92,703	93,770	89,745	371,320	89,256	89,982	93,800	95,690	368,730	398,734
Other	(2,730)	622	1,524	683	10,482	13,311	1,239	1,211	500	500	3,450	2,000
Total Revenues	1,653,701	424,636	448,756	453,703	454,221	1,781,316	437,110	461,798	475,646	468,836	1,843,390	1,876,743
Expenses:												
Electric Utility	1,062,220	287,937	311,944	312,614	307,625	1,220,120	302,473	324,691	328,889	322,507	1,278,559	1,275,616
Bank	306,372	72,676	70,342	68,654	66,893	278,565	63,150	66,971	71,725	73,013	274,859	296,295
Other	18,676	4,935	5,017	4,200	4,912	19,064	3,650	3,190	4,000	4,000	14,840	16,000
Total Expenses	1,387,268	365,548	387,303	385,468	379,430	1,517,749	369,273	394,852	404,614	399,520	1,568,258	1,587,911
Operating Income:												
Electric Utility	194,956	40,975	42,585	46,636	46,369	176,565	44,140	45,914	52,458	50,139	192,650	200,392
Bank	92,883	22,426	22,361	25,116	22,852	92,755	26,106	23,011	22,075	22,677	93,871	102,440
Other	(21,406)	(4,313)	(3,493)	(3,517)	5,570	(5,753)	(2,411)	(1,979)	(3,500)	(3,500)	(11,390)	(14,000)
Total Operating Income	266,433	59,088	61,453	68,235	74,791	263,567	67,837	66,946	71,033	69,316	275,132	288,832
Interest Expense-other than bank	(72,292)	(17,980)	(17,879)	(17,315)	(16,118)	(69,292)	(21,447)	(19,106)	(17,759)	(17,859)	(76,172)	(72,837)
Preferred Stock Dividends of Subsidiaries	(2,006)	(502)	(501)	(501)	(502)	(2,006)	(475)	(475)	(500)	(500)	(1,950)	(2,000)
Pref. Security Distributions of Trust Sub.	(16,035)	(4,009)	(4,009)	(4,008)	(4,009)	(16,035)					0	0
AFUDC - Debt	1,855	443	446	496	529	1,914	644	733	450	450	2,277	1,800
AFUDC - Equity	3,954	988	989	1,098	1,192	4,267	1,449	1,673	1,100	1,100	5,322	4,400
Pre-Tax Income	181,909	38,028	40,499	46,005	55,883	182,415	48,008	49,771	54,323	52,507	204,609	220,195
Income Taxes	63,692	13,701	14,739	17,483	18,444	64,367	17,076	38,533	20,208	19,428	95,245	81,472
Income from Continuing Operations	118,217	24,327	25,760	30,522	37,439	118,048	30,932	11,238	34,115	33,079	109,364	138,723
Discontinued Operations, Net of Tax	0	0	(3,870)	0	0	(3,870)					0	0
Net Income	118,217	24,327	21,890	30,522	37,439	114,178	30,932	11,238	34,115	33,079	109,364	138,723
Applicable Shares	72,954	74,172	74,754	75,032	75,872	74,974	77,156	80,707	81,692	82,032	80,558	82,882
Earnings Per Share:												
Cont. Operations Bf. Non-Recurring Items	$1.62	$0.33	$0.34	$0.41	$0.49	$1.57	$0.40	$0.14	$0.42	$0.40	$1.36	$1.67
Non-Recurring Items												
Discontinued Operations	0.00	0.00	(0.05)	0.00	0.00	(0.05)	0.00	0.00	0.00	0.00	0.00	0.00
GAAP EPS	$1.62	$0.33	$0.29	$0.41	$0.49	$1.52	$0.40	$0.14	$0.42	$0.40	$1.36	$1.67
Dividends Per Share	$1.24	$0.31	$0.31	$0.31	$0.31	$1.24	$0.31	$0.31	$0.31	$0.31	$1.24	$1.24
Dividend Payout Ratio of GAAP EPS	76.5%	94.5%	105.9%	76.2%	62.8%	81.4%	77.3%	222.6%	74.2%	76.9%	91.3%	74.1%
Tax Rate	36.0%	36.0%	36.4%	36.0%	33.0%	35.3%	35.6%	77.4%	37.2%	37.0%	46.5%	37.0%
EPS by Segment (cont. operations)												
Electric Utility	$1.24	$0.24	$0.25	$0.27	$0.29	$1.05	$0.26	$0.27	$0.30	$0.29	$1.13	$1.12
Bank	$0.77	$0.18	$0.18	$0.20	$0.18	$0.75	$0.21	($0.09)	$0.15	$0.16	$0.43	$0.72
Other (operating income)	($0.29)	($0.06)	($0.05)	($0.05)	$0.04	($0.11)	($0.03)	($0.01)				
Unallocated Parent Company	($0.09)	($0.03)	($0.04)	($0.02)	($0.02)	($0.11)	($0.03)	($0.03)				
Total	$1.62	$0.33	$0.34	$0.41	$0.49	$1.57	$0.40	$0.14	$0.42	$0.40	$1.36	$1.67

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Institutional Equity Research

June 14, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

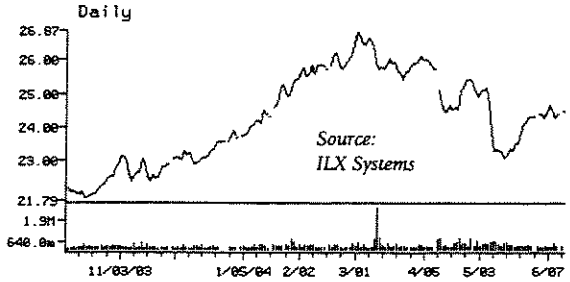
HE – NYSE – $24.49
(Price: 6/14/04)

FY: DEC	2003A[1]	*3/31/04A*	*6/30/04E[2]*	*9/30/04E*	*12/31/04E*	2004E[2]	2005E
Revenue ($M)	$1,781.3	*$437.1*	*$460.7*	*$475.6*	*$468.8*	$1,842.3	$1,877.4
Year-over-year revenue growth	8%	*3%*	*3%*	*5%*	*3%*	3%	2%
Price/Revenue ratio	1.0x					1.1x	1.1x
EPS Revised	**$1.52**	***$0.40***	***$0.08***	***$0.42***	***$0.40***	**$1.30**	**$1.67**
EPS Previous			*NC*	*NC*	*NC*	NC	NC
Price/EPS ratio	16.1x					18.9x	14.6x
EBITDA ($M)	$414.0	*$104.0*	*$104.8*	*$111.5*	*$112.0*	$432.3	$495.3
EV/EBITDA ratio	8.2x					7.9x	6.9x

[1]Includes $0.05/sh. in charges for 2Q'03 write down and increased reserves for a Philippine utility investment; a $0.02/sh. charge for DOH settlement in 3Q'03 and $0.01/sh reversal in 4Q'03; and a $0.03/sh charge for the 4Q'03 Keahole settlement. [2] Includes 2Q'04 charge of $0.30/sh. for REIT tax ruling.

Valuation Data	
Long-term growth rate	3%
Debt/Cap	52.8%
Book value/ share (3/31/03)	$15.29
Dividend (yield)	$1.24 (5.1%)
12-18 month Target Price	$23
5-year Target Price	$26
Return on Equity	10.6%

Trading Data	
Shares outstanding (M)	80.3
Market Capitalization ($M)	$1,966
52-week low	$20.62
52-week high	$26.87
Average daily volume (3 mos.)	184,000
Float	99%
Index Membership	S&P 400 MidCap
Industry	Electric Utilities



Company Description
Hawaiian Electric Industries, Inc. is a holding company engaged in the electric utility and banking businesses in the state of Hawaii. Hawaiian Electric Company, Inc. provides electric services on five islands, whose populations comprise 95% of the state's residents. American Savings Bank, FSB, is the state's third largest financial institution with $6.5 billion in assets.

Adjusting EPS Estimates and Targets for 2-for-1 Stock Split. Maintaining UNDERPERFORM Rating.

- Hawaiian Electric Industries distributed a 2-for-1 stock split, effected as a 100% stock dividend, on June 10, 2004. The share price commenced trading on a split-adjusted basis on June 14, 2004.
- Without making any changes in our forecasts, we are adjusting our EPS estimates to reflect the split. These changes are shown above and in our earnings model on the back page. Note our estimate for 2004 includes a split-adjusted 2Q'04 charge of $0.30 per share for an adverse tax decision at the company's bank subsidiary, American Savings Bank, as discussed in our *Research Bulletin* of June 9.
- Our 12-18 month target price is set at $23 (rounding down to the closest whole number), or 13.8x our 2005 EPS estimate. Over the past decade, the stock of HE has been accorded a median multiple of 12.2x year-forward earnings. Given our forecast of 3% annual earnings growth, we are setting our 5-year target price at $26.
- With the current share price above our revised target price of $23, we continue to maintain our **UNDERPERFORM** rating. We believe the dividend, which produces a current yield of 5.1% at the present share price, is safe.

James L. Bellessa, Jr., CFA jbellessa@dadco.com Ph: (406) 791-7230

Please refer to page two of this report for detailed disclosure and certification information.

D.A. Davidson & Co.
Two Centerpointe Drive, Suite 400 • Lake Oswego, Oregon 97035 • (503) 603-3000 • (800) 755-7848 • www.dadavidson.com

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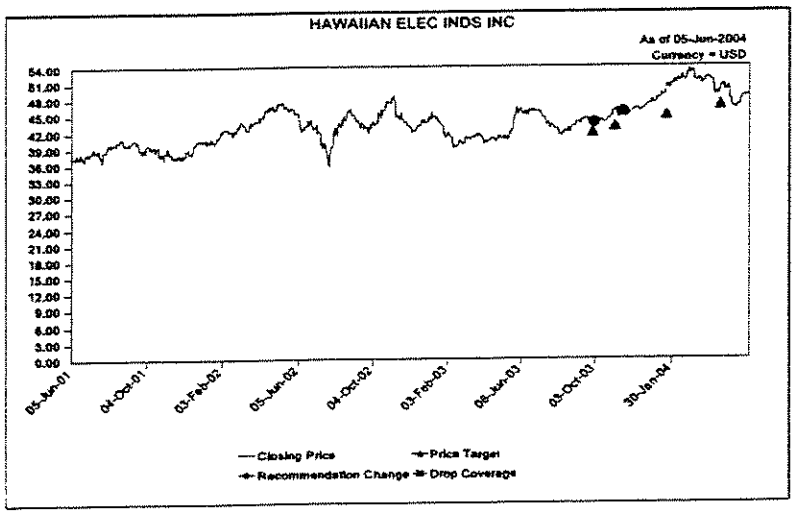
D.A. Davidson & Co. Ratings	**Buy**	**Neutral**	**Underperform**
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 3/31/04)	**Buy**	**Hold**	**Sell**
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
Distribution of Institutional Research Ratings	45%	44%	11%
Corresponding Retail Research Rating	Buy, Core/Buy	Hold, Core/Hold	Avoid
Distribution of Retail Research Ratings	78%	22%	0%
Distribution of combined ratings	53%	39%	8%
Distribution of companies from whom D.A. Davidson & Co. has received compensation for investment banking services in last 12 mos	6%	6%	7%



HAWAIIAN ELEC INDS INC

Currency = USD

Date	Closing Price	Recommendation Change	Date	Closing Price	Price Target
14-Nov-2003	45.85	UNDERPERFORM	22-Apr-2004	50.20	47.00
01-Oct-2003	43.79	NEUTRAL	21-Jan-2004	49.39	45.00
			03-Nov-2003	46.16	43.00
			30-Sep-2003	43.53	42.00

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D.A. Davidson & Co. Institutional Research Rating Scale (beginning 7/9/02)
Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/18/01 – 7/9/02)
Strong Buy, Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/1/99 – 6/18/01)
Buy, Outperform, Neutral, Underperform, Sell

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Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands -- Fiscal year ends 12/31

	2000	2001	2002	1Q03	2003	1Q04
Cash and Equivalents (and Fed Funds Sold)	$ 212,783	$ 450,827	$ 244,525	$ 316,481	$ 279,988	$ 373,172
Accts. Receivable and Unbilled Revenue, net	188,056	164,124	176,327	171,747	187,716	221,681
Available-for-Sale Securities	164,668	1,613,710	1,960,288	1,799,368	1,787,177	1,836,455
Securities Pledged for Repo. Agreements	657,371	756,749	784,362	989,745	941,571	981,631
Held-to-Maturity Investment Securities	1,448,466	84,211	89,545	91,035	94,624	95,566
Loans Receivable, net	3,211,325	2,857,622	2,993,989	3,038,671	3,121,979	3,075,478
Property, Plant and Equipment	2,054,474	2,067,503	2,241,943	2,075,007	2,311,888	2,324,270
Regulatory Assets	116,623	111,376	0	104,558	0	0
Other	363,447	309,867	345,002	345,858	382,228	417,918
Goodwill and Intangibles	101,481	101,954	97,572	95,514	93,987	93,114
Total Assets	8,518,694	8,517,943	8,933,553	9,027,984	9,201,158	9,419,285
Accounts Payable	$ 125,719	$ 119,850	$ 134,416	$ 142,565	$ 132,780	$ 143,583
Deposit Liabilities	3,584,646	3,679,586	3,800,772	3,815,201	4,026,250	4,022,367
Short-Term Borrowings	104,398	0	0	0	0	22,992
Repurchase Agreements	596,504	683,180	667,247	845,959	831,335	851,331
FHLB Advances	1,249,252	1,032,752	1,176,252	1,057,252	1,017,053	935,052
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Regulatory liabilities			57,050		71,882	76,090
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	200,000	0
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406	34,406
Stockholders' Equity	839,059	929,665	1,046,300	1,052,666	1,089,031	1,228,004
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Capital Structure (Excluding ASB's deposits, repos, and advances)						
Long-Term and Short-term Debt	$1,193,129	$1,145,769	$1,106,270	$1,189,265	$1,064,420	$1,412,502
Trust Preferreds	200,000	200,000	200,000	200,000	200,000	0
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406	34,406
Common Stock Equity	839,059	929,665	1,046,300	1,052,666	1,089,031	1,228,004
	$2,266,594	$2,309,840	$2,386,976	$2,476,337	$2,387,857	$2,674,912
% Weighting of Capital Structure						
Long-Term and Short-Term Debt	52.6%	49.6%	46.3%	48.0%	44.6%	52.8%
Trust Preferreds	8.8%	8.7%	8.4%	8.1%	8.4%	0.0%
Preferred Stock of Subs	1.5%	1.5%	1.4%	1.4%	1.4%	1.3%
Common Stock Equity	37.0%	40.2%	43.8%	42.5%	45.6%	45.9%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Common Shares Outstanding (000's)	32,991	35,600	36,809	37,060	37,919	40,148
Book Value Per HEI Share by Segment						
Electric Utilty	$25.01	$24.64	$25.08	$24.98	$24.91	$23.81
Bank	$11.49	$11.43	$12.72	$12.60	$12.26	$12.26
Other	($11.07)	($9.96)	($9.37)	($9.17)	($8.44)	($5.49)
Book Value Per Share	$25.43	$26.11	$28.43	$28.40	$28.72	$30.59

	2Q03	3Q03	4Q03	2003	1Q04	2Q04E	3Q04E	4Q04E	2004E	2005E
	$ 354,529	$ 359,250	$ 353,994	$ 1,398,685	$ 346,613	$ 368,308	$ 381,346	$ 372,645	$ 1,468,912	$ 1,476,649
	92,703	93,770	89,745	371,320	89,258	91,862	93,800	95,690	370,611	398,734
	1,524	663	10,482	13,311	1,239	500	500	500	2,739	2,000
	448,756	453,703	454,221	1,781,316	437,110	460,670	475,646	468,836	1,842,262	1,877,383
	311,944	312,614	307,625	1,220,120	302,473	320,027	328,954	322,572	1,274,025	1,276,205
	70,342	68,654	66,893	276,565	63,150	70,199	71,725	73,013	278,087	296,295
	5,017	4,200	4,912	19,064	3,650	4,000	4,000	4,000	15,650	16,000
	387,303	385,468	379,430	1,517,749	369,273	394,226	404,679	399,585	1,567,762	1,588,500
	42,585	46,636	46,369	176,565	44,140	48,281	52,393	50,074	194,887	200,444
	22,361	25,116	22,852	92,755	26,108	21,664	22,075	22,677	92,524	102,440
	(3,493)	(3,517)	5,570	(5,753)	(2,411)	(3,500)	(3,500)	(3,500)	(12,911)	(14,000)
	61,453	68,235	74,791	263,567	67,837	66,444	70,968	69,251	274,500	288,883
	(17,879)	(17,315)	(16,116)	(69,292)	(21,447)	(18,391)	(17,759)	(17,859)	(75,457)	(72,837)
	(501)	(501)	(502)	(2,008)	(475)	(500)	(500)	(500)	(1,975)	(2,000)
	(4,009)	(4,008)	(4,009)	(16,035)					0	0
	446	496	529	1,914	644	450	450	450	1,994	1,800
	989	1,098	1,192	4,267	1,449	1,100	1,100	1,100	4,749	4,400
	40,499	48,005	55,883	182,415	48,008	49,103	54,258	52,442	203,811	220,246
	14,739	17,483	16,444	64,367	17,076	42,766	20,184	19,403	99,430	81,491
	25,760	30,522	37,439	118,046	30,932	6,337	34,074	33,038	104,381	138,755
	(3,870)	0	0	(3,870)					0	0
	21,890	30,522	37,439	114,178	30,932	6,337	34,074	33,038	104,381	138,755
	74,754	75,032	75,872	74,974	77,156	81,352	81,692	82,032	80,558	82,882
	$0.34	$0.41	$0.49	$1.57	$0.40	$0.08	$0.42	$0.40	$1.30	$1.67
	(0.05)	0.00	0.00	(0.05)	0.00	0.00	0.00	0.00	0.00	0.00
	$0.29	$0.41	$0.49	$1.52	$0.40	$0.08	$0.42	$0.40	$1.30	$1.67
	$0.31	$0.31	$0.31	$1.24	$0.31	$0.31	$0.31	$0.31	$1.24	$1.24
%	105.9%	76.2%	62.8%	81.4%	77.3%	398.0%	74.3%	77.0%	95.7%	74.1%
%	36.4%	36.0%	33.0%	35.3%	35.6%	37.2%	37.2%	37.0%	48.8%	37.0%
	$0.25	$0.27	$0.29	$1.05	$0.26	$0.27	$0.30	$0.28	$1.12	$1.12
	$0.18	$0.20	$0.18	$0.75	$0.21	($0.14)	$0.15	$0.16	$0.37	$0.72
	($0.05)	($0.05)	$0.04	($0.11)						
	($0.04)	($0.02)	($0.02)	($0.11)						
	$0.34	$0.41	$0.49	$1.57	$0.40	$0.08	$0.42	$0.40	$1.30	$1.67

D.A. Davidson & Co.
member SIPC

Institutional Equity Research

June 9, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

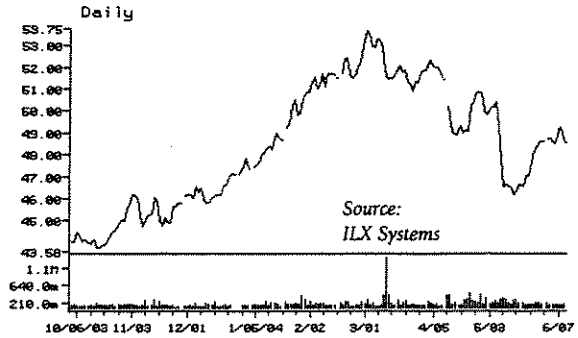
HE – NYSE – $48.57
(Price: 6/9/04)

FY: DEC	2003A[1]	*3/31/04A*	*6/30/04E[2]*	*9/30/04E*	*12/31/04E*	2004E	2005E
Revenue ($M)	$1,781.3	*$437.1*	*$460.7*	*$475.6*	*$468.8*	$1,842.3	$1,877.4
Year-over-year revenue growth	8%	*3%*	*3%*	*5%*	*3%*	3%	2%
Price/Revenue ratio	1.0x					1.1x	1.1x
EPS Revised	**$3.05**	***$0.80***	***$0.16***	***$0.83***	***$0.81***	**$2.59**	**$3.35**
EPS Previous			*$0.76*	*NC*	*NC*	$3.21	NC
Price/EPS ratio	15.9x					18.7x	14.5x
EBITDA ($M)	$414.0	*$104.0*	*$104.8*	*$111.5*	*$112.0*	$432.3	$495.3
EV/EBITDA ratio	8.2x					7.9x	6.9x

[1]Includes $0.10/sh. in charges for 2Q'03 write down and increased reserves for a Philippine utility investment; a $0.04/sh. charge for DOH settlement in 3Q'03 and $0.02/sh reversal in 4Q'03; and a $0.05/sh charge for the 4Q'03 Keahole settlement. [2] Includes $0.60/sh. charge for REIT tax ruling.

Valuation Data	
Long-term growth rate	3%
Debt/Cap	52.8%
Book value/ share (3/31/03)	$30.59
Dividend (yield)	$2.48 (5.1%)
12-18 month Target Price	$47
5-year Target Price	$52
Return on Equity	10.6%

Trading Data	
Shares outstanding (M)	40.1
Market Capitalization ($M)	$1,950
52-week low	$41.25
52-week high	$53.75
Average daily volume (3 mos.)	185,000
Float	99%
Index Membership	S&P 400 MidCap
Industry	Electric Utilities



Company Description
Hawaiian Electric Industries, Inc. is a holding company engaged in the electric utility and banking businesses in the state of Hawaii. Hawaiian Electric Company, Inc. provides electric services on five islands, whose populations comprise 95% of the state's residents. American Savings Bank, FSB, is the state's third largest financial institution with $6.5 billion in assets.

Lowering 2004 EPS Estimates for Adverse Tax Decision. Maintaining UNDERPERFORM Rating.

- Hawaiian Electric Industries will take a 2Q'04 charge to net income, as the company's bank subsidiary lost an appeal of a tax ruling. The Hawaii Tax Appeals Court sided with the State of Hawaii Department of Taxation, that American Savings Bank (ASB) can't take a deduction on dividends received from its real estate investment trust, ASB Realty Corporation.

- The 2Q'04 charge to net income will amount to approximately $24 million for tax benefits taken through March 31, 2004, plus an estimated $0.5 million for the period of April 1 to June 30, 2004, for a combined per share charge of $0.60 per share. We are also lowering our earnings estimates by $0.04 per share for 2H'04 and $0.08 per share for 2005, because the dividends received deduction will not be taken in future periods, unless the company prevails in an expected appeal to the Hawaii Supreme Court.

- When these ASB Realty-related earnings changes are combined with other fine tuning adjustments to earnings, including an assumption that electric results will be stronger than previously forecast due to a strengthening Hawaiian economy and warmer 2Q'04 temperatures than a year ago, our 2004 EPS is reduced from $3.21 to $2.59. Our 2005 EPS point estimate remains unchanged.

- Despite these earnings revisions, we are maintaining our 12-18 month target price of $47, or 14.0x our 2005 EPS estimate. Over the past decade, the stock of HE has been accorded a median multiple of 12.2x year-forward earnings. With the current share price above our revised target price of $47, we continue to maintain our **UNDERPERFORM** rating

James L. Bellessa, Jr., CFA jbellessa@dadco.com Ph: (406) 791-7230

Please refer to page two of this report for detailed disclosure and certification information.

D.A. Davidson & Co.
Two Centerpointe Drive, Suite 400 • Lake Oswego, Oregon 97035 • (503) 603-3000 • (800) 755-7848 • www.dadavidson.com
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The research analyst responsible for this report, attests (i) that all the views expressed in this research report accurately reflect such analyst's personal views about the common stock of the subject company and (ii) that no part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by such analyst in this report.

D.A. Davidson & Co. Ratings	**Buy**	**Neutral**	**Underperform**
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 3/31/04)	**Buy**	**Hold**	**Sell**
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
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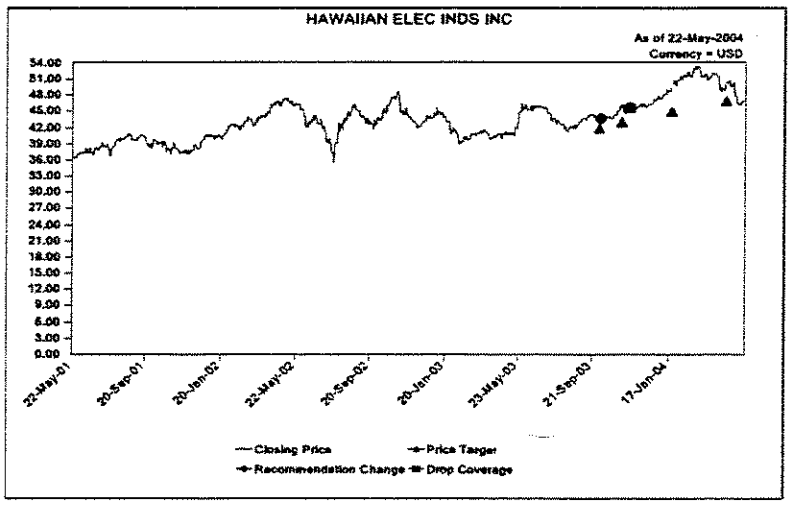

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% Weighting of Capital Structure						
Long-Term and Short-Term Debt	52.6%	49.6%	46.3%	48.0%	44.6%	52.8%
Trust Preferreds	8.8%	8.7%	8.4%	8.1%	8.4%	0.0%
Preferred Stock of Subs	1.5%	1.5%	1.4%	1.4%	1.4%	1.3%
Common Stock Equity	37.0%	40.2%	43.8%	42.5%	45.6%	45.9%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Common Shares Outstanding (000's)	32,991	35,600	36,809	37,060	37,919	40,148
Book Value Per HEI Share by Segment						
Electric Utilty	$25.01	$24.64	$25.08	$24.98	$24.91	$23.81
Bank	$11.49	$11.43	$12.72	$12.60	$12.26	$12.26
Other	($11.07)	($9.96)	($9.37)	($9.17)	($8.44)	($5.49)
Book Value Per Share	$25.43	$26.11	$28.43	$28.40	$28.72	$30.59

03	4Q03	2003	1Q04	2Q04E	3Q04E	4Q04E	2004E	2005E
59,250	$ 353,994	$ 1,396,665	$ 346,613	$ 368,308	$ 381,346	$ 372,645	$ 1,468,912	$ 1,476,649
33,770	89,745	371,320	89,258	91,862	93,800	95,690	370,611	398,734
683	10,482	13,311	1,239	500	500	500	2,739	2,000
53,703	454,221	1,781,316	437,110	460,670	475,646	468,836	1,842,262	1,877,383
12,614	307,625	1,220,120	302,473	320,027	328,954	322,572	1,274,025	1,276,205
38,654	66,893	278,565	63,150	70,199	71,725	73,013	278,087	296,295
4,200	4,912	19,064	3,650	4,000	4,000	4,000	15,650	16,000
35,468	379,430	1,517,749	369,273	394,226	404,679	399,585	1,567,762	1,588,500
46,638	46,369	176,565	44,140	48,281	52,393	50,074	194,887	200,444
25,116	22,852	92,755	26,108	21,664	22,075	22,677	92,524	102,440
(3,517)	5,570	(5,753)	(2,411)	(3,500)	(3,500)	(3,500)	(12,911)	(14,000)
68,235	74,791	263,567	67,837	66,444	70,968	69,251	274,500	288,883
17,315)	(16,118)	(69,292)	(21,447)	(18,391)	(17,759)	(17,859)	(75,457)	(72,837)
(501)	(502)	(2,006)	(475)	(500)	(500)	(500)	(1,975)	(2,000)
(4,008)	(4,009)	(16,035)					0	0
498	529	1,914	644	450	450	450	1,994	1,800
1,098	1,192	4,267	1,449	1,100	1,100	1,100	4,749	4,400
48,005	55,883	182,415	46,008	49,103	54,258	52,442	203,811	220,246
17,483	18,444	64,367	17,076	42,766	20,184	19,403	99,430	81,491
30,522	37,439	118,048	30,932	6,337	34,074	33,038	104,381	138,755
0	0	(3,870)					0	0
30,522	37,439	114,178	30,932	6,337	34,074	33,038	104,381	138,755
37,516	37,936	37,487	38,578	40,676	40,846	41,016	40,279	41,441
$0.81	$0.99	$3.15	$0.80	$0.16	$0.83	$0.81	$2.59	$3.35
0.00	0.00	(0.10)	0.00	0.00	0.00	0.00	0.00	0.00
$0.81	$0.99	$3.05	$0.80	$0.16	$0.83	$0.81	$2.59	$3.35
$0.62	$0.62	$2.48	$0.62	$0.62	$0.62	$0.62	$2.48	$2.48
76.2%	62.8%	81.4%	77.3%	398.0%	74.3%	77.0%	95.7%	74.1%
36.0%	33.0%	35.3%	35.6%	37.2%	37.2%	37.0%	48.8%	37.0%
$0.54	$0.59	$2.11	$0.52	$0.54	$0.61	$0.57	$2.24	$2.24
$0.41	$0.37	$1.50	$0.41	($0.28)	$0.31	$0.32	$0.75	$1.44
($0.09)	$0.07	($0.23)						
($0.04)	($0.04)	($0.23)						
$0.81	$0.99	$3.15	$0.80	$0.16	$0.83	$0.81	$2.59	$3.35

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Institutional Equity Research

April 22, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

HE – NYSE – $49.01

Revenue ($M)	$1,781.3	*$437.1*	*$457.9*	*$472.6*	*$468.0*	$1,835.6	$1,869.3

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D.A. Davidson & Co. Ratings	Buy	Neutral	Underperform
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 3/31/04)	Buy	Hold	Sell
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
Distribution of Institutional Research Ratings	45%	44%	11%
Corresponding Retail Research Rating	Buy, Core/Buy	Hold, Core/Hold	Avoid
Distribution of Retail Research Ratings	78%	22%	0%
Distribution of combined ratings	53%	39%	8%
Distribution of companies from whom D.A. Davidson & Co. has received compensation for investment banking services in last 12 mos	6%	6%	7%

HAWAIIAN ELEC INDS INC
As of 14-Apr-2004

1Q'04 EPS Climbed 22%

Hawaiian Electric Industries reported 1Q'04 EPS of $0.80. These results compare to $0.66 per share a year ago and our forecast of $0.69. Results for the company's core businesses of an electric utility and a savings bank were ahead of our expectations.

Consolidated 1Q'04 revenues of $437.1 million rose $12.5 million, or 3%, from $424.6 million in 1Q'03. Operating income of $67.8 million climbed $8.7 million, or 15%, from $59.1 million. Net income of $30.9 million rose $6.6 million, or 27%, from $24.3 million. Per share results rose 22%, as average shares outstanding climbed 4%.

Utility Business Advance Helped by Stronger Economy and Higher Temperatures

Electric utility revenues in 1Q'04 of $346.6 million rose $17.7 million, or 5%, from $328.9 million in 1Q'03. Temperatures that were 10% warmer than the same period a year ago, as measured by cooling degree days in Oahu, as well as an undisclosed level of customer growth, produced a 4% climb in kilowatt-hour sales. Additionally, higher rates passed higher fuel and power costs through to ratepayers.

Utility expenses in the most recent quarter of $302.5 million rose $14.5 million, or 5%. Increases in fuel oil, purchased power, maintenance, depreciation and property tax expenses were partially offset by a $4.3 million decline in "other operation" costs. $1.6 million of the decline in "other operation" expenses was due to a $1.6 million decrease in retirement benefits expenses, primarily due to an increase in the value of plan assets in 2003. Maintenance expenses rose due to increased overhauls and storm-related

Drag from "Other" Continues to Decline

"Other" revenues of $1.2 million were up from $0.6 million a year earlier. We believe this includes proceeds from the sale of the HEIPC Philippine Development, LLC (see our *Research Bulletin* of March 2, 2004) for an amount that remains undisclosed due to its insignificance. "Other" expenses of $3.7 million dropped $1.3 million from $4.9 million a year ago, as the company continued to de-emphasize, downsize and/or exit its other business ventures.

$6.8 million a year earlier. The net loss decreased due primarily to the impact of lower interest rates and lower legal expenses. On a per share basis, "other" net loss was $0.13 versus a loss of $0.19 a year earlier.

Raising EPS Estimates

We are raising our 2004 EPS estimate from $3.09 to $3.21 due to the first quarter's positive variance of $0.11 from our forecast. Additionally, better results than our previous forecast are expected for the remainder of the year from the utility business, partially offset by lower forecasts for the bank due to ongoing margin pressures. For 2005, we are raising our estimate from $3.28 to $3.35, due to higher forecasts for the utility, partially offset by lower forecasts for the bank.

Raising Target Price, but Maintaining Rating

Based on higher EPS estimates, we are raising our 12-18 month target price from $45 to $47, or 14.3x the average EPS of the next two years. Over the past decade, the stock of

Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands – Fiscal year ends 12/31

	2000	2001	2002	1Q03	2Q03	3Q03	4Q03	2003
Cash and Equivalents (and Fed Funds Sold)	$ 212,783	$ 450,827	$ 244,525	$ 316,481	$ 213,774	$ 234,278	$ 279,988	$ 279,988
Accts. Receivable and Unbilled Revenue, net	188,056	164,124	176,327	171,747	178,542	174,608	187,716	187,716
Available-for-Sale Securities	164,668	1,613,710	1,960,288	1,799,368	1,791,487	1,800,552	1,787,177	1,787,177
Securities Pledged for Repo. Agreements	657,371	756,749	784,362	989,745	960,085	937,337	941,571	941,571
Held-to-Maturity Investment Securities	1,448,466	84,211	89,545	91,035	92,227	93,447	94,624	94,624
Loans Receivable, net	3,211,325	2,857,622	2,993,989	3,038,671	3,120,846	3,142,148	3,121,979	3,121,979
Property, Plant and Equipment	2,054,474	2,067,503	2,241,943	2,075,007	2,079,267	2,083,812	2,311,888	2,311,888
Regulatory Assets	116,623	111,376	0	104,558	105,652	105,565	0	0
Other	363,447	309,867	345,002	345,858	367,017	360,689	382,228	382,228
Goodwill and Intangibles	101,481	101,954	97,572	95,514	93,947	95,271	93,987	93,987
Total Assets	8,518,694	8,517,943	8,933,553	9,027,984	9,002,844	9,027,707	9,201,158	9,201,158
Accounts Payable	$ 125,719	$ 119,850	$ 134,416	$ 142,565	$ 173,763	$ 157,420	$ 132,780	$ 132,780
Deposit Liabilities	3,584,646	3,679,586	3,800,772	3,815,201	3,886,842	3,952,662	4,026,250	4,026,250
Short-Term Borrowings	104,398	0	0	0	0	0	0	0
Repurchase Agreements	596,504	683,180	667,247	845,959	836,648	787,585	831,335	831,335
FHLB Advances	1,249,252	1,032,752	1,176,252	1,057,252	1,039,552	1,037,052	1,017,053	1,017,053
Long-Term Debt	1,088,731	1,145,769	1,106,270	1,189,265	1,063,464	1,063,790	1,064,420	1,064,420
Deferred Income Tax	187,420	185,436	235,431	230,689	226,249	219,556	226,590	226,590
Contributions in Aid of Construction	211,518	213,557	218,094	220,340	220,630	221,242	233,969	233,969
Other	297,041	293,742	257,315	239,641	260,103	286,594	273,442	273,442
Regulatory liabilities			57,050				71,882	71,882
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Stockholders' Equity	839,059	929,665	1,046,300	1,052,666	1,061,187	1,067,400	1,089,031	1,089,031
Total Liabilities and Equity	8,518,694	8,517,943	8,933,553	9,027,984	9,002,844	9,027,707	9,201,158	9,201,158
Capital Structure (Excluding ASB's deposits, repos, and advances)								
Long-Term and Short-term Debt	$1,193,129	$1,145,769	$1,106,270	$1,189,265	$1,063,464	$1,063,790	$1,064,420	$1,064,420
Trust Preferreds	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Common Stock Equity	839,059	929,665	1,046,300	1,052,666	1,061,187	1,067,400	1,089,031	1,089,031
	$2,266,594	$2,309,840	$2,386,976	$2,476,337	$2,359,057	$2,365,596	$2,387,857	$2,387,857
% Weighting of Capital Structure								
Long-Term and Short-Term Debt	52.6%	49.6%	46.3%	48.0%	45.1%	45.0%	44.6%	44.6%
Trust Preferreds	8.8%	8.7%	8.4%	8.1%	8.5%	8.5%	8.4%	8.4%
Preferred Stock of Subs	1.5%	1.5%	1.4%	1.4%	1.5%	1.5%	1.4%	1.4%
Common Stock Equity	37.0%	40.2%	43.8%	42.5%	45.0%	45.1%	45.6%	45.6%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Common Shares Outstanding (000's)	32,991	35,600	36,809	37,060	37,419	37,690	37,919	37,919

Hawaiian Electric Industries, Inc.

Consolidated Statements of Income

$$$ in thousands -- Fiscal year ends 12/31

	2002	1Q03	2Q03	3Q03	4Q03	2003	1Q04P	2Q04E	3Q04E	4Q04E	2004E	2005E
Revenues:												
Electric Utility	$ 1,257,176	$ 328,912	$ 354,529	$ 359,250	$ 353,994	$ 1,396,685	$ 346,813	$ 365,063	$ 377,824	$ 371,283	$ 1,460,783	$ 1,466,473
Bank	399,255	95,102	92,703	93,770	89,745	371,320	89,258	92,330	94,275	96,173	372,036	400,785
Other	(2,730)	622	1,524	683	10,482	13,311	1,239	500	500	500	2,739	2,000
Total Revenues	1,653,701	424,636	448,756	453,703	454,221	1,781,316	437,110	457,893	472,599	467,956	1,835,558	1,869,258
Expenses:												
Electric Utility	1,062,220	287,937	311,944	312,614	307,625	1,220,120	302,473	317,991	327,157	321,878	1,269,500	1,271,001
Bank	306,372	72,676	70,342	68,654	66,893	278,565	63,150	70,256	71,784	73,074	278,263	296,558
Other	18,676	4,935	5,017	4,200	4,912	19,064	3,650	4,000	4,000	4,000	15,650	16,000
Total Expenses	1,387,268	365,548	387,303	385,468	379,430	1,517,749	369,273	392,247	402,941	398,952	1,563,413	1,583,560
Operating Income:												
Electric Utility	194,956	40,975	42,585	46,636	46,369	176,565	44,140	47,071	50,667	49,405	191,283	195,472
Bank	92,883	22,426	22,361	25,116	22,852	92,755	26,108	22,074	22,491	23,100	93,773	104,226
Other	(21,406)	(4,313)	(3,493)	(3,517)	5,570	(5,753)	(2,411)	(3,500)	(3,500)	(3,500)	(12,911)	(14,000)
Total Operating Income	266,433	59,088	61,453	68,235	74,791	263,567	67,837	65,645	69,658	69,004	272,145	285,698
Interest Expense-other than bank	(72,292)	(17,980)	(17,879)	(17,315)	(16,118)	(69,292)	(21,447)	(18,391)	(17,759)	(17,859)	(75,457)	(72,837)
Preferred Stock Dividends of Subsidiaries	(2,006)	(502)	(501)	(501)	(502)	(2,006)	(475)	(500)	(500)	(500)	(1,975)	(2,000)
Pref. Security Distributions of Trust Sub.	(16,035)	(4,009)	(4,009)	(4,008)	(4,009)	(16,035)					0	0
AFUDC - Debt	1,855	443	446	496	529	1,914	644	450	450	450	1,994	1,800
AFUDC - Equity	3,954	988	989	1,098	1,192	4,267	1,449	1,100	1,100	1,100	4,749	4,400
Pre-Tax Income	181,909	38,028	40,499	48,005	55,883	182,415	48,008	48,304	52,949	52,195	201,456	217,061
Income Taxes	63,692	13,701	14,739	17,483	18,444	64,367	17,076	17,389	19,062	18,790	72,317	78,142
Income from Continuing Operations	118,217	24,327	25,760	30,522	37,439	118,048	30,932	30,915	33,887	33,405	129,139	138,919
Discontinued Operations, Net of Tax	0	0	(3,870)	0	0	(3,870)					0	0
Net Income	118,217	24,327	21,890	30,522	37,439	114,178	30,932	30,915	33,887	33,405	129,139	138,919
Applicable Shares	36,477	37,086	37,377	37,516	37,936	37,487	38,578	40,676	40,846	41,016	40,279	41,441
Earnings Per Share:												
Cont. Operations Bf. Non-Recurring Items	$3.24	$0.66	$0.69	$0.81	$0.99	$3.15	$0.80	$0.76	$0.83	$0.81	$3.21	$3.35
Non-Recurring Items												
Discontinued Operations	0.00	0.00	(0.10)	0.00	0.00	(0.10)	0.00	0.00	0.00	0.00	0.00	0.00
GAAP EPS	$3.24	$0.66	$0.59	$0.81	$0.99	$3.05	$0.80	$0.76	$0.83	$0.81	$3.21	$3.35
Dividends Per Share	$2.48	$0.62	$0.62	$0.62	$0.62	$2.48	$0.62	$0.62	$0.62	$0.62	$2.48	$2.48
Dividend Payout Ratio of GAAP EPS	76.5%	94.5%	105.9%	76.2%	62.6%	81.4%	77.3%	81.6%	74.7%	76.1%	77.4%	74.0%
Tax Rate	35.0%	36.0%	36.4%	36.0%	33.0%	35.3%	35.6%	36.0%	36.0%	36.0%	35.9%	36.0%
EPS by Segment (cont. operations)												
Electric Utility	$2.47	$0.48	$0.50	$0.54	$0.59	$2.11	$0.52	$0.53	$0.58	$0.56	$2.19	$2.17
Bank	$1.54	$0.36	$0.36	$0.41	$0.37	$1.50	$0.41	$0.33	$0.33	$0.34	$1.41	$1.54
Other (operating income)	($0.59)	($0.09)	($0.09)	($0.09)	$0.07	($0.20)						
Unallocated Parent Company	($0.19)	($0.10)	($0.07)	($0.04)	($0.04)	($0.25)						
Total	$3.24	$0.66	$0.69	$0.81	$0.99	$3.15	$0.80	$0.76	$0.83	$0.81	$3.21	$3.35

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Institutional Equity Research

April 6, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

HE – NYSE – $51.98
(Price: 4/5/04)

FY: DEC	2003A*	3/31/04E	6/30/04E	9/30/04E	12/31/04E	2004E	2005E
Revenue ($M)	$1,781.3	*$426.8*	*$446.1*	*$461.8*	*$456.6*	$1,791.4	$1,836.9
Year-over-year revenue growth	8%	*1%*	*-1%*	*2%*	*1%*	1%	3%
Price/Revenue ratio	1.1x					1.2x	1.2x
EPS Revised	**$3.05**	***$0.69***	***$0.75***	***$0.84***	***$0.81***	**$3.09**	**$3.28**
EPS Previous		*NC*	*$0.76*	*NC*	*NC*	NC	NC
Price/EPS ratio	17.1x					16.8x	15.8x
EBITDA ($M)	$414.0	*$98.9*	*$104.3*	*$111.0*	*$110.9*	$425.0	$460.8
EV/EBITDA ratio	7.9x					7.7x	7.1x

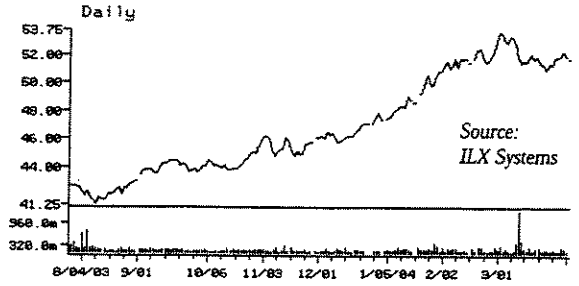
*Includes $0.10/sh. in charges for the 2Q'03 write down and increased expense reserves for a Philippine utility investment, which HEI has a plan to exit; a $0.04/sh. charge for DOH settlement in 3Q'03 and $0.02/sh reversal in 4Q'03; and a $0.05/sh charge for the 4Q'03 Keahole settlement agreement.

Valuation Data

Long-term growth rate	3%
Debt/Cap	53.4%
Book value per share (12/31/03)	$28.32
Dividend (yield)	$2.48 (4.8%)
12-18 month Target Price	$45.00
5-year Target Price	$50.00
Return on Equity	10.8%

Trading Data

Shares outstanding (M)	37.7
Market Capitalization ($M)	$1,959
52-week low	$39.53
52-week high	$53.75
Average daily volume (3 mos.)	157,000
Float	99%
Index Membership	S&P 400 MidCap
Industry	Electric Utilities



Company Description
Hawaiian Electric Industries, Inc. is a holding company engaged in the electric utility and banking businesses in the state of Hawaii. Hawaiian Electric Company, Inc. provides electric services on five islands, whose populations comprise 95% of the state's residents. American Savings Bank, FSB, is the state's third largest financial institution with $6.5 billion in assets.

Fine-Tuning of Earnings Model Leaves 2004 and 2005 EPS Estimates Unchanged.

D.A. Davidson & Co.
Two Centerpointe Drive, Suite 400 • Lake Oswego, Oregon 97035 • (503) 603-3000 • (800) 755-7848 • www.dadavidson.com

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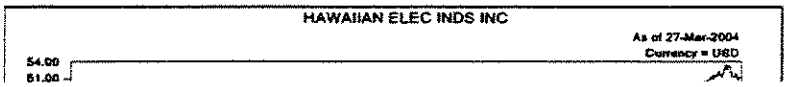
D.A. Davidson & Co. Ratings	Buy	Neutral	Underperform
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 12/31/03)	Buy	Hold	Sell
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
Distribution of Institutional Research Ratings	41%	48%	11%
Corresponding Retail Research Rating	Buy, Core/Buy	Hold, Core/Hold	Avoid
Distribution of Retail Research Ratings	85%	15%	0%
Distribution of combined ratings	52%	40%	8%
Distribution of companies from whom D.A. Davidson & Co. has received compensation for investment banking services in last 12 mos	4%	8%	15%



Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands – Fiscal year ends 12/31

	2000	2001	2002	1Q03	2Q03	3Q03	4Q03	2003
Cash and Equivalents (and Fed Funds Sold)	$ 212,783	$ 450,827	$ 244,525	$ 316,481	$ 213,774	$ 234,278	$ 279,988	$ 279,988
Accts. Receivable and Unbilled Revenue, net	188,056	164,124	176,327	171,747	178,542	174,608	187,716	187,716
Available-for-Sale Securities	164,668	1,613,710	1,960,288	1,799,368	1,791,487	1,800,552	1,787,177	1,787,177
Securities Pledged for Repo. Agreements	657,371	756,749	784,362	989,745	960,085	937,337	941,571	941,571
Held-to-Maturity Investment Securities	1,448,466	84,211	89,545	91,035	92,227	93,447	94,624	94,624
Loans Receivable, net	3,211,325	2,857,622	2,993,989	3,038,671	3,120,846	3,142,148	3,121,979	3,121,979
Property, Plant and Equipment	2,054,474	2,067,503	2,241,943	2,075,007	2,079,267	2,083,812	2,311,888	2,311,888
Regulatory Assets	116,623	111,376	0	104,558	105,652	105,565	0	0
Other	363,447	309,867	345,002	345,858	367,017	360,689	382,228	382,228
Goodwill and Intangibles	101,481	101,954	97,572	95,514	93,947	95,271	93,987	93,987
Total Assets	8,518,694	8,517,943	8,933,553	9,027,984	9,002,844	9,027,707	9,201,158	9,201,158
Accounts Payable	$ 125,719	$ 119,850	$ 134,416	$ 142,565	$ 173,763	$ 157,420	$ 132,780	$ 132,780
Deposit Liabilities	3,584,646	3,679,586	3,800,772	3,815,201	3,886,842	3,952,662	4,026,250	4,026,250
Short-Term Borrowings	104,398	0	0	0	0	0	0	0
Repurchase Agreements	596,504	683,180	667,247	845,959	836,648	787,585	831,335	831,335
FHLB Advances	1,249,252	1,032,752	1,176,252	1,057,252	1,039,552	1,037,052	1,017,053	1,017,053
Long-Term Debt	1,088,731	1,145,769	1,106,270	1,189,265	1,063,464	1,063,790	1,064,420	1,064,420
Deferred Income Tax	187,420	185,436	235,431	230,689	226,249	219,556	226,590	226,590
Contributions in Aid of Construction	211,518	213,557	218,094	220,340	220,630	221,242	233,969	233,969
Other	297,041	293,742	257,315	239,641	260,103	286,594	273,442	273,442
Regulatory liabilities			57,050				71,882	71,882
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Stockholders' Equity	839,059	929,665	1,046,300	1,052,666	1,061,187	1,067,400	1,089,031	1,089,031
Total Liabilities and Equity	8,518,694	8,517,943	8,933,553	9,027,984	9,002,844	9,027,707	9,201,158	9,201,158
Capital Structure (Excluding ASB's deposits, repos, and advances)								
Long-Term and Short-term Debt	$1,193,129	$1,145,769	$1,106,270	$1,189,265	$1,063,464	$1,063,790	$1,064,420	$1,064,420
Trust Preferreds	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Common Stock Equity	839,059	929,665	1,046,300	1,052,666	1,061,187	1,067,400	1,089,031	1,089,031
	$2,266,594	$2,309,840	$2,386,976	$2,476,337	$2,359,057	$2,365,596	$2,387,857	$2,387,857
% Weighting of Capital Structure								
Long-Term and Short-Term Debt	52.6%	49.6%	46.3%	48.0%	45.1%	45.0%	44.6%	44.6%
Trust Preferreds	8.8%	8.7%	8.4%	8.1%	8.5%	8.5%	8.4%	8.4%
Preferred Stock of Subs	1.5%	1.5%	1.4%	1.4%	1.5%	1.5%	1.4%	1.4%
Common Stock Equity	37.0%	40.2%	43.8%	42.5%	45.0%	45.1%	45.6%	45.6%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Common Shares Outstanding (000's)	32,991	35,600	36,809	37,060	37,419	37,690	37,919	37,919

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Institutional Equity Research

RESEARCH NOTE

March 2, 2004

(Price 3/2/04)

Hawaiian Electric Industries, Inc.
James L. Bellessa, Jr., CFA
HE – UNDERPERFORM – $53.44

A Number of Unusual Factors May Affect First Quarter Results

Hawaiian Electric Industries, Inc. has recently released its 2003 Annual Report to Shareholders. While the Report contains much of the detail needed to fill in our earnings model, other details will not become available until the company files its Form 10-K, Statistical Supplement and Utility Forecast, and Corporate Profile. Nonetheless, there are a number of known factors that may have an impact on financial results in 1Q'04 and possibly beyond. Because of their uncertain or yet-to-be-quantified impacts, we are maintaining our 1Q'04 EPS estimate of $0.69, compared to $0.66 in 1Q'03. (See our *Research Bulletin* of January 21, 2004.)

HEI's 2003 Annual Report states that in January 2004, the Department of Health of the State of Hawaii (DOH) announced that it intended to waive 2003 emissions fees. This means the $1.5 million in emission fees accrued in 2003 will be reversed in 1Q'04, increasing EPS by approximately $0.03 per share. Management does not know if the DOH will waive emission fees in 2004, so we expect the company will continue to accrue emission fees during the current year. However, with the approval of the Environmental Protection Agency, the director of the DOH may waive annual fees due from owners or operators of covered sources for the following calendar year, provided that funds in excess of $6 million exist in the Clean Air Special Fund.

HEI Power Group (HEIPC) has signed an agreement for the 1Q'04 sale of HEIPC Philippine Development, LLC, an entity that holds an interest in Cagayan Electric Power & Light Co., Inc. (CEPALCO). Terms of the transaction and the potential financial impacts on HEI have not been disclosed. In 1998 and 1999, HEIPC invested $9.7 million to acquire shares in CEPALCO. This investment has been written-down by $8 million.

HEI is evaluating the impact of applying a new accounting rule, FIN No. 46R, "Consolidation of Variable Interest Entities," in 1Q'04. Since HEI may meet the definition of a primary beneficiary of the Independent Power Projects (IPPs), from which its electric utility businesses purchase power, the company may need to consolidate these IPPs into its financial statements. Besides the potential recognition of a significant amount of assets and liabilities on the balance sheet, the

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The research analyst responsible for this report, attests (i) that all the views expressed in this research report accurately reflect such analyst's personal views about the common stock of the subject company and (ii) that no part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by such analyst in this report.

D.A. Davidson & Co. Ratings	Buy	Neutral	Underperform
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 12/31/03)	Buy	Hold	Sell
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
Distribution of Institutional Research Ratings	41%	48%	11%
Corresponding Retail Research Rating	Buy, Core/Buy	Hold, Core/Hold	Avoid
Distribution of Retail Research Ratings	85%	15%	0%
Distribution of combined ratings	52%	40%	8%
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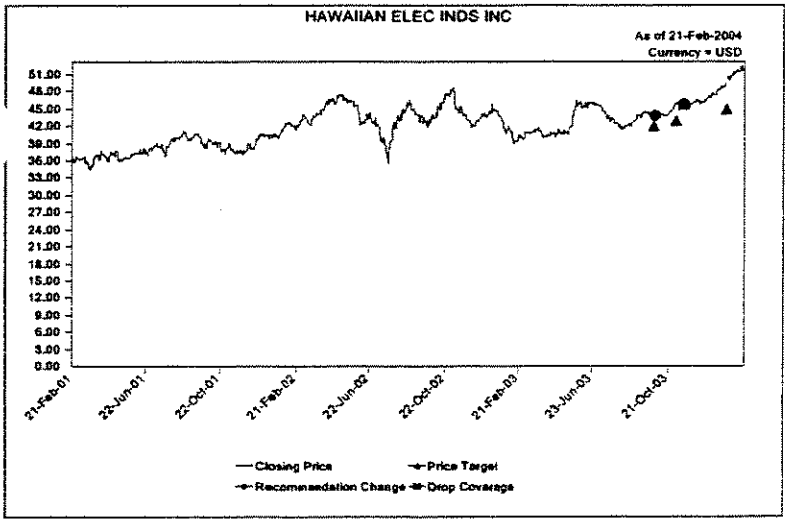

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D.A. Davidson & Co. Institutional Research Rating Scale (beginning 7/9/02)
Buy, Neutral, Underperform
D.A. Davidson & Co. Institutional Research Rating Scale (6/18/01 – 7/9/02)
Strong Buy, Buy, Neutral, Underperform
D.A. Davidson & Co. Institutional Research Rating Scale (6/1/99 – 6/18/01)
Buy, Outperform, Neutral, Underperform, Sell

HAWAIIAN ELEC INDS INC

Currency = USD

Date	Closing Price	Recommendation Change	Date	Closing Price	Price Target
14-Nov-2003	45.85	UNDERPERFORM	21-Jan-2004	49.39	45.00
01-Oct-2003	43.79	NEUTRAL	03-Nov-2003	46.16	43.00
			30-Sep-2003	43.53	42.00

Target prices are our Institutional Research Department's evaluation of price potential over the next 12-18 months and 5 years based upon our assessment of future earnings and cash flow, comparable company valuations, growth prospects and other financial criteria. Certain risks may impede achievement of these price targets including, but not limited to, broader market and macroeconomic fluctuations and unforeseen changes in the subject company's fundamentals or business trends. Information contained herein has been obtained by sources we consider reliable, but is not guaranteed and we are not soliciting any action based upon it. Any opinions expressed are based on our interpretation of data available to us at the time of the original publication of the report. These opinions are subject to change at any time without notice. Investors must bear in mind that inherent in investments are the risks of fluctuating prices and the uncertainties of dividends, rates of return and yield. Investors should also remember that past performance is not necessarily an indicator of future performance and D.A. Davidson & Co. makes no guarantee, express or implied, as to future performance. Investors should note this report was prepared by D.A. Davidson & Co.'s Institutional Research Department for distribution to D.A. Davidson & Co.'s institutional investor clients and assumes a certain level of investment sophistication on the part of the recipient. Readers, who are not institutional investors or other market professionals, should seek the advice of their individual investment advisor for an explanation of this report's contents, and should always seek such advisor's advice before making any investment decisions. Further information and elaboration will be furnished upon request.

D.A. Davidson & Co.
member SIPC

Institutional Equity Research

January 21, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

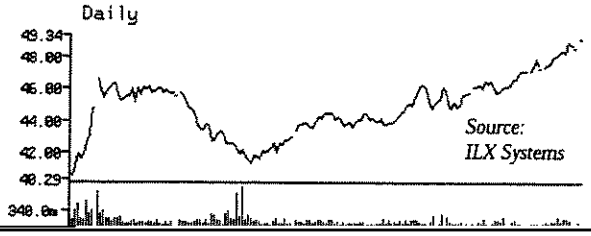
HE – NYSE – $49.17
(Price: 1/20/04)

FY: DEC	2003A*	3/31/04E	6/30/04E	9/30/04E	12/31/04E	2004E	2005E
Revenue ($M)	$1,781.3	*$420.9*	*$440.2*	*$456.1*	*$449.6*	$1,766.8	$1,822.4
Year-over-year revenue growth	8%	*-1%*	*-2%*	*1%*	*-1%*	-1%	3%
Price/Revenue ratio	1.0x					1.1x	1.1x
EPS Revised	**$3.05**	***$0.69***	***$0.76***	***$0.84***	***$0.81***	**$3.09**	**$3.28**
EPS Previous	$2.81	*NC*	*NC*	*NC*	*NC*	NC	NC
Price/EPS ratio	16.1x					15.9x	15.0x
EBITDA ($M)	$418.4	*$101.7*	*$108.2*	*$115.3*	*$115.8*	$440.9	$498.6
EV/EBITDA ratio	7.5x					7.1x	6.3x

*Includes $0.10/sh. in charges for the 2Q'03 write-down and increased expense reserves for a Philippine utility investment, which HEI has a plan to exit; a $0.04/sh. charge for DOH settlement in 3Q'03 and $0.02/sh reversal of in 4Q'03; and a $0.05/sh charge for the 4Q'03 Keahole settlement agreement.

Valuation Data	
Long-term growth rate	3%
Debt/Cap	53.4%
Book value per share (9/30/03)	$28.32
Dividend (yield)	$2.48 (5.0%)
12-18 month Target Price	$45.00 ↑
5-year Target Price	$50.00
Return on Equity	10.8%

Trading Data	
Shares outstanding (M)	37.7
Market Capitalization ($M)	$1,853
52-week low	$38.20
52-week high	$49.37
Average daily volume (3 mos.)	106,000
Float	99%
Index Membership	S&P 400 MidCap
Industry	Electric Utilities



Company Description
Hawaiian Electric Industries, Inc. is a holding company engaged in the electric utility and banking businesses in the state of Hawaii. Hawaiian Electric Company, Inc. provides electric services on five islands, whose populations comprise 95% of the state's residents. American Savings Bank, FSB, is the state's

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The research analyst responsible for this report, attests (i) that all the views expressed in this research report accurately reflect such analyst's personal views about the common stock of the subject company and (ii) that no part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by such analyst in this report.

D.A. Davidson & Co. Ratings	Buy	Neutral	Underperform
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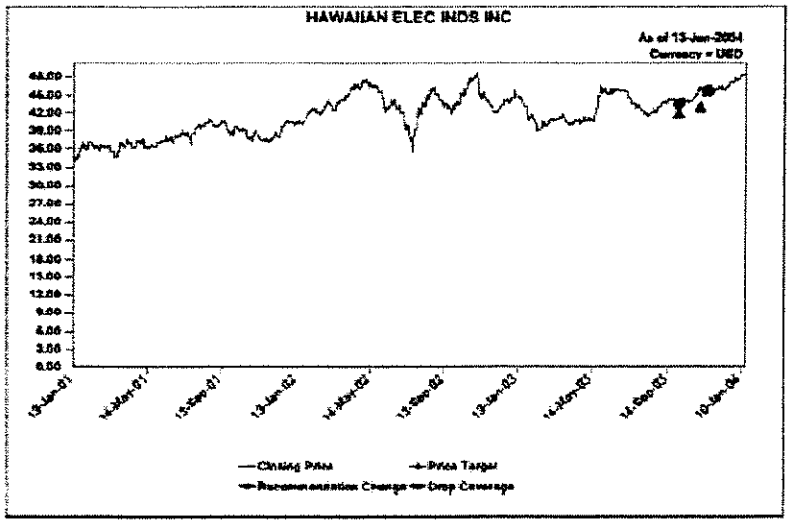

HAWAIIAN ELEC INDS INC

Currency = USD

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Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/18/01 – 7/9/02)
Strong Buy, Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/1/99 – 6/18/01)
Buy, Outperform, Neutral, Underperform, Sell

Target prices are our Institutional Research Department's evaluation of price potential over the next 12-18 months and 5 years based upon our assessment of future earnings and cash flow, comparable company valuations, growth prospects and other financial criteria. Certain risks may impede achievement of these price targets including, but not limited to, broader market and macroeconomic fluctuations and unforeseen changes in the subject company's fundamentals or business trends. Information contained herein has been obtained by sources we consider reliable, but is not guaranteed and we are not soliciting any action based upon it. Any opinions expressed are based on our interpretation of data available to us at the time of the original publication of the report. These opinions are subject to change at any time without notice. Investors must bear in mind that inherent in investments are the risks of fluctuating prices and the uncertainties of dividends, rates of return and yield. Investors should also remember that past performance is not necessarily an indicator of future performance and D.A. Davidson & Co. makes no guarantee, express or implied, as to future performance. Investors should note this report was prepared by D.A. Davidson & Co.'s Institutional Research Department for distribution to D.A. Davidson & Co.'s institutional investor clients and assumes a certain level of investment sophistication on the part of the recipient. Readers, who are not institutional investors or other market professionals, should seek the advice of their individual investment advisor for an explanation of this report's contents, and should always seek such advisor's advice before making any investment decisions. Further information and elaboration will be furnished upon request.

4Q'03 EPS Climbed 38%

Hawaiian Electric Industries reported 4Q'03 EPS of $0.99. These results compare to $0.72 per share a year ago and our forecast of $0.75. Results for the company's core businesses of an electric utility and a savings bank were in line with our expectations. However, "other" results were far ahead of our forecast, principally due to one-time items.

Consolidated 4Q'03 revenues of $454.2 million rose $18.5 million, or 4%, from $435.7 million in 4Q'02. Operating income of $74.8 million climbed $15.3 million, or 26%, from $59.5 million. Net income of $37.4 million rose $11.1 million, or 42%, from $26.4 million.

Utility Business Advance Helped by Warmer Temperatures

Electric utility revenues in 4Q'03 of $354.0 million rose $16.5 million, or 5%, from $337.5 million in 4Q'02. Temperatures that were 3% warmer than the same period a year ago, as measured by cooling degree days in Oahu, as well as undisclosed level of customer growth, produced a 3% climb in kilowatt-hour sales. Additionally, higher rates passed higher fuel and power costs through to ratepayers.

Utility expenses in the most recent quarter of $307.6 million rose $14.9 million, or 5%. Increases in fuel oil, purchased power, pension benefit, depreciation and property tax expenses were partially offset by a $4.0 million decline in maintenance costs. Maintenance costs fell because of the timing and scope of generating unit overhauls relative to a year ago, and the utility's on-going focus on capital expenditures to ensure reliability. In addition, the utility recorded two non-recurring items in 4Q'03. These included: 1) a $3.1 million settlement charge, or $0.05 per share after tax, for the Keahole power plant expansion project (see our *Research Note* of November 14, 2003); and 2) a $0.8 million, or $0.02 per share, reduction in a 3Q'03 charge of $1.6 million, based on a conditional settlement recently reached with the Department of Health of the State of Hawaii for alleged opacity violations at two Maui generating plants (see our *Research Note* of January 9, 2004).

Electric utility net income in 4Q'03 of $22.3 million rose $2.0 million, or 10%. This increase stemmed from a $1.6 million climb in utility operating income, a $0.8 million decline in utility net interest expenses, a $0.3 million net increase in non-regulated results of businesses belonging to the utility, and a $0.7 million increase in utility net income taxes. On a per share basis, utility net income was $0.59 versus $0.54.

Bank Results Advance Due to Lessening Margin Compression

Bank revenues in 4Q'03 of $89.7 million dropped $8.9 million, or 9%, from $98.6 million in 4Q'02. This decline was comprised of a $7.0 million drop in interest and investment income, due to overall lower interest rates in the economy, and a $1.9 million decline in fee and other income.

Bank expenses in 4Q'03 of $66.9 million dropped $10.0 million, or 13%, from $76.8 million in 4Q'02. The drop in expenses included an $8.0 million decline in interest expenses, a $1.5 million reduction in loan loss provisions, and a $0.5 million drop in general and administrative expenses.

Bank operating income of $22.9 million rose $1.1 million, helped by an improved interest rate spread, which is the difference between average rates earned and average rates paid. The 4Q'03 interest rate spread of 3.16% compared to 3.12% a year earlier. The bank does not express its results in terms of net interest margin, which is typical of other financial institutions.

Bank net income in 4Q'03 of $14.0 million rose $0.6 million, or 4%. This increase stemmed from a $1.1 million climb in bank operating income, and a $0.5 million increase in utility net income taxes. On a per share basis, utility net income was $0.37, versus $0.36.

The Quarter's Upside Surprise Occurred Due to One-Time Items

"Other" revenues of $10.5 million were up sharply from ($0.5) million a year earlier, due primarily to $9.5 million for "settlement of lawsuits." This includes an undisclosed settlement from PaineWebber, Inc. on claims relating to three trust certificates purchased by Hawaiian Electric (see our *Research Bulletin* of January 5, 2004). We now believe the Paine Webber settlement must have been larger than the $1 million which we were previously assuming. We believe that these settlement(s) are non-recurring in nature.

"Other" expenses of $4.9 million dropped $1.8 million from $6.7 million a year ago, as the company continued to de-emphasize, downsize and/or exit its other business ventures. Also, in the most recent quarter, there was no repeat of the $0.8 million investment write-downs reported for 4Q'02. Furthermore, management said on the conference call that interest expense for the "other" category dropped.

On a per share basis, "other" net income was $0.03 versus a loss of $0.20 a year earlier. This positive variance, essentially due to the $0.15 per share after tax benefit from the "settlement of lawsuits," explains the positive earnings variance from last year's fourth quarter. We do not expect a recurrence of these "one-time" events in 2004.

No Change in Future Estimates or Our Rating

We continue to maintain our EPS estimates of $3.09 and $3.28 for 2004 and 2005, respectively, and our **UNDERPERFORM** rating. At 15.5x the average of our 2004 and 2005 earnings estimates, we believe the company's shares are overvalued. However, in recognition of the overall market's higher multiple and the increased takeover activity in the banking sector, we are raising our target price from $43 to $45, or 14.1x the average EPS of the next two years. Over the past decade, the stock of HE has been accorded a median multiple of 12.5x year-forward earnings.

James L. Bellessa, Jr., CFA
Vice President; Senior Research Analyst
Ph: (406) 791-7230

Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands -- Fiscal year ends 12/31

	2001	1Q02	2Q02	3Q02	4Q02	2002	1Q03	2Q03	3Q03
Cash and Equivalents (and Fed Funds Sold)	$ 450,827	$ 211,034	$ 243,873	$ 251,467	$ 244,525	$ 244,525	$ 316,481	$ 213,774	$ 234,278
Accts. Receivable and Unbilled Revenue, net	164,124	154,271	172,215	170,264	176,327	176,327	171,747	178,542	174,608
Available-for-Sale Securities	1,613,710	1,848,613	1,943,048	2,011,842	1,960,288	1,960,288	1,799,368	1,791,487	1,800,552
Securities Pledged for Repo. Agreements	756,749	883,534	833,390	755,764	784,362	784,362	989,745	960,085	937,337
Held-to-Maturity Investment Securities	84,211	85,457	86,735	88,047	89,545	89,545	91,035	92,227	93,447
Loans Receivable, net	2,857,622	2,798,970	2,813,086	2,885,007	2,993,989	2,993,989	3,038,671	3,120,846	3,142,148
Property, Plant and Equipment	2,067,503	2,058,350	2,059,582	2,059,411	2,079,325	2,079,325	2,075,007	2,079,267	2,083,812
Regulatory Assets	111,376	109,642	108,153	107,093	105,568	105,568	104,558	105,652	105,565
Other	309,867	317,112	323,610	336,395	345,002	345,002	345,858	367,017	360,689
Goodwill and Intangibles	101,954	101,803	100,294	97,947	97,572	97,572	95,514	93,947	95,271
Total Assets	8,517,943	8,568,786	8,683,986	8,763,237	8,876,503	8,876,503	9,027,984	9,002,844	9,027,707
Accounts Payable	$ 119,850	$ 125,275	$ 120,735	$ 151,543	$ 134,416	$ 134,416	$ 142,565	$ 173,763	$ 157,420
Deposit Liabilities	3,679,586	3,664,745	3,737,016	3,749,455	3,800,772	3,800,772	3,815,201	3,886,842	3,952,662
Short-Term Borrowings	0	0	50,439	29,829	0	0	0	0	0
Repurchase Agreements	683,180	706,212	693,839	617,542	667,247	667,247	845,959	836,648	787,585
FHLB Advances	1,032,752	1,094,752	1,097,752	1,183,752	1,176,252	1,176,252	1,057,252	1,039,552	1,037,052
Long-Term Debt	1,145,769	1,136,597	1,088,576	1,083,517	1,106,270	1,106,270	1,189,265	1,063,464	1,063,790
Deferred Income Tax	185,436	183,437	191,718	229,043	235,431	235,431	230,689	226,249	219,556
Contributions in Aid of Construction	213,557	212,605	213,531	212,814	218,094	218,094	220,340	220,630	221,242
Other	293,742	261,706	257,993	235,088	257,315	257,315	239,641	260,103	286,594
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Stockholders' Equity	929,665	949,051	997,981	1,036,248	1,046,300	1,046,300	1,052,666	1,061,187	1,067,400
Total Liabilities and Equity	8,517,943	8,568,786	8,683,986	8,763,237	8,876,503	8,876,503	9,027,984	9,002,844	9,027,707
Capital Structure (Excluding ASB's deposits, repos, and advances)									
Long-Term and Short-term Debt	$1,145,769	$1,136,597	$1,139,015	$1,113,346	$1,106,270	$1,106,270	$1,189,265	$1,063,464	$1,063,790
Trust Preferreds	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Common Stock Equity	929,665	949,051	997,981	1,036,248	1,046,300	1,046,300	1,052,666	1,061,187	1,067,400
	$2,309,840	$2,320,054	$2,371,402	$2,384,000	$2,386,976	$2,386,976	$2,476,337	$2,359,057	$2,365,596
% Weighting of Capital Structure									
Long-Term and Short-Term Debt	49.6%	49.0%	48.0%	46.7%	46.3%	46.3%	48.0%	45.1%	45.0%
Trust Preferreds	8.7%	8.6%	8.4%	8.4%	8.4%	8.4%	8.1%	8.5%	8.5%
Preferred Stock of Subs	1.5%	1.5%	1.5%	1.4%	1.4%	1.4%	1.4%	1.5%	1.5%
Common Stock Equity	40.2%	40.9%	42.1%	43.5%	43.8%	43.8%	42.5%	45.0%	45.1%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Common Shares Outstanding (000's)	35,600	36,063	36,345	36,572	36,809	36,809	37,060	37,419	37,690

	2002	1Q03	2Q03	3Q03	4Q03P	2003P	1Q04E	2Q04E	3Q04E	4Q04E	2004E	2005E
33	$ 1,257,176	$ 328,912	$ 354,529	$ 359,250	$ 353,994	$ 1,396,685	$ 328,745	$ 346,362	$ 359,952	$ 351,813	$ 1,386,873	$ 1,420,932
22	399,255	95,102	92,703	93,770	89,745	371,320	91,609	93,307	95,695	97,309	377,921	395,423
52)	(2,730)	622	1,524	683	10,482	13,311	500	500	500	500	2,000	8,000
03	1,653,701	424,636	448,756	453,703	454,221	1,781,316	420,855	440,169	456,148	449,622	1,766,793	1,822,355
23	1,062,220	287,937	311,944	312,614	307,625	1,220,120	285,474	298,982	308,604	302,232	1,195,292	1,222,171
45	306,372	72,676	70,342	68,654	66,893	278,565	69,108	70,143	71,189	72,247	282,687	288,467
70	18,676	4,935	5,017	4,200	4,912	19,064	4,000	4,000	4,000	4,000	16,000	20,000
38	1,387,268	365,548	387,303	385,468	379,430	1,517,749	358,583	373,125	383,794	378,479	1,493,980	1,530,639
10	194,956	40,975	42,585	46,636	46,369	176,565	43,271	47,380	51,348	49,581	191,580	198,761
77	92,883	22,426	22,361	25,118	22,852	92,755	22,501	23,164	24,506	25,062	95,233	106,956
22)	(21,406)	(4,313)	(3,493)	(3,517)	5,570	(5,753)	(3,500)	(3,500)	(3,500)	(3,500)	(14,000)	(14,000)
65	266,433	59,088	61,453	68,235	74,791	263,567	62,272	67,044	72,354	71,143	272,814	291,717
74)	(72,292)	(17,980)	(17,879)	(17,315)	(16,118)	(69,292)	(17,900)	(18,000)	(18,100)	(18,200)	(72,200)	(71,200)
02)	(2,006)	(502)	(501)	(501)	(502)	(2,006)	(500)	(500)	(500)	(500)	(2,000)	(2,000)
09)	(16,035)	(4,009)	(4,009)	(4,008)	(4,009)	(16,035)	(4,009)	(4,009)	(4,009)	(4,009)	(16,036)	(16,036)
63	1,855	443	446	496	529	1,914	450	450	450	450	1,800	1,800
77	3,954	998	989	1,098	1,192	4,267	1,000	1,000	1,000	1,000	4,000	4,000
20	181,909	38,028	40,499	48,005	55,883	182,415	41,313	45,985	51,195	49,884	188,378	208,281
45	63,692	13,701	14,739	17,483	18,444	64,367	14,873	16,555	18,430	17,958	67,816	74,981
75	118,217	24,327	25,760	30,522	37,439	118,048	26,440	29,431	32,765	31,926	120,562	133,300
0	0	0	(3,870)	0	0	(3,870)					0	0
75	118,217	24,327	21,890	30,522	37,439	114,178	26,440	29,431	32,765	31,926	120,562	133,300
69	36,477	37,086	37,377	37,516	37,936	37,479	38,356	38,776	39,196	39,616	38,986	40,666
72	$3.24	$0.66	$0.69	$0.81	$0.99	$3.15	$0.69	$0.76	$0.84	$0.81	$3.09	$3.28
00	0.00	0.00	(0.10)	0.00	0.00	(0.10)	0.00	0.00	0.00	0.00	0.00	0.00
72	$3.24	$0.66	$0.59	$0.81	$0.99	$3.05	$0.69	$0.76	$0.84	$0.81	$3.09	$3.28
62	$2.48	$0.62	$0.62	$0.62	$0.62	$2.48	$0.62	$0.62	$0.62	$0.62	$2.48	$2.48
7%	76.5%	94.5%	105.9%	76.2%	62.8%	81.4%	89.9%	81.7%	74.2%	76.9%	80.2%	75.7%
9%	35.0%	36.0%	36.4%	36.0%	33.0%	35.3%	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%
55	$2.47	$0.48	$0.50	$0.54	$0.59	$2.08	$0.49	$0.55	$0.61	$0.57	$2.23	$2.29
36	$1.54	$0.36	$0.36	$0.41	$0.37	$1.50	$0.35	$0.36	$0.38	$0.39	$1.48	$1.61
19)	($0.59)	($0.09)	($0.09)	($0.09)	$0.07	($0.20)						
01)	($0.19)	($0.10)	($0.07)	($0.04)	($0.04)	($0.25)						
72	$3.24	$0.66	$0.69	$0.81	$0.99	$3.15	$0.69	$0.76	$0.84	$0.81	$3.09	$3.28

D.A. Davidson & Co.
member SIPC

Institutional Equity Research

January 9, 2004
Rated: UNDERPERFORM

HAWAIIAN ELECTRIC INDUSTRIES, INC.

HE – NYSE – $48.05
(Price: 1/8/04)

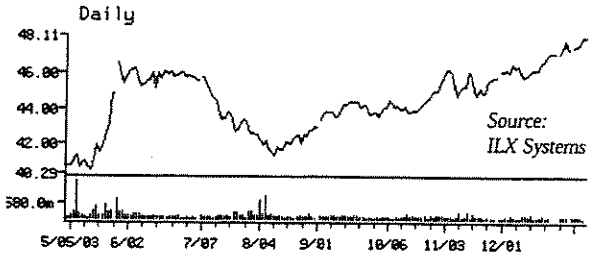
FY: DEC	2002A	*3/31/03A*	*6/30/03A*	*9/30/03A*	*12/31/03E*	2003E	2004E
Revenue ($M)	$1,653.7	*$424.6*	*$448.8*	*$453.7*	*$449.2*	$1,776.3	$1,779.5
Year-over-year revenue growth	-4%	*13%*	*10%*	*5%*	*3%*	7%	0%
Price/Revenue ratio	1.1x					1.0x	1.0x
EPS Revised	**$3.24**	***$0.66***	***$0.59***	***$0.81***	***$0.75***	**$2.81**	**$3.09**
EPS Previous					*$0.73*	$2.79	NC
Price/EPS ratio	14.8x					17.1x	15.5x
EBITDA ($M)	$407.4	*$96.9*	*$101.0*	*$107.1*	*$104.1*	$409.1	$440.7
EV/EBITDA ratio	7.6x					7.6x	7.1x

Valuation Data

Long-term growth rate	3%
Debt/Cap	53.4%
Book value per share (9/30/03)	$28.32
Dividend (yield)	$2.48 (5.2%)
12-18 month Target Price	$43.00
5-year Target Price	$50.00
Return on Equity	9.8%

Trading Data

Shares outstanding (M)	37.7
Market Capitalization ($M)	$1,811
52-week low	$38.20
52-week high	$48.11
Average daily volume (3 mos.)	103,000
Float	99%
Index Membership	S&P 400 MidCap
Industry	Electric Utilities



Company Description
Hawaiian Electric Industries, Inc. is a holding company engaged in the electric utility and banking businesses in the state of Hawaii. Hawaiian Electric Company, Inc. provides electric services on five islands, whose populations comprise 95% of the state's residents. American Savings Bank, FSB, is the state's third largest financial institution with $6.5 billion in assets.

Raising 4Q'03 EPS For Reduced Potential Penalty Accrual.

- We are increasing our 4Q'03 EPS forecast by $0.02 for Hawaiian Electric Industries, as shown above and detailed in the attached model. The higher estimate is due to a lower-than-previously expected penalty under a proposed settlement agreement with the Department of Health of the State of Hawaii (DOH). Our earnings estimates for 2004 and 2005 remain unchanged.
- As announced in an 8-K filing, the pending DOH settlement involves alleged violations of opacity conditions under the DOH's Air Pollution Control Law for two of the utility's generating units on the island of Maui. If finalized, the proposed settlement would resolve all civil liability for the opacity violations from February 1, 1999 to December 31, 2004. The utility claims it has made significant progress in reducing the number of opacity exceedances from the two units, and expects to achieve full compliance with the opacity regulations through the end of 2004, without having to incur significant additional costs.
- Since the settlement is subject to public notice and comment, as well as final action by the DOH, management believes at this time that $0.8 million is the probable penalty amount for the violations. Accordingly, Hawaiian Electric Industries has reduced its initial September 2003 accrual of $1.6 million to $0.8 million in December 2003.
- We are maintaining our **UNDERPERFORM** rating and target price of $43. Our 12-18 month target price is based on a 13.5x multiple of the mid-point of our 2004 and 2005 EPS forecasts.

James L. Bellessa, Jr., CFA jbellessa@dadco.com Ph: (406) 791-7230

Please refer to page two of this report for detailed disclosure and certification information.

D.A. Davidson & Co.

Two Centerpointe Drive, Suite 400 • Lake Oswego, Oregon 97035 • (503) 603-3000 • (800) 755-7848 • www.dadavidson.com

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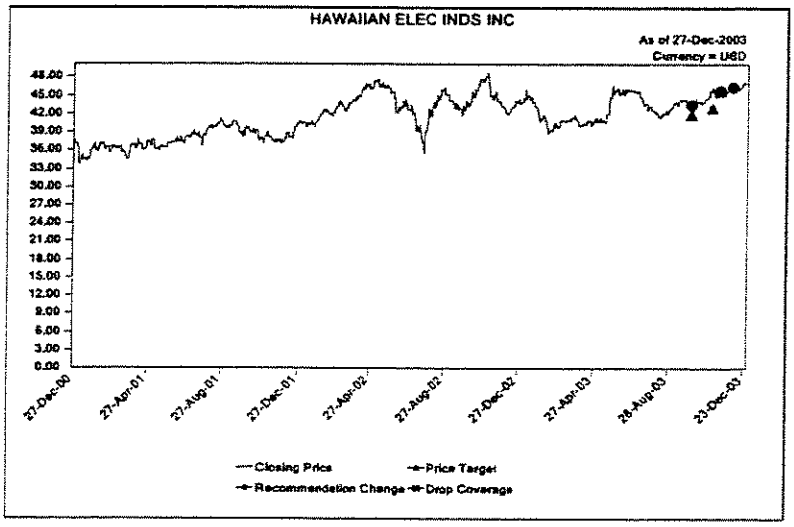
The research analyst responsible for this report, attests (i) that all the views expressed in this research report accurately reflect such analyst's personal views about the common stock of the subject company and (ii) that no part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by such analyst in this report.

D.A. Davidson & Co. Ratings	Buy	Neutral	Underperform
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 9/30/03)	Buy	Hold	Sell
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
Distribution of Institutional Research Ratings	41%	48%	11%
Corresponding Retail Research Rating	Buy, Core/Buy	Hold, Core/Hold	Avoid
Distribution of Retail Research Ratings	85%	15%	0%
Distribution of combined ratings	52%	40%	8%
Distribution of companies from whom D.A. Davidson & Co. has received compensation for investment banking services in last 12 mos	4%	8%	15%



HAWAIIAN ELEC INDS INC

Currency = USD

Date	Closing Price	Recommendation Change	Date	Closing Price	Price Target
04-Dec-2003	46.49	NEUTRAL	03-Nov-2003	46.16	43.00
14-Nov-2003	45.85	UNDERPERFORM	30-Sep-2003	43.53	42.00
30-Sep-2003	43.53	NEUTRAL			

D.A. Davidson & Co. has made two changes to its institutional ratings scale. The first occurred on June 18, 2001 and the second occurred on July 9, 2002. The corresponding scales are reproduced below.

D.A. Davidson & Co. Institutional Research Rating Scale (beginning 7/9/02)

Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/18/01 – 7/9/02)

Strong Buy, Buy, Neutral, Underperform

D.A. Davidson & Co. Institutional Research Rating Scale (6/1/99 – 6/18/01)

Buy, Outperform, Neutral, Underperform, Sell

Target prices are our Institutional Research Department's evaluation of price potential over the next 12-18 months and 5 years based upon our assessment of future earnings and cash flow, comparable company valuations, growth prospects and other financial criteria. Certain risks may impede achievement of these price targets including, but not limited to, broader market and macroeconomic fluctuations and unforeseen changes in the subject company's fundamentals or business trends. Information contained herein has been obtained by sources we consider reliable, but is not guaranteed and we are not soliciting any action based upon it. Any opinions expressed are based on our interpretation of data available to us at the time of the original publication of the report. These opinions are subject to change at any time without notice. Investors must bear in mind that inherent in investments are the risks of fluctuating prices and the uncertainties of dividends, rates of return and yield. Investors should also remember that past performance is not necessarily an indicator of future performance and D.A. Davidson & Co. makes no guarantee, express or implied, as to future performance. Investors should note this report was prepared by D.A. Davidson & Co.'s Institutional Research Department for distribution to D.A. Davidson & Co.'s institutional investor clients and assumes a certain level of investment sophistication on the part of the recipient. Readers, who are not institutional investors or other market professionals, should seek the advice of their individual investment advisor for an explanation of this report's contents, and should always seek such advisor's advice before making any investment decisions. Further information and elaboration will be furnished upon request.

Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands -- Fiscal year ends 12/31

	2001	1Q02	2Q02	3Q02	4Q02	2002	1Q03	2Q03	3Q03
Cash and Equivalents (and Fed Funds Sold)	$ 450,827	$ 211,034	$ 243,873	$ 251,467	$ 244,525	$ 244,525	$ 316,481	$ 213,774	$ 234,278
Accts. Receivable and Unbilled Revenue, net	164,124	154,271	172,215	170,264	176,327	176,327	171,747	178,542	174,608
Available-for-Sale Securities	1,613,710	1,848,613	1,943,048	2,011,842	1,960,288	1,960,288	1,799,368	1,791,487	1,800,552
Securities Pledged for Repo. Agreements	756,749	883,534	833,390	755,764	784,362	784,362	989,745	960,085	937,337
Held-to-Maturity Investment Securities	84,211	85,457	86,735	88,047	89,545	89,545	91,035	92,227	93,447
Loans Receivable, net	2,857,622	2,798,970	2,813,086	2,885,007	2,993,989	2,993,989	3,038,671	3,120,846	3,142,148
Property, Plant and Equipment	2,067,503	2,058,350	2,059,582	2,059,411	2,079,325	2,079,325	2,075,007	2,079,267	2,083,812
Regulatory Assets	111,376	109,642	108,153	107,093	105,568	105,568	104,558	105,652	105,565
Other	309,867	317,112	323,610	336,395	345,002	345,002	345,858	367,017	360,689
Goodwill and Intangibles	101,954	101,803	100,294	97,947	97,572	97,572	95,514	93,947	95,271
Total Assets	8,517,943	8,568,786	8,683,986	8,763,237	8,876,503	8,876,503	9,027,984	9,002,844	9,027,707
Accounts Payable	$ 119,850	$ 125,275	$ 120,735	$ 151,543	$ 134,416	$ 134,416	$ 142,565	$ 173,763	$ 157,420
Deposit Liabilities	3,679,586	3,664,745	3,737,016	3,749,455	3,800,772	3,800,772	3,815,201	3,886,842	3,952,662
Short-Term Borrowings	0	0	50,439	29,829	0	0	0	0	0
Repurchase Agreements	683,180	706,212	693,839	617,542	667,247	667,247	845,959	836,648	787,585
FHLB Advances	1,032,752	1,094,752	1,097,752	1,183,752	1,176,252	1,176,252	1,057,252	1,039,552	1,037,052
Long-Term Debt	1,145,769	1,136,597	1,088,576	1,083,517	1,106,270	1,106,270	1,189,265	1,063,464	1,063,790
Deferred Income Tax	185,436	183,437	191,718	229,043	235,431	235,431	230,689	226,249	219,556
Contributions in Aid of Construction	213,557	212,605	213,531	212,814	218,094	218,094	220,340	220,630	221,242
Other	293,742	261,706	257,993	235,088	257,315	257,315	239,641	260,103	286,594
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Stockholders' Equity	929,665	949,051	997,981	1,036,248	1,046,300	1,046,300	1,052,666	1,061,187	1,067,400
Total Liabilities and Equity	8,517,943	8,568,786	8,683,986	8,763,237	8,876,503	8,876,503	9,027,984	9,002,844	9,027,707
Capital Structure (Excluding ASB's deposits, repos, and advances)									
Long-Term and Short-term Debt	$1,145,769	$1,136,597	$1,139,015	$1,113,346	$1,106,270	$1,106,270	$1,189,265	$1,063,464	$1,063,790
Trust Preferreds	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Common Stock Equity	929,665	949,051	997,981	1,036,248	1,046,300	1,046,300	1,052,666	1,061,187	1,067,400
	$2,309,840	$2,320,054	$2,371,402	$2,384,000	$2,386,976	$2,386,976	$2,476,337	$2,359,057	$2,365,596
% Weighting of Capital Structure									
Long-Term and Short-Term Debt	49.6%	49.0%	48.0%	46.7%	46.3%	46.3%	48.0%	45.1%	45.0%
Trust Preferreds	8.7%	8.6%	8.4%	8.4%	8.4%	8.4%	8.1%	8.5%	8.5%
Preferred Stock of Subs	1.5%	1.5%	1.5%	1.4%	1.4%	1.4%	1.4%	1.5%	1.5%
Common Stock Equity	40.2%	40.9%	42.1%	43.5%	43.8%	43.8%	42.5%	45.0%	45.1%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Common Shares Outstanding (000's)	35,600	36,063	36,345	36,572	36,809	36,809	37,060	37,419	37,690

Hawaiian Electric Industries, Inc.
Consolidated Statements of Income
$$$ in thousands -- Fiscal year ends 12/31

	4Q02	2002	1Q03	2Q03	3Q03	4Q03E	2003E	1Q04E	2Q04E	3Q04E	4Q04E	2004E	2005E
Revenues:													
Electric Utility	$ 337,533	$ 1,257,176	$ 328,912	$ 354,529	$ 359,250	$ 354,400	$ 1,397,091	$ 328,745	$ 346,362	$ 359,952	$ 351,813	$ 1,386,873	$ 1,420,932
Bank	98,622	399,255	95,102	92,703	93,770	94,294	375,869	95,003	98,744	98,519	100,328	390,593	399,726
Other	(452)	(2,730)	622	1,524	683	500	3,328	500	500	500	500	2,000	6,000
Total Revenues	435,703	1,653,701	424,636	448,756	453,703	449,194	1,776,289	424,248	443,606	458,971	452,641	1,779,466	1,826,660
Expenses:													
Electric Utility	292,723	1,062,220	287,937	311,944	312,614	308,463	1,220,958	286,047	299,563	308,477	302,065	1,196,153	1,229,941
Bank	76,845	306,372	72,676	70,342	68,654	70,820	282,492	71,940	73,082	74,247	75,434	294,703	292,265
Other	6,670	18,676	4,935	5,017	4,200	4,500	18,652	4,000	4,000	4,000	4,000	16,000	20,000
Total Expenses	376,238	1,387,268	365,548	387,303	385,468	383,783	1,522,102	361,987	376,646	386,724	381,499	1,506,856	1,542,206
Operating Income:													
Electric Utility	44,810	194,956	40,975	42,585	46,636	45,938	176,134	42,699	46,799	51,475	49,748	190,720	190,991
Bank	21,777	92,883	22,426	22,361	25,116	23,474	93,377	23,063	23,662	24,272	24,894	95,890	107,463
Other	(7,122)	(21,406)	(4,313)	(3,493)	(3,517)	(4,000)	(15,323)	(3,500)	(3,500)	(3,500)	(3,500)	(14,000)	(14,000)
Total Operating Income	59,465	266,433	59,088	61,453	68,235	65,412	254,188	62,261	66,961	72,247	71,142	272,610	284,454
Interest Expense-other than bank	(17,874)	(72,292)	(17,980)	(17,879)	(19,233)	(19,719)	(74,811)	(19,819)	(19,919)	(20,019)	(20,119)	(79,876)	(71,200)
Preferred Stock Dividends of Subsidiaries	(502)	(2,006)	(502)	(501)	(501)	(500)	(2,004)	(500)	(500)	(500)	(500)	(2,000)	(2,000)
Pref. Security Distributions of Trust Sub.	(4,009)	(16,035)	(4,009)	(4,009)	(2,090)	(2,090)	(12,198)	(2,090)	(2,090)	(2,090)	(2,090)	(8,360)	(16,036)
AFUDC - Debt	463	1,855	443	446	496	450	1,835	450	450	450	450	1,800	1,800
AFUDC - Equity	977	3,954	988	989	1,098	1,000	4,075	1,000	1,000	1,000	1,000	4,000	4,000
Pre-Tax Income	38,720	181,909	38,028	40,499	48,005	44,553	171,085	41,302	45,902	51,088	49,683	188,174	201,018
Income Taxes	12,346	63,692	13,701	14,739	17,483	16,173	62,096	15,282	16,984	18,903	18,457	69,624	72,367
Income from Continuing Operations	26,375	118,217	24,327	25,760	30,522	28,380	108,989	26,020	28,918	32,185	31,426	118,550	128,652
Discontinued Operations, Net of Tax	0	0	0	(3,870)	0	0	(3,870)					0	0
Net Income	26,375	118,217	24,327	21,890	30,522	28,380	105,119	26,020	28,918	32,185	31,426	118,550	128,652
Applicable Shares	36,869	36,477	37,086	37,377	37,516	37,750	37,432	37,984	38,218	38,452	38,686	38,335	39,271
Earnings Per Share:													
Cont. Operations Bf. Non-Recurring Items	$0.72	$3.24	$0.66	$0.69	$0.81	$0.75	$2.91	$0.69	$0.76	$0.84	$0.81	$3.09	$3.28
Non-Recurring Items													
Discontinued Operations	0.00	0.00	0.00	(0.10)	0.00	0.00	(0.10)	0.00	0.00	0.00	0.00	0.00	0.00
GAAP EPS	$0.72	$3.24	$0.66	$0.59	$0.81	$0.75	$2.81	$0.69	$0.76	$0.84	$0.81	$3.09	$3.28
Dividends Per Share	$0.62	$2.48	$0.62	$0.62	$0.62	$0.62	$2.48	$0.62	$0.62	$0.62	$0.62	$2.48	$2.48
Dividend Payout Ratio of GAAP EPS	86.7%	76.5%	94.5%	105.9%	76.2%	82.5%	88.3%	90.5%	81.9%	74.1%	76.3%	80.2%	75.7%
Tax Rate	31.9%	35.0%	36.0%	36.4%	36.0%	36.3%	36.3%	37.0%	37.0%	37.0%	37.0%	37.0%	36.0%
EPS by Segment (cont. operations)													
Electric Utility	$0.55	$2.47	$0.48	$0.50	$0.54	$0.55	$2.04	$0.48	$0.54	$0.61	$0.58	$2.22	$2.30
Bank	$0.36	$1.54	$0.36	$0.36	$0.41	$0.38	$1.51	$0.37	$0.38	$0.38	$0.39	$1.52	$1.68
Other (operating income)	($0.19)	($0.59)	($0.09)	($0.09)	($0.09)								
Unallocated Parent Company	($0.01)	($0.18)	($0.10)	($0.07)	($0.04)								
Total	$0.72	$3.24	$0.66	$0.69	$0.81	$0.75	$2.91	$0.69	$0.76	$0.84	$0.81	$3.09	$3.28

D.A. Davidson & Co.
member SIPC

Institutional Equity Research

January 5, 2004
Rated: UNDERPERFORM

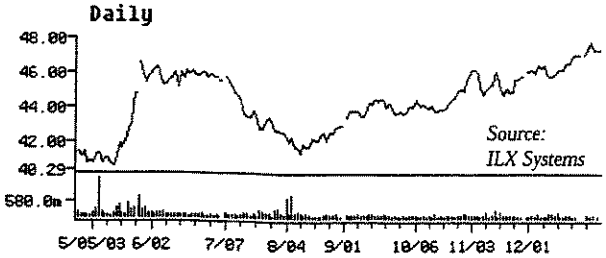
HAWAIIAN ELECTRIC INDUSTRIES, INC.

HE – NYSE – $47.35
(Price: 1/5/04)

FY: DEC	2002A	3/31/03A	6/30/03A	9/30/03A	12/31/03E	2003E	2004E
Revenue ($M)	$1,653.7	$424.6	$448.8	$453.7	$449.2	$1,776.3	$1,779.5
Year-over-year revenue growth	-4%	13%	10%	5%	3%	7%	0%
Price/Revenue ratio	1.0x					1.0x	1.0x
EPS Revised	$3.24	$0.66	$0.59	$0.81	$0.73	$2.79	$3.09
EPS Previous					$0.71	$2.77	NC
Price/EPS ratio	14.6x					17.0x	15.3x
EBITDA ($M)	$407.4	$96.9	$101.0	$107.1	$103.3	$408.3	$440.7
EV/EBITDA ratio	7.6x					7.6x	7.0x

Valuation Data	
Long-term growth rate	3%
Debt/Cap	53.4%
Book value per share (9/30/03)	$28.32
Dividend (yield)	$2.48 (5.2%)
12-18 month Target Price	$43.00
5-year Target Price	$50.00
Return on Equity	9.8%

Trading Data	
Shares outstanding (M)	37.7
Market Capitalization ($M)	$1,785
52-week low	$38.20
52-week high	$48.00
Average daily volume (3 mos.)	103,000
Float	99%
Index Membership	S&P 400 MidCap
Industry	Electric Utilities



Company Description
Hawaiian Electric Industries, Inc. is a holding company engaged in the electric utility and banking businesses in the state of Hawaii. Hawaiian Electric Company, Inc. provides electric services on five islands, whose populations comprise 95% of the state's residents. American Savings Bank, FSB, is the state's third largest financial institution with $6.5 billion in assets.

Raising 4Q'03 EPS For Settlement Payment. Initiating 2005 Forecast. Maintaining UNDERPERFORM Rating.

- Hawaiian Electric Industries (HEI) reported in an 8-K filing that it had settled legal issues with PaineWebber, Inc. that have been ongoing since 2001. Terms of the settlement are confidential. We are assuming a $1 million payment by PaineWebber to HEI and its banking subsidiary, American Savings Bank (ASB). Accordingly, we are raising our 4Q'03 and 2003 EPS by $0.02 per share, after tax, as shown above.

- The agreement settles all claims and counterclaims for a trial that was to begin in early December 2003, and for hearings scheduled for January 26, 2004. The claims related to three trust certificates, originally worth $84 million, that ASB purchased in 2000 from PaineWebber. The Office of Thrift Supervision (OTS) required ASB to divest the certificates because they were impermissible investments under regulations for savings banks. HEI purchased the three trust certificates from ASB in 2001 because of the absence of any other buyers and the need to meet the OTS' demands. Combined, ASB and HEI realized approximately $16.3 million, or $0.38 per share, in losses in previous periods related to these trust certificates.

- We are initiating quarterly 2004 EPS estimates for HEI, as well as a 2005 annual forecast of $3.28. These new estimates are displayed on page four of this report.

- We are maintaining our UNDERPERFORM rating and target price of $43. Our 12-18 month target price is based on a 13.5x

D.A. Davidson & Co.
Two Centerpointe Drive, Suite 400 • Lake Oswego, Oregon 97035 • (503) 603-3000 • (800) 755-7848 • www.dadavidson.com

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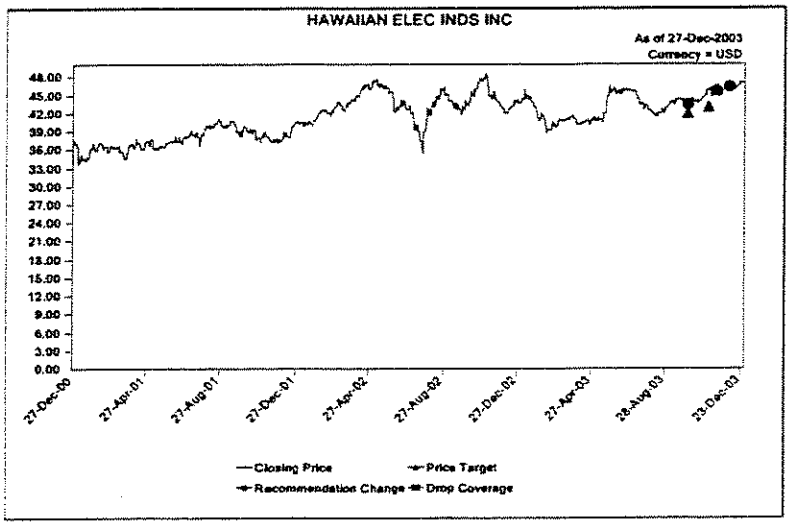
The research analyst responsible for this report, attests (i) that all the views expressed in this research report accurately reflect such analyst's personal views about the common stock of the subject company and (ii) that no part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by such analyst in this report.

D.A. Davidson & Co. Ratings	Buy	Neutral	Underperform
Risk adjusted return potential	Over 15% total return expected on a risk adjusted basis over next 12-18 months	>0-15% return potential on a risk adjusted basis over next 12-18 months	Likely to remain flat or lose value on a risk adjusted basis over next 12-18 months

Distribution of Ratings (as of 9/30/03)	Buy	Hold	Sell
Corresponding Institutional Research Rating	Buy	Neutral	Underperform
Distribution of Institutional Research Ratings	38%	53%	9%
Corresponding Retail Research Rating	Buy, Core/Buy	Hold, Core/Hold	Avoid
Distribution of Retail Research Ratings	86%	14%	0%
Distribution of combined ratings	49%	44%	7%
Distribution of companies from whom D.A. Davidson & Co. has received compensation for investment banking services in last 12 mos	14%	12%	18%



D.A. Davidson & Co. has made two changes to its institutional ratings scale. The first occurred on June 18, 2001 and the second occurred on July 9, 2002. The corresponding scales are reproduced below.
D.A. Davidson & Co. Institutional Research Rating Scale (beginning 7/9/02)
Buy, Neutral, Underperform
D.A. Davidson & Co. Institutional Research Rating Scale (6/18/01 – 7/9/02)
Strong Buy, Buy, Neutral, Underperform
D.A. Davidson & Co. Institutional Research Rating Scale (6/1/99 – 6/18/01)
Buy, Outperform, Neutral, Underperform, Sell

HAWAIIAN ELEC INDS INC

Currency = USD

Date	Closing Price	Recommendation Change	Date	Closing Price	Price Target
04-Dec-2003	46.49	NEUTRAL	03-Nov-2003	46.16	43.00
14-Nov-2003	45.85	UNDERPERFORM	30-Sep-2003	43.53	42.00
30-Sep-2003	43.53	NEUTRAL			

Target prices are our Institutional Research Department's evaluation of price potential over the next 12-18 months and 5 years based upon our assessment of future earnings and cash flow, comparable company valuations, growth prospects and other financial criteria. Certain risks may impede achievement of these price targets including, but not limited to, broader market and macroeconomic fluctuations and unforeseen changes in the subject company's fundamentals or business trends. Information contained herein has been obtained by sources we consider reliable, but is not guaranteed and we are not soliciting any action based upon it. Any opinions expressed are based on our interpretation of data available to us at the time of the original publication of the report. These opinions are subject to change at any time without notice. Investors must bear in mind that inherent in investments are the risks of fluctuating prices and the uncertainties of dividends, rates of return and yield. Investors should also remember that past performance is not necessarily an indicator of future performance and D.A. Davidson & Co. makes no guarantee, express or implied, as to future performance. Investors should note this report was prepared by D.A. Davidson & Co.'s Institutional Research Department for distribution to D.A. Davidson & Co.'s institutional investor clients and assumes a certain level of investment sophistication on the part of the recipient. Readers, who are not institutional investors or other market professionals, should seek the advice of their individual investment advisor for an explanation of this report's contents, and should always seek such advisor's advice before making any investment decisions. Further information and elaboration will be furnished upon request.

Hawaiian Electric Industries, Inc.

Balance Sheet

$$$ in thousands – Fiscal year ends 12/31

	2001	1Q02	2Q02	3Q02	4Q02	2002	1Q03	2Q03	3Q03
Cash and Equivalents (and Fed Funds Sold)	$ 450,827	$ 211,034	$ 243,873	$ 251,467	$ 244,525	$ 244,525	$ 316,481	$ 213,774	$ 234,278
Accts. Receivable and Unbilled Revenue, net	164,124	154,271	172,215	170,264	176,327	176,327	171,747	178,542	174,608
Available-for-Sale Securities	1,613,710	1,848,613	1,943,048	2,011,842	1,960,288	1,960,288	1,799,368	1,791,487	1,800,552
Securities Pledged for Repo. Agreements	756,749	883,534	833,390	755,764	784,362	784,362	989,745	960,085	937,337
Held-to-Maturity Investment Securities	84,211	85,457	86,735	88,047	89,545	89,545	91,035	92,227	93,447
Loans Receivable, net	2,857,622	2,798,970	2,813,086	2,885,007	2,993,989	2,993,989	3,038,671	3,120,846	3,142,148
Property, Plant and Equipment	2,067,503	2,058,350	2,059,582	2,059,411	2,079,325	2,079,325	2,075,007	2,079,267	2,083,812
Regulatory Assets	111,376	109,642	108,153	107,093	105,568	105,568	104,558	105,652	105,565
Other	309,867	317,112	323,610	336,395	345,002	345,002	345,858	367,017	360,689
Goodwill and Intangibles	101,954	101,803	100,294	97,947	97,572	97,572	95,514	93,947	95,271
Total Assets	8,517,943	8,568,786	8,683,986	8,763,237	8,876,503	8,876,503	9,027,984	9,002,844	9,027,707
Accounts Payable	$ 119,850	$ 125,275	$ 120,735	$ 151,543	$ 134,416	$ 134,416	$ 142,565	$ 173,763	$ 157,420
Deposit Liabilities	3,679,586	3,664,745	3,737,016	3,749,455	3,800,772	3,800,772	3,815,201	3,886,842	3,952,662
Short-Term Borrowings	0	0	50,439	29,829	0	0	0	0	0
Repurchase Agreements	683,180	706,212	693,839	617,542	667,247	667,247	845,959	836,648	787,585
FHLB Advances	1,032,752	1,094,752	1,097,752	1,183,752	1,176,252	1,176,252	1,057,252	1,039,552	1,037,052
Long-Term Debt	1,145,769	1,136,597	1,088,576	1,083,517	1,106,270	1,106,270	1,189,265	1,063,464	1,063,790
Deferred Income Tax	185,436	183,437	191,718	229,043	235,431	235,431	230,689	226,249	219,556
Contributions in Aid of Construction	213,557	212,605	213,531	212,814	218,094	218,094	220,340	220,630	221,242
Other	293,742	261,706	257,993	235,088	257,315	257,315	239,641	260,103	286,594
Pref. Sec. of Trust Sub. and Sub. Debentures	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Pref. Stock of Subsidiaries	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Stockholders' Equity	929,665	949,051	997,981	1,036,248	1,046,300	1,046,300	1,052,666	1,061,187	1,067,400
Total Liabilities and Equity	8,517,943	8,568,786	8,683,986	8,763,237	8,876,503	8,876,503	9,027,984	9,002,844	9,027,707

Capital Structure (Excluding ARPI deposits

repos, and advances)									
Long-Term and Short-term Debt	$1,145,769	$1,136,597	$1,139,015	$1,113,346	$1,106,270	$1,106,270	$1,189,265	$1,063,464	$1,063,790
Trust Preferreds	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Preferred Stock of Subs	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406	34,406
Common Stock Equity	929,665	949,051	997,981	1,036,248	1,046,300	1,046,300	1,052,666	1,061,187	1,067,400
	$2,309,840	$2,320,054	$2,371,402	$2,384,000	$2,386,976	$2,386,976	$2,476,337	$2,359,057	$2,365,596
% Weighting of Capital Structure									
Long-Term and Short-Term Debt	49.6%	49.0%	48.0%	46.7%	46.3%	46.3%	48.0%	45.1%	45.0%
Trust Preferreds	8.7%	8.6%	8.4%	8.4%	8.4%	8.4%	8.1%	8.5%	8.5%
Preferred Stock of Subs	1.5%	1.5%	1.5%	1.4%	1.4%	1.4%	1.4%	1.5%	1.5%
Common Stock Equity	40.2%	40.9%	42.1%	43.5%	43.8%	43.8%	42.5%	45.0%	45.1%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Common Shares Outstanding (000's)	35,600	36,063	36,345	36,572	36,809	36,809	37,060	37,419	37,690

Hawaiian Electric Industries, Inc.
Consolidated Statements of Income
$$$ in thousands -- Fiscal year ends 12/31

	4Q02	2002	1Q03	2Q03	3Q03	4Q03E	2003E	1Q04E	2Q04E	3Q04E	4Q04E	2004E	2005E
Revenues:													
Electric Utility	$ 337,533	$ 1,257,176	$ 328,912	$ 354,529	$ 359,250	$ 354,400	$ 1,397,091	$ 328,745	$ 346,362	$ 359,952	$ 351,813	$ 1,386,873	$ 1,420,932
Bank	98,622	399,255	95,102	92,703	93,770	94,294	375,869	95,003	96,744	98,519	100,328	390,593	399,728
Other	(452)	(2,730)	622	1,524	683	500	3,329	500	500	500	500	2,000	6,000
Total Revenues	435,703	1,653,701	424,636	448,756	453,703	449,194	1,776,289	424,248	443,606	458,971	452,641	1,779,466	1,826,660
Expenses:													
Electric Utility	292,723	1,062,220	287,937	311,944	312,614	309,263	1,221,758	286,047	299,563	308,477	302,065	1,196,153	1,229,941
Bank	76,845	306,372	72,676	70,342	68,654	70,820	282,492	71,940	73,082	74,247	75,434	294,703	292,265
Other	6,670	18,676	4,935	5,017	4,200	4,500	18,652	4,000	4,000	4,000	4,000	16,000	20,000
Total Expenses	376,238	1,387,268	365,548	387,303	385,468	384,583	1,522,902	361,987	376,646	386,724	381,499	1,506,856	1,542,206
Operating Income:													
Electric Utility	44,810	194,956	40,975	42,585	46,636	45,136	175,334	42,699	46,799	51,475	49,748	190,720	190,991
Bank	21,777	92,883	22,426	22,361	25,116	23,474	93,377	23,063	23,662	24,272	24,894	95,890	107,463
Other	(7,122)	(21,406)	(4,313)	(3,493)	(3,517)	(4,000)	(15,323)	(3,500)	(3,500)	(3,500)	(3,500)	(14,000)	(14,000)
Total Operating Income	59,465	266,433	59,088	61,453	68,235	64,612	253,388	62,261	66,961	72,247	71,142	272,610	284,454
Interest Expense-other than bank	(17,674)	(72,292)	(17,980)	(17,879)	(19,233)	(19,719)	(74,811)	(19,819)	(19,919)	(20,019)	(20,119)	(79,876)	(71,200)
Preferred Stock Dividends of Subsidiaries	(502)	(2,006)	(502)	(501)	(501)	(500)	(2,004)	(500)	(500)	(500)	(500)	(2,000)	(2,000)
Pref. Security Distributions of Trust Sub.	(4,009)	(16,035)	(4,009)	(4,009)	(2,090)	(2,090)	(12,198)	(2,090)	(2,090)	(2,090)	(2,090)	(8,360)	(16,036)
AFUDC - Debt	463	1,855	443	446	498	450	1,835	450	450	450	450	1,800	1,800
AFUDC - Equity	977	3,954	988	989	1,098	1,000	4,075	1,000	1,000	1,000	1,000	4,000	4,000
Pre-Tax Income	38,720	181,909	38,026	40,499	48,005	43,753	170,285	41,302	45,902	51,088	49,883	188,174	201,018
Income Taxes	12,345	63,692	13,701	14,739	17,483	16,188	62,111	15,282	16,984	18,903	18,457	69,624	72,367
Income from Continuing Operations	26,375	118,217	24,327	25,760	30,522	27,564	108,173	26,020	28,918	32,185	31,426	118,550	128,652
Discontinued Operations, Net of Tax	0	0	0	(3,870)	0	0	(3,870)					0	0
Net Income	26,375	118,217	24,327	21,890	30,522	27,564	104,303	26,020	28,918	32,185	31,426	118,550	128,652
Applicable Shares	36,869	36,477	37,086	37,377	37,516	37,750	37,432	37,984	38,218	38,452	38,686	38,335	39,271
Earnings Per Share:													
Cont. Operations Bf. Non-Recurring Items	$0.72	$3.24	$0.66	$0.69	$0.81	$0.73	$2.89	$0.69	$0.76	$0.84	$0.81	$3.09	$3.28
Non-Recurring Items													
Discontinued Operations	0.00	0.00	0.00	(0.10)	0.00	0.00	(0.10)	0.00	0.00	0.00	0.00	0.00	0.00
GAAP EPS	$0.72	$3.24	$0.66	$0.59	$0.81	$0.73	$2.79	$0.69	$0.76	$0.84	$0.81	$3.09	$3.28
Dividends Per Share	$0.62	$2.48	$0.62	$0.62	$0.62	$0.62	$2.48	$0.62	$0.62	$0.62	$0.62	$2.48	$2.48
Dividend Payout Ratio of GAAP EPS	86.7%	76.5%	94.5%	105.9%	76.2%	84.9%	89.0%	90.5%	81.9%	74.1%	76.3%	80.2%	75.7%
EPS by Segment (cont. operations)													
Electric Utility	$0.55	$2.47	$0.48	$0.50	$0.54	$0.53	$2.02	$0.48	$0.54	$0.61	$0.58	$2.22	$2.30
Bank	$0.36	$1.54	$0.36	$0.36	$0.41	$0.38	$1.51	$0.37	$0.38	$0.38	$0.39	$1.52	$1.68
Other (operating income)	($0.19)	($0.59)	($0.09)	($0.09)	($0.09)								
Unallocated Parent Company	($0.01)	($0.19)	($0.10)	($0.07)	($0.04)								
Total	$0.72	$3.24	$0.66	$0.69	$0.81	$0.73	$2.89	$0.69	$0.76	$0.84	$0.81	$3.09	$3.28

Results for 2002 have been restated to reflect adoption of SFAS No. 123

Goldman Sachs

Hawaiian Electric Industries (HE)
Termination of Coverage: Hawaiian Electric Industries

Analyst Comment

06:19 AM - October 5, 2004

Stock rating: In-Line

Coverage view: Neutral

Mid-Cap Value

Price: US$26.68

United States

Stock data	
52-week range	US$26.82-21.88
Yield	4.6%

Price performance	1M	3M	12M
Absolute	3%	2%	21%
Rel to S&P 500	1%	1%	11%

Capitalization	
Market cap	US$ 2.1bn
Latest net debt/(cash)	-
Free float	-
Shares outstanding	80mn

Forecasts/valuation	2004E	2005E
EPS*	US$1.58	US$1.60
P/E	17.0x	16.7x
Long term EPS growth	4.0%	

* May differ from US GAAP

We have terminated coverage of Hawaiian Electric Industries (HE) to better focus our resources. We currently rate the stock In-Line within our Neutral coverage view. Despite our mostly upbeat view toward HE's fundamentals and its attractive 4.6% dividend yield, we believe there is limited upside at 16.7X our 2005 EPS estimate of $1.60/share. Coverage has been terminated with immediate effect and in ten business days, On October 18th, previously published research will no longer be available on Goldman Sachs' websites.

Full details

I, Jonathan Raleigh, hereby certify that all of the views expressed in this report accurately reflect my personal views about the subject company or companies and its or their securities. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

Jonathan Raleigh
jonathan.raleigh@gs.com
New York: 1-212-357-6334

Charles Balancia
charles.balancia@gs.com
New York: 1-212-902-2349

Goldman Sachs
Global Investment Research

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Distribution of ratings/investment banking relationships
Goldman Sachs Investment Research global coverage universe

	Rating Distribution			Investment Banking Relationships		
	OP/Buy	IL/Hold	U/Sell	OP/Buy	IL/Hold	U/Sell
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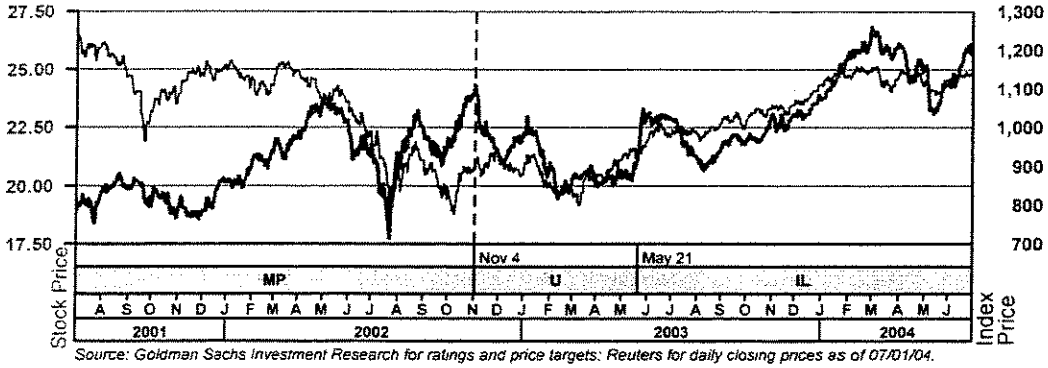
Hawaiian Electric Industries (HE) Currency: U.S. Dollar

Goldman Sachs rating and stock price target history



Source: Goldman Sachs Investment Research for ratings and price targets; Reuters for daily closing prices as of 07/01/04.

- Rating
- Price target
- Price target at removal
- S&P 500; pricing by FactSet
- Covered by Jonathan Raleigh
- Not covered by current analyst
- New rating system as of 11/4/02

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In-Line (IL). We expect this stock to perform in line with the median total return for the analyst's coverage universe over the next 12

months.
Underperform (U). We expect this stock to underperform the median total return for the analyst's coverage universe over the next 12 months.

Other definitions
Coverage View. The coverage view represents each analyst or analyst team's investment outlook on his/her/their coverage group(s). The

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Goldman Sachs

Hawaiian Electric Industries (HE)

HE (IL/N): Revising '04 EPS to $3.15; Valuation Is High, Though Dividend is Safe

Analyst Comment

8:51 PM – January 20, 2004

Stock rating: In-Line

Coverage view: Neutral

Small-Cap Value

Price: US$48.65

United States

Stock data	
52-week range	US$48.98–38.90
Yield	5.1%

Price performance	1M	3M	12M
Absolute	5%	11%	9%
Rel to S&P 500	-1%	3%	-16%

Capitalization	
Market cap	US$ 1.8bn
Latest net debt/(cash)	-
Free float	-
Shares outstanding	38mn

Forecasts/valuation	2004E	2005E
EPS*	US$3.15	-
GSCOPE EPS*	-	-
GSCOPE P/E	-	-

* May differ from US GAAP

We are raising our '04 EPS estimate to $3.15 from $2.95. We are also introducing an '05 EPS estimate of $3.20. Despite the decline in HE's interest rate spread to 3.06% in '03 (versus 3.24% in '02) at American Savings Bank, expansion in key new areas (commercial loans and core deposits) supported solid year-end results ($1.50 '03 EPS). In '04, we expect relatively flat results with a modest increase in the interest rate spread to 3.10%. HE's utility subsidiary appears poised for continued strong sales growth of at least 2.2% in

$17 million assessment (currently recorded as a tax deposit asset), as well as the related bank franchise taxes and interest for subsequent periods. HE's cash balance at the end of the 3Q was $234 million, and consequently we do not believe that an adverse court decision would be significantly detrimental to HE's current cash position.

Full details

2003 EPS RESULTS BOOSTED BY ONE–TIME GAINS: HE reported 2003 EPS of $3.01, excluding one–time nonrecurring gains totaling $0.15. One–time after–tax gains included $5.8 million related to the settlement of lawsuits and $2.7 million in securities gains from HE's available for sale portfolio. These gains were offset by a $1.9 million charge for the Keahole settlement and a $0.8 million charge related to the assessment for the notice of violation at Maui Electric. ASB earnings were relatively flat ($1.50 '03 EPS vs $1.54 '02 EPS) despite a declining in the interest rate spread to 3.06%. Declining interest income as ASB was offset by a $16.7 million decline in the provision for loan losses, a $4.1 million gain for securities sold, and $4.6 million in lower interest expenses as a result of refinancing certain advances from the Federal Home Loan Bank. The Utility subsidiary reported strong 4.4% kWh sales growth that was offset by $14.6 mn (after tax) pension expenses.

'04 UTILITY OUTLOOK: SALES GROWTH OFFSET BY PENSION EXPENSES Looking ahead, to '04, we believe HECO's 2.2% sales growth forecast is achievable, based on better tourism, as well as construction and real estate growth. Importantly, the tourism industry (estimated 25% of Hawaii's total gross state product) has stabilized following weakness in visitor arrivals in '01 and early '02. Despite a modest 0.6% decline in visitor arrivals in '03, the number of visitor days per guest increased 3.8%, which had a positive impact on kWh sales. Based on current economic data, HE's '04 forecast is a 6% increase in visitor arrivals and a 5.1% increase in visitor days per guest. Another significant potential contributor to '04 kWh sales growth could be real estate expansion in Hawaii that has been driven by historically low interest rates. Construction spending increased 7% in '03 and the company is forecasting additional 17% growth in '04.

HECO RATE CASE FILING DELAYED UNTIL 2005 HECO received PUC approval to extend its rate case filing for 12 months. HECO's current allowed ROE is 11.4%, which falls between the allowed returns for HECO's 2 wholly owned subsidiaries: Maui Electric Co. (MECO) = 10.94% and Hawaii Electric Light Co. (HELCO) = 11.5%. In '03, HECO reported a regulatory ROE of 8.62% (versus 11.33% ROE in '02), which primarily reflects the negative impact of a $14.6 mn (after tax) year–over– year increase in pension expenses. Unless the PUC decides to lower the

forcing ASB to pay $17 million for the taxes assessed plus interest for the period from 1999 to 2001 (recorded as a tax deposit asset). ASB filed an appeal with the Hawaii Tax Appeal Court and a new trial is scheduled for July 2004.

I, Jonathan Raleigh, hereby certify that all of the views expressed in this report accurately reflect my personal views about the subject company or companies and its or their securities. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

APPENDIX 1: Disclosures

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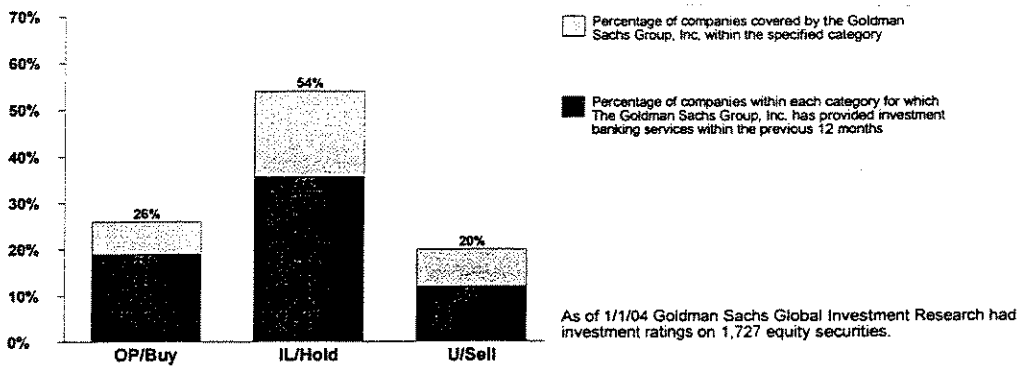

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Ratings and other definitions/identifiers

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RL = Recommended List. Expected to provide price gains of at least 10 percentage points greater than the market over the next 6–18 months.

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TB = Trading Buy. Expected to provide price gains of at least 20 percentage points sometime in the next 6–9 months.

MO = Market Outperformer. Expected to provide price gains of at least 5–10 percentage points greater than the market over the next 6–18 months.

MP = Market Performer. Expected to provide price gains similar to the market over the next 6–18 months.

MU = Market Underperformer. Expected to provide price gains of at least 5 percentage points less than the market over the next 6–18 months.

HE: US$ 48.65

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RESEARCH NOTE
November 16, 2004

David M. Schanzer (215) 665-6261
dschanzer@jmsonline.com
Joseph G. Witthohn, CFA (215) 665-6593
jwitthohn@jmsonline.com

Heike M. Doerr (215) 665-4448
hdoerr@jmsonline.com

Hawaiian Electric Industries (HE $28.88)
Executing Its Strategy

EARNINGS PER SHARE (December)	OLD	NEW	P/E RATIOS
2003A	$1.57		18.4x
2004E	$1.72		16.8x
2005E	$1.68		17.2x

	2003A	2004E	2005E
F1Q	$0.33	$0.40A	$0.41
F2Q	$0.34	$0.44A	$0.45
F3Q	$0.41	$0.51A	$0.42
F4Q	$0.49	$0.37	$0.40

Yield: 4.4%
Dividend: $1.24

Market Cap: $2.3 Billion
Rating: HOLD

3-Yr Growth Rate: 5%
Price Target: $28

Note: Important disclosures can be found on pages 2 and 3.

INVESTMENT CONCLUSION: During our recent meeting, the management of Hawaiian Electric showed confidence in its business model and some hope that the significant Oahu rate case will receive a fair trial now that it has been filed. The electric utility is focused on expanding generation, while encouraging consumers to conserve electricity in order to cut down on the extent of such expansion. The recently filed Oahu rate case will be integral to recovering capital investments and future earnings growth. The transformation to a full-service community bank continues at American Savings Bank, as the company expands its commercial loan portfolio. A benefit to both businesses, the Hawaiian economy is robust; visitor arrivals have returned to pre 9/11 levels, government and military spending is increasing, and strength in the real estate market remains. Despite these strengths, we believe investors should stay on the sidelines, given the stock's full valuation, and we reiterate our HOLD rating. Current shareholders should be pleased by the generous yield.

KEY POINTS:

- **Favorable Environment in Hawaii.** The economy in Hawaii is moving full-steam ahead. Tourism data points suggest that domestic arrivals are reaching levels comparable to 2000 and international arrivals are also improving. The military presence remains strong and the United States Senate recently approved $368 million to be spent on military construction in Hawaii. As many may recall, military personnel account for almost 13% of the company's kilowatt-hours sold. Indicators including building permits, inflation, unemployment, and inflation all point to a healthy economy on the islands.
- **Oahu Rate Case.** Hawaiian Electric recently requested a $74.2 million (7.3%) increase to rate base, requesting an allowed ROE of 11.3%. Additionally, the company has asked that $24 million (which has been a surcharge on customers bills), be included in base rates. The company has not been before the Commission for a rate increase since 1995. Hawaiian Electric does not expect to receive a

management, asking customers to conserve energy. Hawaiian Electric has plans to expand the East Oahu plant, add generation on Oahu, and get the remaining turbines at the Keahole facility running. At the same time, the company has plans to build a dispatch center, which will manage the energy distribution system efficiency.

- **American Savings Bank Update.** We are encouraged by the company's efforts to increase the commercial loan portfolio in order to improve the company's interest rate risk profile. We understand that the process to become a full service community bank will take years to complete. American Savings Bank's asset quality is strong, largely a result of its low risk residential mortgage loans.
- **No Planned Dividend Increases.** Management stated that it would not raise the common stock dividend until the payout ratio reached 65%. Year-to-date the company has had a payout ratio closer to 70% (based on continuing operations adjusted for bank franchise tax). Using our current 2005 estimate of $1.68, we expect the company's payout ratio to be around 74% and do not expect the Board of Directors will issue a dividend increase until 2006, at the earliest.
- **No Changes to Our Estimates.** We believe our estimates of $1.72 and $1.68 per share, for 2004 and 2005 respectively, remain appropriate at this time. The company has given no forward guidance. Our 2005 estimate assumes no rate relief.

VALUATION SUMMARY: HOLD-rated Hawaiian Electric Industries should continue to see price/earnings multiples in the high end of the multiple range for its peers, which currently trade at 14 to 16 times 2005 earnings, thanks to its relatively high common stock dividend. The price of Hawaiian Electric stock continues to be bid up to levels where the yield stays in and around the upper decile of peers. Since we view further upward price movement as unlikely unless the truly unlikely move to lower interest rates occurs, the total return for the next 12 months resides essentially in the 4.4% yield. As previously indicated, our target price could see some erosion should regulatory decisions over the next twelve months revert back to the unbalanced practices of previous regulatory commissions.

Risks to our price target include the timing and extent of changes to interest rates; increasing competition in the electric utility and banking industries; changes in regulatory environment; the effects of international, national, and local economies including the state of the Hawaii tourist industry and the military presence in Hawaii; and faster than expected loan prepayments.

COMPANY DESCRIPTION: *Hawaiian Electric Industries supplies electric service to the majority of Hawaii's population. The company also operates American Savings Bank, a growing thrift located solely in Hawaii with approximately 16% market share.*

EARNINGS MODELS AVAILABLE ON REQUEST

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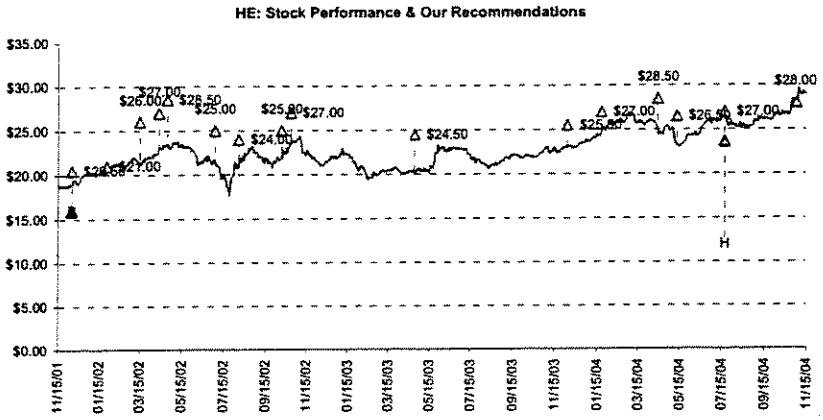
BUY	Expected appreciation to our target price exceeds 15%.
HOLD	Current price reflects the mid-point of a likely price range of plus or minus 15%
SELL	Target price shows the risk of a decline of more than 15%



B - Buy A - Accumulate H - Hold S - Sell NR - Not Rated
TPR - Target Price Removed

Time Period: 11/15/01 - 11/15/04

Rating Changes

Date	Rating	Closing Pric
12/05/01	Buy	18.92
07/20/04	Hold	26.65

Price Target Changes

Date	Price Target	Closing Pric
12/05/01	20.50	18.92
01/25/02	21.00	20.40
03/14/02	26.00	21.27
04/11/02	27.00	22.80
04/23/02	28.50	23.45
07/02/02	25.00	21.44
08/06/02	24.00	21.31
10/08/02	25.00	22.14
10/22/02	27.00	23.40
04/23/03	24.50	20.10
12/03/03	25.50	23.00
01/21/04	27.00	24.69
04/13/04	28.50	24.67
05/11/04	26.50	23.31
07/20/04	27.00	26.65
11/01/04	28.00	28.29

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BUY	HOLD	SELL
42%	54%	4%

***As a percent of total coverage. See ratings definition above.**

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BUY	HOLD	SELL
25%	19%	0%

***Percentages of each rating category where JMS has performed Investment Banking services over the past 12 months.**

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RESEARCH NOTE
November 1, 2004

David M. Schanzer (215) 665-6261
dschanzer@jmsonline.com
Joseph G. Witthohn, CFA (215) 665-6593
jwitthohn@jmsonline.com
Heike M. Doerr (215) 665-4448
hdoerr@jmsonline.com

Hawaiian Electric Industries (HE-$28.04)
Recent Considerations

EARNINGS PER SHARE (December)	OLD	NEW	P/E RATIOS
2003A	$1.57		17.9x
2004E	$1.64	$1.72	17.1x
2005E	$1.68		16.7x

	2003A	2004E	2005E
F1Q	$0.33	$0.40A	$0.41
F2Q	$0.34	$0.44A	$0.45
F3Q	$0.41	$0.51A	$0.42
F4Q	$0.49	$0.37	$0.40

Yield: 4.4% **Market Cap: $2.3 Billion** **3-Yr Growth Rate: 5%**
Dividend: $1.24 **Rating: HOLD** **Price Target: $28 (raised)**

Note: Important disclosures can be found on pages 2 and 3.

INVESTMENT CONCLUSION: Recent results have not altered our overall assessment of Hawaiian Electric at this time, although we have raised our 2004 earnings per share estimate to reflect the strong third quarter. While we continue to perceive ongoing value in this common stock, we believe that the current high valuation and the vagaries of ratemaking, which the company soon faces, are reasons enough to be somewhat cautious at this time. Despite a stronger than expected third quarter, we are maintaining our HOLD rating, while noting that income investors are likely to be attracted to the generous and safe yield.

KEY POINTS:

- Hawaiian Electric reported strong earnings of $0.51 per share in the third quarter compared to our (and the consensus) estimate of $0.41 per share. The improvement largely stemmed from the utility operations; however, the bank realized year-over-year improvements as well.
- At the utility, kilowatt-hour sales increased 3.6% compared to last year's third quarter, due to increased humidity. Fuel and purchased power costs as a percentage of total revenue decreased to 54.1% from 57.4%. O&M expenses were kept in-line, growing only 1% on a year-over-year basis due to a $1.9 million decrease in retirement benefit expenses. The company also benefited from lower interest expenses, which were $1.3 million less than last year. All in all, net income increased almost 30% compared to the third quarter last year.
- We have increased our price target to $28 from $27 to reflect the marginally higher price/earnings multiples common to Hawaiian Electric's peers.
- The company's most significant hurdle yet to be faced is a rate case for its largest service territory on the populous island of Oahu.

VALUATION SUMMARY: HOLD-rated Hawaiian Electric Industries should continue to see price/earnings multiples in the high end of the multiple range for its peers, which currently trade at 15 to 17 times 2005 earnings, thanks to its relatively high common stock dividend. The price of Hawaiian Electric stock continues to be bid up to levels where the yield stays in and around the upper decile of peers. Since we view further upward price movement as unlikely, unless the truly unlikely move to lower interest rates occurs, the total return for the next 12 months resides essentially in the 4.4% yield. As previously indicated, our target price could see some erosion should regulatory decisions over the next twelve months revert back to the unbalanced practices of previous regulatory commissions.

Risks to our price target include, the timing and extent of changes to interest rates; increasing competition in the electric utility and banking industries; changes in regulatory environment; the effects of international, national, and local economies including the state of the Hawaii tourist industry and the military presence in Hawaii; and faster than expected loan prepayments.

COMPANY DESCRIPTION: *Hawaiian Electric Industries supplies electric service to the majority of Hawaii's population. The company also operates American Savings Bank, a growing thrift located solely in Hawaii with approximately 16% market share.*

EARNINGS MODELS AVAILABLE ON REQUEST

DISCLOSURES:

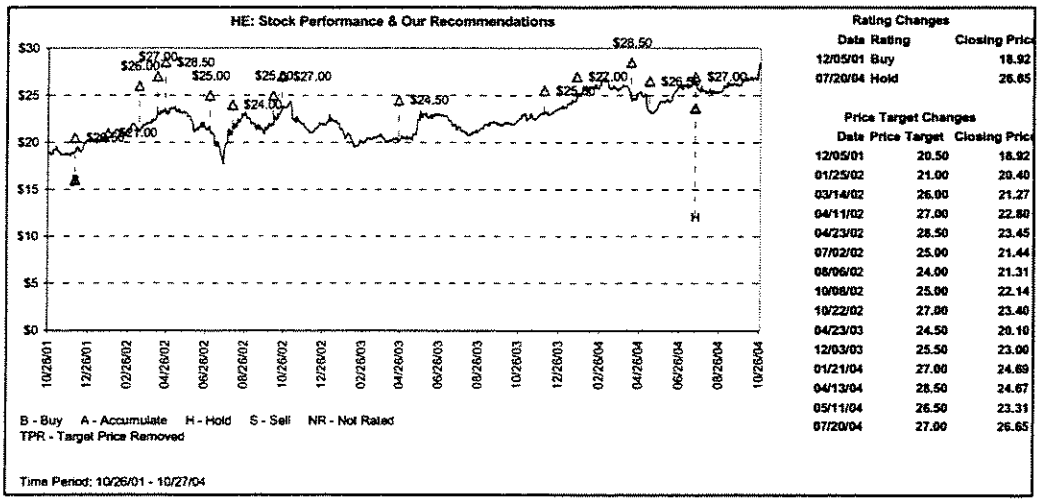
I, David M. Schanzer, hereby certify that all of the views expressed in this research report accurately reflect my personal views about any and all of the subject securities or issuers. No part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views I expressed in this research report.

Janney Montgomery Scott LLC ("JMS") may seek compensation for investment banking services from Hawaiian Electric (HE) in the next 3 months.

Analysts are compensated based on, in part, Janney Montgomery Scott LLC's profitability, which includes its investment banking revenues.

Ratings on stocks are predicted on 12-month target prices based on our estimates of forward earnings and expected valuations. Dividends may be factored into valuation.

BUY	Expected appreciation to our target price exceeds 15%.
HOLD	Current price reflects the mid-point of a likely price range of plus or minus 15%
SELL	Target price shows the risk of a decline of more than 15%



Rating Changes

Date	Rating	Closing Price
12/05/01	Buy	18.92
07/20/04	Hold	26.65

Price Target Changes

Date	Price Target	Closing Price
12/05/01	20.50	18.92
01/25/02	21.00	20.40
03/14/02	26.00	21.27
04/11/02	27.00	22.80
04/23/02	28.50	23.45
07/02/02	25.00	21.44
08/06/02	24.00	21.31
10/08/02	25.00	22.14
10/22/02	27.00	23.40
04/23/03	24.50	20.10
12/03/03	25.50	23.00
01/21/04	27.00	24.69
04/13/04	28.50	24.67
05/11/04	26.50	23.31
07/20/04	27.00	26.65

Janney Montgomery Scott Ratings Distribution*

BUY	HOLD	SELL
42%	54%	4%

***As a percent of total coverage. See ratings definition above.**

Janney Montgomery Scott Ratings of Investment Banking Relationships*

BUY	HOLD	SELL
25%	19%	0%

***Percentages of each rating category where JMS has performed Investment Banking services over the past 12 months.**

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RESEARCH NOTE
July 20, 2004

David M. Schanzer (215) 665-6261
dschanzer@jmsonline.com
Joseph G. Witthohn, CFA (215) 665-6593
jwitthohn@jmsonline.com
Heike M. Doerr (215) 665-4448
hdoerr@jmsonline.com

Hawaiian Electric Industries (HE-$26.50)
Strong Results, Positive Trends, But A Full Valuation
Lower Rating to HOLD

EARNINGS PER SHARE (December)	OLD	NEW	P/E RATIOS
2003A	$1.57		15.2x
2004E	$1.61	$1.64	14.4x
2005E	$1.68		13.8x

	2003A	2004E	2005E
F1Q	$0.33	$0.40A	$0.41
F2Q	$0.34	$0.44A	$0.45
F3Q	$0.41	$0.41	$0.42
F4Q	$0.49	$0.39	$0.40

Yield: 4.7% **Market Cap: $2.1 Billion** **3-Yr Growth Rate: 5%**
Dividend: $1.24 **Rating: HOLD (lowered)** **Price Target: $27**

Note: Important disclosures can be found on pages 2 and 3.

INVESTMENT CONCLUSION: In addition to paying one of the highest common stock dividends among the lower risk electric utility group, Hawaiian Electric Industries has performed admirably with strong quarterly results and can look forward to positive economic trends. The company's improving profile has not gone unnoticed in today's market, however, and we believe a price plateau has been reached based on valuation. Consequently we are lowering our rating to HOLD from Buy, despite the positives and our increase in our 2004 earnings per share estimate to $1.64 from $1.61. Income investors should remain attracted to the company's almost 5% yield.

KEY POINTS:

- Ongoing quarterly earnings reached $0.44 compared with our estimate of $0.41, and we have adjusted our full year estimate for the incremental improvement. Actual reported earnings were $0.14 per share due to a one-time tax adjustment, which the company has to account for. Management is seeking to reverse this tax ruling before the Hawaii Supreme Court.
- For the first two months of the quarter, tourism from Japan increased over 40%, and tourism traffic from the mainland has risen by over 8% during the same period.
- The Oahu real estate market remains consistently strong, and the U.S. military has continued to expand its presence on that island.
- The total impact of these and other positive economic currents will continue to be felt in the months ahead, and have already resulted in a nearly 3% increase in quantity electric sales during the most recent quarter.
- The cost side of the company's businesses has been addressed as well, with almost $3 million in lower costs when compared with the same quarter last year, due to lower pension-related expenses and lower fixed income charges.

- A recent visit to the islands did not alter our long term positive outlook for the company's businesses; however two observations that could have some impact ultimately on tourism can be made:
  - Traffic has become an untenable problem in population areas, not only on major arteries, but on city streets as well. There are just too many cars for the size of the islands with its limited amount of roads. This may limit repeat visits to some of the islands.
  - The company has an opportunity to further develop air-conditioning load, as there is a need for it in the months where trade winds are not at their strongest, and the current build-out of air conditioning infrastructure at the commercial level can be improved.

VALUATION SUMMARY: HOLD-rated Hawaiian Electric Industries should continue to see price/earnings multiples in the high end of the multiple range for its peers. The price of Hawaiian Electric stock has been bid up to that level already, and as a consequence we have lowered our rating to HOLD from Buy. Our target price could see some erosion should regulatory decisions over the next twelve months revert back to the practices of previous regulatory commissions. This target price reflects a total return expectation of about 6.6%, buttressed by the generous yield of almost 5%.

COMPANY DESCRIPTION: *Hawaiian Electric Industries supplies electric service to the majority of Hawaii's population. The company also operates American Savings Bank, a growing thrift located solely in Hawaii with approximately 16% market share.*

EARNINGS MODELS AVAILABLE ON REQUEST

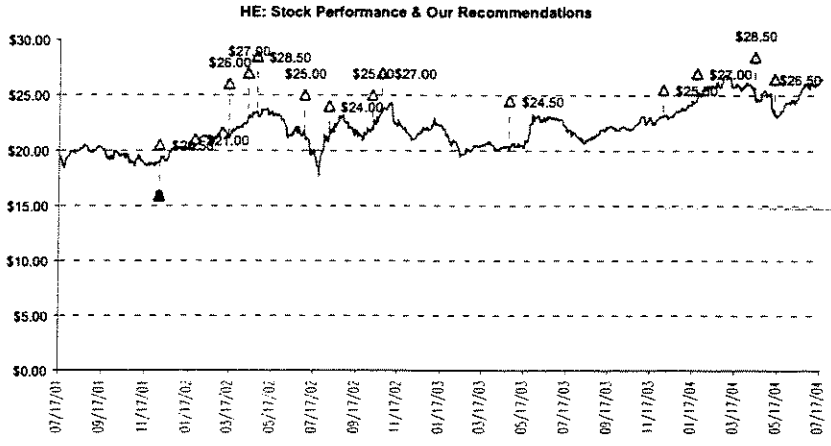
DISCLOSURES:

I, Dave Schanzer, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject company and its underlying securities. I further certify that I have not and will not be receiving direct or indirect compensation in exchange for expressing the specific recommendation in this research report.

Janney Montgomery Scott LLC ("JMS") or an affiliate expects to receive or intends to seek compensation for investment banking services from Hawaiian Electric Industries (HE) in the next 3 months.

Ratings on stocks are predicted on 12-month target prices based on our estimates of forward earnings and expected valuations. Dividends may be factored into valuation.

BUY	Expected appreciation to our target price exceeds 15%.
HOLD	Current price reflects the mid-point of a likely price range of plus or minus 15%
SELL	Target price shows the risk of a decline of more than 15%



Rating Changes

Date	Rating	Closing Price
12/05/01	Buy	18.92

Price Target Changes

Date	Price Target	Closing Price
12/05/01	20.50	18.92
01/25/02	21.00	20.40
03/14/02	26.00	21.27
04/11/02	27.00	22.80
04/23/02	28.50	23.45
07/02/02	25.00	21.44
08/06/02	24.00	21.31
10/08/02	25.00	22.14
10/22/02	27.00	23.40
04/23/03	24.50	20.10
12/03/03	25.50	23.00
01/21/04	27.00	24.69
04/13/04	28.50	24.67
05/11/04	26.50	23.31

B - Buy A - Accumulate H - Hold S - Sell NR - Not Rated
TPR - Target Price Removed

Time Period: 07/17/01 - 07/19/04

Janney Montgomery Scott Ratings Distribution*

BUY	HOLD	SELL
43%	53%	4%

***As a percent of total coverage. See ratings definition above.**

Janney Montgomery Scott Ratings of Investment Banking Relationships*

BUY	HOLD	SELL
13%	11%	0%

***Percentages of each rating category where JMS has performed Investment Banking services over the past 12 months.**

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Janney Since 1832 | Janney Montgomery Scott LLC

RESEARCH NOTE
May 11, 2004

David M. Schanzer (215) 665-6261
dschanzer@jmsonline.com
Heike M. Doerr (215) 665-4448
hdoerr@jmsonline.com

Hawaiian Electric Industries (HE-$46.52)
Oahu Electric Rate Case Looms As An important Milestone

EARNINGS PER SHARE (December)	OLD	NEW	P/E RATIOS
2003A	$3.07		15.2x
2004E	$3.22		14.4x
2005E	$3.36		13.8x

	2003A	2004E	2005E
F1Q	$0.66	$0.80A	$0.82
F2Q	$0.69	$0.82	$0.90
F3Q	$0.81	$0.83	$0.84
F4Q	$0.91	$0.77	$0.80

Yield: 5.3% | **Market Cap: $1.8 Billion** | **3-Yr Growth Rate: 5%**
Dividend: $2.48 | **Rating: BUY** | **Price Target: $53 (lowering)**

Note: Important disclosures can be found on pages 2 and 3.

INVESTMENT CONCLUSION: The company's presentation in New York yesterday supported our contention of a solid foundation heading into the all-important Oahu electric rate increase later this year. While we reiterating our BUY recommendation and maintaining our earnings estimates for 2004 and 2005, we are lowering our price target to $53 from $57 to better reflect the tenuous environment a higher yielding utility such as Hawaiian Electric faces, as the market mirrors its belief in interest rate increases. From our perspective, such companies as Hawaiian Electric will command slightly lower multiples if high payout ratios exist, but these companies will continue to outperform peers, since retail investors and others value their high current yield.

KEY POINTS:

- The company plans to file an unspecified electric rate increase in the fall, which will be the first to be filed in ten years. Observes may need to "Buy a program" in order to identify a whole new array of commissioners and regulatory personnel, who are truly capable of impacting this company's future for some time to come. One real positive: the test year will be 2005.
- The recent strength in the Japanese Yen and the rebounding Japanese economy has arrived at a time when domestic tourist arrivals are up as well. Coupled with most of the other economic news yesterday, the overall economic news appears brighter than it has been for some time.
- The Oahu real estate market remains strong despite the beginnings of higher interest rates, this mainly due to a lack of supply on the island. Real construction spending is estimated to be up 17% in 2004 with potential benefit for both the bank and the utility.
- An expanded military on the islands should bring new spending of over $4 billion nearer term. Additionally, the addition of an aircraft carrier group at the end of the decade remains a possibility.
- Although utility sales growth was about 4% in the first quarter of 2004, the company's sales forecast for the next five years is 2.3%.
- The company has new capital investment projects with major underground transmission lines to be built by 2008 on Oahu, which will serve 56% of customers on the island. Hawaiian Electric is also planning to build its first generating facility since 1992, with scheduled completion at the end of the decade.

- The state of Hawaii has mandated that "renewables" comprise 10% of capacity by 2010 and 20% by 2020. The company is already at 8%.

VALUATION SUMMARY: BUY-rated Hawaiian Electric Industries should continue to see price/earnings multiples in the high end of the multiple range for its peers. Once the future of interest rates is better understood, a multiple premium remains a probability if the perceived forward curve does not indicate a gloomy outlook; however, we think multiples will see some erosion nonetheless. Our target price reflects a total return expectation of about 19% buttressed by the generous yield of over 5%.

COMPANY DESCRIPTION: *Hawaiian Electric Industries supplies electric service to the majority of Hawaii's population. The company also operates American Savings Bank, a growing thrift located solely in Hawaii with approximately 16% market share.*

EARNINGS MODELS AVAILABLE ON REQUEST

DISCLOSURES:

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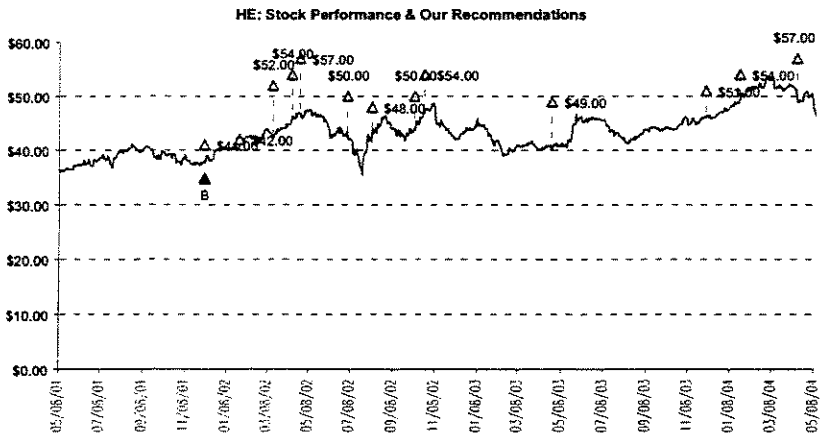
Janney Montgomery Scott LLC ("JMS") or an affiliate expects to receive or intends to seek compensation for investment banking services from Hawaiian Electric Industries (HE) in the next 3 months.

Ratings on stocks are predicted on 12-month target prices based on our estimates of forward earnings and expected valuations. Dividends may be factored into valuation.

BUY	Expected appreciation to our target price exceeds 15%.
HOLD	Current price reflects the mid-point of a likely price range of plus or minus 15%
SELL	Target price shows the risk of a decline of more than 15%



Rating Changes

Date	Rating	Closing Price
12/05/01	Buy	37.84

Price Target Changes

Date	Price Target	Closing Price
12/05/01	41.00	37.84
01/25/02	42.00	40.79
03/14/02	52.00	42.55
04/11/02	54.00	45.59
04/23/02	57.00	46.90
07/02/02	50.00	42.88
08/06/02	48.00	42.61
10/08/02	50.00	44.26
10/22/02	54.00	46.79
04/23/03	49.00	40.20
12/03/03	51.00	45.99
01/21/04	54.00	49.39
04/13/04	57.00	49.35

B - Buy A - Accumulate H - Hold S - Sell NR - Not Rated
TPR - Target Price Removed

Time Period: 05/08/01 - 05/10/04

Janney Montgomery Scott Ratings Distribution*

BUY	HOLD	SELL

40%	56%	4%

*As a percent of total coverage. See ratings definition above.

Janney Montgomery Scott Ratings of Investment Banking Relationships*

BUY	HOLD	SELL
17%	10%	0%

*Percentages of each rating category where JMS has performed Investment Banking services over the past 12 months.

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Janney Since 1832 | Janney Montgomery Scott LLC

RESEARCH NOTE
April 21, 2004

David M. Schanzer (215) 665-6261
dschanzer@jmsonline.com
Heike M. Doerr (215) 665-4448
hdoerr@jmsonline.com

Hawaiian Electric Industries (HE-$48.95)
Solid Earnings Report; Stock-Split Announced

EARNINGS PER SHARE (December)	OLD	NEW	P/E RATIOS
2003A	$3.07		15.9x
2004A	$3.20	$3.22	15.2x
2005E	$3.36		14.6x

	2003A	2004E	2005E
F1Q	$0.66	$0.80A	$0.82
F2Q	$0.69	$0.82	$0.90
F3Q	$0.81	$0.83	$0.84
F4Q	$0.91	$0.77	$0.80

Yield: 5.0%
Dividend: $2.48

Market Cap: $1.9 Billion
Rating: BUY

3-Yr Growth Rate: 5%
Price Target: $57

Note: Important disclosures can be found on pages 2 and 3.

INVESTMENT CONCLUSION: First quarter earnings at Hawaiian Electric came in much as expected. Although the company exceeded our estimate, the gain was related to a loan loss provision reversal at American Savings Bank. Earnings at the utility are strengthening, as the company faces lower retirement benefit expenses, an improving economy, and increased tourism. With its favorable dividend policy and lower risk profile, Hawaiian Electric remains a well-regarded company, particularly by retail investors, who value stock splits such as the two-for-one announced by Hawaiian management yesterday. We continue to rate Hawaiian Electric a BUY.

KEY POINTS:

- **First Quarter Results:** Hawaiian Electric reported first quarter results of $0.80 per share, beating both our $0.78 per share estimate and the consensus estimate of $0.73 per share. In the first quarter of 2003, the company earned $0.66 per share.
- **HECO:** Revenues at the utility increased 5.4% on a year-over-year basis, on kilowatt-hour sales that increased 3.9% compared to the same period last year. O&M expenses decreased 2.9%, with a $1.6 million decrease in retirement benefit expenses more than offsetting additional storm-related expenses witnessed in the quarter. On an annual basis, retirement benefit expenses in 2004 will be $6 million less than 2003 due to contributions made in 2003 and improved performance of plan assets, according to the company's Filing 10K.
- **American Savings Bank:** Earnings at the bank increased 18% on a year-over-year basis. Most of this gain stemmed from the reversal of $1.6 million (approximately $0.03 per share) allowance for loan loss. Net interest income, before the inclusion of this loan loss reversal, was almost 2% lower than the same period last year. The bank benefited from lower administrative expenses and continues to see good asset quality.
- **Tourism:** Tourism on the island continues to see improvement. Although arrivals from Japanese tourists remains below levels reached in recent years, domestic travel continues to improve and visitors are staying in the islands longer.
- **Estimates Remain Intact:** We are adjusting our 2004 estimate slightly to reflect the better than expected showing in the first quarter, higher revenue associated with fuel expenses passed on to

customers, and adjustments to interest expenses and shares outstanding. We see no reason to alter our assumptions regarding the company's earnings capabilities. We expect to learn more details about the quarter and economic trends on the island when we meet with management on May 10 in New York City.

- **Stock Split:** Hawaiian Electric also announced a two-for-one stock split. The split will occur on June 10, 2004 for shareholders of record on May 10, 2004. We will not adjust our numbers until the shares are distributed.

VALUATION SUMMARY: Given the company's sustained common stock dividend policy and management's ability to sustain earnings growth – even during economic downturns on the "islands"- we believe our premium valuation of 17 times our 2005 estimate is valid. With a heavy reliance on a better regulatory climate for rate relief in the future and continued economic improvement in the state, BUY-rated Hawaiian Electric Industries is capable of selling at our target price of $57, which produces a total return of over 22% going forward over the next 12 months.

COMPANY DESCRIPTION: *Hawaiian Electric Industries supplies electric service to the majority of Hawaii's population. The company also operates American Savings Bank, a growing thrift located solely in Hawaii with approximately 16% market share.*

EARNINGS MODELS AVAILABLE ON REQUEST

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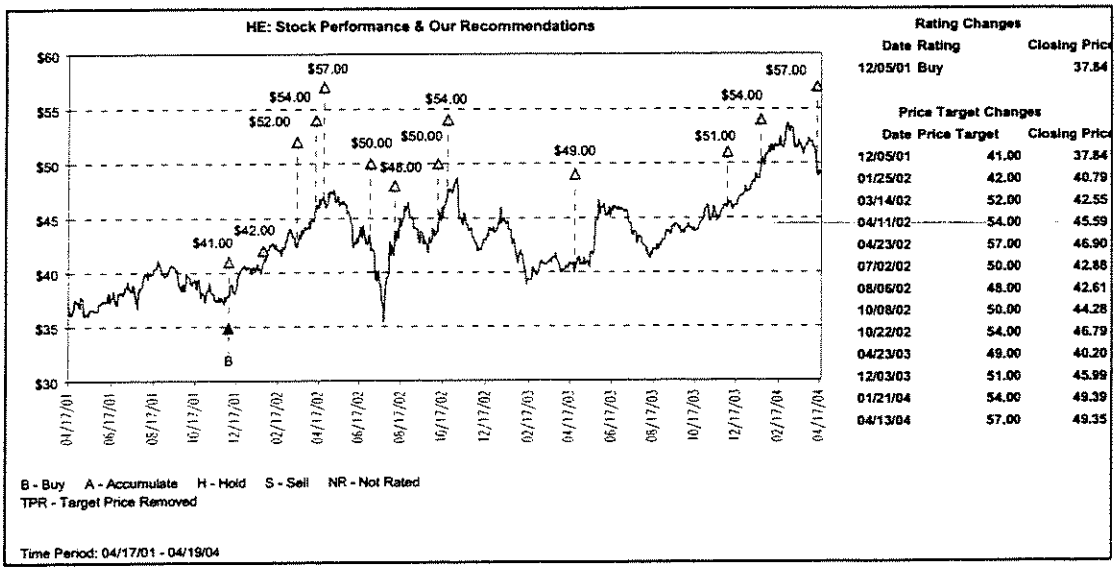
HOLD	Current price reflects the mid-point of a likely price range of plus or minus 15%
SELL	Target price shows the risk of a decline of more than 15%



Rating Changes

Date	Rating	Closing Pric
12/05/01	Buy	37.84

Price Target Changes

Date	Price Target	Closing Pric
12/05/01	41.00	37.84
01/25/02	42.00	40.79
03/14/02	52.00	42.55
04/11/02	54.00	45.59
04/23/02	57.00	46.90
07/02/02	50.00	42.88
08/06/02	48.00	42.61
10/08/02	50.00	44.28
10/22/02	54.00	46.79
04/23/03	49.00	40.20
12/03/03	51.00	45.99
01/21/04	54.00	49.39
04/13/04	57.00	49.35

Janney Montgomery Scott Ratings Distribution*

BUY	HOLD	SELL
40%	56%	4%

***As a percent of total coverage. See ratings definition above.**

Janney Montgomery Scott Ratings of Investment Banking Relationships*

BUY	HOLD	SELL
17%	10%	0%

***Percentages of each rating category where JMS has performed Investment Banking services over the past 12 months.**

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RESEARCH NOTE
March 19, 2004

David M. Schanzer (215) 665-6261
dschanzer@jmsonline.com
Heike M. Doerr (215) 665-4448
hdoerr@jmsonline.com

Hawaiian Electric Industries (HE - $51.72)
Re-supplied And Ready To Go

EARNINGS PER SHARE (December)	OLD	NEW	P/E RATIOS
2003A	$3.07		16.8x
2004E	$3.26	$3.20	16.2x
2005E	$3.36		15.4x

	2003A	2004E	2005E
F1Q	$0.66	$0.78	$0.82
F2Q	$0.69	$0.82	$0.90
F3Q	$0.81	$0.83	$0.84
F4Q	$0.91	$0.77	$0.80

Yield: 4.8% **Market Cap: $2.0 Billion** **3-Yr Growth Rate: 5%**
Dividend: $2.48 **Rating: BUY** **Price Target: $57 (raised)**

Note: Important disclosures can be found on page 2.

INVESTMENT CONCLUSION: After a significant infusion of new capital this month, the company appears poised to resume its moderate growth, which has consistently been a part of our thesis. Much depends on this year's Oahu rate case. BUY-rated Hawaiian Electric's main non-regulated subsidiary, American Savings Bank, remains an integral part of the company's capacity to grow earnings and provide shareholders with a growing income stream. Dividends have experienced a stronger focus in U.S. equity markets in recent months, and few companies provide the generous yield and lower risk profile as does Hawaiian Electric Industries. Our raised target price of $57, up from $54, is a result of our positive outlook.

KEY POINTS:

- We have initiated a 2005 earnings estimate of $3.36 per share, which reflects a full year of rate relief on Oahu and continued strong performance from the bank. Our full year earnings estimate for 2004 has been lowered to $2.20 per share from $2.26 per share, in part due to the addition of new common shares and other "fine-tuning."
- The company expects to save $4.4 million and gain $0.02 per share in earnings as a result of the trust preferred stock refinancing.
- As a part of Hawaiian Electric's ongoing capitalization program, it issued $150 million of common stock and sold a new $50 million trust preferred issue to replace one, which had a higher dividend rate. These financing are in line with rating agency expectations.

VALUATION SUMMARY: Given the company's sustained common stock dividend policy and management's ability to sustain earnings growth – even during economic downturns on the "islands" - we

COMPANY DESCRIPTION: *Hawaiian Electric Industries supplies electric service to the majority of Hawaii's population. The company also operates American Savings Bank, a growing thrift located solely in Hawaii with approximately 16% market share.*

EARNINGS MODELS AVAILABLE ON REQUEST

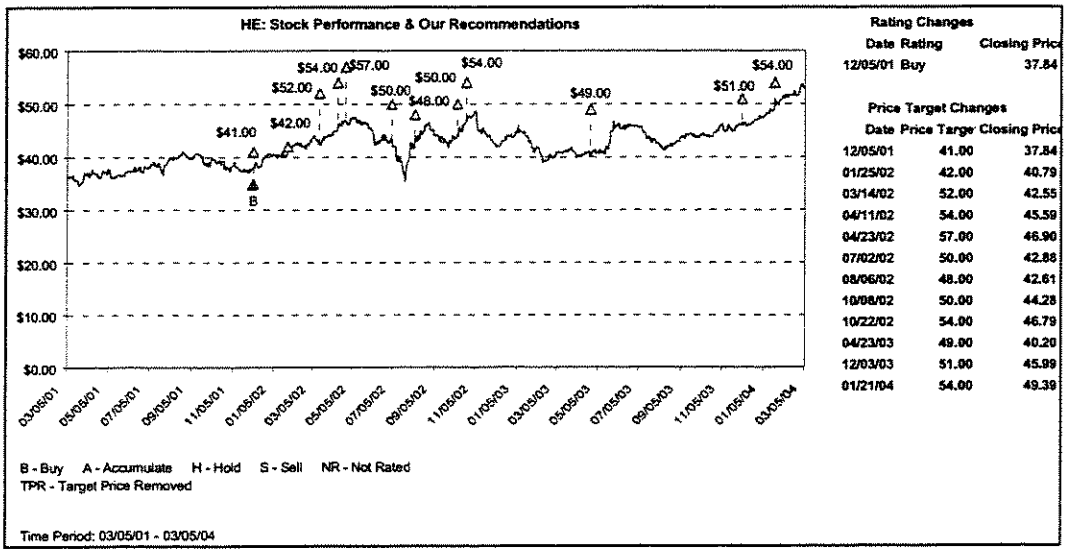
IMPORTANT DISCLOSURES:

I, Dave Schanzer, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject company and its underlying securities. I further certify that I have not and will not be receiving direct or indirect compensation in exchange for expressing the specific recommendation in this research report.

Janney Montgomery Scott LLC ("JMS") or an affiliate expects to receive or intends to seek compensation for investment banking services from Hawaiian Electric Industries (HE) in the next 3 months.

Ratings on stocks are predicted on 12-month target prices based on our estimates of forward earnings and expected valuations. Dividends may be factored into valuation.

BUY	Expected appreciation to our target price exceeds 15%.
HOLD	Current price reflects the mid-point of a likely price range of plus or minus 15%
SELL	Target price shows the risk of a decline of more than 15%



Rating Changes

Date	Rating	Closing Price
12/05/01	Buy	37.84

Price Target Changes

Date	Price Target	Closing Price
12/05/01	41.00	37.84
01/25/02	42.00	40.79
03/14/02	52.00	42.55
04/11/02	54.00	45.59
04/23/02	57.00	46.90
07/02/02	50.00	42.88
08/06/02	48.00	42.61
10/08/02	50.00	44.28
10/22/02	54.00	46.79
04/23/03	49.00	40.20
12/03/03	51.00	45.99
01/21/04	54.00	49.39

Janney Montgomery Scott Ratings Distribution*

BUY	HOLD	SELL
37%	63%	4%

***As a percent of total coverage. See ratings definition above.**

Janney Montgomery Scott Ratings of Investment Banking Relationships*

BUY	HOLD	SELL
12%	6%	0%

***Percentages of each rating category where JMS has performed Investment Banking services over the past 12 months.**

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Symbol(s) HE & Services Date
Use Page Up Page Down, ↑, ↓, or press ↵

	2004	FY	NA	NA	NA	NA	NA	NA
	2003	FY(A)	NA	NA	NA	NA	NA	NA

		-Abs P/E on- Cur	Nxt	-Rel P/E on- Cur	Nxt	EV/NxtFY EBITDA	LT EPS Growth
EPS*	FY	15.4X	NA	0.8X	NA	NA	4%
	CY	NA	NA	NA	NA	NA	NA
GSCOPE EPS*	FY	NA	NA	NA	NA	NA	NA
	CY	NA	NA	NA	NA	NA	NA

* may differ from U.S. GAAP

* FULL VALUATION ON P/E, MORE REASONABLY PRICED ON CASH FLOW AND DIVIDEND BASIS: HE is currently trading at a sharp premium to our 31-stock index, 15.6X '04 EPS versus a 13.6X average for our 31-stock index. However, on an EV/EBITDA basis, HE trades at 6.9X, below the 7.6X average for our index. HE's low risk profile and high dividend yield of 5% (versus a 4.2% index average), offers reasonable downside protection at current levels, even though further upside seems limited. Investors looking for small cap utility exposure should do much better in higher risk names such as AYE and RRI. In-Line rated small caps that have much better valuations than HE include PNM and EAS.

* ASB: MOVEMENT IN INTEREST RATES WILL IMPACT '04 EPS. ASB, traditionally a savings and loan business, is in the 3rd year of expansion in its commercial lending and fee based businesses. The interest rate spread, a key determinant of ASB's performance, came in at 3.06% in '03 versus 3.24% in the same period last year. This compression reflects lower interest rates and high mortgage refinancing volume. Consequently, HE finds itself in an unusual position where a moderate increase in interest rates would likely be beneficial to the bank's earnings. ASB forecasted its interest rate sensitivity in its 3Q 10Q filing, defining a flat to modestly positive impact (+.4%) on net interest income if interest rates increase for up to 100 basis points. ASB estimates that any change in interest rates below current levels or above 100 basis points would negatively impact results. We are forecasting a 3.10% net interest spread in '04 which results in relatively flat earnings at ASB in '04. We estimate that a 5 basis point swing in net interest spreads is worth approximately $0.05 per share.

* WHAT TO WATCH FOR: REIT TAX DISPUTE. A new trial is scheduled in July '04 for ASB's appeal with the Hawaii Tax Appeal Court in its REIT tax dispute

Since HE was assessed by The State of Hawaii Department of Transportation for $17 million in May '03, HE has benefited from approximately $9 million in REIT earnings (over the period 1/1/02 to 9/30/03). The going forward benefit is estimated to be approximately $1 million per quarter. If ASB does not prevail on its appeal, it may be required to write off the original $17 million assessment (currently recorded as a tax deposit asset), as well as the related bank franchise taxes and interest for subsequent periods. HE's cash balance at the end of the 3Q was $234 million, and consequently we do not believe that an adverse court decision would be

==========

2003 EPS RESULTS BOOSTED BY ONE-TIME GAINS: HE reported 2003 EPS of $3.01, excluding one-time nonrecurring gains totaling $0.15. One-time after-tax gains included $5.8 million related to the settlement of lawsuits and $2.7 million in securities gains from HE's available for sale portfolio. These gains were offset by a $1.9 million charge for the Keahole settlement and a $0.8 million charge related to the assessment for the notice of violation at Maui Electric. ASB earnings were relatively flat ($1.50 '03 EPS vs $1.54 '02 EPS) despite a declining in the interest rate spread to 3.06%. Declining interest income as ASB was offset by a $16.7 million decline in the provision for loan losses, a $4.1 million gain for securities sold, and $4.6 million in lower interest expenses as a result of refinancing certain advances from the Federal Home Loan Bank. The Utility subsidiary reported strong 4.4% kWh sales growth that was offset by $14.6 mn (after tax) pension expenses.

'04 UTILITY OUTLOOK: SALES GROWTH OFFSET BY PENSION EXPENSES Looking ahead, to '04, we believe HECO's 2.2% sales growth forecast is achievable, based on better tourism, as well as construction and real estate growth. Importantly, the tourism industry (estimated 25% of Hawaii's total gross state product) has stabilized following weakness in visitor arrivals in '01 and early '02. Despite a modest 0.6% decline in visitor arrivals in '03, the number of visitor days per guest increased 3.8%, which had a positive impact on kWh sales. Based on current economic data, HE's '04 forecast is a 6% increase in visitor arrivals and a 5.1% increase in visitor days per guest. Another significant potential contributor to '04 kWh sales growth could be real estate expansion in Hawaii that has been driven by historically low interest rates. Construction spending increased 7% in '03 and the company is forecasting additional 17% growth in '04.

HECO RATE CASE FILING DELAYED UNTIL 2005 HECO received PUC approval to extend its rate case filing for 12 months. HECO's current allowed ROE is 11.4%, which falls between the allowed returns for HECO's 2 wholly owned subsidiaries: Maui Electric Co. (MECO) = 10.94% and Hawaii Electric Light Co. (HELCO) = 11.5%. In '03, HECO reported a regulatory ROE of 8.62% (versus 11.33% ROE in '02), which primarily reflects the negative impact of a $14.6 mn (after tax) year-over- year increase in pension expenses. Unless the PUC decides to lower the allowed ROE below 11.4%, we belive there is limited ROE risk given that HE earned slightly below its allowed ROE in '02 and well below its allowed ROE in '03, with only modest improvement likely in '04. HE will file a notice of intent with the PUC in July '04 and testimony will follow in the fall. HE does not expect an interim decision until 3Q '05 at the earliest (depends on when testimony is actually filed , at which time, the interim rate would be effective. Any difference in the final order would be refunded.

RENEWABLE ENERGY GROWTH A KEY INITIATIVE AT THE UTILITY HECO has outlined an important new focus on renewable energy supply options that will spearheaded by a HECO subsidiary known as Renewable Hawaii. Renewable Hawaii was formed in response to a growing number of distributed generation projects, and in particular combined heat and power (CHP) projects, being

proposed and installed in Hawaii. Hotels are expected to be the primary customers for these projects. Customer load is usually greater than the output provided by CHP systems, resulting in continued connection to the utility grid to make up the difference in demand. The offering of CHP systems will be subject to PUC review and approval. The PUC opened an investigative docket on Oct. 21, 2003 to develop policies and a framework for DG projects that are deployed in Hawaii. In the interim, Renewable Hawaii has authorization to invest up to $10 mm and has been accepting RFP's.

BACKGROUND ON HE'S REIT TAX DISPUTE HE's REIT tax dispute relates to an ASB subsidiary, ASB Realty Corporation, created in 1998. The State of Hawaii Department of Taxation challenged ASB's position of taking a state dividends received deduction in the bank franchise tax returns. In a May '03 ruling, the State Board of Review ruled against ASB's appeal, forcing ASB to pay $17 million for the taxes assessed plus interest for the period from 1999 to 2001 (recorded as a tax deposit asset). ASB filed an appeal with the Hawaii Tax Appeal Court and a new trial is scheduled for July 2004.

I, Jonathan Raleigh, hereby certify that all of the views expressed in this report accurately reflect my personal views about the subject company or companies and its or their securities. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

APPENDIX 1: Disclosures

GOLDMAN SACHS GLOBAL RATING DISTRIBUTION

	OP/BUY	IL/HOLD	U/SELL
Global	26%	54%	20%

GOLDMAN SACHS INVESTMENT BANKING RELATIONSHIPS

	OP/BUY	IL/HOLD	U/SELL
Global	73%	66%	60%

(continued...)

========== Further Information ==========

United States
Electric Utilities

Merrill Lynch

Comment

Hawaiian Electric

Earnings Review

Third Quarter 2004. *Reported* $0.51 vs. $0.41. *Operating* $0.46 vs. $0.42.

Adjustments: **2004** $0.05 gain on sale of CDOs. **2003** $0.01 penalty payment for opacity violation.

Twelve Months Ended September 2004. *Reported* $1.55 vs. $1.39. *Operating* $1.73 vs. $1.45.

Adjustments: **2004** as above and $0.05 net gain on lawsuit settlements; $0.02 reversal of opacity penalty; $0.30 REIT tax lawsuit loss. **2003** as above and $0.05 loss on discontinued operations.

Table 1: Q3 Segment EPS

	2004	2003
Utility	$ 0.32	$ 0.27
Banks	$ 0.19	$ 0.20
Corporate	$ (0.06)	$ (0.07)
Total	**$ 0.46**	**$ 0.42**

Source: HEI and ML estimates

Segment Earnings Review

HE reported Q3 operating earnings of $0.46 vs. $0.42 and our estimate of $0.43. Q3 operating earnings excludes a $0.05/sh gain on the sale of collateralized debt obligations

■ American Savings Bank

American Savings Bank EPS fell to $0.19 from $0.20. Although net income from the bank was slightly higher than last year, share dilution cut the EPS. As asset quality has increased, ASB was able to reverse $3.8M of loan loss provisions, leading to savings of $0.03/sh. Despite a flattening yield curve, ASB managed to widen the yield spread of its loan portfolio to 3.09% from 3.01% largely through lower interest expense on deposits. Fee income fell as a result of securities sales in 2003, and operating costs were about flat with last year.

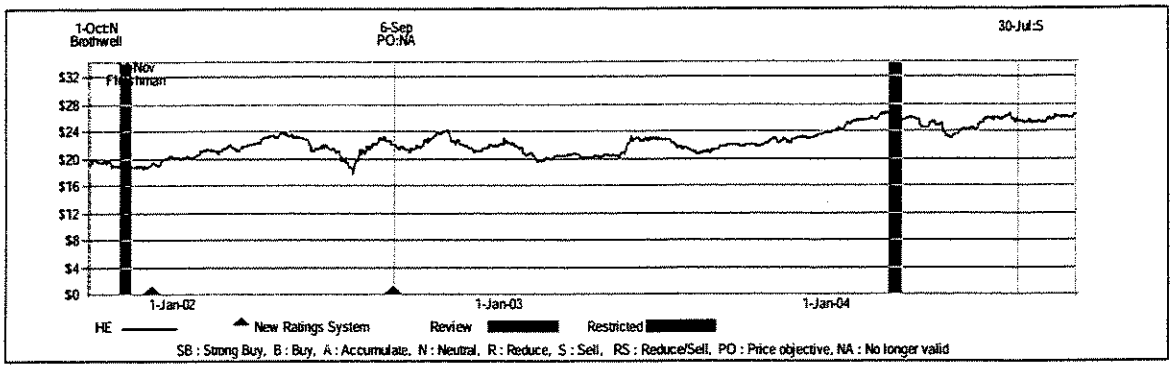
Earnings Estimates and Outlook

We are maintaining our 2004E EPS of $1.65/sh and our 2005E EPS of $1.60. Although the economic strength of the Hawaiian economy has favorably impacted HE's earnings, we believe that the flattening yield curve, the potential absence of loan loss reversals and a return to more normal weather will pressure earnings next year. Longer term, rate cases filed for its Oahu and Maui utility operations could affect earnings after 2005.

We are reaffirming our Sell rating on HE given its high valuation levels. Its 2005 earnings multiple of 17.6x is nearly a 25% premium to the sector, well above levels we believe are sustainable. Its 4.4% dividend yield is above the sector average, but we see more attractive and higher-

Important Disclosures

HE Price Chart



Prior to 8 Dec. 2001, the Investment Opinion System included: Buy, Accumulate, Neutral, Reduce and Sell. From 8 Dec. 2001 to 6 Sep. 2002, the Investment Opinion System included: Strong Buy, Buy, Neutral, and Reduce/Sell. On 8 Dec. 2001 Buy ratings became Strong Buy, Accumulate became Buy, and Reduce and Sell became Reduce/Sell. On 6 Sep. 2002, Strong Buy and Buy ratings became Buy, and Reduce/Sell became Sell. Any exceptions to these rating revisions are reflected in the chart. All price objectives for Neutral and Sell rated securities established before 6 Sep. 2002 were eliminated as of that date. The current Investment Opinion System is contained at the end of the report. Dark Grey shading indicates security is restricted with the opinion suspended. Light Grey shading indicates security is under review with the opinion withdrawn.

Investment Rating Distribution: Utilities Group (as of 30 September 2004)					
Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	29	26.85%	Buy	13	44.83%
Neutral	71	65.74%	Neutral	34	47.89%
Sell	8	7.41%	Sell	2	25.00%

Investment Rating Distribution: Global Group (as of 30 September 2004)					
Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	1095	44.05%	Buy	374	34.16%
Neutral	1207	48.55%	Neutral	333	27.59%
Sell	184	7.40%	Sell	37	20.11%

* Companies in respect of which MLPF&S or an affiliate has received compensation for investment banking services within the past 12 months.

FUNDAMENTAL EQUITY OPINION KEY: Opinions include a Volatility Risk Rating, an Investment Rating and an Income Rating. VOLATILITY RISK RATINGS, indicators of potential price fluctuation, are: A - Low, B - Medium, and C - High. INVESTMENT RATINGS, indicators of expected total return (price appreciation plus yield) within the 12-month period from the date of the initial rating, are: 1 - Buy (10% or more for Low and Medium Volatility Risk Securities - 20% or more for High Volatility Risk securities); 2 - Neutral (0-10% for Low and Medium Volatility Risk securities - 0-20% for High Volatility Risk securities); 3 - Sell (negative return); and 6 - No Rating. INCOME RATINGS, indicators of potential cash dividends, are: 7 - same/higher (dividend considered to be secure); 8 - same/lower (dividend not considered to be secure); and 9 - pays no cash dividend.

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The analyst(s) responsible for covering the securities in this report receive compensation based upon, among other factors, the overall profitability of Merrill Lynch, including profits derived from investment banking revenues

Additional information pursuant to Section 34b of the German Securities Trading Act: Merrill Lynch and/or its affiliates was an underwriter in an offering of securities of the issuer in the last five years: Hawaiian Elec.

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Merrill Lynch

Comment

United States
Electric Utilities

30 July 2004

Steven I. Fleishman
(1) 212 449-0926

Alex Kania
(1) 212 449-7908

Hawaiian Electric Industries Inc.

Sell on Valuation **SELL**

Reason for Report: Rating Downgrade to Sell

Volatility Risk: LOW

Price: **$26.05**

Estimates (Dec)	2003A	2004E	2005E
EPS:	$1.50	$1.65	$1.60
P/E:	17.4x	15.8x	16.3x
GAAP EPS:	$1.52	$1.65	$1.60
GAAP P/E:	17.1x	15.8x	16.3x
EPS Change (YoY):		10.0%	-3.0%
Consensus EPS: (First Call: 21-Jul-2004)		$1.59	$1.63
Cash Flow/Share:	$3.60	$3.48	$3.49
Price/Cash Flow:	7.2x	7.5x	7.5x
Dividend Rate:	$1.24	$1.24	$1.24
Dividend Yield:	4.8%	4.8%	4.8%

Opinion & Financial Data

Investment Opinion:	A-2-7 to A-3-7
Mkt. Value / Shares Outstanding (mn):	$1,953.8 / 75
Book Value/Share (Mar-2004):	$15.19
Price/Book Ratio:	1.7x
ROE 2004E Average:	10.9%
Total Debt / Capital:	47.4%
Est. 5 Year EPS Growth:	2.5%
Est. 5 Year Dividend Growth:	0.0%

Stock Data

52-Week Range:	$26.88-$20.63
Symbol / Exchange:	HE / New York Stock Exchange
Institutional Ownership-Vickers:	31.8%
Brokers Covering (First Call):	6

Highlights:

- Q2 operating earnings were $0.44 vs. $0.35, above our estimate of $0.34, due to warmer weather, utility growth, and loan loss reversals at the bank segment. We are increasing our 2004E/2005E to $1.65/$1.60 to reflect the strong first half. However, normal weather and tightening interest rate spreads could pressure future results.
- Despite the strong quarter, we are lowering our rating on HE to Sell from Neutral. At 16.3x our 2005E, we believe HE is trading at an unsustainable premium valuation to both its utility peers (13.1x 2005) and bank/S&L peers (12-13x 2005).
- Despite the initial Fed tightening, HE shares are up 10% this year, ahead of both the utility and bank indices. We believe the main driver has been continued yield-buying, particularly as long-term interest rates have stayed relatively low.
- We view HE's interest rate risk as a double-edged sword at this juncture. If the yield curve continues to flatten (S-T rates rise, while L-T rates fall), there could be increased pressure on ASB's profits. On the other hand, if L-T rates move up with S-T rates, then we believe higher-yielding "bond proxy" utility stocks like HE could come under selling pressure.
- ASB has indicated that its interest rate risk is limited if the yield curve moves in tandem. However, a flattening curve could pressure this business.
- We continue to believe that HE's dividend is secure and that the Hawaiian economy is on a solid improving trend. Utility rate cases in the next couple of years could provide some ratebase growth.
- Our Sell rating is driven by valuation. Using a P/E versus other utilities as well as a SOTP analysis, we believe theoretical fair value is in the $22-$23 area, 14% below current levels.

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Refer to important disclosures on pages 5 to 6. Analyst Certification on page 3.

Too Expensive

HE is a unique company in the utility sector given that 40% of its earnings come from a savings and loan business, American Savings Bank (ASB). HE has managed the mix of the utility and S&L successfully over time. However, the mix of these two interest rate-sensitive businesses can make the company particularly sensitive to changes in the interest rate environment. Despite the beginning of the Fed tightening cycle and the bottoming in long-term interest rates, HE's stock is up 10% YTD, well ahead of both the 2.4% move in the utility index and 1% move in the bank index (an average of the S&P regional bank and thrift indexes). Moreover, many of the higher-yielding utilities like HE have performed even worse than the utility average, such as Ameren (AEE), Consolidated Edison (ED), and Cinergy (CIN).

We view HE's interest rate risk as a double-edged sword at this juncture. If the yield curve continues to flatten (S-T rates rise, while L-T rates fall), there could be increased pressure on ASB's profits. On the other hand, if L-T rates move up with S-T rates, then we believe higher-yielding "bond proxy" utility stocks like HE could come under selling pressure.

Second Quarter Earnings Strong...

On July 19, HE reported Q2 operating earnings of $0.44 vs. $0.35, above our estimate of $0.34/sh. Reported earnings were $0.14 vs. $0.34, which includes a $0.30 charge related to an adverse tax court decision. Warmer weather and increased tourist activity benefited the utility operations, while earnings from ASB were positively impacted by increased mortgage lending and further reversals of loan loss reserves.

As a result of the strong second quarter results, we are increasing our 2004E to $1.65/sh. This assumes more normal weather comparisons with the second half of last year and continued utility growth, offset by increasing pressure on interest rate spreads from rising short-term interest rates, and share dilution. We are also raising our 2005E by $0.05, to $1.60/sh. This year-over-year earnings decrease reflects more normal weather, tighter interest rate spreads and fewer loan loss reversals.

... But Not Enough to Support Valuation

Given the interest rate risk and an increasingly unsupportable valuation, we are downgrading our rating on HE stock to Sell from Neutral. HE currently trades at 16.3x our 2005E of $1.60, a 24% premium valuation to the average utility (13.1x). Moreover, the stock is also trading at a sizable premium to comparable S&Ls and regional banks (12-13x). We do not see any material synergy value to the two businesses and do not believe that the combined company should be trading at such premiums to the average utilities and banks. We have also valued HE on a sum-of-the-parts basis using 7.5x utility EBITDA ($289M) and 2x the tangible book value of ASB ($399M), and we arrive at a theoretical valuation closer to the $22-$23 range. See Table 1 for the calculations. We continue to believe that HE's 4.8% dividend yield remains secure in our opinion and is above the average utility (4%). However, there are a number of other utilities that provide higher yields and more reasonable valuations. Some that we would prefer include Ameren (5.8% yield and 14x P/E) and Cinergy (4.9% yield and 13.3x P/E). See Table 3.

We would also highlight recent insider sales by senior management. Between July 23 and July 27, Chairman and CEO Robert Clarke exercised approximately 100,000 options and subsequently sold 115,000 shares on the market. This represents a sizeable fraction of Mr. Clarke's holdings in HE. A vice president also sold 10,234 shares in recent days.

Utility Business

Hawaiian Electric Company is composed of three utilities serving the islands of Oahu (HECO), Maui (MECO) and Hawaii (HELCO). Combined, the utilities serve 95% of Hawaii's residents. The utilities are all fully regulated and integrated with no move toward deregulation.

Table 1: Hawaiian Electric Industries Sum of the Parts Valuation ($M)

Utility + Holdco		American Savings Bank	
EBITDA - 2004E	289.2	Book Value of Equity	492.3
Assumed Multiple	7.5	Goodwill	93.1
Assumed Enterprise Value	2168.9	Tangible Book Value	399.2
Net Utility & Holdco Debt + Preferred	1199.0		
Implied Equity Value	969.9	Assumed M/B Multiple	2.0
Shares Outstanding	80.3	Market Equity Value	798.3
Utility Value per Share	**$12.07**	**Per Share**	**$9.94**
Total Value of HE			**$22.01**

Sources: ML estimates and company information. Diluted share count is the average of 3 months ended June 30, 2004; balance sheet data is as of March 31, 2004.

(Continued)

Utility earnings came under pressure in 2003 from rising pension expenses. However, pension is expected to reverse in 2004 positively after due to strong plan performance. Other positives include a healthy Hawaiian economy. HE is forecasting Gross State Product to increase by 2.6% in 2004 with construction spending estimated to be up over 17%. Visitor days are expected to be up over 4% in 2004. Aside from the tourism improvement, the economy is benefiting from a significant expansion of US military presence in the state. Offsetting some of these improvements at the utility will be higher depreciation expense, higher insurance costs and a 3% wage increase from the union settlement reached earlier this year.

■ Capacity Additions & Regulation

HELCO is in the process of expanding its generating capacity by 40 Mw by building two combustion turbines. The first turbine is complete and entered limited commercial operation in May. However, the unit will not be able to run fully until noise reduction equipment is installed, which should be done by the end of the year. The second unit is complete and in the testing phase. The total cost of the expansion is approximately $102 million.

The cost of the plants will not be explicitly recovered until HELCO applies for recovery and regulators approve the application. Based on a 49.7% equity capital structure and an allowed ROE of 11.5%, we believe that the capital additions could ultimately result in nearly $6 million of additional net income annually.

HECO is also preparing to file a full rate case for test year 2005 this fall. Currently, HECO has an allowed ROE of 11.4% based on a rate base of just over $1 billion.

American Savings Bank (ASB)

ASB's earnings depend primarily on net interest income - the spread between its interest earning assets and interest bearing liabilities. ASB has successfully managed its asset optimization strategy such that the spread has typically been somewhere around a positive 3% (plus or minus 20 bp). In 2003, the interest rate spread was 3.08% and that remains our assumption for 2004. The interest earning assets are loans and mortgage/asset-backed securities. The liabilities are comprised of deposit liabilities and borrowings, including advances from the Federal Home Loan Bank.

The long-term strategy is to build core franchise value as a full service community bank. ASB is focusing on increasing business banking, growing and diversifying its loan portfolio, and growing its core deposits. Nonetheless, this process is taking time as residential mortgages still represent 78% of loans down from 84% in 2000.

We remain concerned about ASB's risk to interest rate changes. ASB's primary source of revenue is interest from mortgage lending and its primary cost is interest payable on shorter-term deposits. Because of the longer duration of the mortgage loans, changes in interest rates tend to impact the bank's costs earlier than its revenue. In a period of rising overall interest rates, the bank's margins would narrow until the mortgage portfolio adjusts. HE publishes a chart shown below that appears to imply relatively limited earnings sensitivity for large changes in rates (see Table 2). However, a casual review may lead to a false sense of security as this assumes that the yield curve remains constant and interest rates move in parallel. We believe earnings could come under more pressure if the yield curve were to flatten, which has started play out in 2004.

Table 2: Sensitivity of ASB to Parallel Interest Rate Shifts

Change in Interest Rates (bp)	Change in Net Interest Income (%)
+300	-5.8
+200	-3.2
+100	0.9
Base	--
-100	-4.3

Source: Company data

As a result, we believe that ASB could face more earnings pressure. We are estimating an average interest rate spread of 3.15%, which is in-line with the Q4 '03 average (full year 2003 was 3.08%). G&A should continue to increase as management continues to move to a full service bank. In 2003, ASB benefited by $0.11/share from the reversal of loan loss provisions based on a healthier loan portfolio. While the strong economy has allowed for more loan loss reversals, we do not view this as high quality and sustainable earnings.

Finally, ASB could experience some pressure from higher taxes. On June 7, the Hawaii Tax Appeals Court ruled against American Savings Bank's practice of deducting dividends received from their subsidiary real estate business, due to the fact that the subsidiary is run as a real estate investment trust. In the absence of the deduction, HE will incur approximately $2-$4 million, or $0.03-$0.05/sh, in additional tax expense per year going forward. HE has announced plans to appeal the ruling.

Last year, ASB earned an approximate 11% ROE. This is quite low for a regional bank/S&L (see Table 4), which typically earn in the mid-to-high teens to 20% area. We believe ASB must earn higher returns to merit the P/E and book value premiums attributed to it in HE's stock value.

Analyst Certification

I, Steve Fleishman, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

Table 3: Higher Yielding Utility Alternatives

Company	Ticker	Price 7/29/04	Rating	P/E 2004E	P/E 2005E	EV/ '05E EBITDA	Dividend Yield	Dividend Growth	YTD Performance
Hawaiian Electric	HE	$26.05	A-3-7	15.8	16.3	7.9	4.8%	0.0%	10.0%
Ameren	AEE	$44.10	A-1-7	15.5	14.0	6.0	5.8%	0.0%	-4.1%
Cinergy	CIN	$38.00	A-1-7	14.3	13.3	7.8	4.9%	2.5%	-2.1%
Consolidated Edison	ED	$40.65	A-2-7	15.3	14.3	6.3	5.6%	2.0%	-5.5%
Great Plains Energy	GXP	$28.89	B-2-7	12.8	13.1	6.5	5.7%	0.0%	-9.2%
Comp Average				**14.5**	**13.7**	**6.7**	**5.5%**	**1.1%**	**-5.2%**
Integrated Electric Utilities Average				**14.2**	**13.0**	**7.5**	**4.0%**	**2.3%**	**2.4%**

Source: ML estimates

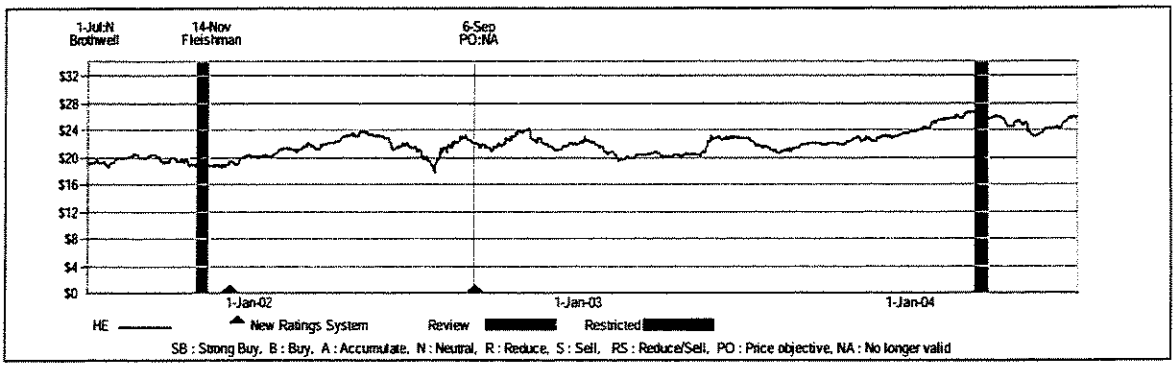
Table 4: Comparable Regional Banks and Thrifts

Company	Ticker	Rating	Price 07/29/04	Cash EPS 2003	Cash EPS 2004E	Cash EPS 2005E	P/E Ratio 2004E	P/E Ratio 2005E	Div. Yield (%)	Price/ '03 Book (x)	Market Cap. ($MM)	Cash ROE 2004E
TCF Financial Corp.	TCB	A-2-7	$60.29	$3.05	$3.75	$4.15	16.1	14.5	2.6	4.4	$4,207	27.4%
Compass Bancshares	CBSS	A-2-7	$44.22	$2.68	$2.90	$3.15	15.2	14.0	2.9	2.8	$5,421	18.4%
Commerce Bancorp	CBH	A-1-7	$50.40	$2.61	$3.25	$4.00	15.5	12.6	1.4	2.9	$3,944	18.4%
Marshall & Ilsley Corp	MI	A-2-7	$38.28	$2.39	$2.70	$3.00	14.2	12.8	2.2	2.5	$8,529	17.8%
Colonial BancGroup	CNB	B-2-7	$19.40	$1.20	$1.31	$1.40	14.8	13.9	3.2	2.0	$2,589	13.5%
M&T Bank Corp.	MTB	B-2-7	$93.45	$5.28	$5.95	$6.70	15.7	13.9	1.8	2.0	$10,964	12.5%
Huntington Bancshares	HBAN	A-2-7	$24.44	$1.52	$1.80	$1.85	13.6	13.2	3	2.4	$5,608	17.5%
AmSouth Bancorp.	ASO	A-3-7	$24.34	$1.77	$1.87	$2.00	13.0	12.2	3.9	2.6	$8,602	19.7%
Zions Bancorporation	ZION	A-1-7	$60.55	$4.08	$4.50	$4.95	13.5	12.2	2.1	2.1	$5,435	15.6%
UnionBanCal Corp.	UB	B-2-7	$57.38	$3.89	$4.40	$4.70	13.0	12.2	2.5	2.1	$8,483	16.2%
Banknorth Group	BNK	B-2-7	$32.03	$2.18	$2.35	$2.60	13.6	12.3	2.4	2.0	$5,527	14.5%
Regions Financial	RF	B-2-7	$29.57	$2.34	$2.40	$2.50	12.3	11.8	5.4	1.8	$8,030	15.0%
North Fork Bancorp.	NFB	A-1-7	$38.87	$2.57	$2.90	$3.50	13.4	11.1	3.1	3.8	$6,688	28.0%
First Horizon National	FHN	A-1-7	$43.60	$3.62	$3.80	$4.20	11.5	10.4	3.6	2.8	$5,431	24.8%
Mid-Cap Bank Median							**13.4**	**12.4**	**2.8**	**2.4**		**17.4%**
10-Yr Mid-Cap Bank Median							**12.1**		**2.9**	**2.2**		**16.3%**
Golden West Financial	GDW	A-2-7	$107.49	$7.14	$8.11	$8.90	13.3	12.1		2.7	$16,700	20.1%
Washington Mutual	WM	B-2-7	$38.85	$4.21	$3.33	$3.96	11.7	9.8		1.7	$33,887	14.5%

Sources: ML estimates and company data

Important Disclosures

HE Price Chart



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Refer to important disclosures on pages 5 to 6.

Investment Rating Distribution: Utilities Group (as of 30 June 2004)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	26	24.07%	Buy	10	38.46%
Neutral	72	66.67%	Neutral	33	45.83%
Sell	10	9.26%	Sell	2	20.00%

Investment Rating Distribution: Global Group (as of 30 June 2004)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	1115	45.03%	Buy	390	34.98%
Neutral	1207	48.75%	Neutral	313	25.93%
Sell	154	6.22%	Sell	27	17.53%

* Companies in respect of which MLPF&S or an affiliate has received compensation for investment banking services within the past 12 months.

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Merrill Lynch

Comment

United States
Electric Utilities

22 January 2004

Steven I. Fleishman
(212) 449-0926

Peter McRae
(212) 449-1170

Hawaiian Electric Industries Inc.

Pension Relief in '04

NEUTRAL

Reason for Report: 2003 Year-end Earnings Review; Raising 2004E; Initiating 2005E.

Volatility Risk: LOW

Price: $49.39

Estimates (Dec)	2003A	2004E	2005E
EPS:	$2.99	$3.00	$3.05
P/E:	16.5x	16.5x	16.2x
GAAP EPS:	$3.05	$3.00	$3.05
GAAP P/E:	16.2x	16.5x	16.2x
EPS Change (YoY):		0.3%	1.7%
Q1 EPS (Mar):	$0.65	NA	
Cash Flow/Share:	$5.91	$6.63	$6.73
Price/Cash Flow:	8.4x	7.4x	7.3x
Dividend Rate:	$2.48	$2.48	$2.48
Dividend Yield:	5.0%	5.0%	5.0%

Opinion & Financial Data

Investment Opinion:	A-2-7
Mkt. Value / Shares Outstanding (mn):	$1,876.8 / 38
Book Value/Share (Sep-2003):	$28.31
Price/Book Ratio:	1.7x
Total Debt / Capital:	45.0%
Est. 5 Year EPS Growth:	2.5%
Est. 5 Year Dividend Growth:	0.0%

Stock Data

52-Week Range:	$49.40-$38.20
Symbol / Exchange:	HE / New York
Institutional Ownership-Vickers:	30.6%

Highlights:

- **Hawaiian Electric reported 2003 operating earnings per share of $2.99 vs. $3.24. This was $0.08 above consensus.**
- **The utility reported 2003 operating earnings per share of $2.18 vs. $2.47. Higher pension and depreciation expenses were partially offset by lower maintenance expense and core growth.**
- **ASB reported 2003 operating earnings per share of $1.43 vs. $1.54. 2003 proved to be a challenging year for the bank as the tough rate environment compressed margins making year-over-year comparisons difficult.**
- **The interest rate spread decreased to 3.08% from 3.24% in 2002. On a positive note, the spread began to improve in Q4; averaging 3.16% vs. 3.12% in Q4 '02.**
- **We are raising our 2004E to $3.00 from $2.85. Pension expense is expected to decrease by $0.12/sh in 2004. We believe that the bank could have another difficult year, as a continuation of the low interest rate environment would make growth difficult.**
- **We are initiating our 2005E at $3.05. A continued improvement in the interest rate spread and core growth at the utility should drive earnings growth.**
- **HE is currently trading at 16.5x our new 2004E. This is a considerable premium to the integrated average of 14.1x. The dividend yield of 5% is above the group average of 3.8%. The high P/E makes stock appreciation unlikely, but the above average dividend yield should provide downside support. We are maintaining our Neutral rating.**

Investors should assume that Merrill Lynch is seeking or will seek investment banking or other business relationships with the companies in this report.

Refer to important disclosures on page 4.
Analyst Certification on page 3.

Merrill Lynch Global Securities Research & Economics Group
Global Fundamental Equity Research Department

Earnings Review

Fourth Quarter 2003. Reported $0.99 vs. $0.72. *Operating* $0.86 vs. 0.72.

Adjustments: **2003** $0.16 gain on settlement of outstanding lawsuits; $0.05 charge relating to Keahole settlement; $0.02 gain on reversal of accrual made for opacity violations.

Twelve Months Ended September 2003. *Reported* $3.05 vs. $3.24. *Operating* $2.99 vs. $3.24.

Adjustments: **2003** as above and $0.04 charge for opacity violations in Q3 and $0.10 loss from discontinued operations in Q2.

Table 1: EPS by Segment

	Q4 2003	Q4 2002	FY2003	FY2002
Utility	0.61	0.56	2.18	2.47
Bank	0.37	0.36	1.43	1.54
Other	(0.12)	(0.20)	(0.62)	(0.77)
Continuing Operations	**0.86**	**0.72**	**2.99**	**3.24**
Discontinued Operations	0.00	0.00	(0.10)	0.00
One-time Items	0.13	0.00	0.16	0.00
GAAP Earnings	**0.99**	**0.72**	**3.05**	**3.24**

Source: Hawaiian Electric, Merrill Lynch

Hawaiian Electric Industries reported 2003 operating earnings per share of $2.99 vs. $3.24. This was $0.19 above our estimate and $0.08 above consensus. An increase in pension (-$0.45) and depreciation expense (-$0.09) along with margin compression (-$0.07) and increased G&A expense at the bank (-$0.15) negatively impacted earnings vs. prior year. These pressures were partially offset by lower interest expense at the bank (+$0.08) and holding company (+$0.05), a lower loan loss provision (+$0.11); higher fee income (+$0.03), and lower maintenance expense at the utility (+$0.03). The remaining amount is attributable to core growth at the

American Savings Bank

ASB reported 2003 operating earnings per share of $1.43 vs. $1.54. 2003 proved to be a challenging year for the bank as the tough rate environment compressed margins making year-over-year comparisons difficult. Margin compression negatively impacted earnings (-$0.07) as the interest rate spread decreased to 3.08% from 3.24% in 2002. On a positive note at the bank, the spread began to improve in Q4; averaging 3.16% vs. 3.12% in Q4 '02. Other negative factors include an increase in G&A expense (-$0.12) and higher pension expense (-$0.06). An increase in fee income (+0.03) and a lower loan loss provision (+0.11) partially offset the higher expenses and lower margins.

Other

2003 operating earnings per share at the holding company was a loss of $0.62 vs. a loss of $0.77. Lower interest expense (+0.05) and the absence of write-offs that occurred in 2002 accounted for the improvement.

Tax Dispute

In 1998, the American Savings Bank formed a subsidiary to reduce its Hawaiian bank franchise tax. The subsidiary, ASB Realty Corporation, elects to be taxed as a real estate investment trust. This tax treatment has reduced ASB's tax by approximately $17M from 1999-2002. The State of Hawaii Department of Taxation challenged the bank's use of this favorable tax treatment. In October 2002, ASB appealed to the State Board of Review, First Taxation District and in May 2003, the Board ruled in favor of the Department of Taxation. In response to the decision and in accordance with Hawaiian law, ASB paid the assessed tax in the amount of $17M. However, ASB continues to believe in its position and plans to argue this point in court in the spring of 2004.

The company is treating the payment as a deposit and has therefore not booked any expense related to this payment.

On November 6, 2003, HELCO entered into a settlement agreement with the KDC and the Hawaii Department of Hawaiian Home Lands (DHHL). On November 12, 2003, the motion to vacate the November 7, 2002 Final Judgement was granted and construction activities resumed.

Construction continues and the first unit is expected to be up in a test state by February 9 with the second unit expected in March. HE booked a loss of $3.1M pre-tax in Q4 '03 relating to legal and other fees required under the settlement agreement.

Opacity Violation Settlement

On September 5, 2003, HE's MECO subsidiary received a notice of violation (NOV) from the Hawaii Department of Health (DOH). The DOH alleged that MECO violated pollution control rules from February 1999 to June 2000. The alleged violations pertain to the opacity percentages of exhaust plumes at two of its Maalaea units. The opacity issue at these units was brought to the attention of the DOH by MECO back in 1998 and corrective actions were taken. Since the end of 2000, a 90% reduction in opacity incidents has been achieved at these two plants.

On December 23, 2003, MECO and the DOH reached a settlement, which is subject to public notice for 30 days. The settlement calls for MECO to come into full opacity compliance by December 31, 2004 and pay a penalty of $800k. In Q4 '03, HE reversed a portion of an accrual booked in Q3 '03 to be in-line with the new settlement. Management expects to be in full compliance by the required date at no significant additional cost.

Earnings

We are raising our 2004E EPS to $3.00 from $2.85. Pension expense is expected to decrease by $4.7M after-tax or $0.12/sh in 2004. (HE benefited from a 25% return on assets in 2003) This calculation is based on a 6.25% discount rate and a 9% return on assets.

Pension expense at the utility is estimated to be $3.8M (+$0.10) lower in 2004. The utility should also benefit from the healthy Hawaiian economy. The company is forecasting Gross State Product to increase by 2.8% in 2004 with construction spending estimated to be up over 17%. Visitor days are expected to be up over 5% in 2004. Offsetting some of these improvements at the utility will be higher depreciation expense, higher insurance costs and a 3% wage increase from the union settlement reached earlier this year.

We believe that the bank could have another difficult year. A continuation of the low interest rate environment would make growth difficult. We are estimating an average interest rate spread of 3.15%, which is in-line with the Q4 '03 average. G&A should continue to increase as management continues to move to a full service bank. In addition, the earnings benefit experienced in 2003 from the decrease in the loan loss provision is not estimated to continue, making year-over-year comps difficult. Offsetting some of these pressures, the bank will benefit from lower pension expense, lower interest expense, and an increase in management fees. A negative outcome in the pending tax dispute could have a material impact on our earnings estimate.

We are initiating our 2005E EPS at $3.05. A continued improvement in the interest rate spread and core growth at the utility should drive earnings growth. We expect HE to file a rate case in 2004 with a 2005 test year for the island of Oahu. Our estimate does not factor in the possible rate case outcome.

Stock Outlook

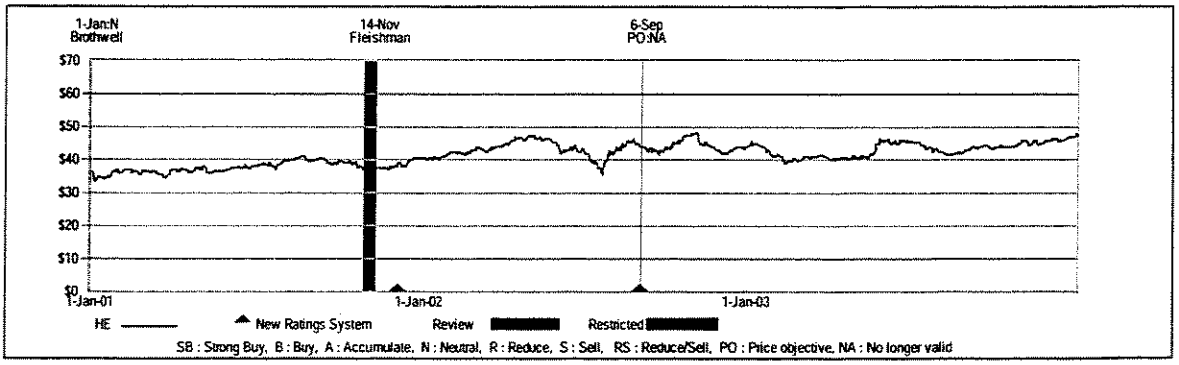
HE is currently trading at 16.4x our new 2004E. This is a considerable premium to the integrated average of 14.1x. The dividend yield of 5% is above the group average of 3.8%. Despite the high payout ratio, we believe the dividend is secure. The high P/E makes stock appreciation unlikely, but the above average dividend yield should provide downside support. We are maintaining our Neutral rating.

Analyst Certification

I, Steven Fleishman, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

Important Disclosures

HE Price Chart



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Investment Rating Distribution: Utilities Group (as of 31 December 2003)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	32	29.09%	Buy	14	43.75%
Neutral	61	55.45%	Neutral	28	45.90%
Sell	17	15.45%	Sell	6	35.29%

Investment Rating Distribution: Global Group (as of 31 December 2003)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	1050	42.53%	Buy	352	33.52%
Neutral	1236	50.06%	Neutral	309	25.00%
Sell	183	7.41%	Sell	31	16.94%

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PiperJaffray.

Company Note
October 26, 2004

Kathleen L. Steinbrecher, CFA, Sr Research Analyst
415 277-1582, kathleen.l.steinbrecher@pjc.com

Hawaiian Electric (HE - $28.25)

Market Perform **Volatility: Low**

Solid Quarter; Raising TP to $26; Maintaining MP Rating

Reason for Report:
Change in Price Target

Changes	Previous	Current
Rating	--	Market Perform
Price Tgt	$23.00	$26.00
FY04E Rev (mil)	$1,897.9	$1,877.3
FY05E Rev (mil)	$1,920.9	$1,945.9
FY04E EPS	$1.61	$1.78
FY05E EPS	$1.63	$1.82

Price:	$28.25
52 Week High:	$28.32
52 Week Low:	$22.23
Price Target:	$26.00
(14x 2005E EPS of $1.82)	
Shares Out (mil):	80.5
Market Cap. (mil):	$2,274.1
Avg Daily Vol (000):	214
Div (ann):	$1.24
Est LT EPS Growth:	2%
P/E to LT EPS Growth (FY05):	7.8x
Est Next Rep Date:	01/25/2005
Fiscal Year End:	Dec

Rev (mil)	2003A	2004E	2005E
Mar	$424.6A	$437.1A	NA
Jun	$448.8A	$461.8A	NA
Sep	$453.8A	$506.8A	NA
Dec	$454.2A	$471.7E	NA
FY	$1,781.4A	$1,877.3E	$1,945.9E
CY	$1,781.4A	$1,877.3E	$1,945.9E
FY RM	1.3x	1.2x	1.2x
CY RM	1.3x	1.2x	1.2x

EPS	2003A	2004E	2005E
Mar	$0.33A	$0.40A	NA
Jun	$0.35A	$0.44A	NA
Sep	$0.41A	$0.51A	NA
Dec	$0.50A	$0.43E	NA
FY	$1.58A	$1.78E	$1.82E
CY	$1.58A	$1.78E	$1.82E
FY P/E	17.9x	15.9x	15.5x
CY P/E	17.9x	15.9x	15.5x

KEY POINTS:

- **Solid economic fundamentals drove earnings above expectations.** HE reported 3Q'04 EPS from continuing operations of $0.51 versus our and consensus estimates of $0.38 and $0.41, respectively.
- **The Hawaii economy continues to be strong,** driven by near-record visitor arrivals, solid real estate and construction markets, and growing military spending.
- **Utility outperformed in the quarter.** Operating income for the utility increased 13.0% from a year ago, to $52.7 million. Kilowatthour sales grew 3.6% from the year-earlier quarter as greater humidity resulted in higher residential usage. Commercial sales increased 2.8%.
- **Modest earnings growth at bank.** Operating earnings at the bank increased 5.6% from the year earlier quarter. Net interest spread was a modest 3.09%, up eight bps from a year earlier. Total non-interest income declined nearly 24% from a year earlier. Recurring deposit and financial services fees were flat, at $12.9 million, while loan servicing income and losses on securities sales were ($0.3) million compared to $3.7 million in the 3Q'03.
- **Credit quality was a positive** and continued to improve, allowing the bank to recapture $3.8 million in loan loss reserves in the quarter.

INVESTMENT RECOMMENDATION:

We are maintaining our Market Perform rating and raising our target price to $26. We continue to assume a 14 multiple, applying it to our higher 2005 EPS estimate of $1.82. The Hawaii economy continues to run on all cylinders. The uemployment rate declined to 2.9%, boosting the local economy, and tourism remains strong, with visitor arrivals nearing record levels. The revenue growth outlook is positive with increases in residential construction, military expenditures and tourism likely to contribute to top line growth. The expense outlook, however, is less clear with rising fuel and interest costs. We are maintaining our Market Perform rating.

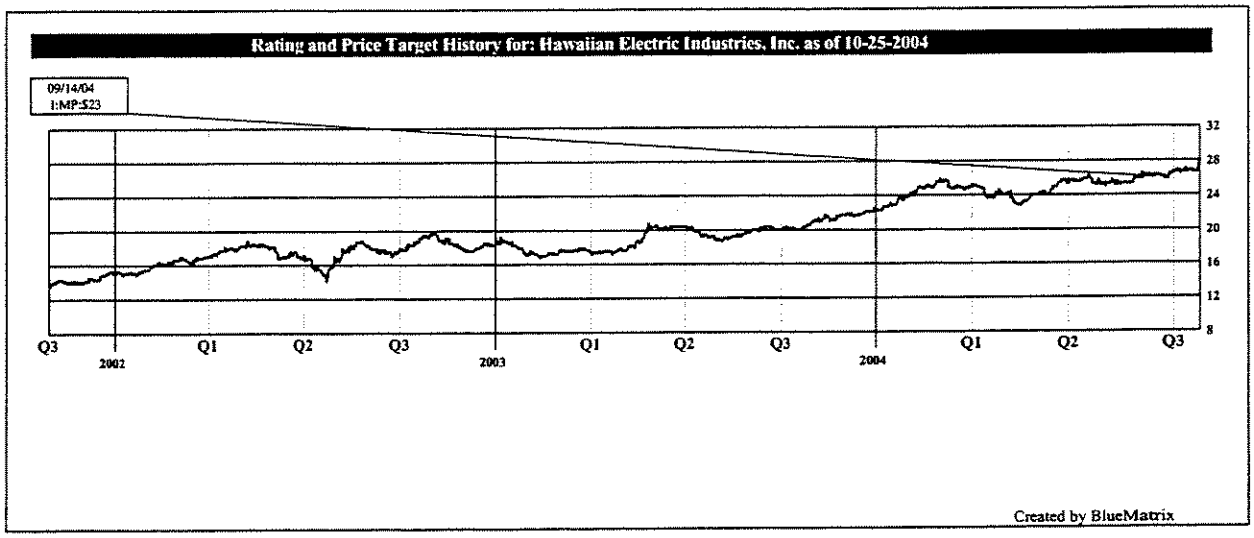
RISKS TO ACHIEVEMENT OF TARGET PRICE:

Slower than expected economic growth could reduce utility usage. Rising inflation, higher fuel costs and unexpected maintenance and repair expenses could erode earnings. Increasing interest rates could reduce net interest margins at American Savings. Additional risks include unexpected events regarding weather and the bank's ability to execute on its strategy of originating higher-yielding commercial loans.

COMPANY DESCRIPTION:

Hawaiian Electric Industries, headquartered in Honolulu, Hawaii, is the holding company for three electric utility subsidiaries and a savings institution. The utilities provide power to approximately 93% of Hawaii's public utility market and contributed 81% of revenue and 65% of operating income in 3Q'04 while the $6.5 billion asset savings bank subsidiary, American Savings Bank, contributed 18% of revenue and 33% of operating income. The thrift has 68 branches throughout the Islands and has the third-largest deposit market share in Hawaii at 19%.

Important Research Disclosures



Distribution of Ratings/IB Services Firmwide

	Piper Jaffray		IB Serv./Past 12 Mos.	
Rating	Count	Percent	Count	Percent
BUY [OP]	281	53.63	90	32.03
HOLD [MP]	216	41.22	39	18.06
SELL [UP]	27	5.15	5	18.52

Notes: The boxes on the Rating and Price Target History chart above indicate the date of the Research Note, the rating, and the price target. Each box represents a date on which an analyst made a change to a rating or price target, except for the first box, which may only represent the first Note written during the past three years. Distribution of Ratings/IB Services Firmwide shows the number of companies in each rating category from which Piper Jaffray received compensation for investment banking services within the past 12 months.

Legend:

I: Initiating Coverage

D: Discontinuing Coverage

S: Suspending Coverage

R: Resuming Coverage

T: Transferring Coverage

SB: Strong Buy (effective 01/12/04, Equity Research eliminated the SB rating)

OP: Outperform (prior to 12/12/01, OP stocks were rated "Buy")

MP: Market Perform (prior to 12/12/01, MP stocks were rated "Neutral")

UP: Underperform (prior to 12/12/01, UP stocks were rated "Sell")

NA: Not Available

UR: Under Review

GP On: Listed on one of the Guided Portfolios maintained by Piper Jaffray

GP Off: Removed from the Guided Portfolios maintained by Piper Jaffray

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Company Note
October 26, 2004

Important Research Disclosures

Analyst Certification — Kathleen L. Steinbrecher, CFA, Sr Research Analyst

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Hawaiian Electric Industries (HE)
Earnings Model ($000s)

	2002	2003	2004E	2005E
Segment Breakdown				
Revenue				
Electric Utility	1,257,176	1,396,685	1,498,989	1,581,433
Bank	399,255	371,320	359,281	344,910
Other	(2,730)	13,311	19,004	19,574
Total Revenue	1,653,701	1,781,316	1,877,273	1,945,916
Expenses				
Electric Utility	1,062,220	1,220,120	1,314,456	1,367,034
Bank	306,372	278,565	258,772	248,421
Other	18,676	19,064	15,549	15,860
Total Expense	1,387,268	1,517,749	1,588,777	1,631,315
Operating income				
Electric Utility	194,956	176,565	184,533	214,399
Bank	92,883	92,755	100,509	96,488
Other	(21,406)	(5,753)	3,455	3,714
Total operating income (loss)	266,433	263,567	288,497	314,602
Interest expense–Other than bank	72,292	69,292	77,489	86,787
Other expenses, net	12,232	11,860	(8,185)	(16,479)
Income from continuing oper.	181,909	182,415	219,193	244,293
Income taxes	63,692	64,367	101,617	89,470
Income from continuing operations	118,217	118,048	117,576	154,822
Loss from discontinued oper, net	0	(3,870)	1,913	0
Net Income	118,217	114,178	119,488	146,637
EPS	$1.61	1.58	1.78	1.82
Dividends per common share	$1.24	$1.24	1.24	1.24
F/D shares outstanding	73,426	74,713	78,951	80,509

Note: EPS reflect income from continuing operations.

Kathy Steinbrecher, CFA
415.277.1582
kathleen.l.steinbrecher@pjc.com

PiperJaffray.

Company Note
September 14, 2004

Kathleen L. Steinbrecher, CFA, Sr Research Analyst
415 277-1582, kathleen.l.steinbrecher@pjc.com

Reason for Report:
Initiating Coverage

Changes	Previous	Current
Rating	--	Market Perform
Price Tgt	--	$23.00
FY04E Rev (mil)	--	$1,897.9
FY05E Rev (mil)	--	$1,920.9
FY04E EPS	--	$1.61
FY05E EPS	--	$1.63

Price:	$26.09
52 Week High:	$26.87
52 Week Low:	$21.66
Price Target:	$23.00
(14x 2005E EPS of $1.63)	
Shares Out (mil):	80.7
Market Cap. (mil):	$2,105.5
Avg Daily Vol (000):	281
Div (ann):	$1.24
Est LT EPS Growth:	2%
P/E to LT EPS Growth (FY05):	8.0x
Est Next Rep Date:	10/19/2004
Fiscal Year End:	Dec

Rev (mil)	2003A	2004E	2005E
Mar	$424.6A	$437.1A	NA
Jun	$448.8A	$461.8A	NA
Sep	$453.8A	$495.4E	NA
Dec	$454.2A	$503.6E	NA
FY	$1,781.4A	$1,897.9E	$1,920.9E
CY	$1,781.4A	$1,897.9E	$1,920.9E
FY RM	1.2x	1.1x	1.1x
CY RM	1.2x	1.1x	1.1x

EPS	2003A	2004E	2005E
Mar	$0.33A	$0.40A	NA
Jun	$0.35A	$0.44A	NA
Sep	$0.41A	$0.38E	NA
Dec	$0.50A	$0.39E	NA
FY	$1.58A	$1.61E	$1.63E
CY	$1.58A	$1.61E	$1.63E
FY P/E	16.5x	16.2x	16.0x
CY P/E	16.5x	16.2x	16.0x

Hawaiian Electric (HE - $26.09)

Market Perform — Volatility: Low

Initiating Coverage With Market Perform Rating

KEY POINTS:

- **Dominant Market Share.** Hawaiian Electric Industries (HE) is a Mid-Cap utility providing power to 93% of the Hawaiian electric public utility market.
- **Solid Economic Fundamentals.** Tourism is the leading industry in Hawaii and visitor arrivals are expected to grow 2.9% in 2005.
- **Positive Operating Trends.** The percent of higher-cost corrective maintenance has declined from 65% in 1999 to 41% in 2004.
- **Diversified Earnings.** Savings bank subsidiary contributed 33% to operating income in the recent quarter.
- **Dividend Yield Supports Stock Price.** As a utility, HE pays a high dividend, currently yielding 4.8%, which should support the stock price.

INVESTMENT RECOMMENDATION:

We are initiating coverage on Hawaiian Electric Industries, Inc. with a Market Perform rating and a 12-month target price of $23. HE is the holding company for three utility subsidiaries and a savings institution with $6.5 billion in assets. The utility subsidiaries contributed 80% to revenue in the 2Q'04, while American Savings Bank (ASB) contributed 20%. The Piper Jaffray (PJC) Mid-Cap Utility Peer Group, which includes 26 utilities with market caps of $2–$10 billion, is trading at 14.0x consensus EPS estimates in 2005. The PJC Thrift Peer Group, consisting of 30 thrifts with assets of $2–$10 billion, is trading at 11x consensus EPS estimates in 2005 (SNL). We believe HE should trade at a market multiple due to the dominant competitive position of the utility in the Hawaii market, the stable regulatory environment, and its high 4.8% dividend yield. We expect HE to grow an earnings of 2% in 2005, in line with its peer group. Our price target is based on 14x our 2005 EPS estimate of $1.63.

RISKS TO ACHIEVEMENT OF TARGET PRICE:

A sector rotation out of utilities could depress valuations. Slower than expected economic growth could reduce utility usage. Unexpected maintenance and repair expenses could reduce near-term earnings. Increasing interest rates could reduce net interest margins at American Savings. Additional risks include unexpected events regarding weather and HE's ability to execute on its strategy of originating higher-yielding commercial loans.

COMPANY DESCRIPTION:

Hawaiian Electric Industries, headquartered in Honolulu, Hawaii, is the holding company for three electric utility subsidiaries and a savings institution. The utilities provide power to approximately 93% of Hawaii's public utility market and contributed 80.0% of revenue and 67% of operating income in 2Q'04 while the savings bank subsidiary, American Savings Bank contributed 20% of revenue and 33% of operating income. The Hawaiian Electric Co. (HECO) owns and operates three generating plants on Oahu; Maui Electric Co. (MECO) owns and operates two generating plants on Maui; and Hawaiian Electric Light Co. (HELCO) owns and operates five generating plants on the island of Hawaii. In 2002, American Savings Bank, a $6.5 billion in assets savings institution, began shifting its loan mix away from single family lending, toward providing full community banking services and originating commercial loans. The thrift has 68 branches throughout the Islands and has the third-largest deposit market share in Hawaii at 19%.

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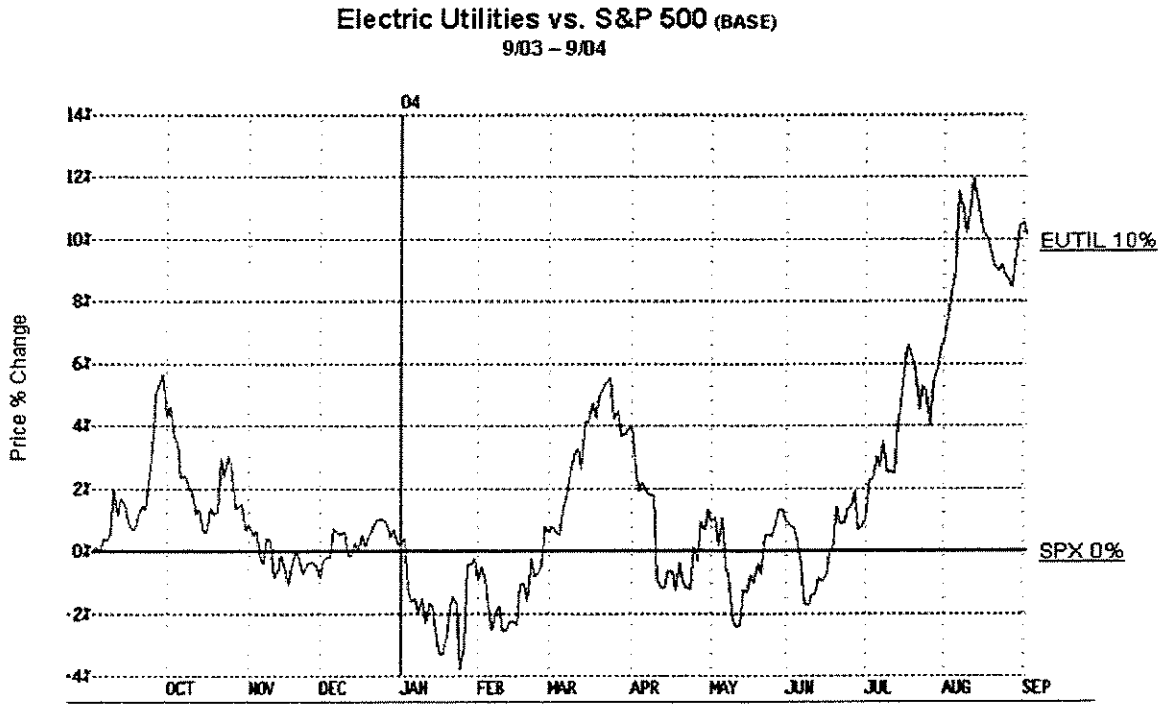
Valuation and Investment Recommendation

We are initiating coverage on Hawaiian Electric Industries, Inc. with a Market Perform rating and a 12-month price target of $23. The utilities stocks have outperformed the S&P by an average 14% in the last 12 months. The PJC Mid-Cap Utility Peer Group, which includes 26 utilities with market caps of $2–$10 billion, is trading at 14.0x consensus EPS estimates in 2005. The PJC Thrift Peer Group, consisting of 30 thrifts with assets of $2–$10 billion, is trading at 11x consensus EPS estimates in 2005 (SNL). HE's ROE is higher at 13.3% compared to its S&P utility peer group (Baseline) median of 10.75%, we believe this is due to the thrift subsidiary, American Savings. However, we are concerned that ASB will be a drag on earnings in 2005 due to its high percentage of fixed rate residential mortgages (approximately 80%). In an increasing rate environment, which we expect, the yield in the loan portfolio will decline as both prepayments and new loan originations slow. We believe HE should trade at a market multiple due to the dominant competitive position of the utility in the Hawaii market, the stable regulatory environment, and its high 4.8% dividend yield. We expect HE to grow earnings ~2% in 2005, in line with its peer group. Our 12-month price target of $23 is based on 14x our 2005 EPS estimate of $1.63.



Source: Baseline

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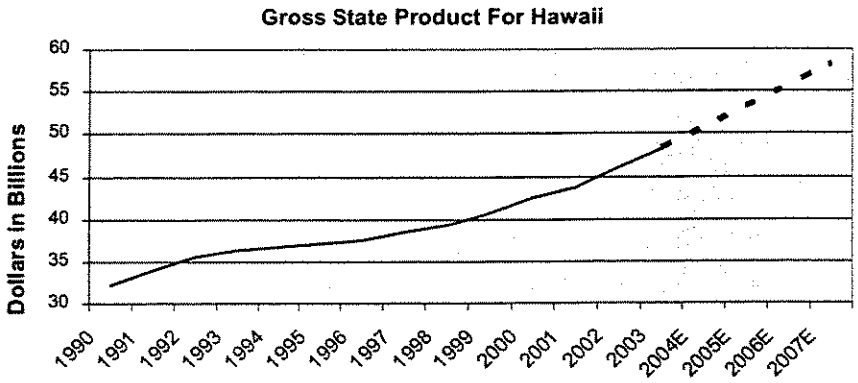
Hawaiian Economic Growth Drives Utility Usage

The Hawaiian economy experienced a prolonged economic downturn and then lagged when the rest of the United States began to improve. During the 1990s, Hawaii's payroll employment growth was negative, compared to increasing payroll growth nationally. Not until 2000 did payroll growth begin to expand in Hawaii, up 3.1% year over year compared to 2.2% growth nationally. Personal income growth lagged payroll employment in Hawaii from 1993 to 2001. Personal income growth began to expand in 4Q'03 at an annualized rate of 5.1% in Hawaii compared to 4.3% nationally. The August 2004, Department of Business, Economic Development & Tourism (DBEDT) forecast an increase in visitor arrivals from 1.6% in 2002 to 2.9% in 2005. The DBEDT is also forecasting 2.5%–2.9% average annual percentage growth in personal income through 2010. We expect increasing visitor arrivals and military expansion to contribute to higher economic growth. Kilowatt-hour sales, which are positively correlated with Real Gross State Product, should increase 2% into 2007. Revenue is expected to grow at least 2% per year for the next few years based on the positive correlation between GSP growth and kilowatt-hour sales.



Source: Hawaii State DBEDT and Bureau of Economic Analysis

Increasing Visitor Arrivals—Key Economic Driver

Visitor arrivals are a key driver for economic expansion in Hawaii. Tourism dollars accounted for 17% of GSP, 22% of civilian jobs, and 26% of state and local taxes (2000 Census). Following several years of economic weakness, Japan's GDP is expected to increase 3.8% annually in 2005 (August, Blue Chip Economist Forecast, DBEDT). The recent influx of Japanese visitors to Hawaii has contributed to higher earnings at HE by increasing utility demand in hotels and demand from other supporting tourism businesses. Nearly 38% of kilowatt sales at HE were generated by the hotel industry and military in 2003 (Company statistical report).

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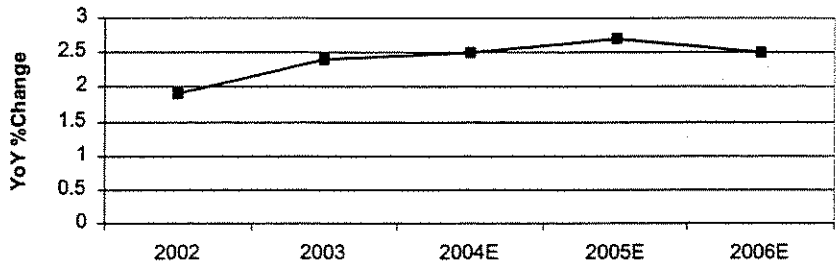
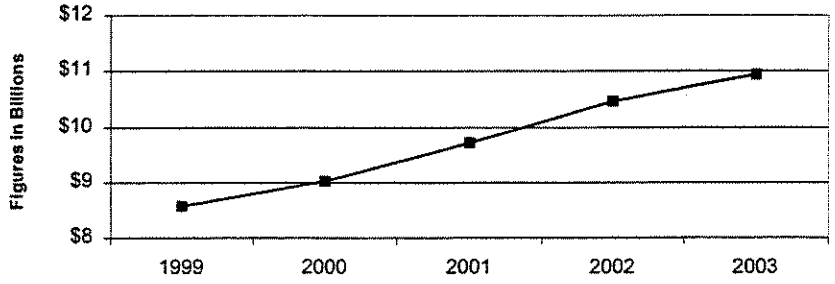
Kilowatt-Hour Sales



Source: Hawaiian Electric

Military Expansion Drives Kilowatt-Hour Sales
Military construction projects and personnel both contribute to higher kilowatt-hour sales for HE. On October 1, 2004, Hawaii is expected to receive $865 million in defense spending for fiscal year 2004/2005. Additional military projects include the acquisition of 1,400 acres on Oahu and 23,000 acres on the Big Island, and call for approximately 480 additional soldiers to be stationed in Hawaii. The military could spend $150 million to prepare for eight C-17 cargo planes at Hickam Air Force Base. Although military expansion is positive for earnings at HE, rising government debt levels and the possibility for a change in the Administration could result in the delay or cancellation of future projects. As a general rule, we do not include the possible benefit of military expansions in our estimates until final funding has been approved.

Federal Government Expenditures



Source: State of Hawaii, DBEDT

HELCO Power— Rate Increase Anticipated
Early in 1991, the utility strategically planned to meet demand forecasts by installing two combustion turbines, CT-4 and CT-5, at its Keahole power plant. After lengthy litigation and regulatory delays a settlement was reached in late 2003 and is expected to be implemented in 2004. The settlement and installation costs are approximately $93 million plus an additional $8 million required to complete the installations of CT-4 and CT-5. These costs are expected to be recovered through the rate-making process governed by the Public Utilities Commission of the State of Hawaii. Should there be a continued delay, which we do not anticipate, earnings could be reduced.

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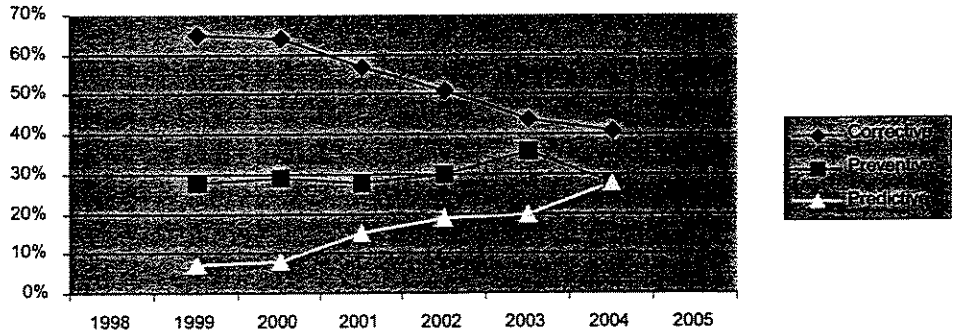
Rate Base Growth Drives Earnings
The utilities request rate increases from the PUC are in order to pay for higher maintenance and other utility operating costs associated with operating the utilities. The PUC has established a government considered "reasonable" ROAE of 11.40% for HECO; 11.5% for HELCO; and 10.94% for MECO, each established using a specific test year. In 2003 the ROAE's calculated and reported to the PUC were HECO, 9.20%; HELCO, 6.61% and MECO, 10.08%. All were lower than the expected ROAE established by the utility regulatory agency.

HECO has not initiated a rate case since 1993, but plans to file a request and testimony by month-end using 2005 as a test year. The PUC is required by statute to issue an interim decision and order within 11 months after the request and testimony is filed. Once the interim decision is approved, the utility may begin charging customers based on the new rate; however, the final rate is determined by the PUC when it issues the final order. If the final order is different than the interim decision, the utility is required to refund or implement the new rate accordingly. We believe the length of time from the prior rate increase and lower ROAE at HECO compared to the expected regulatory ROAE bodes well for a future rate increase. A rate increase at HECO will also mitigate future inflationary costs.

Improved Optimization of Expenditures
The utility launched a comprehensive strategy to improve productivity and maintenance costs. The company outlined a procedure to address employee concerns and implement employee ideas. The new procedures resulted in less down time due to employee conflicts and improved efficiencies. HE established a cross-training program that has led to a more competent and flexible workforce. Additionally, HE management, through systematically modernizing aging assets and better maintenance of existing facilities, has reduced the percent of higher-cost corrective maintenance from 65% in 1999 to 41% in 2004. Predictive maintenance has increased from 7% in 1999 to 28% in 2004, leading to reduced costs and power outages for HE's customer base. The change in maintenance mix also reduces overtime costs and replacement costs on damaged equipment and lowers the need to purchase additional power to supplement unexpected generation or line failure.

Maintenance Mix



Source: Hawaiian Electric

American Savings Compares Favorably to its Peers
American Savings has 68 branches located throughout the Hawaiian Islands. Its loan mix is 78% single-family residential (SFR) loans, the majority which are fixed; 9% business loans; 7% consumer loans; and 6% commercial loans, primarily real estate. The bank announced in early 2002 its intent to reduce SFR and focus on commercial lending. However, the loan mix at 6/30/04 is similar to the mix at the end of 2002. We believe growing commercial loan portfolios has been difficult in Hawaii due to high customer liquidity created by the strong economy, which has resulted in a high level of prepayments. Put simply, commercial loans are being paid down faster than they can be originated.

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Although there are eight banking institutions headquartered in Hawaii (FDIC), the Hawaiian banking market is quite consolidated. Bank of Hawaii and First Hawaiian Bank each have a 30% market share and 74 and 57 branches, respectively. American Savings has a smaller market share of 19% but a big retail branch presence, with 68 branches. Hawaii has also taken steps to protect its native banking market from the incursion of out-of-state banks, enacting a statute that limits out-of-state banks from entering Hawaii except through an "interstate merger transaction." In effect, the statute prevents out-of-state banks from acquiring or opening de novo branches in Hawaii.

Compared to its thrift peer group, American Savings Bank outperforms on several key metrics. In the 1Q'04, its cost of interest-bearing liabilities was 2.08% compared to 2.17% for thrifts with similar asset levels. Profitability was also higher in the 1Q'04—ROAE was 12.3% compared to 11.2% on average for its peer group and ASB's net interest margin was higher, at 3.49% compared to 3.24% for the average thrift peer.

Key Performance Metrics	American Savings Bank	Avg SNL Thrift Peer Group ($2-$10 Billion)
Cost of IBL	2.08%	2.17%
ROAE	12.49%	11.21%
NIM	3.49%	3.24%
Reserves/Loans	1.23%	1.08%
Cost of Interest-bearing Deposits	1.37%	1.62%
Yield on Interest Earning Assets	5.48%	5.13%

Source: SNL Financial

Credit Quality Mixed

Reserves to loans in the 1Q'04 were 1.23% compared to 1.08% for the SNL peer group. Although non-performing assets to loans and OREO (other real estate owned) was higher at ASB than at its peers, at 0.83% versus 0.56%, ASB has been reversing reserves in recent quarters due to the strong economy and we do not anticipate credit problems at the company.

Interest Rate Sensitivity—A Negative For Bank

ASB's balance sheet is liability sensitive, meaning that as interest rates increase, the company's liabilities will reprice faster than its assets, resulting in net interest margin compression. According to the company, a 100bp increase in interest rates will result in a 2% decline in net interest income. In addition, ASB's high level of mortgage-backed securities (MBS) and large percentage of fixed rate residential loans could also be a drag on the net interest margin if the yield curve steepens. As long rates rise, the yield on the fixed-rate residential portfolio will remain flat and slower prepayments will reduce the cash flow available to invest in higher yielding assets.

Deposit Mix Delivers Low Cost Funds

Interest-bearing liabilities were comprised of 50% core deposits, 19% CDs; and 31% FHLB (Federal Home Loan Bank) advances. The cost of deposits was low, at 1.37%, compared to a 1.62% average for its thrift peer group. Similar to other thrifts and community banks, ASB has a large percentage of mortgage backed securities on its balance sheet—mortgage-related securities were nearly 48% of earning assets at 6/30/04. If interest rates continue to increase, the bank could experience margin pressure due to the lower yield on existing fixed rate loans and MBS.

Investments Risks

The main risks to our target price are an economic slowdown in Hawaii, increasing interest rates and credit deterioration at American Savings. A decline in visitor arrivals, military expansion or cooling weather trends would reduce power usage and negatively impact earnings at the utility. Additionally, unscheduled maintenance and repair expenses would reduce near-term earnings. At the thrift subsidiary, a 100bp increase in interest rates could compress net interest margins 2% if interest costs rise faster than asset yields rise. The risk of margin compression is greater at American Savings due to the bank's high concentration of fixed-rate residential mortgages The S&P Utility index has outperformed the broader market by 10% in the last 12 months. We believe market volatility has resulted in a "flight to yield" in the sector. Should market conditions change, we anticipate a sector rotation out of higher-priced utilities.

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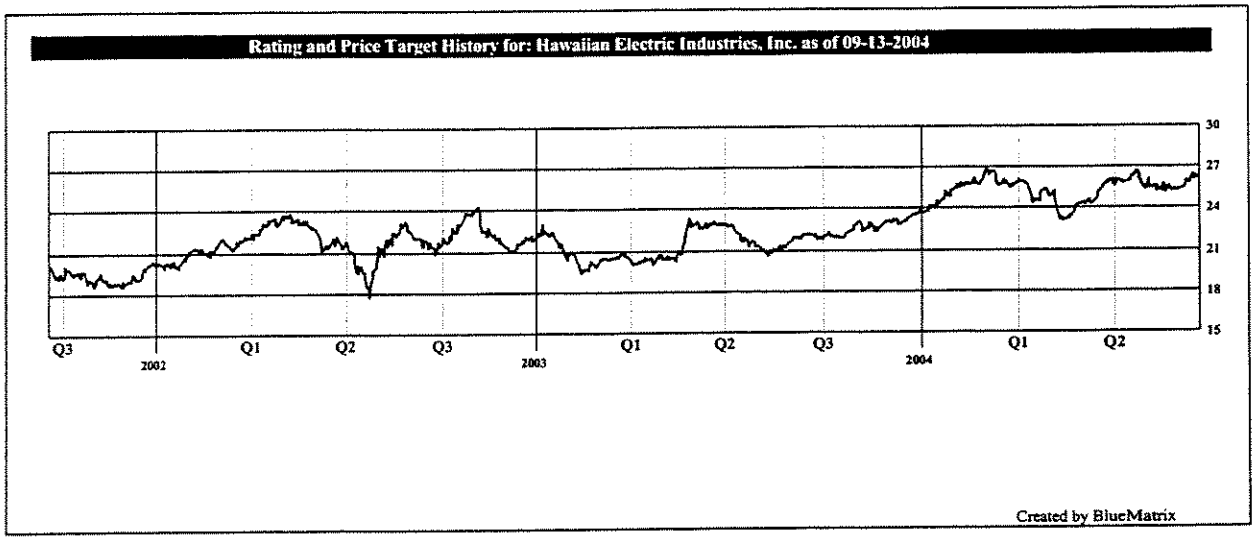
Important Research Disclosures



Distribution of Ratings/IB Services Firmwide

	Piper Jaffray		IB Serv./Past 12 Mos.	
Rating	Count	Percent	Count	Percent
BUY [OP]	290	57.31	90	31.03
HOLD [MP]	193	38.14	32	16.58
SELL [UP]	23	4.55	6	26.09

Notes: The boxes on the Rating and Price Target History chart above indicate the date of the Research Note, the rating, and the price target. Each box represents a date on which an analyst made a change to a rating or price target, except for the first box, which may only represent the first Note written during the past three years. Distribution of Ratings/IB Services Firmwide shows the number of companies in each rating category from which Piper Jaffray received compensation for investment banking services within the past 12 months.

Legend:

I: Initiation of Coverage

D: Discontinuation of Coverage

SB: Strong Buy (effective 01/12/04, Equity Research eliminated the SB rating)

OP: Outperform (prior to 12/12/01, OP stocks were rated "Buy")

MP: Market Perform (prior to 12/12/01, MP stocks were rated "Neutral")

UP: Underperform (prior to 12/12/01, UP stocks were rated "Sell")

NA: Not Available

UR: Under Review

SUS: Suspended

GP On: Listed on one of the Guided Portfolios maintained by Piper Jaffray

GP Off: Removed from the Guided Portfolios maintained by Piper Jaffray

Important Research Disclosures

Analyst Certification — Kathleen L. Steinbrecher, CFA, Sr Research Analyst

The views expressed in this report, including the Key Points and Risk sections in particular, accurately reflect my personal views about the subject company and the subject security. In addition, no part of my compensation was, is, or will be directly or indirectly related to the specific recommendations or views contained in this report.

Research Disclosures

Piper Jaffray was making a market in the securities of Bank of Hawaii Corporation at the time this research report was published. Piper Jaffray will buy and sell Bank of Hawaii Corporation securities on a principal basis.

Piper Jaffray was making a market in the securities of Hawaiian Electric Industries, Inc. at the time this research report was published. Piper Jaffray will buy and sell Hawaiian Electric Industries, Inc. securities on a principal basis.

Piper Jaffray has received compensation for investment banking services from Hawaiian Electric Industries, Inc. within the past 12 months.

Within the past 12 months, Piper Jaffray was a managing underwriter of an offering of, or dealer manager of a tender offer for, the securities of Hawaiian Electric Industries, Inc. or the securities of an affiliate.

Piper Jaffray research analysts receive compensation that is based, in part, on the firm's overall revenues, which include investment banking revenues. Piper Jaffray research analysts who follow this Company report to the Head of Investment Research who, in turn, reports directly to the Chief Executive Officer of Piper Jaffray.

Rating Definitions

Investment Opinion: Investment opinions are based on each stock's return potential relative to broader market indices*, not on an absolute return.

- **Outperform (OP):** Expected to outperform the relevant broader market index over the next 12 months.
- **Market Perform (MP):** Expected to perform in line with the relevant broader market index over the next 12 months.
- **Underperform (UP):** Expected to underperform the relevant broader market index over the next 12 months.
- **Suspended (SUS):** No active analyst coverage, however coverage expected to resume.

* Russell 2000 and S&P 500

- **Volatility Rating:** Our focus on growth companies implies that the stocks we recommend are typically more volatile than the overall stock market. We are not recommending the "suitability" of a particular stock for an individual investor. Rather, it identifies the volatility of a particular stock.
- **Low:** The stock price has moved up or down by more than 10% in a month in fewer than 8 of the past 24 months.
- **Medium:** The stock price has moved up or down by more than 20% in a month in fewer than 8 of the past 24 months.
- **High:** The stock price has moved up or down by more than 20% in a month in at least 8 of the past 24 months. All IPO stocks automatically get this volatility rating for the first 12 months of trading.

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Hawaiian Electric Industries (HE)
Earnings Model ($000s)

	2002	2003	2004E	2005E
Segment Breakdown				
Revenue				
Electric Utility	1,257,176	1,396,685	1,536,354	1,582,444
Bank	399,255	371,320	349,412	326,700
Other	(2,730)	13,311	12,113	11,750
Total Revenue	1,653,701	1,781,316	1,897,879	1,920,894
Expenses				
Electric Utility	1,062,220	1,220,120	1,342,132	1,368,975
Bank	306,372	278,565	257,673	251,231
Other	18,676	19,064	16,776	15,434
Total Expense	1,387,268	1,517,749	1,616,581	1,635,640
Operating income				
Electric Utility	194,956	176,565	194,222	213,469
Bank	92,883	92,755	91,739	75,470
Other	(21,406)	(5,753)	(4,663)	(3,685)
Total operating income (loss)	266,433	263,567	281,298	285,254
Interest expense–Other than bank	72,292	69,292	69,985	71,385
Other expenses, net	12,232	11,860	11,808	23,593
Income from continuing oper.	181,909	182,415	199,505	190,277
Income taxes	63,692	64,367	69,827	70,730
Income from continuing operations	118,217	118,048	129,678	119,547
Loss from discontinued oper, net	0	(3,870)	0	0
Net Income	118,217	114,178	129,678	131,355
EPS	$1.61	$1.58	1.61	1.63
Dividends per common share	$1.24	$1.24	1.24	1.24
F/D shares outstanding	73,426	74,713	80,707	80,707

Kathy Steinbrecher, CFA
Senior Research Analyst
415.277.1582
kathleen.l.steinbrecher@pjc.com

ValuEngine
QUANTITATIVE SUMMARY REPORT

HAWAIIAN ELECTRIC INDUSTRIES INC (NYSE - HE)

COMPANY PROFILE & BASIC INFORMATION

COMPANY PROFILE

Hawaiian Electric Industries, Inc. operates as a holding company with its principal subsidiaries engaged in the electric utility, banking, and other businesses operating primarily in the state of Hawaii. It engages in the production, purchase, transmission, distribution, and sale of electricity on the islands of Oahu; Maui, Lanai, and Molokai; and Hawaii. The company, through its subsidiary, American Savings Bank, F.S.B., engages in the banking activities. Its loan portfolio consists of residential mortgage loans, construction and development loans, multifamily residential and commercial real estate loans, consumer loans, and business loans.

LAST UPDATE: Sep 13, 2004

SECTOR: Public Utilities
INDUSTRY: Electrical Utilities
CONTACT: 900 Richards Street
Honolulu, Hawaii 96813
USA

Tel: 808-543-5662
Web: http://www.hei.com

ValuEngine

QUANTITATIVE SUMMARY REPORT

VALUENGINE STOCK FORECAST MODEL & MARKET RATIO BASED VALUATION

THE VALUENGINE STOCK FORECAST MODEL

The predictive variables used in ValuEngine.com forecasting models include both proprietary and well-established forecasting

Historical Forecast Returns

40%

VALUENGINE FORECAST ANALYSIS

Target Price	Expected Return

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QUANTITATIVE SUMMARY REPORT

MARKET RATIO BASED VALUATION & QUANTITATIVE SUMMARY

To establish a valuation standard, we use both (i) the average historical market ratio of the stock over the past 10 years (or however long there is data available for the stock), and (ii) the average market ratio today of five comparable stocks in the same sector and from companies of similar size. These two alternative perspectives should give you a good idea about where this stock's valuation stands today.

1. Valuation Based on HE's Past PE
Over the past 10 years, HE's average PE is 12.53. HE earned $1.75 per share in its recent 4 quarters. The analyst consensus estimate is $1.62 for its 4 quarter forward EPS. HE's current sales per share is 1.17. The following assessment is based on multiplying the historical PE with next 4 quarter EPS for HE.

HE - P/E Ratio Chart

MARKET RATIO	
Market Price	$26.27
Historical Average PE	12.53
PE-Based Fair Value	$20.36
Comparable Stocks' Average PE	14.61
Comparable PE-Based Fair Value	$23.74

COMPARABLES' PE

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QUANTITATIVE SUMMARY REPORT

VALUATION COMPARISON

VALUATION COMPARISON

	HE	Industry Average	Sector Average	S&P 500
Valuation	10.23% overvalued	12.59% overvalued	3.12% overvalued	N/A
Valuation Rank	33	38	47	n/a

MOMENTUM COMPARISON

	HE	Industry Average	Sector Average	S&P 500
Recent 12-M Return	32.01%	0.23%	0.22%	0.11%
Momentum Rank	71	59	57	49

QUALITY COMPARISON

	HE	Industry Average	Sector Average	S&P 500
Sharpe Ratio	0.40	0.02	0.03	-0.19%
Sharpe Ratio Rank	76	49	48	30
5-Yr Average Return	7.77%	-0.02%	-0.06%	-0.03%
5-Yr Return Rank	64	48	44	41
Volatility	19.31%	0.45%	0.50%	0.16%
Volatility Rank	97	73	65	99

EPS & GROWTH COMPARISON

	HE	Industry Average	Sector Average	S&P 500
Expected EPS Growth	-7.14%	0.18%	0.29%	N/A
EPS Growth Rank	11	32	40	N/A
Average EPS Surprise	15.79%	0.03%	0.12%	N/A
EPS Surprise Rank	77	45	50	N/A

OTHER VALUATION COMPARISONS

	HE	Industry Average	Sector Average	S&P 500
P/E Ratio	15.01	16.13	18.46	21.82
P/E Ratio Rank	80	75	65	62
Market/Book Ratio	1.81	1.68	1.98	N/A
Market/Book Rank	56	64	58	N/A
Price/Sales Ratio	1.17	1.48	1.46	N/A
Price/Sales Rank	60	63	61	N/A

THE MODELS AND THE VALUENGINE SYSTEM

ValuEngine.com employs four computer models to provide its services and functions. They are:

- The VE Stock Valuation Model.
- The VE Stock Forecast Model.
- The VE Portfolio Advisor model.
- The VE Portfolio Forecast Model.

The Stock Valuation Model is VE's "flagship" model. It uses three primary variables to arrive at a computer modeled or fair value price for any stock at any given point in time. These variables are the company's trailing 12 month earnings per share (EPS), the analyst consensus of its future 12 months EPS and the current yield of the 30 year Treasury bond which creates the interest rate "climate" in which the market as a whole operates.

Underlying these three time sensitive variables are seven additional criteria. Five are specific to the stock being evaluated and are unique to the VE stock valuation model in that they quantify the subjective component of value for that stock. They include the price history of the stock and its relationship to the market in terms of volatility, momentum and liquidity as well as its market capitalization. Two others are related to the interest rate climate, tracking the duration of the interest rate cycle and its volatility. These seven criteria provide a structured parametrical platform for the three primary variables. The correlation of these variables defines their complex interrelationship and is the core of the computer model that delivers the fair value price of a stock.

The deviation of the stock's current market price from the current fair value is calculated as a percentage to provide a measure of the extent to which the market is "mispricing" the stock. Because the three primary variables are time sensitive, and a change in any or all of them produces a change in the fair value, the VE model is the only system that provides valuation of a stock in real time.

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COMPARISON OF SIMILAR STOCKS TO HE

VALUATION COMPARISON

Comparable Tickers	HE	GXP	OGE	PSD
Last Trade	$26.27	$30.29	$25.81	$22.98
Model Price	$23.83	$27.40	$21.87	$23.10
Valuation	10.23% overvalued	10.54% overvalued	17.99% overvalued	0.54% undervalued
Valuation Rank	33	33	23	51

MOMENTUM COMPARISON

Comparable Tickers	HE	GXP	OGE	PSD
Recent 12-M Return	32.01%	0.08%	0.23%	0.06%
Momentum Rank	71	45	63	42

EPS & GROWTH COMPARISON

Comparable Tickers	HE	GXP	OGE	PSD
Expt EPS Growth	-7.14%	-0.03%	-0.09%	0.13%
EPS Growth Rank	11	12	10	38
EPS Surprise	15.79%	0.11%	0.02%	-0.11%
EPS Surprise Rank	77	72	48	18

QUALITY COMPARISON

Comparable Tickers	HE	GXP	OGE	PSD
Sharpe Ratio	0.40	0.22	0.11	0.01
Sharpe Ratio Rank	76	65	56	47
5 Yr Avg Annual Return	7.77%	0.05%	0.03%	0.00%
5 Yr Avg Annual Rtn Rank	64	57	52	47
Volatility	19.31%	0.21%	0.24%	0.21%
Volatility Rank	97	95	90	95

SIZE COMPARISON

Comparable Tickers	HE	GXP	OGE	PSD
Market Cap [billions]	2.12	2.25	2.26	2.29
Size Rank	88	89	89	89

OTHER COMPARISONS

Comparable Tickers	HE	GXP	OGE	PSD
P/E Ratio	15.01	12.94	14.34	16.30
P/E Ratio Rank	80	87	83	76
Market/Book Ratio	1.81	2.04	1.89	1.36
Market/Book Rank	56	48	53	70
Price/Sales Ratio	1.17	0.96	0.56	0.91
Price/Sales Rank	[illegible]	[illegible]	[illegible]	[illegible]

To establish its validity, the stock valuation model was backtested against the S P 500 index over a fifteen year period. A rigorous out-of-sample discipline was employed that permitted only data available at the point in the timeline that each valuation was made. This eliminated any forward looking bias or survivorship bias that could result from data leakage.

The model tracked the index accurately, showing the market to be over or undervalued when indeed it was. For example, when the test period was charted, the price bubble that preceded the 1987 crash is clearly visible as is the overvaluation of 1998 that provoked Alan Greenspan's remark about "irrational exuberance".

The **Stock Forecast Model** was developed from the accumulated test data and uses a total of eight predictive variables (including the mispricing measure). These are incorporated into our own econometric formula that enables the model to capture a stock's susceptibility to short term price reversals, its probability of intermediate term price momentum continuation, and the probability of long term price reversals. The model is at the heart of a computer screening program that ferrets out stocks with the characteristics needed for favorable investment results. Strongly undervalued stocks with high momentum proved to provide the greatest return and the program will sort through the more than 7000 stocks in our database to find them.

Because most of the variables in the model are firm-specific, the model automatically adapts across sectors and industries. In fact, regression analysis comparing the VE models against existing valuation methods showed the mispricing measure to be the only predictive variable of significant value in all sectors.

The forecasting model was backtested with the same methodology used in validating the valuation model and while not a perfect crystal ball, it was

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QUANTITATIVE SUMMARY REPORT

COMPARISON OF SIMILAR STOCKS TO HE

RETURN FORECAST: EXPECTED RETURN

Comparable Tickers	HE	GXP	OGE	PSD
One Month	-0.00%	-0.01%	-0.00%	-0.01%

We can say that its use, together with the stock valuation model, will definitely enhance the investor's odds of success in the stock market.

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QUANTITATIVE SUMMARY REPORT

EARNINGS REPORTS AND ANALYST RECOMMENDATIONS

EARNINGS HISTORY

	0000-00	2003-09	2003-12	2004-03	2004-06
Estimate Earnings	N/A	0.42	0.38	0.37	0.38
Actual Earnings	N/A	0.41	0.50	0.40	0.44
Earnings Difference	N/A	-0.01	0.12	0.03	0.06
Earnings Surprise	N/A	-2.38%	31.58%	8.11%	15.79%

EARNINGS GROWTH

	Last 5 Years	This Year (2004-12)	Next Year (2005-12)	Next 5 Years	Price/EPS (2004-12)	PE/Growth Ratio (2004-12)
HE	3.80%	2.50%	0.60%	2.80%	16.30	5.82
Electric Utilities	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EARNINGS ESTIMATES AND ANALYST RECOMMENDATIONS

Earnings Estimates		Average Recommendation (strong buy 1.00-5.00 strong sell)	
This Quarter (2004-09)	0.41	This Week	3.50
This Year (2004-12)	1.62	Last Week	3.50
Next Year (2005-12)	1.63	Change	0.00

EARNINGS PER SHARE ESTIMATES

	This Quarter (2004-09)	Next Quarter (2004-12)	This Year (2004-12)	Next Year (2005-12)
Average Estimate	0.41	0.40	1.62	1.63
Number of Analysts	3	3	6	6
Low Estimate	0.41	0.39	1.48	1.50
High Estimate	0.42	0.42	1.70	1.75
Year Ago EPS	0.41	0.50	1.58	1.62
EPS Growth	0.00%	-20.00%	2.53%	0.62%

CONSENSUS EPS TREND

	This Quarter	Next Quarter	This Year	Next Year

CA-IR-128

Ref: T-4, Page 15, Line 8.

a. Please provide all workpapers, analyses and source documents for the test data and the manufacturers' unit data for calculating the A, B, and C "heat rate constants."

b. Please provide the completion date of test data.

c. Please provide a comparison of the value for the A, B and C heat rate constants utilized in HECO's last rate case with those utilized for each unit by HECO in this rate case and an explanation of the differences.

HECO Response:

a. The data is voluminous. One copy each with be provided to the Consumer Advocate, Department of Defense and the Commission under separate transmittal.

Since the time of HECO's filing of direct testimony, the Test Year 2005 A, B and C heat rate constants have been updated. The updated net A, B and C heat rate constants for each HECO, steam, generating unit is provided below:

Unit	A	B	C
Honolulu 8	36.41316	10.31147	0.00568
Honolulu 9	69.89196	8.94844	0.02204
Waiau 3	146.53942	4.81132	0.08544
Waiau 4	49.46043	9.31119	0.03203
Waiau 5	61.05946	8.81372	0.02981
Waiau 6	64.11038	8.74074	0.03199
Waiau 7	88.24671	7.94372	0.01961
Waiau 8	86.81869	8.08703	0.01314
Kahe 1	73.44596	8.16741	0.01291
Kahe 2	45.99150	9.09279	0.00350
Kahe 3		8.55572	0.00636

	57.74815		
Kahe 4	75.55387	8.43939	0.00739
Kahe 5	89.34437	8.64339	0.00305
Kahe 6	117.08141	8.18332	0.00770

HECO determined that there was a need to update the input/output (I/O) ABCs. First, the previous set of I/O ABCs as provided in the voluminous documents was based upon dated information and, in some cases, older testing techniques (e.g. Manual testing techniques were used for Hon. 8 and 9 and Waiau 3 and 4. Currently, HECO is using the Plant Information Monitoring System ("PI Monitor")). Secondly, using available information, HECO has only recently been able to identify deterioration trends and forecast their impacts into future years for its reheat units.

The above I/O ABCs were updated as of 12/31/04 to reflect their latest operating conditions going into 2005 (except for Waiau 4 due to inaccurate flow measurement). In comparing the I/O ABCs with past daily heat rates, HECO discovered an unmistakable trend in deterioration among its reheat units. This deterioration would occur after boiler outage work until a reheat unit's next outage in which there would be recovery of unit efficiency. In sum, the HECO reheat units would experience "sawtooth" deterioration between boiler outages. Therefore, using the latest test year overhaul schedule, HECO applied adjustment factors to its reheat ABC coefficients. The impact of this adjustment factor was to both improve and deteriorate the unit efficiencies.

b. The date of the data used to generate the Input/Output ABC constants are shown below:

Honolulu 8	9/25/98
Honolulu 9	6/20/96

Waiau 3	2/25/98
Waiau 4	2/19/98
Waiau 5	1/02/02
Waiau 6	10/29/01
Waiau 7	4/12/03
Waiau 8	9/16/02
Waiau 9	11/17/94
Waiau 10	5/2/95
Kahe 1	4/13/03
Kahe 2	9/17/02
Kahe 3	7/05/02
Kahe 4	4/26/03
Kahe 5	4/13/03
Kahe 6	9/26/01

c. The Input/Output ABC constants utilized in the 1995 Rate Case were derived on a gross basis. This means that auxiliary or electrical consumption used by plant equipment to generate electricity was not accounted for. The auxiliary consumption varies directly with the loading of the unit. The ABC constants utilized in these proceedings were derived on a net basis and account for auxiliary consumption at each load point. A direct comparison is not applicable because of this.

Steam Turbine Performance and Economics

ROBERT L. BARTLETT
General Electric Company
Schenectady, N.Y.

with contributions by
J. E. MULDER AND R. C. SHELDON
General Electric Company
Schenectady, N.Y.

FWH OUTAGE
IMPACT
FACTORS
(Feed Water Heater "FWH")

McGRAW-HILL BOOK COMPANY, INC.
New York Toronto London
1958

7-heater reheat cycle	*Change in heat rate, %*
Removal from service of lowest-pressure heater	0.4 poorer
Removal from service of two lowest-pressure heaters	1.3 poorer
Removal from service of all four low-pressure heaters	3.1 poorer
Removal from service of highest-pressure heater	1.0 poorer
Removal from service of both high-pressure heaters	2.0 poorer
Removal from service of all heaters	14.4 poorer
Change in unit output resulting from removal of highest-pressure heater from service	6.5 per cent increase
6-heater reheat cycle	
Removal from service of lowest-pressure heater	0.5 poorer
Removal from service of two lowest-pressure heaters	1.4 poorer
Removal from service of all three low-pressure heaters	2.5 poorer
Removal from service of highest-pressure heater	1.2 poorer
Removal from service of both high-pressure heaters	2.4 poorer
Removal from service of all heaters	13.8 poorer
Change in unit output resulting from removal of highest-pressure heater from service	6.0 per cent increase
5-heater reheat cycle	
Removal from service of lowest-pressure heater	0.7 poorer
Removal from service of both low-pressure heaters	1.8 poorer
Removal from service of highest-pressure heater	1.3 poorer
Removal from service of both high-pressure heaters	2.7 poorer
Removal from service of all heaters	12.8 poorer
Change in unit output resulting from removal of highest-pressure heater from service	5.9 per cent increase
5-heater nonreheat cycle	
Removal from service of one low-pressure heater	0.7 poorer
Removal from service of both low-pressure heaters	2.1 poorer
Removal from service of highest-pressure heater	1.5 poorer

#1 #2
0.7 + 1.1

	Gross-Adjusted			Net-Adjusted			2003 Op. NHR Var		2003 OpNHR		Choosen	
be	A	B	C	A	B	C	May	YTD	May	YTD	Adj. Factor	Comments
	43.83	10.37701	0.003887	56.77924	10.50928	0.00800411	-	**474**	-	**14,083**	1.0337	
	56.68216	8.941716	0.019832	62.67367	9.403831	0.01947	(640)	(1,025)	13,225	13,871	1.0000	Inadequate Coriolis flowmeter data
	46.75018209	9.047274	0.0282	69.31	8.458923	0.04503839	371	**447**	13,324	**13,849**	1.03242	34/35 FWHs out for 35 FWH testing 2 weeks
	39.69087792	9.121279	0.023861	49.04626	9.23322	0.03176466	(110)	**(113)**	13,384	**13,524**	0.9916	
itor	35.27	9.062056	0.018765	31.25216	10.17756	0.00993228	(746)	**(700)**	13,117	**13,412**	0.9478	
itor	57.32	8.079893	0.022664	61.28777	8.58656	0.02067788	(171)	**(160)**	12,436	**12,550**	0.9872	
itor	63.37703064	7.893539	0.012524	61.57467	8.66113	0.00896984	(96)	(284)	10,359	10,268	1.00153	72 FWH outage for 8 weeks factored in
itor	101.3102082	6.427454	0.024767	105.5491	6.943365	0.02343198	188	74	10,208	10,258	1.00038	82 FWH testing for 2 weeks, ah steam coils unknown
	197.9733177	7.843552	0.029242	198.6939	7.84966	0.02922136		604		18,985	1.0318	ok
	190.70	7.270986	0.028535	191.3958	7.275668	0.02851313		(313)		19,009	0.9835	ok
itor	82.0093657	7.274936	0.016958	87.84728	7.833765	0.0151798	(109)	(275)			1	Unknown deterioration, frequent 14 FWH outages, use **4/03 submittal**
tor	68.46	7.504355	0.014974	67.30861	8.36906	0.01044385	65	**93**	10,140	**10,217**	1.00911	
tor	84.8575	7.087236	0.017211	104.9663	7.175863	0.01870174	93	**130**	9,958	**10,018**	1.01296	
tor	77.2369	7.346801	0.013887	82.46542	7.949515	0.0107074	2	(124)	9,989	10,016	1	No adjustment, May 03 okay, aux steam unit
tor	108.7307	7.752421	0.006565	119.9209	8.324337	0.01	(6)	(88)	10,144	10,186	1.00000	Okay
tor	96.4886965	7.775881	0.006717	128.2775	8.03514	0.0074353					1.0000	

S Generator ABC Coefficients IOC

	Gross			Net			
ie	A	B	C	A	B	C	Comments
	42.40305666	10.03887	0.003761	54.92906	10.16683	0.00774329	
	56.68216	8.941716	0.019832	62.67367	9.403831	0.01947	
	45.28206382	8.763158	0.027314	67.13639	8.193284	0.04362403	-
	40.02604735	9.198303	0.024062	49.46043	9.31119	0.03203289	-
tor	37.2135243	9.561239	0.019799	32.97369	10.73819	0.0104794	54 FWH back
tor	58.0588777	8.184465	0.022957	62.08097	8.697689	0.0209455	-
tor	63.2799436	7.881447	0.012505	61.48035	8.647863	0.0089561	Update, no change in Aux. MW curves
tor	101.2713644	6.42499	0.024758	105.5086	6.940702	0.023423	Update and on aux. steam header
	191.86665	7.60161	0.02834	192.565	7.60753	0.02832	-
	193.89893	7.392846	0.029013	194.6036	7.397606	0.028991	-
tor	44.9070554	8.221735	0.008088	50.08378	8.812857	0.0055022	Improved performance-off aux. steam header
tor	67.8455155	7.436632	0.014839	66.70119	8.293533	0.0103496	
tor	83.7719745	6.996573	0.016991	103.6235	7.084067	0.0184625	
tor	77.2369122	7.346801	0.013887	82.46542	7.949515	0.0107074	Update on aux. steam header
tor	108.7306886	7.752421	0.006565	119.9209	8.324337	0.0052993	Update, no change in Aux. MW curves
tor	96.4886965	7.775881	0.006717	128.2775	8.03514	0.0074353	Updated due to high Op NHR var.

ustment Factor * EMS I/O ABC Constant

upon OpNHR or upcoming feedwater heater outages, etc.

W4, W5, W6, K2, K3, W9, W10

Adjustment Factor = (1 + OpNHR Var/OpNHR) on YTD basis

Adjustment Factor = CF*2*7/365 + (1 + OpNHR Var/OpNHR)*(365-2*7)/365*

CF = 1.036 or estimated impact for 2 FWHs out of service 2 weeks

Weighting based upon calendar days

Adjustment Factor = CF*8*7/365+1*(365-8*7)/365

CF = 1.01 or estimated impact for 1 FWH out of service 8 weeks

Weighting based upon calendar days

For W8

Adjustment Factor = CF*2*7/365+1*(365-2*7)/365

CF = 1.01 or estimated impact for 1 FWH out of service 2 weeks

Weighting based upon calendar days

For H9, K1, K4, K5, K6-no adjustment factor

K1 uses previous ABC.

OpNHR = Operational Net Heat Rate

OpNHR = Sum of Energy Consumption for Period / Sum of Net Generation for Period

Energy Consumption (Mbtu/Hr) = A + B*MW + C*MW*MW, using gross ABCs and gross MWs.

Startup energy consumption added in when unit started up from outage

Net MW = gross MW - auxiliary load

Auxiliarly load = calculated as shown in 2 below.

OpNHR Var = Recorded Heat Rate - OpNHR, for period shown

Actual values for OpNHR and OpNHR Var shown. Worksheet calculations for the time of the analysis are not available. Original files were overwritten as 2003 was completed.

W Baseline Curves to be used in 2004 Op NHR Calc

Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	Offline MW-Turning Gear	Daily-KWH	Comments
					0.067	1,598	
					0.055	1,322	
27	0.01622	1.18997	0.02307	1.30268	0.290	6,970	
27	0.01622	1.18997	0.02307	1.30268	0.182	4,365	
28	0.02029	1.1098	0.03095	1.00018	0.323	7,741	
28	0.02029	1.1098	0.03095	1.00018	0.177	4,247	
30	0.0194	1.1462	0.0261	1.3309	0.203	4,882	
28	0.0117	1.2747	0.0175	1.5065	0.176	4,233	
48	0.0043	2.2433	0.02135	2.00565	0.476	11,433	5/03 Subm
48	0.01369	1.70529	0.01792	2.06556	0.358	8,600	5/03 Subm
		0.1		0.1	0.037	884	
		0.1		0.1	0.018	424	
39	0.01962	1.84087	0.01893	2.29597	0.333	7,983	4/03 Subm
50	0.0153	1.8906	0.01971	2.37624	0.372	8,933	5/03 Subm
49	0.0178	1.826	0.0165	2.2644	0.275	6,600	
39	0.0178	1.826	0.0165	2.2991	0.218	5,221	5/03 Subm
80	0.00728	4.025	0.02422	3.53442	0.696	16,706	5/03 Subm
80	0.0164	4.17806	0.02988	3.84886	0.522	12,538	

Auxiliary MW = Slope x Gross MW + Intercept

Slope1 and Intercept1 is used from minimum load to break MW

Slope2 and Intercept2 is used above break MW

When gross MW is equal to 0, offline MW is used for hourly auxiliary consumption.

o, originally completed on 6/9/03, additional notes added on 2/8/05.

SUPPORTING WORKPAPERS FOR HONOLULU 8

H8ABC998.xls

UNIT	H8	Post-overhaul test-CORIOLIS									
Test Date	9/25/1998										
	Test Input/Output(No MVL Corrections)				Test Heat Rates		MVL/Circ.Wtr. Corr. Heat Rates				
Test Point	Gross MW	Aux. MW	Net MW	MBtu/Hr	Gross Btu/KWH	Net Btu/KWH	MVL Adj?	Gross Btu/KWH	Net Btu/KWH	Net Residual Btu/KWH	
1	25.120	1.732	23.388	297.10	11,827	12,703	NO	11,820	12,695	0	
2	36.320	2.094	34.226	412.19	11,349	12,043	NO	11,342	12,036	0	
3	46.368	2.488	43.880	516.32	11,135	11,767	NO	11,127	11,758	0	
4	0.000	0.000	0.000	0.00	0	0		0	0	0	
5	0.000	0.000	0.000	0.00	0	0		0	0	0	
6	0.000	0.000	0.000	0.00	0	0		0	0	0	
7	0.000	0.000	0.000	0.00	0	0		0	0	0	
8	0.000	0.000	0.000	0.00	0	0		0	0	0	
9	0.000	0.000	0.000	0.00	0	0		0	0	0	
10	0.000	0.000	0.000	0.00	0	0		0	0	0	

INPUT/OUTPUT ABC COEFFICIENTS	Gross	Net
Coefficients		
A	42.40305666	54.9290562
B	10.03886886	10.16682661
C	0.003760637	0.00774329
Equation Fit		
R-square	100.00%	100.00%
Std. Deviation	#DIV/0!	#DIV/0!

NOTE:
1. Acceptable ABC Coefficients must meet following criteria:
   A. R-Square>90%
   B. Net Heat Rate Residuals<Test Uncertainty.
   C. Standard Deviation < Test Uncertainty.
   D. Gross and Net Heat Rate Curves must have a similar shape as previous test results.
2. Net Residual = ABC Heat Rate - Test Calculation
3. ABC Coefficients curve fitted to test MBtu/HR and MVL corrected gross & net MW.

COMMENTS:

NHR

24 12641.3762

UNIT	H8	
Test Date	9/25/1998	CORIOLIS GPM Data from KLBs and 20.3 API

Instructions: Input data as shown. Blank out cells that do not have test data. Type "y" for mean of the valve loop correction, "n" for no correction.

Primary Input/Output Data

Test Point	M.V.L Correction?	Duration (Minutes)	Gross Std. KWH Start	Gross Std. KWH End	Aux. Std. KWH Start	Aux. Std. KWH End	Fuel Oil Meter (Gallons, 60°F) Start	Fuel Oil Meter (Gallons, 60°F) End	Correction Factor	HHV (MBtu/Bbl)
1	n	45	0	2355	0	2706	0	1508.497192	1.0000	6.204
2	n	21	0	1589	0	1527	0	974.454949	1.0000	6.218
3	n	15	0	1449	0	1296	0	876.9567496	1.0000	6.182
4										
5										
6										
7										
8										
9										
10										

Secondary Data for Mean of the Valve Loop Correction

Test Point	Pressure(PSIA) Throttle	Pressure(PSIA) Cold RH	Enthalpy (Btu/Lbm) Throttle	Enthalpy (Btu/Lbm) Cold RH	Throttle Flow (Lbm/HR)
1					222,821
2					315,293
3					403,196
4					
5					
6					
7					
8					
9					
10					
VWO-NP					576,667

Condenser Correction Data

CWIT Deg. F	Circ. Wtr GPM	Unplug. Tubes
80.2	74,000	6,041
80.5	74,000	6,041
80.5	74,000	6,041

Correct to CWIT of: y | 79.8 F?

Note:
1. Version 3, 5/96
2. ABCs from curve fit of MBtu/Hr vs MW.
3. MVL correction by SDG&E method.
4. MVL & Condens. correct MW.
5. By A.W.K. Ho, TE

H8ABC998.xls

Note: To add units, input below last unit and do an descending alphabetical sort.

	Auxiliary KWH
8	0.48
8	0.48
2	0.48
2	0.48
2	0.48
2	0.48
9	1.4
9	1.4
6	0.048
6	0.48
6	0.48
8	0.48
8	0.48
2	0.48
2	0.48
6	0.048

H8ABC998.xls

UNIT	H8						
Test Date	9/25/1998						

UNCORRECTED OUTPUT

Test Point	Gross MW	Aux. MW	Net MW	Corr. Flow Bbl/Hr	MBtu/Hr	Gross Heat Rate Btu/KWH	Net Heat Rate Btu/KWH
1	25.120	1.732	23.388	47.889	297.10	11,827	12,703
2	36.320	2.094	34.226	66.289	412.19	11,349	12,043
3	46.368	2.488	43.880	83.520	516.32	11,135	11,767
4	0.000	0.000	0.000	0.000	0.00	0	0
5	0.000	0.000	0.000	0.000	0.00	0	0
6	0.000	0.000	0.000	0.000	0.00	0	0
7	0.000	0.000	0.000	0.000	0.00	0	0
8	0.000	0.000	0.000	0.000	0.00	0	0
9	0.000	0.000	0.000	0.000	0.00	0	0
10	0.000	0.000	0.000	0.000	0.00	0	0

ADJUSTED OUTPUT

Test Point	HP Eff. Change	MVL MW Correction	Circ. Corr Factor	Corrected Gross MW	Corrected Net MW	MBtu/Hr	Gross Heat Rate Btu/KWH	Net Heat Rate Btu/KWH
1	#DIV/0!	#DIV/0!	1.000582	25.135	23.403	297.10	11,820	12,695
2	#DIV/0!	#DIV/0!	1.000567	36.341	34.246	412.19	11,342	12,036
3	#DIV/0!	#DIV/0!	1.000723	46.402	43.913	516.32	11,127	11,758
4	0.000	0.000	0	0.000	0.000	0.00	0	0
5	0.000	0.000	0	0.000	0.000	0.00	0	0
6	0.000	0.000	0	0.000	0.000	0.00	0	0
7	0.000	0.000	0	0.000	0.000	0.00	0	0
8	0.000	0.000	0	0.000	0.000	0.00	0	0
9	0.000	0.000	0	0.000	0.000	0.00	0	0
10	0.000	0.000	0	0.000	0.000	0.00	0	0

GROSS ABC CALCULATION

Point	Independent	Dependent	x*x	x*y	x*x*y	x*x*x	x*x*x*x
1	25.135	297.102	631.749732	7467.55233	187694.1807	15878.79711	399107.7238
2	36.341	412.188	1320.63777	14979.14433	544350.7957	47992.74274	1744084.116
3	46.402	516.319	2153.09985	23957.96697	1111685.771	99907.07751	4635838.951
4	0.000	0.000	0	0	0	0	0
5	0.000	0.000	0	0	0	0	0
6	0.000	0.000	0	0	0	0	0
7	0.000	0.000	0	0	0	0	0
8	0.000	0.000	0	0	0	0	0
9	0.000	0.000	0	0	0	0	0
10	0.000	0.000	0	0	0	0	0
Total	107.8767193	1225.608654	4105.48735	46404.66362	1843730.747	163778.6174	6779030.792
			Denominator		-5748844.154		
Number of Samples		3					
Coefficients							
	A	42.40305666					
	B	10.03886886					
	C	0.003760637					

NET ABC CALCULATION

Point	Independent	Dependent	x*x	x*y	x*x*y	x*x*x	x*x*x*x
1	23.403	297.102	547.690679	6953.019006	162720.0584	12817.49111	299965.08
2	34.246	412.188	1172.81651	14115.95238	483420.6754	40164.75372	1375498.574
3	43.913	516.319	1928.36799	22673.20075	995652.5034	84680.78396	3718603.097
4	0.000	0.000	0	0	0	0	0
5	0.000	0.000	0	0	0	0	0
6	0.000	0.000	0	0	0	0	0
7	0.000	0.000	0	0	0	0	0
8	0.000	0.000	0	0	0	0	0
9	0.000	0.000	0	0	0	0	0
10	0.000	0.000	0	0	0	0	0
Total	101.5623878	1225.608654	3648.87518	43742.17214	1641793.237	137663.0288	5394066.751
			Denominator		-4622318.41		
Number of Samples		3					
Coefficients							
	A	54.9290562					
	B	10.16682661					
	C	0.00774329					

Condenser Data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	UNIT	H8														
2	Test Date	9/25/1998														
3																
4			Circ. Water Data	Circ. Water	Average	Condenser Data										Reference Only
5		Unit	Density-Lb/Ft3	Cp	CWIT-F	Tube Diam. in.	Tube Thickness	Effective Length	Cl.Surf. Area-Ft2	Duty Slope	Duty Const.	C	C1	C2	No. tubes	Circ. Wtr GPM
6		H8	63.9	0.955	79.8	0.875	0.049	28	40,000	4,959,972	25,547,491	263	0.85	0.97	6236	59,920
7		H9	63.9	0.955	79.8	0.875	0.049	28	40,000	4,959,972	25,547,491	263	0.85	0.97	6236	59,920
8		K1	63.9	0.955	78.6	0.875	0.025	30	55,000	4,219,836	32,427,093	263	0.85	0.83	8004	72,000
9		K2	63.9	0.955	78.6	0.875	0.025	30	55,000	4,219,836	32,427,093	263	0.85	0.83	8004	72,000
10		K3	63.9	0.955	78.6	0.875	0.025	30	57,000	4,260,243	21,707,144	263	0.85	0.83	8300	74,000
11		K4	63.9	0.955	78.6	0.875	0.025	30	57,000	4,260,243	21,707,144	263	0.85	0.83	8300	74,000
12		K5	63.9	0.955	78.6	1	0.035	28	90,338	4,367,365	31,674,023	263	0.85	0.77	12328	147,300
13		K6	63.9	0.955	78.6	0.875	0.035	28	97,069	4,367,365	31,674,023	263	0.85	0.77	15132	147,300
14		W3	63.9	0.955	79.8	0.875	0.049	22	47,500	5,373,872	22,220,991	263	0.85	0.97	9424	47,200
15		W4	63.9	0.955	79.8	0.875	0.049	22	47,500	5,195,054	26,791,573	263	0.85	0.97	9424	47,200
16		W5	63.9	0.955	79.8	0.875	0.049	28	40,000	5,069,410	22,318,378	263	0.85	0.97	6236	55,340
17		W6	63.9	0.955	79.8	0.875	0.049	28	40,000	5,069,410	22,318,378	263	0.85	0.97	6236	55,340
18		W7	63.9	0.955	79.8	0.875	0.049	29.77083333	57,000	4,160,493	29,686,117	263	0.85	0.97	8300	74,000
19		W8	63.9	0.955	79.8	0.875	0.049	29.77083333	57,000	4,160,493	29,686,117	263	0.85	0.97	8300	74,000
20					1995 Historical											
21																
22				MW Corr. = A*F^2 + B*F + C												
23		Unit	Vacuum	A	B	C	Comments									
24	1	H8-1	1	3.1E-13	-3.1E-07	0.091253171	Uses W5/6									
25	2	H8-2	1.5	0.0E+00	-5.4E-08	0.032650484	Uses W5/6									
26	3	H8-3	2	0.0E+00	0.0E+00	0	Uses W5/6									
27	4	H8-4	2.5	0.0E+00	3.6E-08	-0.026229413	Uses W5/6									
28	5	H8-5	3	0.0E+00	6.1E-08	-0.050658617	Uses W5/6									
29	6	H9-1	1	3.1E-13	-3.1E-07	0.091253171	Uses W5/6									
30	7	H9-2	1.5	0.0E+00	-5.4E-08	0.032650484	Uses W5/6									
31	8	H9-3	2	0.0E+00	0.0E+00	0	Uses W5/6									
32	9	H9-4	2.5	0.0E+00	3.6E-08	-0.026229413	Uses W5/6									
33	10	H9-5	3	0.0E+00	6.1E-08	-0.050658617	Uses W5/6									
34	11	K1-1	1	1.52E-13	-2.23E-07	0.087961664										
35	12	K1-2	1.5	0	-3.56E-08	0.028721437										
36	13	K1-3	2	0	0	0										
37	14	K1-4	2.5	0	1.85E-08	-0.020892487										
38	15	K1-5	3.5	0	4.02E-08	-0.053981446										
39	16	K2-1	1	1.52E-13	-2.2E-07	0.087961664										
40	17	K2-2	1.5	0	-3.6E-08	0.028721437										
41	18	K2-3	2	0	0.0E+00	0										
	19	K2-4	2.5	0	1.8E-08	-0.020892487										
	20	K2-5	3.5	0	4.0E-08	-0.053981446										
	21	K3-1	1	2.45E-13	-3.11E-07	0.105162812										
45	22	K3-2	1.5	0	-5.12E-08	0.033785678										
46	23	K3-3	2	0	0	0										
47	24	K3-4	2.5	0	3.50E-08	-0.027770582										
48	25	K3-5	3	0	6.14E-08	-0.051311549										
49	26	K4-1	1	2.5E-13	-3.1E-07	0.105162812										
50	27	K4-2	1.5	0.0E+00	-5.1E-08	0.033785678										
51	28	K4-3	2	0.0E+00	0.0E+00	0										
52	29	K4-4	2.5	0.0E+00	3.5E-08	-0.027770582										
53	30	K4-5	3	0.0E+00	6.1E-08	-0.051311549										
54	31	K5-1	1.5	3.20E-14	-7.26E-08	0.039341205										
55	32	K5-2	2	0	0	0										
56	33	K5-3	2.5	0	2.43E-08	-0.025513084										
57	34	K5-4	3	0	4.10E-08	-0.046816224										
58	35	K5-5	3.5	0	5.57E-08	-0.066850645										
59	36	K6-1	1.5	3.2E-14	-7.3E-08	0.039341205										
60	37	K6-2	2	0.0E+00	0.0E+00	0										
61	38	K6-3	2.5	0.0E+00	2.4E-08	-0.025513084										
62	39	K6-4	3	0.0E+00	4.1E-08	-0.046816224										
63	40	K6-5	3.5	0.0E+00	5.6E-08	-0.066850645										
64	41	W3-1	1	3.12E-13	-3.09851E-07	0.091253171	Uses W5/6									
65	42	W3-2	1.5	0	-5.44605E-08	0.032650484	Uses W5/6									
66	43	W3-3	2	0	0	0	Uses W5/6									
67	44	W3-4	2.5	0	3.56144E-08	-0.026229413	Uses W5/6									
68	45	W3-5	3	0	6.07846E-08	-0.050658617	Uses W5/6									
69	46	W4-1	1	3.12E-13	-3.09851E-07	0.091253171	Uses W5/6									
70	47	W4-2	1.5	0	-5.44605E-08	0.032650484	Uses W5/6									
71	48	W4-3	2	0	0	0	Uses W5/6									
72	49	W4-4	2.5	0	3.56144E-08	-0.026229413	Uses W5/6									
73	50	W4-5	3	0	6.07846E-08	-0.050658617	Uses W5/6									
74	51	W5-1	1	3.1E-13	-3.1E-07	0.091253171										
75	52	W5-2	1.5	0.0E+00	-5.4E-08	0.032650484										
76	53	W5-3	2	0.0E+00	0.0E+00	0										
77	54	W5-4	2.5	0.0E+00	3.6E-08	-0.026229413										
78	55	W5-5	3	0.0E+00	6.1E-08	-0.050658617										
79	56	W6-1	1	3.1E-13	-3.1E-07	0.091253171										
80	57	W6-2	1.5	0.0E+00	-5.4E-08	0.032650484										
81	58	W6-3	2	0.0E+00	0.0E+00	0										
82	59	W6-4	2.5	0.0E+00	3.6E-08	-0.026229413										
83	60	W6-5	3	0.0E+00	6.1E-08	-0.050658617										
84	61	W7-1	1	1.73E-13	-2.37E-07	0.091283465										
85	62	W7-2	1.5	0.00E+00	-3.78E-08	0.029755102										
86	63	W7-3	2	0	0	0										
87	64	W7-4	2.5	0	2.94E-08	-0.026387755										
	65	W7-5	3	0	4.68E-08	-0.046136054										
	66	W8-1	1	1.7E-13	-2.4E-07	0.091283465										
	67	W8-2	1.5	0.0E+00	-3.8E-08	0.029755102										
91	68	W8-3	2	0.0E+00	0.0E+00	0										
92	69	W8-4	2.5	0.0E+00	2.9E-08	-0.026387755										
93	70	W8-5	3	0.0E+00	4.7E-08	-0.046136054										

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	UNIT	H8														
2	Test Date	[illegible]														
3																
4	No.	INPUT DATA				MANUFACTURER DATA										
5				Cooling Wtr	Unplugged	Tube	Tube	Condenser Duty		Estimated						
6		Load	CWIT	Flow-GPM	Tubes	OD In.	Thick. In	Slope	Intercept	Circ. Dens.	C	C1	C2	Co of Circ.	CWIT-Nom.	Cooling Area
7	1	25.12	80.2	74,000	6,041	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
8	2	36.32	80.5	74,000	6,041	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
9	3	46.368	80.5	74,000	6,041	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
10	4	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
11	5	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
12	6	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
13	7	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
14	8	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
15	9	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
16	10	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
17	No.	COMMON CALCULATION SECTION														
18		Velocity	Conden.													
19		Ft/Sec	Duty-Btu/Hr	Mass-Lb/HR	CWOT-CWIT		Lookup Table for Unit MW Vacuum Correction									
20	1	8.288360716	150,141,988	37,927,155	4.145228965			Vac.	A	B	C					
21	2	8.288360716	205,693,674	37,927,155	5.678940242			0	3.12E-13	-3.1E-07	0.091253					
22	3	8.288360716	255,531,473	37,927,155	7.054898359		H8-1	1	3.12E-13	-3.1E-07	0.091253					
23	4	#DIV/0!	25,547,491	0	#DIV/0!		H8-2	1.5	0	-5.4E-08	0.03265					
24	5	#DIV/0!	25,547,491	0	#DIV/0!		H8-3	2	0	0	0					
25	6	#DIV/0!	25,547,491	0	#DIV/0!		H8-4	2.5	0	3.56E-08	-0.02623					
26	7	#DIV/0!	25,547,491	0	#DIV/0!		H8-5	3	0	6.08E-08	-0.05066					
27	8	#DIV/0!	25,547,491	0	#DIV/0!		Note Vacuum at 0 in Hg is at 1 in Hg.									
28	9	#DIV/0!	25,547,491	0	#DIV/0!											
29	10	#DIV/0!	25,547,491	0	#DIV/0!											

	A	B	C	D	E	F	G	H	I
30	No.	Calculation at Actual CWIT							
31		General							
32		C3	U	Tsat-Calc.	Tsat-TTD	Psat-Calc.	Psat-TTD	Psat-Lim	Psat-inHg
33	1	1.03825	648.160663	88.308869	89.34522897	1.342412	1.38691	1.380883	1.38691
34	2	1.039375	648.8629801	91.6008751	91.17894024	1.489155	1.469467	1.391982	1.489155
35	3	1.039375	648.8629801	94.2905212	92.55489836	1.620739	1.534624	1.391982	1.620739
36	4	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
37	5	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
38	6	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
39	7	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
40	8	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
41	9	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
42	10	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
43	No.	Calculation at Average CWIT							
44		General							
45		C3	U	Tsat-Calc.	Tsat-TTD	Psat-Calc.	Psat-TTD	Psat-Lim	Psat-inHg
46	1	1.03675	647.2242402	87.9168994	88.94522897	1.32599	1.36955	1.36627	1.36955
47	2	1.03675	647.2242402	90.5201063	90.47894024	1.457517	1.437375	1.36627	1.457517
48	3	1.03675	647.2242402	93.6144119	91.85489836	1.586673	1.501132	1.36627	1.586673
49	4	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
50	5	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
	6	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
	7	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
	8	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
	9	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
	10	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!

	J	K	L	M	N	O	P
31	Low Vacuum Calculation						
32	Thr. Flow	Low Vac.	Vac.	A	B	C	%
33	222.821	1.38691	1	3.12E-13	-3.1E-07	0.09125317	3.77%
34	315.293	1.489155	1	3.12E-13	-3.1E-07	0.09125317	2.46%
35	403.196	1.620739	1.5	0	-5.4E-08	0.03265048	1.07%
36	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
37	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
38	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
39	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
40	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
41	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
42	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
44	Low Vacuum Calculation						
45	Thr. Flow	Low Vac.	Vac.	A	B	C	%
46	222.821	1.36955	1	3.12E-13	-3.1E-07	0.09125317	3.77%
47	315.293	1.457517	1	3.12E-13	-3.1E-07	0.09125317	2.46%
48	403.196	1.586673	1.5	0	-5.4E-08	0.03265048	1.07%
49	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
50	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

	Q	R	S	T	U	V	W	X
31	Higher Vacuum Calculation							Interpolated
32	Thr. Flow	High Vac.	Vac.	A	B	C	%	%
33	222.821	1.886909545	1.5	0	-5.4461E-08	0.03265	2.05%	2.44%
34	315.293	1.989154571	1.5	0	-5.4461E-08	0.03265	1.55%	1.57%
35	403.196	2.120739004	2	0	0	0	0.00%	0.81%
36	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
37	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
38	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
39	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
40	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
41	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
42	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
44	Higher Vacuum Calculation							Interpolated
45	Thr. Flow	High Vac.	Vac.	A	B	C	%	%
46	222.821	1.869550169	1.5	0	-5.4461E-08	0.03265	2.05%	2.50%
47	315.293	1.957517159	1.5	0	-5.4461E-08	0.03265	1.55%	1.63%
48	403.196	2.086672585	2	0	0	0	0.00%	0.68%
49	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
50	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

	A	B
56	No.	Corr. Fact.
57		MW %
58		to Avg F
59	1	1.000582489
60	2	1.000566635
61	3	1.000722631
62	4	#DIV/0!
63	5	#DIV/0!
64	6	#DIV/0!
65	7	#DIV/0!
66	8	#DIV/0!
67	9	#DIV/0!
68	10	#DIV/0!

	A	B	C	D	E	F
69						
70		Note:				
71		Calculations based on the following:				
72		1. Formulas used				
73			Q = U*A*LMTD			
74				Q = Condenser Duty, Btu/Hr		
75				A = Condenser Surface Area available for heat transfer, Ft2		
76				LMTD = Log mean temperature difference		
77					LMTD = (CWOT - CWIT)/(ln(Tsat - CWIT)/(Tsat - CWOT))	
78						CWOT = Circ. Water Outlet Temp., F
79						CWIT = Circ. Water Inlet Temp., F
80						Tsat = Condensing steam saturation temperature
81				U = Heat Transfer Coefficient		
82					U = C*C1*C2*C3*Sqrt(V)	
83						CSqrt(V) = Ideal heat transfer coefficient
84					C1 = Cleanliness Factor	
85					C2 = Material Correction Factor	
86					C3 = Inlet Water Correction Factor	
87			Q = w*Cp*(CWOT - CWIT)			
88				w = Mass flow of Circ. Water, Lb/HR		
89				Cp = Specific heat capacity of circ. water, Btu/(Lb-F)		
90			Using the above two equations, Tsat is found			
91			Tsat = CWIT + [(Q/(w*Cp)) /(1 - exp(-U*A/(w*Cp))]			
92				Q is determined from manufacturer heat balances.		
93		Checks must be made that the condenser backpressure is realistic. HEI has determined that Tsat should not be below 5 F TTD.				
94			Tsat-TTD = CWIT + (CWOT - CWIT) + 5			
95		Moreover, at minimum loads air removal systems are limited and HEI has determined a minimum curve for Psat.				
96			Psat-Min = 0.0006614719*CWIT^2 - 0.0693021645*CWIT + 2.6843030303			
97		Psat is calculated for the Tsat's above and the maximum is taken as Psat.				
98			Psat = 0.000726771308957*Tsat^2 - 0.086177950400781*Tsat + 3.2849954516314			
99		2. Method: The purpose is to determine the MW correction factor to adjust test conditions to average CWIT conditions.				
100		a. Input/Condenser manufacturer data is looked up based upon the unit.				
101		b. Calculation of variables that are common to other calculations is done.				
102		c. The MW correction factor is done at actual CWIT.				
103			1) Tsat is calculated			
104			(2) The MW correction factor is found through interpolation.			
105				(a) MW correction factor is found at the lower curve.		
106				b) MW correction factor is found at the higher curve.		
107					If backpressure is below 2" and correction factor becomes negative, the correction factor is set to 0.	
108					If backpressure is above 2" and correction factor becomes positive, the correction factor is set to 0.	
					The curves asymptotically approach 0 correction and should not pass the x-axis.	
				(c) Interpolation is done now.		
		d. The MW correction factor is calculated at average CWIT.				
			1) Same procedures as in c above.			
		e. The correction factors are ratioed to correct the test to average CWIT conditions. The formula used is:				
114			CF = (1 + CFavg) / (1 + CFtest)			
115			From heat balance correction			
116			MW-1 = (1 + CF-1) MW-design			
117			MW-2 = (1 + CF-2)*MW-design			
118			If 1 is the average condition, to go from 2 to 1			
119			MW-1 = (1 + CF-1)/((1 + CF-2) * MW-2			

H8ABC998.xls

	A	B	C	D	E	F	G
1	UNIT	**H8**					
2	Test Date	**9/25/1998**					
3	**Gross ABC Coefficients**						
4							
5	Gross						
6	A	42.40305666					
7	B	10.03886886					
8	C	0.003760637					
9							
10	Point	Gross MW	ABC	Test	Residual	Test-Sqr	SS(Residual)
11	1	25.13463212	11,820	11,820	0	139,722,522	0
12	2	36.34058019	11,342	11,342	0	128,649,050	0
13	3	46.40150695	11,127	11,127	0	123,814,521	0
14	4	0	0	0	0	0	0
15	5	0	0	0	0	0	0
16	6	0	0	0	0	0	0
17	7	0	0	0	0	0	0
18	8	0	0	0	0	0	0
19	9	0	0	0	0	0	0
20	10	0	0	0	0	0	0
21		Sum		34,290		392,186,094	0
22							
23		SS(Total)	251804.9791				
24		R-Square	1				
25		Std.Dev.	#DIV/0!				
26							
27							
28							
29							
30							
31							
32							
33							
34							
35	**Net ABC Coefficients**						
36							
37	Net						
38	A	54.9290562					
39	B	10.16682661					
40	C	0.00774329					
41							
42	Point	Net MW	ABC	Test	Residual	Test-Sqr	SS(Residual)
43	1	[illegible]	[illegible]	[illegible]	0	[illegible]	0

SUPPORTING WORKPAPERS FOR HONOLULU 9

H9ABC696.XLS

VL Corrections)			Test Heat Rates		MVL/Circ.Wtr. Corr. Heat Rates			
W	Net MW	MBtu/Hr	Gross Btu/KWH	Net Btu/KWH	MVL Adj?	Gross Btu/KWH	Net Btu/KWH	Net Residual Btu/KWH
	22.886	287.30	11,713	12,553	NO	11,725	12,566	24
	33.366	399.66	11,275	11,978	NO	11,282	11,986	-54
	43.052	501.19	11,049	11,642	NO	11,058	11,652	46
	51.515	599.18	11,066	11,631	NO	11,073	11,638	-15
	0.000	0.00	0	0		0	0	0
	0.000	0.00	0	0		0	0	0
	0.000	0.00	0	0		0	0	0
	0.000	0.00	0	0		0	0	0
	0.000	0.00	0	0		0	0	0
	0.000	0.00	0	0		0	0	0

7326
1106
9577

97%
6.41

NOTE:
1. Acceptable ABC Coefficients must meet following criteria:
   A. R-Square>90%
   B. Net Heat Rate Residuals<Test Uncertainty.
   C. Standard Deviation < Test Uncertainty.
   D. Gross and Net Heat Rate Curves must have a similar shape as previous test results.
2. Net Residual = ABC Heat Rate - Test Calculation
3. ABC Coefficients curve fitted to test MBtu/HR and MVL corrected gross & net MW.

UNIT	H9	
Test Date	6/20/1996	Post-overhaul adjusted to constant throttle

Instructions: Input data as shown. Blank out cells that do not have test data. Type "y" for mean of the valve loop correction, "n" for no correction.

Primary Input/Output Data

Test Point	M.V.L Correction?	Duration (Minutes)	Gross Std. KWH Start	Gross Std. KWH End	Aux. Std. KWH Start	Aux. Std. KWH End	Fuel Oil Meter (Gallons, 60°F) Start	Fuel Oil Meter (Gallons, 60°F) End	Correction Factor	HHV (MBtu/Bbl)
1	n	20	0	1022	0	1140	9478	10130	1.0000	6.169
2	n	20	0	1477	0	1446	11528	12435	1.0000	6.169
3	n	20	0	1890	0	1603	15418	16558	1.0000	6.155
4	n	30	0	3384	0	2739	20744	22784	1.0000	6.168
5										
6										
7										
8										
9										
10										

Secondary Data for Mean of the Valve Loop Correction

Test Point	Pressure(PSIA) Throttle	Pressure(PSIA) Cold RH	Enthalpy (Btu/Lbm) Throttle	Enthalpy (Btu/Lbm) Cold RH	Throttle Flow (Lbm/HR)	CWIT Deg. F	Circ. Wtr GPM	Unplug. Tubes
1	1872.02	164	1484.49	1329.74	220,000	79	74,000	5,962
2	1862.02	273.66	1477.97	1324.15	310,000	79	74,000	5,962
3	1855.02	334.83	1478.2	1334.14	395,000	79	74,000	5,962
4	1828.35	465.16	1478.44	1346.27	470,000	79	74,000	5,962
5								
6								
7								
8								
9								
10								
VWO-NP					576,667			

Condenser Correction Data

Correct to CWIT of: y **79.8 F?**

Note:
1. Version 3, 5/96
2. ABCs from curve fit of MBtu/Hr vs MW.
3. MVL correction by SDG&E method.
4. MVL & Condens. correct MW.
5. By A.W.K. Ho, TE

UNIT	H9
Test Date	6/20/1996

Note: To add units, input below last unit and do an descending alphabetical sort.

Unit	Gross MWH	Auxiliary KWH
H8	0.008	0.48
H9	0.008	0.48
K1	0.012	0.48
K2	0.012	0.48
K3	0.012	0.48
K4	0.012	0.48
K5	0.0189	1.4
K6	0.0189	1.4
W10	0.0096	0.048
W3	0.006	0.48
W4	0.006	0.48
W5	0.008	0.48
W6	0.008	0.48
W7	0.012	0.48
W8	0.012	0.48
W9	0.0096	0.048

H9ABC696.XLS

UNIT	H9							
Test Date	6/20/1996							

UNCORRECTED OUTPUT

Test Point	Gross MW	Aux. MW	Net MW	Corr. Flow Bbl/Hr	MBtu/Hr	Gross Heat Rate Btu/KWH	Net Heat Rate Btu/KWH
1	24.528	1.642	22.886	46.571	287.30	11,713	12,553
2	35.448	2.082	33.366	64.786	399.66	11,275	11,978
3	45.360	2.308	43.052	81.429	501.19	11,049	11,642
4	54.144	2.629	51.515	97.143	599.18	11,066	11,631
5	0.000	0.000	0.000	0.000	0.00	0	0
6	0.000	0.000	0.000	0.000	0.00	0	0
7	0.000	0.000	0.000	0.000	0.00	0	0
8	0.000	0.000	0.000	0.000	0.00	0	0
9	0.000	0.000	0.000	0.000	0.00	0	0
10	0.000	0.000	0.000	0.000	0.00	0	0

ADJUSTED OUTPUT

Test Point	HP Eff. Change	MVL MW Correction	Circ. Corr Factor	Corrected Gross MW	Corrected Net MW	MBtu/Hr	Gross Heat Rate Btu/KWH	Net Heat Rate Btu/KWH
1	-0.947	-0.094	0.999024	24.504	22.862	287.30	11,725	12,566
2	-1.294	-0.181	0.999352	35.425	33.343	399.66	11,282	11,986
3	-1.249	-0.208	0.999167	45.322	43.014	501.19	11,058	11,652
4	-1.337	-0.243	0.999436	54.113	51.484	599.18	11,073	11,638
5	0.000	0.000	0	0.000	0.000	0.00	0	0
6	0.000	0.000	0	0.000	0.000	0.00	0	0
7	0.000	0.000	0	0.000	0.000	0.00	0	0
8	0.000	0.000	0	0.000	0.000	0.00	0	0
9	0.000	0.000	0	0.000	0.000	0.00	0	0
10	0.000	0.000	0	0.000	0.000	0.00	0	0

GROSS ABC CALCULATION

Point	Independent	Dependent	x*x	x*y	x*x*y	x*x*x	x*x*x*x
1	24.504	287.299	600.449008	7039.995736	172508.4853	14713.43915	360539.0111
2	35.425	399.663	1254.93185	14158.07122	501549.918	44455.98254	1574853.951
3	45.322	501.193	2054.1038	22715.17387	1029502.15	93096.54799	4219342.404
4	54.113	599.177	2928.26719	32423.55188	1754550.768	158458.6887	8574748.734
5	0.000	0.000	0	0	0	0	0
6	0.000	0.000	0	0	0	0	0
7	0.000	0.000	0	0	0	0	0
8	0.000	0.000	0	0	0	0	0
9	0.000	0.000	0	0	0	0	0
10	0.000	0.000	0	0	0	0	0
Total	159.3647861	1787.332214	6837.75184	76336.79271	3458111.322	310724.6563	14729484.1
			Denominator		-73593032.12		
Number of Samples		4					
Coefficients							
	A	56.68216484					
	B	8.941716204					
	C	0.019832402					

NET ABC CALCULATION

Point	Independent	Dependent	x*x	x*y	x*x*y	x*x*x	x*x*x*x
1	22.862	287.299	522.692125	6568.365463	150188.9006	11950.02935	273037.0579

Condenser Data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	UNIT	H9														
2	Test Date	6/20/1996														
3																
4			Circ. Water Data	Circ. Water	Average	Condenser Data										Reference Only
5		Unit	Density-Lb/Ft3	Cp	CWIT-F	Tube Diam. In.	Tube Thickness	Effective Length	CLSurf. Area-Ft2	Duty Slope	Duty Const.	C	C1	C2	No. tubes	Circ. Wtr GPM
6		H8	63.9	0.955	79.8	0.875	0.049	28	40,000	4,959,972	25,547,491	263	0.85	0.97	6236	59,920
7		H9	63.9	0.955	79.8	0.875	0.049	28	40,000	4,959,972	25,547,491	263	0.85	0.97	6236	59,920
8		K1	63.9	0.955	78.6	0.875	0.025	30	55,000	4,219,836	32,427,093	263	0.85	0.83	8004	72,000
9		K2	63.9	0.955	78.6	0.875	0.025	30	55,000	4,219,836	32,427,093	263	0.85	0.83	8004	72,000
10		K3	63.9	0.955	78.6	0.875	0.025	30	57,000	4,260,243	21,707,144	263	0.85	0.83	8300	74,000
11		K4	63.9	0.955	78.6	0.875	0.025	30	57,000	4,260,243	21,707,144	263	0.85	0.83	8300	74,000
12		K5	63.9	0.955	78.6	1	0.035	28	90,338	4,367,365	31,674,023	263	0.85	0.77	12328	147,300
13		K6	63.9	0.955	78.6	0.875	0.035	28	97,069	4,367,365	31,674,023	263	0.85	0.77	15132	147,300
14		W3	63.9	0.955	79.8	0.875	0.049	22	47,500	5,373,872	22,220,991	263	0.85	0.97	9424	47,200
15		W4	63.9	0.955	79.8	0.875	0.049	22	47,500	5,195,054	26,791,573	263	0.85	0.97	9424	47,200
16		W5	63.9	0.955	79.8	0.875	0.049	28	40,000	5,069,410	22,318,378	263	0.85	0.97	6236	55,340
17		W6	63.9	0.955	79.8	0.875	0.049	28	40,000	5,069,410	22,318,378	263	0.85	0.97	6236	55,340
18		W7	63.9	0.955	79.8	0.875	0.049	29.77083333	57,000	4,160,493	29,686,117	263	0.85	0.97	8300	74,000
19		W8	63.9	0.955	79.8	0.875	0.049	29.77083333	57,000	4,160,493	29,686,117	263	0.85	0.97	8300	74,000
20					1995 Historical											
21																
22				MW Corr. = A*F^2 + B*F + C												
23		Unit	Vacuum	A	B	C	Comments									
24	1	H8-1	1	3.1E-13	-3.1E-07	0.091253171	Uses W5/6									
25	2	H8-2	1.5	0.0E+00	-5.4E-08	0.032650484	Uses W5/6									
26	3	H8-3	2	0.0E+00	0.0E+00	0	Uses W5/6									
27	4	H8-4	2.5	0.0E+00	3.6E-08	-0.026229413	Uses W5/6									
28	5	H8-5	3	0.0E+00	6.1E-08	-0.050658617	Uses W5/6									
29	6	H9-1	1	3.1E-13	-3.1E-07	0.091253171	Uses W5/6									
30	7	H9-2	1.5	0.0E+00	-5.4E-08	0.032650484	Uses W5/6									
31	8	H9-3	2	0.0E+00	0.0E+00	0	Uses W5/6									
32	9	H9-4	2.5	0.0E+00	3.6E-08	-0.026229413	Uses W5/6									
33	10	H9-5	3	0.0E+00	6.1E-08	-0.050658617	Uses W5/6									
34	11	K1-1	1	1.52E-13	-2.23E-07	0.087961664										
35	12	K1-2	1.5	0	-3.56E-08	0.028721437										
36	13	K1-3	2	0	0	0										
37	14	K1-4	2.5	0	1.85E-08	-0.020892487										
38	15	K1-5	3.5	0	4.02E-08	-0.053981446										
39	16	K2-1	1	1.52E-13	-2.2E-07	0.087961664										
40	17	K2-2	1.5	0	-3.6E-08	0.028721437										
	18	K2-3	2	0	0.0E+00	0										
	19	K2-4	2.5	0	1.8E-08	-0.020892487										
	20	K2-5	3.5	0	4.0E-08	-0.053981446										
	21	K3-1	1	2.45E-13	-3.11E-07	0.105162812										
45	22	K3-2	1.5	0	-5.12E-08	0.033785678										
46	23	K3-3	2	0	0	0										
47	24	K3-4	2.5	0	3.50E-08	-0.027770582										
48	25	K3-5	3	0	6.14E-08	-0.051311549										
49	26	K4-1	1	2.5E-13	-3.1E-07	0.105162812										
50	27	K4-2	1.5	0.0E+00	-5.1E-08	0.033785678										
51	28	K4-3	2	0.0E+00	0.0E+00	0										
52	29	K4-4	2.5	0.0E+00	3.5E-08	-0.027770582										
53	30	K4-5	3	0.0E+00	6.1E-08	-0.051311549										
54	31	K5-1	1.5	3.20E-14	-7.26E-08	0.039341205										
55	32	K5-2	2	0	0	0										
56	33	K5-3	2.5	0	2.43E-08	-0.025513084										
57	34	K5-4	3	0	4.10E-08	-0.046816224										
58	35	K5-5	3.5	0	5.57E-08	-0.066850645										
59	36	K6-1	1.5	3.2E-14	-7.3E-08	0.039341205										
60	37	K6-2	2	0.0E+00	0.0E+00	0										
61	38	K6-3	2.5	0.0E+00	2.4E-08	-0.025513084										
62	39	K6-4	3	0.0E+00	4.1E-08	-0.046816224										
63	40	K6-5	3.5	0.0E+00	5.6E-08	-0.066850645										
64	41	W3-1	1	3.12E-13	-3.09851E-07	0.091253171	Uses W5/6									
65	42	W3-2	1.5	0	-5.44605E-08	0.032650484	Uses W5/6									
66	43	W3-3	2	0	0	0	Uses W5/6									
67	44	W3-4	2.5	0	3.56144E-08	-0.026229413	Uses W5/6									
68	45	W3-5	3	0	6.07846E-08	-0.050658617	Uses W5/6									
69	46	W4-1	1	3.12E-13	-3.09851E-07	0.091253171	Uses W5/6									
70	47	W4-2	1.5	0	-5.44605E-08	0.032650484	Uses W5/6									
71	48	W4-3	2	0	0	0	Uses W5/6									
72	49	W4-4	2.5	0	3.56144E-08	-0.026229413	Uses W5/6									
73	50	W4-5	3	0	6.07846E-08	-0.050658617	Uses W5/6									
74	51	W5-1	1	3.1E-13	-3.1E-07	0.091253171										
75	52	W5-2	1.5	0.0E+00	-5.4E-08	0.032650484										
76	53	W5-3	2	0.0E+00	0.0E+00	0										
77	54	W5-4	2.5	0.0E+00	3.6E-08	-0.026229413										
78	55	W5-5	3	0.0E+00	6.1E-08	-0.050658617										
79	56	W6-1	1	3.1E-13	-3.1E-07	0.091253171										
80	57	W6-2	1.5	0.0E+00	-5.4E-08	0.032650484										
81	58	W6-3	2	0.0E+00	0.0E+00	0										
82	59	W6-4	2.5	0.0E+00	3.6E-08	-0.026229413										
83	60	W6-5	3	0.0E+00	6.1E-08	-0.050658617										
84	61	W7-1	1	1.73E-13	-2.37E-07	0.091283465										
85	62	W7-2	1.5	0.00E+00	-3.78E-08	0.029755102										
86	63	W7-3	2	0	0	0										
87	64	W7-4	2.5	0	2.94E-08	-0.026387755										
	65	W7-5	3	0	4.68E-08	-0.046136054										
	66	W8-1	1	1.7E-13	-2.4E-07	0.091283465										
	67	W8-2	1.5	0.0E+00	-3.8E-08	0.029755102										
91	68	W8-3	2	0.0E+00	0.0E+00	0										
92	69	W8-4	2.5	0.0E+00	2.9E-08	-0.026387755										
93	70	W8-5	3	0.0E+00	4.7E-08	-0.046136054										

Condenser Calculation

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	SPIT	[redacted]														
2	Test Date	[redacted]														
3																
4	No.	INPUT DATA				MANUFACTURER DATA										
5				Cooling Wtr	Unplugged	Tube	Tube	Condenser Duty		Estimated						
6		Load	CWT	Flow-GPM	Tubes	OD In.	Thick. In	Slope	Intercept	Orc. Dens.	C	C1	C2	Co of Orc.	CWT-Nom.	Cooling Area
7	1	24.528	79	74,000	5,962	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
8	2	35.448	79	74,000	5,962	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
9	3	45.36	79	74,000	5,962	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
10	4	54.144	79	74,000	5,962	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
11	5	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
12	6	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
13	7	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
14	8	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
15	9	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
16	10	0	0	0	0	0.875	0.049	4959972	25547491	63.9	263	0.85	0.97	0.955	79.8	40,000
17	No.	COMMON CALCULATION SECTION														
18		Velocity	Condsn.													
19		Ft/Sec	Duty-Btu/Hr	Mass-Lb/HR	CWOT-CWT		Lookup Table for Unit MW Vacuum Correction									
20	1	8.398186361	147,205,684	37,927,155	4.064161369			Vac.	A	B	C					
21	2	8.398186361	201,368,578	37,927,155	5.559529864			0	3.12E-13	-3.1E-07	0.091253					
22	3	8.398186361	250,531,821	37,927,155	6.916864344		HG-1	1	3.12E-13	-3.1E-07	0.091253					
23	4	8.398186361	294,100,215	37,927,155	8.118737188		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					

HONOLULU 9 UNIT EFFICIENCY TEST DATA SHEET

Load: 24 MW

Date: 6/20/96

GENERAL	Instr/Units	Location	Reading #1 950	Reading #2 1000	Reading #3 1010	Average	
EMS Gross MWs	MWs	EMS Panel	23.9	24.6	23.7		
EMS Reactive Load	MVars	EMS Panel	18.1	18.2	19.1		
Gross KWH Meter	KWH Stnd	Contr Rm	Ø	513	1022		
Auxiliary KWH Meter	KWH Stnd	Turb Deck	Ø	592	1140		
BOILER							
Drum Pressure	psig	Test Gage	1401	1401	1401	~~[illegible]~~	1401
Excess O2	%	M4 Chart	4.9	5.0	4.7		
Steam Flow	lb/hr	M8 Chart	210,000	210,000	210,000	210,000	
Attemp Flow	lb/hr	M3 Chart	23,000	23,000	23,000	23,000	
FW Flow	lb/hr	M14 Chart	220,000	225,000	220,000		
PSH Gas Inlet Temp	F	Westron #19	1047	1050	1047		
AH #1 Gas In Temp	F	Westron #20	584	586	582		
AH #2 Gas In Temp	F	Westron #21	580	582	578		
Boiler Master H/A Station	control psi	Control Bd	16	15.5	15.5		
FD Fan H/A Station	control psi	Control Bd	14	13	14		
TURBINE							
Throttle Pressure	psig	Test Gage	1362	1362	1362	1362	1376.7 a
First Stage Pressure	psig	Test Gage	275	275	275		
Crossover Pressure	psig	Test Gage	3.5	3.65	3.4	3.517-34	14.747
SSH Header Outlet Temp	F	Westron #10	947	948	945		
Throttle Stm Temp (EWA) ~~[illegible]~~	F	Westron #14 ~~#13~~	938	938	935	937	
Crossover Temp	F	Thermocouple	210.7	211.0	210.5	210.73	
CONDENSOR	Instrmnt	Location					
Condensor Vacuum	Inches Hg	Manometer	28.41	28.41	28.41	28.41	
Barometric Pressure	Inches Hg	Barometer	30.16	30.16	30.16	30.16	

1. (652 Gal/ 20 min) * (60 min/1 hr) * (1 Bbl/42 gal) * (6.25 EE 6 Btu/Bbl) = 291,071,429 Btu/Hr
2. (1022 Gross Watt-Hr) * (1/ 20 min) * (60 min/1 hr) * (8 PTCT) = 24,528 KW Gross Output
3. (1140 Aux Watt-Hr) * (1/ 20 min) * (60 min/1 hr) * (0.48 PTCT) = 1,641.6 KW Aux Output
4. PRELIMINARY Gross Unit Heat Rate = (#1 / #2) = 11,867 Btu/Kwhr
5. PRELIMINARY Net Unit Heat Rate = [#1 / (#2 - #3)] = 12,718 Btu/Kwhr
6. NET LOAD (Gross - Auxiliary) = 22,886.4 KW

HONOLULU 9 UNIT EFFICIENCY TEST DATA SHEET

Load: 24 MW

Date: 6/20/96

CIRC WATER TEMPS	Instr/Units	Location	Reading #1 950	Reading #2 1000	Reading #3 1010	Average
CW Inlet Temperature	F	1st Flr Chart	79	79	79	
CW Outlet Temperature	F	1st Flr Chart	87	87	87	
FEEDWATER HEATERS						
FWH#1 Cond Inlet Temp	F	3FL AEJ by Railng	112	112	112	
FWH #1 Cond Out Temp	F	2FL abv cond rail makai	150	150	150	
FWH #2 Cond Out Temp	F	2FL b/w 92/95 makai	—	Out of	Service	
FWH #3 Cond Out Temp	F	1FL b/w BFPs	265	265	265	
FWH #4 FW Out Temp	F	1FL Gage Panel	316	317	316	
FWH #5 FW Out Temp	F	1FL Gage Panel	350	350	350	

FUEL OIL FLOW TIMED READINGS - Tankyard Brodie Meter

Time:	Brodie Meter Fuel Flow in Gallons --->		
950		9478	
1000		9805	327
1010		10130	325

Notes:

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	HONOLULU	**Type of Sample:**	LSFO
Unit:	H-9	**Date Received:**	06-20-96
Sample Date:	06-20-96	**Analysis Date:**	06-24-96
Sample Time:	0955	**Report Date:**	06-24-96
Sample Conditions:	24 MW		

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	21.3
D 4294	Sulfur, Wt. %	0.36
D 240	BTU/lb	19,047.3
	BTU/bbl	6,169,000

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Lab Supervisor

cc: C. Kishimoto, WPC-JC
A. Koyamatsu, WPO-GV

HONOLULU 9 UNIT EFFICIENCY TEST DATA SHEET

Load: 35 MW

Date: 6/20/96

GENERAL	Instr/Units	Location	Reading #1 1045	Reading #2 1055	Reading #3 1105	Average	
EMS Gross MWs	MWs	EMS Panel	35.2	34.8	34.9		
EMS Reactive Load	MVars	EMS Panel	19.5	19.6	18.3		
Gross KWH Meter	KWH Stnd	Contr Rm	Ø	740	1477		
Auxiliary KWH Meter	KWH Stnd	Turb Deck	Ø	726	1446		
BOILER							
Drum Pressure	psig	Test Gage	1401	1401	1401		
Excess O2	%	M4 Chart	2.7	2.7	2.7		
Steam Flow	lb/hr	M8 Chart	310,000	310,000	310,000		
Attemp Flow	lb/hr	M3 Chart	34,000	34,000	34,000		
FW Flow	lb/hr	M14 Chart	310,000	310,000	310,000	310,000	
PSH Gas Inlet Temp	F	Westron #19	1146	1139	1134		
AH #1 Gas In Temp	F	Westron #20	642	641	641		
AH #2 Gas In Temp	F	Westron #21	633	633	633		
Boiler Master H/A Station	control psi	Control Bd	19	19	19		
FD Fan H/A Station	control psi	Control Bd	16	16	16		
TURBINE							
Throttle Pressure	psig	Test Gage	1341	1341	1341	1341	1355.7
First Stage Pressure	psig	Test Gage	409	404	404		
Crossover Pressure	psig	Test Gage	10.0	9.8	9.6	9.8-3.47	21.03
SSH Header Outlet Temp	F	Westron #10	945	944	943		
Throttle Stm Temp	F	Westron #14	937	936	935	936	
Crossover Temp	F	Thermocouple	232.2	232.1	231.6	231.97	
CONDENSOR	Instrmnt	Location					
Condensor Vacuum	Inches Hg	Manometer	28.09	28.09	28.10	28.093	
Barometric Pressure	Inches Hg	Barometer	30.16	30.16	30.16	30.16	

1. (907 Gal/ 20 min) * (60 min/1 hr) * (1 Bbl/42 gal) * (6.25 FF 6 Btu/Bbl) = 404,910 Btu

HONOLULU 9 UNIT EFFICIENCY TEST DATA SHEET

Load: 35 MW

Date: 6/20/96

CIRC WATER TEMPS	Instr/Units	Location	Reading #1 1045	Reading #2 1055	Reading #3 1105	Average
CW Inlet Temperature	F	1st Flr Chart	79	79	79	
CW Outlet Temperature	F	1st Flr Chart	89	89	90	
FEEDWATER HEATERS						
FWH#1 Cond Inlet Temp	F	3FL AEJ by Railing	112	112	112	
FWH #1 Cond Out Temp	F	2FL abv cond rail makai	165	165	170	
~~FWH #2 Cond Out Temp~~	~~F~~	~~2FL b/w 92/95 makai~~		Out of	Service	
FWH #3 Cond Out Temp	F	1FL b/w BFPs	282	285	285	
FWH #4 FW Out Temp	F	1FL Gage Panel	335	335	335	
FWH #5 FW Out Temp	F	1FL Gage Panel	375	376	376	

FUEL OIL FLOW TIMED READINGS - Tankyard Brodie Meter

Time:	Brodie Meter Fuel Flow in Gallons --->		
1045		11528	
1055		11983	455
1105		12435	452

Notes:

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	HONOLULU	**Type of Sample:**	LSFO
Unit:	H-9	**Date Received:**	06-20-96
Sample Date:	06-20-96	**Analysis Date:**	06-24-96
Sample Time:	1050	**Report Date:**	06-24-96
Sample Conditions:	35 MW		

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	21.3
D 4294	Sulfur, Wt. %	0.35
D 240	BTU/lb	19,045.2
	BTU/bbl	6,169,000

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Lab Supervisor

cc: C. Kishimoto, WPC-JC
A. Koyamatsu, WPO-GV

HONOLULU 9 UNIT EFFICIENCY TEST DATA SHEET

Load: 45 MW

Date: 6/20/96

GENERAL	Instr/Units	Location	Reading #1 1200	Reading #2 1210	Reading #3 1220	Average
EMS Gross MWs	MWs	EMS Panel	45.0	45.2	45.3	
EMS Reactive Load	MVars	EMS Panel	16.9	12.6	11.7	
Gross KWH Meter	KWH Stnd	Contr Rm	Ø	944	1890	
Auxiliary KWH Meter	KWH Stnd	Turb Deck	Ø	801	1603	
BOILER						
Drum Pressure	psig	Test Gage	1401	1401	1401	
Excess O2	%	M4 Chart	0.8	0.9	0.9	
Steam Flow	lb/hr	M8 Chart	400,000	400,000	400,000	
Attemp Flow	lb/hr	M3 Chart	43,000	44,000	44,000	
FW Flow	lb/hr	M14 Chart	395,000	395,000	395,000	
PSH Gas Inlet Temp	F	Westron #19	1218	1217	1220	
AH #1 Gas In Temp	F	Westron #20	689	690	690	
AH #2 Gas In Temp	F	Westron #21	680	681	681	
Boiler Master H/A Station	control psi	Control Bd	22	22	22	
FD Fan H/A Station	control psi	Control Bd	18	18	18	
TURBINE						
Throttle Pressure	psig	Test Gage	1312	1312	1312	
First Stage Pressure	psig	Test Gage	526	527	527	
Crossover Pressure	psig	Test Gage	15.5	15.5	15.5	
SSH Header Outlet Temp	F	Westron #10	943	945	944	
Throttle Stm Temp	F	Westron #14	936	937	937	
Crossover Temp	F	Thermocouple	244.6	244.9	245.0	
CONDENSOR	**Instrmnt**	**Location**				
Condensor Vacuum	Inches Hg	Manometer	27.71	27.69	27.72	
Barometric Pressure	Inches Hg	Barometer	30.16	30.16	30.16	

1. (1140 Gal/ 20 min) * (60 min/1 hr) * (1 Bbl/42 gal) * (6.25 EE 6 Btu/Bbl) = 508,928,571 Btu/Hr
2. (1890 Gross Watt-Hr) * (1/ 20 min) * (60 min/1 hr) * (8 PTCT) = 45,360 KW Gross Output
3. (1603 Aux Watt-Hr) * (1/ 20 min) * (60 min/1 hr) * (0.48 PTCT) = 2,308.32 KW Aux Output
4. PRELIMINARY Gross Unit Heat Rate = (#1 / #2) = 11,220 Btu/Kwhr
5. PRELIMINARY Net Unit Heat Rate = [#1 / (#2 - #3)] = 11,821 Btu/Kwhr
6. NET LOAD (Gross - Auxiliary) = 43,052 KW

HONOLULU 9 UNIT EFFICIENCY TEST DATA SHEET

Load: 45 MW

Date: 6/20/96

CIRC WATER TEMPS	Instr/Units	Location	Reading #1 1200	Reading #2 1210	Reading #3 1220	Average
CW Inlet Temperature	F	1st Flr Chart	79	79	79	
CW Outlet Temperature	F	1st Flr Chart	92	92	92	
FEEDWATER HEATERS						
FWH#1 Cond Inlet Temp	F	3FL AEJ by Railng	112	112	112	
FWH #1 Cond Out Temp	F	2FL abv cond rail makai	175	177	177	
~~FWH #2 Cond Out Temp~~	~~F~~	~~2FL b/w 92/95 makai~~	OUT	OF	SERVICE	
FWH #3 Cond Out Temp	F	1FL b/w BFPs	300	300	300	
FWH #4 FW Out Temp	F	1FL Gage Panel	350	350	350	
FWH #5 FW Out Temp	F	1FL Gage Panel	395	395	395	

FUEL OIL FLOW TIMED READINGS - Tankyard Brodie Meter

Time: 1200	Brodie Meter Fuel Flow in Gallons --->	15418	
			570
Time: 1210	Brodie Meter Fuel Flow in Gallons --->	15988	
			570
Time: 1220	Brodie Meter Fuel Flow in Gallons --->	16558	
Time:	Brodie Meter Fuel Flow in Gallons --->		

Notes:

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	HONOLULU	**Type of Sample:**	LSFO
Unit:	H-9	**Date Received:**	06-20-96
Sample Date:	06-20-96	**Analysis Date:**	06-24-96
Sample Time:	1207	**Report Date:**	06-24-96
Sample Conditions:	45 MW		

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	21.3
D 4294	Sulfur, Wt. %	0.35
D 240	BTU/lb	19,003.2
	BTU/bbl	6,155,000

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Lab Supervisor

cc: C. Kishimoto, WPC-JC
A. Koyamatsu, WPO-GV

HONOLULU 9 UNIT EFFICIENCY TEST DATA SHEET

baskets
jged
cooking

Load: MAX Load (ID Fan Limited) Date: 6/20/96
Cannot go VWO, only 80% gov. Vh.

GENERAL	Instr/Units	Location	Reading #1 1325	Reading #2 1335	Reading #3 1355	Average
EMS Gross MWs	MWs	EMS Panel	53.7	53.9	53.6	
EMS Reactive Load	MVars	EMS Panel	15.8	150	14.8	
Gross KWH Meter	KWH Stnd	Contr Rm	Ø	1130	3384	
Auxiliary KWH Meter	KWH Stnd	Turb Deck	Ø	[illegible]	[illegible]	

HONOLULU 9 UNIT EFFICIENCY TEST DATA SHEET

Load: Max Load

Date: 6/20/96

CIRC WATER TEMPS	Instr/Units	Location	Reading #1 1325	Reading #2 1335	Reading #3	Average
CW Inlet Temperature	F	1st Flr Chart	79	79		
CW Outlet Temperature	F	1st Flr Chart	94	94		
FEEDWATER HEATERS						
FWH#1 Cond Inlet Temp	F	3FL AEJ by Railing	112	112		
FWH #1 Cond Out Temp	F	2FL abv cond rail makai	180	185		
FWH #2 Cond Out Temp	F	2FL b/w 92/95 makai	170	170		
FWH #3 Cond Out Temp	F	1FL b/w BFPs	310	320		
FWH #4 FW Out Temp	F	1FL Gage Panel	360	360		
FWH #5 FW Out Temp	F	1FL Gage Panel	410	410		

FUEL OIL FLOW TIMED READINGS - Tankyard Brodie Meter

Time: 1325	Brodie Meter Fuel Flow in Gallons --->	2074 4	
			681
Time: 1335	Brodie Meter Fuel Flow in Gallons --->	2142 5	
			679
Time: 1345	Brodie Meter Fuel Flow in Gallons --->	2210 4	
			680
Time: 1355	Brodie Meter Fuel Flow in Gallons --->	2278 4	

Notes:

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	HONOLULU	**Type of Sample:**	LSFO
Unit:	H-9	**Date Received:**	06-20-96
Sample Date:	06-20-96	**Analysis Date:**	06-24-96
Sample Time:	1340	**Report Date:**	06-24-96
Sample Conditions:	54 MW		

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	21.2
D 4294	Sulfur, Wt. %	0.35
D 240	BTU/lb	19,030.1
	BTU/bbl	6,168,000

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto

Charles Kishimoto
Lab Supervisor

cc: C. Kishimoto, WPC-JC
A. Koyamatsu, WPO-GV

SUPPORTING WORKPAPERS FOR WAIAU 3

UNIT	W3									
Test Date	2/25/1998	Using Coriolis Flowmeter						Circ. Wtr. Adjusted to 79.8 F		
	Test Input/Output(No MVL Corrections)				Test Heat Rates		MVL/Circ.Wtr. Corr. Heat Rates			
Test Point	Gross MW	Aux. MW	Net MW	MBtu/Hr	Gross Btu/KWH	Net Btu/KWH	MVL Adj?	Gross Btu/KWH	Net Btu/KWH	Net Residual Btu/KWH
1	24.786	1.680	23.106	278.60	11,240	12,058	NO	11,305	12,132	-14
2	30.258	1.895	28.363	332.28	10,981	11,715	NO	11,041	11,783	21
3	41.454	2.176	39.278	454.34	10,960	11,567	NO	11,014	11,628	-12
4	50.058	2.756	47.302	549.97	10,987	11,627	NO	11,025	11,670	4
5	0.000	0.000	0.000	0.00	0	0		0	0	0
6	0.000	0.000	0.000	0.00	0	0		0	0	0
7	0.000	0.000	0.000	0.00	0	0		0	0	0
8	0.000	0.000	0.000	0.00	0	0		0	0	0
9	0.000	0.000	0.000	0.00	0	0		0	0	0
10	0.000	0.000	0.000	0.00	0	0		0	0	0

INPUT/OUTPUT ABC COEFFICIENTS

	Gross	Net
Coefficients		
A	45.28206382	67.136386
B	8.763158048	8.193283525
C	0.027314192	0.043624027
Equation Fit		
R-square	92.91%	99.50%
Std. Deviation	64.36	28.06

NOTE:

1. Acceptable ABC Coefficients must meet following criteria:
   A. R-Square>90%
   B. Net Heat Rate Residuals<Test Uncertainty.
   C. Standard Deviation < Test Uncertainty.
   D. Gross and Net Heat Rate Curves must have a similar shape as previous test results.
2. Net Residual = ABC Heat Rate - Test Calculation
3. ABC Coefficients curve fitted to test MBtu/HR and MVL corrected gross & net MW.

COMMENTS:

UNIT	W3
Test Date	2/25/1998

Instructions: Input data as shown. Blank out cells that do not have test data. Type "y" for mean of the valve loop correction, "n" for no correction.

Primary Input/Output Data

Test Point	M.V.L Correction?	Duration (Minutes)	Gross Std. KWH		Aux. Std. KWH		Coriolis Oil Meter (Gallons, 60		Correction Factor	HHV (MBtu/Bbl)
			Start	End	Start	End	Start	End		
1	n	20	0	1377	0	1167	0	627.3717268	1.0000	6.217
2	n	20	0	1681	0	1316	0	748.2527291	1.0000	6.217
3	n	20	0	2303	0	1511	0	1023.132107	1.0000	6.217
4	n	20	0	2781	0	1914	0	1238.475787	1.0000	6.217
5										
6										
7										
8										
9										
10										

Secondary Data for Mean of the Valve Loop Correction

Test Point	Pressure(PSIA)		Enthalpy (Btu/Lbm)		Throttle Flow (Lbm/HR)
	Throttle	Cold RH	Throttle	Cold RH	
1					224,030
2					266,905
3					367,240
4					447,125
5					
6					
7					
8					
9					
10					
VWO-NP					463,000

Condenser Correction Data

CWIT Deg. F	Circ. Wtr GPM	Unplug. Tubes
75.8	47,200	9,281
75.9	47,200	9,281
76	47,200	9,281
76.2	47,200	9,281

Correct to CWIT of y **79.8 F**

Note:
1. Version 3, 5/96
2. ABCs from curve fit of MBtu/Hr vs MW.
3. MVL correction by SDG&E method.
4. MVL & Condens. correct MW.
5. CWIT at Waterfront
6. By A.W.K. Ho, TE

W3ABC298a.xls

UNIT	**W3**
Test Date	**2/25/1998**

Note: To add units, input below last unit and do an descending alphabetical sort.

Unit	Gross MWH	Auxiliary KWH
H8	0.008	0.48
H9	0.008	0.48
K1	0.012	0.48
K2	0.012	0.48
K3	0.012	0.48
K4	0.012	0.48
K5	0.0189	1.4
K6	0.0189	1.4
W10	0.0096	0.048
W3	0.006	0.48
W4	0.006	0.48
W5	0.008	0.48
W6	0.008	0.48
W7	0.012	0.48
W8	0.012	0.48
W9	0.0096	0.048

UNIT	W3
Test Date	2/25/1998

UNCORRECTED OUTPUT

Test Point	Gross MW	Aux. MW	Net MW	Corr. Flow Bbl/Hr	MBtu/Hr	Gross Heat Rate Btu/KWH	Net Heat Rate Btu/KWH
1	24.786	1.680	23.106	44.812	278.60	11,240	12,058
2	30.258	1.895	28.363	53.447	332.28	10,981	11,715
3	41.454	2.176	39.278	73.081	454.34	10,960	11,567
4	50.058	2.756	47.302	88.463	549.97	10,987	11,627
5	0.000	0.000	0.000	0.000	0.00	0	0
6	0.000	0.000	0.000	0.000	0.00	0	0
7	0.000	0.000	0.000	0.000	0.00	0	0
8	0.000	0.000	0.000	0.000	0.00	0	0
9	0.000	0.000	0.000	0.000	0.00	0	0
10	0.000	0.000	0.000	0.000	0.00	0	0

ADJUSTED OUTPUT

Test Point	HP Eff. Change	MVL MW Correction	Circ. Corr Factor	Corrected Gross MW	Corrected Net MW	MBtu/Hr	Gross Heat Rate Btu/KWH	Net Heat Rate Btu/KWH
1	#DIV/0!	#DIV/0!	0.994252	24.644	22.963	278.60	11,305	12,132
2	#DIV/0!	#DIV/0!	0.994602	30.095	28.200	332.28	11,041	11,783
3	#DIV/0!	#DIV/0!	0.995081	41.250	39.074	454.34	11,014	11,628
4	#DIV/0!	#DIV/0!	0.996504	49.883	47.127	549.97	11,025	11,670
5	0.000	0.000	0	0.000	0.000	0.00	0	0
6	0.000	0.000	0	0.000	0.000	0.00	0	0
7	0.000	0.000	0	0.000	0.000	0.00	0	0
8	0.000	0.000	0	0.000	0.000	0.00	0	0
9	0.000	0.000	0	0.000	0.000	0.00	0	0
10	0.000	0.000	0	0.000	0.000	0.00	0	0

GROSS ABC CALCULATION

Point	Independent	Dependent	x*x	x*y	x*x*y	x*x*x	x*x*x*x
1	24.644	278.598	607.303688	6865.635356	169193.5072	14966.10809	368817.7693
2	30.095	332.278	905.689599	9999.788888	300940.4192	27256.43619	820273.6502
3	41.250	454.344	1701.56852	18741.71228	773096.9988	70189.82557	2895335.426
4	49.883	549.972	2488.31519	27434.24718	1368502.965	124124.664	6191712.481
5	0.000	0.000	0	0	0	0	0
6	0.000	0.000	0	0	0	0	0
7	0.000	0.000	0	0	0	0	0
8	0.000	0.000	0	0	0	0	0
9	0.000	0.000	0	0	0	0	0
10	0.000	0.000	0	0	0	0	0
Total	145.8712976	1615.190966	5702.877	63041.3837	2611733.89	236537.0339	10276139.33
			Denominator		-25156707.87		
Number of Samples		4					
Coefficients							
	A	45.28206382					
	B	8.763158048					
	C	0.027314192					

NET ABC CALCULATION

Point	Independent	Dependent	x*x	x*y	x*x*y	x*x*x	x*x*x*x
1	22.963	278.598	527.301774	6397.457226	146905.1454	12108.45826	278047.1612
2	28.200	332.278	795.219541	9370.109435	264233.6871	22424.90261	632374.1192
3	39.074	454.344	1526.79568	17753.133	693690.0547	59658.37015	2331105.053
4	47.127	549.972	2220.94047	25918.43715	1221454.43	104665.9394	4932576.553
5	0.000	0.000	0	0	0	0	0
6	0.000	0.000	0	0	0	0	0
7	0.000	0.000	0	0	0	0	0
8	0.000	0.000	0	0	0	0	0
9	0.000	0.000	0	0	0	0	0
10	0.000	0.000	0	0	0	0	0
Total	137.3637776	1615.190966	5070.25746	59439.13681	2326283.317	198857.6704	8174102.886
			Denominator		-19152604.99		
Number of Samples		4					
Coefficients							
	A	67.13638578					
	B	8.193283525					
	C	0.043624027					

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	UNIT	W3													
2	Test Date	2/25/1998													
3															
4			Circ. Water Data	Circ. Water	Average	Condenser Data									
5		Unit	Density-Lb/Ft3	Cp	CWIT-F	Tube Diam. in.	Tube Thickness	Effective Length	Cl.Surf. Area-Ft2	Duty Slope	Duty Const.	C	C1	C2	No. tubes
6		H8	63.9	0.955	79.8	0.875	0.049	28	40,000	4,959,972	25,547,491	263	0.85	0.97	6236
7		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	UNIT	W3																						
2	Test Date	3/28/1988																						
3																								
4	No.	INPUT DATA				MANUFACTURER DATA																		
5				Cooling Wtr	Unplugged	Tube	Tube	Condenser Duty		Estimated														
6		Load	CWIT	Flow-GPM	Tubes	OD in.	Thick in	Slope	Intercept	Crc. Dens.	C	C1	C2	Cp of Crc.	CWIT-Nom.	Cooling Area								
7	1	24.786	75.8	47,200	9,281	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
8	2	30.258	75.8	47,200	9,281	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
9	3	41.454	76	47,200	9,281	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
10	4	50.058	76.2	47,200	9,281	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
11	5	0	0	0	0	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
12	6	0	0	0	0	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
13	7	0	0	0	0	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
14	8	0	0	0	0	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
15	9	0	0	0	0	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
16	10	0	0	0	0	0.875	0.049	5373872	2222099	63.9	263	0.85	0.97	0.955	79.8	47,500								
17	No.	COMMON CALCULATION SECTION																						
18		Velocity	Condsr.																					
19		Ft./Sec	Duty-Btu/Hr	Mass-Lb/HR	CWOT-CWIT		Lookup Table for Unit MW Vacuum Correction																	
20	1	3.441065866	155,417,782	24,191,374	6.727237993			Vac.	A	B	C													
21	2	3.441065866	184,823,610	24,191,374	8.00006532		0		3.12E-13	-3.1E-07	0.091253													
22	3	3.441065866	244,989,481	24,191,374	10.60433702		W3-1	1	3.12E-13	-3.1E-07	0.091253													
23	4	3.441065866	291,226,276	24,191,374	12.60569052		W3-2	1.5	0	-5.4E-08	0.03265													
24	5	#DIV/0!	22,220,991	0	#DIV/0!		W3-3	2	0	0	0													
25	6	#DIV/0!	22,220,991	0	#DIV/0!		W3-4	2.5	0	3.56E-08	-0.02623													
26	7	#DIV/0!	22,220,991	0	#DIV/0!		W3-5	3	0	6.08E-08	-0.05066													
27	8	#DIV/0!	22,220,991	0	#DIV/0!		Note Vacuum at 0 in Hg is at 1 in Hg.																	
28	9	#DIV/0!	22,220,991	0	#DIV/0!																			
29	10	#DIV/0!	22,220,991	0	#DIV/0!																			
30	No.	Calculation at Actual CWIT																						
31		General								Low Vacuum Calculation							Higher Vacuum Calculation							Interpolated
32		C3	U	Test-Calc.	Test-TTD	Pest-Calc.	Pest-TTD	Pest-Lm	Pest-inHg	Thr. Flow	Low Vac.	Vac.	A	B	C	%	Thr. Flow	High Vac.	Vac.	A	B	C	%	%
33	1	1.02175	410.8959551	87.5928319	87.52737799	1.312581	1.309885	1.231778	1.312581	224,030	1.312581	1	3.12E-13	-3.1E-07	0.091253317	3.75%	224,030	1.812580649	1.5	0	-5.4461E-08	0.03265	2.04%	2.68%
34	2	1.022125	411.1467977	89.9208213	88.90006532	1.412297	1.367605	1.234883	1.412297	266,905	1.412297	1	3.12E-13	-3.1E-07	0.091253317	3.08%	266,905	1.912297467	1.5	0	-5.4461E-08	0.03265	1.81%	2.03%
35	3	1.0225	411.2976404	94.5807014	91.60433702	1.635564	1.489317	1.238	1.635564	367,240	1.635564	1.5	0	-5.4E-08	0.03265048	1.27%	367,240	2.135563798	2	0	0	0	0.00%	0.92%
36	4	1.02325	411.5953257	98.2771348	93.80569052	1.835118	1.596243	1.244275	1.835118	447,125	1.835118	1.5	0	-5.4E-08	0.03265048	0.83%	447,125	2.335117942	2	0	0	0	0.00%	0.27%
37	5	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
38	6	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
39	7	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
40	8	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
41	9	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
42	10	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
43	No.	Calculation at Average CWIT																						
44		General								Low Vacuum Calculation							Higher Vacuum Calculation							Interpolated
45		C3	U	Test-Calc.	Test-TTD	Pest-Calc.	Pest-TTD	Pest-Lm	Pest-inHg	Thr. Flow	Low Vac.	Vac.	A	B	C	%	Thr. Flow	High Vac.	Vac.	A	B	C	%	%
46	1	1.03675	417.0296613	91.484359	91.52737799	1.483692	1.4857	1.36627	1.4857	224,030	1.4857	1	3.12E-13	-3.1E-07	0.091253317	3.75%	224,030	1.985699936	1.5	0	-5.4461E-08	0.03265	2.04%	2.09%
47	2	1.03675	417.0296613	93.6950986	92.80006532	1.590703	1.546523	1.36627	1.590703	266,905	1.590703	1.5	0	-5.4E-08	0.03265048	1.81%	266,905	2.090703146	2	0	0	0	0.00%	1.48%
48	3	1.03675	417.0296613	98.2183882	95.40433702	1.831791	1.678309	1.36627	1.831791	367,240	1.831791	1.5	0	-5.4E-08	0.03265048	1.27%	367,240	2.331791158	2	0	0	0	0.00%	0.43%
49	4	1.03675	417.0296613	101.694485	97.40569052	2.037274	1.786283	1.36627	2.037274	447,125	2.037274	2	0	0	0	0.00%	447,125	2.537273654	2.5	0	3.56144E-08	-0.02623	-1.03%	-0.06%
50	5	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
51	6	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
52	7	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
53	8	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
54	9	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
55	10	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
56	No.	Corr. Fact.																						
57		MW %																						
58		to Avg F																						
59	1	0.994252093																						
60	2	0.994602329																						
61	3	0.995080643																						
62	4	0.996504356																						
63	5	#DIV/0!																						
64	6	#DIV/0!																						
65	7	#DIV/0!																						
66	8	#DIV/0!																						
67	9	#DIV/0!																						
68	10	#DIV/0!																						
69																								
70		Note:																						
71		Calculations based on the following:																						
72		1. Formula used																						
73			Q = UFA*LMTD																					
74				Q = Condenser Duty, Btu/Hr																				
75				A = Condenser Surface Area available for heat transfer, Ft2																				
76				LMTD = Log mean temperature difference																				
77					LMTD = (CWOT - CWIT)/(ln(Tsat - CWIT)/(Tsat - CWOT))																			
78						CWOT = Crc. Water Outlet Temp., F																		
79						CWIT = Crc. Water Inlet Temp., F																		
80						Tsat = Condensing steam saturation temperature																		
81				U = Heat Transfer Coefficient																				
82					U = C*C1*C2*C3*Sort(V)																			
83						CSort(V) = Ideal heat transfer coefficient																		
84					C1 = Cleanliness Factor																			
85					C2 = Materials Correction Factor																			
86					C3 = Inlet Water Correction Factor																			
87			Q = w*Cp*(CWOT - CWIT)																					
88				w = Mass flow of Crc. Water, Lb/HR																				
89				Cp = Specific heat capacity of circ. water, Btu/(Lb-F)																				
90			Using the above two equations, Tsat is found																					
91			Tsat = CWIT + [(Q/Em*Cp)] /(1 - exp(-UFA/Em*Cp))																					
92				Q is determined from manufacturer heat balances.																				
93		Checks must be made that the condenser backpressure is realistic. HEI has determined that Tsat should not be below 5 F TTD.																						
94			Tsat-TTD = CWIT + (CWOT - CWIT) + 5																					
95		Moreover, at minimum leaks air removal systems are limited and HEI has determined a minimum curve for Psat.																						
96			Psat-Min = 0.000661471 9*CWIT^2 - 0.0693021645*CWIT + 2.6843030303																					
97		Psat is calculated for the Tsat's above and the maximum is taken as Psat.																						
98			Psat = 0.000726771308957*Tsat^2 - 0.0861779504007 81*Tsat + 3.2849954516314																					
99		2. Method: The purpose is to determine the MW correction factor to adjust test conditions to average CWIT conditions.																						
100		a. Input/Condenser manufacturer data is looked up based upon the unit.																						
101		b. Calculation of variables that are common to other calculations is done.																						
102		c. The MW correction factor is done at actual CWIT.																						
103			1) Tsat is calculated																					
104			2) The MW correction factor is found through interpolation.																					
105				a) MW correction factor is found at the lower curve.																				
106				b) MW correction factor is found at the higher curve.																				
107					If backpressure is below 2" and correction factor becomes negative, the correction factor is set to 0.																			
108					If backpressure is above 2" and correction factor becomes positive, the correction factor is set to 0.																			
109					The curves asymptotically approach 0 correction and should not pass the x-axis.																			
110				c) Interpolation is done now.																				
111		d. The MW correction factor is calculated at average CWIT.																						
112			1) Same procedures as in c above.																					
113		e. The correction factors are ratioed to correct the test to average CWIT conditions. The formula used is:																						
114			CF = (1 + CFavg) / (1 + CFtest)																					
115			From heat balance correction																					
116			MW-1 = (1 + CF-1) MW-design																					
117			MW-2 = (1 + CF-2)MW-design																					
118			If 1 is the average condition, to go from 2 to 1																					
119			MW-1 = (1 + CF-1)/(1 + CF-2) * MW-2																					

W3ABC298a.xls

	A	B	C	D	E	F	G
1	UNIT	**W3**					
2	Test Date	**2/25/1998**					
3	**Gross ABC Coefficients**						
4							
5	Gross						
6	A	45.28206382					
7	B	8.763158048					
8	C	0.027314192					
9							
10	Point	Gross MW	ABC	Test	Residual	Test-Sqr	SS(Residual)
11	1	24.64353237	11,274	11,305	-31	127,805,526	983
12	2	30.09467726	11,090	11,041	49	121,905,388	2376
13	3	41.25007296	10,988	11,014	-27	121,316,437	716
14	4	49.88301504	11,033	11,025	8	121,555,696	67
15	5	0	0	0	0	0	0
16	6	0	0	0	0	0	0
17	7	0	0	0	0	0	0
18	8	0	0	0	0	0	0
19	9	0	0	0	0	0	0
20	10	0	0	0	0	0	0
21		Sum		44,386		492,583,047	4142
22							
23		SS(Total)	58414.12101				
24		R-Square	0.929083965				
25		Std.Dev.	64.36223914				
26							
27							
28							
29							
30							
31							
32							
33							
34							
35	**Net ABC Coefficients**						
36							
37	Net						
38	A	67.13638578					
39	B	8.193283525					
40	C	0.043624027					
41							
42	Point	Net MW	ABC	Test	Residual	Test-Sqr	SS(Residual)
43	1	22.96305237	12,119	12,132	-14	147,196,104	189
44	2	28.19963726	11,804	11,783	21	138,840,203	448
45	3	39.07423296	11,616	11,628	-12	135,203,573	136
46	4	47.12685504	11,674	11,670	4	136,189,551	14
47	5	0	0	0	0	0	0
48	6	0	0	0	0	0	0
49	7	0	0	0	0	0	0
50	8	0	0	0	0	0	0
51	9	0	0	0	0	0	0
52	10	0	0	0	0	0	0
53		Sum		47,213		557,429,430	787
54							
55		SS(Total)	157337.7447				
56		R-Square	0.994996856				
57		Std.Dev.	28.05678854				

SUPPORTING WORKPAPERS FOR WAIAU 4

W4-0298a.xls

Circ. Wtr. Adjusted to 79.8 F

		Test Heat Rates		MVL/Circ.Wtr. Corr. Heat Rates			
/	MBtu/Hr	Gross Btu/KWH	Net Btu/KWH	MVL Adj?	Gross Btu/KWH	Net Btu/KWH	Net Residual Btu/KWH
	274.91	11,370	12,150	NO	11,442	12,232	0
	393.00	11,117	11,791	NO	11,183	11,865	0
	552.55	11,146	11,808	NO	11,197	11,865	0
	0.00	0	0		0	0	0
	0.00	0	0		0	0	0
	0.00	0	0		0	0	0
	0.00	0	0		0	0	0
	0.00	0	0		0	0	0
	0.00	0	0		0	0	0
	0.00	0	0		0	0	0

:able ABC Coefficients must meet following criteria:
uare>90%
eat Rate Residuals<Test Uncertainty.
lard Deviation < Test Uncertainty.
and Net Heat Rate Curves must have a similar shape as previous test results.
sidual = ABC Heat Rate - Test Calculation
efficients curve fitted to test MBtu/HR and MVL corrected gross & net MW.

UNIT	W4
Test Date	2/19/1998

Instructions: Input data as shown. Blank out cells that do not have test data. Type "y" for mean of the valve loop correction, "n" for no correction.

Primary Input/Output Data

Test Point	M.V.L Correction?	Duration (Minutes)	Gross Std. KWH Start	Gross Std. KWH End	Aux. Std. KWH Start	Aux. Std. KWH End	Coriolis Flowmeter (Gallons, 6 Start	Coriolis Flowmeter (Gallons, 6 End	Correction Factor	HHV (MBtu/Bbl)
1	n	25	0	1679	0	1346	0	774.9518707	1.0000	6.208
2	n	10	0	982	0	702	0	443.3537971	1.0000	6.205
3	n	10	0	1377	0	965	0	623.6468232	1.0000	6.202
4										
5										
6										
7										
8										
9										
10										

Secondary Data for Mean of the Valve Loop Correction

Test Point	Pressure(PSIA) Throttle	Pressure(PSIA) Cold RH	Enthalpy (Btu/Lbm) Throttle	Enthalpy (Btu/Lbm) Cold RH	Throttle Flow (Lbm/HR)
1					204,000
2					300,000
3					404,000
4					
5					
6					
7					
8					
9					
10					
VWO-NP					439,000

Condenser Correction Data

CWIT Deg. F	Circ. Wtr GPM	Unplug. Tubes
76	47,200	9,424
76	47,200	9,424
76	47,200	9,424

Correct to CWIT of: y 79.8 F

Note:
1. Version 3, 5/96
2. ABCs from curve fit of MBtu/Hr vs MW.
3. MVL correction by SDG&E method.
4. MVL & Condens. correct MW.
5. CWIT at Waterfront
6. By A.W.K. Ho, TE

214.7 PSIA

Fuel Btu/Hr	Heating Usage mass-Lb/Hr	Steam Usage T-In	T-out	H-Fuel, Btu	%	Aux Steam Usage (from heat of vaporization) mass-Lb/Hr	h lost to sewer
274,908,641	14,483.55	150	215	442,472	0.161%	528.4	165,873
393,001,473	20,715.27	150	215	632,852	0.161%	755.8	237,242
552,551,085	29,139.28	150	215	890,205	0.161%	1,063.1	333,718
							mass flow*(361.9-48)

Total Heat Penalty	
608,345	0.221%
870,093	0.221%
1,223,923	0.222%

UNIT	W4
Test Date	2/19/1998

Note: To add units, input below last unit and do an descending alphabetical sort.

Unit	Gross MWH	Auxiliary KWH
H8	0.008	0.48
H9	0.008	0.48
K1	0.012	0.48
K2	0.012	0.48
K3	0.012	0.48
K4	0.012	0.48
K5	0.0189	1.4
K6	0.0189	1.4
W10	0.0096	0.048
W3	0.006	0.48
W4	0.006	0.48
W5	0.008	0.48
W6	0.008	0.48
W7	0.012	0.48
W8	0.012	0.48
W9	0.0096	0.048

UNIT	W4
Test Date	2/19/1998

UNCORRECTED OUTPUT

Test Point	Gross MW	Aux. MW	Net MW	Corr. Flow Bbl/Hr	MBtu/Hr	Gross Heat Rate Btu/KWH	Net Heat Rate Btu/KWH
1	24.178	1.551	22.627	44.283	274.91	11,370	12,150
2	35.352	2.022	33.330	63.336	393.00	11,117	11,791
3	49.572	2.779	46.793	89.092	552.55	11,146	11,808
4	0.000	0.000	0.000	0.000	0.00	0	0
5	0.000	0.000	0.000	0.000	0.00	0	0
6	0.000	0.000	0.000	0.000	0.00	0	0
7	0.000	0.000	0.000	0.000	0.00	0	0
8	0.000	0.000	0.000	0.000	0.00	0	0
9	0.000	0.000	0.000	0.000	0.00	0	0
10	0.000	0.000	0.000	0.000	0.00	0	0

ADJUSTED OUTPUT

Test Point	HP Eff. Change	MVL MW Correction	Circ. Corr Factor	Corrected Gross MW	Corrected Net MW	MBtu/Hr	Gross Heat Rate Btu/KWH	Net Heat Rate Btu/KWH
1	#DIV/0!	#DIV/0!	0.993707	24.025	22.475	274.91	11,442	12,232
2	#DIV/0!	#DIV/0!	0.994094	35.143	33.121	393.00	11,183	11,865
3	#DIV/0!	#DIV/0!	0.9955	49.349	46.570	552.55	11,197	11,865
4	0.000	0.000	0	0.000	0.000	0.00	0	0
5	0.000	0.000	0	0.000	0.000	0.00	0	0
6	0.000	0.000	0	0.000	0.000	0.00	0	0
7	0.000	0.000	0	0.000	0.000	0.00	0	0
8	0.000	0.000	0	0.000	0.000	0.00	0	0
9	0.000	0.000	0	0.000	0.000	0.00	0	0
10	0.000	0.000	0	0.000	0.000	0.00	0	0

GROSS ABC CALCULATION

Point	Independent	Dependent	x*x	x*y	x*x*y	x*x*x	x*x*x*x
1	24.025	274.909	577.22271	6604.806446	158683.5105	13868.0409	333186.0565
2	35.143	393.001	1235.04438	13811.32867	485374.2615	43403.40956	1525334.626
3	49.349	552.551	2435.31719	27267.80649	1345637.155	120180.3047	5930769.803
4	0.000	0.000	0	0	0	0	0
5	0.000	0.000	0	0	0	0	0
6	0.000	0.000	0	0	0	0	0
7	0.000	0.000	0	0	0	0	0
8	0.000	0.000	0	0	0	0	0
9	0.000	0.000	0	0	0	0	0
10	0.000	0.000	0	0	0	0	0
Total	108.5175908	1220.461199	4247.58428	47683.94161	1989694.927	177451.7551	7789290.486
			Denominator		-15995833.28		

Number of Samples		3
Coefficients		
	A	40.02604735
	B	9.198303319
	C	0.024061993

NET ABC CALCULATION

Point	Independent	Dependent	x*x	x*y	x*x*y	x*x*x	x*x*x*x
1	22.475	274.909	505.119674	6178.535307	138861.7631	11352.49781	255145.8853
2	33.121	393.001	1097.02967	13016.77402	431134.2766	36335.20049	1203474.099
3	46.570	552.551	2168.74003	25732.15651	1198339.658	100997.6442	4703433.321
4	0.000	0.000	0	0	0	0	0
5	0.000	0.000	0	0	0	0	0
6	0.000	0.000	0	0	0	0	0
7	0.000	0.000	0	0	0	0	0
8	0.000	0.000	0	0	0	0	0
9	0.000	0.000	0	0	0	0	0
10	0.000	0.000	0	0	0	0	0
Total	102.1660388	1220.461199	3770.88938	44927.46583	1768335.698	148685.3425	6162053.306
			Denominator		-11901533.56		

Number of Samples		3
Coefficients		
	A	49.46043342
	B	9.311189976
	C	0.032032895

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	UNIT	W4													
2	Test Date	2/19/1998													
3															
4			Circ. Water Data	Circ. Water	Average	Condenser Data									
5		Unit	Density-Lb/Ft3	Cp	CWIT-F	Tube Diam. In.	Tube Thickness	Effective Length	Cl.Surf. Area-Ft2	Duty Slope	Duty Const.	C	C1	C2	No. tubes
6		H8	63.9	0.955	79.8	0.875	0.049	28	40,000	4,959,972	25,547,491	263	0.85	0.97	6236
7		H9	63.9	0.955	79.8	0.875	0.049	28	40,000	4,959,972	25,547,491	263	0.85	0.97	6236
8		K1	63.9	0.955	78.6	0.875	0.025	30	55,000	4,219,836	32,427,093	263	0.85	0.83	8004
9		K2	63.9	0.955	78.6	0.875	0.025	30	55,000	4,219,836	32,427,093	263	0.85	0.83	8004
10		K3	63.9	0.955	78.6	0.875	0.025	30	57,000	4,260,243	21,707,144	263	0.85	0.83	8300
11		K4	63.9	0.955	78.6	0.875	0.025	30	57,000	4,260,243	21,707,144	263	0.85	0.83	8300
12		K5	63.9	0.955	78.6	1	0.035	28	90,338	4,367,365	31,674,023	263	0.85	0.77	12328
13		K6	63.9	0.955	78.6	1	0.035	28	90,338	4,367,365	31,674,023	263	0.85	0.77	15132
14		W3	63.9	0.955	79.8	0.875	0.049	22	47,500	5,373,872	22,220,991	263	0.85	0.97	9424
15		W4	63.9	0.955	79.8	0.875	0.049	22	47,500	5,195,054	26,791,573	263	0.85	0.97	9424
16		W5	63.9	0.955	79.8	0.875	0.049	28	40,000	5,069,410	22,318,378	263	0.85	0.97	6236
17		W6	63.9	0.955	79.8	0.875	0.049	28	40,000	5,069,410	22,318,378	263	0.85	0.97	6236
18		W7	63.9	0.955	79.8	0.875	0.049	29.77083333	57,000	4,160,493	29,686,117	263	0.85	0.97	8300
19		W8	63.9	0.955	79.8	0.875	0.049	29.77083333	57,000	4,160,493	29,686,117	263	0.85	0.97	8300
20					1995 Historical										
21															
22				MW Corr. = A*F^2 + B*F + C											
23		Unit	Vacuum	A	B	C	Comments								
24	1	H8-1	1	3.1E-13	-3.1E-07	0.091253171	Uses W5/6								
25	2	H8-2	1.5	0.0E+00	-5.4E-08	0.032650484	Uses W5/6								
26	3	H8-3	2	0.0E+00	0.0E+00	0	Uses W5/6								
27	4	H8-4	2.5	0.0E+00	3.6E-08	-0.026229413	Uses W5/6								
28	5	H8-5	3	0.0E+00	6.1E-08	-0.050658617	Uses W5/6								
29	6	H9-1	1	3.1E-13	-3.1E-07	0.091253171	Uses W5/6								
30	7	H9-2	1.5	0.0E+00	-5.4E-08	0.032650484	Uses W5/6								
31	8	H9-3	2	0.0E+00	0.0E+00	0	Uses W5/6								
32	9	H9-4	2.5	0.0E+00	3.6E-08	-0.026229413	Uses W5/6								
33	10	H9-5	3	0.0E+00	6.1E-08	-0.050658617	Uses W5/6								
34	11	K1-1	1	1.52E-13	-2.23E-07	0.087961664									
35	12	K1-2	1.5	0	-3.56E-08	0.028721437									
36	13	K1-3	2	0	0	0									
37	14	K1-4	2.5	0	1.85E-08	-0.020892487									
38	15	K1-5	3.5	0	4.02E-08	-0.053981446									
39	16	K2-1	1	1.52E-13	-2.2E-07	0.087961664									
40	17	K2-2	1.5	0	-3.6E-08	0.028721437									
41	18	K2-3	2	0	0.0E+00	0									
42	19	K2-4	2.5	0	1.8E-08	-0.020892487									
43	20	K2-5	3.5	0	4.0E-08	-0.053981446									
44	21	K3-1	1	2.45E-13	-3.11E-07	0.105162812									
45	22	K3-2	1.5	0	-5.12E-08	0.033785678									
47	24	K3-4	2.5	0	3.50E-08	-0.027770582									

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	UNIT	W4														
2	Test Date	2/19/1999														
3																
4	No.	INPUT DATA				MANUFACTURER DATA										
5				Cooling Wtr	Unplugged	Tube		Tube	Condenser Duty		Estimated					
6		Load	CWT	Flow-GPM	Tubes	OD in.		Thick. in	Slope	Intercept	Crrc. Dens.	C	C1	C2	Co of Crrc.	CWIT-Nom.	Cooling Area
7	1	24.1776	76	47,200	9,424	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
8	2	35.352	76	47,200	9,424	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
9	3	49.572	76	47,200	9,424	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
10	4	0	0	0	0	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
11	5	0	0	0	0	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
12	6	0	0	0	0	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
13	7	0	0	0	0	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
14	8	0	0	0	0	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
15	9	0	0	0	0	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
16	10	0	0	0	0	0.875		0.049	5195054	26791573	63.9	263	0.85	0.97	0.955	79.8	47,500
17	No.	COMMON CALCULATION SECTION														
18																
19		Velocity	Conden.													
		Ft/Sec	Duty-Btu/Hr	Mass-Lb/Hr	CWOT-CWT											
20	1	3.388851051	152,395,511	24,191,374	6.596413361											
21	2	3.388851051	210,447,122	24,191,374	9.109175623											
22	3	3.388851051	284,320,790	24,191,374	12.30678749											
23	4	#DIV/0!	26,791,573	0	#DIV/0!											
24	5	#DIV/0!	26,791,573	0	#DIV/0!											
25	6	#DIV/0!	26,791,573	0	#DIV/0!											
26	7	#DIV/0!	26,791,573	0	#DIV/0!											
27	8	#DIV/0!	26,791,573	0	#DIV/0!											
28	9	#DIV/0!	26,791,573	0	#DIV/0!											
29	10	#DIV/0!	26,791,573	0	#DIV/0!											
30	No.	Calculation at Actual CWT														
31		General														
32		C3	U	Test-Calc.	Test-TTD	Plant-Calc.	Plant-TTD	Plant-Lim	Plant-InHg	Low Vacuum Calculation Thr. Flow	Low Vac.	Vac	A	B	C	%
33	1	1.0225	408.1651919	87.6145569	87.59641936	1.313475	1.312728	1.238	1.313475	204,000	1.313475	1	3.12E-13	-3.1E-07	0.09125317	4.10%
34	2	1.0225	408.1651919	92.0388588	90.10917562	1.509865	1.42071	1.238	1.509865	300,000	1.509865	1.5	0	-5.4E-08	0.03265048	1.63%
35	3	1.0225	408.1651919	97.669611	93.30678749	1.800923	1.571393	1.238	1.800923	404,000	1.800923	1.5	0	-5.4E-08	0.03265048	1.06%
36	4	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
37	5	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
38	6	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
39	7	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
40	8	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
41	9	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
42	10	0.7375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
43	No.	Calculation at Average CWT														
44		General														
45		C3	U	Test-Calc.	Test-TTD	Plant-Calc.	Plant-TTD	Plant-Lim	Plant-InHg	Low Vacuum Calculation Thr. Flow	Low Vac.	Vac	A	B	C	%
46	1	1.03675	413.8535576	91.3127723	91.39641936	1.475681	1.479582	1.36627	1.479582	204,000	1.479582	1	3.12E-13	-3.1E-07	0.09125317	4.10%
47	2	1.03675	413.8535576	95.6862336	93.90917562	1.6938	1.601443	1.36627	1.6938	300,000	1.6938	1.5	0	-5.4E-08	0.03265048	1.63%
48	3	1.03675	413.8535576	101.279022	97.10678749	2.01179	1.769787	1.36627	2.01179	404,000	2.01179	2	0	0	0	0.00%
49	4	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
50	5	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
51	6	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
52	7	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
53	8	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
54	9	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
55	10	1.03675	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
56	No.	Corr. fact.														
57		MW vs														
58		Ta Avg F														
59	1	0.993707383														
60	2	0.994093636														
61	3	0.995500141														
62	4	#DIV/0!														
63	5	#DIV/0!														
64	6	#DIV/0!														
65	7	#DIV/0!														
66	8	#DIV/0!														
67	9	#DIV/0!														
68	10	#DIV/0!														
69																
70		Notes:														
71		Calculations based on the following:														
72		1. Formulas used:														
73			Q = U*A*LMTD													
74				Q = Condenser Duty, Btu/Hr												
75				A = Condenser Surface Area available for heat transfer, Ft2												
76				LMTD = Log mean temperature difference												
77					LMTD = (CWOT - CWIT)/(ln(Tsat - CWIT)/(Tsat - CWOT))											
78						CWOT = Crc. Water Outlet Temp., F										
79						CWIT = Crc. Water Inlet Temp., F										
80						Tsat = Condensing steam saturation temperature										
81				U = Heat Transfer Coefficient												
82																

	Q	R	S	T	U	V	W	X
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31								
32	Higher Vacuum Calculation Thr. Flow	High Vac.	Vac.	A	B	C	%	Interpolated %
33	204,000	1.813474803	1.5	0	-5.44E-08	0.03265	2.15%	2.88%
34	300,000	2.009863129	2	0	0	0	0.00%	1.60%
35	404,000	2.300923091	2	0	0	0	0.00%	0.42%
36	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
37	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
38	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
39	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
40	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
41	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
42	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
43								
44								
45	Higher Vacuum Calculation Thr. Flow	High Vac.	Vac.	A	B	C	%	Interpolated %
46	204,000	1.979582109	1.5	0	-5.44E-08	0.03265	2.15%	2.23%
47	300,000	2.193795877	2	0	0	0	0.00%	1.00%
48	404,000	2.51179022	2.5	0	3.56144E-08	-0.02623	-1.18%	-0.03%
49	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
50	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
51	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
52	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
53	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
54	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
55	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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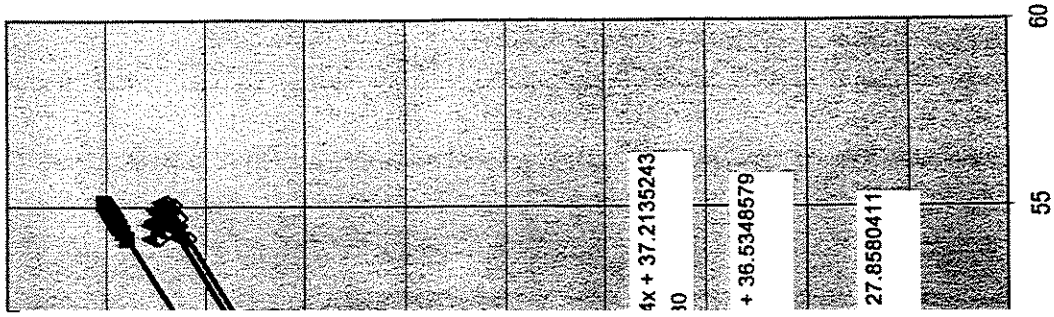
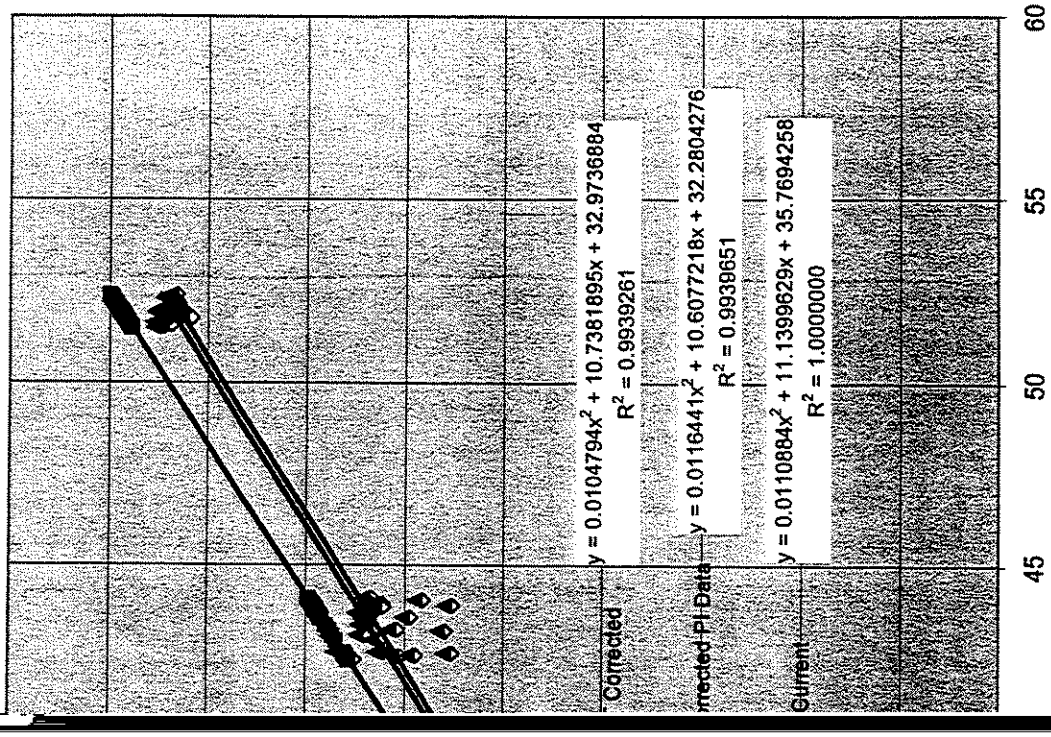
W4-0298a.xls

	A	B	C	D	E	F	G
1	UNIT	**W4**					
2	Test Date	**2/19/1998**					
3	**Gross ABC Coefficients**						
4							
5	Gross						
6	A	40.02604735					
7	B	9.198303319					
8	C	0.024061993					
9							
10	Point	Gross MW	ABC	Test	Residual	Test-Sqr	SS(Residual)
11	1	24.02545961	11,442	11,442	0	130,928,253	0
12	2	35.14319824	11,183	11,183	0	125,056,362	0
13	3	49.34893299	11,197	11,197	0	125,368,762	0
14	4	0	0	0	0	0	0
15	5	0	0	0	0	0	0
16	6	0	0	0	0	0	0
17	7	0	0	0	0	0	0
18	8	0	0	0	0	0	0
19	9	0	0	0	0	0	0
20	10	0	0	0	0	0	0
21		Sum		33,822		381,353,377	0
22							
23		SS(Total)	42617.97985				
24		R-Square	1				
25		Std.Dev.	#DIV/0!				
26							
27							
28							
29							
30							
31							
32							
33							
34							
35	**Net ABC Coefficients**						
36							
37	Net						
38	A	49.46043342					
39	B	9.311189976					
40	C	0.032032895					
41							
42	Point	Net MW	ABC	Test	Residual	Test-Sqr	SS(Residual)
43	1	22.47486761	12,232	12,232	0	149,617,535	0
44	2	33.12143824	11,865	11,865	0	140,789,408	0
45	3	46.56973299	11,865	11,865	0	140,778,838	0
46	4	0	0	0	0	0	0
47	5	0	0	0	0	0	0
48	6	0	0	0	0	0	0
49	7	0	0	0	0	0	0
50	8	0	0	0	0	0	0
51	9	0	0	0	0	0	0
52	10	0	0	0	0	0	0
53		Sum		35,962		431,185,782	0
54							
55		SS(Total)	89585.4841				
56		R-Square	1				
57		Std.Dev.	#DIV/0!				

SUPPORTING WORKPAPERS FOR WAIAU 5


4x + 37.2135243
30
+ 36.5348579
27.8580411
55
60

2/24/2005


with PI Gr. MW correction-54 FWH Back
y = 0.0104794x² + 10.7381895x + 32.9736884
R² = 0.9939261
Corrected
y = 0.0116441x² + 10.6077218x + 32.2804276
R² = 0.9939651
rrected PI Data
y = 0.0110884x² + 11.1399629x + 35.7694258
R² = 1.0000000
Current
45
50
55
60

raction

27.8580411	35.7694258		CWIT Adjustment				79	80	79.8						
10.661483	11.1399629		Actual Conditions				Average Conditions			Adjustment					
0.0116087	0.0110884	W6-CDR-CV	Low	High	Interpolated	Low	High	Interpolated			Adjusted		Aux MW C	W5DT-FD04	
EMS Gr I/O	EMS Net I/O										Gross I/O-CW	Net I/O-CWIT	Corr.	Opacity	NHR
303.152877	303.9225838	73.218491	1.001439	1.002863	1.00175038	1.011482	1.013508	1.01310296	1.01133275	281.3979354	281.3979	1.612997	0.641272		
305.250569	303.7398629	73.219391	1.00144	1.002863	1.00175217	1.011463	1.013484	1.01307951	1.01130753	282.1537504	282.1538	1.815174	0.638402		
303.01709	305.8906435	73.220284	1.001439	1.002863	1.0017529	1.011483	1.01351	1.01310449	1.01133173	282.9233526	282.9234	1.432184	0.635531		
302.25809	303.5745401	73.221176	1.001439	1.002862	1.00175398	1.01149	1.013519	1.01311302	1.01133916	280.6221719	280.6222	1.563265	0.632661		
302.283802	302.9173857	73.222069	1.001439	1.002862	1.00175526	1.011489	1.013519	1.01311274	1.01133758	278.5424216	278.5424	1.607683	0.62692		
302.309535	303.1099566	73.222961	1.001439	1.002862	1.00175653	1.011489	1.013518	1.01311245	1.011336	278.0069347	278.0069	1.593454	0.62405		
302.335248	303.3025335	73.223862	1.001439	1.002862	1.00175782	1.011489	1.013518	1.01311216	1.01133441	278.0069347	278.0069	1.593454	0.62405		
302.360982	303.4951387	73.224754	1.001439	1.002862	1.0017591	1.011489	1.013518	1.01311187	1.01133283	284.2076735	284.2077	1.579226	0.621179		
302.386695	303.6877278	73.225647	1.001439	1.002862	1.00176037	1.011489	1.013517	1.01311158	1.01133125	279.4350107	279.435	1.564997	0.618309		
302.412429	303.8803229	73.22654	1.001439	1.002862	1.00176165	1.011488	1.013517	1.01311129	1.01132968	280.5180627	280.5181	1.55077	0.615438		
302.438142	304.072924	73.227432	1.001439	1.002862	1.00176293	1.011488	1.013517	1.0131111	1.0113281	281.2223264	281.2223	1.536541	0.612568		
302.463876	304.2655312	73.228325	1.001439	1.002862	1.00176421	1.011488	1.013516	1.01311071	1.01132652	281.1079405	281.1079	1.522314	0.609698		
302.489611	304.4581667	73.229225	1.001439	1.002862	1.00176549	1.011488	1.013516	1.01311042	1.01132493	280.9935827	280.9936	1.508085	0.606827		
302.515324	304.650786	73.230118	1.001439	1.002862	1.00176677	1.011487	1.013516	1.01311013	1.01132335	280.8792285	280.8792	1.493856	0.603957		
302.541059	303.8685121	73.23101	1.001439	1.002862	1.00176805	1.011487	1.013516	1.01310984	1.01132177	277.9838322	277.9838	1.563223	0.601086		
302.566773	302.8167326	73.231903	1.001439	1.002862	1.00176932	1.011487	1.013515	1.01310955	1.0113202	281.8528217	281.8528	1.65571	0.598216		
302.592508	301.7651335	73.232796	1.001439	1.002863	1.0017706	1.011487	1.013515	1.01310926	1.01131862	283.5019163	283.5019	1.748199	0.595346		
302.618221	301.5761179	73.233696	1.001439	1.002863	1.00177189	1.011486	1.013515	1.01310897	1.01131703	283.9606499	283.9606	1.766701	0.592475		
302.643957	301.6256336	73.234589	1.001439	1.002863	1.00177317	1.011486	1.013514	1.01310868	1.01131545	279.7506001	279.7506	1.764742	0.589605		
302.669671	301.6751497	73.235481	1.001439	1.002863	1.00177444	1.011486	1.013514	1.01310839	1.01131387	281.0707232	281.0707	1.762781	0.586734		
302.695406	301.7246662	73.236374	1.001439	1.002863	1.00177572	1.011486	1.013514	1.0131081	1.0113123	284.2776088	284.2776	1.760822	0.583864		
302.721121	301.7741831	73.237267	1.001439	1.002863	1.001777	1.011486	1.013513	1.01310781	1.01131072	284.9721019	284.9721	1.758862	0.580994		
302.746856	301.8237004	73.238167	1.001439	1.002863	1.00177828	1.011485	1.013513	1.01310752	1.01130913	279.2311293	279.2311	1.756903	0.578123		
302.772571	301.8732181	73.239059	1.001439	1.002863	1.00177956	1.011485	1.013513	1.01310724	1.01130755	277.7438234	277.7438	1.754942	0.575253		
302.798307	301.9227362	73.239952	1.001439	1.002863	1.00178084	1.011485	1.013512	1.01310695	1.01130597	277.8722415	277.8722	1.752983	0.572382		
302.824043	301.9722547	73.240845	1.001439	1.002863	1.00178212	1.011485	1.013512	1.01310666	1.0113044	278.0006592	278.0007	1.751024	0.569512		
302.849758	302.0217737	73.241737	1.001439	1.002863	1.00178339	1.011484	1.013512	1.01310637	1.01130282	278.1291073	278.1291	1.749063	0.566642		
302.875495	302.071293	73.242638	1.001439	1.002863	1.00178468	1.011484	1.013512	1.01310608	1.01130123	278.2575212	278.2575	1.747105	0.563771		
302.90121	302.1208127	73.24353	1.001439	1.002863	1.00178596	1.011484	1.013511	1.01310579	1.01129965	278.3859377	278.3859	1.745144	0.560901		
302.926946	302.1703328	73.244423	1.001439	1.002863	1.00178723	1.011484	1.013511	1.0131055	1.01129807	280.2073399	280.2073	1.743185	0.55803		
302.952662	302.2198755	73.245316	1.001439	1.002863	1.00178851	1.011483	1.013511	1.01310521	1.0112965	282.4970104	282.497	1.741222	0.55516		
302.978399	302.2693965	73.246208	1.001439	1.002863	1.00178979	1.011483	1.01351	1.01310492	1.01129492	282.6530414	282.653	1.739264	0.55229		
303.004114	302.3189178	73.247101	1.001439	1.002863	1.00179106	1.011483	1.01351	1.01310463	1.01129334	282.2189554	282.219	1.737303	0.549419		
303.029851	302.3684395	73.248001	1.001439	1.002863	1.00179235	1.011483	1.01351	1.01310434	1.01129175	281.7848676	281.7849	1.735344	0.546549		
303.055567	302.4179616	73.248894	1.001439	1.002863	1.00179363	1.011483	1.013509	1.01310406	1.01129018	278.8209541	278.821	1.733383	0.543678		
303.081305	302.4674841	73.249786	1.001439	1.002863	1.00179491	1.011482	1.013509	1.01310377	1.0112888	277.8479316	277.8479	1.731424	0.540808		
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302.985176	302.8215139	73.256943	1.001439	1.002863	1.00180507	1.011483	1.01351	1.01310485	1.01127942	287.2196808	287.2197	1.692511	0.517845		
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302.932201	302.8128631	73.258728	1.001439	1.002863	1.0018076	1.011484	1.013511	1.01310544	1.01127746	278.7500465	278.75	1.688541	0.512104		
302.905714	302.8085488	73.259621	1.001439	1.002863	1.00180886	1.011484	1.013511	1.01310574	1.01127648	278.9805606	278.9806	1.686556	0.509234		
302.879226	302.8042122	73.260513	1.001439	1.002863	1.00181012	1.011484	1.013512	1.01310604	1.0112755	276.156231	276.1562	1.684572	0.506363		
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302.826274	302.7955836	73.262306	1.001439	1.002863	1.00181266	1.011485	1.013512	1.01310663	1.01127354	275.3607599	275.3608	1.680603	0.500622		
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302.720327	302.778282	73.265877	1.001439	1.002863	1.00181772	1.011486	1.013513	1.01310782	1.01126962	280.5305386	280.5305	1.672665	0.489141		
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302.614404	302.7610027	73.269455	1.001439	1.002863	1.00182278	1.011487	1.013515	1.01310901	1.0112657	283.9245722	283.9246	1.664726	0.477659		
302.587918	302.7566662	73.270348	1.001439	1.002862	1.00182404	1.011487	1.013515	1.01310931	1.01126472	282.7604525	282.7605	1.662743	0.474789		
302.561433	302.752352	73.271248	1.001439	1.002862	1.00182532	1.011487	1.013515	1.01310961	1.01126373	278.5868632	278.5869	1.660757	0.471918		
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302.481998	302.739387	73.273926	1.001439	1.002862	1.00182911	1.011488	1.013516	1.0131105	1.0112608	281.7979066	281.7979	1.654804	0.463307		
302.455513	302.7350505	73.274818	1.001439	1.002862	1.00183037	1.011488	1.013517	1.0131108	1.01125982	282.8989469	282.8989	1.652821	0.460437		
302.429028	302.7307362	73.275719	1.001439	1.002862	1.00183165	1.011488	1.013517	1.0131111	1.01125883	282.7851937	282.7852	1.650835	0.457566		
302.402543	302.726422	73.276611	1.001439	1.002862	1.00183291	1.011488	1.013517	1.0131114	1.01125785	282.671413	282.6714	1.648849	0.454696		
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302.349595	302.7177713	73.278397	1.001439	1.002862	1.00183544	1.011489	1.013518	1.01311199	1.0112559	282.4438831	282.4439	1.644882	0.448955		
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302.219666	301.8367524	73.282867	1.001439	1.002862	1.00184174	1.011491	1.01352	1.01311458	1.01125212	276.7682065	276.7682	1.700001	0.434603		
301.968702	302.5777827	73.28376	1.001439	1.002862	1.00184297	1.011492	1.013522	1.01311629	1.01125258	282.2695787	282.2696	1.623011	0.431733		
301.817741	303.6105269	73.284653	1.001439	1.002862	1.0018442	1.011494	1.013524	1.01311799	1.01125303	277.8696077	277.8696	1.521011	0.428862		
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301.515834	303.8524753	73.286446	1.001439	1.002862	1.00184667	1.011496	1.013528	1.0131214	1.01125394	281.8760804	281.8761	1.473408	0.423122		
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304.543775	302.9132492	73.289124	1.00144	1.002863	1.00185127	1.011469	1.013492	1.01308739	1.01121536	283.8139717	283.814	1.823231	0.41451		
304.871211	305.3799645	73.290024	1.00144	1.002863	1.00185263	1.011466	1.013488	1.01308374	1.01121034	281.6286832	281.6287	1.640823	0.41164		
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304.068383	304.5707923	73.298958	1.00144	1.002863	1.00186515	1.011474	1.013497	1.0130927	1.01120666	279.3455303	279.3455	1.638823	0.382936		
303.988111	304.4334752	73.299858	1.00144	1.002863	1.00186641	1.011474	1.013498	1.0130936	1.01120628	284.5516204	284.5516	1.643459	0.380066		
303.90784	304.2961389	73.300751	1.00144	1.002863	1.00186766	1.011475	1.013499	1.0130945	1.01120592	280.4455304	280.4455	1.648098	0.377195		
303.827571	304.1588058	73.301643	1.00144	1.002863	1.00186891	1.011476	1.0135	1.0130954	1.01120555	279.0618416	279.0618	1.652737	0.374325		
303.747302	304.0214979	73.302536	1.00144	1.002863	1.00187016	1.011476	1.013501	1.0130963	1.01120519	279.3410506	279.3411	1.657373	0.371454		
303.667035	303.9881334	73.303429	1.00144	1.002863	1.00187141	1.011477	1.013502	1.0130972	1.01120482	279.6202287	279.6202	1.653097	0.368584		
303.586769	303.9835291	73.304329	1.001439	1.002863	1.00187267	1.011478	1.013503	1.0130981	1.01120445	279.8994036	279.8994	1.646355	0.365714		
303.506504	303.9789471	73.305222	1.001439	1.002863	1.00187392	1.011479	1.013504	1.013099	1.01120408	280.1785815	280.1786	1.63961	0.362843		
303.426241	303.9743428	73.306114	1.001439	1.002863	1.00187517	1.011479	1.013505	1.0130999	1.01120372	286.6953877	286.6954	1.632868	0.359973		
303.345957	303.9697385	73.307007	1.001439	1.002863	1.00187642	1.01148	1.013506	1.0131008	1.01120336	280.9480466	280.948	1.626123	0.357102		
303.265695	303.9651343	73.307899	1.001439	1.002863	1.00187767	1.011481	1.013507	1.0131017	1.011203	282.4483364	282.4484	1.619381	0.354232		
303.185435	303.9605522	73.3088	1.001439	1.002863	1.00187893	1.011481	1.013508	1.0131026	1.01120262	277.344538	277.3445	1.612637	0.351362		
303.105176	303.955948	73.309692	1.001439	1.002863	1.00188018	1.011482	1.013509	1.0131035	1.01120226	273.5052461	273.5052	1.605894	0.348491		
303.024918	303.9513437	73.310585	1.001439	1.002863	1.00188143	1.011483	1.01351	1.0131044	1.0112019	278.6484592	278.6485	1.599152	0.345621		
302.944662	303.9467617	73.311478	1.001439	1.002863	1.00188268	1.011484	1.013511	1.0131053	1.01120154	285.9746332	285.9746	1.592407	0.34275		
302.864406	303.9421574	73.31237	1.001439	1.002863	1.00188392	1.011484	1.013512	1.0131062	1.01120118	282.1822181	282.1822	1.585665	0.33988		
302.784152	303.9375532	73.313271	1.001439	1.002863	1.00188518	1.011485	1.013513	1.01310711	1.0112008	280.2160004	280.216	1.578922	0.33701		
302.703878	303.9329489	73.314163	1.001439	1.002863	1.00188643	1.011486	1.013514	1.01310801	1.01120044	279.6055328	279.6055	1.572178	0.334139		
302.623626	303.9283669	73.315056	1.001439	1.002863	1.00188768	1.011486	1.013515	1.01310891	1.01120008	278.9950656	278.9951	1.565434	0.331269		
302.543375	303.9237627	73.315948	1.001439	1.002862	1.00188893	1.011487	1.013515	1.01310981	1.01119973	278.3846298	278.3846	1.558691	0.328398		
302.463126	303.9191585	73.316841	1.001439	1.002862	1.00189018	1.011488	1.013516	1.01311072	1.01119937	277.7741636	277.7742	1.551949	0.325528		
302.382877	303.9145765	73.317734	1.001439	1.002862	1.00189143	1.011489	1.013517	1.01311162	1.01119901	277.163698	277.1637	1.545204	0.322658		
302.30263	303.9099723	73.318634	1.001439	1.002862	1.00189269	1.011489	1.013518	1.01311252	1.01119864	278.6591017	278.6591	1.538462	0.319787		
302.222384	303.905368	73.319527	1.001439	1.002862	1.00189394	1.01149	1.013519	1.01311343	1.01119828	280.7369463	280.7369	1.531719	0.316917		
301.973505	303.9007638	73.320419	1.001439	1.002862	1.00189514	1.011492	1.013522	1.01311623	1.01119986	279.3953739	279.3954	1.509977	0.314046		
301.677978	303.8961818	73.321312	1.001439	1.002862	1.00189633	1.011495	1.013526	1.01311957	1.01120199	282.8460771	282.8461	1.484083	0.311176		
301.382489	303.8915776	73.322205	1.001439	1.002862	1.00189752	1.011498	1.013529	1.0131229	1.01120412	283.3394374	283.3394	1.458193	0.308306		
301.087016	303.8869734	73.323105	1.001439	1.002862	1.00189872	1.0115	1.013533	1.01312624	1.01120624	282.575826	282.5758	1.432302	0.305435		
300.791537	303.8823914	73.323997	1.001439	1.002862	1.00189991	1.011503	1.013536	1.01312959	1.01120838	281.8122156	281.8122	1.406408	0.302565		
300.496096	303.8777872	73.32489	1.001439	1.002862	1.0019011	1.011505	1.01354	1.01313293	1.01121052	275.9090749	275.9091	1.380518	0.299694		
302.551888	301.678218	73.325783	1.001439	1.002862	1.00190293	1.011487	1.013515	1.01310972	1.0111855	280.0531447	280.0531	1.752041	0.296824		

r Adjust		Outliers/filtered
ux Diff.		
75	0.125922	
84	0.32476	
59	-0.06467	
55	0.077615	
91	0.136219	
32	0.121951	
73	0.107681	
14	0.093412	
55	0.079142	
96	0.064874	
37	0.050604	
78	0.036336	
19	0.022068	
06	0.007797	
01	0.077122	
42	0.169569	
83	0.262017	
24	0.280477	
65	0.278477	
06	0.276476	
47	0.274476	
87	0.272474	
28	0.270474	
69	0.268473	
51	0.266473	
51	0.264473	
92	0.262471	
93	0.616728	
27	0.076099	
12	1.017972	
04	0.283683	
99	0.356713	
07	0.52656	
63	0.616765	
98	0.70497	
37	0.404386	
87	0.600643	
73	0.642669	
06	0.63074	
47	0.618821	
113	0.291849	
95	0.238783	
751	0.39691	
145	0.422823	
354	0.400945	
335	0.379067	
329	0.357189	
724	0.361308	
119	0.372618	
513	0.383928	
774	0.771863	
063	0.604934	
222	0.401917	
763	0.471163	
863	0.481863	
963	0.492803	
063	0.503622	
163	0.514442	
263	0.525262	
362	0.536081	
462	0.546897	
562	0.557717	
662	0.568536	
762	0.579354	
862	0.590174	
962	0.600993	
062	0.611813	
162	0.622629	
262	0.633449	
362	0.644268	
461	0.655088	
978	0.633883	
332	0.693826	
687	0.673765	
342	0.643704	
396	0.613647	
751	0.483586	
105	0.453525	
248	0.443418	
818	0.43883	
169	0.434241	
084	0.258833	
991	0.505689	
506	0.728441	
109	0.714242	
714	0.634569	
318	0.554877	
193	0.546523	
596	0.271907	
416	0.343633	
236	0.309418	
056	0.436693	
213	0.489714	
637	0.456467	
269	0.443221	
839	0.42997	
409	0.418724	
629	0.218963	
331	-0.27287	
633	-0.37583	
582	0.62946	
062	0.898782	
342	0.889402	
567	0.022047	
048	-0.22193	
528	-0.22784	
111	0.494457	
538	0.326421	
665	0.33301	
392	0.339599	
819	0.346185	
247	0.352774	
626	0.456966	
544	0.617927	
463	0.559436	
382	0.600943	
301	0.642451	
673	0.556583	
341	0.435489	
009	0.314397	
676	0.193301	
668	0.338137	
329	0.450032	
992	0.564926	
061	0.54991	
404	0.498964	
975	0.448006	
097	0.397063	
444	0.346104	
791	0.379228	
137	0.435613	
484	0.491991	
831	0.548373	
995	0.345555	
725	0.07104	

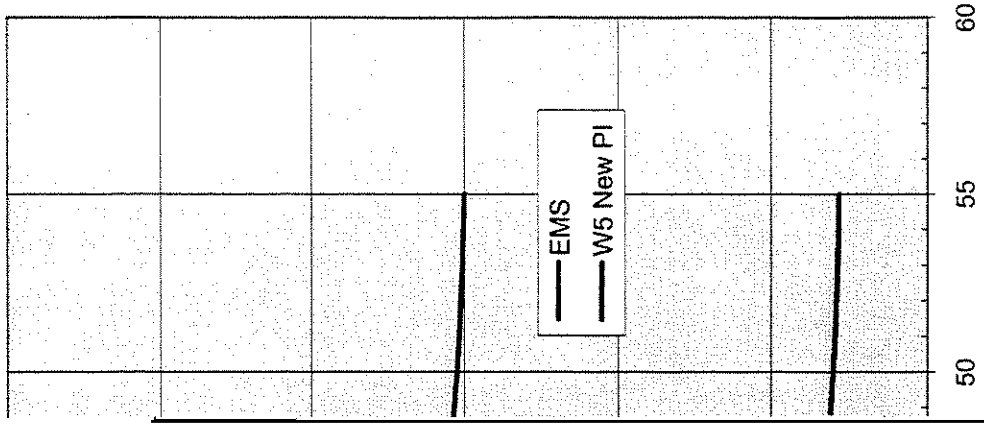
37275.42	1	24.75881	24.33905	22.97504	22.55528	279.0146	294.2253	292.6755	281.9605	281.9605	73.792
37275.42	2	24.76737	24.34745	22.98724	22.56732	284.6022	294.3196	292.8156	287.5064	287.5064	73.79267
37275.42	1	24.77593	24.35585	22.99943	22.57935	286.1924	294.4139	292.9558	289.2129	289.2129	73.79333
37275.42	2	24.78449	24.36425	23.01163	22.59139	288.3431	294.5082	293.0959	289.3646	289.3646	73.794
37275.42	3	24.79304	24.37265	23.02383	22.60343	286.4938	294.6025	290.2361	289.5163	289.5163	73.79466
37275.42	4	24.8016	24.38105	23.03602	22.61547	280.4862	294.6968	293.3762	283.4458	283.4468	73.79533
37275.42	5	24.81016	24.38945	23.07884	22.65813	278.1097	294.7911	293.8729	281.0426	281.0426	73.796
37276.42	6	24.81546	24.39467	23.13012	22.70932	283.9046	294.8497	294.4688	286.8961	286.8961	73.79666
37275.42	7	24.8199	24.39901	23.13339	22.71251	279.8787	294.8965	294.5069	282.8293	282.8293	73.79733
37275.42	8	24.82432	24.40335	23.12338	22.70241	279.2831	294.9472	294.3884	282.2271	282.2271	73.798
37276.42	9	24.82874	24.40769	23.11337	22.69232	280.6296	294.996	294.2709	283.4862	283.4862	73.79866
37275.42	10	24.83316	24.41203	23.10336	22.68223	281.776	295.0447	294.1534	284.7453	284.7453	73.79932
37275.43	11	24.83758	24.41637	23.09335	22.67214	283.0224	295.0934	294.0359	286.0045	286.0045	73.8
37275.43	12	24.842	24.42071	23.08334	22.66204	282.7156	295.1421	293.9184	285.694	285.694	73.80066
37275.43	13	24.84643	24.42505	23.07332	22.65195	281.9792	295.1909	293.8009	284.9495	284.9495	73.80132
37275.43	14	24.85065	24.42939	23.06331	22.64186	281.2429	295.2396	293.6834	284.2049	284.2049	73.80199
37276.43	15	24.85527	24.43373	23.0633	22.63178	280.5065	295.2884	293.5659	283.4603	283.4603	73.80266
37276.43	16	24.85969	24.43807	23.04329	22.62167	279.7701	295.3371	293.4484	282.7156	282.7158	73.80332
37275.43	17	24.86411	24.44241	23.03328	22.61158	279.7676	295.3858	293.3309	282.733	282.733	73.80399
37275.43	18	24.86854	24.44675	23.02327	22.60148	280.0135	295.4346	293.2134	282.9609	282.9609	73.80465
37275.43	19	24.87296	24.45109	23.01325	22.59139	283.6131	295.4833	293.0959	286.5979	286.6979	73.80532
37276.43	20	24.87738	24.45543	23.00324	22.5813	281.7561	295.532	292.9784	284.721	284.721	73.80598
37276.43	21	24.8818	24.45977	22.99023	22.57121	278.1318	295.5806	292.8609	281.058	281.058	73.80665
37276.43	22	24.88622	24.46411	22.98322	22.56111	283.0247	295.6295	292.7434	286.002	286.002	73.80732
37275.43	23	24.89064	24.46846	22.97321	22.55102	284.2016	295.6783	292.6259	287.1906	287.1906	73.80798
37278.43	24	24.7036	24.28506	23.15884	22.74009	283.6969	293.6191	294.8271	286.6896	286.6896	73.80865
37275.43	25	24.67276	24.25458	23.01125	22.59007	283.1963	293.2771	293.1154	286.1825	286.1825	73.80931

###########	52.40204	51.43784	48.4356	47.4714	604.6273	606.9766	589.5871	608.2274	608.2274	76.16087	3.966446	2.266424	1.700022
###########	53.80292	52.81295	49.8606	48.87063	612.8254	623.3015	608.6681	616.2784	616.2784	76.16526	3.942417	2.293883	1.648533
###########	54.91732	53.90684	51.07203	50.06165	613.7614	638.3191	621.2426	617.1584	617.1584	76.16969	3.845284	2.31573	1.529584
###########	56.55125	54.5291	52.18019	51.15804	612.6076	643.7367	634.6881	616.073	616.073	76.1741	3.371059	2.328156	1.042903
###########	56.0742	55.04243	52.65939	51.62762	618.1006	649.8625	640.4544	621.6013	621.6013	76.1785	3.414806	2.338407	1.076399

	Net EMS	W5 New PI	
	35.769426	32.97369	
	11.139963	10.73819	
	0.0110884	0.010479	
	EMS	W5 New PI	
25	12,848	12,319	(529)
26	12,804	12,279	(525)
27	12,764	12,242	(522)
28	12,728	12,209	(519)
29	12,695	12,179	(516)
30	12,665	12,152	(513)
31	12,638	12,127	(511)
32	12,613	12,104	(509)
33	12,590	12,083	(507)
34	12,569	12,064	(505)
35	12,550	12,047	(503)
36	12,533	12,031	(501)
37	12,517	12,017	(500)
38	12,503	12,004	(498)
39	12,490	11,992	(497)
40	12,478	11,982	(496)
41	12,467	11,972	(495)
42	12,457	11,963	(494)
43	12,449	11,956	(493)
44	12,441	11,949	(492)
45	12,434	11,943	(491)
46	12,428	11,937	(491)
47	12,422	11,932	(490)
48	12,417	11,928	(489)
49	12,413	11,925	(489)
50	12,410	11,922	(488)
51	12,407	11,919	(488)
52	12,404	11,917	(487)
53	12,403	11,916	(487)
54	12,401	11,915	(486)
55	12,400	11,914	(486)

#DIV/0!

2/24/2005



Condenser Adjustment

Starting Temp 72

Cycling Unit, HR Adjustment from 75 Degr. F

Coefficients

Temp. Rise		x2	x	constant
1	73	-2.8300E-07	1.6638E-05	1.0012E+00
2	74	-5.6976E-07	3.2730E-05	1.0024E+00
3	75	-2.6598E-07	6.7297E-06	1.0044E+00
4	76	4.9795E-07	- 5.2256E-05	1.0070E+00
5	77	5.6158E-07	- 6.3128E-05	1.0089E+00
6	78	1.2771E-06	- 1.2447E-04	1.0118E+00
7	79	2.0586E-06	- 2.0366E-04	1.0153E+00
8	80	2.6205E-06	- 2.6447E-04	1.0185E+00
9	81	3.1911E-06	- 3.2772E-04	1.0218E+00
10	82	3.5374E-06	- 3.7829E-04	1.0251E+00

Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

See HRCondImpact.xls

Auxiliary Calculator-First Ordered Curve-Hourly

Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10	
H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	Now based upon ODPM	Adusted H8/9 to 27 MW on 6/7 from 30 MW
H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000		
K1	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K4	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K5	80	0.01397	3.86311	0.02901	3.14307	0.416667	10,000	Previously 90 MW	
K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW	
W10			0.1		0.1	0.025	600		
W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW	
W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW	
W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W7	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W8	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W9			0.1		0.1	0.041667	1,000		
H5						0.0625	1,500		
H7						0.083333	2,000		
					2.23771				

Check on PI ABC Calculation

W5 Data

	Mbtu	NHR	OPNHR Rpt1 ABC	OPNHR EMS	OPNHR PI-Corr	OPNHR Var Rpt1 ABC	OPNHR Var EMS	OPNHR Var PI-Corr	Mbtus Rpt1 ABC	Mbtus EMS	Mbtus PI-Corr	Comments
1/1/2002	3,925	13,101	12,773	13,272	13,032	328.45	(170.67)	69.27	3,946	4,100	3932.1651	
1/2/2002	3,499	12,911	12,955	13,415	13,257	(44.00)	(503.63)	(345.64)	3,525	3,650	3505.3661	
1/3/2002	4,445	12,837	12,691	13,196	12,946	145.65	(359.11)	(109.07)	4,531	4,711	4516.299	
1/4/2002	3,759	12,859	12,718	13,243	12,948	140.80	(383.29)	(88.65)	3,765	3,920	3756.0911	
1/5/2002	4,782	12,847	12,668	13,171	12,917	179.28	(324.25)	(69.88)	4,803	4,994	4786.6666	
1/6/2002	4,135	12,946	12,853	13,322	13,156	92.59	(375.69)	(210.33)	4,097	4,246	4077.1529	
1/7/2002	4,589	12,374	12,675	13,176	12,925	(300.94)	(802.36)	(550.83)	4,792	4,981	4774.9072	Wrong?/Outlier
1/8/2002	4,701	12,623	12,832	13,285	13,164	(209.59)	(662.21)	(541.02)	4,834	5,005	4809.1202	54 FWH Out
1/9/2002	4,206	12,627	12,729	13,231	12,981	(101.46)	(603.06)	(353.37)	4,235	4,401	4219.7883	54 FWH Out
1/10/2002	4,169	13,261	12,738	13,247	12,992	523.06	13.87	269.56	3,989	4,149	3977.6632	54 FWH Out
1/11/2002	4,512	13,163	12,680	13,187	12,922	483.01	(23.83)	241.08	4,538	4,719	4522.7696	54 FWH Out
1/12/2002	4,552	13,097	12,725	13,220	12,989	371.07	(123.89)	107.22	4,484	4,658	4467.5094	54 FWH Out
1/13/2002	1,593	14,746	13,468	14,020	13,703	1,278.02	726.29	1,043.27	1,520	1,583	1518.3398	54 FWH Out
1/14/2002	4,436	13,097	12,782	13,262	13,075	315.39	(165.22)	21.52	4,422	4,588	4404.2967	54 FWH Out
1/15/2002	3,488	14,355	12,905	13,407	13,175	1,449.98	948.68	1,180.51	3,120	3,241	3109.3555	54 FWH Out
1/16/2002	4,511	12,934	12,785	13,266	13,086	148.19	(332.05)	(152.76)	4,422	4,588	4404.9829	54 FWH Out
1/17/2002	4,283	12,894	12,766	13,260	13,055	127.79	(366.42)	(161.17)	4,209	4,372	4196.0273	54 FWH Out
Sum/Avg	69586.716				Avg.	290	(206)	21	69,232	71,908	68,979	
									-0.51%	3.34%	-0.87%	Diff from Act
Sum 1/1-7	29,134				Avg.	77.41	(417.00)	(186.45)	29,458	30,602	29,349	
									1.11%	5.04%	0.74%	Diff from Act
Sum 1/1-6	24,545				Avg.	140.46	(352.77)	(125.72)	24,666	25,621	24,574	
									0.50%	4.38%	0.12%	Diff from Act

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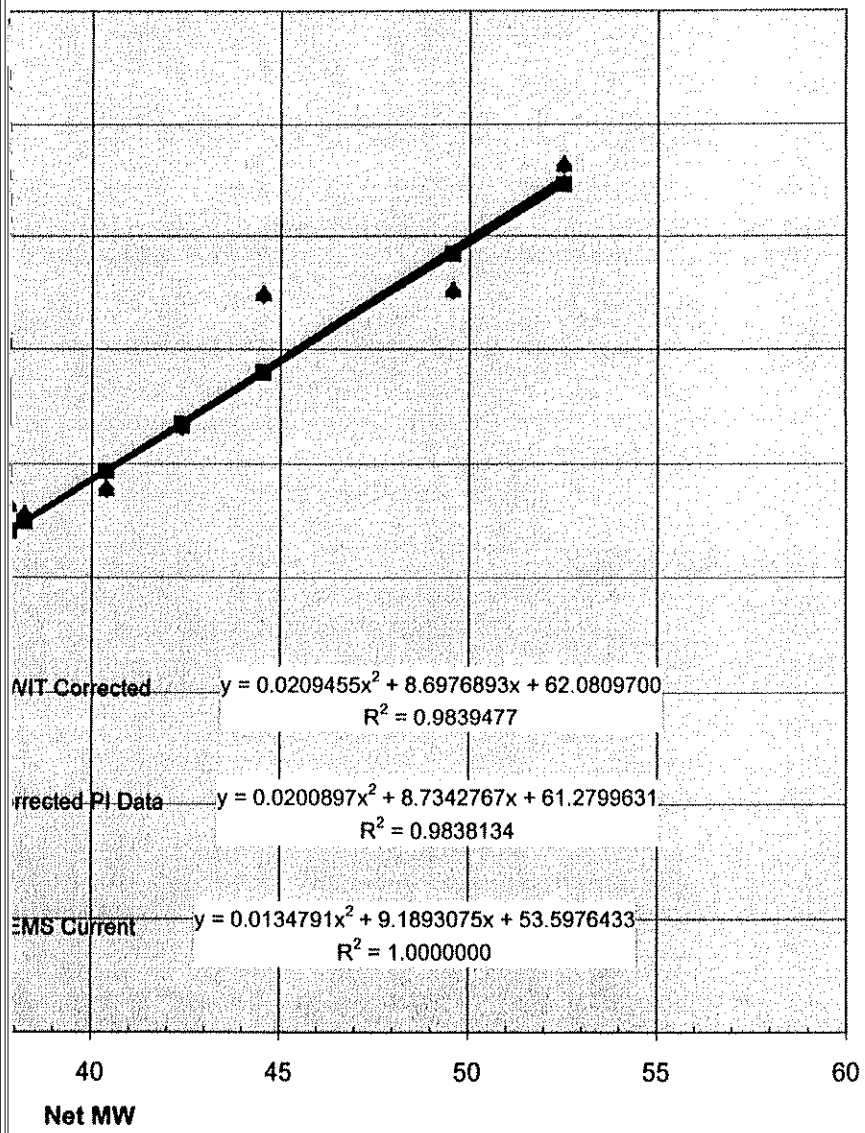
t IO Plot 2/24/2005

/O ABC-W6 (10/19, 10/25-29)



ually Adjust	
el Aux Diff.	
76877	-0.16743
77126	-0.2353
82379	0.128991
84649	0.003867
85371	-0.05133
86265	-0.07928
48663	-0.0559
86995	-0.25942
87679	0.257765
89567	0.047767
90963	-0.16584
92776	0.03799
93032	0.198966
93397	0.169222
93721	0.001064
96187	0.36768
96765	0.037094
96934	0.134026
97218	0.285823
97292	-0.17377
.49731	0.381352
97697	-0.36931
98083	-0.09951
98631	0.065981
98631	0.005628
99483	0.64113
00149	0.094069
01125	0.289503
01722	0.215503
02255	-0.1345
02768	0.456359
04707	-0.22957
09029	0.677624
10458	0.325021
13796	-0.3069
.61823	0.129282
525755	-0.07326
526161	0.009907
527338	0.589866
527799	0.041375
532154	0.034532
532685	0.036037
534521	0.252661
535574	0.350037
541118	0.030671
542527	0.018377
542726	0.462214
548096	0.134983
1.55115	0.537742
554318	0.01382
558816	0.329923
560097	0.225945
560915	0.266407
574093	0.514002
578671	0.662113
579288	-0.14054
585354	0.402453
1.69077	0.600646
591026	0.384617
591196	0.463924
592778	-0.04935
.593144	0.446834
1.59537	0.020971
.616891	0.065482
.622152	0.173888
1.62395	0.234067
.631105	0.343821
.657206	0.283021
1.94172	0.051669
.942431	0.309179
.950777	0.004015
.968551	-0.27542
.963524	0.221539
1.96962	-0.10784
1.97152	0.002743
1.97445	0.189323
.976216	0.139816
.978637	0.467156
.982028	-0.44207
.983741	-0.18788
.998066	0.367973
.000488	0.010632
.004709	-0.12045
.004748	-0.46064
.006747	-0.85708
2.00786	0.241125
2.00926	0.361334
.009957	-0.09817
.011687	-0.08754
.024354	-0.04568
.038891	0.201061
.047087	0.190241
.081231	-0.30214
.120974	-0.35468
.177872	0.270915
.276396	0.100877
.341603	0.360499

Outliers/filtered										
6.331441	6.842739	74.21408	103.0307	117.1088	74.2443	74.2443	79.57745	-1.5113	1.496766	-3.00806
7.842163	6.457149	123.1229	124.5597	113.4964	123.3908	123.3908	78.66401	1.385014	1.513796	-0.12878
10.85656	9.099394	174.0972	160.7313	138.3308	174.611	174.611	78.25126	1.757163	1.560097	0.197066
13.11823	11.26939	172.4437	170.5995	158.8674	172.8812	172.8812	78.41978	1.848836	1.133565	0.71517
21.36572	19.02943	227.0112	244.7362	233.348	227.7725	227.7725	77.79687	2.33629	1.59537	0.740921
22.27729	20.04045	273.208	253.0925	243.169	273.7072	273.7072	78.70828	2.236841	1.496934	0.739907
23.37333	22.21331	265.7052	263.1827	264.3736	266.0903	266.0903	78.93081	1.160023	1.535574	-0.37555
23.8457	22.68021	267.8645	267.5457	268.9466	268.563	268.563	78.21474	1.165497	1.578671	-0.41317
23.93876	22.74789	262.7446	268.4063	269.61	263.1559	263.1559	78.85635	1.190866	1.527799	-0.33693
24.3667	23.36384	271.1975	272.368	276.653	271.9198	271.9198	78.17236	1.002859	1.480869	-0.47801
24.8784	23.85511	275.2379	277.1144	280.4801	275.6494	275.6494	78.89483	1.023285	1.490202	-0.46692
25.00907	24.06662	273.6011	278.3282	282.5603	274.4194	274.4194	77.95643	0.942453	1.492585	-0.55013
25.05357	24.44527	287.0399	278.7416	286.2875	287.4526	287.4526	78.92982	0.608295	1.493397	-0.8851
28.92484	26.0618	310.0024	315.0072	302.2428	310.4753	310.4753	78.85434	2.863045	1.564009	1.29903
32.62939	31.70865	356.3874	350.2664	358.5306	356.9135	356.9135	78.86957	0.920746	1.63158	-0.7108
32.93542	30.27509	351.6768	353.1922	344.1694	352.1943	352.1943	78.87141	2.660339	1.637162	1.02317
33.26282	30.55921	365.4586	356.3369	347.0033	365.2618	365.2618	80.13375	2.703606	1.643134	1.06047
33.55599	31.14284	358.4781	359.1664	352.8518	359.128	359.128	78.63722	2.413153	1.648481	0.76467
33.61719	31.50145	365.7619	359.7454	356.45	365.6191	365.6191	80.04366	2.115736	1.649598	0.46613
34.58276	31.20764	368.381	369.0677	353.5017	368.902	368.902	78.9035	3.375128	1.66721	1.70791
34.6899	32.11809	372.2364	370.0932	362.6453	372.9025	372.9025	78.64729	2.571808	1.669164	0.90264
47.90031	45.99281	490.7144	501.1926	504.7526	491.5535	491.5535	78.67361	1.907501	2.195779	-0.2882
37.19377	34.37976	398.8113	394.4204	385.4557	399.5596	399.5596	78.57681	2.814003	1.98197	0.83203
38.33765	35.05975	421.9159	405.6173	392.3408	422.7422	422.7422	78.5164	3.278099	2.004817	1.2732
54.16216	52.79198	580.992	565.7046	576.2855	581.9748	581.9748	78.69502	1.370186	2.320828	-0.950
50.47412	50.03514	510.52	527.5245	547.1311	511.5045	511.5045	78.53654	0.438976	2.247178	-1.80

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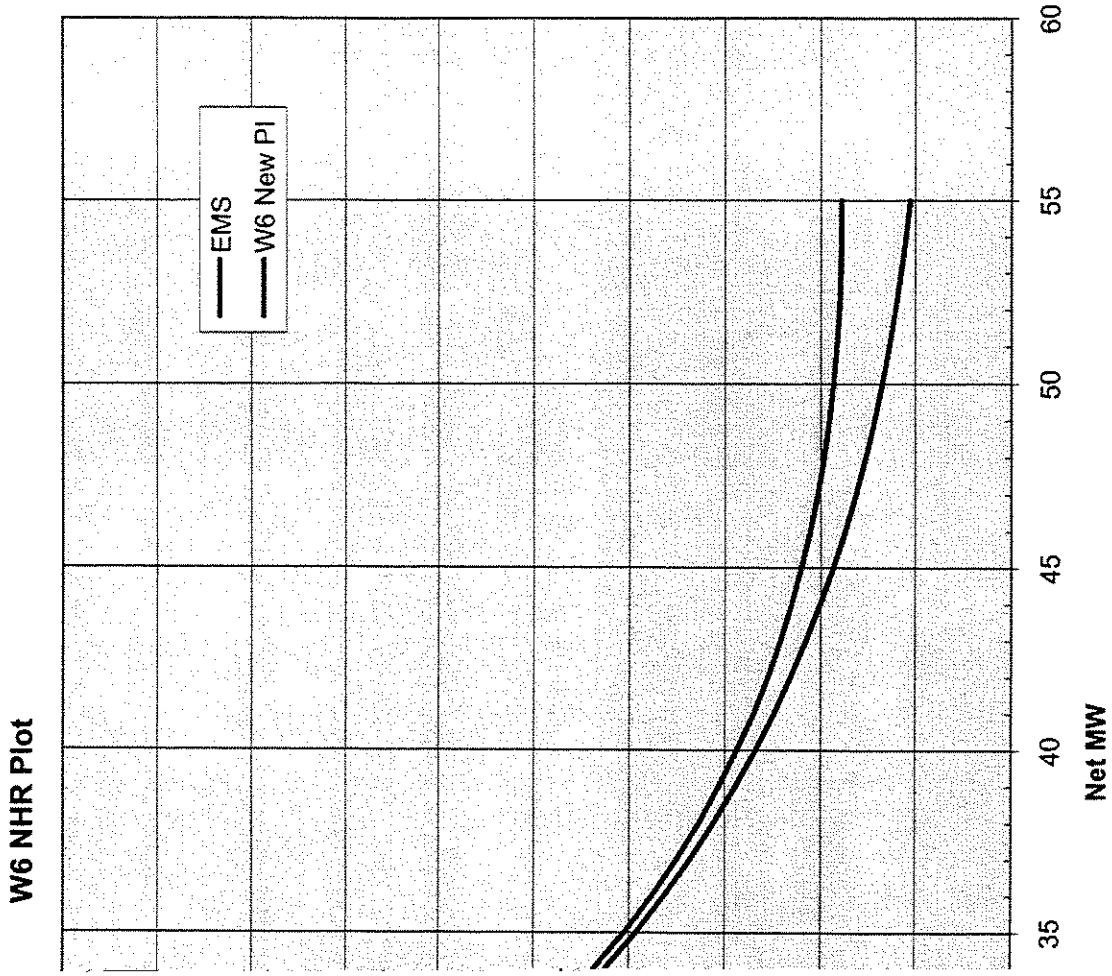
NHR Plot



	Net EMS	W6 New PI
	53.597643	62.08097
	9.1893075	8.697689
	0.0134791	0.020946
	EMS	W6 New PI
25	11,670	11,705
26	11,601	11,630
27	11,538	11,563
28	11,481	11,501
29	11,428	11,446
30	11,380	11,395
31	11,336	11,350
32	[illegible]	[illegible]
33	11,258	11,270
34	11,224	11,236
35	11,192	11,205
36	11,163	11,176
37	11,137	11,151
38	11,112	11,127
39	11,089	11,106
40	11,068	11,088
41	11,049	11,071
42	11,032	11,056
43	11,015	11,042
44	11,001	11,030
45	10,987	11,020
46	10,975	11,011
47	10,963	11,003
48	10,953	10,996
49	10,944	10,991
50	10,935	10,987
51	10,928	10,983
52	10,921	10,981
53	10,915	10,979
54	10,910	10,978
55	10,905	10,978

Condenser Adjustment

Cycling Unit, HR Adjustment from 75 Degr. F

Temp. Rise		Coefficients x2	x	constant
1	76	-2.8300E-07	1.6638E-05	1.0012E+00
2	77	-5.6976E-07	3.2730E-05	1.0024E+00
3	78	-2.6598E-07	6.7297E-06	1.0044E+00
4	79	4.9795E-07	- 5.2256E-05	1.0070E+00
5	80	5.6158E-07	- 6.3128E-05	1.0089E+00
6	81	1.2771E-06	- 1.2447E-04	1.0118E+00
7	82	2.0586E-06	- 2.0366E-04	1.0153E+00
8	83	2.6205E-06	- 2.6447E-04	1.0185E+00
9	84	3.1911E-06	- 3.2772E-04	1.0218E+00
10	85	3.5374E-06	- 3.7829E-04	1.0251E+00

Kahe Avg CWIT is 76.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

See HRCondImpact.xls

Auxiliary Calculator-First Ordered Curve-Hourly

Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10	
H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	Now based upon ODPM	Adusted H8/9 to 27 MW on 6/7 from 30 MW
H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000		
K1	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K4	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K5	80	0.01397	3.86311	0.02901	3.14307	0.416667	10,000	Previously 90 MW	
K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW	
W10			0.1		0.1	0.025	600		
W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW	
W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW	
W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W7	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W8	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W9			0.1		0.1	0.041667	1,000		
H5						0.0625	1,500		
H7						0.083333	2,000		

2.23771

Check on PI ABC Calculation

W6 Data

	Mbtu	NHR	OPNHR Rpt1 ABC	EMS	PI-Corr	OPNHR Var Rpt1 ABC	EMS	PI-Corr	Mbtus Rpt1 ABC	EMS	PI-Corr
10/20/2001	4,810.44	12,023.10	12,064.51	12,064.51	12,015.32	(41.41)	(41.41)	7.78	4,862.95	4,862.95	4,843.13
10/21/2001	4,072.05	12,177.19	12,066.15	12,066.15	12,018.52	111.04	111.04	158.68	4,102.27	4,102.27	4,086.08
10/22/2001	4,318.45	12,099.87	12,233.98	12,233.98	12,182.42	**(134.10)**	**(134.10)**	**(82.55)**	4,411.72	4,411.72	4,393.12
10/23/2001	5,038.60	11,877.89	11,781.19	11,781.19	11,747.67	**96.70**	**96.70**	**130.22**	5,105.50	5,105.50	5,090.97
10/24/2001	5,019.90	11,641.70	11,850.50	11,850.50	11,814.07	**(208.80)**	**(208.80)**	**(172.37)**	4,990.47	4,990.47	4,975.13
10/25/2001	5,134.63	12,187.59	11,829.45	11,829.45	11,792.24	**358.14**	**358.14**	**395.36**	5,000.99	5,000.99	4,985.25
10/26/2001	5,229.68	11,950.82	11,951.33	11,951.33	11,910.87	**(0.50)**	**(0.50)**	**39.95**	5,349.52	5,349.52	5,331.41
10/27/2001	4,623.60	12,106.84	12,257.94	12,257.94	12,202.91	**(151.10)**	**(151.10)**	**(96.07)**	4,606.37	4,606.37	4,585.69
10/28/2001	3,353.99	12,272.17	12,367.03	12,367.03	12,312.24	**(94.86)**	**(94.86)**	**(40.07)**	3,313.23	3,313.23	3,298.55
10/29/2001	4282.6932	12087.759	12154.128	12154.128	12104.031	**(66.37)**	**(66.37)**	**(16.27)**	4,252.18	4,252.18	4,234.66
10/30/2001	4150.2031	12131.55	12261.67	12261.67	12208.746	**(130.12)**	**(130.12)**	**(77.20)**	3,887.06	3,887.06	3,870.28
Sum/Avg	50034.238				Avg.	(24)	(24)	22	49,882.25	49,882.25	49,694.27
								Diff from Act	-0.30%	-0.30%	-0.68%

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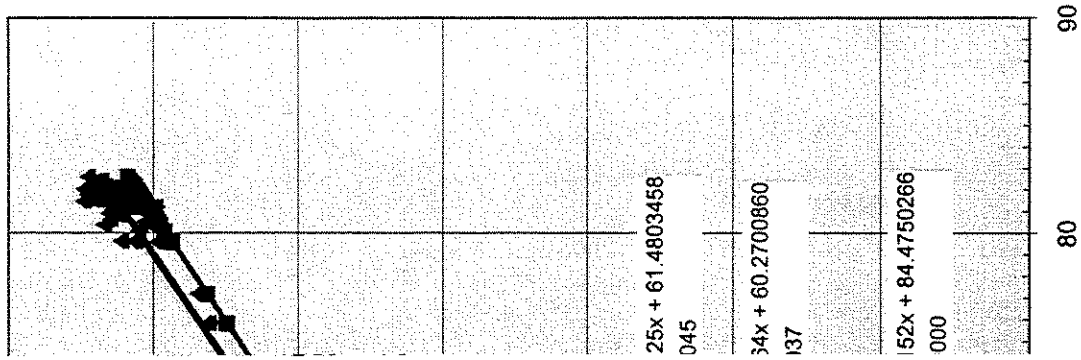
				3.2799436	2.0634658	1.9941577		90


25x + 61.4803458
045
34x + 60.2700860
137
52x + 84.4750266
000
80
90

	NHR Actual	New ABC	Diff
%	9,978	9,887	(91)
%	9,978	9,887	(91)
%	9,978	9,887	(91)
%	9,978	9,887	(91)
%	9,978	9,887	(91)
%	9,978	9,887	(91)
%	9,978	9,887	(91)
%	9,978	9,887	(91)
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5%	9,981	9,887	(95)
5%	9,981	9,887	(95)
5%	9,981	9,887	(95)
5%	9,981	9,887	(95)
5%	9,982	9,887	(95)
5%	9,982	9,887	(95)
5%	9,982	9,887	(95)
5%	9,982	9,887	(95)
5%	9,982	9,887	(95)

lot Data

ly Adjust

	Aux Diff.	Opacity	Act. NHR
386	0.013351	0.022253	10,675
568	-0.00203	0.020768	10,747
3785	-0.00811	0.019282	10,569

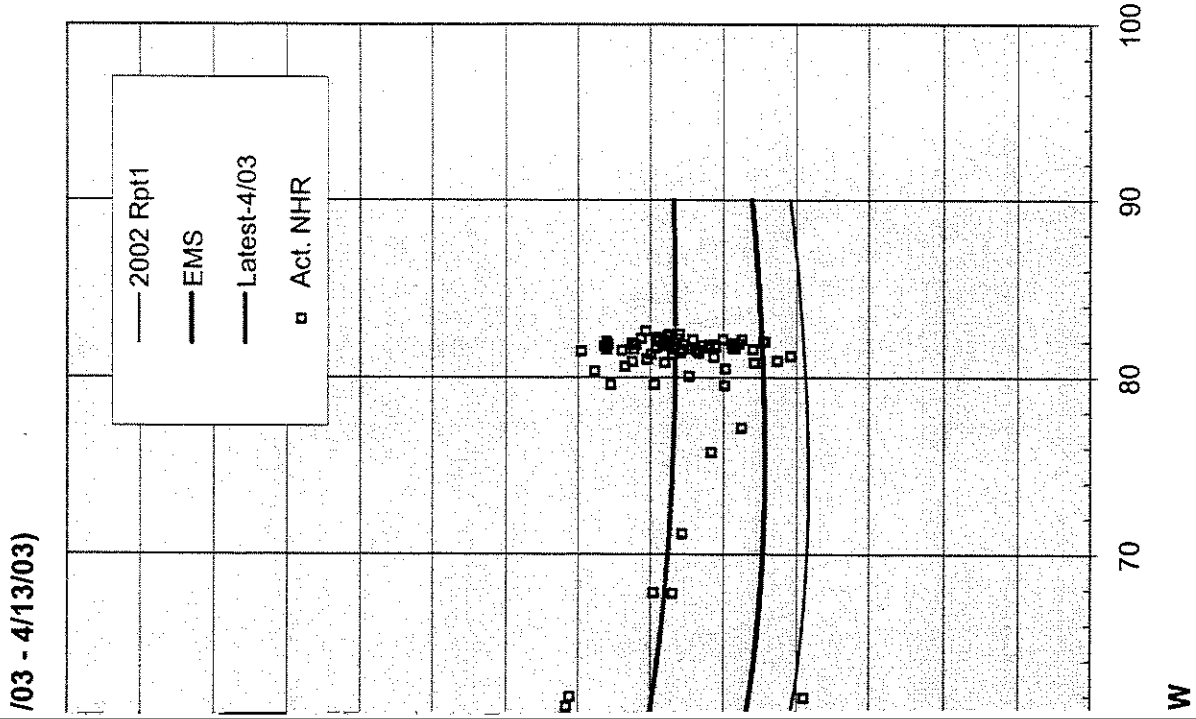
0694	0.035329	0.007399	10,780
5068	0.045455	0.005913	11,213
3334	0.098095	0.004428	11,050
3461	0.043027	0.002942	10,133
3147	0.05191	0.001457	
3602	0.064865	-2.9E-05	10,167
7069	0.067886	-0.00151	10,565
4046	-0.00512	-0.003	10,475
3696	-0.03908	-0.00449	10,056
3296	-0.01232	-0.005	10,348
1475	-0.03228	-0.005	10,422
3094	0.005291	-0.005	10,191
5165	-0.01438	-0.005	10,112
7103	0.010376	-0.005	10,033
5428	0.011493	-0.005	10,353
9628	0.026231	-0.005	10,208
5053	-0.01194	-0.005	10,161
2165	0.04768	-0.005	10,267
0953	-0.00661	-0.005	9,947
8565	0.021503	-0.005	9,886
0189	0.03924	-0.005	9,967
5503	-0.00899	-0.005	9,970
9506	0.039003	-0.005	9,889
1103	0.037742	-0.005	10,320
9378	0.02503	-0.005	10,071
8666	0.047269	-0.005	10,390
7515	0.044435	-0.005	10,248
5115	0.031922	-0.005	10,056
6278	0.022947	-0.005	9,971
3078	0.019966	-0.005	9,815
2228	0.025326	-0.005	9,973
7403	0.021273	-0.005	10,155
2515	0.037949	-0.005	10,026
7403	0.034656	-0.005	9,977
0183	0.006598	-0.005	10,138
6528	0.0076	-0.005	10,067
1103	0.044653	-0.005	10,244
7313	0.051346	-0.005	10,117
7753	0.047352	-0.005	10,119
3059	0.068814	-0.005	10,041
6976	0.037789	-0.005	9,955
0432	0.039302	-0.01726	10,326
5365	0.058635	0.01707	10,139
7613	0.069557	0.015231	10,248
2228	0.039608	0.013392	10,185
9728	0.041694	0.011553	10,177
6665	0.068971	0.009714	10,022
5115	0.054727	0.007875	10,149
4303	-0.00317	0.006036	10,154
0163	0.069406	0.004197	10,076
0713	0.017277	0.002358	10,246
2273	0.045941	0.000519	10,000
1453	0.025585	-0.00132	10,063
0191	0.066151	-0.00316	10,319
6278	0.072036	-0.005	10,108
0653	0.029205	-0.00684	10,183
2295	0.015376	-0.00751	10,126
6878	0.082902	-0.00751	10,314
11328	0.047697	-0.00751	10,116
5115	-0.00468	-0.00751	10,037
0362	0.006784	-0.00751	10,153
2803	0.037305	-0.00751	10,224
6502	0.024506	-0.00751	10,238
11433	0.032693	-0.00751	10,093
1374	0.029968	-0.00751	10,185
5549	0.015934	-0.00751	10,109
6253	-0.0047	-0.00751	10,152
14302	0.000399	-0.00751	10,166
9978	0.055789	-0.00751	10,277
5815	0.071252	14.02002	10,198
11818	0.05317	0.63496	10,137
3003	0.018481	4.029411	10,021
20603	0.014111	8.935107	10,212
11451	-0.00257	0.175266	10,189
56094	-0.015	-0.00743	10,308
8872	-0.00717	-0.00733	9,994
56094	0.009497	-0.00724	9,996
36778	-0.05215	-0.00714	9,652
6998	-0.00793	-0.00705	9,918
35053	-0.01955	-0.00696	9,914
37009	-0.03731	-0.00686	10,094
12715	-0.04028	-0.00677	9,949
12904	-0.04547	-0.00667	10,140
13793	-0.07651	-0.00658	9,780
25571	-0.07641	-0.00649	9,819
32403	-0.06336	-0.00639	10,595
51352	0.521599	-0.0063	9,842
10062	-0.01668	-0.0062	9,931
30409	-0.02484	-0.00611	10,431
36447	0.487459	-0.00602	9,923
34192	-0.02969	-0.00592	10,339
44221	-0.04688	-0.00583	10,821
44188	-0.06792	-0.00573	10,474
42293	-0.06775	-0.00564	10,716
40836	-0.02777	-0.00554	11,034
38952	-0.02118	-0.00545	10,846
38721	-0.01676	-0.00536	10,207
42568	-0.04952	-0.00526	11,268
44188	-0.00351	-0.00517	10,672
46544	0.008777	-0.00507	11,119
48534	-0.03017	-0.00767	10,480
45939	-0.02283	-0.00876	10,628
50373	-0.05913	-0.00985	10,367
56603	-0.06928	-0.01094	10,578
60701	-0.06624	-0.01203	10,553
58279	-0.04271	-0.01312	10,671
60372	-0.05288	-0.01421	10,906
55595	-0.06092	-0.0153	10,619
56274	-0.05209	-0.01639	10,363
57631	-0.06107	-0.01748	10,762
59704	-0.05986	-0.01857	10,909

Outliers

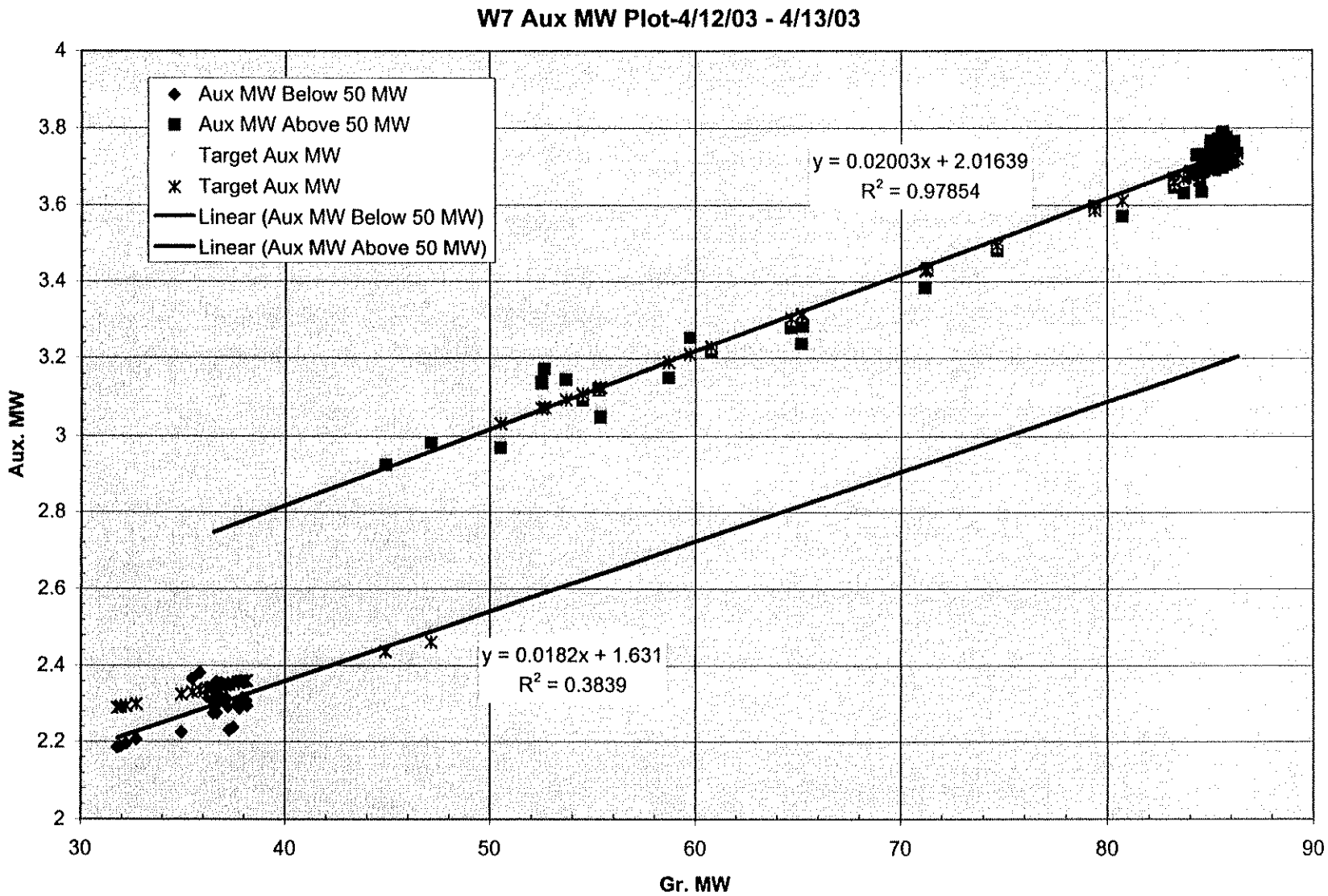
########	37.27317	35.04246	374.9604	369.1176	370.6495	#DIV/0!	#DIV/0!	88.20805	2.230715	2.350935	-0.12022	0.017797	10,700
########	37.48047	35.24265	380.1999	370.835	372.3891	#DIV/0!	#DIV/0!	92.50652	2.237817	2.353261	-0.11544	0.016311	10,788
########	34.94114	32.71645	356.5627	349.8985	350.525	#DIV/0!	#DIV/0!	93.63124	2.224685	2.32477	-0.10008	0.014826	10,899
########	32.72656	30.52004	336.0774	331.8179	331.669	#DIV/0!	#DIV/0!	93.67233	2.206526	2.299922	-0.0934	0.01334	11,012
########	32.21777	30.02285	340.4476	327.6874	327.4206	#DIV/0!	#DIV/0!	94.03008	2.194924	2.294213	-0.09929	0.011855	
########	31.79932	29.61415	333.9976	324.2968	323.9338	#DIV/0!	#DIV/0!	94.89562	2.185165	2.289518	-0.10435	0.01037	11,278
########	31.95508	29.76746	340.6401	325.5582	325.2411	#DIV/0!	#DIV/0!	85.73214	2.187621	2.291266	-0.10365	0.008884	11,443

########	36.82556	34.43109	360.4621	365.4227	365.3444	#DIV/0!	#DIV/0!	83.31089	2.395475	2.345924	0.049551	3.684386	10,459

2/24/2005



	Net		0.0148389x2 + 7.6465152x + 84.4750266	
	2002 Rpt1	EMS	Latest-4/03	2-Sep
	97.51246	84.47503	61.48035	141.9275
	7.13419	7.646515	8.647863	5.294179
	0.01777	0.014839	0.008956	0.036209
	2002 Rpt1	EMS	Latest-4/03	
25	11,479	11,396	11,331	
26	11,347	11,281	11,245	
27	11,226	11,176	11,167	
28	11,114	11,079	11,094	
29	11,012	10,990	11,028	
30	10,918	10,908	10,966	
31	10,831	10,832	10,909	
32	10,750	10,761	10,856	
33	10,676	10,696	10,806	
34	10,606	10,636	10,761	
35	10,542	10,579	10,718	
36	10,483	10,527	10,678	
37	10,427	10,479	10,641	
38	10,376	10,433	10,606	
39	10,328	10,391	10,574	
40	10,283	10,352	10,543	
41	10,241	10,315	10,515	
42	10,202	10,281	10,488	
43	10,166	10,249	10,463	
44	10,132	10,219	10,439	
45	10,101	10,191	10,417	
46	10,071	10,166	10,396	
47	10,044	10,141	10,377	
48	10,019	10,119	10,359	
49	9,995	10,098	10,341	
50	9,973	10,078	10,325	
51	9,952	10,060	10,310	
52	9,933	10,043	10,296	
53	9,916	10,027	10,283	
54	9,900	10,012	10,270	
55	9,884	9,999	10,258	
56	9,871	9,986	10,247	
57	9,858	9,974	10,237	
58	9,846	9,964	10,227	
59	9,835	9,954	10,218	
60	9,826	9,945	10,210	
61	9,817	9,937	10,202	
62	9,809	9,929	10,195	
63	9,802	9,922	10,188	
64	9,795	9,916	10,182	
65	9,789	9,911	10,176	
66	9,784	9,906	10,170	
67	9,780	9,902	10,166	
68	9,777	9,898	10,161	
69	9,774	9,895	10,157	
70	9,771	9,892	10,153	
71	9,769	9,890	10,150	
72	9,768	9,888	10,147	
73	9,767	9,887	10,144	
74	9,767	9,886	10,141	
75	9,767	9,886	10,139	
76	9,768	9,886	10,137	
77	9,769	9,886	10,136	
78	9,770	9,887	10,135	
79	9,772	9,888	10,134	
80	9,775	9,890	10,133	
81	9,777	9,891	10,132	
82	9,781	9,893	10,132	
83	9,784	9,896	10,132	
84	9,788	9,899	10,132	
85	9,792	9,902	10,132	
86	9,796	9,905	10,133	
87	9,801	9,908	10,134	
88	9,806	9,912	10,135	
89	9,811	9,916	10,136	
90	9,817	9,921	10,137	


W7 Aux MW Plot-4/12/03 - 4/13/03
Aux MW Below 50 MW
Aux MW Above 50 MW
Target Aux MW
Target Aux MW
Linear (Aux MW Below 50 MW)
Linear (Aux MW Above 50 MW)
y = 0.02003x + 2.01639
R² = 0.97854
y = 0.0182x + 1.631
R² = 0.3839
Aux. MW
Gr. MW
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
30
40
50
60
70
80
90

Corrected Aux MW

Aux MW B	Aux MW A	Target Aux MW				Target Aux MW	
31.79932	2.185165	2.289518	31.79932	2.185165		30	
31.95508	2.187621	2.291266	31.95508	2.187621		31	2.28055
32.21777	2.194924	2.294213	32.21777	2.194924		32	2.29177
32.72656	2.206526	2.299922	32.72656	2.206526		33	2.30299
34.94114	2.224685	2.32477	34.94114	2.224685		34	2.31421
35.48698	2.366223	2.330894	35.48698	2.366223		35	2.32543
35.85899	2.380523	2.335068	35.85899	2.380523		36	2.33665
36.18457	2.321964	2.338721	36.18457	2.321964		37	2.34787
36.20517	2.317792	2.338952	36.20517	2.317792		38	2.35909
36.37305	2.313064	2.340836	36.37305	2.313064		39	2.37031
36.46973	2.312227	2.34192	36.46973	2.312227		40	2.38153
36.50342	2.274549	2.342298	36.50342	2.274549		41	2.39275
36.52743	2.293048	2.342568	36.52743	2.293048		42	2.40397
36.64258	2.35721	2.34386	36.64258	2.35721		43	2.41519
36.67188	2.276266	2.344188	36.67188	2.276266		44	2.42641
36.67188	2.340679	2.344188	36.67188	2.340679		45	2.43763
36.6748	2.297344	2.344221	36.6748	2.297344		46	2.44885
36.82793	2.323113	2.345939	36.82793	2.323113		47	2.46007
36.88184	2.355321	2.346544	36.88184	2.355321		48	2.47129
37.05918	2.318366	2.348534	37.05918	2.318366		49	2.48251
37.08154	2.34067	2.348785	37.08154	2.34067		50	3.02254
37.15137	2.347537	2.349568	37.15137	2.347537		51	3.04174
37.22312	2.291242	2.350373	37.22312	2.291242		52	3.06094
37.27317	2.230715	2.350935	37.27317	2.230715		53	3.08014
37.48047	2.237817	2.353261	37.48047	2.237817		54	3.09934
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
37.74902	2.304189	2.356274	37.74902	2.304189		56	3.13774
37.77832	2.287322	2.356603	37.77832	2.287322		57	3.15694
37.86995	2.296556	2.357631	37.86995	2.296556		58	3.17614
37.92773	2.31557	2.358279	37.92773	2.31557		59	3.19534
38.05469	2.299846	2.359704	38.05469	2.299846		60	3.21454
38.11426	2.307497	2.360372	38.11426	2.307497		61	3.23374
38.14355	2.294458	2.360701	38.14355	2.294458		62	3.25294
44.89453	2.923906	2.436447	44.89453	2.923906		63	3.27214
47.11426	2.982951	2.461352	47.11426	2.982951		64	3.29134
50.51367	2.969043	3.032403	50.51367	2.969043		65	3.31054
52.50324	3.135467	3.070602	52.50324	3.135467		66	3.32974
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
52.64551	3.171428	3.073334	52.64551	3.171428		68	3.36814
53.67745	3.145057	3.093147	53.67745	3.145057		69	3.38734
54.48333	3.09174	3.10862	54.48333	3.09174		70	3.40654
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
55.36621	3.049161	3.125571	55.36621	3.049161			
58.70605	3.150612	3.189696	58.70605	3.150612			
59.73547	3.252488	3.209461	59.73547	3.252488			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
64.66406	3.279252	3.30409	64.66406	3.279252			
65.16943	3.237287	3.313793	65.16943	3.237287			
65.21928	3.28247	3.31475	65.21928	3.28247			
71.17188	3.383568	3.42904	71.17188	3.383568			
71.27084	3.436231	3.43094	71.27084	3.436231			
74.66797	3.481783	3.496165	74.66797	3.481783			
79.4043	3.597478	3.587103	79.4043	3.597478			
80.73828	3.572433	3.612715	80.73828	3.572433			
83.25	3.645936	3.66094	83.25	3.645936			
83.25	3.670437	3.66094	83.25	3.670437			
83.27663	3.658877	3.661451	83.27663	3.658877			
83.72656	3.63278	3.67009	83.72656	3.63278			
84.05664	3.68792	3.676428	84.05664	3.68792			
84.18395	3.671707	3.678872	84.18395	3.671707			
84.35547	3.729845	3.682165	84.35547	3.729845			
84.50586	3.673113	3.685053	84.50586	3.673113			
84.50586	3.665504	3.685053	84.50586	3.665504			
84.5957	3.634631	3.686778	84.5957	3.634631			
84.63412	3.73195	3.687515	84.63412	3.73195			
84.74414	3.717858	3.689628	84.74414	3.717858			
84.89453	3.730464	3.692515	84.89453	3.730464			
84.92383	3.713063	3.693078	84.92383	3.713063			
85.04297	3.754	3.695365	85.04297	3.754			
85.06641	3.767067	3.695815	85.06641	3.767067			
85.10352	3.704128	3.696528	85.10352	3.704128			
85.14445	3.74866	3.697313	85.14445	3.74866			
85.23532	3.746135	3.698866	85.23532	3.746135			

Condenser Adjustment

Small Reheat Unit, HR Adjustment from 75 Degr. F

Temp. Rise	Coefficients	x2	x	constant	Original Adjust.
1	74	2.1476E-07	- 4.0812E-05	1.0027E+00	76
2	75	4.4654E-07	- 8.4556E-05	1.0055E+00	77
3	76	6.4158E-07	- 1.2225E-04	1.0083E+00	78
4	77	8.5921E-07	- 1.6336E-04	1.0112E+00	79
5	78	1.1974E-06	- 2.2083E-04	1.0147E+00	80
6	79	1.7181E-06	- 3.0262E-04	1.0190E+00	81
7	80	2.2406E-06	- 3.8429E-04	1.0234E+00	82
8	81	2.6258E-06	- 4.4887E-04	1.0273E+00	83
9	82	2.6804E-06	- 4.7109E-04	1.0300E+00	84
10	83	2.7406E-06	- 4.9474E-04	1.0328E+00	85

Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

See HRCondImpact.xls

Auxiliary Calculator-First Ordered Curve-Hourly

Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10
H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	Now based upon ODPM Adusted H8/9 to 27 MW on 6/7 fr
H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000	
K1	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	
K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	
K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	
K4	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	
K5	80	0.01397	3.86311	0.02901	3.14307	0.416667	10,000	Previously 90 MW
K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW
W10			0.1		0.1	0.025	600	
W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW
W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW
W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW
W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW
W7	48	0.0043	2.2433	0.02135	2.00565	0.372222	8,933	Previously 50 MW
W8	48	0.0043	2.2433	0.02135	2.00565	0.372222	8,933	Previously 50 MW
W9			0.1		0.1	0.041667	1,000	
H5						0.0625	1,500	
H7						0.083333	2,000	

Check on PI ABC Calculation

W7 Data

	Net KWHs	NHR	OPNHR Rpt1 ABC	Curr EMS	PI-CWIT Corr	OPNHR Var Rpt1 ABC	Curr EMS	PI-CWIT Corr	Mbtus Actual	Rpt1	Curr EMS	PI-CWIT	Oper. Net KWHs Rpt1	Curr EMS	PI-CWIT
4/1/2003	1,719,000	9,901	9,892	9,953	10,187	9	(52)	(286)	17,020	16,750	16,852	17,272	1,693,308	1,693,210.2	1695397.943
4/2/2003	1,622,000	9,933	9,933	9,979	10,210	0	(46)	(277)	16,111	15,965	16,037	16,432	1,607,345	1,607,193.1	1609378.497
4/3/2003	1,709,000	9,961	9,892	9,956	10,189	69	5	(229)	17,023	16,765	16,870	17,289	1,694,757	1,694,474.6	1696758.555
4/4/2003	1,787,000	9,867	9,858	9,922	10,167	9	(55)	(300)	17,632	17,495	17,616	18,063	1,774,696	1,775,470.7	1776634.925
4/5/2003	1,962,000	9,917	9,800	9,890	10,133	116	27	(216)	19,457	18,803	18,970	19,461	1,918,616	1,918,168.0	1920562.364
4/6/2003	1,657,800	9,914	9,912	9,960	10,197	2	(46)	(284)	16,435	16,363	16,448	16,856	1,650,940	1,651,395.8	1652994.858
4/7/2003	1,713,700	9,765	9,894	9,952	10,189	(129)	(186)	(424)	16,735	16,733	16,833	17,253	1,691,256	1,691,507.4	1693196.971
4/8/2003	1,638,900	10,355	9,928	9,981	10,211	427	374	144	16,971	16,091	16,175	16,570	1,620,708	1,620,526.8	1622737.839
4/9/2003	1,633,900	10,002	9,930	9,977	10,211	72	24	(209)	16,342	16,032	16,111	16,506	1,614,502	1,614,737.9	1616456.576
4/10/2003	1,656,300	10,202	9,923	9,971	10,206	279	232	(4)	16,898	16,159	16,238	16,639	1,628,352	1,628,573.7	1630276.36
4/11/2003	1,644,700	10,111	9,931	9,983	10,215	180	128	(104)	16,630	16,062	16,148	16,541	1,617,362	1,617,565.2	1619295.805
4/12/2003	1,737,300	10,096	9,881	9,937	10,178	215	159	(82)	17,540	16,960	17,059	17,490	1,716,403	1,716,687.4	1718356.743
4/13/2003	1,562,300	9,877	9,971	10,001	10,235	(94)	(123)	(357)	15,432	15,328	15,383	15,754	1,537,227	1,538,194.4	1539238.346
4/14/2003	1,677,800	10,102	9,907	9,964	10,196	195	138	(95)	16,948	16,467	16,558	16,968	1,662,197	1,661,875.0	1664153.584
4/15/2003															
4/16/2003															
Avg/Sum	23,721,700	10,000				97	41	(194)	237,174	231,972	233,299	239,093	23,427,670	23,429,580	23,455,439
						0.97%	0.41%	-1.94%		-2.19%	-1.63%	0.81%	-1.24%	-1.23%	-1.12%

SUPPORTING WORKPAPERS FOR WAIAU 8

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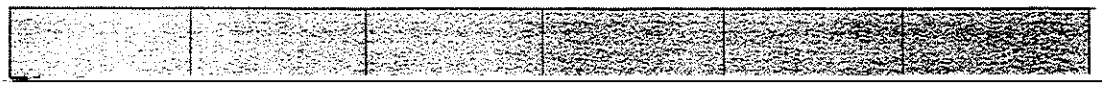

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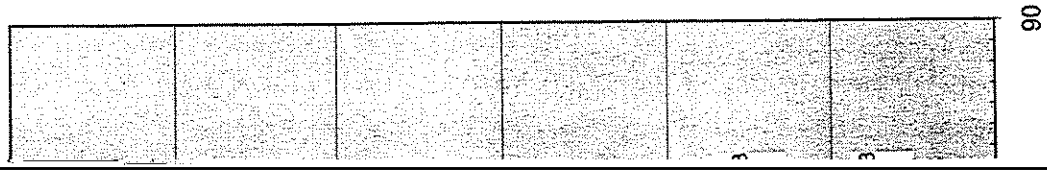

79.8

polated	Adjustment	Adjusted Gross I/O-CW	Net I/O-CWIT	W8AT-FDG Corr.
0557717	1.00001464	554.9007654	554.9008	1.094038
0571206	1.00002096	534.8152888	534.8153	1.115959
0594137	1.00002562	521.1606318	521.1606	1.13788
0606407	0.99997675	506.3282252	506.3282	1.159801
0613272	0.99989629	485.9921046	485.9921	1.181723
0634502	0.99980945	482.7955004	482.7955	1.203644
0646941	0.99971981	476.8033182	476.8033	1.225565
0651449	1.00013105	468.7622612	468.7623	1.247486
0665813	1.00015349	448.4830719	448.4831	1.269408
0642871	1.00016652	476.9922886	476.9923	1.291329
0062831	1.00018075	489.3350756	489.3351	1.31325
0610977	1.00019322	505.8458286	505.8458	1.31921
0585038	1.00020166	528.4893673	528.4894	1.303028
0570736	1.00021314	537.5898974	537.5899	1.286845
0561407	1.00022585	550.7934351	550.7934	1.270662
0547579	1.00023615	574.5665575	574.5666	1.25448
0532815	1.00024535	606.2539325	606.2539	1.238297
0500971	1.00024624	661.9962801	661.9963	1.77154
0485658	1.00025387	668.2689159	668.2689	1.226119
0510266	1.00027994	628.1897836	628.1898	1.229627
0513902	1.00029666	627.7098458	627.7098	1.233135
0531066	1.00032136	595.6312314	595.6312	1.236643
0533485	1.00033819	588.3723142	588.3723	1.24015
0529911	1.00030425	599.1968994	599.1969	1.243658
0530208	1.0001907	601.2644805	601.2645	1.247166
0532676	1.00007729	591.5061621	591.5062	1.250674
0534813	0.99996294	587.3210698	587.3211	1.254182
0535295	0.99984819	571.8261421	571.8261	1.257689
0534923	0.99973379	589.6408426	589.6408	1.261197
0540921	0.99961551	590.2581348	590.2581	1.264705
0537693	0.99950325	588.5283056	588.5283	1.268213
0542309	0.99943908	575.6314621	575.6315	1.271721
0541579	0.99945231	574.6697074	574.6697	1.275229
0545574	0.99946063	577.4760314	577.476	1.166057
0540183	0.99949919	578.735287	578.7353	1.138757
0537828	0.99957627	585.7631652	585.7632	1.109457
0546001	0.99964575	579.5365107	579.5365	1.080157
0538876	0.99972545	583.9210612	583.9211	1.050857
0508448	0.99981133	616.4113297	616.4113	1.190289
0517024	0.99988086	622.5724271	622.5724	1.039408
0520332	0.99995306	621.7614014	621.7614	2.884701
0519091	1.00002592	610.9518125	610.9518	6.785048
0518988	1.00009303	604.7888008	604.7888	2.488701
0511167	1.00013946	623.1410266	623.141	3.079324
0508129	1.00018617	626.0874819	626.0875	1.085258
.0049664	1.00022891	643.5126273	643.5126	1.101637
0510604	1.00028237	630.9252351	630.9252	0.914143
.0052128	1.00033647	606.7211053	606.7211	0.947452
0533428	1.00039364	588.7990057	588.799	0.98076
0548136	1.00045526	563.5855612	563.5856	1.014068
0553617	1.00050666	557.4300504	557.4301	1.047376
0553987	1.00054437	548.3435647	548.3436	1.056831
0554643	1.00059292	545.3506843	545.3507	1.081247
0569035	1.00063596	538.4438517	538.4437	1.105664
0575837	1.00068252	543.5612891	543.5613	1.13008
0573215	1.00071806	543.8501955	543.8502	1.154496
0572272	1.00075549	529.8292378	529.8292	1.178913
0570979	1.00079231	534.9327132	534.9327	1.203329
0575493	1.00083119	537.6723031	537.6723	1.227746
0581177	1.00082162	550.9420988	550.9421	1.252162
0557977	1.00082814	561.4984306	561.4984	1.276578
0564053	1.0008485	556.9497117	556.9497	1.300995
0553594	1.00084392	555.7451609	555.7452	1.325411
0536205	1.0008287	589.6908485	589.6908	1.349827
0522808	1.00081941	603.2202566	603.2203	1.374244
0500507	1.00079734	656.0081817	656.0082	1.559245
0493916	1.00078742	637.6128802	637.6129	1.270732
0475099	1.00074067	695.5053607	695.5054	1.333922
0478746	1.00072326	680.7506741	680.7507	1.347429
0496501	1.00072322	646.5152107	646.5152	1.341342
0505489	1.00071192	630.1085472	630.1085	1.335255
0509085	1.00069342	637.3605344	637.3605	1.329168
0506402	1.00066709	637.7724575	637.7725	1.323081
0502244	1.00063933	635.9364659	635.9365	1.316994
0498148	1.00061589	639.0354252	639.0354	1.310907
0501383	1.0006134	637.0936803	637.0937	1.30482
0507318	1.00061383	628.6968959	628.6969	1.412443
0501253	1.00060118	632.5704891	632.5705	1.374095
0501534	1.00059543	649.039001	649.039	1.335749
0498147	1.00058586	642.2642997	642.2643	1.297401
0492038	1.00057364	645.0066324	645.0066	1.259054
0487575	1.00056331	664.8467739	664.8468	1.373722
0486572	1.00056646	666.8503667	666.8504	1.295612
0482686	1.00058713	670.9779482	670.9779	1.217502
0466785	1.00059582	698.1736086	698.1736	1.13335
0472879	1.00062568	688.7957504	688.7958	1.151003
0446511	1.00062618	755.5631521	755.5632	1.503812
0447957	1.00065033	763.5256988	763.5257	1.264381
0476419	1.00070191	687.879156	687.8792	1.993005
0487022	1.00073929	672.6388532	672.6389	6.998831
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0525127	1.00079298	590.3640747	590.3641	1.1662
1.0049746	1.00074665	638.9782616	638.9783	1.025971
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.00625221	1.00083493	479.2771771	479.2772	1.28013
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Opacity																	
.951	1.094038																
.717	1.115069																
.495	1.137098																
.759	1.159901																
.739	1.181723																
.282	1.203544																
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.901	1.269408																
.924	1.291429																
.374	1.31325																
.859	1.31921																
.671	1.303028																
.904	1.286845																
.719	1.270662																
.159	1.254548																
.739	1.238297																
.026	1.77154																
.803	1.225119																
.492	1.229627																
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.456	1.236643																
.965	1.240151																
.212	1.243658																
.135	1.247166																
.783	1.250674																
.284	1.254182																
.765	1.257689																
.612	1.261197																
.912	1.264705																
.202	1.268213																
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.289	1.275229																
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.184	1.098357																
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.754	1.101637																
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.501	1.066285																
.969	1.105564																
.106	1.13008																
.960	1.154596																
.690	1.179113																
.575	1.203329																
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.003	1.252162																
.935	1.276578																
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.818	1.270732																
.847	1.333922																
.902	1.397109																
.254	1.341342																
.047	1.335555																
.891	1.329168																
.472	1.323081																
.816	1.316994																
.824	1.310907																
.519	1.304820																
.184	1.412443																
.039	1.374095																
.081	1.335748																
.778	1.297401																
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.638	1.220707																
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.015	1.356621																
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.628	1.025911																
.063	1.101119																
.622	1.152878																
.722	1.195162																
.548	1.237646	62.30672	49.35367	506.9773	501.1	499.8257	508.3551	508.3551	77.79728	2.953053	3.066829	-0.11378
.652	1.28013	62.30672	49.35367	506.9773	501.1	499.8257	508.3551	508.3551	77.79728	2.953053	3.066829	-0.11378
.375	1.322614	62.30672	49.35367	506.9773	501.1	499.8257	508.3551	508.3551	77.79728	2.953053	3.066829	-0.11378
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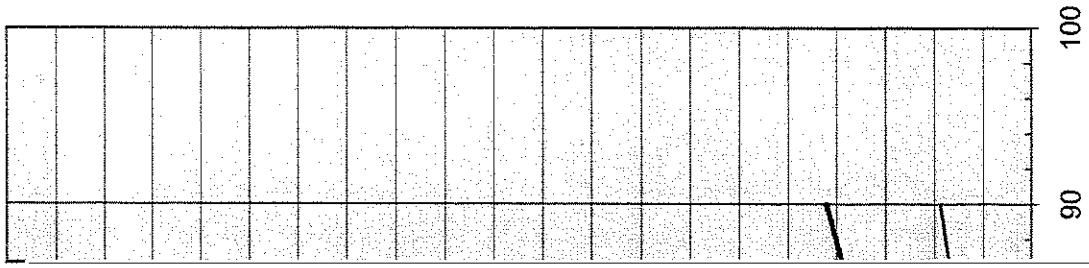
100
90

	Net EMS	W8-9/02
	88.965746	105.5086
	7.5048886	6.940702
	0.0166132	0.023423

0.0234230x2 + 6.9407024x + 105.5086342

	EMS	W8-9/02
25	11,479	11,747
26	11,359	11,608
27	11,248	11,481
28	11,147	11,365
29	11,054	11,258
30	10,969	11,160
31	10,890	11,070
32	10,817	10,987
33	10,749	10,911
34	10,686	10,840
35	10,628	10,775
36	10,574	10,715
37	10,524	10,659
38	10,477	10,607
39	10,434	10,560
40	10,394	10,515
41	10,356	10,474
42	10,321	10,437
43	10,288	10,402
44	10,258	10,369
45	10,229	10,339
46	10,203	10,312
47	10,179	10,286
48	10,156	10,263
49	10,135	10,242
50	10,115	10,222
51	10,097	10,204
52	10,080	10,188
53	10,064	10,173
54	10,050	10,159
55	10,036	10,147
56	10,024	10,136
57	10,013	10,127
58	10,002	10,118
59	9,993	10,111
60	9,984	10,105
61	9,977	10,099
62	9,970	10,095
63	9,964	10,091
64	9,958	10,088
65	9,953	10,086
66	9,949	10,085
67	9,946	10,085
68	9,943	10,085
69	9,941	10,086
70	9,939	10,088
71	9,937	10,090
72	9,937	10,093
73	9,936	10,096
74	9,937	10,100
75	9,937	10,104
76	9,938	10,109
77	9,940	10,115
78	9,941	10,120
79	9,943	10,127
80	9,946	10,133
81	9,949	10,141
82	9,952	10,148
83	9,956	10,156
84	9,960	10,164
85	9,964	10,173
86	9,968	10,182
87	9,973	10,191
88	9,978	10,201
89	9,983	10,211
90	9,989	10,221

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	Aux MW bi	Aux MW Ai	Target Aux MW	
34.48701	2.185724		2.319674	30
34.84059	2.173346		2.323641	31
37.55837	2.210412		2.354135	32
37.77628	2.231581		2.35658	33
39.37667		2.860526	2.374636	34
42.67434		2.893158	2.411536	35
44.92885		2.911207	2.436832	36
46.31144		2.957405	2.452344	37
47.70539		2.967896	2.467984	38
47.95336		2.987721	2.470767	39
48.03183		2.902446	2.471647	40
48.55948		2.992242	2.477567	41
49.40949		3.024366	2.487104	42
50.04968		2.965755	3.023494	43
50.37278		2.973175	3.029697	44
51.64749		3.036577	3.054172	45
51.89693		3.010376	3.058961	46
52.39864		3.062722	3.068594	47
53.77873		3.082545	3.095092	48
54.0415		3.003504	3.100137	49
54.05702		3.024957	3.100435	50
54.83589		3.068677	3.115389	51
55.93697		3.030534	3.13653	52
55.97872		3.031548	3.137331	53
56.25705		3.043064	3.142675	54
56.37287		3.03804	3.144899	55
56.50426		3.13025	3.147422	56
56.53229		3.042211	3.14796	57
56.56237		3.110498	3.148537	58
56.77352		3.05569	3.152592	59
57.32454		3.107166	3.163171	60
57.39923		3.075262	3.164605	61
57.47344		3.118807	3.16603	62
57.7313		3.085642	3.170981	63
57.7364		3.079105	3.171079	64
57.76578		3.088616	3.171643	65
58.17849		3.094069	3.179567	66
58.21223		3.174702	3.180215	67
58.70028		3.108491	3.189585	68
58.74912		3.088915	3.190523	69
58.75215		3.055048	3.190581	70
59.48096		3.120054	3.204575	71
59.55629		3.085117	3.206021	
59.7706		3.093696	3.210135	
59.82888		3.117097	3.211254	
60.27794		3.096707	3.219877	
60.37926		3.128928	3.221822	
60.47089		3.124459	3.223581	
60.57387		3.103896	3.225558	
60.67115		3.134132	3.227426	
60.75728		3.101221	3.22908	
60.76243		3.163955	3.229179	
60.90503		3.125716	3.231916	
60.92413		3.112087	3.232283	
61.13535		3.103526	3.236339	
61.26534		3.121185	3.238835	
61.31857		3.129435	3.239857	
61.33444		3.127526	3.240161	
61.52545		3.147212	3.243829	
61.5337		3.153516	3.243987	
61.6223		3.147746	3.245688	
61.64236		3.148239	3.246073	
61.87659		3.156011	3.250571	
61.98904		3.141376	3.25273	
62.04582		3.111704	3.25382	
62.12257		3.19046	3.255293	
62.7572		3.199789	3.267478	
63.01146		3.221733	3.27236	
63.10848		3.145635	3.274223	
63.34239		3.199505	3.278714	
63.48846		3.234517	3.281518	
63.681		3.245779	3.285215	
63.69701		3.201316	3.285523	
64.00444		3.23511	3.291425	
64.46664		3.215144	3.3003	
64.50052		3.197735	3.30095	
64.94256		3.213823	3.309437	
65.03453		3.239629	3.311203	
65.08987		3.197343	3.312266	
65.2843		3.177093	3.315999	
65.38975		3.230981	3.318023	
65.44269		3.253953	3.31904	
65.57777		3.202295	3.321633	
65.7313		3.160861	3.324581	
65.88516		3.225062	3.327535	
66.31377		3.247542	3.335764	
66.43995		3.230028	3.338187	
66.5629		3.232443	3.340546	
66.5891		3.189274	3.341051	
66.61182		3.237518	3.341487	
66.6609		3.242173	3.342429	
66.74194		3.230089	3.343965	
66.80725		3.264996	3.345239	
66.85139		3.26443	3.346087	
67.15819		3.243734	3.351977	
67.15837		3.214203	3.351981	
67.28111		3.259251	3.354337	
67.42822		3.279622	3.357162	
67.46325		3.23223	3.357642	
67.92357		3.240517	3.366572	
68.27139		3.251268	3.373351	
68.42903		3.36069	3.376377	
69.11985		3.285565	3.389641	
69.22708		3.300956	3.3917	
69.31488		3.311286	3.393386	
69.49427		3.258798	3.39683	
69.56064		3.413644	3.398104	
69.71141		3.396062	3.400999	
70.08796		3.293953	3.408229	
70.90177		3.303472	3.423854	
71.3979		3.402236	3.43338	
71.48862		3.422401	3.435121	
71.68497		3.356418	3.438891	
72.1774		3.383206	3.448346	
72.43319		3.476285	3.453257	
73.59937		3.349252	3.475648	
74.31189		3.518869	3.489328	
74.87589		3.511427	3.500175	
75.20136		3.575519	3.506406	
78.98698		3.577475	3.579128	
79.50421		3.517474	3.589021	

Condenser Adjustment

Small Reheat Unit, HR Adjustment from 75 Degr. F

Temp. Rise		Coefficients x2	x	constant
1	76	2.1476E-07	- 4.0812E-05	1.0027E+00
2	77	4.4654E-07	- 8.4556E-05	1.0055E+00
3	78	6.4158E-07	- 1.2225E-04	1.0083E+00
4	79	8.5921E-07	- 1.6336E-04	1.0112E+00
5	80	1.1974E-06	- 2.2083E-04	1.0147E+00
6	81	1.7181E-06	- 3.0262E-04	1.0190E+00
7	82	2.2406E-06	- 3.8429E-04	1.0234E+00
8	83	2.6258E-06	- 4.4887E-04	1.0273E+00
9	84	2.6804E-06	- 4.7109E-04	1.0300E+00
10	85	2.7406E-06	- 4.9474E-04	1.0328E+00

Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

See HRCondImpact.xls

Auxiliary Calculator-First Ordered Curve-Hourly

Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10	
H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	Now based upon ODPM	Adusted H8/9 to 27 MW on 6/7 fro
H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000		
K1	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K4	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K5	80	0.01397	3.86311	0.02901	3.14307	0.416667	10,000	Previously 90 MW	
K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW	
W10			0.1		0.1	0.025	600		
W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW	
W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW	
W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W7	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W8	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W9			0.1		0.1	0.041667	1,000		
H5						0.0625	1,500		
H7						0.083333	2,000		

Chec ; on PI ABC Calculation

W8 Data

	Actual Net KWH	Mbtu	NHR	Operational Net KWH	OPNHR Rpt1 ABC	EMS	PI-CWIT Cor	OPNHR Var Rpt1 ABC	EMS	PI-CWIT Cor	Mbtu Rpt1 ABC	EMS	PI-CWIT Corr	Mbtu Var Rpt1 ABC	EMS	PI-CWIT Corr
9/1/2002	1,324,100	13,630	10,294	1,322,311	10,023	10,082	10,173	270	212	121	13,254	13,331	13,451	(376)	(299)	(179)
9/2/2002	1,219,700	12,651	10,372	1,225,706	10,098	10,159	10,268	274	214	104	12,377	12,452	12,586	(274)	(200)	(65)
9/3/2002	1,366,700	14,011	10,252	1,377,865	10,016	10,088	10,214	235	163	38	13,801	13,901	14,073	(210)	(110)	62
9/4/2002	1,382,900	14,013	10,133	1,392,546	9,994	10,065	10,182	138	68	(49)	13,918	14,016	14,179	(95)	3	166
9/5/2002	1,366,600	14,171	10,370	1,380,343	9,995	10,063	10,174	375	307	196	13,796	13,890	14,044	(375)	(281)	(127)
9/6/2002	1,435,100	14,778	10,297	1,442,651	9,981	10,056	10,183	317	241	114	14,401	14,510	14,693	(377)	(268)	(85)
9/7/2002	1,332,300	13,673	10,188	1,338,394	10,006	10,066	10,160	182	122	27	13,392	13,473	13,599	(181)	(101)	25
9/8/2002	1,257,000	12,822	10,200	1,260,813	10,059	10,116	10,209	141	85	(9)	12,682	12,754	12,872	(139)	(68)	50
9/9/2002	1,228,000	12,670	10,318	1,232,027	10,089	10,146	10,246	229	171	72	12,430	12,601	12,623	(240)	(169)	(47)
9/10/2002	1,239,000	12,820	10,347	1,250,907	10,093	10,145	10,257	264	202	91	12,613	12,691	12,830	(207)	(129)	10
9/11/2002	1,250,000	12,817	10,253	1,258,741	10,080	10,144	10,257	173	110	(4)	12,688	12,768	12,911	(129)	(49)	95
9/12/2002	1,249,000	12,828	10,270	1,253,689	10,073	10,132	10,234	197	138	36	12,629	12,703	12,830	(199)	(125)	3
9/13/2002	1,288,200	13,282	10,311	1,304,858	10,042	10,105	10,210	269	206	101	13,103	13,185	13,323	(179)	(97)	41
9/14/2002	1,340,900	13,735	10,243	1,358,045	10,001	10,062	10,155	242	181	88	13,582	13,665	13,792	(153)	(70)	57
9/15/2002	1,463,900	14,809	10,116	1,469,268	9,946	10,015	10,122	170	101	(6)	14,613	14,715	14,871	(196)	(94)	63
9/16/2002	1,335,200	13,613	10,195	1,333,111	10,018	10,081	10,185	178	114	10	13,355	13,439	13,578	(258)	(174)	(35)
9/17/2002	1,257,900	12,868	10,229	1,268,168	10,064	10,125	10,228	165	105	1	12,763	12,840	12,971	(104)	(28)	103
9/18/2002								-	-	-				-	-	-
9/19/2002								-	-	-				-	-	-
9/20/2002								-	-	-				-	-	-
9/21/2002														-	-	-
9/22/2002														-	-	-
9/23/2002																
9/24/2002																
9/25/2002																
Total/Avg	22,336,500	229,090	10,258	22,469,643	10,033	10,097	10,203	191	137	47	225,397	226,831	229,225	(168)	(103)	6
			Diff. From Act	0.596%							-1.61%	-0.99%	0.06%			

SUPPORTING WORKPAPERS FOR WAIAU 9

UNIT	W9
Test Date	11/17/94

Test Point	Test Input/Output(No MVL Corrections) Gross MW	Aux. MW	Net MW	MBtu/Hr	Test Heat Rates Gross Btu/KWH	Net Btu/KWH	MVL Corr. Heat Rates-Load Adjusted Adj?	Gross Btu/KWH	Net Btu/KWH	Net Residual Btu/KWH
1	6.259	0.092	6.167	239.70	38,296	38,869	NO	38,296	38,869	139
2	9.658	0.093	9.565	268.67	27,820	28,089	NO	27,820	28,089	-78
3	20.045	0.092	19.952	356.85	17,803	17,885	NO	17,803	17,885	-61
4	30.067	0.093	29.975	444.04	14,768	14,814	NO	14,768	14,814	67
5	39.994	0.092	39.902	542.59	13,567	13,598	NO	13,567	13,598	-35
6	43.238	0.091	43.147	573.03	13,253	13,281	NO	13,253	13,281	12
7	0.000	0.000	0.000	0.00	0	0		0	0	0
8	0.000	0.000	0.000	0.00	0	0		0	0	0
9	0.000	0.000	0.000	0.00	0	0		0	0	0
10	0.000	0.000	0.000	0.00	0	0		0	0	0

INPUT/OUTPUT ABC COEFFICIENTS

	Gross	Net
Coefficients		
A	191.86665	192.56503
B	7.6016119	7.607532
C	0.0283367	0.028319
Equation Fit		
R-square	99.99%	99.99%
Std. Deviation	106.82	108.03

NOTE:
1. Acceptable ABC Coefficients must meet following criteria:
   A. R-Square > 90%
   B. Net Heat Rate Residuals < Test Uncertainty.
   C. Standard Deviation < Test Uncertainty.
   D. Gross and Net Heat Rate Curves must have a similar shape as previous test results.
2. Net Residual = ABC Heat Rate - Test Calculation
3. ABC Coefficients curve fitted to test MBtu/HR and MVL corrected gross & net MW.

COMMENTS:
1. Test Point #6 is Base Load. Peak load and Peak Reserve load not part of ABC calculation.

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	WAIAU	**Type of Sample:**	DIESEL
Unit:	W-9	**Date Received:**	11-17-94
Sample Date:	11-17-94	**Analysis Date:**	11-18-94
Sample Conditions:	40 MW & 30 MW	**Report Date:**	11-21-94

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	37.2
D 4294	Sulfur, Wt. %	0.15
D 240	BTU/lb	19,706.7
	BTU/bbl	5,781,000
	BTU/gal	137,682

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Senior Chemist

cc: C. Kishimoto, JC
J. Itai, GV

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	WAIAU	**Type of Sample:**	DIESEL
Unit:	W-9	**Date Received:**	11-17-94
Sample Date:	11-17-94	**Analysis Date:**	11-18-94
Sample Conditions:	Spin. Res. & Base	**Report Date:**	11-21-94

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	37.3
D 4294	Sulfur, Wt. %	0.15
D 240	BTU/lb	19,668.1
	BTU/bbl	5,766,000
	BTU/gal	137,283

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Senior Chemist

cc: C. Kishimoto, JC
J. Itai, GV

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	WAIAU	**Type of Sample:**	DIESEL
Unit:	W-9	**Date Received:**	11-17-94
Sample Date:	11-17-94	**Analysis Date:**	11-18-94
Sample Conditions:	20 MW & 10 MW	**Report Date:**	11-21-94

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	37.2
D 4294	Sulfur, Wt. %	0.15
D 240	BTU/lb	19,667.8
	BTU/bbl	5,769,000
	BTU/gal	137,360

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Senior Chemist

cc: C. Kishimoto, JC
J. Itai, GV

- turning gear oil pump

7. Finished demolition of main control

D. Waiau 6

1. Routine maintenance.

1. Replaced the flow control valve and the isolat valve to the Boiler Drum water pH transmitter.

2. Fabricated and installed insulation following repairs on B-2 floor boiler leak.

F. Waiau 8

1. Routine maintenance.

G. Waiau 9

1. Troubleshot the Generator Field Ground alarm that was on the annunciator. Found a ground signal on conductor #858 and conductors #6 and #7 of the J22 cable. Electricians installed 2 five-conductor cables to by-pass the #6 and #7 conductors of the J22 cable. Rechecked the circuit and found the ground detector still sensing a ground in the excitation cubicle. Continued troubleshooting the circuit with the Electricians by isolating each diode and condenser in the rectifier circuit, but the ground could not be located. Electricians were able to ascertain that the field was not grounded and unit was placed on line with the alarm still activated. No problems were noticed and the unit was made available.
   a. On September 19, personnel from the Relay Department checked the setting of Ground Detector 64F. They found both relays, F1 and F2, set to specs. F1 tripped at 35 volts and F2 at 105 volts. Upon re-installation, the detector tripped the alarm

1. The engineering work station has been repaired and was put in service on September 20.

I. Waiau Station

Waiau 9 Unit Efficiency Test Data Sheet

Load: BASE Date: 11-17-94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 0905	0920	0935		
LEFT PANEL METERS								
Frequency	Hz	L-Top	128	60	60			
Phase Current 1	Amps	L-Mid	122	2.15	2.16			
Phase Current 2	Amps	L-Mid	123	2.11	2.12			
Phase Current 3	Amps	L-Mid	124	2.13	2.15			
Output Voltage 1-2	KV	L-Bot	119	1.37	136			
Output Voltage 2-3	KV	L-Bot	120	1.37	137			
Output Voltage 3-1	KV	L-Bot	121	1.37	137			
Field Current	Amps	L-Mid	127	330	330			
Gen Field Temp	Deg C	L-Bot	142	17	17			
Unit Load	MW	C-Mid	118	43	43			
Unit Reactive Load	MVars	C-Bot	125	22	23			
Field Voltage	Volts	R-Mid	126	172	178			
GENERATOR RTDs, Dial 1-8								
Generator RTD #1	Deg C		129	120	121			
Generator RTD #2	Deg C		130	71	76			
Generator RTD #3	Deg C		131	73	75			
Generator RTD #4	Deg C		132	73	74			
Generator RTD #5	Deg C		133	72	73			
Generator RTD #6	Deg C		134	72	74			
Generator RTD #7	Deg C		135	44	37			
Generator RTD #8	Deg C		136	31	31			
MCC DATA								
MCC Amps 1	Amps		146	113	113			
MCC Amps 2	Amps		147	113	113			
MCC Amps 3	Amps		148	114	113			
MCC Volts 1-2	Volts		143	490	489			
MCC Volts 2-3	Volts		144	489	489			
MCC Volts 3-1	Volts		145	489	489			
LEFT PANEL, Misc								
Gross KW Rot Meter	Sec (1 rev)	L-Panel-B	156	9".55	9".76			
Aux KW Rot Meter	Sec (1 rev)	L-Panel-B	155	22".71	22".65			
Battery Charger Volts	Volts		140	136	136			
Battery Charger Amps	Amps		141	8.5	8.5			
EXH TEMP			71	899	899			

Waiau 9 Unit Efficiency Test Data Sheet

Load: BASE Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD				
THERMOCOUPLES								
Turbine Exhaust #1	Deg F	Mid Top	51	911	912			
Turbine Exhaust #2	Deg F	Mid Top	52	891	892			
Turbine Exhaust #3	Deg F	Mid Top	53	887	868			
Turbine Exhaust #4	Deg F	Mid Top	54	862	865			
Turbine Exhaust #5	Deg F	Mid Top	55	869	871			
Turbine Exhaust #6	Deg F	Mid Top	56	891	892			
Turbine Exhaust #7	Deg F	Mid Top	57	908	908			
Turbine Exhaust #8	Deg F	Mid Top	58	897	898			
Turbine Exhaust #9	Deg F	Mid Top	59	900	901			
Turbine Exhaust #10	Deg F	Mid Top	60	908	908			
Turbine Exhaust #11	Deg F	Mid Top	61	899	901			
Turbine Exhaust #12	Deg F	Mid Top	62	923	923			
OverTemp Ch T.C. #T1	Deg F	Mid Top	63	890	892			
OverTemp Ch T.C. #T2	Deg F	Mid Top	64	[illegible]	[illegible]			

Waiau 9 Unit Efficiency Test Data Sheet

Load: BASE Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 0905	0920	0935		
MIDDLE PANEL, MISC INSTRUMENTS								
Speed	RPM	L-Mid	50	3	3600			
Peak Res Fire Hours	Hours	L-Mid	91		44.8			
Digital Setpoint	%	L-Mid	87		105.7			
Total Fired Hours	Hours	L-Mid	88		9092.2			
Peak Fired Hours	Hours	R-Mid	90		596.1			
VCE	Volts	R-Mid	86		14.9			
EXH TE MT.	F				900			
CENTER BOTTOM PANEL (open cover)								
Analog Exh OverTemp A	Deg F	M-Top	70		—			
Analog Exh OverTemp B	Deg F	M-Top	71		—			
Vibration #1 (Accy Comp)	In/Sec	L-Bot	96		.12			
Vibration #2 (Air Comp Flange)	In/Sec	L-Bot	97		.08			
Vibration #3 (Gen Mauka)	In/Sec	L-Bot	98		.09			
Vibration #4 (Gen Makai)	In/Sec	L-Bot	99		.02			
INSIDE CENTER MAIN PANEL (Open door)								
Manual Initiated Starts	Counter	CNT1	92		3162			
Total Starts	Counter	CNT2	93		1269			
Emergency Load Starts	Counter	CNT3	94		29			
Fired Starts	Counter	CNT4	95		1043			
GAGE CABNET ASSEMBLY								
Atomizing Air Manifold Press			18	130	130			
L.O. Bearing Header Press			12	255	255			
L.O. Main Pump Disch Press			13	64	64			
Lube Emerg Pump Press			31	0	0			
Hydraulic Trip Ckt Press			15	1600	1600			
Cooling Water Press			19	51	50.5			
F.O. Press After Filter			17	40	48			
DP Across L.O. Filter			21	0	0			
AUXILARY (CENTER) COMPARTMENT								
Compressor Discharge Press		Test Gage	14	111	111			
Liq Fuel Main Filter DP		Ewa	16	12				
AMBIENT CONDITIONS								
Barometric Press	Inches Hg	W5/6 CR			30.1			
Ambient Temp	Deg F	Sling Psychr			79			
Relitive Humidity	%	Sling Psychr			71%			
BRG #1	L			2.0				
"	R			1.6				
BRG #4	L			1.3				
"	R			1.8				
BRG #5	L			1.3				
"	R			2.0				

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

READING	UNITS	LOCATION	TEST PT	TEST LOAD 0905	0920	0935		
FUEL SKID								
Fuel Press Reg	% Open	Before Dual Strainr	VPC-5	50%				
Fuel Press Reg	% Open	After Dual Strainr	VPC-2	100%				
Fuel Fwd Pmp Disch	Psig	Low-Before Strainr	P-8	162		162		
F.O. Press After Strainer		Panel	P-4	65.5		65.5		
TRANSFORMER, Makai of Generator								
Main Trans Winding Temp		Makai-Ewa-Up Hi-L			50			
Main Trans Top Oil Temp		Makai-Ewa-Up Hi-R			45			
Aux Trans Top Oil Temp		Makai-Wai-On Aux Trans			35			
EWA OUTSIDE, Misc Gages								
Cooling Wtr Tank Lev	% Full	Fwd Up Hi	27	75				
Cooling Wtr Temp-R	Deg F	Fwd Up Hi	42	113				
Atom Air Mainifold Temp		Last Door	44	265		267		
WAIKIKI OUTSIDE, Last Door								
Liq Fuel Nozzle Pr #1	Psig	Selector	2	470		470		
Liq Fuel Nozzle Pr #2	Psig	Selector	3	470		470		
Liq Fuel Nozzle Pr #3	Psig	Selector	4	470		470		
Liq Fuel Nozzle Pr #4	Psig	Selector	5	460		460		
Liq Fuel Nozzle Pr #5	Psig	Selector	6	480		480		
Liq Fuel Nozzle Pr #6	Psig	Selector	7	470		470		
Liq Fuel Nozzle Pr #7	Psig	Selector	8	470		470		

Waiau 9 Unit Efficiency Test Data Sheet

Load: BASE Date: 4/17/94

READING	UNITS	LOCATION	0905	0920	0935
START-UP COST			Start	Synchronize	Minimum Load
Fuel Flow Meter	Gallons	Fuel Skid			

Start-to-Synch Gallons: _____

Synch-to-EMS Min Gallons: _____

TEST TIMES

Load: BASE				
GROSS KWH Standard	Below Left Panel	0	1126	2252
AUX KWH Standard	Below Left Panel	0	477	953

To check Watt-Hr-Meters (Rotary):

Gross Watts = 3600 x (1 rev) x (14400/120) x (4000/5) x (1.2) / Time for one revolution (seconds) = 414,720,000/seconds for 1-rev

Aux Watts = 3600 x (1 rev) x (480/120) x (600/5) x (1,2) / Time for one revolution (seconds) = 2,073,600/seconds for 1-rev

Test Load: BASE

Heat Rate Verification:

1. (2687 gal/ 30 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 578,099,000 Btu/hr.
2. (2252 Gr Watt-hr) x (1/ 30 min) x (60 min/hr) x (9.6 ptct) = 43,238.4 Gross KW Load.
3. (953 Aux Watt-hr) x (1/ 30 min) x (60 min/hr) x (0.048 ptct) = 91,488 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 13,370 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 13,398 Btu/Kwh.

NET = 43,146.912 KW

Data Taker: Ame

Waiau 9 Unit Efficiency Test Data Sheet

Load: SP RES Date: 11/17/96

				TEST LOAD				
READING	UNITS	LOCATION	TEST PT	0745	0800	0815		
LEFT PANEL METERS :								
Frequency	Hz	L-Top	128	60.1		60.1		
Phase Current 1	Amps	L-Mid	122	1050		1050		
Phase Current 2	Amps	L-Mid	123	1050		1050		
Phase Current 3	Amps	L-Mid	124	1050		1050		
Output Voltage 1-2	KV	L-Bot	119	13.7		13.7		
Output Voltage 2-3	KV	L-Bot	120	13.7		13.7		
Output Voltage 3-1	KV	L-Bot	121	13.7		13.7		
Field Current	Amps	L-Mid	127	270		270		
Gen Field Temp	Deg C	L-Bot	142	FLUCTUATING		0-30 °C		
Unit Load	MW	C-Mid	118	6.1		6.0		
Unit Reactive Load	MVars	C-Bot	125	24		23		
Field Voltage	Volts	R-Mid	126	132		132		
GENERATOR RTDs, Dial 1-8								
Generator RTD #1	Deg C		129	120		120		
Generator RTD #2	Deg C		130	57		57		
Generator RTD #3	Deg C		131	57		58		
Generator RTD #4	Deg C		132	56		57		

Waiau 9 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

READING	UNITS	LOCATION	TEST PT	TEST LOAD 0745	0800	0815		
THERMOCOUPLES								
Turbine Exhaust #1	Deg F	Mid Top	51	505	502			
Turbine Exhaust #2	Deg F	Mid Top	52	509	505			
Turbine Exhaust #3	Deg F	Mid Top	53	512		510		
Turbine Exhaust #4	Deg F	Mid Top	54	508		505		
Turbine Exhaust #5	Deg F	Mid Top	55	503		501		
Turbine Exhaust #6	Deg F	Mid Top	56	503		501		
Turbine Exhaust #7	Deg F	Mid Top	57	503		501		
Turbine Exhaust #8	Deg F	Mid Top	58	501		499		
Turbine Exhaust #9	Deg F	Mid Top	59	504		502		
Turbine Exhaust #10	Deg F	Mid Top	60	505		502		
Turbine Exhaust #11	Deg F	Mid Top	61	505		502		
Turbine Exhaust #12	Deg F	Mid Top	62	503		502		
OverTemp Ch T.C. #T1	Deg F	Mid Top	63	505		504		
OverTemp Ch T.C. #T3	Deg F	Mid Top	65	505		502		
OverTemp Ch T.C. #T5	Deg F	Mid Top	67	502		500		
OverTemp Ch T.C. #T2	Deg F	Mid Top	64	509		505		
OverTemp Ch T.C. #T4	Deg F	Mid Top	66	502		502		
OverTemp Ch T.C. #T6	Deg F	Mid Top	68	502		501		
SELECTOR THERMOCOUPLES								
Compressor Disch Left	Deg F	Pos #1	73	525		525		
Compressor Disch Right	Deg F	Pos #2	74	—		—		
1st Stg Fwd (Inner)	Deg F	Pos #3	75	546		547		
1st Stg Fwd (Inner)	Deg F	Pos #4	76	564		565		
1st Stg Aft (Outer)	Deg F	Pos #5	77	644		643		
1st Stg Aft (Outer)	Deg F	Pos #6	78	644		643		
2nd Stg Fwd (Outer)	Deg F	Pos #7	79	644		635		
2nd Stg Fwd (Outer)	Deg F	Pos #8	80	648		650		
2nd Stg Aft (Outer)	Deg F	Pos #10	81	549		560		
3rd Stg Aft (Outer)	Deg F	Pos #11	84	366		390		
3rd Stg Aft (Outer)	Deg F	Pos #12	85	366		390		
3rd Stg Fwd (Outer)	Deg F	Pos #13	82	553		567		
Exhaust Duct Ave	Deg F	Pos #16		501-515		500-515		
3rd Stg Fwd (Outer)	Deg F	Pos #20	83	555		565		
Compressor Inlet	Deg F	Pos #18		73		73		
Compressor Inlet	Deg F	Pos #19		[illegible]		[illegible]		

Waiau 9 Unit Efficiency Test Data Sheet

Load: SR Date: 11-17-94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 7:45	8:00	8:15		
MIDDLE PANEL, MISC INSTRUMENTS								
Speed	RPM	L-Mid	50	3600				
Peak Res Fire Hours	Hours	L-Mid	91	448				
Digital Setpoint	%	L-Mid	87	101				
Total Fired Hours	Hours	L-Mid	88	906				
Peak Fired Hours	Hours	R-Mid	90	5960				
VCE	Volts	R-Mid	86	8.7				
CENTER BOTTOM PANEL (open cover)								
Analog Exh OverTemp A	Deg F	M-Top	70	—				
Analog Exh OverTemp B	Deg F	M-Top	71	—				
Vibration #1 (Accy Comp)	In/Sec	L-Bot	96	0.11				
Vibration #2 (Air Comp Flange)	In/Sec	L-Bot	97	0.07				
Vibration #3 (Gen Mauka)	In/Sec	L-Bot	98	0.16				
Vibration #4 (Gen Makai)	In/Sec	L-Bot	99	0.02				
INSIDE CENTER MAIN PANEL (Open door)								
Manual Initiated Starts	Counter	CNT1	92	3162				
Total Starts	Counter	CNT2	93	1269				
Emergency Load Starts	Counter	CNT3	94	29				
Fired Starts	Counter	CNT4	95	1043				
GAGE CABNET ASSEMBLY								
Atomizing Air Manifold Press			18	101		101		
L.O. Bearing Header Press			12	25		25		
L.O. Main Pump Disch Press			13	64		64		
Lube Emerg Pump Press			31	0		0		
Hydraulic Trip Ckt Press			15	1600		1600		
Cooling Water Press			19	51		51		
F.O. Press After Filter			17	62.2		63		
DP Across L.O. Filter			21	0		0		
AUXILARY (CENTER) COMPARTMENT								
Compressor Discharge Press		Test Gage	14	89		89.1		
Liq Fuel Main Filter DP		Ewa	16	0		0		
AMBIENT CONDITIONS								
Barometric Press	Inches Hg	W5/6 CR		30.10				
Ambient Temp	Deg F	Sling Psychr		76	78			
Relitive Humidity	%	Sling Psychr		78.1	76			
Bow+Ly								
B #1 L	2.2							
R	2.1							
#4 L	1.4							
R	1.8							
#5 L	1.1							
R	1.8							

ATM / COMP ≈ 1.12

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

READING	UNITS	LOCATION	TEST PT	TEST LOAD 0745	0800	0815		
FUEL SKID								
Fuel Press Reg	% Open	Before Dual Strainr	VPC-5	40%				
Fuel Press Reg	% Open	After Dual Strainr	VPC-2	100%				
Fuel Fwd Pmp Disch	Psig	Low-Before Strainr	P-8	161				
F.O. Press After Strainer		Panel	P-4	66				
TRANSFORMER, Makai of Generator								
Main Trans Winding Temp		Makai-Ewa-Up Hi-L			45			
Main Trans Top Oil Temp		Makai-Ewa-Up Hi-R			43			
Aux Trans Top Oil Temp		Makai-Wai-On Aux Trans			34			
EWA OUTSIDE, Misc Gages								
Cooling Wtr Tank Lev	% Full	Fwd Up Hi	27	FULL +				
Cooling Wtr Temp-R	Deg F	Fwd Up Hi	42	104				
Atom Air Mainifold Temp		Last Door	44	230				
WAIKIKI OUTSIDE, Last Door								
Liq Fuel Nozzle Pr #1	Psig	Selector	2	365				
Liq Fuel Nozzle Pr #2	Psig	Selector	3	365				
Liq Fuel Nozzle Pr #3	Psig	Selector	4	365				
Liq Fuel Nozzle Pr #4	Psig	Selector	5	365				
Liq Fuel Nozzle Pr #5	Psig	Selector	6	370				
Liq Fuel Nozzle Pr #6	Psig	Selector	7	370				
Liq Fuel Nozzle Pr #7	Psig	Selector	8	370				
Liq Fuel Nozzle Pr #8	Psig	Selector	9	365				
Liq Fuel Nozzle Pr #9	Psig	Selector	10	365				
Liq Fuel Nozzle Pr #10	Psig	Selector	11	365				
FO Pump Inlet Press	Psig	Selector	34	180				
FO Pump Outlet Press	Psig	Selector	35	375				
DP Across HP Fuel Filter		Gage	20	0				
Atom Air Compr Inlet Temp		Gage	40	164				
WAIKIKI OUTSIDE, Misc Gages								
Lube Oil Tank Level	% Full	Fwd Down	28	FULL +				
Lube Oil Tank Temp	Deg F	Fwd Down	38	144				
L.O. Brg Hdr Temp	Deg F	Middle Down	37	123				
Cooling Wtr Temp-L	Deg F	Fwd Up	39	106				
				TEST TIMES				
Load: _____								
Fuel Flow Meter	Gallons	Fuel Skid		52608	53048	53481		

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

READING	UNITS	LOCATION	0745	0800	0815
START-UP COST			Start	Synchronize	Minimum Load
Fuel Flow Meter	Gallons	Fuel Skid			

Start-to-Synch Gallons: _____

Synch-to-EMS Min Gallons: _____

TEST TIMES

Load: 59 MW

GROSS KWH Standard	Below Left Panel	0	168	326
103 AUX KWH Standard	Below Left Panel	0	481	961

To check Watt-Hr-Meters (Rotary):

Gross Watts = 3600 x (1 rev) x (14400/120) x (4000/5) x (1.2) / Time for one revolution (seconds) = 414,720,000/seconds for 1-rev

Aux Watts = 3600 x (1 rev) x (480/120) x (600/5) x (1,2) / Time for one revolution (seconds) = 2,073,600/seconds for 1-rev

Test Load: _____

Heat Rate Verification:

1. (873 gal/ 30 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 241,821,000 Btu/hr.
2. (326 Gr Watt-hr) x (1/ 30 min) x (60 min/hr) x (9.6 ptct) = 6,259 Gross KW Load.
3. (961 Aux Watt-hr) x (1/ 30 min) x (60 min/hr) x (0.048 ptct) = 92.256 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 38,634 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 39,212 Btu/Kwh.

115.2 kW

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 10 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1235	1250	1305		
LEFT PANEL METERS								
Frequency	Hz	L-Top	128	60.2				
Phase Current 1	Amps	L-Mid	122	1.8				
Phase Current 2	Amps	L-Mid	123	1.8				
Phase Current 3	Amps	L-Mid	124	1.8				
Output Voltage 1-2	KV	L-Bot	119	14.1				
Output Voltage 2-3	KV	L-Bot	120	14.2				
Output Voltage 3-1	KV	L-Bot	121	14.2				
Field Current	Amps	L-Mid	127	357				
Gen Field Temp	Deg C	L-Bot	142	18.2-19	18			
Unit Load	MW	C-Mid	118	10	10			
Unit Reactive Load	MVars	C-Bot	125	43	43			
Field Voltage	Volts	R-Mid	126	227				
GENERATOR RTDs, Dial 1-8								
Generator RTD #1	Deg C		129	122	122			
Generator RTD #2	Deg C		130	77	77			
Generator RTD #3	Deg C		131	80	79			
Generator RTD #4	Deg C		132	76	77			
Generator RTD #5	Deg C		133	77	77			
Generator RTD #6	Deg C		134	77	76			
Generator RTD #7	Deg C		135	37	39			
Generator RTD #8	Deg C		136	33	34			
MCC DATA								
MCC Amps 1	Amps		146	130				
MCC Amps 2	Amps		147	140				
MCC Amps 3	Amps		148	135				
MCC Volts 1-2	Volts		143	505				
MCC Volts 2-3	Volts		144	506				
MCC Volts 3-1	Volts		145	506				
LEFT PANEL, Misc								
Gross KW Rot Meter	Sec (1 rev)	L-Panel-B	156	44.83"				
Aux KW Rot Meter	Sec (1 rev)	L-Panel-B	155	22.52"				
Battery Charger Volts	Volts		140	136				
Battery Charger Amps	Amps		141	8.7				
Exh Temp				546				
T/C spread				17				

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 10 MW Date: 11/17/94

				TEST LOAD				
READING	UNITS	LOCATION	TEST PT	1235	1250	1305		
THERMOCOUPLES								
Turbine Exhaust #1	Deg F	Mid Top	51	550	549			
Turbine Exhaust #2	Deg F	Mid Top	52	552	552			
Turbine Exhaust #3	Deg F	Mid Top	53	555	556			
Turbine Exhaust #4	Deg F	Mid Top	54	551	552			
Turbine Exhaust #5	Deg F	Mid Top	55	546	547			
Turbine Exhaust #6	Deg F	Mid Top	56	547	549			
Turbine Exhaust #7	Deg F	Mid Top	57	548	549			
Turbine Exhaust #8	Deg F	Mid Top	58	542	544			
Turbine Exhaust #9	Deg F	Mid Top	59	547	550			
Turbine Exhaust #10	Deg F	Mid Top	60	548	550			
Turbine Exhaust #11	Deg F	Mid Top	61	549	551			
Turbine Exhaust #12	Deg F	Mid Top	62	550	551			
OverTemp Ch T.C. #T1	Deg F	Mid Top	63	550	551			
OverTemp Ch T.C. #T3	Deg F	Mid Top	65	549	549			
OverTemp Ch T.C. #T5	Deg F	Mid Top	67	548	548			
OverTemp Ch T.C. #T2	Deg F	Mid Top	64	551	551			
OverTemp Ch T.C. #T4	Deg F	Mid Top	66	542	543			
OverTemp Ch T.C. #T6	Deg F	Mid Top	68	549	548			
SELECTOR THERMOCOUPLES								
Compressor Disch Left	Deg F	Pos #1	73	534	535			
Compressor Disch Right	Deg F	Pos #2	74					
1st Stg Fwd (Inner)	Deg F	Pos #3	75	561	560			
1st Stg Fwd (Inner)	Deg F	Pos #4	76	581	579			
1st Stg Aft (Outer)	Deg F	Pos #5	77	672	672			
1st Stg Aft (Outer)	Deg F	Pos #6	78	672	672			
2nd Stg Fwd (Outer)	Deg F	Pos #7	79	668	665			
2nd Stg Fwd (Outer)	Deg F	Pos #8	80					
2nd Stg Aft (Outer)	Deg F	Pos #10	81	602	549			
3rd Stg Aft (Outer)	Deg F	Pos #11	84	481	482			
3rd Stg Aft (Outer)	Deg F	Pos #12	85	482	483			
3rd Stg Fwd (Outer)	Deg F	Pos #13	82	620	615			
Exhaust Duct Ave	Deg F	Pos #16		546	545			
3rd Stg Fwd (Outer)	Deg F	Pos #20	83	618	612			
Compressor Inlet	Deg F	Pos #18		79	78			
Compressor Inlet	Deg F	Pos #19		80	79			

Waiau 9 Unit Efficiency Test Data Sheet

Load: 10 MW Date: 11/17/94

				TEST LOAD				
READING	UNITS	LOCATION	TEST PT	1235	1260	1305		
MIDDLE PANEL, MISC INSTRUMENTS								
Speed	RPM	L-Mid	50		3600			
Peak Res Fire Hours	Hours	L-Mid	91		448			
Digital Setpoint	%	L-Mid	87		101.4			
Total Fired Hours	Hours	L-Mid	88		90951.7			
Peak Fired Hours	Hours	R-Mid	90		5961			
VCE	Volts	R-Mid	86		9.2			
CENTER BOTTOM PANEL (open cover)								
Analog Exh OverTemp A	Deg F	M-Top	70	—				
Analog Exh OverTemp B	Deg F	M-Top	71	—				
Vibration #1 (Accy Comp)	In/Sec	L-Bot	96		.2			
Vibration #2 (Air Comp Flange)	In/Sec	L-Bot	97		.07			
Vibration #3 (Gen Mauka)	In/Sec	L-Bot	98		.06			
Vibration #4 (Gen Makai)	In/Sec	L-Bot	99		.07			
INSIDE CENTER MAIN PANEL (Open door)								
Manual Initiated Starts	Counter	CNT1	92		3162			
Total Starts	Counter	CNT2	93		1269			
Emergency Load Starts	Counter	CNT3	94		29			
Fired Starts	Counter	CNT4	95		1043			
GAGE CABNET ASSEMBLY								
Atomizing Air Manifold Press			18	102				
L.O. Bearing Header Press			12	25.5				
L.O. Main Pump Disch Press			13	64.5				
Lube Emerg Pump Press			31	0				
Hydraulic Trip Ckt Press			15	1610				
Cooling Water Press			19	50				
F.O. Press After Filter			17	62				
DP Across L.O. Filter			21	0				

Waiau 9 Unit Efficiency Test Data Sheet

Load: 10 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1235	1250	1325		
FUEL SKID								
Fuel Press Reg	% Open	Before Dual Strainr	VPC-5	30%				
Fuel Press Reg	% Open	After Dual Strainr	VPC-2	100%				
Fuel Fwd Pmp Disch	Psig	Low-Before Strainr	P-8	162				
F.O. Press After Strainer		Panel	P-4	66				
TRANSFORMER, Makai of Generator								
Main Trans Winding Temp		Makai-Ewa-Up Hi-L		65				
Main Trans Top Oil Temp		Makai-Ewa-Up Hi-R		65				
Aux Trans Top Oil Temp		Makai-Wai-On Aux Trans		40				
EWA OUTSIDE, Misc Gages								
Cooling Wtr Tank Lev	% Full	Fwd Up Hi	27	>F				
Cooling Wtr Temp-R	Deg F	Fwd Up Hi	42	120				
Atom Air Mainifold Temp		Last Door	44	245				
WAIKIKI OUTSIDE, Last Door								
Liq Fuel Nozzle Pr #1	Psig	Selector	2	380				
Liq Fuel Nozzle Pr #2	Psig	Selector	3	380				
Liq Fuel Nozzle Pr #3	Psig	Selector	4	380	DANGER TAG			
Liq Fuel Nozzle Pr #4	Psig	Selector	5	370				
Liq Fuel Nozzle Pr #5	Psig	Selector	6	380	OIL PIPING			
Liq Fuel Nozzle Pr #6	Psig	Selector	7	380				
Liq Fuel Nozzle Pr #7	Psig	Selector	8	375				
Liq Fuel Nozzle Pr #8	Psig	Selector	9	375				
Liq Fuel Nozzle Pr #9	Psig	Selector	10	380				
Liq Fuel Nozzle Pr #10	Psig	Selector	11	380				
FO Pump Inlet Press	Psig	Selector	34	185				
FO Pump Outlet Press	Psig	Selector	35	390				
DP Across HP Fuel Filter		Gage	20	0				
Atom Air Compr Inlet Temp		Gage	40	180				
WAIKIKI OUTSIDE, Misc Gages								
Lube Oil Tank Level	% Full	Fwd Down	28	F				
Lube Oil Tank Temp	Deg F	Fwd Down	38	161				
L.O. Brg Hdr Temp	Deg F	Middle Down	37	138				
Cooling Wtr Temp-L	Deg F	Fwd Up	39	120				
				TEST TIMES				
Load: _____								
				68094	68582	69072		
Fuel Flow Meter	Gallons	Fuel Skid						

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 10 MW Date: 4/17/94

READING	UNITS	LOCATION	1235	1250	1305
START-UP COST			Start	Synchronize	Minimum Load
Fuel Flow Meter	Gallons	Fuel Skid			
				Start-to-Synch Gallons: _____	
				Synch-to-EMS Min Gallons: _____	
				TEST TIMES	
Load: _____					
GROSS KWH Standard		Below Left Panel	0	250	503
AUX KWH Standard		Below Left Panel	0	483	965

To check Watt-Hr-Meters (Rotary):

Gross Watts = 3600 x (1 rev) x (14400/120) x (4000/5) x (1.2) / Time for one revolution (seconds) = 414,720,000/seconds for 1-rev

Aux Watts = 3600 x (1 rev) x (480/120) x (600/5) x (1,2) / Time for one revolution (seconds) = 2,073,600/seconds for 1-rev

Test Load: _____

Heat Rate Verification:

1. (490 gal/ 30 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 135,730,000 Btu/hr.
2. (503 Gr Watt-hr) x (1/ 30 min) x (60 min/hr) x (9.6 ptct) = 9,657.6 Gross KW Load.
3. (965 Aux Watt-hr) x (1/ 30 min) x (60 min/hr) x (0.048 ptct) = 92.64 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 14,054 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 14,160.3 Btu/Kwh.

Waiau 9 Unit Efficiency Test Data Sheet

Load: 20 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1150	1205	1220		
LEFT PANEL METERS								
Frequency	Hz	L-Top	128	60.1				
Phase Current 1	Amps	L-Mid	122	1900				
Phase Current 2	Amps	L-Mid	123	1900				
Phase Current 3	Amps	L-Mid	124	1900				
Output Voltage 1-2	KV	L-Bot	119	14				
Output Voltage 2-3	KV	L-Bot	120	14				
Output Voltage 3-1	KV	L-Bot	121	14				
Field Current	Amps	L-Mid	127	375				
Gen Field Temp	Deg C	L-Bot	142	14-22				
Unit Load	MW	C-Mid	118	20				
Unit Reactive Load	MVars	C-Bot	125	40				
Field Voltage	Volts	R-Mid	126	215				
GENERATOR RTDs, Dial 1-8								
Generator RTD #1	Deg C		129	120				
Generator RTD #2	Deg C		130	75				
Generator RTD #3	Deg C		131	80				
Generator RTD #4	Deg C		132	77				
Generator RTD #5	Deg C		133	76				
Generator RTD #6	Deg C		134	76				
Generator RTD #7	Deg C		135	36				
Generator RTD #8	Deg C		136	32				
MCC DATA								
MCC Amps 1	Amps		146	130				
MCC Amps 2	Amps		147	130				
MCC Amps 3	Amps		148	130				
MCC Volts 1-2	Volts		143	503				
MCC Volts 2-3	Volts		144	503				
MCC Volts 3-1	Volts		145	503				
LEFT PANEL, Misc								
Gross KW Rot Meter	Sec (1 rev)	L-Panel-B	156	21.0				
Aux KW Rot Meter	Sec (1 rev)	L-Panel-B	155	22.5				
Battery Charger Volts	Volts		140	136				
Battery Charger Amps	Amps		141	8.7				
Exh Temp				640		640		
T/C Spread				17		17		

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 20 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1150	1205	1220		
THERMOCOUPLES								
Turbine Exhaust #1	Deg F	Mid Top	51	648		649		
Turbine Exhaust #2	Deg F	Mid Top	52	652		653		
Turbine Exhaust #3	Deg F	Mid Top	53	655		655		
Turbine Exhaust #4	Deg F	Mid Top	54	645		645		
Turbine Exhaust #5	Deg F	Mid Top	55	640		642		
Turbine Exhaust #6	Deg F	Mid Top	56	642		643		
Turbine Exhaust #7	Deg F	Mid Top	57	645		648		
Turbine Exhaust #8	Deg F	Mid Top	58	643		647		
Turbine Exhaust #9	Deg F	Mid Top	59	650		652		
Turbine Exhaust #10	Deg F	Mid Top	[illegible]	[illegible]		[illegible]		

Waiau 9 Unit Efficiency Test Data Sheet

Load: 20 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1150	1205	1220		
MIDDLE PANEL, MISC INSTRUMENTS								
Speed	RPM	L-Mid	50		3600			
Peak Res Fire Hours	Hours	L-Mid	91		448			
Digital Setpoint	%	L-Mid	87		102.5			
Total Fired Hours	Hours	L-Mid	88		90949			
Peak Fired Hours	Hours	R-Mid	90		5961			
VCE	Volts	R-Mid	86		11.0			
CENTER BOTTOM PANEL (open cover)								
Analog Exh OverTemp A	Deg F	M-Top	70		—			
Analog Exh OverTemp B	Deg F	M-Top	71		—			
Vibration #1 (Accy Comp)	In/Sec	L-Bot	96		0.19			
Vibration #2 (Air Comp Flange)	In/Sec	L-Bot	97		0.07			
Vibration #3 (Gen Mauka)	In/Sec	L-Bot	98		0.07			
Vibration #4 (Gen Makai)	In/Sec	L-Bot	99		0.06			
INSIDE CENTER MAIN PANEL (Open door)								
Manual Initiated Starts	Counter	CNT1	92		3162			
Total Starts	Counter	CNT2	93		1269			
Emergency Load Starts	Counter	CNT3	94		29			
Fired Starts	Counter	CNT4	95		1043			
GAGE CABNET ASSEMBLY								
Atomizing Air Manifold Press			18	113	113			
L.O. Bearing Header Press			12	25.6	25.6			
L.O. Main Pump Disch Press			13	64.2	64.2			
Lube Emerg Pump Press			31	0	0			
Hydraulic Trip Ckt Press			15	1610	1610			
Cooling Water Press			19	50	50			
F.O. Press After Filter			17	58.3	58			
DP Across L.O. Filter			21	0	0			
AUXILARY (CENTER) COMPARTMENT								
Compressor Discharge Press		Test Gage	14	98.1	98.1			
Liq Fuel Main Filter DP		Ewa	16	7.0	7			
AMBIENT CONDITIONS								
Barometric Press	Inches Hg	W5/6 CR		30.10				
Ambient Temp	Deg F	Sling Psychr		81.5	83			
Relitive Humidity	%	Sling Psychr		75%	70%			
BENTLY (mils)								
#1 L					2.2			
R					2.3			
#4 L					1.4			
R					2.0			
					1.4			

Waiau 9 Unit Efficiency Test Data Sheet

Load: 20 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1150	1205	1220		
FUEL SKID								
Fuel Press Reg	% Open	Before Dual Strainr	VPC-5	38%				
Fuel Press Reg	% Open	After Dual Strainr	VPC-2	100%				
Fuel Fwd Pmp Disch	Psig	Low-Before Strainr	P-8	162				
F.O. Press After Strainer		Panel	P-4	65.3				
TRANSFORMER, Makai of Generator								
Main Trans Winding Temp		Makai-Ewa-Up Hi-L		65				
Main Trans Top Oil Temp		Makai-Ewa-Up Hi-R		65				
Aux Trans Top Oil Temp		Makai-Wai-On Aux Trans		39				
EWA OUTSIDE, Misc Gages								
Cooling Wtr Tank Lev	% Full	Fwd Up Hi	27	110%				
Cooling Wtr Temp-R	Deg F	Fwd Up Hi	42	119				
Atom Air Mainifold Temp		Last Door	44	251				
WAIKIKI OUTSIDE, Last Door								
Liq Fuel Nozzle Pr #1	Psig	Selector	2	390				
Liq Fuel Nozzle Pr #2	Psig	Selector	3	395				
Liq Fuel Nozzle Pr #3	Psig	Selector	4	400				
Liq Fuel Nozzle Pr #4	Psig	Selector	5	390				
Liq Fuel Nozzle Pr #5	Psig	Selector	6	400				
Liq Fuel Nozzle Pr #6	Psig	Selector	7	395				
Liq Fuel Nozzle Pr #7	Psig	Selector	8	390				
Liq Fuel Nozzle Pr #8	Psig	Selector	9	395				
Liq Fuel Nozzle Pr #9	Psig	Selector	10	400				
Liq Fuel Nozzle Pr #10	Psig	Selector	11	395				
FO Pump Inlet Press	Psig	Selector	34	176				
FO Pump Outlet Press	Psig	Selector	35	412				
DP Across HP Fuel Filter		Gage	20	1				
Atom Air Compr Inlet Temp		Gage	40	183				
WAIKIKI OUTSIDE, Misc Gages								
Lube Oil Tank Level	% Full	Fwd Down	28	110%				
Lube Oil Tank Temp	Deg F	Fwd Down	38	162				
L.O. Brg Hdr Temp	Deg F	Middle Down	37	138				
Cooling Wtr Temp-L	Deg F	Fwd Up	39	119				
Load: 20 MW				TEST TIMES				
Fuel Flow Meter	Gallons	Fuel Skid		66239	66888	67538		

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 20 MW Date: 11/17/94

READING	UNITS	LOCATION	1150	1205	1220		
START-UP COST			Start	Synchronize	Minimum Load		
Fuel Flow Meter	Gallons	Fuel Skid					
				Start-to-Synch Gallons:			
				Synch-to-EMS Min Gallons:			
				TEST TIMES			
Load:							
GROSS KWH Standard		Below Left Panel	0	522	1044		
AUX KWH Standard		Below Left Panel	0	482	963		

To check Watt-Hr-Meters (Rotary):

3600 x (1 rev) x (14400/120) x (4000/5) x (1.2)

Gross Watts = _____ = 414,720,000/seconds for 1-rev

Time for one revolution (seconds)

3600 x (1 rev) x (480/120) x (600/5) x (1.2)

Aux Watts = _____ = 2,073,600/seconds for 1-rev

Waiau 9 Unit Efficiency Test Data Sheet

Load: 30 MW Date: 11/17/94

				TEST LOAD				
READING	UNITS	LOCATION	TEST PT	1100	1115	1130		
LEFT PANEL METERS								
Frequency	Hz	L-Top	128	60.1	60.1			
Phase Current 1	Amps	L-Mid	122	2	2			
Phase Current 2	Amps	L-Mid	123	2	2			
Phase Current 3	Amps	L-Mid	124	2	2			
Output Voltage 1-2	KV	L-Bot	119	13.9	13.9			
Output Voltage 2-3	KV	L-Bot	120	14.0	14.0			
Output Voltage 3-1	KV	L-Bot	121	14.0	13.9			
Field Current	Amps	L-Mid	127	361	362			
Gen Field Temp	Deg C	L-Bot	142	17.5	13.5-17.5			
Unit Load	MW	C-Mid	118	30	30			
Unit Reactive Load	MVars	C-Bot	125	35	35			
Field Voltage	Volts	R-Mid	126	206	207			
GENERATOR RTDs, Dial 1-8								
Generator RTD #1	Deg C		129	122	121			
Generator RTD #2	Deg C		130	75	76			
Generator RTD #3	Deg C		131	78	78			
Generator RTD #4	Deg C		132	76	76			
Generator RTD #5	Deg C		133	76	76			
Generator RTD #6	Deg C		134	76	76			
Generator RTD #7	Deg C		135	37	44			
Generator RTD #8	Deg C		136	31	31			
MCC DATA								
MCC Amps 1	Amps		146	140	140			
MCC Amps 2	Amps		147	135	130			
MCC Amps 3	Amps		148	140	135			
MCC Volts 1-2	Volts		143	500	500			
MCC Volts 2-3	Volts		144	500	500			
MCC Volts 3-1	Volts		145	500	500			
LEFT PANEL, Misc								
Gross KW Rot Meter	Sec (1 rev)	L-Panel-B	156	13.98"	13.82"			
Aux KW Rot Meter	Sec (1 rev)	L-Panel-B	155	22.39"	22.46"			
Battery Charger Volts	Volts		140	136	136			
Battery Charger Amps	Amps		141	8.7	8.7			
EXHAUST TEMP				739	740			
T/C SPREAD				34	34			

Data Taker: [illegible]

Waiau 9 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

				TEST LOAD				
READING	UNITS	LOCATION	TEST PT	1600	1115	1130		
THERMOCOUPLES								
Turbine Exhaust #1	Deg F	Mid Top	51	739	739			
Turbine Exhaust #2	Deg F	Mid Top	52	739	743			
Turbine Exhaust #3	Deg F	Mid Top	53	740	749			
Turbine Exhaust #4	Deg F	Mid Top	54	731	728			
Turbine Exhaust #5	Deg F	Mid Top	55	731	728			
Turbine Exhaust #6	Deg F	Mid Top	56	741	750			
Turbine Exhaust #7	Deg F	Mid Top	57	741	748			
Turbine Exhaust #8	Deg F	Mid Top	58	738	737			
Turbine Exhaust #9	Deg F	Mid Top	59	750	763			
Turbine Exhaust #10	Deg F	Mid Top	60	742	747			
Turbine Exhaust #11	Deg F	Mid Top	61	742	746			
Turbine Exhaust #12	Deg F	Mid Top	62	739	741			
OverTemp Ch T.C. #T1	Deg F	Mid Top	63	741	748			
OverTemp Ch T.C. #T3	Deg F	Mid Top	65	731	725			
OverTemp Ch T.C. #T5	Deg F	Mid Top	67	741	747			
OverTemp Ch T.C. #T2	Deg F	Mid Top	64	745	752			
OverTemp Ch T.C. #T4	Deg F	Mid Top	66	739	741			
OverTemp Ch T.C. #T6	Deg F	Mid Top	68	741	743			
SELECTOR THERMOCOUPLES								
Compressor Disch Left	Deg F	Pos #1	73	561	562			
Compressor Disch Right	Deg F	Pos #2	74					
1st Stg Fwd (Inner)	Deg F	Pos #3	75	595	598			
1st Stg Fwd (Inner)	Deg F	Pos #4	76	621	621			
1st Stg Aft (Outer)	Deg F	Pos #5	77	782	783			
1st Stg Aft (Outer)	Deg F	Pos #6	78	771	771			
2nd Stg Fwd (Outer)	Deg F	Pos #7	79	752	753			
2nd Stg Fwd (Outer)	Deg F	Pos #8	80					
2nd Stg Aft (Outer)	Deg F	Pos #10	81	636	634			
3rd Stg Aft (Outer)	Deg F	Pos #11	84	511	509			
3rd Stg Aft (Outer)	Deg F	Pos #12	85	511	509			
3rd Stg Fwd (Outer)	Deg F	Pos #13	82	670	668			
Exhaust Duct Ave	Deg F	Pos #16		735	739			
3rd Stg Fwd (Outer)	Deg F	Pos #20	83	679	678			
Compressor Inlet	Deg F	Pos #18		[illegible]	[illegible]			

Waiau 9 Unit Efficiency Test Data Sheet

Load: 30 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1100	1115	1130		
MIDDLE PANEL, MISC INSTRUMENTS								
Speed	RPM	L-Mid	50		3600			
Peak Res Fire Hours	Hours	L-Mid	91		4418			
Digital Setpoint	%	L-Mid	87		103.8			
Total Fired Hours	Hours	L-Mid	88		5094.1			
Peak Fired Hours	Hours	R-Mid	90		596.1			
VCE	Volts	R-Mid	86		125			
CENTER BOTTOM PANEL (open cover)								
Analog Exh OverTemp A	Deg F	M-Top	70		—			
Analog Exh OverTemp B	Deg F	M-Top	71		—			
Vibration #1 (Accy Comp)	In/Sec	L-Bot	96		.16			
Vibration #2 (Air Comp Flange)	In/Sec	L-Bot	97		.06			
Vibration #3 (Gen Mauka)	In/Sec	L-Bot	98		.07			
Vibration #4 (Gen Makai)	In/Sec	L-Bot	99		.05			
INSIDE CENTER MAIN PANEL (Open door)								
Manual Initiated Starts	Counter	CNT1	92		3162			
Total Starts	Counter	CNT2	93		1269			
Emergency Load Starts	Counter	CNT3	94		29			
Fired Starts	Counter	CNT4	95		1043			
GAGE CABNET ASSEMBLY								
Atomizing Air Manifold Press			18	121				
L.O. Bearing Header Press			12	25.5				
L.O. Main Pump Disch Press			13	64.4				
Lube Emerg Pump Press			31	0				
Hydraulic Trip Ckt Press			15	1650				
Cooling Water Press			19	50				
F.O. Press After Filter			17	545				
DP Across L.O. Filter			21	0				
AUXILARY (CENTER) COMPARTMENT								
Compressor Discharge Press		Test Gage	14	103.5				
Liq Fuel Main Filter DP		Ewa	16	9.0				
AMBIENT CONDITIONS								
Barometric Press	Inches Hg	W5/6 CR		30.1				
Ambient Temp	Deg F	Sling Psychr		81				
Relitive Humidity	%	Sling Psychr		77%				
BENTLY (MRS)								
#1 L				2.2		2.2		
#1 R				2.0		2.0		
#4 L				1.5		1.5		
R				2.0		2.0		
#5 L				1.3		1.4		
R				3.0		3.2		

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

				TEST LOAD				
READING	UNITS	LOCATION	TEST PT	1100	1115	1130		
FUEL SKID								
Fuel Press Reg	% Open	Before Dual Strainr	VPC-5	30%				
Fuel Press Reg	% Open	After Dual Strainr	VPC-2	100%				
Fuel Fwd Pmp Disch	Psig	Low-Before Strainr	P-8	162				
F.O. Press After Strainer		Panel	P-4	65.5				
TRANSFORMER, Makai of Generator								
Main Trans Winding Temp		Makai-Ewa-Up Hi-L		60				
Main Trans Top Oil Temp		Makai-Ewa-Up Hi-R		65				
Aux Trans Top Oil Temp		Makai-Wai-On Aux Trans		40				
EWA OUTSIDE, Misc Gages								
Cooling Wtr Tank Lev	% Full	Fwd Up Hi	27	F				
Cooling Wtr Temp-R	Deg F	Fwd Up Hi	42	118				
Atom Air Mainifold Temp		Last Door	44	260				
WAIKIKI OUTSIDE, Last Door								
Liq Fuel Nozzle Pr #1	Psig	Selector	2	425				
Liq Fuel Nozzle Pr #2	Psig	Selector	3	425				
Liq Fuel Nozzle Pr #3	Psig	Selector	4	425				
Liq Fuel Nozzle Pr #4	Psig	Selector	5	420				
Liq Fuel Nozzle Pr #5	Psig	Selector	6	430				
Liq Fuel Nozzle Pr #6	Psig	Selector	7	420				
Liq Fuel Nozzle Pr #7	Psig	Selector	8	420				
Liq Fuel Nozzle Pr #8	Psig	Selector	9	420				
Liq Fuel Nozzle Pr #9	Psig	Selector	10	425				
Liq Fuel Nozzle Pr #10	Psig	Selector	11	420				
FO Pump Inlet Press	Psig	Selector	34	170				
FO Pump Outlet Press	Psig	Selector	35	450				
DP Across HP Fuel Filter		Gage	20	3				
Atom Air Compr Inlet Temp		Gage	40	190				
WAIKIKI OUTSIDE, Misc Gages								
Lube Oil Tank Level	% Full	Fwd Down	28	>F				
Lube Oil Tank Temp	Deg F	Fwd Down	38	162				
L.O. Brg Hdr Temp	Deg F	Middle Down	37	138				
Cooling Wtr Temp-L	Deg F	Fwd Up	39	118				
				TEST TIMES				
Load: 30 MW								
				63688	64491	65301		
Fuel Flow Meter	Gallons	Fuel Skid						

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

READING	UNITS	LOCATION	1100	1115	1130		
START-UP COST			Start	Synchronize	Minimum Load		
Fuel Flow Meter	Gallons	Fuel Skid					
				Start-to-Synch Gallons: _____			
				Synch-to-EMS Min Gallons: _____			
				TEST TIMES			
Load: _____							
GROSS KWH Standard		Below Left Panel	0	779	1566		
AUX KWH Standard		Below Left Panel	0	483	964		

To check Watt-Hr-Meters (Rotary):

Gross Watts = 3600 x (1 rev) x (14400/120) x (4000/5) x (1.2) / Time for one revolution (seconds) = 414,720,000/seconds for 1-rev

Aux Watts = 3600 x (1 rev) x (480/120) x (600/5) x (1,2) / Time for one revolution (seconds) = 2,073,600/seconds for 1-rev

Test Load: _____

Heat Rate Verification:

1. (1613 gal/ 30 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 466,801,000 Btu/hr.
2. (1566 Gr Watt-hr) x (1/ 30 min) x (60 min/hr) x (9.6 ptct) = 30,067.2 Gross KW Load.
3. (964 Aux Watt-hr) x (1/ 30 min) x (60 min/hr) x (0.048 ptct) = 92.544 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 14,860 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 14,906 Btu/Kwh.

NET = 29,974,656

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 40 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1000	1015	1030		
LEFT PANEL METERS								
Frequency	Hz	L-Top	128	60.1	60.1			
Phase Current 1	Amps	L-Mid	122	2050				
Phase Current 2	Amps	L-Mid	123	2050				
Phase Current 3	Amps	L-Mid	124	2050				
Output Voltage 1-2	KV	L-Bot	119	13.7				
Output Voltage 2-3	KV	L-Bot	120	13.7				
Output Voltage 3-1	KV	L-Bot	121	13.7				
Field Current	Amps	L-Mid	127	325				
Gen Field Temp	Deg C	L-Bot	142	7				
Unit Load	MW	C-Mid	118	40		40		
Unit Reactive Load	MVars	C-Bot	125	22		23		
Field Voltage	Volts	R-Mid	126	178		205		
GENERATOR RTDs, Dial 1-8								
Generator RTD #1	Deg C		129	120		120		
Generator RTD #2	Deg C		130	75		75		
Generator RTD #3	Deg C		131	78		79		
Generator RTD #4	Deg C		132	75		77		
Generator RTD #5	Deg C		133	75		75		
Generator RTD #6	Deg C		134	75		76		
Generator RTD #7	Deg C		135	38		37		
Generator RTD #8	Deg C		136	30		31		
MCC DATA								
MCC Amps 1	Amps		146	130				
MCC Amps 2	Amps		147	130				
MCC Amps 3	Amps		148	130				
MCC Volts 1-2	Volts		143	490				
MCC Volts 2-3	Volts		144	490				
MCC Volts 3-1	Volts		145	490				
LEFT PANEL, Misc								
Gross KW Rot Meter	Sec (1 rev)	L-Panel-B	156	10.3				
Aux KW Rot Meter	Sec (1 rev)	L-Panel-B	155	22.5				
Battery Charger Volts	Volts		140	136				
Battery Charger Amps	Amps		141	8.7				
Exh Temp			#71	850	850			
Thermocouple Spread			Digital	43	43			

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 40 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1000	1015	1030		
THERMOCOUPLES								
Turbine Exhaust #1	Deg F	Mid Top	51	866	860			
Turbine Exhaust #2	Deg F	Mid Top	52	858	858			
Turbine Exhaust #3	Deg F	Mid Top	53	852	850			
Turbine Exhaust #4	Deg F	Mid Top	54	832	832			
Turbine Exhaust #5	Deg F	Mid Top	55	830	830			
Turbine Exhaust #6	Deg F	Mid Top	56	870	870			
Turbine Exhaust #7	Deg F	Mid Top	57	865	863			
Turbine Exhaust #8	Deg F	Mid Top	58	863	860			
Turbine Exhaust #9	Deg F	Mid Top	59	870	868			
Turbine Exhaust #10	Deg F	Mid Top	60	872	870			
Turbine Exhaust #11	Deg F	Mid Top	61	870	867			
Turbine Exhaust #12	Deg F	Mid Top	62	872	870			
OverTemp Ch T.C. #T1	Deg F	Mid Top	63	868	865			
OverTemp Ch T.C. #T3	Deg F	Mid Top	65	935	939			
OverTemp Ch T.C. #T5	Deg F	Mid Top	67	855	854			
OverTemp Ch T.C. #T2	Deg F	Mid Top	64	857	856			
OverTemp Ch T.C. #T4	Deg F	Mid Top	66	857	857			
OverTemp Ch T.C. #T6	Deg F	Mid Top	68	848	848			
SELECTOR THERMOCOUPLES								
Compressor Disch Left	Deg F	Pos #1	73	577	576			
Compressor Disch Right	Deg F	Pos #2	74	—	—			
1st Stg Fwd (Inner)	Deg F	Pos #3	75	618	615			
1st Stg Fwd (Inner)	Deg F	Pos #4	76	648	648			
1st Stg Aft (Outer)	Deg F	Pos #5	77	823	823			
1st Stg Aft (Outer)	Deg F	Pos #6	78	803	803			
2nd Stg Fwd (Outer)	Deg F	Pos #7	79	800	800			
2nd Stg Fwd (Outer)	Deg F	Pos #8	80	—	—			
2nd Stg Aft (Outer)	Deg F	Pos #10	81	648	650			
3rd Stg Aft (Outer)	Deg F	Pos #11	84	525	525			
3rd Stg Aft (Outer)	Deg F	Pos #12	85	525	526			
3rd Stg Fwd (Outer)	Deg F	Pos #13	82	695	695			
Exhaust Duct Ave	Deg F	Pos #16		858	855-875			
3rd Stg Fwd (Outer)	Deg F	Pos #20	83	708	710			
Compressor Inlet	Deg F	Pos #18		75	75			
Compressor Inlet	Deg F	Pos #19		76	76			

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 40 MW Date: 11/17/94

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1000	1015	1030		
MIDDLE PANEL, MISC INSTRUMENTS								
Speed	RPM	L-Mid	50	3600	3600			
Peak Res Fire Hours	Hours	L-Mid	91	448	448			
Digital Setpoint	%	L-Mid	87	105	105			
Total Fired Hours	Hours	L-Mid	88	90930	90933			
Peak Fired Hours	Hours	R-Mid	90	5961	5961			
VCE	Volts	R-Mid	86	14.2	14.2			
CENTER BOTTOM PANEL (open cover)								
Analog Exh OverTemp A	Deg F	M-Top	70	—	—			
Analog Exh OverTemp B	Deg F	M-Top	71	—	—			
Vibration #1 (Accy Comp)	In/Sec	L-Bot	96	0.14	0.14			
Vibration #2 (Air Comp Flange)	In/Sec	L-Bot	97	0.07	0.07			
Vibration #3 (Gen Mauka)	In/Sec	L-Bot	98	0.08	0.08			
Vibration #4 (Gen Makai)	In/Sec	L-Bot	99	0.03	0.03			
INSIDE CENTER MAIN PANEL (Open door)								
Manual Initiated Starts	Counter	CNT1	92	3162	3162			
Total Starts	Counter	CNT2	93	1269	1269			
Emergency Load Starts	Counter	CNT3	94	29	29			
Fired Starts	Counter	CNT4	95	1043	1043			
GAGE CABNET ASSEMBLY								
Atomizing Air Manifold Press			18	128	128			
L.O. Bearing Header Press			12	25.4	25.5			
L.O. Main Pump Disch Press			13	64.2	64.2			
Lube Emerg Pump Press			31	0	0			
Hydraulic Trip Ckt Press			15	1605	1605			
Cooling Water Press			19	50	50			
F.O. Press After Filter			17	49	49			
DP Across L.O. Filter			21	0	0			
AUXILARY (CENTER) COMPARTMENT								
Compressor Discharge Press		Test Gage	14	109.1	109.2			
Liq Fuel Main Filter DP		Ewa	16	11	11			
AMBIENT CONDITIONS								
Barometric Press	Inches Hg	W5/6 CR		30.1				
Ambient Temp	Deg F	Sling Psychr		79.5	80			
Relitive Humidity	%	Sling Psychr		76%	76%			
Beatty								
#1 L				2.0				
R				1.9				
#4 L				1.5				
R				2.0				
#5 L				1.3				
R				2.1				

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 40 MW Date: 11/17/04

READING	UNITS	LOCATION	TEST PT	TEST LOAD 1000	1015	1030
FUEL SKID						
Fuel Press Reg	% Open	Before Dual Strainr	VPC-5	35%	35%	
Fuel Press Reg	% Open	After Dual Strainr	VPC-2	100%	100%	
Fuel Fwd Pmp Disch	Psig	Low-Before Strainr	P-8	162	162	
F.O. Press After Strainer		Panel	P-4	65.1	65.1	
TRANSFORMER, Makai of Generator						
Main Trans Winding Temp		Makai-Ewa-Up Hi-L		59	59	
Main Trans Top Oil Temp		Makai-Ewa-Up Hi-R		59	59	
Aux Trans Top Oil Temp		Makai-Wai-On Aux Trans		36	36	
EWA OUTSIDE, Misc Gages						
Cooling Wtr Tank Lev	% Full	Fwd Up Hi	27	110%	110%	
Cooling Wtr Temp-R	Deg F	Fwd Up Hi	42	117	117	
Atom Air Mainifold Temp		Last Door	44	270	268	
WAIKIKI OUTSIDE, Last Door						
Liq Fuel Nozzle Pr #1	Psig	Selector	2	460	460	
Liq Fuel Nozzle Pr #2	Psig	Selector	3	455	455	
Liq Fuel Nozzle Pr #3	Psig	Selector	4	460	460	
Liq Fuel Nozzle Pr #4	Psig	Selector	5	450	450	
Liq Fuel Nozzle Pr #5	Psig	Selector	6	461	460	
Liq Fuel Nozzle Pr #6	Psig	Selector	7	460	460	
Liq Fuel Nozzle Pr #7	Psig	Selector	8	455	455	
Liq Fuel Nozzle Pr #8	Psig	Selector	9	455	455	
Liq Fuel Nozzle Pr #9	Psig	Selector	10	455	455	
Liq Fuel Nozzle Pr #10	Psig	Selector	11	455	455	
FO Pump Inlet Press	Psig	Selector	34	116.5	116.5	
FO Pump Outlet Press	Psig	Selector	35	491	491	
DP Across HP Fuel Filter		Gage	20	5	6	
Atom Air Compr Inlet Temp		Gage	40	195	195	
WAIKIKI OUTSIDE, Misc Gages						
Lube Oil Tank Level	% Full	Fwd Down	28	Full +	105%	
Lube Oil Tank Temp	Deg F	Fwd Down	38	160	161	
L.O. Brg Hdr Temp	Deg F	Middle Down	37	137	137	
Cooling Wtr Temp-L	Deg F	Fwd Up	39	117	117	
				TEST TIMES		
Load: _____						
Fuel Flow Meter	Gallons	Fuel Skid		60016	61002	61987

Data Taker: _____

Waiau 9 Unit Efficiency Test Data Sheet

Load: 40 MW Date: 11/17/91

READING	UNITS	LOCATION	1000	1015	1030		
START-UP COST			Start	Synchronize	Minimum Load		
Fuel Flow Meter	Gallons	Fuel Skid					
				Start-to-Synch Gallons: _____			
				Synch-to-EMS Min Gallons: _____			
				TEST TIMES			
Load: _____							
GROSS KWH Standard		Below Left Panel	0	1042	2083		
10 AUX KWH Standard		Below Left Panel	0	478	959		

To check Watt-Hr-Meters (Rotary):

$$\text{Gross Watts} = \frac{3600 \times (1\ \text{rev}) \times (14400/120) \times (4000/5) \times (1.2)}{\text{Time for one revolution (seconds)}} = 414{,}720{,}000/\text{seconds for 1-rev}$$

$$\text{Aux Watts} = \frac{3600 \times (1\ \text{rev}) \times (480/120) \times (600/5) \times (1.2)}{\text{Time for one revolution (seconds)}} = 2{,}073{,}600/\text{seconds for 1-rev}$$

Test Load: _____

Heat Rate Verification:

1. (1971 gal/ 30 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 545,967,000 Btu/hr.

2. (2083 Gr Watt-hr) x (1/ 30 min) x (60 min/hr) x (9.6 btu) = 39 [illegible] Gross KW Load

Waiau 9 Unit Efficiency Test Data Sheet

Load: PEAK Date: 11-17-94

						TEST LOAD			
[redacted]									
Generator Megawatts	MW	W7/8 Cntrl Rm	160						
Generator Volts	KV	W7/8 Cntrl Rm	161						
Generator Amps	Amps	W7/8 Cntrl Rm	162						
Field Volts	VDC	W7/8 Cntrl Rm	163						
Generator Power Factor		W7/8 Cntrl Rm	164						
Generator Vars	MVars	W7/8 Cntrl Rm	165						
Field Amps	Amps	W7/8 Cntrl Rm	166						
Compressor Disch'g Press.			(Test gage)		114.7				
		0		1 MIN	2 MIN				
MAIN		0		89	177				
AUX		0		32	63				

SUPPORTING WORKPAPERS FOR WAIAU 10

UNIT	W10
Test Date	5/2/95

Test Point	Test Input/Output(No MVL Corrections) Gross MW	Aux. MW	Net MW	MBtu/Hr	Test Heat Rates Gross Btu/KWH	Net Btu/KWH	MVL Corr. Heat Rates-Load Adjusted Adj?	Gross Btu/KWH	Net Btu/KWH	Net Residual Btu/KWH
1	5.674	0.095	5.579	236.16	41,624	42,330	NO	41,624	42,330	111
2	10.656	0.094	10.562	276.50	25,948	26,178	NO	25,948	26,178	-50
3	20.333	0.093	20.240	357.24	17,570	17,650	NO	17,570	17,650	-51
4	30.442	0.090	30.351	444.42	14,599	14,642	NO	14,599	14,642	47
5	40.493	0.088	40.405	541.14	13,364	13,393	NO	13,364	13,393	-8
6	45.274	0.087	45.186	588.23	12,993	13,018	NO	12,993	13,018	-4
7	0.000	0.000	0.000	0.00	0	0		0	0	0
8	0.000	0.000	0.000	0.00	0	0		0	0	0
9	0.000	0.000	0.000	0.00	0	0		0	0	0
10	0.000	0.000	0.000	0.00	0	0		0	0	0

INPUT/OUTPUT ABC COEFFICIENTS

	Gross	Net
Coefficients		
A	193.89893	194.60357
B	7.3928455	7.397606
C	0.0290134	0.028991
Equation Fit		
R-square	100.00%	100.00%
Std. Deviation	79.98	81.02

NOTE:

1. Acceptable ABC Coefficients must meet following criteria:
   A. R-Square > 90%
   B. Net Heat Rate Residuals < Test Uncertainty.
   C. Standard Deviation < Test Uncertainty.
   D. Gross and Net Heat Rate Curves must have a similar shape as previous test results.
2. Net Residual = ABC Heat Rate - Test Calculation
3. ABC Coefficients curve fitted to test MBtu/HR and MVL corrected gross & net MW.

COMMENTS:

UNIT	W10
Test Date	5/2/95

Instructions: Input data as shown. Blank out cells that do not have test data. Type "y" for mean of the valve loop correction, "n" for no correction.

Primary Input/Output Data

Test Point	M.V.L Correction?	Duration (Minutes)	Gross Std. KWH		Aux. Std. KWH		Fuel Oil Meter (Gallons, 60		Correction Factor	HHV (MBtu/Bbl)
			Start	End	Start	End	Start	End		
Sp Res	n	20	0	197	0	657	30643	31216	1.0000	5.770
10 MW	n	20	0	370	0	652	44211	44882	1.0000	5.769
20 MW	n	20	0	706	0	643	42808	43676	1.0000	5.762
30 MW	n	20	0	1057	0	628	40811	41888	1.0000	5.777
40 MW	n	20	0	1406	0	612	38069	39382	1.0000	5.770
Base	n	20	0	1572	0	607	34617	36044	1.0000	5.771
7										
8										
9										
10										

Secondary Data for Mean of the Valve Loop Correction

Test Point	Pressure(PSIA)		Enthalpy (Btu/Lbm)		Throttle Flow (Lbm/HR)
	Throttle	Cold RH	Throttle	Cold RH	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
VWO-NP					

NOTE:
1. Excel Spreadsheet by A.W.K. Ho, 9/20/93.
2. ABC coefficients calculated by Least Square Fit of MBtu/Hr and corrected MVL loads or test loads.
3. MVL corrections based on San Diego Gas & Electric calculation methods.
4. Corrected for KWH error on W9/10 on 5/24/94.

Waiau 10 Unit Efficiency Test Data Sheet

Load: _____ Date: 5/2/95

				TEST LOAD			
READING	UNITS	LOCATION	TEST PT	SPIN RES	PEAK	BASE	40 MW
MAIN OVERVIEW SCREEN (2050)							
Gross Load	MW	Monitor Scrn		5.8	53.7	45.5	40.3
Reactive Load	MVars	Monitor Scrn		2.1	5.4	20.9	27.5
Generator Voltage	KV	Monitor Scrn		13.2	13.2	13.8	13.9
Power Factor		Monitor Scrn		0.94	1.0	0.89	0.83
VCE	%	Monitor Scrn		65	86	82	79
CSO	%	Monitor Scrn		[illegible]	80	[illegible]	[illegible]

Waiau 10 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

				TEST LOAD			
READING	UNITS	LOCATION	TEST PT	SPIN RES	PEAK	BASE	40 MW
COMBUSTION CHAMBERS SCREEN (2070), Thermocouples							
Turbine Exhaust #1	Deg F	Monitor Screen	XD-1	489	983	902	841
Turbine Exhaust #2	Deg F	Monitor Screen	XD-2	490	969	899	836
Turbine Exhaust #3	Deg F	Monitor Screen	XD-3	488	977	888	834
Turbine Exhaust #4	Deg F	Monitor Screen	XD-4	486	980	981	839
Turbine Exhaust #5	Deg F	Monitor Screen	XD-5	483	987	893	841
Turbine Exhaust #6	Deg F	Monitor Screen	XD-6	484	971	915	862
Turbine Exhaust #7	Deg F	Monitor Screen	XD-7	486	983	902	850
Turbine Exhaust #8	Deg F	Monitor Screen	XD-8	487	971	899	857
Turbine Exhaust #9	Deg F	Monitor Screen	XD-9	499	978	897	852
Turbine Exhaust #10	Deg F	Monitor Screen	XD-10	490	968	893	848
Turbine Exhaust #11	Deg F	Monitor Screen	XD-11	490	974	891	844
Turbine Exhaust #12	Deg F	Monitor Screen	XD-12	495	976	878	847
OverTemp Ch T.C. #T1	Deg F	Monitor Screen	XDT-1	488	966	881	834
OverTemp Ch T.C. #T3	Deg F	Monitor Screen	XDT-2	487	957	880	845
OverTemp Ch T.C. #T5	Deg F	Monitor Screen	XDT-3	482	971	886	836
OverTemp Ch T.C. #T2	Deg F	Monitor Screen	XDT-4	487	987	903	843
OverTemp Ch T.C. #T4	Deg F	Monitor Screen	XDT-5	489	967	881	841
OverTemp Ch T.C. #T6	Deg F	Monitor Screen	XDT-6	492	963	882	841
STATUS SCREEN (2075), Thermocouples							
Compressor Inlet #1	Deg F	Monitor Screen		76.9	79.7	80.1	82.1
Compressor Inlet #2	Deg F	Monitor Screen		75.6	78.8	80.1	81.3
Compressor Outlet #1	Deg F	Monitor Screen		531	602	592	587
Compressor Outlet #2	Deg F	Monitor Screen		[illegible]	[illegible]	[illegible]	[illegible]

Waiau 10 Unit Efficiency Test Data Sheet Load: _____ Date: 5/2/95

				5 MW	TEST LOAD		
READING	UNITS	LOCATION	TEST PT	~~[illegible]~~	PEAK	BASE	40 MW
MIDDLE PANEL, Digital LEDs							
Variable Contr Voltage		M-Top		66.1	86.9	82.4	79.6
Exhaust Avg Temp	0-1200 F	M-Top		487.4	977.8	893.6	850.3
Speed	0-4000 rp	M-Top		3630	3630	3630	3630
Exhaust Differential	0-200 F	M-Top		12.3	24.8	36.0	31.7
MIDDLE PANEL, Totalizers							
Total Starts	Counts	M-Top		3259	→	→	→
Manual Starts	Counts	M-Top		2101	→	→	→
Fast Starts	Counts	M-Top		133	→	→	→
Fired Starts	Counts	M-Top		2938	→	→	→
Fired Time Meter	Hours	M-Top		546.4		547.6	548.5
Peak Load Meter	Hours	M-Top		6.2		6.4	6.4
Peak Res Load Mtr	Hours	M-Top		0.3		0.3	0.3
GAGE CABNET ASSEMBLY							
Atomizing Air Manifold Press			18	126	170	163	155
L.O. Bearing Header Press			12	29	28.2	28.0	27.8
L.O. Main Pump Disch Press			13	63	63	63	62.7
Lube Emerg Pump Press			31	0 ~~[illegible]~~	4.0	4.0	3.5
Hydraulic Trip Ckt Press			15	1510	1490	1480	1470
Cooling Water Press			19	~~[illegible]~~ 55	54	55	55
F.O. Press After Filter			17	61	50	53	54.2
DP Across L.O. Filter			21	0	0	0	0
AUXILARY (CENTER) COMPARTMENT							
Compressor Discharge Press		Test Gage	14	88.85	114.89	110.5	107.55
Liq Fuel Main Filter DP		Ewa	16	1	1.0	1.0	1.0
AMBIENT CONDITIONS		4718					
Barometric Press	Inches Hg	~~W5/6~~ CR		29.997	30.009	30.010	30.008
Ambient Temp	Deg F	Sling Psychr		73	77	77	79
Relitive Humidity	%	Sling Psychr		78%	79%	75%	70%

Data Taker: _____

Waiau 10 Unit Efficiency Test Data Sheet Load: _____ Date: _____

				TEST LOAD			
READING	UNITS	LOCATION	TEST PT	SPIN RES	PEAK	BASE	40 MW
FUEL SKID							
Fuel Press Reg	% Open	Before Dual Strainr	VPC-5	75%	50%	50%	50%
Fuel Press Reg	% Open	After Dual Strainr	VPC-2	100%	100%	100%	100%
Fuel Fwd Pmp Disch	Psig	Low-Before Strainr	P-8	160	160	160	160
F.O. Press After Strainer		Panel	P-4	72	71	71	71
TRANSFORMER, Makai of Generator							
Main Trans Winding Temp		Makai-Ewa-Up Hi-L		45		59	65
Main Trans Top Oil Temp		Makai-Ewa-Up Hi-R		42		48	59
Aux Trans Top Oil Temp		Makai-Waikiki-On Aux Trans		33		36	39
EWA OUTSIDE, Misc Gages							
Cooling Wtr Tank Lev	% Full	Fwd Up Hi	27	Full			
Cooling Wtr Temp-R	Deg F	Fwd Up Hi	42	100	110	112	118
Atom Air Mainifold Temp		Last Door	44	240	290	280	265
WAIKIKI OUTSIDE, Last Door							
Liq Fuel Nozzle Pr #1	Psig	Selector	2	250	405	370	355
Liq Fuel Nozzle Pr #2	Psig	Selector	3	245	385	350	340
Liq Fuel Nozzle Pr #3	Psig	Selector	4	245	380	348	335
Liq Fuel Nozzle Pr #4	Psig	Selector	5	245	375	340	330
Liq Fuel Nozzle Pr #5	Psig	Selector	6	245	380	345	335
Liq Fuel Nozzle Pr #6	Psig	Selector	7	245	380	350	340
Liq Fuel Nozzle Pr #7	Psig	Selector	8	245	385	345	340
Liq Fuel Nozzle Pr #8	Psig	Selector	9	250	390	355	345
Liq Fuel Nozzle Pr #9	Psig	Selector	10	250	395	355	350
Liq Fuel Nozzle Pr #10	Psig	Selector	11	250	390	350	340
FO Pump Inlet Press	Psig	Selector	34	75	60	65	65
FO Pump Outlet Press	Psig	Selector	35	250	420	375	360
DP Across HP Fuel Filter		Gage	20	0	4.6	4.0 ~~370~~	4.0
Atom Air Compr Inlet Temp		Gage	40	125	150	150	150
WAIKIKI OUTSIDE, Misc Gages							
Lube Oil Tank Level	% Full	Fwd Down	28	Full	FULL	Full	FULL
Lube Oil Tank Temp	Deg F	Fwd Down	38	143	158	161	167
L.O. Brg Hdr Temp	Deg F	Middle Down	37	108	120	125	128
Cooling Wtr Temp-L	Deg F	Fwd Up	39	100	109	112	116

Data Taker: _____

Waiau 10 Unit Efficiency Test Data Sheet

Load: _____ Date: 5/2/95

READING	UNITS	LOCATION					
START-UP COST			Start	Synchronize	Minimum Load		
Fuel Flow Meter	Gallons	Fuel Skid	29516	29728	29765		
		Time →	7:03	7:14	7:16		
100% capacity for	5 sec.			Start-to-Synch Gallons:		152	
20% " "	30 sec.			Synch-to-EMS Min Gallons:		37	

Waiau 10 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

READING	UNITS	LOCATION	TEST PT	TEST LOAD			
WAIAU 7/8 REMOTE PANEL							
Generator Megawatts	MW	W7/8 Cntrl Rm	160				
Generator Volts	KV	W7/8 Cntrl Rm	161				
Generator Amps	Amps	W7/8 Cntrl Rm	162				
Field Volts	VDC	W7/8 Cntrl Rm	163				
Generator Power Factor		W7/8 Cntrl Rm	164				
Generator Vars	MVars	W7/8 Cntrl Rm	165				
Field Amps	Amps	W7/8 Cntrl Rm	166				
				TEST TIMES			
Load: 5 MW				0745	0755	0805	
Fuel Flow Meter	Gallons	Fuel Skid		[illegible]	[illegible]	[illegible]	

Waiau 10 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

To check Watt-Hr-Meters (Rotary):

Gross KWatts = $\frac{3600 \times (1\ rev) \times (14400/120) \times (4000/5) \times (1.2)}{\text{Time for one revolution (seconds)}}$ = 414,720,000/seconds for 1-rev

Aux Watts = $\frac{3600 \times (1\ rev) \times (480/120) \times (600/5) \times (1,2)}{\text{Time for one revolution (seconds)}}$ = 2,073,600/seconds for 1-rev

Test Load: SPILL PES

Heat Rate Verification:

1. (573 gal/ 20 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 238.0815 Btu/hr.
2. (197 Gr Watt-hr) x (1/ 20 min) x (60 min/hr) x (9.6 ptct) = 5,673.6 Gross KW Load.
3. (657 Aux Watt-hr) x (1/ 20 min) x (60 min/hr) x (0.048 ptct) = 94.6 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 41,963 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 42,674 Btu/Kwh.

Test Load: BASE

Heat Rate Verification:

1. (1427 gal/ 20 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 592.9185 Btu/hr.
2. (~~607~~ 1572 Gr Watt-hr) x (1/ 20 min) x (60 min/hr) x (9.6 ptct) = 45,273.6 Gross KW Load.
3. (607 Aux Watt-hr) x (1/ 20 min) x (60 min/hr) x (0.048 ptct) = 87.408 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 13,096 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 13,122 Btu/Kwh.

Test Load: 40 MW

Heat Rate Verification:

1. (657 gal/ 10 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 545,967,000 Btu/hr.
2. (703 Gr Watt-hr) x (1/ 10 min) x (60 min/hr) x (9.6 ptct) = 40,492.8 Gross KW Load.
3. (308 Aux Watt-hr) x (1/ 10 min) x (60 min/hr) x (0.048 ptct) = 88.704 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 13,483 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 13,573 Btu/Kwh.

Test Load: ~~[illegible]~~ PEAK

Heat Rate Verification:

1. (gal/ min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = Btu/hr.
2. (833 Gr Watt-hr) x (1/ 9 min) x (60 min/hr) x (9.6 ptct) = 53,312 Gross KW Load.
3. (256 Aux Watt-hr) x (1/ 9 min) x (60 min/hr) x (0.048 ptct) = 81.92 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = Btu/Kwh.

Test Load: 20 MW

Heat Rate Verification:

1. (gal/ min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = Btu/hr.
2. (Gr Watt-hr) x (1/ min) x (60 min/hr) x (9.6 ptct) = Gross KW Load.
3. (Aux Watt-hr) x (1/ min) x (60 min/hr) x (0.048 ptct) = Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = Btu/Kwh.

10 MW

1. ___ gal / ___ min - - - = _____ Btu/hr
2. _____ GWH / ___ min - - = _____ Gross KW
3. _____ AWH / ___ min - - = _____ Aux KW

Data Taker: _____

Waiau 10 Unit Efficiency Test Data Sheet

Load: _____ Date: 5/2/95

				TEST LOAD			
READING	UNITS	LOCATION	TEST PT	30 MW	20 MW	10 MW	
MAIN OVERVIEW SCREEN (2050)							
Gross Load	MW	Monitor Scrn		30.9	20.3	10.5	
Reactive Load	MVars	Monitor Scrn		28.9	30.4	31.2	
Generator Voltage	KV	Monitor Scrn		13.9	14.0	14.0	
Power Factor		Monitor Scrn		0.72	0.56	0.33	
VCE	%	Monitor Scrn		74	70	67	
CSO	%	Monitor Scrn		53	42	32	
Oil Flow		Monitor Scrn		1376	1102	845	
LEFT PANEL METERS							
Frequency	Hz	L-Top	128	60.2	60.2	60.1	

Waiau 10 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

				TEST LOAD			
READING	UNITS	LOCATION	TEST PT	30 MW	20 MW	10 MW	
COMBUSTION CHAMBERS SCREEN (2070), Thermocouples							
Turbine Exhaust #1	Deg F	Monitor Screen	XD-1	729	642	556	
Turbine Exhaust #2	Deg F	Monitor Screen	XD-2	732	642	555	
Turbine Exhaust #3	Deg F	Monitor Screen	XD-3	731	641	553	
Turbine Exhaust #4	Deg F	Monitor Screen	XD-4	730	639	549	
Turbine Exhaust #5	Deg F	Monitor Screen	XD-5	734	637	547	
Turbine Exhaust #6	Deg F	Monitor Screen	XD-6	737	639	550	
Turbine Exhaust #7	Deg F	Monitor Screen	XD-7	742	639	550	
Turbine Exhaust #8	Deg F	Monitor Screen	XD-8	750	641	550	
Turbine Exhaust #9	Deg F	Monitor Screen	XD-9	740	645	554	
Turbine Exhaust #10	Deg F	Monitor Screen	XD-10	742	647	554	

Waiau 10 Unit Efficiency Test Data Sheet Load: _____ Date: 5-2-95

READING	UNITS	LOCATION	TEST PT	TEST LOAD 30 MW	20 MW	10 MW
MIDDLE PANEL, Digital LEDs						
Variable Contr Voltage		M-Top		74.4	70.8	67.8
Exhaust Avg Temp	0-1200 F	M-Top		738.4	643.5	551.1
Speed	0-4000 rp	M-Top		3630	3630	3624
Exhaust Differential	0-200 F	M-Top		21.7	12.9	16.7
MIDDLE PANEL, Totalizers						
Total Starts	Counts	M-Top		3259		
Manual Starts	Counts	M-Top		2101		
Fast Starts	Counts	M-Top		133		
Fired Starts	Counts	M-Top		2938		
Fired Time Meter	Hours	M-Top		549.3	550.0	550.5
Peak Load Meter	Hours	M-Top		6.4		
Peak Res Load Mtr	Hours	M-Top		0.3		
GAGE CABNET ASSEMBLY						
Atomizing Air Manifold Press			18	144	135	138
L.O. Bearing Header Press			12	27.9	27.9	27.9
L.O. Main Pump Disch Press			13	63	63	63
Lube Emerg Pump Press			31	3.6	3.5	3.5
Hydraulic Trip Ckt Press			15	1470	1470	1470
Cooling Water Press			19	55	55	55
F.O. Press After Filter			17	56.5	58.5	60
DP Across L.O. Filter			21	0	0	0
AUXILARY (CENTER) COMPARTMENT						
Compressor Discharge Press		Test Gage	14	101.8	96.27	90.5
Liq Fuel Main Filter DP		Ewa	16	1.0	1.0	1.0
AMBIENT CONDITIONS						
Barometric Press	Inches Hg	W5/6 CR		29.999	29.996	29.995
Ambient Temp	Deg F	Sling Psychr		79	81	80
Relitive Humidity	%	Sling Psychr		72%	73%	72%

Data Taker: _____

Waiau 10 Unit Efficiency Test Data Sheet Load: _____ Date: _____

READING	UNITS	LOCATION	TEST PT	TEST LOAD 30 MW	20 MW	10 MW
FUEL SKID						
Fuel Press Reg	% Open	Before Dual Strainr	VPC-5	65%	65%	70%
Fuel Press Reg	% Open	After Dual Strainr	VPC-2	100%	100%	100%
Fuel Fwd Pmp Disch	Psig	Low-Before Strainr	P-8	160	160	160
F.O. Press After Strainer		Panel	P-4	72	72	72
TRANSFORMER, Makai of Generator						
Main Trans Winding Temp		Makai-Ewa-Up Hi-L		70	70	70
Main Trans Top Oil Temp		Makai-Ewa-Up Hi-R		61	61	61
Aux Trans Top Oil Temp		Makai-Waikiki-On Aux Trans		40	40	40
EWA OUTSIDE, Misc Gages						
Cooling Wtr Tank Lev	% Full	Fwd Up Hi	27	Full		
Cooling Wtr Temp-R	Deg F	Fwd Up Hi	42	120	121	121
Atom Air Mainifold Temp		Last Door	44	260	250	245
WAIKIKI OUTSIDE, Last Door						
Liq Fuel Nozzle Pr #1	Psig	Selector	2	318	290	265
Liq Fuel Nozzle Pr #2	Psig	Selector	3	305	280	260
Liq Fuel Nozzle Pr #3	Psig	Selector	4	300	275	250
Liq Fuel Nozzle Pr #4	Psig	Selector	5	295	270	245
iq Fuel Nozzle Pr #5	Psig	Selector	6	300	275	250
q Fuel Nozzle Pr #6	Psig	Selector	7	300	280	255
Liq Fuel Nozzle Pr #7	Psig	Selector	8	300	280	255
Liq Fuel Nozzle Pr #8	Psig	Selector	9	300	285	260
Liq Fuel Nozzle Pr #9	Psig	Selector	10	310	295	265
Liq Fuel Nozzle Pr #10	Psig	Selector	11	300	280	255
FO Pump Inlet Press	Psig	Selector	34	70	70	75
FO Pump Outlet Press	Psig	Selector	35	320	290	261
DP Across HP Fuel Filter		Gage	20	1.6	1.0	0
Atom Air Compr Inlet Temp		Gage	40	145	145	137
WAIKIKI OUTSIDE, Misc Gages						
Lube Oil Tank Level	% Full	Fwd Down	28	Full +	Full	Full
Lube Oil Tank Temp	Deg F	Fwd Down	38	170	169	169
L.O. Brg Hdr Temp.	Deg F	Middle Down	37	130	130	130
Cooling Wtr Temp-L	Deg F	Fwd Up	39	116	118	119

Data Taker: _____

Waiau 10 Unit Efficiency Test Data Sheet Load: _____ Date: _____

READING	UNITS	LOCATION					
START-UP COST			Start	Synchronize	Minimum Load		
Fuel Flow Meter	Gallons	Fuel Skid					
				Start-to-Synch Gallons:			
				Synch-to-EMS Min Gallons:			
			TEST TIMES				
Load: 30 MW			1035	1045	1055		
GROSS KWH Standard	Counts	Below Left Panel	0	529	1057		
AUX KWH Standard	Counts	Below Left Panel	0	314	628		
			~~1115~~	TEST TIMES			
Load: 20 MW			1115	1125	1135		
GROSS KWH Standard	Counts	Below Left Panel	0	353	706		
AUX KWH Standard	Counts	Below Left Panel	0	321	643		
			TEST TIMES				
Load: 10 MW			1150	1200	1210		
GROSS KWH Standard	Counts	Below Left Panel	0	187	370		
AUX KWH Standard	Counts	Below Left Panel	0	326	652		
			TEST TIMES				
Load:							
GROSS KWH Standard	Counts	Below Left Panel					
AUX KWH Standard	Counts	Below Left Panel					
			TEST TIMES				
Load:							
GROSS KWH Standard	Counts	Below Left Panel					
AUX KWH Standard	Counts	Below Left Panel					
			TEST TIMES				
Load:							
GROSS KWH Standard	Counts	Below Left Panel					
AUX KWH Standard	Counts	Below Left Panel					
			TEST TIMES				
Load:							
GROSS KWH Standard	Counts	Below Left Panel					
AUX KWH Standard	Counts	Below Left Panel					

Data Taker: _____

Waiau 10 Unit Efficiency Test Data Sheet

Load: _____ Date: _____

READING	UNITS	LOCATION	TEST PT	TEST LOAD			
WAIAU 7/8 REMOTE PANEL							
Generator Megawatts	MW	W7/8 Cntrl Rm	160				
Generator Volts	KV	W7/8 Cntrl Rm	161				
Generator Amps	Amps	W7/8 Cntrl Rm	162				
Field Volts	VDC	W7/8 Cntrl Rm	163				
Generator Power Factor		W7/8 Cntrl Rm	164				
Generator Vars	MVars	W7/8 Cntrl Rm	165				
Field Amps	Amps	W7/8 Cntrl Rm	166				
				TEST TIMES			
Load: 30 MW				1035	1045	1055	
Fuel Flow Meter	Gallons	Fuel Skid		40811	41350	41888	
				TEST TIMES			
Load: 20 MW				1115	1125	1135	
Fuel Flow Meter	Gallons	Fuel Skid		42808	43242	43676	
				TEST TIMES			
Load: 10 MW				1150	1200	1210	
Fuel Flow Meter	Gallons	Fuel Skid		44211	44548	44882	
				TEST TIMES			
Load:							
Fuel Flow Meter	Gallons	Fuel Skid					
				TEST TIMES			
Load:							
Fuel Flow Meter	Gallons	Fuel Skid					
				TEST TIMES			
Load:							
Fuel Flow Meter	Gallons	Fuel Skid					

Data Taker: _____

Waiau 10 Unit Efficiency Test Data Sheet Load: _____ Date: _____

To check Watt-Hr-Meters (Rotary):

Gross KWatts = 3600 x (1 rev) x (14400/120) x (4000/5) x (1.2) / Time for one revolution (seconds) = 414,720,000/seconds for 1-rev

Aux Watts = 3600 x (1 rev) x (480/120) x (600/5) x (1.2) / Time for one revolution (seconds) = 2,073,600/seconds for 1-rev

Test Load: 30 MW

Heat Rate Verification:

1. (539 gal/ 10 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 447,909,000 Btu/hr.
2. (529 Gr Watt-hr) x (1/ 10 min) x (60 min/hr) x (9.6 ptct) = 30,470.4 Gross KW Load.
3. (314 Aux Watt-hr) x (1/ 10 min) x (60 min/hr) x (0.048 ptct) = 90,432 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 14,700 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 14,784 Btu/Kwh.

Test Load: 20 MW

Heat Rate Verification:

1. (434 gal/ 10 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 360,654,000 Btu/hr.
2. (353 Gr Watt-hr) x (1/ 10 min) x (60 min/hr) x (9.6 ptct) = 20,332.8 Gross KW Load.
3. (321 Aux Watt-hr) x (1/ 10 min) x (60 min/hr) x (0.048 ptct) = 92.448 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 17,738 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 17,819 Btu/Kwh.

Test Load: 10 MW

Heat Rate Verification:

1. (337 gal/ 10 min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = 280,047,000 Btu/hr.
2. (187 Gr Watt-hr) x (1/ 10 min) x (60 min/hr) x (9.6 ptct) = 10,771 Gross KW Load.
3. (326 Aux Watt-hr) x (1/ 10 min) x (60 min/hr) x (0.048 ptct) = 93,888 Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = 26,000 Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = 26,228 Btu/Kwh.

Test Load:

Heat Rate Verification:

1. (gal/ min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = Btu/hr.
2. (Gr Watt-hr) x (1/ min) x (60 min/hr) x (9.6 ptct) = Gross KW Load.
3. (Aux Watt-hr) x (1/ min) x (60 min/hr) x (0.048 ptct) = Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = Btu/Kwh.

Test Load:

Heat Rate Verification:

1. (gal/ min) x (60 min/hr) x (1bbl/42 gal) x (5.817 MBtu/Bbl) = Btu/hr.
2. (Gr Watt-hr) x (1/ min) x (60 min/hr) x (9.6 ptct) = Gross KW Load.
3. (Aux Watt-hr) x (1/ min) x (60 min/hr) x (0.048 ptct) = Aux KW Load.
4. Preliminary Gross Heat Rate (#1/#2) = Btu/Kwh.
5. Preliminary Net Heat Rate (#1/#2-#3) = Btu/Kwh.

 Data Taker: _____

Fuel Oil Analysis Report

Heat Rate Test

Source:	WAIAU	**Type of Sample:**	DIESEL
Unit:	W-10	**Date Received:**	05-03-95
Sample Date:	05-02-95	**Analysis Date:**	05-04-95
Sample Conditions:	Spin Reserve	**Report Date:**	05-08-95

Sample Time: 0800

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	37.4
D 4294	Sulfur, Wt. %	0.18
D 240	BTU/lb	19,692.8
	BTU/bbl	5,770,000
	BTU/gal	137,377

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Lab Supervisor

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	WAIAU	**Type of Sample:**	DIESEL
Unit:	W-10	**Date Received:**	05-03-95
Sample Date:	05-02-95	**Analysis Date:**	05-04-95
Sample Conditions:	Base Load	**Report Date:**	05-08-95
Sample Time:	0900		

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	37.4
D 4294	Sulfur, Wt. %	0.17
D 240	BTU/lb	19,696.2
	BTU/bbl	5,771,000
	BTU/gal	137,401

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Lab Supervisor

cc: C. Kishimoto, JC
J. Itai, GV

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	WAIAU	**Type of Sample:**	DIESEL
Unit:	W-10	**Date Received:**	05-03-95
Sample Date:	05-02-95	**Analysis Date:**	05-04-95
Sample Conditions:	40 MW	**Report Date:**	05-08-95
Sample Time:	1000		

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	37.4
D 4294	Sulfur, Wt. %	0.17
D 240	BTU/lb	19,691.8
	BTU/bbl	5,770,000
	BTU/gal	137,370

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Lab Supervisor

cc: C. Kishimoto, JC
J. Itai, GV

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	WAIAU	**Type of Sample:**	DIESEL
Unit:	W-10	**Date Received:**	05-03-95
Sample Date:	05-02-95	**Analysis Date:**	05-04-95
Sample Conditions:	30 MW	**Report Date:**	05-08-95
Sample Time:	1045		

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	37.4
D 4294	Sulfur, Wt. %	0.18
D 240	BTU/lb	19,718.9
	BTU/bbl	5,777,000
	BTU/gal	137,559

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto

Charles Kishimoto
Lab Supervisor

cc: C. Kishimoto, JC
J. Itai, GV

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	WAIAU	**Type of Sample:**	DIESEL
Unit:	W-10	**Date Received:**	05-03-95
Sample Date:	05-02-95	**Analysis Date:**	05-04-95
Sample Conditions:	20 MW	**Report Date:**	05-08-95
Sample Time:	1125		

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	37.4
D 4294	Sulfur, Wt. %	0.18
D 240	BTU/lb	19,668.2
	BTU/bbl	5,762,000
	BTU/gal	137,205

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Lab Supervisor

cc: C. Kishimoto, JC
J. Itai, GV

HECO CHEMISTRY LABORATORY
Fuel Oil Analysis Report

Heat Rate Test

Source:	WAIAU	**Type of Sample:**	DIESEL
Unit:	W-10	**Date Received:**	05-03-95
Sample Date:	05-02-95	**Analysis Date:**	05-04-95
Sample Conditions:	10 MW	**Report Date:**	05-08-95
Sample Time:	1200		

ASTM No.	ANALYSIS	RESULTS
D 4052	API Gravity @ 60 °F	37.4
D 4294	Sulfur, Wt. %	0.18
D 240	BTU/lb	19,690.4
	BTU/bbl	5,769,000
	BTU/gal	137,360

Analyzed by: K. Yokoyama

Approved by: Charles Kishimoto
Charles Kishimoto
Lab Supervisor

cc: C. Kishimoto, JC
J. Itai, GV

SUPPORTING WORKPAPERS FOR KAHE 1

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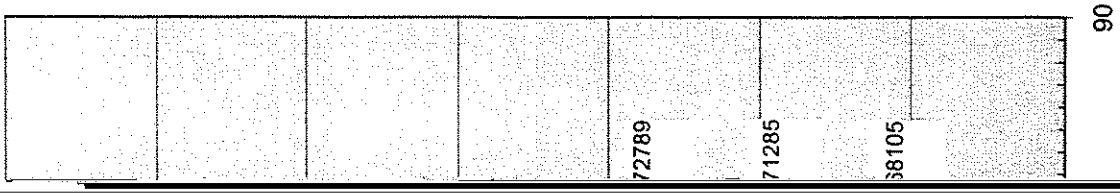


ABC Check	Gr. - Net
42	3.080042
68	3.079968
94	3.079694
52	3.07982
46	3.079746
72	3.079672
98	3.079598
24	3.079924
45	3.07945
76	3.079376
02	3.079302
28	3.079228
54	3.079154
08	3.07908
06	3.079006
33	3.078933
58	3.078858
84	3.078784
11	3.078711
36	3.078636
62	3.078562
89	3.078489
14	3.078414
41	3.078341
67	3.078267
93	3.078193
19	3.078119
45	3.078045
71	3.077971
97	3.077897
23	3.077823
49	3.077749
75	3.077675
01	3.077601
27	3.077527
53	3.077453
79	3.077379
05	3.077306
31	3.077231
57	3.077157
83	3.077083
09	3.077009
05	3.076935
61	3.076861
87	3.076787
13	3.076713
39	3.076639
65	3.076565
91	3.076491
17	3.076417
43	3.076343
69	3.076269
95	3.076195
21	3.076121
47	3.076047
73	3.075973
99	3.075899
25	3.075825
51	3.075751
77	3.075677
03	3.075603
29	3.075529
55	3.075455
81	3.075381
07	3.075307
33	3.075233
59	3.075159
85	3.075085
11	3.075011
07	3.074937
63	3.074863
79	3.074789
16	3.074716
41	3.074641
68	3.074568
94	3.074494
19	3.074419
46	3.074346
72	3.074272
98	3.074198
24	3.074124
05	3.074005
78	3.073978
02	3.073902
28	3.073828
54	3.073754
68	3.07368
06	3.073606
32	3.073532
58	3.073458
84	3.073384
31	3.07331
36	3.073236
62	3.073162
88	3.073088
14	3.073014
94	3.07294
66	3.072866
92	3.072792
78	3.072718
44	3.072644
57	3.072257
96	3.072496
22	3.072422
48	3.072348
74	3.072274
22	3.0722
28	3.072128
62	3.072062
78	3.071978
04	3.071904
83	3.07183
78	3.071756
82	3.071682
08	3.071608
34	3.071534
46	3.07146
86	3.071386
12	3.071312
29	3.071239
64	3.071164

Checks

Corr.	CWIT	Act. Aux M	Manually Adjust Target Aux	Diff.	Opacity	Outliers
1795105	77.64716	3.361287	3.376121	-0.014834		
.1473031	77.62984	3.2229	3.300726	-0.077826		
.7104373	77.62119	3.227463	3.239868	-0.012405		
.6850943	77.61254	3.141144	2.589118	0.552026		
.9393143	77.60389	3.149503	2.558881	0.590622		
.5216721	77.59525	3.280945	2.534119	0.746826		
.7482265	77.58659	3.235413	2.513686	0.721727		
.6873394	77.57795	3.206665	2.498566	0.708099		
.2061937	77.5693	3.164969	2.46283	0.702139		
3.444612	77.56065	2.629395	2.442146	0.187249		
.9802432	77.552	2.575562	2.427966	0.147596		
.5336843	77.54335	2.602921	2.414806	0.188115		
.9825579	77.53471	2.515592	2.369642	0.145949		
.3373674	77.52605	2.567057	2.37256	0.194497		
.7151005	77.51741	2.568172	2.372849	0.195323		
.3329362	77.50876	2.532511	2.370808	0.161704		
.4071819	77.50011	2.575835	2.375605	0.20023		
.5832728	77.49146	2.592957	2.375044	0.217912		
.8294208	77.48282	2.498438	2.373111	0.125326		
.6975112	77.47417	2.514523	2.372088	0.142435		
.3947077	77.46552	2.518066	2.389643	0.128424		
.2502312	77.45687	3.049133	2.425185	0.623948		
.6143246	77.44823	3.152161	2.44338	0.708781		
.1055655	77.43958	3.172028	2.462685	0.709343		
.6652134	77.43093	3.18634	2.501459	0.684881		
8.651657	77.42228	3.239624	2.562569	0.677055		
.1294341	77.41364	3.274436	2.590148	0.684288		
.2468354	77.40498	3.273367	2.591334	0.682033		
8.191153	77.39634	3.299737	3.246735	0.053002		
2.336812	77.38769	3.407823	3.352461	0.055362		
.1234502	77.37904	3.353729	3.397388	-0.043657		
.3711979	77.37039	3.464938	3.514067	-0.049129		
.0265373	77.36175	3.602552	3.66362	-0.061068		
.0633444	77.36949	3.742676	3.801426	-0.058751		
.2173431	77.39364	3.939891	3.826939	0.112952		
.7267789	77.41778	3.972782	3.846783	0.125999		
.0726923	77.44193	3.917928	3.820766	0.097162		
.1598118	77.46607	3.883487	3.77862	0.104867		
5.979153	77.49021	3.977679	3.88983	0.087849		
.4297378	77.51436	4.002587	3.896698	0.105889		
.5556641	77.5385	3.956588	3.845403	0.111184		
.3030866	77.56264	3.982981	3.860461	0.12252		
.6818455	77.58678	3.930173	3.828113	0.10206		
.7570761	77.61093	3.889933	3.7668	0.123134		
.3756741	77.63508	3.881207	3.743802	0.137406		
.2662445	77.65922	3.740849	3.615997	0.124853		
.3670523	77.68336	3.5518	3.591208	-0.039408		
.0977636	77.7075	3.556943	3.589555	-0.032612		
16.340372	77.73165	3.658325	3.69434	-0.036014		
7.4637071	77.75579	3.521682	3.572223	-0.050542		
.0070491	77.77994	3.48682	3.529575	-0.042755		
3.4919952	77.80408	3.569092	3.497751	0.071341		
4.2252751	77.82822	3.518856	3.476612	0.042243		
2.3825438	77.85237	3.447828	3.46296	-0.015132		
4.9320492	77.87651	3.416122	3.446353	-0.030232		
9.7700264	77.90066	3.407846	3.441039	-0.033193		
2.8384757	77.9248	3.414594	3.446543	-0.031948		
2.0111168	77.94894	3.393595	3.431906	-0.038311		
79.318833	77.97309	3.36956	3.411432	-0.041871		
7.7562688	77.99723	3.374756	3.417249	-0.042494		
4.9729573	78.02138	3.36685	3.399256	-0.032406		
4.0565125	78.04552	3.347356	3.393997	-0.046641		
5.7023538	78.06966	3.348437	3.385256	-0.036819		
5.1518847	78.0938	3.368578	3.387379	-0.0188		
6.5690771	78.11795	3.398941	3.438089	-0.039148		
3.5453441	78.10268	3.387104	3.425998	-0.038893		
96.922762	78.07687	3.40802	3.450993	-0.042973		
7.3821791	78.05105	3.393348	3.442775	-0.049428		
4.4997565	78.02523	3.354106	3.416856	-0.06275		
1.4626965	77.99942	3.333569	3.377744	-0.044175		
3.1615656	77.9736	3.33124	3.375672	-0.044432		
4.6163803	77.94778	3.353748	3.403056	-0.049308		
7.5162541	77.92197	3.376798	3.412125	-0.036327		
4.6916204	77.89616	3.375525	3.419162	-0.043637		
1.9771873	77.87034	3.379665	3.414322	-0.034657		
8.8259577	77.84452	3.400107	3.42454	-0.024433		
7.0414984	77.81871	3.496059	3.509352	-0.013293		
4.8907947	77.79289	3.64864	3.639727	0.008913		
6.6865005	77.76707	3.642528	3.578935	0.063593		
49.372887	77.74126	3.554932	3.503732	0.0512		
9.6088864	77.71545	3.527787	3.484004	0.043784		
1.0688919	77.68963	3.459487	3.436886	0.022602		
0.3360003	77.66381	3.44104	3.434708	0.006332		
548.4446	77.638	3.384027	3.346265	0.037762		
8.1312207	77.61218	3.217987	3.239255	-0.021268		
55.518381	77.58636	3.335541	3.382749	-0.047208		
0.8813085	77.56055	3.233543	3.240997	-0.007455		
4.4892279	77.53474	3.200785	2.596284	0.604501		
58.326008	77.50892	3.157166	2.564255	0.59291		
3.2547819	77.4831	3.172638	2.585315	0.587323		
4.4267512	77.45729	3.305969	2.515712	0.790257		
6.9642647	77.43147	3.162305	2.485445	0.67686		
70.238134	77.40565	2.536209	2.4346	0.101609		
0.3535685	77.37984	2.497538	2.399231	0.098307		
16.2496851	77.35403	2.477713	2.379761	0.097952		
39.8796996	77.32821	2.464403	2.373207	0.091196		
11.4777778	77.30298	2.461145	2.372197	0.088948		
32.4980092	77.28375	2.453487	2.371374	0.082112		
50.6825211	77.26453	2.533173	2.366746	0.166427		
52.4004067	77.2453	2.512051	2.365687	0.146364		
385.176465	77.22607	2.544339	2.359758	0.18458		
11.0498753	77.20684	2.471827	2.371247	0.10058		
18.3370708	77.18761	2.482779	2.372007	0.110772		
17.1170202	77.16839	2.467274	2.37124	0.096035		
17.9683718	77.14916	2.479434	2.370554	0.10888		
15.3610401	77.12994	2.478257	2.372179	0.106079		
15.0130414	77.11071	2.472099	2.374194	0.097905		
15.7597244	77.09148	2.474174	2.370712	0.103462		
42.1788101	77.07225	2.474381	2.370828	0.103553		
38.3578601	77.05302	2.462025	2.372993	0.109032		
41.5529718	77.0338	2.457294	2.371589	0.085705		
40.1316143	77.01457	2.461752	2.372175	0.089577		
39.5604855	76.99535	2.463917	2.374651	0.089265		
39.1223634	76.97612	2.46546	2.373852	0.091609		
41.8630197	76.95689	2.45511	2.375963	0.079147		
42.6968937	76.93767	2.470567	2.37389	0.096677		
38.4588518	76.91843	2.501646	2.371247	0.130401		
340.779102	76.89921	2.470877	2.374836	0.096041		
38.7180851	76.87998	2.465932	2.373327	0.092605		
39.8005754	76.86076	2.467053	2.371473	0.09558		
39.5611301	76.84153	2.467473	2.375044	0.092428		

Gr. MW

Aux MW-Below 50 MW	
32.36241	2.544339
32.78467	2.512051
32.86011	2.533173
33.06641	2.515592
33.13135	2.479434
33.14258	2.474174
33.14941	2.532511
33.15088	2.474381
33.18018	2.467274
33.18066	2.471827
33.18066	2.501648
33.18978	2.453487
33.19678	2.467053
33.20508	2.457294
33.23482	2.482779
33.24062	2.514523
33.2468	2.461752
33.24707	2.478257
33.24837	2.461145
33.27419	2.567057
33.29482	2.568172
33.30506	2.482025
33.31348	2.498438
33.32031	2.464403
33.32882	2.465932
33.36621	2.46546
33.36895	2.470567
33.39063	2.472099
33.42318	2.463917
33.43633	2.470877
33.45117	2.592957
33.45117	2.467473
33.4911	2.575835
33.5166	2.45511
33.78711	2.477713
34.49094	2.518066
35.17383	2.497538
36.2832	2.602921
37.22051	2.575562
37.69304	2.536209
38.23047	2.629395

Aux MW-Above 50 MW	
38.31836	3.152161
39.69336	3.172028
39.70371	3.164969
41.31445	3.162305
42.24902	3.206665
42.45508	3.18634
43.32593	3.235413
43.47021	3.305969
44.78125	3.280945
46.54492	3.149503
46.80762	3.239624
46.92773	3.157166
48.42773	3.172638
48.69857	3.141144
48.77197	3.274436
48.85645	3.273367
49.20898	3.200785
51.34375	3.217987
51.37532	3.227463
51.43359	3.233543
51.72949	3.299737
54.514	3.2229
56.86255	3.384027
57.18213	3.407823
58.37915	3.33124
58.40234	3.361287
58.486	3.333569
58.74414	3.335541
58.87344	3.348437
58.98291	3.368578
59.32422	3.347356
59.49902	3.353729
59.59546	3.36685
59.79144	3.353748
60.22339	3.36956
60.25918	3.375798
60.37246	3.379665
60.50312	3.354106
60.52344	3.374756
60.62207	3.375525
60.89941	3.400107
60.97461	3.387104
61.2793	3.393595
61.42383	3.44104
61.53613	3.459487
61.5982	3.398941
61.75032	3.407846
61.83984	3.393346
62.02441	3.416122
62.03418	3.414594
62.26367	3.40802
62.88086	3.447828
63.58496	3.518856
63.96614	3.527787
64.67513	3.569092
64.9836	3.554932
65.27344	3.496059
65.5166	3.464938
66.31641	3.48682
68.51591	3.521682
68.86206	3.642528
69.40977	3.556943
69.49498	3.5518
70.77344	3.740849
71.99727	3.64864
73.22949	3.602552
74.8138	3.658325
77.3647	3.881207
78.55078	3.889933
79.16037	3.883487
80.33659	3.742676
81.33398	3.917928
81.65234	3.939891
81.71289	3.930173
82.6046	3.956588
82.67578	3.972782
83.38119	3.982981
84.89584	3.977679
85.25003	4.002587

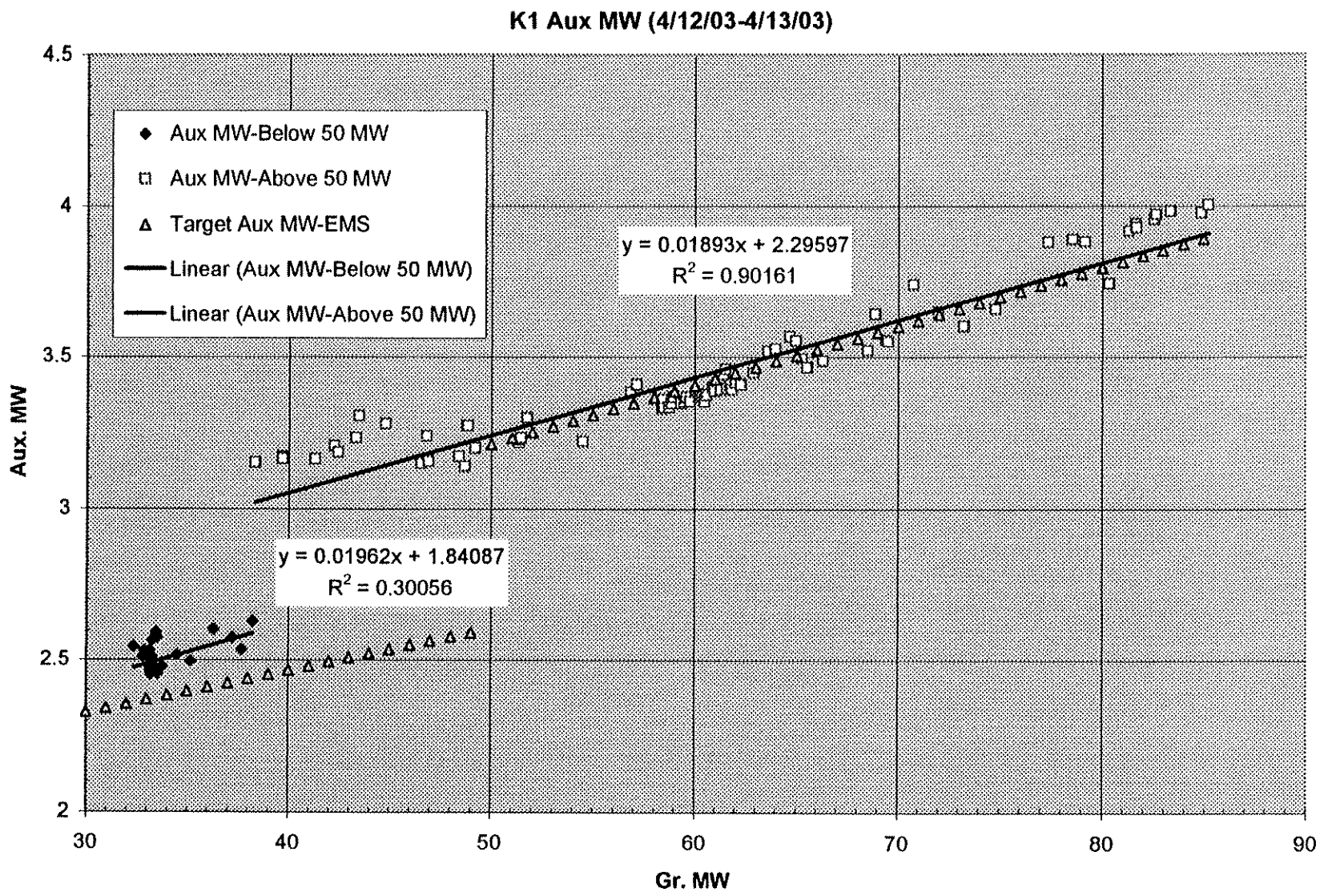
Outliers

Operational Aux MW Monitoring

	Target Aux MW-EMS
30	2.32659
31	2.34063
32	2.35467
33	2.36871
34	2.38275
35	2.39679
36	2.41083
37	2.42487
38	2.43891
39	2.45295
40	2.46699
41	2.48103
42	2.49507
43	2.50911
44	2.52315
45	2.53719
46	2.55123
47	2.56527
48	2.57931
49	2.59335
50	3.2132
51	3.22259
52	3.25198
53	3.27137
54	3.29076
55	3.31015
56	3.32954
57	3.34893
58	3.36832
59	3.38771
60	3.4071
61	3.42649
62	3.44588
63	3.46527
64	3.48466
65	3.50405
66	3.52344
67	3.54283
68	3.56222
69	3.58161
70	3.601
71	3.62039
72	3.63978
73	3.65917
74	3.67856
75	3.69795
76	3.71734
77	3.73673
78	3.75612
79	3.77551
80	3.7949
81	3.81429
82	3.83368
83	3.85307
84	3.87246
85	3.89185

32.36241	2.544339
32.78467	2.512051
32.86011	2.533173
33.06641	2.515592
33.13135	2.479434
33.14258	2.474174
33.14941	2.532511
33.15088	2.474381
33.18018	2.467274
33.18066	2.471827
33.18066	2.501648
33.18978	2.453487
33.19678	2.467053
33.20508	2.457294
33.23482	2.482779
33.24062	2.514523
33.2468	2.461752
33.24707	2.478257
33.24837	2.461145
33.27419	2.567057
33.29482	2.568172
33.30506	2.482025
33.31348	2.498438
33.32031	2.464403
33.32882	2.465932
33.36621	2.46546
33.36895	2.470567
33.39063	2.472099
33.42318	2.463917
33.43633	2.470877
33.45117	2.592957
33.45117	2.467473
33.4911	2.575835
33.5166	2.45511
33.78711	2.477713
34.49094	2.518066
35.17383	2.497538
36.2832	2.602921
37.02246	3.049133
37.22051	2.575562
37.69304	2.536209
38.23047	2.629395
38.31836	3.152161
39.69336	3.172028
39.70371	3.164969
41.31445	3.162305
42.24902	3.206665
42.45508	3.18634
43.32593	3.235413
43.47021	3.305969
44.78125	3.280945
46.54492	3.149503
46.80762	3.239624
46.92773	3.157166
48.42773	3.172638
48.69857	3.141144
48.77197	3.274436
48.85645	3.273367
49.20898	3.200785
51.34375	3.217987
51.37532	3.227463
51.43359	3.233543
51.72949	3.299737
54.514	3.2229
56.86255	3.384027
57.18213	3.407823
58.37915	3.33124
58.40234	3.361287
58.486	3.333569
58.74414	3.335541
58.87344	3.348437
58.98291	3.368578
59.32422	3.347356
59.49902	3.353729
59.59546	3.36685
59.79144	3.353748
60.22339	3.36956
60.25918	3.375798
60.37246	3.379665
60.50312	3.354106
60.52344	3.374756
60.62207	3.375525
60.89941	3.400107
60.97461	3.387104
61.2793	3.393595
61.42383	3.44104
61.53613	3.459487
61.5982	3.398941
61.75032	3.407846
61.83984	3.393346
62.02441	3.416122
62.03418	3.414594
62.26367	3.40802
62.88086	3.447828
63.58496	3.518856
63.96614	3.527787
64.67513	3.569092
64.9836	3.554932
65.27344	3.496059
65.5166	3.464938
66.31641	3.48682
68.51591	3.521682
68.86206	3.642528
69.40977	3.556943
69.49498	3.5518
70.77344	3.740849
71.99727	3.64864
73.22949	3.602552
74.8138	3.658325

79.16037	3.883487
80.33659	3.742676
81.33398	3.917928
81.65234	3.939891
81.71289	3.930173
82.6046	3.956588
82.67578	3.972782
83.38119	3.982981
84.89584	3.977679
85.25003	4.002587


K1 Aux MW (4/12/03-4/13/03)
Aux MW-Below 50 MW
Aux MW-Above 50 MW
Target Aux MW-EMS
Linear (Aux MW-Below 50 MW)
Linear (Aux MW-Above 50 MW)
y = 0.01893x + 2.29597
R2 = 0.90161
y = 0.01962x + 1.84087
R2 = 0.30056
Aux. MW
Gr. MW
4.5
4
3.5
3
2.5
2
30
40
50
60
70
80
90

Condenser Adjustment

Small Reheat Unit, HR Adjustment from 75 Degr. F

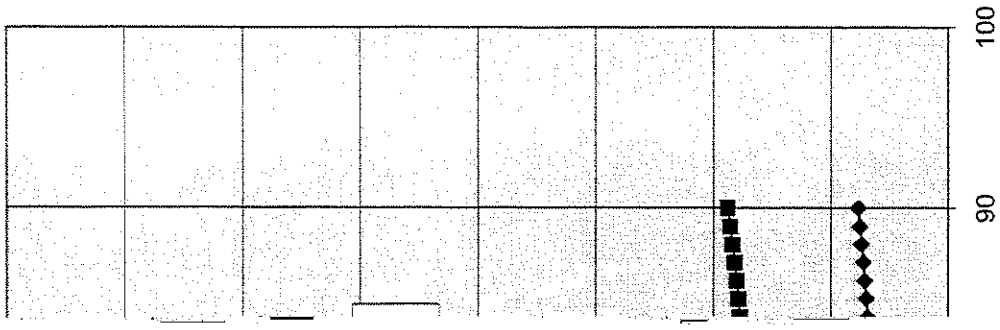
Temp. Rise		Coefficients x2	x	constant
1	76	2.1476E-07	- 4.0812E-05	1.0027E+00
2	77	4.4654E-07	- 8.4556E-05	1.0055E+00
3	78	6.4158E-07	- 1.2225E-04	1.0083E+00
4	79	8.5921E-07	- 1.6336E-04	1.0112E+00
5	80	1.1974E-06	- 2.2083E-04	1.0147E+00
6	81	1.7181E-06	- 3.0262E-04	1.0190E+00
7	82	2.2406E-06	- 3.8429E-04	1.0234E+00
8	83	2.6258E-06	- 4.4887E-04	1.0273E+00
9	84	2.6804E-06	- 4.7109E-04	1.0300E+00
10	85	2.7406E-06	- 4.9474E-04	1.0328E+00

Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

See HRCondImpact.xls

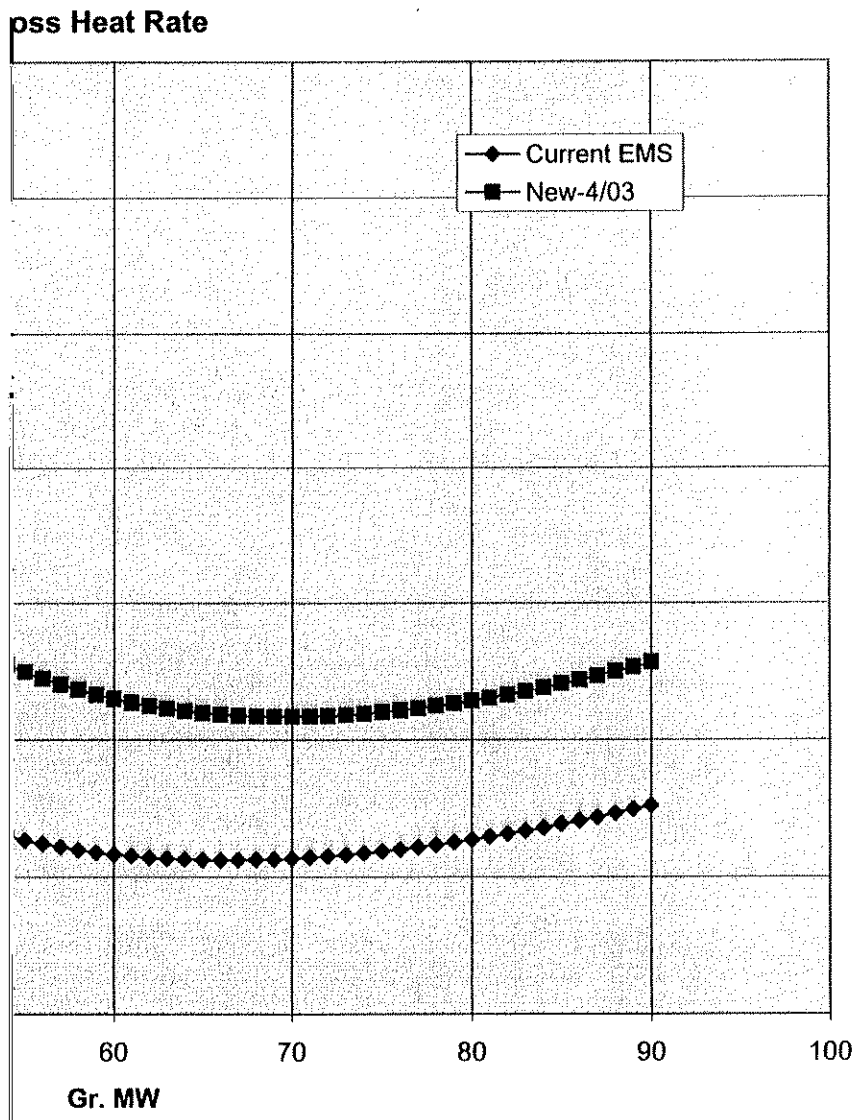
Auxiliary Calculator-First Ordered Curve-Hourly

Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10	
H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	Now based upon ODPM	Adusted H8/9 to 27 MW on 6/7 fr
H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000		
K1	50	0.01404	1.90539	0.01939	2.2437	0.372222	8,933	Last EMS 9/02	
K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K4	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K5	80	0.01397	3.86311	0.02901	3.14307	0.416667	10,000	Previously 90 MW	
K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW	
W10			0.1		0.1	0.025	600		
W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW	
W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW	
W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W7	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W8	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W9			0.1		0.1	0.041667	1,000		
H5						0.0625	1,500		
H7						0.083333	2,000		


100
90

R Curve Plot

2/24/2005



NHR Plot

59.386811	87.84728
8.3384192	7.833765
0.0106093	0.01518

GHR Plot

55.98256	82.00937
7.734096	7.274936
0.012756	0.016958

Net MW

	Current EMS	New-4/03	
30	10,636	11,217	-
31	10,583	11,138	-
32	10,534	11,065	-
33	10,488	10,997	-
34	10,446	10,934	-
35	10,407	10,875	-
36	10,370	10,820	-
37	10,336	10,770	-
38	10,304	10,722	-
39	[illegible]	[illegible]	-
40	10,247	10,637	-
41	10,222	10,599	-
42	10,198	10,563	-
43	10,176	10,529	-
44	10,155	10,498	-
45	10,136	10,469	-
46	10,117	10,442	-
47	10,101	10,416	-
48	10,085	10,393	-
49	10,070	10,370	-
50	10,057	10,350	-
51	10,044	10,330	-
52	10,032	10,312	-
53	10,021	10,296	-
54	10,011	10,280	-
55	10,002	10,266	-
56	9,993	10,253	-
57	9,985	10,240	-
58	9,978	10,229	-
59	9,971	10,218	-
60	9,965	10,209	-
61	9,959	10,200	-
62	9,954	10,192	-
63	9,949	10,184	-
64	9,945	10,178	-
65	9,942	10,172	-
66	9,938	10,167	-
67	9,936	10,162	-
68	9,933	10,158	-
69	9,931	10,154	-
70	9,929	10,151	-
71	9,928	10,149	-
72	9,927	10,147	-
73	9,926	10,145	-
74	9,926	10,144	-
75	9,926	10,144	-
76	9,926	10,143	-
77	9,927	10,143	-
78	9,927	10,144	-
79	9,928	10,145	-
80	9,929	10,146	-

Gr. MW

	Current EM	New-4/03	
30	9,983	10,517	-
31	9,935	10,446	-
32	9,892	10,380	-
33	9,851	10,320	-
34	9,814	10,264	-
35	9,780	10,212	-
36	9,748	10,163	-
37	9,719	10,119	-
38	9,692	10,077	-
39	[illegible]	[illegible]	-
40	9,644	10,003	-
41	9,623	9,970	-
42	9,603	9,940	-
43	9,585	9,911	-
44	9,568	9,885	-
45	9,552	9,860	-
46	9,538	9,838	-
47	9,525	9,817	-
48	9,513	9,797	-
49	9,502	9,780	-
50	9,492	9,763	-
51	9,482	9,748	-
52	9,474	9,734	-
53	[illegible]	[illegible]	-
54	9,460	9,709	-
55	9,454	9,699	-
56	9,448	9,689	-
57	9,443	9,680	-
58	9,439	9,672	-
59	9,436	9,665	-
60	9,433	9,659	-
61	9,430	9,654	-
62	9,428	9,649	-
63	9,426	9,645	-
64	9,425	9,642	-
65	9,425	9,639	-
66	9,424	9,637	-
67	9,424	9,635	-
68	9,425	9,634	-
69	9,426	9,634	-
70	9,427	9,634	-
71	9,428	9,634	-
72	9,430	9,635	-
73	9,432	9,636	-
74	9,435	9,638	-
75	9,437	9,640	-
76	9,440	9,643	-
77	9,443	9,646	-
78	9,447	9,649	-
79	9,450	9,653	-
80	9,454	9,657	-

2/24/2005

OPNHR Var-Corr. Using Act. Net KWH

	PI NEW	Report1	EMS	PI NEW
2	10,369	(118)	11	279
3	9,716	(93)	27	282
9	10,286	(141)	(15)	252
2	10,273	(152)	(24)	217
1	10,221	(345)	(222)	25
5	10,313	(568)	(438)	(161)
7	10,407	(431)	(303)	(23)
2	10,185	(414)	(289)	(16)
9	10,507	(506)	(376)	(68)
3	10,271	(567)	(439)	(156)
!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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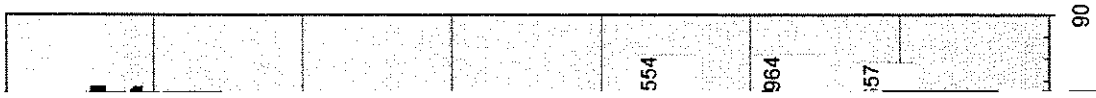
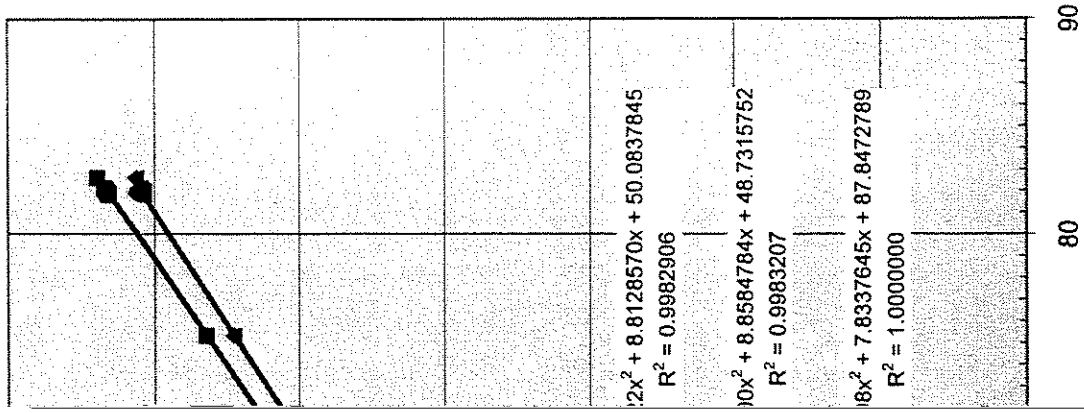
!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
		(333)	(207)	63

2/24/2005




2x² + 8.8128570x + 50.0837845
R² = 0.9982906
0x² + 8.8584784x + 48.7315752
R² = 0.9983207
8x² + 7.8337645x + 87.8472789
R² = 1.0000000
80
90

ck

	GHR	NHR
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7	9,374	9,940
3	9,374	9,940
9	9,374	9,940
5	9,374	9,940
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6	9,375	9,941
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7	9,375	9,941
3	9,375	9,941
9	9,375	9,941
5	9,375	9,941
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9	9,375	9,941
5	9,375	9,941
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65	9,375	9,941
91	9,375	9,941
17	9,375	9,941
43	9,375	9,941
69	9,375	9,941
95	9,375	9,941
21	9,376	9,941
47	9,375	9,942
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25	9,375	9,942
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306	9,376	9,943
232	9,376	9,943
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901	9,377	9,943
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714	9,377	9,943
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5459	9,378	9,945
5385	9,378	9,945
5311	9,378	9,945
5237	9,378	9,945
5163	9,378	9,945

9,377 9,943

Number	Date-Time	K1GrMW	Use Calc K1NtMW	K1MBluperHr	PI Data EMS Gr I/O	EMS Net I/O	Gross I/O-CWIT Corr.	Net I/O-CWIT Corr.	Checks CWIT	Manually Adjust Act. Aux M	Target Aux	Diff.	Opacity	Outliers
				82.0093657		87.8472769								
				7.2749364		7.8337645								
				0.0169581		0.0151798	Adjusted-Mbtu/Hr							
1	4/28/03 8:00 AM	52.94727	49.76575	500.1400757	514.737913	515.2951633	500.7429133	500.7429133	77.67593	3.181519	3.298262	-0.11674	2.04	
2	4/28/03 8:15 AM	54.21523	50.97779	533.0026245	526.266535	526.6435468	533.588024	533.588024	77.7426	3.237444	3.322284	-0.08482	4.36	
3	4/28/03 8:30 AM	54.97168	51.75809	536.770874	533.170277	533.9731046	537.3079887	537.3079887	77.80927	3.213593	3.336584	-0.12299	4.68	
4	4/28/03 8:45 AM	57.17188	53.89597	556.2705688	553.360761	554.149513	556.7652673	556.7652673	77.87595	3.275907	3.378234	-0.10233	6.16	
5	4/28/03 9:00 AM	57.55938	54.25685	558.7628784	556.933735	557.569063	559.2100786	559.2100786	77.94263	3.302524	3.385569	-0.08304	5.51	
6	4/28/03 9:15 AM	58.87337	55.54067	566.4899902	569.087423	569.7659247	566.8891976	566.8891976	78.00931	3.332703	3.410443	-0.07774	6.71	
7	4/28/03 9:30 AM	58.62402	55.33458	555.6574707	566.776601	567.8046404	556.0044491	556.0044491	78.07598	3.289441	3.405723	-0.11628	5.35	
8	4/28/03 9:45 AM	59.11831	55.73519	559.4537354	571.359395	571.618312	559.7553315	559.7553315	78.14266	3.383118	3.41508	-0.03196	3.87	
9	4/28/03 10:00 AM	59.18066	55.73616	558.5149536	571.938151	571.6275488	558.7701913	558.7701913	78.20934	3.444507	3.41626	0.028247	1.76	
10	4/28/03 10:15 AM	59.27246	55.89104	551.6513672	572.790364	573.1033108	551.8581852	551.8581852	78.27602	3.381421	3.417998	-0.03658	1.88	
11	4/28/03 10:30 AM	59.16211	55.79127	557.9890137	571.76593	572.1525802	558.1528692	558.1528692	78.34269	3.370841	3.415909	-0.04507	1.55	
12	4/28/03 10:45 AM	59.30859	55.93856	554.1193237	573.125888	573.5562177	554.2366072	554.2366072	78.40936	3.370036	3.418682	-0.04865	1.45	
13	4/28/03 11:00 AM	59.38379	56.01599	557.9946289	573.824262	574.2943926	558.0671891	558.0671891	78.47604	3.367799	3.420105	-0.05231	1.41	
14	4/28/03 11:15 AM	59.17969	55.80979	551.6712646	571.929087	572.3290893	551.6980789	551.6980789	78.54272	3.369893	3.416241	-0.04635	1.44	
15	4/28/03 11:30 AM	59.42285	56.04173	554.0687256	574.187159	574.539851	554.0505496	554.0505496	78.6094	3.381118	3.420845	-0.03973	1.49	
16	4/28/03 11:45 AM	60.70801	57.31437	565.3126831	586.154698	586.6992602	565.249498	565.249498	78.67607	3.393638	3.445173	-0.05154	1.50	
17	4/28/03 12:00 PM	60.46419	57.06227	571.9769287	583.879943	584.2866252	571.8667949	571.8667949	78.74275	3.401924	3.440557	-0.03863	1.47	
18	4/28/03 12:15 PM	60.92871	57.51535	573.8320923	588.21555	588.6239753	573.6765091	573.6765091	78.80943	3.413363	3.44935	-0.03599	1.51	
19	4/28/03 12:30 PM	61.45508	57.98385	573.0480347	593.137258	593.11555	572.8482869	572.8482869	78.87611	3.471225	3.459315	0.01191	1.55	
20	4/28/03 12:45 PM	61.36328	57.89433	575.0109863	592.27825	592.2567869	574.7646444	574.7646444	78.94278	3.46895	3.457577	0.011373	1.45	
21	4/28/03 1:00 PM	61.33447	57.91561	575.0739746	592.008727	592.4608378	574.7815547	574.7815547	79.00946	3.418868	3.457032	-0.03816	1.36	
22	4/28/03 1:15 PM	60.94434	57.51208	578.5195313	588.361514	588.5927208	578.1757707	578.1757707	79.07613	3.432251	3.449646	-0.0174	1.46	
23	4/28/03 1:30 PM	61.09961	57.63226	573.958252	589.812477	589.7442244	573.5702529	573.5702529	79.14281	3.467346	3.452586	0.014761	1.42	
24	4/28/03 1:45 PM	61.12012	57.69654	581.3284302	590.004175	590.3602435	580.887326	580.887326	79.20949	3.423581	3.452974	-0.02939	1.37	
25	4/28/03 2:00 PM	61.39453	58.07605	574.7006226	592.570647	594.000224	574.2185781	574.2185781	79.27616	3.318481	3.458168	-0.13969	1.44	
26	4/28/03 2:15 PM	61.32202	58.04958	574.6455078	591.892247	593.7461792	574.1155308	574.1155308	79.34284	3.272444	3.456796	-0.18435	1.39	
27	4/28/03 2:30 PM	61.30879	58.02406	573.6929321	591.768457	593.5013157	573.1693644	573.1693644	79.33495	3.284729	3.456545	-0.17182	1.37	
28	4/28/03 2:45 PM	60.67432	57.42238	572.8278809	585.840245	587.7334544	572.3227288	572.3227288	79.30436	3.25194	3.444535	-0.1926	1.35	
29	4/28/03 3:00 PM	60.97363	57.72782	573.3486328	588.635218	590.6600903	572.8668343	572.8668343	79.27377	3.245817	3.450201	-0.20438	1.47	
30	4/28/03 3:15 PM	60.72433	57.47944	572.7640991	586.307061	588.2800522	572.3031398	572.3031398	79.24318	3.244886	3.445482	-0.2006	1.43	
31	4/28/03 3:30 PM	60.63314	57.39351	571.7617188	585.455953	587.4570349	571.322912	571.322912	79.21259	3.239624	3.443755	-0.20413	1.47	
32	4/28/03 3:45 PM	60.38509	57.1522	567.0405273	583.142376	585.1470577	566.6257203	566.6257203	79.182	3.23289	3.43906	-0.20617	1.42	
33	4/28/03 4:00 PM	60.13428	56.90619	559.6748047	580.605125	582.7939077	559.285606	559.285606	79.15141	3.22809	3.434312	-0.20622	1.39	
34	4/28/03 4:15 PM	59.65332	56.43254	545.2025146	576.329192	578.2686204	544.842107	544.842107	79.12082	3.220776	3.425207	-0.20443	1.43	
35	4/28/03 4:30 PM	59.34277	55.13419	547.7644653	564.172656	565.8987578	547.4174918	547.4174918	79.09023	3.208585	3.400399	-0.19181	1.24	
36	4/28/03 4:45 PM	59.66943	56.41653	588.4084473	576.47902	578.1157166	588.0652116	588.0652116	79.05965	3.252905	3.425512	-0.17261	1.95	
37	4/28/03 5:00 PM	60.42285	57.09863	578.1115112	583.494451	584.6345233	577.7998373	577.7998373	79.02905	3.324219	3.439775	-0.11556	2.95	
38	4/28/03 5:15 PM	59.35449	56.02142	577.0164185	573.552157	574.3461987	576.7233237	576.7233237	78.99847	3.333069	3.419551	-0.08648	3.02	
39	4/28/03 5:30 PM	57.21724	53.97392	554.1973877	553.778783	554.8878027	553.9286982	553.9286982	78.96787	3.24332	3.379092	-0.13577	1.92	
40	4/28/03 5:45 PM	57.22266	53.97921	574.5514526	553.828702	554.9379304	574.2949505	574.2949505	78.93729	3.243445	3.379195	-0.13575	15.18	
41	4/28/03 6:00 PM	58.26223	55.05319	551.9573975	563.612435	565.1287781	551.7355557	551.7355557	78.9067	3.229034	3.399253	-0.17022	2.29	
42	4/28/03 6:15 PM	57.67285	54.44747	546.3149414	557.98101	559.3768402	546.1142863	546.1142863	78.87611	3.225384	3.387717	-0.16233	4.54	
43	4/28/03 6:30 PM	57.93913	54.72614	551.6193237	560.440213	562.021686	551.43847	551.43847	78.84552	3.212992	3.392756	-0.17977	3.79	
44	4/28/03 6:45 PM	58.70361	55.49561	551.6274414	567.513968	569.3369576	551.4693572	551.4693572	78.81493	3.208008	3.407229	-0.19922	1.35	
45	4/28/03 7:00 PM	60.05273	56.79791	567.3349609	580.045709	581.7588287	567.1964933	567.1964933	78.78434	3.254822	3.432768	-0.17795	1.34	
46	4/28/03 7:15 PM	62.89453	59.58756	594.6190796	606.644611	608.5407734	594.5007024	594.5007024	78.75375	3.30697	3.486563	-0.17959	1.58	
47	4/28/03 7:30 PM	63.76563	60.43786	597.1035767	614.852798	616.7509921	597.0071707	597.0071707	78.72316	3.327769	3.503053	-0.17528	1.69	
48	4/28/03 7:45 PM	63.59961	60.27996	597.036438	613.286473	615.2247431	596.9610417	596.9610417	78.69257	3.319648	3.499911	-0.18026	1.72	
49	4/28/03 8:00 PM	61.08626	57.80814	577.1576538	589.687717	591.4301953	577.1032518	577.1032518	78.66199	3.278122	3.452333	-0.17421	1.34	
50	4/28/03 8:15 PM	60.98242	57.72382	570.9709473	588.717335	590.621773	570.9379541	570.9379541	78.63139	3.258603	3.450367	-0.19176	1.43	
51	4/28/03 8:30 PM	59.50342	56.26082	561.0889893	574.935758	576.6295919	561.0765034	561.0765034	78.60081	3.2426	3.42237	-0.17977	1.29	
52	4/28/03 8:45 PM	59.2214	55.98714	555.6350098	572.316307	574.0192965	555.6433182	555.6433182	78.57021	3.234266	3.417031	-0.18277	1.28	
53	4/28/03 9:00 PM	56.43457	53.25674	519.6442871	546.576482	548.1021895	519.6714984	519.6714984	78.53963	3.177832	3.364276	-0.18644	1.19	
54	4/28/03 9:15 PM	56.32851	53.15553	527.9425049	545.602104	547.1458198	527.9906478	527.9906478	78.50904	3.172989	3.362269	-0.18928	1.27	
55	4/28/03 9:30 PM	55.51563	52.34497	516.4058838	538.14661	539.4980428	516.4734043	516.4734043	78.47845	3.170654	3.346881	-0.17623	1.22	
56	4/28/03 9:45 PM	54.09717	50.95993	507.4343567	525.190762	526.4760424	507.5215964	507.5215964	78.44786	3.137235	3.320029	-0.18279	1.18	
57	4/28/03 10:00 PM	49.41895	46.39185	471.2002258	482.944687	483.9400892	471.3041055	471.3041055	78.41727	3.0271	3.231471	-0.20437	1.16	
58	4/28/03 10:15 PM	48.17969	45.06549	459.2628343	471.878065	471.7083527	459.384816	459.384816	78.38668	3.114197	3.208011	-0.09381	1.28	
59	4/28/03 10:30 PM	47.25156	44.16441	447.6999817	463.624013	463.4289535	447.83289	447.83289	78.36676	3.087158	3.190442	-0.10328	1.29	
60	4/28/03 10:45 PM	43.43066	40.40024	420.395874	429.951436	429.1093838	420.5359093	420.5359093	78.34989	3.030426	3.118112	-0.08769	1.32	
61	4/28/03 11:00 PM	36.99219	34.06869	336.8309937	374.331013	372.3522041	336.9596064	336.9596064	78.33302	2.923497	2.566657	0.35684	1.38	
62	4/28/03 11:15 PM	32.7373	30.38456	322.3115234	338.345699	339.8870535	322.4493197	322.4493197	78.31615	2.352748	2.483176	-0.13043	1.72	
63	4/28/03 11:30 PM	32.6582	30.30993	318.5448608	337.682518	339.2336627	318.6907192	318.6907192	78.29929	2.348276	2.481624	-0.13335	1.92	
64	4/28/03 11:45 PM	32.66671	30.32432	320.5018616	337.753859	339.3597	320.6582286	320.6582286	78.28242	2.34239	2.481791	-0.1394	1.95	
65	4/29/03 12:00 AM	32.73457	30.39888	321.72229	338.322764	340.0124888	321.8887944	321.8887944	78.26555	2.335688	2.483122	-0.14743	1.91	
66	4/29/03 12:15 AM	32.70703	30.364	320.8757019	338.091864	339.7070484	321.0514488	321.0514488	78.24868	2.343033	2.482582	-0.13955	2.16	
67	4/29/03 12:30 AM	32.69238	30.2607	321.081665	337.969051	339.8027828	321.2671936	321.2671936	78.23181	2.431681	2.482295	-0.05061	2.07	
68	4/29/03 12:45 AM	35.86631	33.40488	358.6937256	364.749258	366.4722068	358.9040606	358.9040606	78.21494	2.461426	2.544567	-0.08314	1.84	
69	4/29/03 1:00 AM	33.15723	30.69812	328.1235962	341.869844	342.6341801	328.3317861	328.3317861	78.19807	2.459106	2.491415	-0.03231	1.94	
70	4/29/03 1:15 AM	33.02734	30.56326	326.6113892	340.779179	341.4523072	326.8286883	326.8286883	78.18121	2.464084	2.488866	-0.02478	2.23	
71	4/29/03 1:30 AM	33.20996	30.74259	325.0177002	342.312833	343.0240612	325.2431661	325.2431661	78.16434	2.467366	2.492449	-0.02508	2.19	
72	4/29/03 1:45 AM	33.10986	30.69962	327.288147	341.472054	342.6473675	327.5252245	327.5252245	78.14747	2.410239	2.490486	-0.08025	2.10	
73	4/29/03 2:00 AM	33.20508	30.79057	326.1774902	342.271812	343.4447442	326.423218	326.423218	78.1306	2.414503	2.492354	-0.07785	2.29	
74	4/29/03 2:15 AM	33.03833	30.62077	327.503418	340.671412	341.9561974	327.7604269	327.7604269	78.11373	2.417565	2.489082	-0.07152	2.38	
75	4/29/03 2:30 AM	33.18999	30.77771	324.4356079	342.145099	343.3319679	324.6994149	324.6994149	78.09686	2.412282	2.492058	-0.07978	2.30	
76	4/29/03 2:45 AM	33.37256	31.0321	324.5191345	343.679312	345.5634959	324.7920708	324.7920708	78.07999	2.340454	2.49564	-0.15519	2.34	
77	4/29/03 3:00 AM	33.11068	30.76729	326.958374	341.478877	343.2405397	327.2440136	327.2440136	78.06313	2.34339	2.490501	-0.14711	2.30	
78	4/29/03 3:15 AM	32.82031	30.42134	326.520813	339.041858	340.2091667	326.8168933	326.8168933	78.04626	2.398972	2.484805	-0.08563	2.32	
79	4/29/03 3:30 AM	33.42212	31.06712	331.056427	344.096	345.870845	331.3642078	331.3642078	78.02939	2.354995	2.496612	-0.14162	6.17	
80	4/29/03 3:45 AM	33.1814	30.7746	328.4645081	342.072869	343.3046474	328.7806041	328.7806041	78.01252	2.406799	2.491889	-0.08509	4.62	
81	4/29/03 4:00 AM	33.18248	30.82368	326.3751526	342.081938	343.7350784	326.6989537	326.6989537	77.99565	2.358792	2.49191	-0.13312	2.49	
82	4/29/03 4:15 AM	33.06641	30.70087	328.8046875	341.107138	342.658277	329.1411425	329.1411425	77.97878	2.365537	2.489633	-0.1241	2.23	
83	4/29/03 4:30 AM	33.33105	30.98006	324.1574707	343.330428	345.1067951	324.4976408	324.4976408	77.96191	2.350995	2.494825	-0.14383	2.32	
84	4/29/03 4:45 AM	33.08398	30.73142	325.2070618	341.254737	342.9260706	325.5590671	325.5590671	77.94505	2.352567	2.489978	-0.13741	2.28	
85	4/29/03 5:00 AM	32.85059	30.49424	324.1655579	339.295809	340.8476729	324.5271468	324.5271468	77.92817	2.356343	2.485398	-0.12906	2.44	
86	4/29/03 5:15 AM	33.07227	30.71149	325.1202698	341.156336	342.7514167	325.4915451	325.4915451	77.9113	2.360771	2.489748	-0.12898	2.40	
87	4/29/03 5:30 AM	33.34188	30.98657	326.1939087	343.421458	345.1639083	326.5747679	326.5747679	77.89443	2.355316	2.495038	-0.13972	2.51	
88	4/29/03 5:45 AM	36.14453	33.75888	347.4555664	367.113054	369.60626	347.8567306	347.8567306	77.87756	2.385648	2.550026	-0.16438	2.18	
89	4/29/03 6:00 AM	39.06348	36.61434	387.649292	392.070974	395.0255922	388.0909334	388.0909334	77.86069	2.449137	3.035442	-0.5863	3.82	
90	4/29/03 6:15 AM	50.99414	48.40132	497.6271362	497.086379	502.5733308	498.1219351	498.1219351	77.84998	2.592823	3.261289	-0.66847	6.42	
91	4/29/03 6:30 AM	64.67578	61.35161	621.5866089	623.456559	625.6003216	622.0848129	622.0848129	77.86842	3.323975	3.520283	-0.19631	5.94	
92	4/29/03 6:45 AM	78.91553	75.32029	744.8008423	761.724097	764.0058974	745.2902779	745.2902779	77.92686	3.595239	3.789841	-0.1946	9.15	
93	4/29/03 7:00 AM	86.39648	82.62612	812.2242432	837.119531	838.7545337	812.6971646	812.6971646	77.96531	3.77036	3.931455	-0.1611	7.21	
94	4/29/03 7:15 AM	85.9189	82.16223	809.2996826	832.249561	833.9601307	809.7414611	809.7414611	78.00375	3.756685	3.922415	-0.16575	5.63	
95	4/29/03 7:30 AM	85.91752	82.11015	810.6575928	832.235491	833.4222222	811.0698097	811.0698097	78.0422	3.80737	3.922389	-0.11502	4.43	
96	4/29/03 7:45 AM	85.82896	82.0706	810.6292114	831.333349	833.0137914	811.0113729	811.0113729	78.08064	3.758369	3.920712	-0.16234	4.16	
97	4/29/03 8:00 AM	85.88937	82.07744	808.6555786	831.948739	833.0844498	809.0063996	809.0063996	78.11909	3.811935	3.921856	-0.10992	4.47	
98	4/29/03 8:15 AM	85.85547	82.04578	809.3988037	831.603335	832.7575359	809.7197831	809.7197831	78.15753	3.809692	3.921214	-0.11152	4.46	
99	4/29/03 8:30 AM	85.68334	81.87041	811.2015991	829.850411	830.9474567	811.4934204	811.4934204	78.19598	3.812927	3.917956	-0.10503	4.08	
100	4/29/03 8:45 AM	85.71875	81.90336	810.9777832	830.210921	831.2874668	811.2390997	811.2390997	78.23442	3.815388	3.918626	-0.10324	4.13	
101	4/29/03 9:00 AM	85.70321	81.93734	808.5914307	830.052683	831.6381455	808.8217758	808.8217758	78.27287	3.765869	3.918332	-0.15246	4.14	
102	4/29/03 9:15 AM	85.77111	81.96961	808.1398315	830.744113	831.9711939	808.3396717	808.3396717	78.31131	3.801504	3.919617	-0.11811	3.66	
103	4/29/03 9:30 AM	85.82564	82.05607	810.0726318	831.299467	832.8638263	810.2425481	810.2425481	78.34975	3.769567	3.920649	-0.15108	3.79	
104	4/29/03 9:45 AM	85.75	81.93666	810.7694092	830.529131	831.6311052	810.9093244	810.9093244	78.3882	3.813342	3.919218	-0.10588	3.73	
105	4/29/03 10:00 AM	85.67638	81.86545	810.3214111	829.779573	830.8962456	810.4310992	810.4310992	78.42664	3.810932	3.917824	-0.10689	3.61	
106	4/29/03 10:15 AM	85.69782	81.8832	812.3488159	829.997842	831.079433	812.4283659	812.4283659	78.46509	3.814619	3.91823	-0.10361	3.51	
107	4/29/03 10:30 AM	85.84694	82.0333	808.9833984	831.516446	832.6287185	809.0321242	809.0321242	78.50353	3.81364	3.921053	-0.10741	3.66	
108	4/29/03 10:45 AM	85.70508	81.92822	810.4241943	830.071715	831.5440457	810.4429529	810.4429529	78.54198	3.776855	3.918367	-0.14151	3.39	
109	4/29/03 11:00 AM	85.69092	81.9265	810.1983032	829.927543	831.526262	810.186794	810.186794	78.58042	3.764416	3.918099	-0.15368	3.24	
110	4/29/03 11:15 AM	85.82015	82.01006	810.1390991	831.243593	832.3888047	810.0971376	810.0971376	78.61887	3.810091	3.920545	-0.11045	3.33	
111	4/29/03 11:30 AM	85.82129	82.06104	810.7567749	831.255172	832.9151375	810.684494	810.684494	78.65731	3.760248	3.920567	-0.16032	3.47	
112	4/29/03 11:45 AM	85.72244	81.95664	808.7694092	830.24852	831.8373087	808.6672052	808.6672052	78.69576	3.765807	3.918696	-0.15289	3.06	
113	4/29/03 12:00 PM	85.64989	81.82928	807.2124023	829.509826	830.5229596	807.0803053	807.0803053	78.7342	3.820611	3.917322	-0.09671	3.20	
114	4/29/03 12:15 PM	85.79813	82.03522	810.7954712	831.01933	832.648573	810.6323589	810.6323589	78.77264	3.762911	3.920129	-0.15722	3.31	
115	4/29/03 12:30 PM	85.74084	81.93112	808.7680664	830.435824	831.5739536	808.5751999	808.5751999	78.81109	3.809717	3.919044	-0.10933	3.08	
116	4/29/03 12:45 PM	85.71094	81.93398	810.46875	830.131374	831.6034705	810.2452236	810.2452236	78.84953	3.776957	3.918478	-0.14152	3.20	
117	4/29/03 1:00 PM	85.74137	81.96317	811.9320068	830.441263	831.9047884	811.6777322	811.6777322	78.88798	3.778198	3.919054	-0.14086	3.45	
118	4/29/03 1:15 PM	85.64795	81.83158	809.5488892	829.490099	830.5467579	809.265163	809.265163	78.92642	3.816367	3.917286	-0.10092	3.30	
119	4/29/03 1:30 PM	85.77898	82.01096	807.347168	830.824064	832.3980445	807.0340167	807.0340167	78.96487	3.768005	3.919766	-0.15176	3.33	
120	4/29/03 1:45 PM	85.71549	81.95492	808.3255005	830.17775	831.8196466	807.9815781	807.9815781	79.00331	3.760568	3.918564	-0.158	3.29	
121	4/29/03 2:00 PM	85.80302	81.99506	809.2440796	831.069061	832.2339709	808.8669502	808.8669502	79.04175	3.807954	3.920221	-0.11227	3.50	

Gr. MW

Aux MW-Below 50 MW		Aux MW-Above 50 MW			
32.6582	2.348276	43.43066	3.030426	32.6582	2.348276
32.66671	2.34239	47.25156	3.087158	32.66671	2.34239
32.69238	2.431681	48.17969	3.114197	32.69238	2.431681
32.70703	2.343033	49.41895	3.0271	32.70703	2.343033
32.73457	2.335688	50.99414	2.592823	32.73457	2.335688
32.7373	2.352748	52.94727	3.181519	32.7373	2.352748
32.82031	2.398972	54.09717	3.137235	32.82031	2.398972
32.85059	2.356343	54.21523	3.237444	32.85059	2.356343
33.02734	2.464084	54.97168	3.213593	33.02734	2.464084
33.03833	2.417565	55.51563	3.170654	33.03833	2.417565
33.06641	2.365537	56.32851	3.172989	33.06641	2.365537
33.07227	2.360771	56.43457	3.177832	33.07227	2.360771
33.08398	2.352567	57.17188	3.275907	33.08398	2.352567
33.10986	2.410239	57.21724	3.24332	33.10986	2.410239
33.11068	2.34339	57.22266	3.243445	33.11068	2.34339
33.15723	2.459106	57.55938	3.302524	33.15723	2.459106
33.1814	2.406799	57.67285	3.225384	33.1814	2.406799
33.18248	2.358792	57.93913	3.212992	33.18248	2.358792
33.18999	2.412282	58.28223	3.229034	33.18999	2.412282
33.20508	2.414503	58.34277	3.208585	33.20508	2.414503
33.20996	2.467366	58.62402	3.289441	33.20996	2.467366
33.33105	2.350995	58.70361	3.208008	33.33105	2.350995
33.34188	2.355316	58.87337	3.332703	33.34188	2.355316
33.37256	2.340454	59.11831	3.383118	33.37256	2.340454
33.42212	2.354995	59.16211	3.370841	33.42212	2.354995
35.86631	2.461426	59.17969	3.369893	35.86631	2.461426
36.14453	2.385648	59.18066	3.444507	36.14453	2.385648
39.06348	2.449137	59.2214	3.234266	36.99219	2.923497
		59.27246	3.381421	39.06348	2.449137
		59.30859	3.370036	43.43066	3.030426
		59.35449	3.333069	47.25156	3.087158
		59.38379	3.367799	48.17969	3.114197
		59.42285	3.381118	49.41895	3.0271
		59.50342	3.2426	50.99414	2.592823
		59.65332	3.220776	52.94727	3.181519
		59.66943	3.252905	54.09717	3.137235
		60.05273	3.254822	54.21523	3.237444
		60.13428	3.22809	54.97168	3.213593
		60.38509	3.23289	55.51563	3.170654
		60.42285	3.324219	56.32851	3.172989
		60.46419	3.401924	56.43457	3.177832
		60.63314	3.239624	57.17188	3.275907
		60.67432	3.25194	57.21724	3.24332
		60.70801	3.393636	57.22266	3.243445
		60.72433	3.244886	57.55938	3.302524
		60.92871	3.413363	57.67285	3.225384
		60.94434	3.432251	57.93913	3.212992
		60.97363	3.245817	58.28223	3.229034
		60.98242	3.258603	58.34277	3.208585
		61.08626	3.278122	58.62402	3.289441
		61.09961	3.467346	58.70361	3.208008
		61.12012	3.423581	58.87337	3.332703
		61.30879	3.284729	59.11831	3.383118
		61.32202	3.272444	59.16211	3.370841
		61.33447	3.418868	59.17969	3.369893
		61.36328	3.46895	59.18066	3.444507
		61.39453	3.318481	59.2214	3.234266
		61.45508	3.471225	59.27246	3.381421
		62.89453	3.30697	59.30859	3.370036
		63.59961	3.319648	59.35449	3.333069
		63.76563	3.327769	59.38379	3.367799
		64.67578	3.323975	59.42285	3.381118
		78.91553	3.595239	59.50342	3.2426
		85.64795	3.816367	59.65332	3.220776
		85.64989	3.820611	59.66943	3.252905
		85.67638	3.810932	60.05273	3.254822
		85.68334	3.812927	60.13428	3.22809
		85.69092	3.764418	60.38509	3.23289
		85.69782	3.814619	60.42285	3.324219
		85.70321	3.765869	60.46419	3.401924
		85.70508	3.776855	60.63314	3.239624
		85.71094	3.776957	60.67432	3.25194
		85.71549	3.760568	60.70801	3.393636
		85.71875	3.815388	60.72433	3.244886
		85.72244	3.765807	60.92871	3.413363
		85.74084	3.809717	60.94434	3.432251
		85.74137	3.778198	60.97363	3.245817
		85.75	3.813342	60.98242	3.258603
		85.77111	3.801504	61.08626	3.278122
		85.77896	3.768005	61.09961	3.467346
		85.79813	3.762911	61.12012	3.423581
		85.80302	3.807954	61.30879	3.284729
		85.82015	3.810091	61.32202	3.272444
		85.82129	3.760248	61.33447	3.418868
		85.82564	3.769567	61.36328	3.46895
		85.82896	3.758369	61.39453	3.318481
		85.84694	3.81364	61.45508	3.471225
		85.85547	3.809692	62.89453	3.30697
		85.88937	3.811935	63.59961	3.319648
		85.91752	3.80737	63.76563	3.327769
		85.9189	3.756665	64.67578	3.323975
		86.39648	3.77036	78.91553	3.595239
				85.64795	3.816367
				85.64989	3.820611
				85.67638	3.810932
				85.68334	3.812927
				85.69092	3.764418
				85.69782	3.814619
				85.70321	3.765869
				85.70508	3.776855
				85.71549	3.760568
				85.71875	3.815388
				85.72244	3.765807
				85.74084	3.809717
				85.74137	3.778198
				85.75	3.813342
				85.77111	3.801504
				85.77896	3.768005
				85.79813	3.762911
				85.80302	3.807954
				85.82015	3.810091
				85.82129	3.760248
				85.82564	3.769567
				85.82896	3.758369
				85.84694	3.81364
				85.85547	3.809692
				85.88937	3.811935
				85.91752	3.80737
				85.9189	3.756665
				86.39648	3.77036

Operational Aux MW Monitoring

	Target Aux MW-EMS		
30	2.42947	32.36241	2.544339
31	2.44909	32.78467	2.512051
32	2.46871	32.86011	2.533173
33	2.48833	33.06641	2.515592
34	2.50795	33.13135	2.479434
35	2.52757	33.14258	2.474174
36	2.54719	33.14941	2.532511
37	2.56681	33.15088	2.474381
38	2.58643	33.18018	2.467274
39	3.03424	33.18066	2.471827
40	3.05317	33.18066	2.501548
41	3.0721	33.18978	2.463487
42	3.09103	33.19678	2.467053
43	3.10996	33.20508	2.457294
44	3.12889	33.23482	2.482779
45	3.14782	33.24062	2.514523
46	3.16675	33.2468	2.461752
47	3.18568	33.24707	2.478257
48	3.20461	33.24837	2.461145
49	3.22354	33.27419	2.567057
50	3.24247	33.29482	2.568172
51	3.2514	33.30506	2.482025
52	3.28033	33.31348	2.498438
53	3.29926	33.32031	2.464403
54	3.31819	33.32882	2.465932
55	3.33712	33.36621	2.46546
56	3.35605	33.36895	2.470567
57	3.37498	33.39063	2.472099
58	3.39391	33.42318	2.463917
59	3.41284	33.43633	2.470877
60	3.43177	33.45117	2.592957
61	3.4507	33.45117	2.467473
62	3.46963	33.4911	2.575835
63	3.48856	33.5166	2.46511
64	3.50749	33.78711	2.477713
65	3.52642	34.49094	2.518066
66	3.54535	35.17383	2.497538
67	3.56428	36.2832	2.602921
68	3.58321	37.02246	3.049133
69	3.60214	37.22051	2.575562
70	3.62107	37.69304	2.536209
71	3.64	38.23047	2.625395
72	3.65893	38.31836	3.152151
73	3.67786	39.69336	3.172028
74	3.69679	39.70371	3.164969
75	3.71572	41.31445	3.162305
76	3.73465	42.24902	3.206665
77	3.75358	42.45508	3.18634
78	3.77251	43.32593	3.235413
79	3.79144	43.47021	3.305969
80	3.81037	44.78125	3.280945
81	3.8293	46.54492	3.149503
82	3.84823	46.80762	3.239624
83	3.86716	46.92773	3.157166
84	3.88609	48.42773	3.172638
85	3.90502	48.69857	3.141144
		48.77197	3.274436
		48.85645	3.273367
		49.20898	3.200785
		51.34375	3.217987
		51.37532	3.227463
		51.43359	3.233543
		51.72949	3.299737
		54.514	3.2229
		56.86255	3.384027
		57.18213	3.407823
		58.37915	3.33124
		58.4023	3.361287
		58.466	3.333569
		58.74414	3.335541
		58.87344	3.348437
		58.98291	3.368578
		59.32422	3.347356
		59.49902	3.353729
		59.59546	3.36685
		59.79144	3.353746
		60.22339	3.36956
		60.25918	3.375798
		60.37246	3.379665
		60.50312	3.354106
		60.52344	3.374756
		60.62207	3.375525
		60.89941	3.400107
		60.97461	3.387104
		61.2793	3.393595
		61.42383	3.44104
		61.53613	3.469487
		61.5982	3.398941
		61.75032	3.407846
		61.83984	3.393346
		62.02441	3.416122
		62.03418	3.414594
		62.26367	3.40802
		62.88086	3.447828
		63.58496	3.518856
		63.96614	3.527787
		64.67513	3.569092
		64.9836	3.554932
		65.27344	3.496059
		65.5166	3.464838
		68.51591	3.521682
		68.86206	3.642528
		69.40977	3.556943
		69.49498	3.5518
		70.77344	3.740849
		71.99727	3.64864
		73.22949	3.602552
		74.8138	3.658325
		77.3647	3.881207
		78.55078	3.889903
		79.16037	3.883487
		80.33659	3.742676
		81.33398	3.917928
		81.65234	3.939891
		81.71289	3.930173
		82.6046	3.956588
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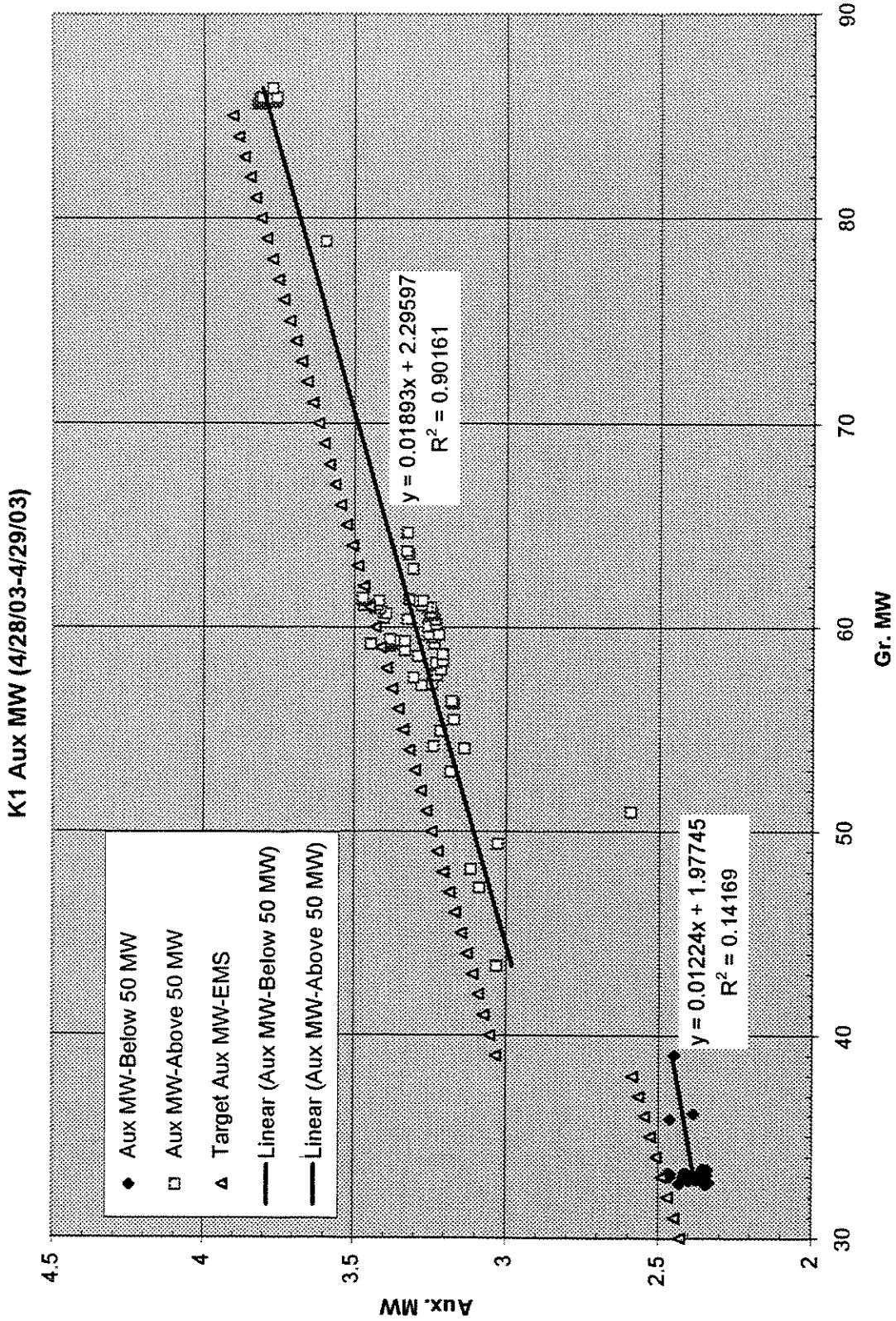
		84.89584	3.977679
		85.25003	4.002587


K1 Aux MW (4/28/03-4/29/03)
Aux MW-Below 50 MW
Aux MW-Above 50 MW
Target Aux MW-EMS
Linear (Aux MW-Below 50 MW)
Linear (Aux MW-Above 50 MW)
y = 0.01893x + 2.29597
R² = 0.90161
y = 0.01224x + 1.97745
R² = 0.14169
Aux. MW
Gr. MW
4.5
4
3.5
3
2.5
2
30
40
50
60
70
80
90

Condenser Adjustment

Small Reheat Unit, HR Adjustment from 75 Degr. F

Temp. Rise	Coefficients x2	x	constant
1	76 2.1476E-07	- 4.0812E-05	1.0027E+00
2	77 4.4654E-07	- 8.4556E-05	1.0055E+00
3	78 6.4158E-07	- 1.2225E-04	1.0083E+00
4	79 8.5921E-07	- 1.6336E-04	1.0112E+00
5	80 1.1974E-06	- 2.2083E-04	1.0147E+00
6	81 1.7181E-06	- 3.0262E-04	1.0190E+00
7	82 2.2406E-06	- 3.8429E-04	1.0234E+00
8	83 2.6258E-06	- 4.4887E-04	1.0273E+00
9	84 2.6804E-06	- 4.7109E-04	1.0300E+00
10	85 2.7406E-06	- 4.9474E-04	1.0328E+00

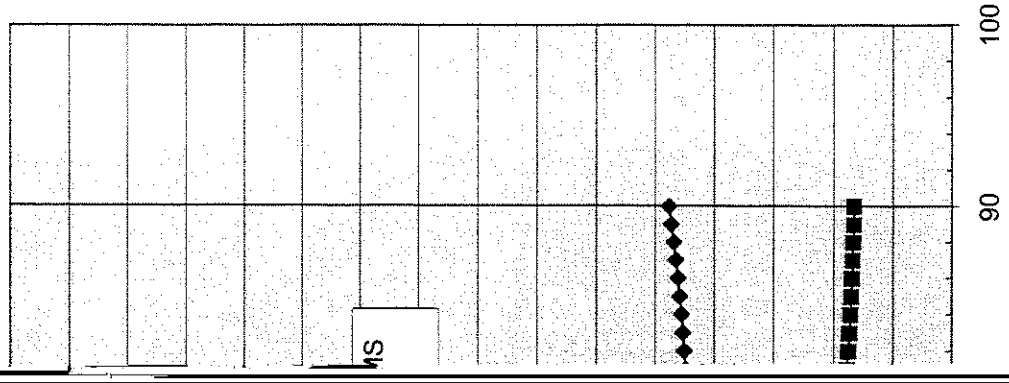
Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

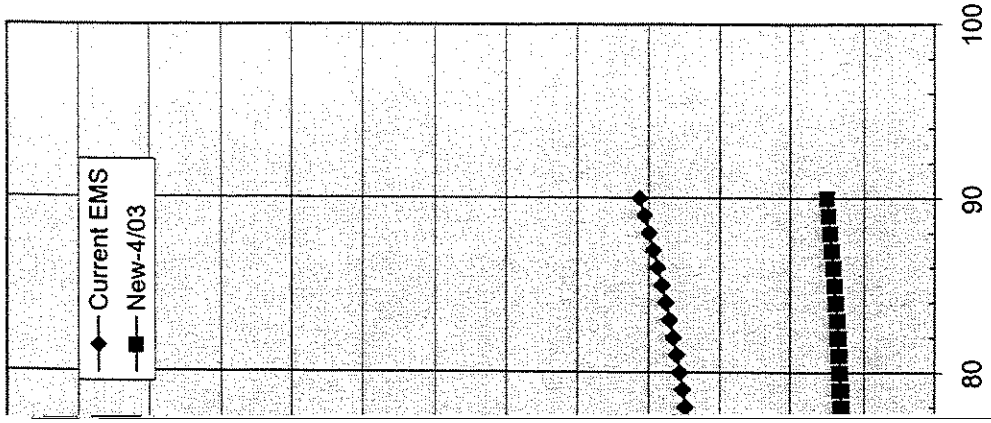
See HRCondImpact.xls

Auxiliary Calculator-First Ordered Curve-Hourly

Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10	
H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	Now based upon ODPM	Adusted H8/9 to 27 MW on 6/7 fro
H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000		
K1	39	0.01962	1.84087	0.01893	2.29597	0.372222	8,933	Last EMS 4/03	
K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K4	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K5	80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10,000	Previously 90 MW	
K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW	
W10			0.1		0.1	0.025	600		
W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW	
W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW	
W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W7	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W8	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W9			0.1		0.1	0.041667	1,000		
H5						0.0625	1,500		
H7						0.083333	2,000		

0.01962x + 1.84087 0.01893x + 2.29597


100
90
SW


Current EMS
New-4/03
100
90
80

(1PIABCCalc0403a.xls

Curve Plot Data

NHR Plot

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7.8337645	8.812857
0.0151798	0.005502

GHR Plot

82.00937	44.90706
7.274936	8.221735
0.016958	0.008088

Net MW

	Current EMS	New-4/03	
30	11,217	10,647	-
31	11,138	10,599	-
32	11,065	10,554	-
33	10,997	10,512	-
34	10,934	10,473	-
35	10,875	10,436	-
36	10,820	10,402	-
37	10,770	10,370	-
38	10,722	10,340	-
39	10,678	10,312	-
40	10,637	10,285	-
41	10,599	10,260	-
42	10,563	10,236	-
43	10,529	10,214	-
44	10,498	10,193	-
45	10,469	10,173	-
46	10,442	10,155	-
47	10,416	10,137	-
48	10,393	10,120	-
49	10,370	10,105	-
50	10,350	10,090	-
51	10,330	10,076	-
52	10,312	10,062	-
53	10,296	10,049	-
54	10,280	10,037	-
55	10,266	10,026	-
56	10,253	10,015	-
57	10,240	10,005	-
58	10,229	9,995	-
59	10,218	9,986	-
60	10,209	9,978	-
61	10,200	9,970	-
62	10,192	9,962	-
63	10,184	9,954	-
64	10,178	9,948	-
65	10,172	9,941	-
66	10,167	9,935	-
67	10,162	9,929	-
68	10,158	9,924	-
69	10,154	9,918	-
70	10,151	9,913	-
71	10,149	9,909	-
72	10,147	9,905	-
73	10,145	9,901	-
74	10,144	9,897	-
75	10,144	9,893	-
76	10,143	9,890	-
77	10,143	9,887	-
78	10,144	9,884	-
79	10,145	9,882	-
80	10,146	9,879	-
81	10,148	9,877	-
82	10,150	9,875	-
83	10,152	9,873	-
84	10,155	9,871	-
85	10,158	9,870	-
86	10,161	9,868	-
87	10,164	9,867	-
88	10,168	9,866	-
89	10,172	9,865	-
90	10,176	9,865	-

Gr. MW

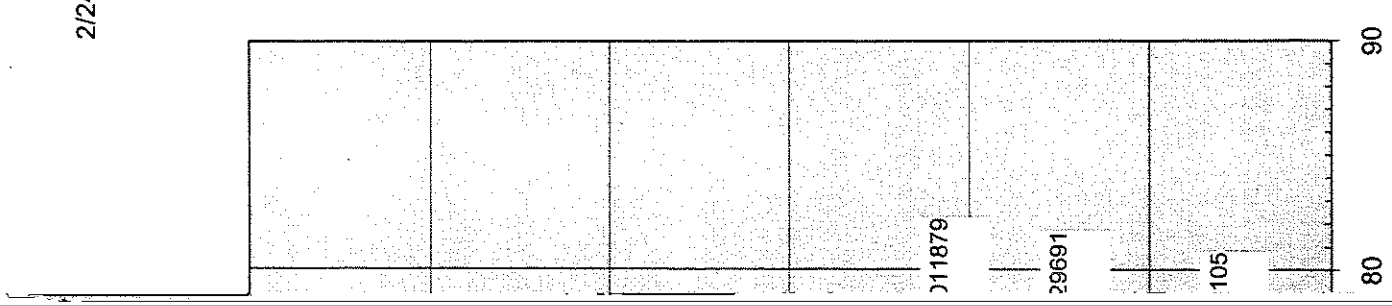
	Current EM	New-4/03	
30	10,517	9,961	-
31	10,446	9,921	-
32	10,380	9,884	-
33	10,320	9,849	-
34	10,264	9,818	-
35	10,212	9,788	-
36	10,163	9,760	-
37	10,119	9,735	-
38	10,077	9,711	-
39	10,039	9,689	-
40	10,003	9,668	-
41	9,970	9,649	-
42	9,940	9,631	-
43	9,911	9,614	-
44	9,885	9,598	-
45	9,860	9,584	-
46	9,838	9,570	-
47	9,817	9,557	-
48	9,797	9,546	-
49	9,780	9,535	-
50	9,763	9,524	-
51	9,748	9,515	-
52	9,734	9,506	-
53	9,721	9,498	-
54	9,709	9,490	-
55	9,699	9,483	-
56	9,689	9,477	-
57	9,680	9,471	-
58	9,672	9,465	-
59	9,665	9,460	-
60	9,659	9,455	-
61	9,654	9,451	-
62	9,649	9,448	-
63	9,645	9,444	-
64	9,642	9,441	-
65	9,639	9,438	-
66	9,637	9,436	-
67	9,635	9,434	-
68	9,634	9,432	-
69	9,634	9,431	-
70	9,634	9,429	-
71	9,634	9,428	-
72	9,635	9,428	-
73	9,636	9,427	-
74	9,638	9,427	-
75	9,640	9,427	-
76	9,643	9,427	-
77	9,646	9,428	-
78	9,649	9,428	-
79	9,653	9,429	-
80	9,657	9,430	-
81	9,661	9,431	-
82	9,666	9,433	-
83	9,671	9,434	-
84	9,676	9,436	-
85	9,681	9,438	-
86	9,687	9,439	-
87	9,693	9,442	-
88	9,699	9,444	-
89	9,706	9,446	-
90	9,712	9,449	-

-WH	OPNHR Rpt1 ABC	EMS	PI NEW	OPNHR Var Rpt1 ABC	EMS	PI NEW	Mbtus Report1	EMS	PI NEW	Mbtu Difference from Actual Report1	EMS	PI NEW	Corr. OpNHR Report1	EMS	PI NEW	OPNHR Var-Corr. Using Act. Net KWH Report1	EMS	PI NEW
32,136	9,961	10,332	10,062	86	(285)	(15)	13,230	13,757	13,404	(99)	427	74	9,972	10,369	10,103	(75)	322	56
89,650	9,977	10,349	10,079	(497)	(869)	(599)	12,824	13,339	12,998	(187)	327	(13)	9,343	9,718	9,470	(137)	238	(10)
88,198	9,970	10,341	10,076	43	(328)	(66)	12,807	13,315	12,983	(155)	354	21	9,893	10,286	10,029	(119)	273	17
25,185	9,879	10,244	9,992	186	(179)	74	15,060	15,622	15,239	(245)	317	(66)	9,904	10,273	10,022	(161)	208	(44)
99,922	9,908	10,278	10,036	286	(83)	159	13,867	14,388	14,049	(483)	38	(302)	9,851	10,221	9,980	(343)	27	(214)
38,091	9,998	10,371	10,090	471	98	380	12,624	13,141	12,795	(717)	(200)	(546)	9,906	10,313	10,040	(563)	(157)	(429)
33,155	10,004	10,380	10,108	425	49	321	12,291	12,793	12,464	(528)	(27)	(355)	9,999	10,407	10,140	(430)	(22)	(289)
84,980	10,001	10,376	10,105	184	(191)	80	12,306	12,807	12,480	(501)	(0)	(327)	9,787	10,185	9,925	(398)	(0)	(260)
08,227	10,089	10,481	10,169	543	151	444	11,123	11,607	11,291	(822)	(138)	(454)	10,069	10,507	10,221	(563)	(125)	(411)
07,183	10,026	10,405	10,124	406	26	307	12,051	12,553	12,222	(702)	(200)	(531)	9,858	10,268	9,997	(574)	(163)	(434)
96,940	9,962	10,330	10,071	289	(78)	160	12,885	13,392	13,062	(329)	178	(152)	9,997	10,390	10,134	(255)	138	(118)
31,286	9,985	10,363	10,098	372	(6)	260	12,561	13,066	12,736	(596)	(91)	(421)	9,888	10,285	10,026	(469)	(72)	(331)
56,210	10,244	10,670	10,319	395	(31)	319	9,815	10,297	9,971	(595)	(113)	(439)	10,031	10,523	10,190	(608)	(116)	(449)
05,797	10,012	10,390	10,123	405	27	294	12,032	12,523	12,206	(475)	16	(300)	10,021	10,430	10,167	(395)	14	(250)
33,285	10,041	10,422	10,147	356	(26)	250	11,631	12,117	11,803	(520)	(35)	(348)	9,951	10,367	10,099	(445)	(30)	(298)
19,714	10,058	10,447	10,163	452	64	348	11,514	12,004	11,684	(553)	(63)	(383)	10,029	10,455	10,177	(481)	(55)	(333)
05,063	10,009	10,385	10,120	373	(3)	262	12,020	12,509	12,196	(490)	(2)	(315)	9,975	10,381	10,121	(407)	(2)	(261)
58,273	9,980	10,350	10,090	421	51	311	12,519	13,017	12,696	(427)	71	(250)	10,058	10,458	10,200	(343)	57	(201)
19,605	9,919	10,281	10,055	360	(2)	224	13,081	13,567	13,268	(556)	(70)	(369)	9,860	10,226	10,001	(419)	(53)	(278)
39,101	10,029	10,409	10,141	386	6	274	11,682	12,163	11,858	(532)	(51)	(358)	9,961	10,371	10,110	(454)	(44)	(305)
53,426	10,053	10,436	10,153	374	(9)	274	11,540	12,028	11,711	(660)	(172)	(489)	9,863	10,260	10,009	(564)	(147)	(418)
18,878	10,057	10,441	10,158	336	(48)	236	11,479	11,966	11,650	(500)	(13)	(330)	9,959	10,362	10,107	(434)	(12)	(286)
39,149	10,083	10,471	10,183	151	(238)	50	11,126	11,606	11,295	(286)	194	(116)	9,977	10,408	10,129	(256)	174	(104)
39,814	10,037	10,419	10,149	21	(362)	(92)	11,597	12,078	11,771	(152)	329	22	9,927	10,339	10,076	(130)	282	19
35,616	10,035	10,418	10,153	87	(296)	(31)	11,558	12,035	11,733	(117)	360	58	10,021	10,434	10,172	(101)	312	50
38,028	10,481	11,004	10,536	237	(266)	162	7,958	8,429	8,071	(143)	328	(31)	10,528	11,151	10,677	(189)	434	(41)
11,995	10,032	10,423	10,167	1,198	808	1,063	11,434	11,901	11,611	(291)	176	(114)	10,951	11,399	11,121	(279)	168	(110)
23,295	9,775	10,149	9,877	(412)	(786)	(514)	10,931	11,394	11,095	(573)	(111)	(409)	8,897	9,273	9,030	(467)	(90)	(333)
24,580		TotalAvg 4/23-25		86	(299)	(24)	34,280	35,718	34,798	(555)	883	(37)				(163)	256	(12)
		Trip on 4/26								-1.59%	2.54%	-0.11%						
		Bad KWH on 4/27-28																

SUPPORTING WORKPAPERS FOR KAHE 2

4/24/2005

90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i Data

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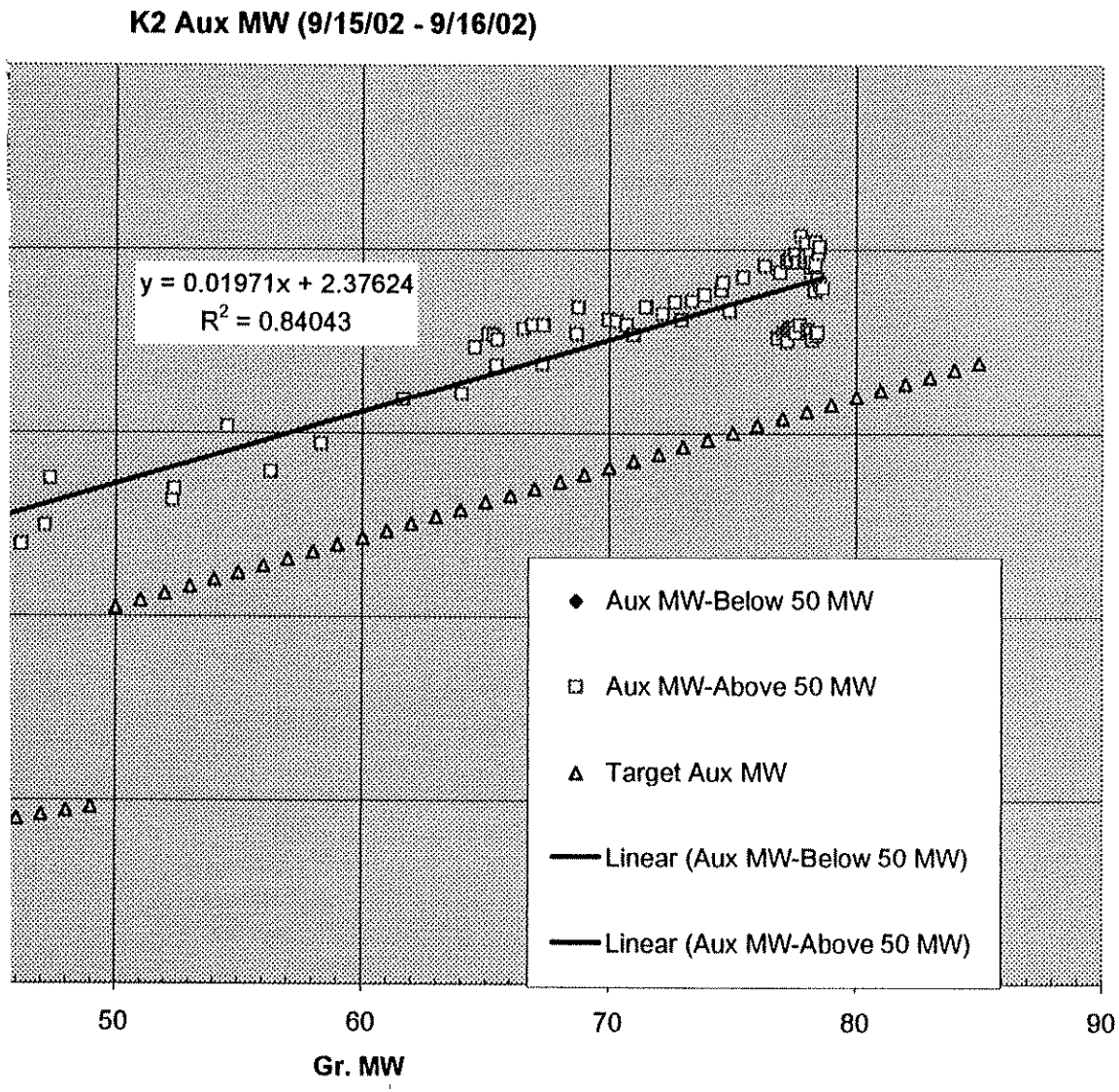
Checks

Net I/O	Gross I/O-CWIT Corr.	Net I/O-CWIT Corr.	CWIT	Act. Aux M	Opacity
3.242317	302.8944687	302.8944687	79.85474	2.356873	5.82
4.939194	313.761568	313.761568	79.81927	2.363383	8.72
5.492408	303.0717809	303.0717809	79.8931	2.371094	9.70
5.552638	309.9666536	309.9666536	79.83047	2.375639	9.62
15.81189	301.7038459	301.7038459	79.87744	2.349601	9.44
8.270323	302.456816	302.456816	79.83701	2.303575	6.09
18.32496	304.5137459	304.5137459	79.86179	2.369671	8.83
18.90398	302.119982	302.119982	79.8902	2.340395	3.58
19.29676	304.6625235	304.6625235	79.94339	2.347581	1.96
9.940167	308.747011	308.747011	79.81482	2.367386	12.13
0.718151	302.5825811	302.5825811	79.84613	2.314327	8.66
0.655254	305.2863414	305.2863414	79.98112	2.341676	1.16
1.249468	308.6407714	308.6407714	79.90793	2.362694	3.95
21.41507	302.3894927	302.3894927	79.92566	2.355133	2.56
4.732735	305.3250889	305.3250889	79.87247	2.362019	4.59
6.043605	305.4015476	305.4015476	79.97885	2.358974	0.96
7.166108	308.6872724	308.6872724	79.99658	2.306563	0.61
8.644704	317.4094292	317.4094292	80.16553	2.384139	10.34
7.950702	311.3085355	311.3085355	80.12518	2.347785	9.10
8.429829	311.629435	311.629435	80.10683	2.373292	6.89
8.435278	310.2378411	310.2378411	80.22255	2.380979	2.06
8.560898	315.586805	315.586805	80.08754	2.36954	6.57
8.491311	316.8855185	316.8855185	80.1454	2.377669	5.31
8.944793	313.1789681	313.1789681	80.24184	2.330244	1.68
9.548735	319.5749845	319.5749845	80.06825	2.383088	8.60
9.565012	314.3857968	314.3857968	80.35756	2.387258	1.22
9.697555	311.1941839	311.1941839	80.31898	2.377266	2.99
0.015875	315.1060151	315.1060151	80.37685	2.344637	0.96
0.475402	316.4276201	316.4276201	80.2997	2.373155	3.54
0.884581	308.9065294	308.9065294	80.18396	2.369766	3.06
0.971297	321.632524	321.632524	80.06467	2.388362	12.65
1.146459	312.726973	312.726973	80.20326	2.374026	3.07
1.301296	315.4911845	315.4911845	80.16469	2.379911	6.25
1.784031	313.4639155	313.4639155	80.12611	2.374151	5.30
2.361402	320.0303368	320.0303368	80.20587	2.34924	11.59
32.65934	304.6754693	304.6754693	80.28041	2.374654	0.92
3.337566	319.8747826	319.8747826	80.14536	2.38188	9.62
33.503204	312.4828149	312.4828149	80.33827	2.373885	2.01
33.913013	319.0298482	319.0298482	80.08484	2.384837	9.53
34.444836	318.8895954	318.8895954	80.10501	2.339673	9.17
34.061665	313.7868288	313.7868288	80.22604	2.385365	11.55
34.078071	316.8604334	316.8604334	80.1857	2.390593	11.10
35.444896	310.7684616	310.7684616	80.26112	2.379358	1.40
0.615817	312.7789925	312.7789925	80.39613	2.348065	1.00
5.308842	334.4401925	334.4401925	80.01431	2.400947	0.26
7.375545	373.7549545	373.7549545	79.90875	2.430304	11.58
8.861658	388.0513879	388.0513879	80.03204	3.124367	0.22
4.686785	405.6690318	405.6690318	80.41542	3.184607	1.00
1.096469	441.0597771	441.0597771	80.24822	2.565841	13.53
7.836922	459.8690683	459.8690683	79.92441	3.194224	12.67
8.099582	440.2115555	440.2115555	80.43471	3.248793	0.06
8.757665	458.05776	458.05776	80.04977	3.374908	0.32
2.840425	484.3672729	484.3672729	80.45399	3.315357	0.90
3.314262	496.3996635	496.3996635	79.94006	3.346355	13.61
1.478431	499.3355386	499.3355386	80.0675	3.515722	0.43
8.813471	529.2080324	529.2080324	80.47328	3.395168	0.65
7.024155	562.8217635	562.8217635	79.95572	3.471559	14.22
6.497878	577.0333279	577.0333279	80.49257	3.591991	0.81
72.098451	664.7620108	664.7620108	80.55043	3.809134	0.66
75.030736	667.2335144	667.2335144	80.47346	3.804822	0.94
78.843859	696.5589765	696.5589765	80.00269	3.794859	12.64
81.716804	668.5075719	668.5075719	80.53114	3.769719	0.71
685.83165	675.0404298	675.0404298	80.589	3.843475	0.57
692.28964	677.0462206	677.0462206	80.56972	3.825043	0.62
96.766684	678.0390416	678.0390416	80.50761	3.857018	1.74
99.457421	679.2452239	679.2452239	80.46207	3.808367	0.93
03.311596	712.3654524	712.3654524	80.01834	3.859343	11.67
07.835563	691.487121	691.487121	80.64687	3.877292	0.43
13.813407	701.3317478	701.3317478	80.49622	3.887854	1.19
14.319007	713.4523304	713.4523304	80.51899	3.910343	1.10
17.554466	694.7815711	694.7815711	80.48484	3.832561	0.96
21.786017	738.0922591	738.0922591	80.034	3.924554	10.67
29.558293	707.9575201	707.9575201	80.60829	3.954968	0.52
736.69273	726.0517168	726.0517168	80.34824	3.760004	1.03
35.747637	722.9278248	722.9278248	80.42793	3.937778	0.97
38.537411	721.6040403	721.6040403	80.37101	3.773314	1.04
739.65417	727.628023	727.628023	80.32548	3.772659	1.01
40.093118	724.7873546	724.7873546	80.31409	3.750298	1.03
40.213934	726.70909	726.70909	80.35963	3.752006	1.04
38.224074	735.2943319	735.2943319	80.45069	3.965038	0.94
40.686178	728.949665	728.949665	80.28448	3.782015	1.07
39.180162	737.8147688	737.8147688	80.62758	3.969917	0.47
40.946656	725.2842563	725.2842563	80.22166	3.768754	1.01
42.134341	727.3276739	727.3276739	80.30014	3.788828	1.06
42.968158	736.4802914	736.4802914	80.33688	3.775079	1.03
41.084326	735.9361024	735.9361024	80.66815	3.984922	0.38
42.161348	723.6502022	723.6502022	80.43931	3.965194	0.96
44.501095	735.5962879	735.5962879	80.38239	3.79444	1.05
42.630651	738.832411	738.832411	80.66697	4.036259	0.33
44.458166	729.8458456	729.8458456	80.12793	3.968079	2.00
45.182948	740.3704753	740.3704753	80.19055	3.98088	0.99
44.935784	732.5250596	732.5250596	80.65559	4.016788	0.28
747.5128	732.937954	732.937954	80.39378	3.783654	1.05
46.459277	738.4978229	738.4978229	80.15924	3.985154	1.21
48.682569	733.6901972	733.6901972	80.25317	3.774321	0.84
47.544078	737.0851601	737.0851601	80.41654	3.930492	1.00
47.376583	758.2233184	758.2233184	80.06531	3.951351	12.83
49.310841	745.6640933	745.6640933	80.23752	3.755746	0.87
47.399729	731.041259	731.041259	80.11227	3.965722	2.99
748.058525	753.3026055	753.3026055	80.63282	4.018144	5.40
749.485574	740.0757007	740.0757007	80.14359	3.887313	0.35
749.057544	756.7239655	756.7239655	80.04965	3.958699	5.63
751.123027	735.653281	735.653281	80.40516	3.765572	1.02
751.35996	748.2847852	748.2847852	80.26883	3.773867	0.99
749.976166	743.6639405	743.6639405	80.20621	3.921648	0.88
749.802608	742.7614402	742.7614402	80.1749	3.9697	0.86
749.984348	747.5996905	747.5996905	80.6442	4.005281	0.24
751.190976	741.2789616	741.2789616	80.08096	3.906136	7.47
752.396497	745.6238882	745.6238882	80.09662	3.8949	6.53

Outliers

#########	64.03443	60.42643	615.5989	618.8243	618.3831	614.5858	614.5858	79.97137	3.607999	14.58
#########	64.59064	60.85659	630.6638	623.8848	622.3761	629.1653	629.1653	80.59687	3.734051	3.56
#########	65.11891	61.34722	630.382	628.6946	628.9328	628.9017	628.9017	80.58729	3.771693	14.49
#########	65.32848	61.5633	633.1983	630.6037	628.9401	631.6981	631.6981	80.61005	3.765184	1.86
#########	65.448	61.76243	643.8769	631.6744	630.7905	642.8222	642.8222	79.98703	3.683568	18.59
#########	65.48299	61.72712	638.7119	632.0115	630.4824	637.2267	637.2267	80.5759	3.755864	5.74
#########	66.56445	62.77688	654.9554	641.8737	640.2415	653.4674	653.4674	80.55314	3.785574	2.12
#########	66.9069	63.11319	646.1061	644.9995	643.352	644.6351	644.6351	80.56452	3.793712	2.25
#########	67.32388	63.63524	637.848	648.8077	648.2115	636.4384	636.4384	80.51186	3.688632	0.76
#########	67.34362	63.55051	641.4877	648.9881	647.4226	640.0304	640.0304	80.54176	3.793106	4.37
#########	68.69658	64.92466	656.6279	661.3594	660.2248	655.1844	655.1844	80.53007	3.771924	1.04
#########	68.764	64.92341	674.147	661.9765	660.2132	672.5966	672.5966	80.62144	3.840586	6.18


K2 Aux MW (9/15/02 - 9/16/02)
y = 0.01971x + 2.37624
R2 = 0.84043
Aux MW-Below 50 MW
Aux MW-Above 50 MW
Target Aux MW
Linear (Aux MW-Below 50 MW)
Linear (Aux MW-Above 50 MW)
50
60
70
80
90
Gr. MW

Gr. MW	Aux MW-Below 50 MW		Aux MW-Above 50 MW	Outliers	Operational Aux MW M	Target Aux
29.33984	2.356873	40.71159	3.124367		30	2.26933
29.53556	2.363383	42.51566	3.184607		31	2.28055
29.60495	2.371094	46.16808	3.194224		32	2.29177
29.61621	2.375639	47.1265	3.246793		33	2.30299
29.61908	2.349601	47.32673	3.374908		34	2.31421
29.84708	2.303575	52.30355	3.315357		35	2.32543
29.91927	2.369671	52.3862	3.346355		36	2.33665
29.95452	2.340395	54.53351	3.515722		37	2.34787
30.00548	2.347581	56.29691	3.395168		38	2.35909
30.09698	2.367386	58.34853	3.471559		39	2.37031
30.1306	2.314327	61.65749	3.591991		40	2.38153
30.15094	2.341675	64.03443	3.607999		41	2.39275
30.23817	2.362694	64.59064	3.734051		42	2.40397
30.24906	2.355133	65.11891	3.771693		43	2.41519
30.62549	2.362019	65.32848	3.765184		44	2.42641
30.76842	2.358974	65.446	3.683568		45	2.43763
30.84099	2.306563	65.48299	3.755864		46	2.44885
[illegible]	[illegible]	[illegible]	[illegible]		47	2.46007
30.96956	2.347785	66.9069	3.793712		48	2.47129
31.0484	2.373292	67.32388	3.688632		49	2.48251
31.0567	2.380979	67.34362	3.793106		50	3.02254
31.05924	2.36954	68.69658	3.771924		51	3.04174
31.05963	2.377669	68.764	3.840586		52	3.06094
31.06268	2.330244	70.00658	3.809134		53	3.08014
31.18275	2.383088	70.31634	3.804822		54	3.09934
31.18873	2.387258	70.71465	3.794859		55	3.11854
31.19349	2.377266	70.997	3.769719		56	3.13774
31.19629	2.344637	71.51103	3.843475		57	3.15694
31.27595	2.373155	72.18314	3.825043		58	3.17614
31.3181	2.369766	72.6957	3.857018		59	3.19534
31.34634	2.388362	72.93236	3.808367		60	3.21454
31.3515	2.374026	73.39492	3.859343		61	3.23374
31.37462	2.379911	73.89577	3.877292		62	3.25294
31.42257	2.374151	74.54406	3.887854		63	3.27214
31.46191	2.34924	74.62047	3.910343		64	3.29134
31.54272	2.374654	74.88766	3.832561		65	3.31054
31.60316	2.38188	75.43066	3.924554		66	3.32974
31.61359	2.373885	76.28893	3.954968		67	3.34894
31.67013	2.384837	76.84264	3.760004		68	3.36814
31.68413	2.339673	76.9305	3.937778		69	3.38734
31.6872	2.385365	77.06283	3.773314		70	3.40654
31.69425	2.390593	77.18095	3.772659		71	3.42574
31.83506	2.379358	77.20528	3.750298		72	3.44494
32.37874	2.348065	77.21983	3.752006		73	3.46414
34.06353	2.400947	77.22122	3.965038		74	3.48334
36.53857	2.430304	77.30006	3.782015		75	3.50254
42.60211	2.565641	77.3278	3.969917		76	3.52174
		77.3345	3.788754		77	3.54094
		77.46087	3.788828		78	3.56014
		77.53577	3.775079		79	3.57934
		77.54531	3.984922		80	3.59854
		77.64011	3.965194		81	3.61774
		77.7181	3.79444		82	3.63694
		77.76107	4.036259		83	3.65614
		77.88718	3.968079		84	3.67534
		77.97702	3.98088		85	3.69454
		77.98666	4.016788			
		78.02741	3.783654			
		78.11695	3.985154			
		78.14238	3.774321			
		78.17757	3.930492			
		78.18063	3.951351			
		78.19056	3.755746			
		78.19746	3.965722			
		78.31989	4.018144			
		78.34069	3.887313			
		78.3666	3.958699			
		78.39291	3.765572			
		78.42637	3.773867			
		78.42715	3.921648			
		78.47676	3.9897			

Condenser Adjustment

Small Reheat Unit, HR Adjustment from 75 Degr. F

Temp. Rise	Coefficients x2	x	constant
1	76 2.1476E-07	- 4.0812E-05	1.0027E+00
2	77 4.4654E-07	- 8.4556E-05	1.0055E+00
3	78 6.4158E-07	- 1.2225E-04	1.0083E+00
4	79 8.5921E-07	- 1.6336E-04	1.0112E+00
5	80 1.1974E-06	- 2.2083E-04	1.0147E+00
6	81 1.7181E-06	- 3.0262E-04	1.0190E+00
7	82 2.2406E-06	- 3.8429E-04	1.0234E+00
8	83 2.6258E-06	- 4.4887E-04	1.0273E+00
9	84 2.6804E-06	- 4.7109E-04	1.0300E+00
10	85 2.7406E-06	- 4.9474E-04	1.0328E+00

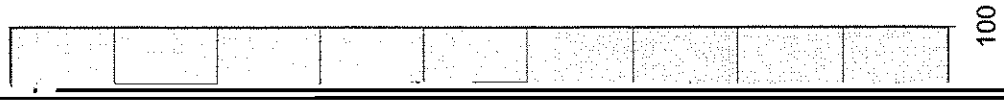
Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

See HRCondImpact.xls

Auxiliary Calculator-First Ordered Curve-Hourly

Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10	
H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	Now based upon ODPM	Adusted H8/9 to 27 MW on 6/7 frc
H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000		
K1	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K4	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K5	80	0.01397	3.86311	0.02901	3.14307	0.416667	10,000	Previously 90 MW	
K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW	
W10			0.1		0.1	0.025	600		
W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW	
W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW	
W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W7	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W8	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W9			0.1		0.1	0.041667	1,000		
H5						0.0625	1,500		
H7						0.083333	2,000		

2/24/2005



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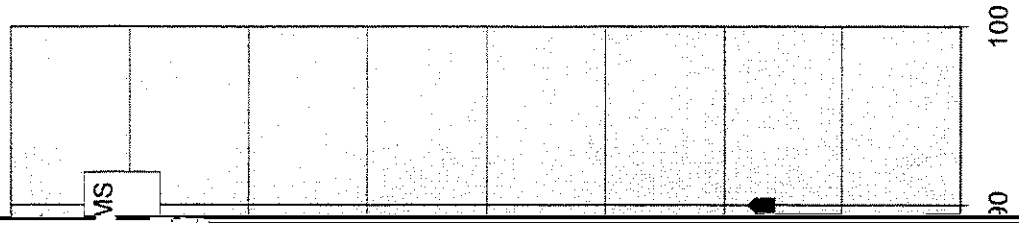
2/24/2005



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Curve Plot Data

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NHR Plot

74.686411	66.70119	47.57623
8.7145647	8.293533	9.252365
0.004685	0.01035	0.000346

Net MW	Current EMS	Revised New-9/02	First 9/02
30	11,345	10,827	10,849
31	11,269	10,766	10,798
32	11,198	10,709	10,750
33	11,132	10,656	10,706
34	11,071	10,607	10,663
35	11,012	10,562	10,624
36	10,958	10,519	10,586
37	10,906	10,479	10,551
38	10,858	10,442	10,518
39	10,812	10,407	10,486
40	10,769	10,375	10,456
41	10,728	10,345	10,427
42	10,690	10,316	10,400
43	10,653	10,290	10,374
44	10,618	10,265	10,349
45	10,585	10,242	10,325
46	10,554	10,220	10,303
47	10,524	10,199	10,281
48	10,495	10,180	10,260
49	10,468	10,162	10,240
50	10,443	10,145	10,221
51	10,418	10,129	10,203
52	10,394	10,114	10,185
53	10,372	10,101	10,168
54	10,351	10,088	10,152
55	10,330	10,076	10,136
56	10,311	10,064	10,121
57	10,292	10,054	10,107
58	10,274	10,044	10,093
59	10,257	10,035	10,079
60	10,240	10,026	10,066
61	10,225	10,018	10,053
62	10,210	10,011	10,041
63	10,195	10,004	10,029
64	10,181	9,998	10,018
65	10,168	9,992	10,007
66	10,155	9,987	9,996
67	10,143	9,982	9,986
68	10,131	9,978	9,976
69	10,120	9,974	9,966
70	10,109	9,971	9,956
71	10,099	9,968	9,947
72	10,089	9,965	9,938
73	10,080	9,963	9,929
74	10,071	9,961	9,921
75	10,062	9,959	9,913
76	10,053	9,958	9,905
77	10,045	9,957	9,897
78	10,038	9,956	9,889
79	10,030	9,955	9,882
80	10,023	9,955	9,875
81	10,016	9,955	9,868
82	10,010	9,956	9,861
83	10,003	9,956	9,854
84	9,997	9,957	9,848
85	9,991	9,958	9,842
86	9,986	9,959	9,835
87	9,981	9,961	9,829
88	9,976	9,962	9,823
89	9,971	9,964	9,818
90	9,966	9,966	9,812

0.0148387x2 + 7.4366318x + 67.8455155

GHR Plot

61.78843	67.84552	47.72328
8.303325	7.436632	8.411112
0.006179	0.014839	0.005143

Gr. MW	Current EM	Revised New-9/02	First 9/02
30	10,548	10,143	10,156
31	10,488	10,085	10,110
32	10,432	10,032	10,067
33	10,380	9,982	10,027
34	10,331	9,937	9,990
35	10,285	9,894	9,955
36	10,242	9,855	9,922
37	10,202	9,819	9,891
38	10,164	9,786	9,862
39	10,129	9,755	9,835
40	10,095	9,726	9,810
41	10,064	9,700	9,786
42	10,034	9,675	9,763
43	10,006	9,652	9,742
44	9,979	9,631	9,722
45	9,954	9,612	9,703
46	9,931	9,594	9,685
47	9,908	9,578	9,668
48	9,887	9,562	9,652
49	9,867	9,548	9,637
50	9,848	9,535	9,623
51	9,830	9,524	9,609
52	9,813	9,513	9,596
53	9,797	9,503	9,584
54	9,781	9,494	9,573
55	9,767	9,486	9,562
56	9,753	9,479	9,551
57	9,740	9,473	9,542
58	9,727	9,467	9,532
59	9,715	9,462	9,523
60	9,704	9,458	9,515
61	9,693	9,454	9,507
62	9,683	9,451	9,500
63	9,673	9,448	9,493
64	9,664	9,446	9,486
65	9,656	9,445	9,480
66	9,647	9,444	9,474
67	9,640	9,443	9,468
68	9,632	9,443	9,463
69	9,625	9,444	9,458
70	9,619	9,445	9,453
71	9,612	9,446	9,448
72	9,606	9,447	9,444
73	9,601	9,449	9,440
74	9,596	9,452	9,437
75	9,591	9,454	9,433
76	9,586	9,457	9,430
77	9,582	9,460	9,427
78	9,577	9,464	9,424
79	9,574	9,468	9,422
80	9,570	9,472	9,419
81	9,567	9,476	9,417
82	9,564	9,481	9,415
83	9,561	9,486	9,413
84	9,558	9,491	9,411
85	9,555	9,496	9,410
86	9,553	9,502	9,408
87	9,551	9,507	9,407
88	9,549	9,513	9,406
89	9,548	9,520	9,405
90	9,546	9,526	9,404

K1 Data

	Actual Net KWH	Mbtu	NHR	Op. Nt KWH	OPNHR Rpt1 ABC	OPNHR EMS	OPNHR PI NEW	OPNHR Var Rpt1 ABC	OPNHR Var EMS	OPNHR Var PI NEW	Mbtus Report1	Mbtus EMS	Mbtus PI NEW	Mbtu Difference from Actual Report1	Mbtu Difference from Actual EMS	Mbtu Difference from Actual PI NEW	Corr. OpNHR Report1	Corr. OpNHR EMS	Corr. OpNHR PI NEW	OPNHR Var-Corr. Using Act. Net KWH Report1	OPNHR Var-Corr. Using Act. Net KWH EMS	OPNHR Var-Corr. Using Act. Net KWH PI NEW
9/1/2002	1,417,500	13418.90812	9,467	1,310,554	10,037	10,295	10,058	(570)	(829)	(591)	13,153.54	13,492.61	13,181	(265)	74	(238)	9,279	9,519	9,299	(187)	52	(168)
9/2/2002	1,259,000	12926.59246	10,267	1,271,399	10,084	10,345	10,116	183	(77)	150	12,821.10	13,152.17	12,863	(105)	226	(63)	10,184	10,447	10,217	(84)	179	(50)
9/3/2002	1,385,800	14069.79137	10,153	1,395,281	10,017	10,245	10,049	136	(93)	104	13,976.44	14,295.28	14,021	(93)	225	(49)	10,085	10,316	10,117	(67)	163	(35)
9/4/2002	1,431,400	14569.24663	10,178	1,441,148	10,000	10,218	10,032	178	(39)	147	14,411.49	14,725.30	14,457	(158)	156	(112)	10,068	10,287	10,100	(110)	109	(78)
9/5/2002	1,432,600	14456.61308	10,091	1,438,323	9,993	10,213	10,022	99	(122)	69	14,372.62	14,689.56	14,414	(84)	233	(42)	10,033	10,254	10,062	(59)	163	(29)
9/6/2002	1,466,800	14858.28944	10,130	1,480,539	9,981	10,191	10,011	149	(61)	119	14,776.93	15,088.20	14,821	(81)	230	(37)	10,074	10,286	10,104	(55)	157	(25)
9/7/2002	1,301,600	13235.2202	10,168	1,313,342	10,044	10,301	10,068	124	(132)	100	13,191.85	13,528.12	13,223	(43)	293	(12)	10,135	10,393	10,159	(33)	225	(10)
9/8/2002	1,088,900	11347.68413	10,421	1,101,459	10,198	10,516	10,232	223	(95)	190	11,232.77	11,582.90	11,270	(115)	235	(78)	10,316	10,637	10,350	(106)	216	(72)
9/9/2002	1,296,400	13118.4373	10,119	1,289,340	10,052	10,317	10,073	67	(198)	46	12,960.66	13,302.45	12,987	(158)	184	(131)	9,997	10,261	10,018	(122)	142	(101)
9/10/2002	1,369,100	13986.58221	10,216	1,394,343	10,021	10,249	10,055	194	(33)	161	13,973.41	14,290.37	14,020	(13)	304	34	10,206	10,438	10,240	(10)	222	25
9/11/2002	1,368,100	13834.59328	10,112	1,372,019	10,028	10,264	10,058	84	(152)	55	13,758.63	14,082.38	13,799	(76)	248	(36)	10,057	10,293	10,086	(56)	181	(26)
9/12/2002	1,329,100	13538.7261	10,186	1,339,982	10,040	10,285	10,069	146	(99)	117	13,453.91	13,782.11	13,492	(85)	243	(46)	10,123	10,370	10,151	(64)	183	(35)
9/13/2002	1,403,200	14292.29898	10,186	1,430,276	10,000	10,221	10,030	186	(35)	155	14,302.63	14,618.83	14,346	10	327	54	10,193	10,418	10,224	7	233	38
9/14/2002	1,408,700	14296.16946	10,148	1,429,723	9,985	10,213	10,007	164	(64)	142	14,275.60	14,601.30	14,307	(21)	305	11	10,134	10,365	10,156	(15)	217	8
9/15/2002	1,726,600	16334.75621	9,461	1,599,876	9,928	10,119	9,951	(467)	(659)	(490)	15,883.28	16,189.96	15,920	(451)	(145)	(415)	9,199	9,377	9,220	(261)	(84)	(240)
9/16/2002	1,270,700	14033.74995	11,044	1,398,339	10,011	10,242	10,040	1,033	802	1,004	13,999.24	14,321.40	14,039	(35)	288	5	11,017	11,270	11,048	(27)	226	4
9/17/2002	1,343,700	13764.57903	10,244	1,358,351	10,032	10,272	10,062	211	(28)	182	13,627.5	13,952.6	13,667.8	(137)	188	(97)	10,142	10,384	10,172	(102)	140	(72)
9/18/2002																						
9/19/2002																						
9/20/2002																						
9/21/2002																						
9/22/2002																						
TOTAL/AVG	23,299,200.00	236,082.24		23,364,294.33				126	(113)	98	234,171.58	239,695.49	234,829.36	(1,910.66)	3,613.25	(1,252.87)				(79)	160	(51)
											-0.81%	1.53%	-0.53%	-0.81%	1.53%	-0.53%						

SUPPORTING WORKPAPERS FOR KAHE 3

2/24/2005

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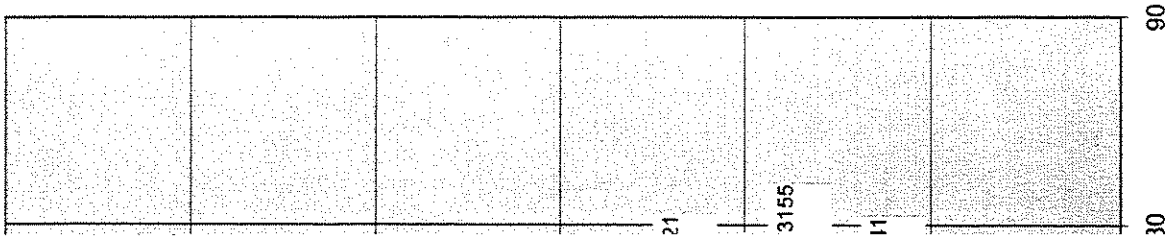
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067	81.68638												
061	7.631122												
853	0.012718414	79.733964	CWIT Adjustment Actual Conditions Low	High	Interpolated	79 Average Conditions Low	80 High	78.6 Interpolated	Adjustment	Adjusted Gross I/O-CW	Net I/O-CWT	Aux MW C Corr.	K3AT-FDSI Opacity
I/O	EMS Net I/O	K2CWITAvg											
129	504.6118457	80.01461	1.006308	1.007719	1.00832675	1.004914	1.006308	1.0043576	0.99804323	508.9609912	508.961	2.499168	2.039719
336	467.6711691	79.980797	1.005188	1.006662	1.00863391	1.005188	1.006662	1.00459811	0.99797761	467.279993	467.28	2.986548	1.974321
488	420.4543518	79.946983	1.00566	1.007281	1.0071954	1.00566	1.007281	1.00501169	0.99783189	416.3533043	416.3533	2.656342	1.908924
518	362.4366102	79.91317	1.006221	1.008022	1.00786526	1.006221	1.008022	1.00550077	0.99765396	388.4631562	388.4632	3.347908	3.182018
422	348.8502036	79.879356	1.006444	1.008317	1.00809099	1.006444	1.008317	1.00569467	0.99762291	357.4581108	357.4581	2.713165	3.262738
705	348.8543743	79.845543	1.006452	1.008328	1.00803781	1.006452	1.008328	1.00570159	0.99768241	360.007491	360.0075	2.63446	1.846329
411	348.9758716	79.811729	1.00644	1.008311	1.00795881	1.00644	1.008311	1.00569088	0.99774998	357.4672236	357.4672	2.741207	1.938367
261	348.8848106	79.777916	1.006436	1.008307	1.00789148	1.006436	1.008307	1.00568808	0.99781385	354.2480336	354.248	2.807259	2.030404
387	349.4299846	79.744102	1.006446	1.00832	1.00784081	1.006446	1.00832	1.00569688	0.99787275	355.8476706	355.8477	2.619747	2.122441
801	379.4281625	79.760414	1.006063	1.007813	1.00739381	1.006063	1.007813	1.00536344	0.99798453	391.0639906	391.064	2.993504	2.214478
545	439.1598395	79.789345	1.005422	1.006968	1.00664222	1.005422	1.006968	1.00480298	0.9981729	455.7193573	455.7194	3.315849	2.306516
277	482.9074198	79.818275	1.005046	1.006477	1.00621687	1.005046	1.006477	1.00447327	0.99826717	489.27777	489.2778	3.133888	2.398553
679	506.0530105	79.847206	1.004846	1.006218	1.00600823	1.004846	1.006218	1.00429758	0.99829957	516.4255936	516.4256	3.304245	2.49059
026	549.1427461	79.876137	1.004526	1.005805	1.0056468	1.004526	1.005805	1.00401459	0.99837695	562.81106	562.8111	3.404446	1.714484
731	591.7422215	79.905067	1.004259	1.005464	1.00534967	1.004259	1.005464	1.00377628	0.99843497	597.5490063	597.549	3.409924	2.085304
045	619.3658186	79.933998	1.004133	1.005306	1.00522889	1.004133	1.005306	1.00366403	0.99844326	631.8765699	631.8766	2.863377	2.832338
883	611.5647037	79.962929	1.004147	1.005324	1.00528009	1.004147	1.005324	1.00367648	0.99840481	622.4997343	622.4997	3.425903	2.640468
176	628.7652639	79.991859	1.00405	1.005203	1.00519333	1.00405	1.005203	1.00358942	0.99840438	637.6428008	637.6428	3.594635	1.899682
462	677.0941621	80.02079	1.004915	1.006014	1.00493758	1.003816	1.004915	1.00337612	0.99844621	693.0527542	693.0528	4.134521	2.899485
1169	754.011556	80.049721	1.004652	1.005745	1.00470634	1.00359	1.004652	1.00316491	0.99846579	760.2459564	760.246	3.678596	2.97028
261	678.3840557	80.078651	1.004937	1.006039	1.00502395	1.003834	1.004937	1.00339328	0.99837749	683.0236524	683.0237	3.486107	1.905055
498	641.8318202	80.107582	1.005167	1.006303	1.00528951	1.004022	1.005167	1.00356369	0.99828326	644.9220619	644.9221	2.816078	1.924231
723	632.0264289	80.136513	1.00519	1.00633	1.0053457	1.00404	1.00519	1.00356023	0.99824391	635.8663222	635.8663	3.465759	1.943406
208	632.6667372	80.165443	1.005187	1.006327	1.00537578	1.004038	1.005187	1.00357818	0.99821201	637.076339	637.0763	3.446693	1.962582
877	632.9162314	80.194374	1.005185	1.006325	1.00540694	1.004036	1.005185	1.0035769	0.9981798	637.5816838	637.5817	3.450691	1.981757
877	632.9718775	80.201561	1.005185	1.006325	1.00541513	1.004036	1.005185	1.0035769	0.99817167	638.7655357	638.7655	3.444916	2.000932
186	632.868413	80.20327	1.005187	1.006327	1.005419	1.004038	1.005187	1.00357824	0.99816917	642.9739242	642.9739	3.423317	2.020108
288	640.1869251	80.204979	1.005142	1.006274	1.00537397	1.004001	1.005142	1.00354526	0.99818107	646.3892568	646.3893	3.45083	2.57022
699	641.0833372	80.206688	1.005138	1.006289	1.00537141	1.003998	1.005138	1.00354209	0.99818046	644.3299315	644.3299	3.43618	2.529242
3039	640.9814731	80.208397	1.005137	1.006268	1.00537279	1.003998	1.005137	1.0035417	0.9981787	647.9708327	647.9708	3.456879	2.488264
7287	640.279545	80.210106	1.005137	1.006268	1.00537498	1.003998	1.005137	1.00354188	0.9981767	643.2658506	643.2659	3.525627	2.447287
5539	639.1762202	80.211815	1.005141	1.006273	1.00538087	1.004001	1.005141	1.00354453	0.99817369	647.6306118	647.6306	3.577698	2.406309
9824	632.3816763	80.213524	1.005189	1.00633	1.0054328	1.00404	1.005189	1.00357973	0.99815693	639.4381329	639.4381	3.439697	2.365332
1119	623.9617793	80.215233	1.00525	1.006402	1.00549825	1.004089	1.00525	1.00362384	0.99813584	637.2581916	637.2582	3.294525	2.324354
2364	608.9033099	80.216942	1.005341	1.006511	1.00559492	1.004161	1.005341	1.0036889	0.99810459	620.7321104	620.7321	3.435966	2.283377
0701	601.4800225	80.218651	1.005397	1.006578	1.00565491	1.004205	1.005397	1.00372837	0.9980843	608.9199342	608.9199	3.373314	2.242399
3976	609.8243059	80.22036	1.005345	1.006515	1.0056027	1.004164	1.005345	1.00369148	0.99809943	616.0731582	616.0732	3.27866	2.201422
3193	605.0663253	80.222069	1.005369	1.006545	1.00562992	1.004183	1.005369	1.00370866	0.9980895	611.1687475	611.1687	3.414551	2.160444
5587	604.5075271	80.223778	1.005369	1.006544	1.00563165	1.004183	1.005369	1.00370847	0.99808759	611.7748152	611.7748	3.479389	2.119467
3155	610.9557449	80.225487	1.005325	1.006491	1.00558765	1.004148	1.005325	1.00367712	0.99810008	620.0326978	620.0327	3.47768	2.07849
3565	615.0861035	80.227198	1.0053	1.006462	1.00556409	1.004128	1.0053	1.00365964	0.99810608	631.1728241	631.1728	3.426342	8.85553
0662	611.1975971	80.180824	1.005319	1.006484	1.00552978	1.004143	1.005319	1.00367313	0.99815358	621.6935946	621.6936	3.541416	2.321811
4882	608.4013112	80.122353	1.005387	1.006567	1.00553158	1.004198	1.005387	1.00372177	0.99820015	616.2035613	616.2036	2.765404	1.869309
1003	597.5864947	80.063881	1.005423	1.006611	1.00549903	1.004226	1.005423	1.00374729	0.99825783	603.9129647	603.913	3.388672	2.128845
3633	614.9534393	80.005409	1.005295	1.006456	1.00530124	1.004124	1.005295	1.0036559	0.99836334	624.9116485	624.9116	3.526051	2.60731
0891	652.4864659	79.946938	1.003948	1.005076	1.00501587	1.003948	1.005076	1.00349665	0.99848835	655.6358286	655.6358	3.378395	2.656122
8386	607.4178656	79.888466	1.004177	1.005362	1.00522968	1.004177	1.005362	1.00370366	0.99848192	607.2728129	607.2728	3.269638	2.346233
5878	541.3432868	79.829994	1.004601	1.005901	1.00568026	1.004601	1.005901	1.00408093	0.9984097	539.9408689	539.9409	3.064743	2.036344
3345	506.485438	79.771523	1.004889	1.006273	1.00595684	1.004889	1.006273	1.00433519	0.99838795	511.7532256	511.7532	2.647762	1.726454
4972	471.5931726	79.713051	1.005119	1.006573	1.00615576	1.005119	1.006573	1.00453795	0.99839209	476.3473443	476.3473	3.433899	1.733278
7406	418.8027209	79.654579	1.005675	1.007301	1.00673961	1.005675	1.007301	1.0050249	0.99829878	411.1437501	411.1438	2.673828	1.847558
7937	426.5259615	79.598107	1.005556	1.007144	1.00650254	1.005556	1.007144	1.00492039	0.99842807	428.0863955	428.0864	3.166801	1.961837
4449	426.5574419	79.537636	1.00555	1.007137	1.00640348	1.00555	1.007137	1.00491576	0.99852175	431.9748049	431.9748	3.225254	2.076117
5757	426.71455	79.479164	1.005553	1.00714	1.00631335	1.005553	1.00714	1.00491777	0.99861318	432.7479901	432.748	3.180248	2.190396
5757	427.1107277	79.420692	1.005553	1.00714	1.00622053	1.005553	1.00714	1.00491777	0.99870529	438.9344506	438.9345	3.134743	3.382616
5808	424.2314456	79.362221	1.005577	1.007171	1.00615423	1.005577	1.007171	1.00493859	0.9987918	441.0297346	441.0297	3.187286	2.387548
0185	423.8604011	79.303749	1.005586	1.007183	1.00607101	1.005586	1.007183	1.0049466	0.99888238	434.6465284	434.6465	3.123283	2.195343
4767	423.347956	79.312767	1.005579	1.007175	1.00607604	1.005579	1.007175	1.00494072	0.99886956	428.9623493	428.9623	3.260433	1.360857
3701	423.8313711	79.338768	1.005583	1.00718	1.00612447	1.005583	1.00718	1.00494463	0.99882734	427.0532217	427.0532	3.152802	1.535726
3644	423.9634846	79.364769	1.005578	1.007174	1.00616035	1.005578	1.007174	1.0049402	0.99878733	427.254779	427.2548	3.196602	1.727123
1687	424.4148781	79.39077	1.005574	1.007169	1.00619742	1.005574	1.007169	1.00493877	0.99874711	430.8754082	430.8754	3.190487	1.91852
2713	458.8949747	79.416771	1.005245	1.006736	1.00586624	1.005245	1.006736	1.00464784	0.99878871	463.7132909	463.7133	3.25811	2.109917
2761	462.769025	79.442772	1.00521	1.006691	1.00586543	1.00521	1.006691	1.00461725	0.9987591	469.2447798	469.2448	3.262325	2.301315
5007	486.0907676	79.468773	1.005012	1.006432	1.00567759	1.005012	1.006432	1.00444316	0.99877254	496.9097305	496.9097	3.237762	2.713338
6882	511.8666797	79.494774	1.004781	1.006133	1.00544999	1.004781	1.006133	1.00423994	0.99879651	527.7480052	527.748	3.603168	2.962359
7072	541.1161486	79.520775	1.004593	1.005891	1.00526935	1.004593	1.005891	1.00407411	0.99881103	549.3060139	549.306	3.211781	2.030306
9518	543.46964	79.546776	1.004573	1.005865	1.00527914	1.004573	1.005865	1.00405574	0.99878303	550.9261342	550.9261	3.281429	2.037752
9104	561.0019586	79.572777	1.004451	1.005708	1.00517108	1.004451	1.005708	1.00394747	0.99878268	567.2389467	567.2389	3.353886	2.045198
8433	561.4005214	79.598778	1.004452	1.00571	1.00520558	1.004452	1.00571	1.00394884	0.99874976	566.2290595	566.2291	3.283958	2.052644
7371	570.7616614	79.624779	1.004389	1.00563	1.0051645	1.004389	1.00563	1.00389286	0.99873489	577.8901705	577.8902	3.3372	2.06009
5379	570.8874567	79.65078	1.004388	1.005628	1.00519511	1.004388	1.005628	1.00389161	0.99870323	573.1345356	573.1345	3.350174	2.067536
0707	574.6769397	79.676781	1.004364	1.005598	1.00519946	1.004364	1.005598	1.00387063	0.99867805	579.1019726	579.102	3.346887	2.074982
1208	574.6434497	79.702782	1.004365	1.0056	1.00523291	1.004365	1.0056	1.00387165	0.99864563	576.2340656	576.2341	3.308231	2.082428
2842	576.1526344	79.705765	1.004358	1.005591	1.00522824	1.004358	1.005591	1.00386542	0.99864426	576.2084128	576.2084	3.288879	2.089875
3832	574.2525202	79.702957	1.004368	1.005603	1.00523584	1.004368	1.005603	1.00387368	0.99864494	580.2306289	580.2306	3.332726	2.097321
3884	574.3002168	79.70015	1.004367	1.005602	1.00523161	1.004367	1.005602	1.00387311	0.99864857	581.1358152	581.1358	3.338768	2.411011
3461	572.170459	79.697342	1.004411	1.005658	1.00528043	1.004411	1.005658	1.00391218	0.99863895	571.634427	571.6344	2.805641	2.458793
4044	567.9107929	79.694534	1.004409	1.005655	1.00527405	1.004409	1.005655	1.00391004	0.99864314	572.7681662	572.7682	3.314671	2.506575
4237	567.209842	79.691727	1.004411	1.005658	1.00527397	1.004411	1.005658	1.00391259	0.99864576	573.8446275	573.8446	3.341999	2.554357
0228	568.9135795	79.688919	1.004408	1.005654	1.00526662	1.004408	1.005654	1.00390971	0.9986502	574.0396067	574.0396	3.210938	2.559989
2398	567.2394752	79.686111	1.004412	1.005659	1.00526776	1.004412	1.005659	1.00391319	0.99865252	573.4096502	573.4097	3.327251	2.534678
1639	568.1138275	79.683304	1.004412	1.005659	1.00526395	1.004412	1.005659	1.00391298	0.99865608	570.9090166	570.909	3.235683	2.509367
3254	568.8110799	79.680496	1.00441	1.005656	1.00525804	1.00441	1.005656	1.00391115	0.99866016	574.4802904	574.4803	3.194317	2.484056
7992	568.4704109	79.677689	1.004406	1.005651	1.0052497	1.004406	1.005651	1.00390752	0.99866483	571.953585	571.9536	3.302204	2.458746
0227	568.1469091	79.674881	1.004409	1.005655	1.00524997	1.004409	1.005655	1.00391035	0.99866737	573.1427259	573.1427	3.282677	2.433435
9377	564.4362156	79.672073	1.004434	1.005687	1.00527649	1.004434	1.005687	1.00393287	0.99866343	570.0796787	570.0797	3.255447	2.408124
1758	559.852787	79.669266	1.004461	1.005722	1.00530506	1.004461	1.005722	1.00395692	0.99865897	567.6650287	567.665	3.300827	2.382813
8433	561.4458803	79.666458	1.004452	1.00571	1.00529075	1.004452	1.00571	1.00394884	0.99866516	567.2690477	567.269	3.278969	2.357502
9189	564.4718632	79.663651	1.004431	1.005683	1.00526171	1.004431	1.005683	1.00392969	0.99867495	574.3335535	574.3336	3.312511	2.332191
29926	555.0701214	79.632019	1.004497	1.005767	1.00529968	1.004497	1.005767	1.0039883	0.99869553	565.2060199	565.206	3.237564	4.903011
35485	555.4049925	79.59314	1.004496	1.005766	1.0052492	1.004496	1.005766	1.00398748	0.99874487	563.7892244	563.7892	3.216015	3.099841
54791	581.6104437	79.554253	1.004325	1.005549	1.0050035	1.004325	1.005549	1.00383596	0.99883827	593.2569564	593.257	3.283627	4.775602
97476	576.4458744	81.45845	1.008815	1.008154	1.00742882	1.004357	1.005589	1.00386428	0.99646173	580.2066885	580.2067	3.38932	1.958843
30401	671.1116083	80.65316	1.005629	1.006864	1.00643584	1.004389	1.005629	1.00389227	0.9974727	578.7270947	578.7271	3.310444	1.975585
48273	547.8457416	79.847878	1.004547	1.005832	1.0056365	1.004547	1.005832	1.00403308	0.99840557	550.9159145	550.9159	3.20882	1.992326
54483	517.0223382	79.431244	1.004768	1.006116	1.00534947	1.004768	1.006116	1.00422849	0.99888499	523.2157612	523.2158	3.219067	2.009068
20151	477.3958751	79.404999	1.005086	1.00653	1.00567096	1.005086	1.00653	1.00450898	0.99884465	477.6838736	477.6839	3.213684	1.923573
33671	439.6905789	79.378754	1.005431	1.006981	1.00601826	1.005431	1.006981	1.00481159	0.99880055	440.1951276	440.1951	3.136238	1.383437
35786	392.7634383	79.352509	1.005989	1.007715	1.00659738	1.005989	1.007715	1.00529868	0.99870981	395.3344402	395.3344	2.227868	1.73096
51719	374.5179039	79.326263	1.006101	1.007862	1.00667539	1.006101	1.007862	1.00539593	0.99872902	381.7517648	381.7518	3.176247	2.078483
50423	374.4366108	79.300018	1.006098	1.007859	1.00662665	1.006098	1.007859	1.00539394	0.99877541	389.2320842	389.2321	3.209579	3.195434
49172	374.8041446	79.273773	1.006098	1.007856	1.00657795	1.006098	1.007856	1.00539195	0.99882175	383.2017696	383.2018	3.190434	4.995638
95695	374.83478	79.247528	1.006098	1.007859	1.00653366	1.006098	1.007859	1.00539349	0.99886723	380.1592731	380.1593	3.168449	2.60144
33435	374.7421897	79.221283	1.006101	1.007863	1.00649066	1.006101	1.007863	1.0053961	0.9989125	381.7505638	381.7506	3.147938	2.632261
73061	374.6495698	79.195038	1.006104	1.007867	1.00644761	1.006104	1.007867	1.00539871	0.99895783	381.2840756	381.2841	3.127434	2.663082
11795	374.5569855	79.168793	1.006107	1.007871	1.00640451	1.006107	1.007871	1.00540133	0.9990032	375.8027619	375.8028	3.106926	2.693903
16707	374.6875364	79.142548	1.006074	1.007827	1.00632343	1.006074	1.007827	1.00537235	0.9990549	385.5866221	385.5866	3.418846	2.724724
82316	462.6515351	79.116302	1.005198	1.006673	1.00536791	1.005198	1.006673	1.00460539	0.99924154	477.6167519	477.6168	3.426479	2.745081
97838	478.4903654	79.090057	1.005062	1.006498	1.00519151	1.005062	1.006498	1.00448771	0.99929983	488.9965529	488.9966	3.412125	2.663121
29128	519.3964965	79.063812	1.004734	1.006073	1.00481957	1.004734	1.006073	1.00419867	0.99938208	528.4923827	528.4924	3.456455	2.019882
38344	536.2405751	79.037567	1.00462	1.005926	1.00466904	1.00462	1.005926	1.00409771	0.99943133	543.5460092	543.546	3.331982	2.825481
37178	560.1610941	79.065704	1.004448	1.005705	1.00453048	1.004448	1.005705	1.00394505	0.9994172	571.9415051	571.9415	3.492542	3.347847
75778	571.4909253	79.148468	1.004384	1.005623	1.00456755	1.004384	1.005623	1.00388781	0.99932335	578.9355134	578.9355	3.356464	3.307538
10458	594.9598393	79.231232	1.004244	1.005446	1.00462171	1.004244	1.005446	1.00376314	0.99924485	601.2050168	601.205	3.336578	2.182161
83014	586.7581684	79.313995	1.004284	1.005496	1.00466476	1.004284	1.005496	1.0037991	0.99913836	591.3473317	591.3473	3.476795	2.480513
34994	600.9002758	79.396759	1.004209	1.005402	1.00468237	1.004209	1.005402	1.00373214	0.99505419	607.6429419	607.6429	3.354664	2.752262
31634	598.6224922	79.479523	1.004221	1.005417	1.00479423	1.004221	1.005417	1.00374259	0.99895338	604.504044	604.504	3.37672	2.711016
47054	604.1965971	79.562286	1.004186	1.005373	1.00485359	1.004186	1.005373	1.00371166	0.99886359	615.7528234	615.7528	3.442997	2.669769
21171	612.1214784	79.64505	1.004145	1.005321	1.00490377	1.004145	1.005321	1.0036747	0.99877693	622.0560004	622.056	3.405739	2.628523
23517	612.8141604	79.727814	1.004141	1.005316	1.00499588	1.004141	1.005316	1.00367075	0.99868145	624.7881366	624.7881	3.420067	2.587276
44414	612.5285543	79.810577	1.004141	1.005316	1.00509299	1.004141	1.005316	1.00367064	0.99858486	620.7181329	620.7181	3.453327	2.54603

Aux MW
2.499168
2.986546
2.656342
3.347908
2.713165
2.63446
2.741207
2.807259
2.619747
2.993504
3.316849
3.139888
3.304245
3.404446
3.409924
2.863377
3.425903
3.594635
4.134521
3.678596
3.486107
2.816078
3.465759
3.446693
3.450691
3.444916
3.423317
3.45063
3.43618
3.456879
3.525627
3.577698
3.439697
3.294525
3.435966
3.373314
3.27866
3.414551
3.479389
3.47768
3.426342
3.541416
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3.528051
3.378395
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3.198238
2.227886
3.176247
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3.169449
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3.418846
3.428479
3.412125
3.456455
3.331982
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3.355464
3.336578
3.476785
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3.37672
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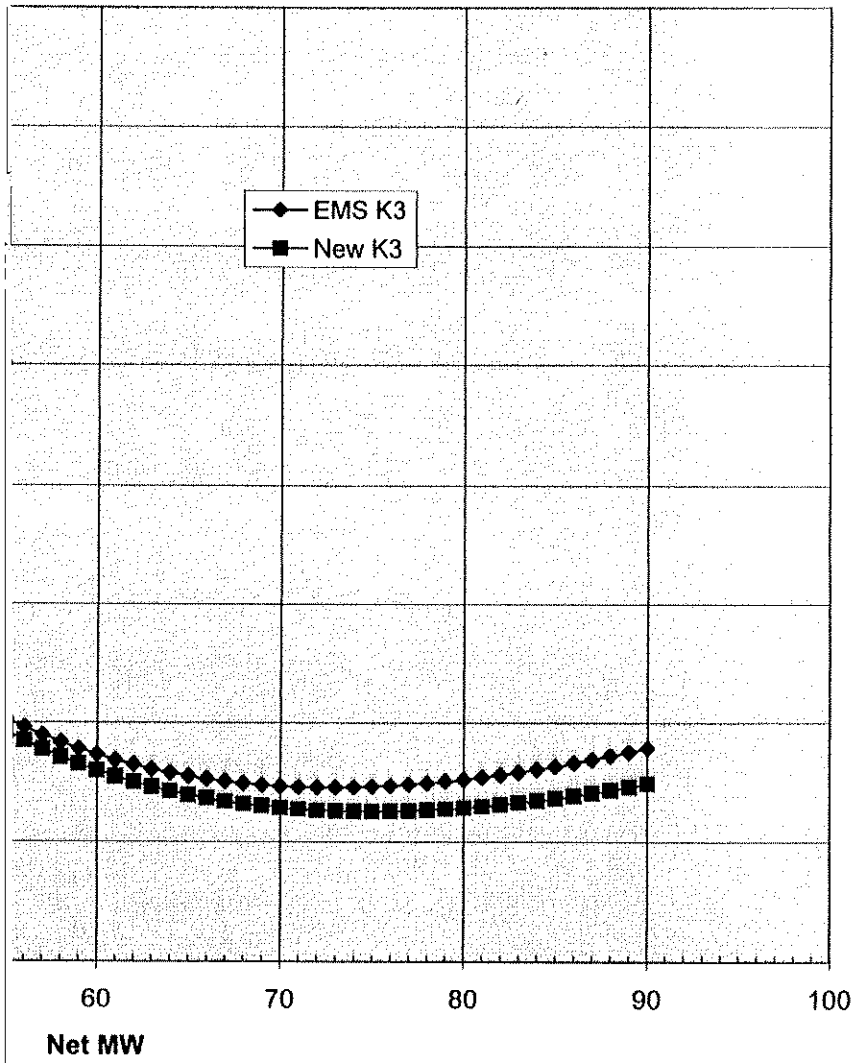
3.405739
3.420067
3.453327

HR Curve Plot 2/24/2005

eat Rate Plot



K3PIABCCalc0702.xls

NHR Data

EMS K3	New K3		1st
105.26819	103.62352	0.0198551x2 + 6.9999611x + 105.2681941	65.34712
6.9999611	7.0840666		8.183594
0.0198551	0.0184625		0.011394

Net MW

	EMS K3	New K3	Diff (New - EMS)
30	11,105	11,092	(12)
31	11,011	10,999	(12)
32	10,925	10,913	(12)
33	10,845	10,833	(12)
34	10,771	10,760	(12)
35	10,703	10,691	(12)
36	10,639	10,627	(12)
37	10,580	10,568	(12)
38	10,525	10,513	(12)
39	10,473	10,461	(12)
40	10,426	10,413	(13)
41	10,382	10,368	(13)
42	10,340	10,327	(14)
43	10,302	10,288	(14)
44	10,266	10,251	(15)
45	10,233	10,218	(15)
46	10,202	10,186	(16)
47	10,173	10,157	(16)
48	10,146	10,129	(17)
49	10,121	10,103	(18)
50	10,098	10,080	(18)
51	10,077	10,057	(19)
52	10,057	10,037	(20)
53	10,038	10,018	(21)
54	10,022	10,000	(22)
55	10,006	9,984	(22)
56	9,992	9,968	(23)
57	9,979	9,954	(24)
58	9,967	9,942	(25)
59	9,956	9,930	(26)
60	9,946	9,919	(27)
61	9,937	9,909	(28)
62	9,929	9,900	(29)
63	9,922	9,892	(30)
64	9,916	9,885	(31)
65	9,910	9,878	(32)
66	9,905	9,873	(33)
67	9,901	9,868	(34)
68	9,898	9,863	(35)
69	9,896	9,860	(36)
70	9,894	9,857	(37)
71	9,892	9,854	(38)
72	9,892	9,853	(39)
73	9,891	9,851	(40)
74	9,892	9,851	(41)
75	9,893	9,850	(42)
76	9,894	9,851	(43)
77	9,896	9,851	(44)
78	9,898	9,853	(46)
79	9,901	9,854	(47)
80	9,904	9,856	(48)
81	9,908	9,859	(49)
82	9,912	9,862	(50)
83	9,916	9,865	(51)
84	9,921	9,869	(52)
85	9,926	9,872	(54)
86	9,932	9,877	(55)
87	9,937	9,881	(56)
88	9,943	9,886	(57)
89	9,950	9,892	(58)
90	9,957	9,897	(60)

Small Reheat Unit, HR Adjustment from 75 Degr. F

	Coefficients			
Temp. Rise		x2	x	constant
1	76	2.1476E-07	- 4.0812E-05	1.0027E+00
2	77	4.4654E-07	- 8.4556E-05	1.0055E+00
3	78	6.4158E-07	- 1.2225E-04	1.0083E+00
4	79	8.5921E-07	- 1.6336E-04	1.0112E+00
5	80	1.1974E-06	- 2.2083E-04	1.0147E+00
6	81	1.7181E-06	- 3.0262E-04	1.0190E+00
7	82	2.2406E-06	- 3.8429E-04	1.0234E+00
8	83	2.6258E-06	- 4.4887E-04	1.0273E+00
9	84	2.6804E-06	- 4.7109E-04	1.0300E+00
10	85	2.7406E-06	- 4.9474E-04	1.0328E+00

Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

See HRCondImpact.xls

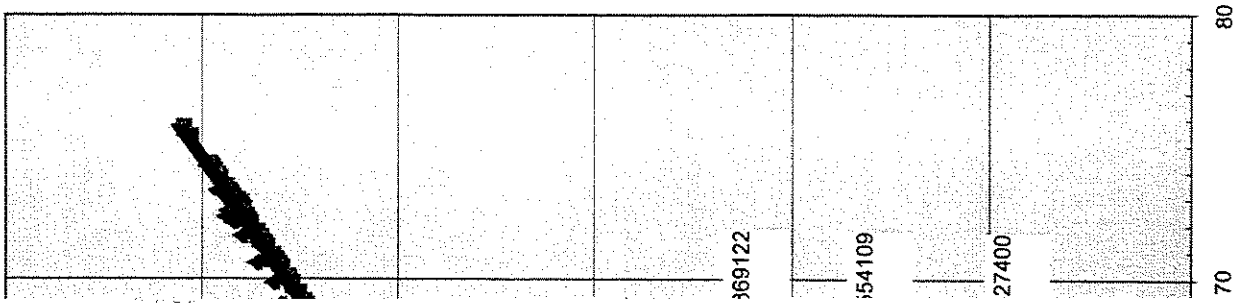
Check on PI ABC Calculation

K3 Data

	Actual Net KWH	Mbtu	NHR	Operational Net KWH	OPNHR Rpt1	EMS	PI-CWIT Corr	OPNHR Var Rpt1	EMS	PI-CWIT Corr	Mbtu Rpt1	EMS	PI-CWIT Corr
6/1/2002	1,472,300	14,455	9,818	1,472,210	9,787	9,943	9,910	31	(125)	(93)	14,408	14,638	14,590
6/2/2002	1,563,300	15,260	9,761	1,554,565	9,754	9,921	9,887	7	(160)	(126)	15,164	15,423	15,370
6/3/2002	1,693,900	16,672	9,842	1,693,348	9,741	9,949	9,902	101	(107)	(59)	16,496	16,848	16,767
6/4/2002	1,585,600	15,648	9,869	1,587,374	9,777	9,982	9,932	92	(113)	(63)	15,519	15,846	15,766
6/5/2002	1,475,700	14,576	9,878	1,479,802	9,796	9,973	9,932	81	(96)	(55)	14,497	14,759	14,698
6/6/2002	1,609,800	15,811	9,822	1,608,998	9,764	9,969	9,920	58	(147)	(98)	15,710	16,040	15,961
6/7/2002	1,406,500	13,853	9,849	1,411,941	9,820	9,984	9,945	30	(135)	(96)	13,865	14,096	14,042
6/8/2002	1,428,200	14,052	9,839	1,420,751	9,810	9,960	9,928	30	(120)	(89)	13,937	14,150	14,105
6/9/2002	1,387,400	13,626	9,821	1,384,984	9,828	9,974	9,943	(7)	(153)	(122)	13,612	13,814	13,771
6/10/2002	1,506,400	14,840	9,852	1,503,920	9,797	9,986	9,941	54	(134)	(89)	14,735	15,018	14,950
6/11/2002	1,350,500	13,327	9,868	1,352,386	9,852	10,011	9,973	16	(143)	(105)	13,324	13,539	13,487
6/12/2002	1,344,300	13,321	9,909	1,335,767	9,869	10,036	9,993	40	(126)	(84)	13,183	13,405	13,349
6/13/2002	1,436,800	14,490	10,085	1,445,007	9,828	10,014	9,968	256	71	117	14,202	14,470	14,404
6/14/2002	1,387,000	13,687	9,868	1,403,083	9,827	9,992	9,953	41	(123)	(85)	13,788	14,019	13,965
6/15/2002	1,405,100	13,708	9,756	1,405,131	9,811	9,959	9,927	(55)	(203)	(171)	13,785	13,993	13,949
6/16/2002	1,359,800	13,518	9,941	1,340,530	9,844	9,987	9,955	98	(45)	(14)	13,196	13,388	13,345
6/17/2002	1,414,000	13,821	9,774	1,412,894	9,828	9,999	9,958	(54)	(225)	(184)	13,887	14,128	14,070
6/18/2002	1,488,800	14,797	9,939	1,488,404	9,800	9,985	9,941	139	(45)	(2)	14,587	14,861	14,796
6/19/2002	1,457,800	14,689	10,076	1,506,506	9,782	9,949	9,913	294	126	163	14,736	14,989	14,934
6/20/2002	1,444,300	14,168	9,810	1,437,850	9,804	9,959	9,926	5	(149)	(116)	14,097	14,319	14,272
6/21/2002	1,432,000	14,144	9,877	1,446,488	9,808	9,980	9,940	69	(103)	(63)	14,188	14,436	14,378
6/22/2002	1,557,200	15,242	9,788	1,555,349	9,752	9,918	9,884	36	(130)	(96)	15,168	15,426	15,373
6/23/2002	1,470,000	14,404	9,798	1,465,508	9,789	9,944	9,912	10	(146)	(113)	14,346	14,573	14,526
6/24/2002	1,538,600	15,186	9,870	1,549,831	9,790	9,991	9,942	80	(121)	(72)	15,173	15,485	15,409
6/25/2002	1,409,900	13,818	9,801	1,397,286	9,826	9,988	9,950	(25)	(187)	(149)	13,730	13,956	13,903
6/26/2002	1,439,500	14,226	9,882	1,448,764	9,809	9,982	9,941	74	(99)	(59)	14,210	14,461	14,402
6/27/2002	1,423,600	14,004	9,837	1,421,385	9,817	9,984	9,945	19	(147)	(109)	13,954	14,191	14,136
6/28/2002	1,437,600	14,196	9,875	1,447,659	9,802	9,970	9,932	73	(95)	(57)	14,190	14,433	14,378
Sum/Avg	40,925,900	403,540	9,861	40,977,720	9,804	9,975	9,935	57	(114)	**(75)**	401,685	408,703	407,095
			Diff from Act	0.127%							-0.46%	1.28%	**0.88%**

SUPPORTING WORKPAPERS FOR KAHE 4

2/24/2005



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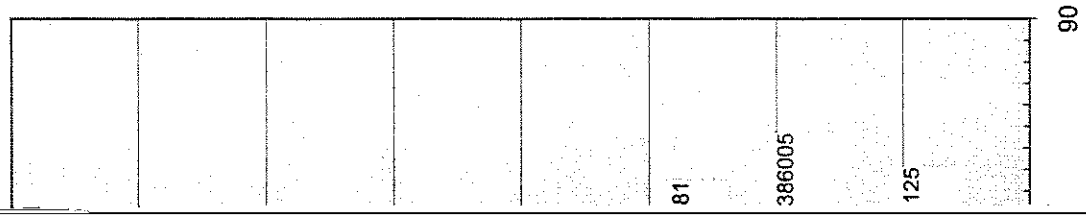

traction

			16888.46753	76.23274	85.7942125		CWIT Adjustment			79	80	78.6				
				7.2786449	7.6737417		Actual Conditions			Average Conditions			Adjustment			
W		K4NtMW	K4MBtuperHr	0.0141013	0.0131897	78.33497	Low	High	Interpolated	Low	High	Interpolated		Adjusted		Aux MW Cl
			PI Data	EMS Gr I/O	EMS Net I/O	K1CWITAvg								Gross I/O-CW	Net I/O-CWIT	Corr.
57	72.39632	72.79066	703.9014893	710.291528	714.2562712	78.317924	1.003749	1.004835	1.00409469	1.004835	1.005927	1.00439877	1.00030284	704.1146602	704.1147	3.149124
43	72.39428	72.78857	703.8827515	710.271979	714.2362156	78.318207	1.003749	1.004836	1.00409507	1.004836	1.005927	1.00439885	1.00030254	704.0957062	704.0957	3.149139
33	72.39222	72.78647	703.8640137	710.252358	714.216087	78.318489	1.00375	1.004836	1.00409545	1.004836	1.005927	1.00439893	1.00030224	704.0767523	704.0768	3.149155
76	72.39017	72.78438	703.8452759	710.23281	714.1960316	78.318779	1.00375	1.004836	1.00409583	1.004836	1.005927	1.00439901	1.00030194	704.0577925	704.0578	3.14917
35	72.38812	72.78229	703.8265991	710.213261	714.1759764	78.319061	1.00375	1.004836	1.00409621	1.004836	1.005928	1.00439909	1.00030164	704.0388996	704.0389	3.149185
23	72.38607	72.7802	703.8078613	710.193641	714.1559213	78.319344	1.00375	1.004836	1.00409659	1.004836	1.005928	1.00439916	1.00030134	704.0199456	704.0199	3.149193
96	72.38402	72.7781	703.7891235	710.174092	714.1357931	78.319626	1.00375	1.004836	1.00409697	1.004836	1.005928	1.00439924	1.00030104	704.0009917	704.001	3.149216
69	72.38197	72.77601	703.7703857	710.154544	714.1157382	78.319908	1.00375	1.004836	1.00409735	1.004836	1.005928	1.00439932	1.00030074	703.9820378	703.982	3.149231
43	72.37991	72.77392	703.751709	710.134924	714.0956834	78.320198	1.00375	1.004836	1.00409774	1.004836	1.005928	1.0043994	1.00030043	703.9631391	703.9631	3.149239
16	72.37787	72.77183	703.7329712	710.115376	714.0756287	78.32048	1.00375	1.004836	1.00409812	1.004836	1.005928	1.00439948	1.00030013	703.9441852	703.9442	3.149254
89	72.37582	72.76973	703.7142334	710.095828	714.055501	78.320763	1.00375	1.004836	1.0040985	1.004836	1.005928	1.00439956	1.00029983	703.9252312	703.9252	3.149277
53	72.37376	72.76764	703.6954956	710.076208	714.0354466	78.321045	1.00375	1.004836	1.00409887	1.004836	1.005928	1.00439964	1.00029954	703.9062773	703.9063	3.149284
36	72.37171	72.76555	703.6767578	710.056661	714.0153923	78.321335	1.00375	1.004836	1.00409926	1.004836	1.005928	1.00439972	1.00029923	703.8873176	703.8873	3.1493
09	72.36966	72.76345	703.6580811	710.037113	713.9952649	78.321617	1.00375	1.004836	1.00409964	1.004836	1.005928	1.0043998	1.00029893	703.8684248	703.8684	3.149323
82	72.36761	72.76136	703.6393433	710.017494	713.9752108	78.321899	1.00375	1.004837	1.00410002	1.004837	1.005928	1.00439987	1.00029863	703.8494709	703.8495	3.14933
56	72.36556	72.75927	703.6206055	709.997947	713.9551568	78.322182	1.00375	1.004837	1.0041004	1.004837	1.005928	1.00439995	1.00029833	703.830517	703.8305	3.149345
29	72.36351	72.75718	703.6018677	709.978399	713.935103	78.322472	1.003751	1.004837	1.00410079	1.004837	1.005929	1.00440003	1.00029802	703.8115573	703.8116	3.149361
02	72.36145	72.75508	703.5831909	709.958781	713.9149761	78.322754	1.003751	1.004837	1.00410117	1.004837	1.005929	1.00440011	1.00029772	703.7926645	703.7927	3.149376
76	72.35941	72.75299	703.5644531	709.939234	713.8949224	78.323036	1.003751	1.004837	1.00410154	1.004837	1.005929	1.00440019	1.00029742	703.7737106	703.7737	3.149391
49	72.35736	72.7509	703.5457153	709.919687	713.8748689	78.323318	1.003751	1.004837	1.00410192	1.004837	1.005929	1.00440027	1.00029713	703.7547568	703.7548	3.149406
22	72.3553	72.74881	703.5269775	709.900068	713.8548155	78.323608	1.003751	1.004837	1.00410231	1.004837	1.005929	1.00440035	1.00029682	703.7357971	703.7358	3.149414
96	72.35325	72.74671	703.5082397	709.880522	713.8346891	78.323891	1.003751	1.004837	1.00410269	1.004837	1.005929	1.00440043	1.00029652	703.7168433	703.7168	3.149437
69	72.3512	72.74462	703.489563	709.860975	713.8146359	78.324173	1.003751	1.004837	1.00410307	1.004837	1.005929	1.0044005	1.00029622	703.6979505	703.698	3.149452
42	72.34915	72.74253	703.4708252	709.841357	713.7945829	78.324455	1.003751	1.004837	1.00410345	1.004837	1.005929	1.00440058	1.00029592	703.6789967	703.679	3.14946
15	72.3471	72.74043	703.4520874	709.821811	713.7744568	78.324745	1.003751	1.004837	1.00410384	1.004837	1.005929	1.00440066	1.00029561	703.660037	703.66	3.149483
89	72.34505	72.73834	703.4333496	709.802265	713.7544039	78.325027	1.003751	1.004837	1.00410422	1.004837	1.005929	1.00440074	1.00029531	703.6410832	703.6411	3.149498
62	72.343	72.73625	703.4146729	709.782647	713.7343512	78.32531	1.003751	1.004838	1.0041046	1.004838	1.005929	1.00440082	1.00029501	703.6221905	703.6222	3.149506
35	72.34095	72.73416	703.3959351	709.763101	713.7142987	78.325592	1.003751	1.004838	1.00410497	1.004838	1.005929	1.0044009	1.00029472	703.6032367	703.6032	3.149521
09	72.3389	72.73206	703.3771973	709.743556	713.694173	78.325882	1.003751	1.004838	1.00410536	1.004838	1.00593	1.00440098	1.00029441	703.5842771	703.5843	3.149544
82	72.33684	72.72997	703.3584595	709.723938	713.6741207	78.326164	1.003751	1.004838	1.00410574	1.004838	1.00593	1.00440106	1.00029411	703.5653233	703.5653	3.149551
55	72.33479	72.72788	703.3397827	709.704393	713.6540684	78.326447	1.003751	1.004838	1.00410612	1.004838	1.00593	1.00440114	1.00029381	703.5464305	703.5464	3.149567
29	72.33275	72.72579	703.3210449	709.684847	713.6340163	78.326729	1.003752	1.004838	1.0041065	1.004838	1.00593	1.00440122	1.00029351	703.5274767	703.5275	3.149582
02	72.33069	72.72369	703.3023071	709.66523	713.6138911	78.327011	1.003752	1.004838	1.00410688	1.004838	1.00593	1.00440129	1.00029321	703.508523	703.5085	3.149597
75	72.32864	72.7216	703.2835693	709.645685	713.5938392	78.327301	1.003752	1.004838	1.00410727	1.004838	1.00593	1.00440137	1.0002929	703.4895634	703.4896	3.149612
48	72.32659	72.71951	703.2648315	709.62614	713.5737875	78.327583	1.003752	1.004838	1.00410765	1.004838	1.00593	1.00440145	1.0002926	703.4706096	703.4706	3.149628
22	72.32454	72.71742	703.2461548	709.606523	713.5537358	78.327866	1.003752	1.004838	1.00410803	1.004838	1.00593	1.00440153	1.0002923	703.451717	703.4517	3.149635
95	72.32249	72.71532	703.227417	709.586979	713.5336111	78.328148	1.003752	1.004838	1.00410841	1.004838	1.00593	1.00440161	1.00029201	703.4327632	703.4328	3.149658
68	72.32044	72.71323	703.2086792	709.567434	713.5135596	78.328438	1.003752	1.004838	1.00410879	1.004838	1.00593	1.00440169	1.0002917	703.4138037	703.4138	3.149673
42	72.31838	72.71114	703.1899414	709.547818	713.4935083	78.32872	1.003752	1.004839	1.00410917	1.004839	1.00593	1.00440177	1.0002914	703.3948499	703.3948	3.149681
15	72.31633	72.70905	703.1712646	709.528273	713.473384	78.329002	1.003752	1.004839	1.00410955	1.004839	1.005931	1.00440185	1.0002911	703.3759572	703.376	3.149704
88	72.31429	72.70695	703.1625269	709.508729	713.4533329	78.329285	1.003752	1.004839	1.00410993	1.004839	1.005931	1.00440193	1.0002908	703.3570035	703.357	3.149719
61	72.31223	72.70486	703.1337891	709.489113	713.4332819	78.329575	1.003752	1.004839	1.00411032	1.004839	1.005931	1.00440201	1.00029049	703.338044	703.338	3.149727
35	72.31018	72.70277	703.1150513	709.469569	713.4132311	78.329857	1.003752	1.004839	1.0041107	1.004839	1.005931	1.00440208	1.00029019	703.3190903	703.3191	3.149742
08	72.30813	72.70068	703.0963745	709.450025	713.3931071	78.330139	1.003752	1.004839	1.00411108	1.004839	1.005931	1.00440216	1.00028989	703.3001976	703.3002	3.149765
81	72.30608	72.69859	703.0776367	709.43041	713.3730565	78.330421	1.003752	1.004839	1.00411146	1.004839	1.005931	1.00440224	1.00028959	703.281244	703.2812	3.149773
55	72.30403	72.6965	703.0588989	709.410866	713.353006	78.330711	1.003752	1.004839	1.00411185	1.004839	1.005931	1.00440232	1.00028929	703.2622845	703.2623	3.149788
28	72.30198	72.6944	703.0401611	709.391322	713.3329556	78.330994	1.003753	1.004839	1.00411223	1.004839	1.005931	1.0044024	1.00028899	703.2433308	703.2433	3.149803
01	72.29992	72.69231	703.0214233	709.371707	713.3128322	78.331276	1.003753	1.004839	1.00411261	1.004839	1.005931	1.00440248	1.00028869	703.2243771	703.2244	3.149818
75	72.29788	72.69022	703.0027466	709.352164	713.292782	78.331558	1.003753	1.004839	1.00411298	1.004839	1.005931	1.00440256	1.00028839	703.2054845	703.2055	3.149834
48	72.29583	72.68813	702.9840088	709.332621	713.272732	78.331848	1.003753	1.004839	1.00411337	1.004839	1.005931	1.00440264	1.00028808	703.186525	703.1865	3.149849
21	72.29377	72.68603	702.965271	709.313006	713.2526089	78.33213	1.003753	1.00484	1.00411375	1.00484	1.005931	1.00440272	1.00028778	703.1675714	703.1676	3.149864
94	72.29172	72.68394	702.9465332	709.293463	713.2325591	78.332413	1.003753	1.00484	1.00411413	1.00484	1.005932	1.0044028	1.00028748	703.1486177	703.1486	3.149879
68	72.28967	72.68185	702.9278564	709.27392	713.2125094	78.332695	1.003753	1.00484	1.00411451	1.00484	1.005932	1.00440288	1.00028718	703.1297251	703.1297	3.149895
41	72.28762	72.67976	702.9091187	709.254306	713.1924598	78.332985	1.003753	1.00484	1.0041149	1.00484	1.005932	1.00440296	1.00028687	703.1107657	703.1108	3.149902
14	72.28557	72.67766	702.8903809	709.234763	713.1723371	78.333267	1.003753	1.00484	1.00411528	1.00484	1.005932	1.00440303	1.00028658	703.091812	703.0918	3.149925
88	72.28352	72.67557	702.8716431	709.215221	713.1522878	78.333549	1.003753	1.00484	1.00411566	1.00484	1.005932	1.00440311	1.00028628	703.0728584	703.0729	3.14994
61	72.28146	72.67348	702.8529053	709.195606	713.1322385	78.333832	1.003753	1.00484	1.00411604	1.00484	1.005932	1.00440319	1.00028598	703.0539048	703.0539	3.149948
34	72.27942	72.67139	702.8342285	709.176064	713.1121894	78.334114	1.003753	1.00484	1.00411642	1.00484	1.005932	1.00440327	1.00028568	703.0350122	703.035	3.149963
07	72.27737	72.66929	702.8154907	709.156522	713.0920672	78.334404	1.003753	1.00484	1.00411681	1.00484	1.005932	1.00440335	1.00028537	703.0160528	703.0161	3.149986
81	72.27531	72.6672	702.7967529	709.136908	713.0720184	78.334686	1.003753	1.00484	1.00411719	1.00484	1.005932	1.00440343	1.00028507	702.9970992	702.9971	3.149994
54	72.27326	72.66511	702.7780151	709.117367	713.0519696	78.334969	1.003754	1.00484	1.00411757	1.00484	1.005932	1.00440351	1.00028477	702.9781456	702.9781	3.150009
27	72.27121	72.66301	702.7593384	709.097825	713.0318478	78.335251	1.003754	1.00484	1.00411795	1.00484	1.005932	1.00440359	1.00028447	702.9592531	702.9593	3.150032
18	72.26916	72.66092	702.7406006	709.078211	713.0117992	78.335541	1.003754	1.00484	1.00411833	1.00484	1.005933	1.00440367	1.00028416	702.9402937	702.9403	3.15004
74	72.26711	72.65883	702.7218628	709.05867	712.9917508	78.335823	1.003754	1.004841	1.00411871	1.004841	1.005933	1.00440375	1.00028386	702.9213402	702.9213	3.150055
47	72.26506	72.65674	702.703125	709.039129	712.9717025	78.336105	1.003754	1.004841	1.00411909	1.004841	1.005933	1.00440383	1.00028356	702.9023866	702.9024	3.15007
172	72.26301	72.65464	702.6844482	709.019516	712.9515811	78.336388	1.003754	1.004841	1.00411947	1.004841	1.005933	1.00440391	1.00028326	702.8834941	702.8835	3.150085
394	72.26096	72.65255	702.6657104	708.999976	712.931533	78.336678	1.003754	1.004841	1.00411986	1.004841	1.005933	1.00440399	1.00028296	702.8645347	702.8645	3.150101
367	72.25891	72.65046	702.6469727	708.980434	712.9114851	78.33696	1.003754	1.004841	1.00412024	1.004841	1.005933	1.00440406	1.00028266	702.8455812	702.8456	3.150116
164	72.25685	72.64837	702.6282349	708.960821	712.8914372	78.337242	1.003754	1.004841	1.00412062	1.004841	1.005933	1.00440414	1.00028236	702.8266276	702.8266	3.150124
514	72.2548	72.64627	702.6094971	708.94128	712.8713163	78.337524	1.003754	1.004841	1.004121	1.004841	1.005933	1.00440422	1.00028206	702.8076741	702.8077	3.150146
587	72.25276	72.64418	702.5908203	708.92174	712.8512687	78.337814	1.003754	1.004841	1.00412139	1.004841	1.005933	1.0044043	1.00028176	702.7887758	702.7888	3.150162
156	72.2507	72.64209	702.5720825	708.902127	712.8312212	78.338097	1.003754	1.004841	1.00412177	1.004841	1.005933	1.00440438	1.00028145	702.7698223	702.7698	3.150169
533	72.24865	72.64	702.5533447	708.882587	712.8111738	78.338379	1.003754	1.004841	1.00412215	1.004841	1.005933	1.00440446	1.00028115	702.7508688	702.7509	3.150185
507	72.2466	72.6379	702.5346069	708.863047	712.7910533	78.338661	1.003754	1.004841	1.00412253	1.004841	1.005933	1.00440454	1.00028085	702.7319153	702.7319	3.150208
148	72.24455	72.63581	702.5159302	708.843435	712.7710062	78.338951	1.003754	1.004841	1.00412292	1.004841	1.005934	1.00440462	1.00028054	702.713017	702.713	3.150215
453	72.2425	72.63372	702.4971924	708.823895	712.7509591	78.339233	1.003755	1.004842	1.0041233	1.004842	1.005934	1.0044047	1.00028024	702.6940635	702.6941	3.15023
427	72.24045	72.63162	702.4784546	708.804355	712.7308391	78.339516	1.003755	1.004842	1.00412368	1.004842	1.005934	1.00440478	1.00027995	702.67511	702.6751	3.150253
414	72.23839	72.62953	702.4597168	708.784743	712.7107922	78.339798	1.003755	1.004842	1.00412406	1.004842	1.005934	1.00440486	1.00027965	702.6561566	702.6562	3.150261
373	72.23634	72.62744	702.440979	708.765204	712.6907455	78.340088	1.003755	1.004842	1.00412445	1.004842	1.005934	1.00440494	1.00027934	702.6371973	702.6372	3.150276
347	72.2343	72.62535	702.4223022	708.745664	712.670699	78.34037	1.003755	1.004842	1.00412483	1.004842	1.005934	1.00440502	1.00027904	702.6183049	702.6183	3.150291
132	72.23224	72.62325	702.4035645	708.726053	712.6505793	78.340652	1.003755	1.004842	1.00412521	1.004842	1.005934	1.0044051	1.00027874	702.5993514	702.5994	3.150307
293	72.23019	72.62116	702.3848267	708.706514	712.630533	78.340935	1.003755	1.004842	1.00412559	1.004842	1.005934	1.00440518	1.00027844	702.5803979	702.5804	3.150322
266	72.22814	72.61907	702.3660889	708.686903	712.6104867	78.341217	1.003755	1.004842	1.00412597	1.004842	1.005934	1.00440525	1.00027814	702.5614445	702.5614	3.15033
124	72.22609	72.61698	702.3474121	708.667364	712.5904406	78.341507	1.003755	1.004842	1.00412636	1.004842	1.005934	1.00440533	1.00027783	702.5425463	702.5425	3.150345
213	72.22404	72.61488	702.3286743	708.647825	712.5703215	78.341789	1.003755	1.004842	1.00412674	1.004842	1.005934	1.00440541	1.00027753	702.5235929	702.5236	3.150368
186	72.22198	72.61279	702.3099365	708.628214	712.5502756	78.342072	1.003755	1.004842	1.00412712	1.004842	1.005935	1.00440549	1.00027723	702.5046394	702.5046	3.150375
116	72.21993	72.6107	702.2911987	708.608675	712.5302298	78.342354	1.003755	1.004842	1.0041275	1.004842	1.005935	1.00440557	1.00027693	702.485686	702.4857	3.150391
133	72.21789	72.6086	702.272522	708.589137	712.510111	78.342644	1.003755	1.004843	1.00412789	1.004843	1.005935	1.00440565	1.00027662	702.4667878	702.4668	3.150414
106	72.21583	72.60651	702.2537842	708.569527	712.4900654	78.342926	1.003755	1.004843	1.00412827	1.004843	1.005935	1.00440573	1.00027632	702.4478344	702.4478	3.150421
108	72.21378	72.60442	702.2350464	708.549988	712.47002	78.343208	1.003756	1.004843	1.00412865	1.004843	1.005935	1.00440581	1.00027603	702.428881	702.4289	3.150436
053	72.21173	72.60233	702.2163086	708.53045	712.4499747	78.343491	1.003756	1.004843	1.00412903	1.004843	1.005935	1.00440589	1.00027573	702.4099276	702.4099	3.150452
028	72.20968	72.60023	702.1975708	708.51084	712.4298563	78.343781	1.003756	1.004843	1.00412942	1.004843	1.005935	1.00440597	1.00027542	702.3909684	702.391	3.150467
999	72.20763	72.59814	702.178894	708.491302	712.4098113	78.344063	1.003756	1.004843	1.0041298	1.004843	1.005935	1.00440605	1.00027512	702.3720761	702.3721	3.150482
973	72.20558	72.59605	702.1601563	708.471765	712.3897663	78.344345	1.003756	1.004843	1.00413018	1.004843	1.005935	1.00440613	1.00027482	702.3531227	702.3531	3.150497
946	72.20352	72.59396	702.1414185	708.452155	712.3697214	78.344627	1.003756	1.004843	1.00413056	1.004843	1.005935	1.00440621	1.00027452	702.3341693	702.3342	3.150505
919	72.20147	72.59187	702.1226807	708.432618	712.3496035	78.344917	1.003756	1.004843	1.00413094	1.004843	1.005935	1.00440629	1.00027421	702.3152102	702.3152	3.150528
893	72.19943	72.58978	702.1040039	708.41308	712.3295589	78.3452	1.003756	1.004843	1.00413132	1.004843	1.005936	1.00440637	1.00027391	702.2963178	702.2963	3.150543
866	72.19737	72.58768	702.0852661	708.393471	712.3095144	78.345482	1.003756	1.004843	1.00413171	1.004843	1.005936	1.00440645	1.00027361	702.2773645	702.2774	3.150551
839	72.19532	72.58559	702.0665283	708.373934	712.28947	78.345764	1.003756	1.004843	1.00413209	1.004843	1.005936	1.00440653	1.00027331	702.2584111	702.2584	3.150566
812	72.19327	72.5835	702.0477905	708.354397	712.2693526	78.346054	1.003756	1.004844	1.00413247	1.004844	1.005936	1.00440661	1.000273	702.239452	702.2395	3.150589
786	72.19122	72.58141	702.0290527	708.334788	712.2493084	78.346336	1.003756	1.004844	1.00413286	1.004844	1.005936	1.00440669	1.0002727	702.2204987	702.2205	3.150597
759	72.18917	72.57932	702.010376	708.315251	712.2292644	78.346619	1.003756	1.004844	1.00413324	1.004844	1.005936	1.00440677	1.0002724	702.2016064	702.2016	3.150612
732	72.18712	72.57722	701.9916382	708.295714	712.2091473	78.346901	1.003756	1.004844	1.00413362	1.004844	1.005936	1.00440684	1.0002721	702.182653	702.1827	3.150635
706	72.18508	72.57513	701.9729004	708.276106	712.1891035	78.347191	1.003756	1.004844	1.004134	1.004844	1.005936	1.00440692	1.0002718	702.1636939	702.1637	3.150642
679	72.18301	72.57304	701.9541626	708.256569	712.1690598	78.347473	1.003757	1.004844	1.00413439	1.004844	1.005936	1.004407	1.0002715	702.1447406	702.1447	3.150658
652	72.18097	72.57095	701.9354858	708.237033	712.1490162	78.347755	1.003757	1.004844	1.00413477	1.004844	1.005936	1.00440708	1.0002712	702.1258484	702.1258	3.150673
626	72.17891	72.56885	701.916748	708.217425	712.1288996	78.348038	1.003757	1.004844	1.00413515	1.004844	1.005936	1.00440716	1.0002709	702.1068951	702.1069	3.150688
599	72.17686	72.56676	701.8980103	708.197889	712.1088563	78.34832	1.003757	1.004844	1.00413553	1.004844	1.005936	1.00440724	1.0002706	702.0879418	702.0879	3.150703
572	72.17481	72.56467	701.8792725	709.178353	712.088813	78.34861	1.003757	1.004844	1.00413592	1.004844	1.005937	1.00440732	1.00027029	702.0689827	702.069	3.150719
545	72.17276	72.56258	701.8605957	708.158745	712.0687699	78.348892	1.003757	1.004844	1.0041363	1.004844	1.005937	1.0044074	1.00026999	702.0500905	702.0501	3.150726
519	72.17071	72.56048	701.8418579	708.13921	712.0486538	78.349174	1.003757	1.004844	1.00413668	1.004844	1.005937	1.00440748	1.00026969	702.0311372	702.0311	3.150749
492	72.16866	72.55839	701.8231201	708.119674	712.0286109	78.349457	1.003757	1.004844	1.00413706	1.004844	1.005937	1.00440756	1.00026939	702.0121839	702.0122	3.150764
465	72.1666	72.5563	701.8043823	708.100067	712.0085681	78.349747	1.003757	1.004845	1.00413745	1.004845	1.005937	1.00440764	1.00026908	701.9932249	701.9932	3.150772
438	72.16456	72.5542	701.7856445	708.080531	711.9884523	78.350029	1.003757	1.004845	1.00413783	1.004845	1.005937	1.00440772	1.00026878	701.9742716	701.9743	3.150795
412	72.16251	72.55211	701.7669678	708.060996	711.9684097	78.350311	1.003757	1.004845	1.00413821	1.004845	1.005937	1.0044078	1.00026848	701.9553794	701.9554	3.15081
385	72.16045	72.55002	701.74823	708.041389	711.9483673	78.350594	1.003757	1.004845	1.00413859	1.004845	1.005937	1.00440788	1.00026818	701.9364262	701.9364	3.150818
358	72.1584	72.54793	701.7294922	708.021854	711.928325	78.350883	1.003757	1.004845	1.00413898	1.004845	1.005937	1.00440796	1.00026787	701.9174671	701.9175	3.150833
332	72.15635	72.54583	701.7107544	708.002319	711.9082097	78.351166	1.003757	1.004845	1.00413936	1.004845	1.005937	1.00440804	1.00026757	701.8985139	701.8985	3.150856
305	72.1543	72.54374	701.6920776	707.982713	711.8881676	78.351448	1.003758	1.004845	1.00413974	1.004845	1.005937	1.00440812	1.00026727	701.8796217	701.8796	3.150864
278	72.15225	72.54165	701.6733398	707.963178	711.8681256	78.35173	1.003758	1.004845	1.00414012	1.004845	1.005938	1.0044082	1.00026697	701.8606685	701.8607	3.150879
251	72.1502	72.53958	701.6546021	707.943643	711.8480838	78.35202	1.003758	1.004845	1.00414051	1.004845	1.005938	1.00440828	1.00026667	701.8417095	701.8417	3.150894

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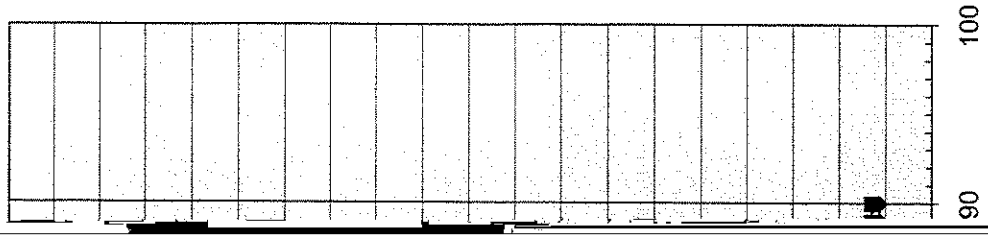
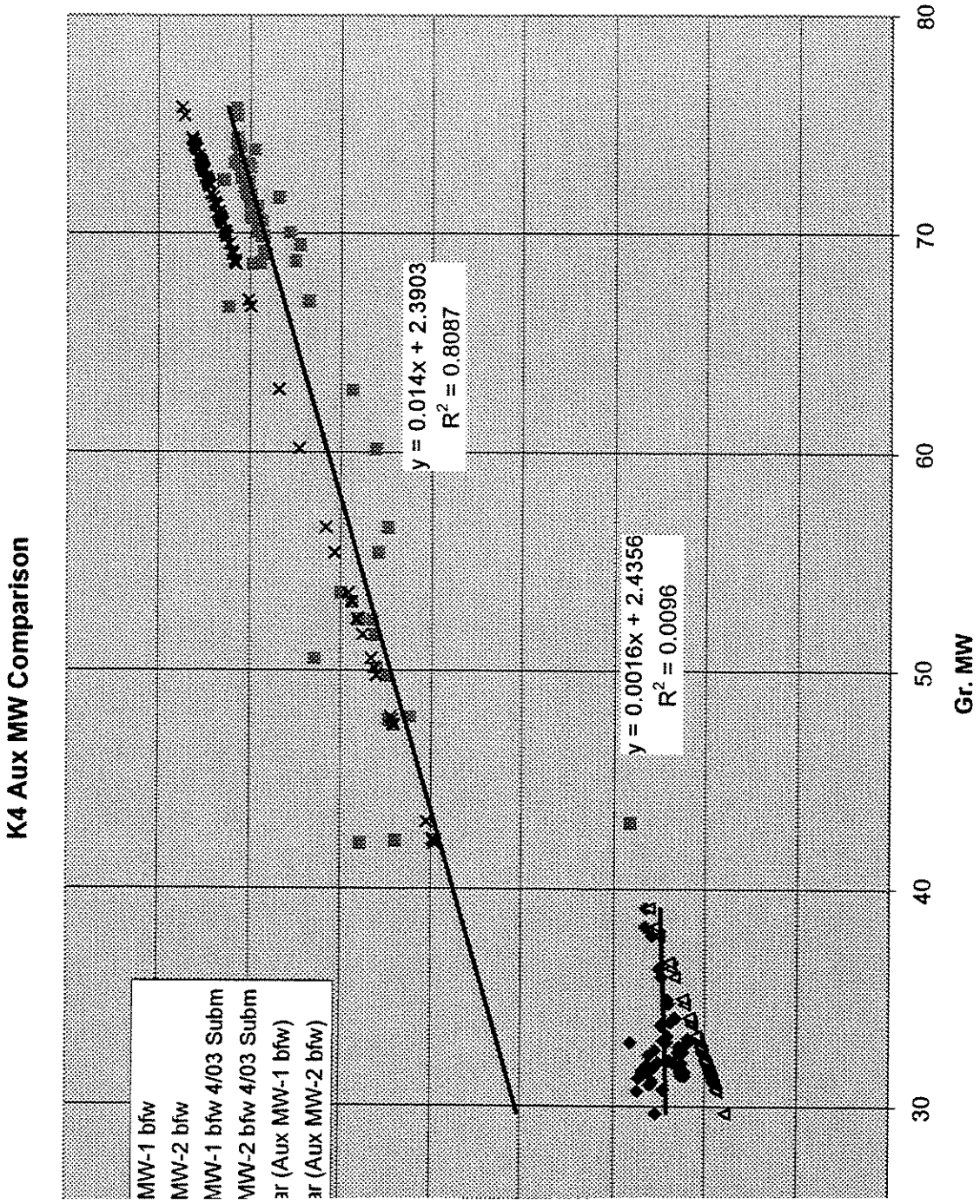
Number	Date-Time	K4GrMW	NtMW	K4MBtuperHr PI Data	EMS Gr I/O	EMS Net I/O	Adjusted-Mbtu/Hr Gross I/O-CWIT Corr.	Net I/O-CWIT Corr.	Checks CWIT	Aux MW	Manually Adjust Target Aux	Diff.
					76.23274	85.7942125						
					7.2786449	7.6737417						
					0.0141013	0.0131897						
1	4/25/2003 0:00	53.56348	50.3658	497.0762329	506.559544	505.746809	498.550768	498.550768	76.38427	3.197681	3.090959	0.106722
2	4/25/2003 0:15	52.39583	49.23744	501.0016174	496.316022	495.6057275	502.5209089	502.5209089	76.36941	3.158393	3.06854	0.089853
3	4/25/2003 0:30	51.67871	48.55607	486.7275391	490.043915	489.4982231	488.2275894	488.2275894	76.35454	3.122638	3.054771	0.067867
4	4/25/2003 0:45	49.78906	46.69113	471.5939331	473.586074	472.8442567	473.0945445	473.0945445	76.33967	3.097931	2.491363	0.606568
5	4/25/2003 1:00	47.74968	44.65721	452.1512451	455.937083	454.7858605	453.6402863	453.6402863	76.32481	3.092468	2.468481	0.623987
6	4/25/2003 1:15	42.07227	38.91772	399.7251587	407.422188	404.415757	401.1596293	401.1596293	76.30994	3.154541	2.404781	0.74976
7	4/25/2003 1:30	31.58899	29.14426	315.5635071	320.228959	320.6428785	316.8894606	316.8894606	76.29507	2.444733	2.287158	0.157574
8	4/25/2003 1:45	31.58541	29.14139	316.2907715	320.199727	320.6187182	317.6283339	317.6283339	76.2802	2.444016	2.287118	0.156898
9	4/25/2003 2:00	31.60398	29.14965	318.5991821	320.351453	320.6884279	319.9546899	319.9546899	76.26534	2.454331	2.287327	0.167004
10	4/25/2003 2:15	31.43994	28.99496	316.4790039	319.01162	319.3827674	317.8372271	317.8372271	76.25047	2.444977	2.285486	0.159491
11	4/25/2003 2:30	31.40797	28.96353	318.6641846	318.750581	319.1174965	320.0409935	320.0409935	76.2356	2.444443	2.285127	0.159315
12	4/25/2003 2:45	31.44629	28.99464	317.7419739	319.063451	319.3799869	319.1225773	319.1225773	76.22073	2.451654	2.285557	0.166097
13	4/25/2003 3:00	32.01204	29.56213	323.0541382	323.687635	324.1731085	324.4549215	324.4549215	76.20586	2.449912	2.291905	0.158007
14	4/25/2003 3:15	32.04163	29.53912	323.6789856	323.92968	323.9786188	325.0905029	325.0905029	76.191	2.502502	2.292237	0.210265
15	4/25/2003 3:30	32.49683	30.03855	326.4409485	327.657187	328.2035266	327.8637629	327.8637629	76.17613	2.458278	2.297344	0.160934
16	4/25/2003 3:45	32.76758	30.31097	332.2452087	329.877071	330.5109034	333.6964032	333.6964032	76.16126	2.456604	2.300382	0.156222
17	4/25/2003 4:00	32.41839	29.96577	326.1952515	327.014465	327.5874095	327.6293656	327.6293656	76.15767	2.452623	2.296464	0.156159
18	4/25/2003 4:15	33.04647	30.55632	333.6991272	332.165829	332.590611	335.1450427	335.1450427	76.17097	2.490145	2.303511	0.186633
19	4/25/2003 4:30	32.02051	29.5522	322.6925964	323.756891	324.0891183	324.1041369	324.1041369	76.18428	2.468312	2.292	0.176312
20	4/25/2003 4:45	32.16035	29.68264	324.8528137	324.901321	325.192037	326.2631735	326.2631735	76.19759	2.47771	2.293569	0.184141
21	4/25/2003 5:00	32.07617	29.59156	324.3510437	324.212362	324.4218816	325.7532141	325.7532141	76.21089	2.484614	2.292625	0.191989
22	4/25/2003 5:15	32.61367	30.10567	334.6210632	328.614934	328.7718906	336.0484351	336.0484351	76.2242	2.507996	2.298655	0.20934
23	4/25/2003 5:30	30.79346	28.30261	327.6764832	313.738753	313.5465979	329.1038358	329.1038358	76.2375	2.490845	2.278233	0.212612
24	4/25/2003 5:45	32.94043	30.37838	345.1890259	331.295355	331.082126	346.6382237	346.6382237	76.25081	2.562048	2.302322	0.259727
25	4/25/2003 6:00	31.62646	29.08926	330.5182495	320.535137	320.17864	331.9247304	331.9247304	76.26412	2.537201	2.287579	0.249622
26	4/25/2003 6:15	31.59644	29.07104	331.7187195	320.289792	320.0247916	333.122962	333.122962	76.27743	2.525398	2.287242	0.238156
27	4/25/2003 6:30	30.72571	28.17842	313.5619507	313.18686	312.5010173	314.8986786	314.8986786	76.29073	2.547293	2.277472	0.269821
28	4/25/2003 6:45	31.29639	28.75298	343.5666504	317.839739	317.3415035	345.010859	345.010859	76.30404	2.543409	2.283875	0.259534
29	4/25/2003 7:00	32.3553	29.83278	323.5767212	326.497682	326.4620476	324.9083691	324.9083691	76.31734	2.522522	2.295757	0.226765
30	4/25/2003 7:15	31.18549	28.67072	322.6524353	316.93485	316.6479727	323.9953444	323.9953444	76.33065	2.514771	2.282631	0.232139
31	4/25/2003 7:30	31.77686	29.26521	321.4279175	321.764236	321.6642319	322.7465357	322.7465357	76.34396	2.511645	2.289266	0.222379
32	4/25/2003 7:45	31.02588	28.50785	314.6838684	315.633079	315.2753678	315.9814379	315.9814379	76.35726	2.518024	2.28084	0.237184
33	4/25/2003 8:00	29.70398	27.19661	299.5493774	304.879408	304.2497699	300.8012526	300.8012526	76.37057	2.507374	2.266009	0.241365
34	4/25/2003 8:15	31.02588	28.50697	318.110199	315.633079	315.2678929	319.4064983	319.4064983	76.38388	2.518911	2.28084	0.238071
35	4/25/2003 8:30	31.90081	29.37365	319.8850708	322.777747	322.5802444	321.1644023	321.1644023	76.39719	2.527158	2.290657	0.2365
36	4/25/2003 8:45	42.19792	39.12162	410.3206482	408.486081	406.1903051	411.7262755	411.7262755	76.41049	3.076294	2.406191	0.670103
37	4/25/2003 9:00	50.56738	47.31222	491.0434875	480.352636	478.3804107	492.5321311	492.5321311	76.4238	3.255162	3.033434	0.221728
38	4/25/2003 9:15	66.65625	63.21088	648.093811	624.052775	623.559113	649.6995708	649.6995708	76.4371	3.445374	3.34234	0.103034
39	4/25/2003 9:30	69.1957	65.82646	647.5343018	647.401341	648.0820707	649.0881541	649.0881541	76.45041	3.36924	3.391097	-0.021858
40	4/25/2003 9:45	70.77474	67.37594	666.4916992	662.011272	662.6946291	668.0571936	668.0571936	76.46371	3.398804	3.421415	-0.022611
41	4/25/2003 10:00	71.37802	67.9795	670.3382568	667.611623	668.4037379	671.8941718	671.8941718	76.47702	3.398522	3.432998	-0.034476
42	4/25/2003 10:15	72.15039	68.73886	683.7883301	674.796652	675.6001985	685.3544302	685.3544302	76.49033	3.411532	3.447828	-0.036296
43	4/25/2003 10:30	72.82678	69.41199	683.9317017	681.102659	681.992183	685.4788773	685.4788773	76.50364	3.414793	3.460814	-0.046021
44	4/25/2003 10:45	73.23047	69.81226	688.8157959	684.872381	685.7987459	690.3586276	690.3586276	76.51694	3.418213	3.468565	-0.050352
45	4/25/2003 11:00	73.10558	69.68737	683.3068237	683.705679	684.6106222	684.8290857	684.8290857	76.53025	3.418213	3.466167	-0.047954
46	4/25/2003 11:15	72.93642	69.52044	685.138855	682.125997	683.0231001	686.6575191	686.6575191	76.54356	3.415981	3.462919	-0.046938
47	4/25/2003 11:30	73.14063	69.71466	687.5680542	684.033001	684.8702192	689.079469	689.079469	76.55686	3.425964	3.46684	-0.040876
48	4/25/2003 11:45	72.97188	69.55216	683.3987427	682.45707	683.324727	684.8932989	684.8932989	76.57017	3.419719	3.4636	-0.043881
49	4/25/2003 12:00	73.24789	69.81417	685.0748291	685.035137	685.8169677	686.5623539	686.5623539	76.57975	3.433716	3.468899	-0.035184
50	4/25/2003 12:15	73.53125	70.10627	686.0117798	687.684137	688.5975675	687.4922956	687.4922956	76.58707	3.424976	3.47434	-0.049364
51	4/25/2003 12:30	73.23307	69.81011	690.1345825	684.896691	685.7783101	691.6223181	691.6223181	76.59439	3.422962	3.468615	-0.045653
52	4/25/2003 12:45	74.11328	70.68413	691.8538818	693.132313	694.1049888	693.3287901	693.3287901	76.60171	3.429148	3.485515	-0.056367
53	4/25/2003 13:00	74.25352	70.82843	696.7739258	694.446437	695.4816239	698.2521069	698.2521069	76.60902	3.425086	3.488208	-0.063121
54	4/25/2003 13:15	74.38021	70.9504	695.3835449	695.634137	696.6456805	696.8517571	696.8517571	76.61635	3.42981	3.49064	-0.06083
55	4/25/2003 13:30	73.34654	69.91664	691.7020874	685.957155	686.79218	693.1697928	693.1697928	76.62366	3.429898	3.470794	-0.040895
56	4/25/2003 13:45	72.91992	69.50683	678.5009155	681.972012	682.8937634	679.940529	679.940529	76.63098	3.41309	3.462603	-0.049513
57	4/25/2003 14:00	72.56836	69.15162	686.4969482	678.691857	679.5183674	687.9525385	687.9525385	76.63831	3.416735	3.455853	-0.039118
58	4/25/2003 14:15	72.43295	68.97604	680.4319458	677.429343	677.8510474	681.8709665	681.8709665	76.64562	3.456909	3.453253	0.003657
59	4/25/2003 14:30	73.01937	69.59861	680.097229	682.900526	683.7664395	681.522746	681.522746	76.65294	3.42076	3.464512	-0.043752
60	4/25/2003 14:45	73.27385	69.84441	686.4641724	685.277755	686.1046805	687.8944178	687.8944178	76.66026	3.429443	3.469398	-0.039955
61	4/25/2003 15:00	73.2515	69.83526	685.1237793	685.06893	686.0176694	686.5460677	686.5460677	76.66758	3.41624	3.468969	-0.052728
62	4/25/2003 15:15	72.58984	69.17746	678.5812988	678.89221	679.7637779	679.9927396	679.9927396	76.6749	3.412382	3.456265	-0.043883
63	4/25/2003 15:30	72.25065	68.84105	680.9416504	675.730543	676.5698049	682.3568151	682.3568151	76.68222	3.409601	3.449752	-0.040152
64	4/25/2003 15:45	71.78906	68.39026	674.0842896	671.433273	672.2946095	675.4856191	675.4856191	76.68954	3.398805	3.44089	-0.042085
65	4/25/2003 16:00	71.82209	68.4131	675.3330078	671.740554	672.5111581	676.7310854	676.7310854	76.69685	3.408985	3.441524	-0.032539
66	4/25/2003 16:15	72.38965	68.989	683.0628662	677.025781	677.9741185	684.4642952	684.4642952	76.70417	3.400649	3.452421	-0.051773
67	4/25/2003 16:30	70.45248	67.06703	660.8702393	659.023827	659.7763538	662.2451096	662.2451096	76.71149	3.385448	3.415228	-0.029779
68	4/25/2003 16:45	72.36008	68.95863	687.2938843	676.750251	677.6858295	688.6933647	688.6933647	76.71881	3.401453	3.451854	-0.050401
69	4/25/2003 17:00	70.72852	67.33544	667.6817017	661.582566	662.3118715	669.0562902	669.0562902	76.72613	3.393078	3.420528	-0.027449
70	4/25/2003 17:15	70.12891	66.74561	657.034729	656.027235	656.7425434	658.3897529	658.3897529	76.73345	3.383301	3.409015	-0.025714
71	4/25/2003 17:30	70.57227	67.20033	662.0291748	660.133946	661.0353538	663.3833701	663.3833701	76.74077	3.371935	3.417528	-0.045593
72	4/25/2003 17:45	70.61914	67.24028	671.4540405	660.56846	661.4127955	672.8214527	672.8214527	76.74809	3.378856	3.418428	-0.039571
73	4/25/2003 18:00	69.88867	66.51592	653.6784058	653.804328	654.5762733	655.0135843	655.0135843	76.75541	3.372753	3.404403	-0.03165
74	4/25/2003 18:15	68.60693	65.21415	661.4343872	641.971816	642.3250386	662.7970814	662.7970814	76.76273	3.392783	3.379793	0.01299
75	4/25/2003 18:30	68.69488	65.31844	659.4403076	642.782201	643.304908	660.7922444	660.7922444	76.77004	3.376435	3.381482	-0.005046
76	4/25/2003 18:45	69.05664	65.69217	659.2352295	646.118061	646.818581	660.5764513	660.5764513	76.77737	3.364472	3.388428	-0.023955
77	4/25/2003 19:00	69.86914	66.50155	662.9129639	653.623675	654.4408061	664.2455678	664.2455678	76.78468	3.36759	3.404028	-0.036438
78	4/25/2003 19:15	71.6321	68.23145	679.1821899	669.973382	670.7898041	680.5195784	680.5195784	76.792	3.400651	3.437876	-0.037225
79	4/25/2003 19:30	70.72721	67.34391	665.8613892	661.570468	662.3919416	667.1781948	667.1781948	76.79932	3.383301	3.420502	-0.037202
80	4/25/2003 19:45	71.25	67.86564	669.7114258	666.42232	667.3259837	671.023987	671.023987	76.80664	3.384362	3.43054	-0.046178
81	4/25/2003 20:00	70.92188	67.53386	665.3991699	663.376187	664.187496	666.7189586	666.7189586	76.79077	3.388014	3.42424	-0.036226
82	4/25/2003 20:15	73.02031	69.62021	684.664978	682.909289	683.9718147	686.011949	686.011949	76.77132	3.400103	3.46453	-0.064427
83	4/25/2003 20:30	70.94922	67.5636	664.6766968	663.629915	664.468685	666.0233223	666.0233223	76.75188	3.38562	3.424765	-0.039145
84	4/25/2003 20:45	73.98047	70.55963	691.8939819	691.888264	692.9176664	693.2730567	693.2730567	76.73244	3.420836	3.482965	-0.062129
85	4/25/2003 21:00	75.77148	72.34167	710.4623413	708.706514	709.9514324	711.8727526	711.8727526	76.713	3.42981	3.517353	-0.087543
86	4/25/2003 21:15	75.41818	71.98953	707.5007935	705.381724	706.5788149	708.9238857	708.9238857	76.69356	3.42865	3.510569	-0.081919
87	4/25/2003 21:30	73.18945	69.7868	683.159668	684.489158	685.5565731	684.5737891	684.5737891	76.67412	3.402649	3.467778	-0.065129
88	4/25/2003 21:45	73.84701	70.45712	691.9595947	690.638642	691.9403183	693.3984436	693.3984436	76.65468	3.38989	3.480403	-0.090513
89	4/25/2003 22:00	71.62891	68.29244	668.2793579	669.943656	671.3676608	669.710579	669.710579	76.63523	3.336464	3.437815	-0.101351
90	4/25/2003 22:15	70.05391	66.74183	654.336853	655.333107	656.7069252	655.7732139	655.7732139	76.61579	3.312079	3.407575	-0.095496
91	4/25/2003 22:30	68.77002	65.47077	643.7457275	643.47479	644.736635	645.1908143	645.1908143	76.59635	3.299247	3.382924	-0.083678
92	4/25/2003 22:45	69.50781	66.21856	652.340332	650.283543	651.7737776	653.8083449	653.8083449	76.57691	3.289257	3.39709	-0.107833
93	4/25/2003 23:00	66.94531	63.67613	625.8487549	626.701339	627.907998	627.3080462	627.3080462	76.55746	3.269182	3.34789	-0.078708
94	4/25/2003 23:15	62.87402	59.70013	596.0812378	589.614883	590.9271117	597.5483175	597.5483175	76.53802	3.173889	3.269721	-0.095832
95	4/25/2003 23:30	60.17383	57.05179	566.800415	565.275918	566.5261187	568.2538445	568.2538445	76.51859	3.122042	3.217878	-0.095835
96	4/25/2003 23:45	56.57129	53.47694	538.7130127	533.123607	533.8820959	540.1705943	540.1705943	76.49915	3.094352		
97	4/26/2003 0:00	52.33691	49.20919	496.5175171	495.800165	495.3522431	497.9498225	497.9498225	76.4797	3.127727	3.067409	0.060318
98	4/26/2003 0:15	47.89648	44.85151	445.3143005	457.203656	456.5063226	446.6908777	446.6908777	76.46026	3.04497	2.470129	0.574841
99	4/26/2003 0:30	42.25195	39.26321	393.1791382	408.943732	407.4232172	394.5064617	394.5064617	76.44082	2.988739	2.406797	0.581942
100	4/26/2003 0:45	36.64648	34.17569	360.7045898	361.907036	363.4548774	362.03623	362.03623	76.42138	2.470798	2.343904	0.126894
101	4/26/2003 1:00	33.12663	30.68999	333.2794495	332.824102	333.7243543	334.5859216	334.5859216	76.40193	2.436635	2.304411	0.132224
102	4/26/2003 1:15	32.94228	30.50562	330.2304077	331.31054	332.1606751	331.5397762	331.5397762	76.38249	2.436663	2.302342	0.134321
103	4/26/2003 1:30	34.71699	32.23788	347.4923401	345.921259	346.8871596	348.8466584	348.8466584	76.36305	2.479114	2.322255	0.156859
104	4/26/2003 1:45	36.39258	33.8925	365.6151733	359.797433	361.0275477	367.0178824	367.0178824	76.34361	2.500076	2.341055	0.159022
105	4/26/2003 2:00	38.2934	35.763	372.0523987	375.634758	377.0997724	373.4530243	373.4530243	76.32417	2.530402	2.362382	0.16802
106	4/26/2003 2:15	33.73251	31.23735	334.7309875	337.805317	338.3716716	336.0885763	336.0885763	76.30473	2.495164	2.311209	0.183955
107	4/26/2003 2:30	32.98457	30.50297	330.8520508	331.657667	332.138207	332.2199787	332.2199787	76.28529	2.481603	2.302817	0.178786
108	4/26/2003 2:45	33.24707	30.76643	329.8287048	333.81348	334.3728713	331.19851	331.19851	76.26584	2.48064	2.305762	0.174878
109	4/26/2003 3:00	32.52441	30.07814	324.5847168	327.883285	328.5387349	325.9582397	325.9582397	76.2464	2.446275	2.297654	0.148621
110	4/26/2003 3:15	34.0918	31.62549	352.2846375	340.764068	341.6720029	353.75371	353.75371	76.22696	2.466309	2.31524	0.151069
111	4/26/2003 3:30	34.94287	32.46125	357.9968872	347.787238	348.7919082	358.5311836	358.5311836	77.75253	2.481618	2.324789	0.156829
112	4/26/2003 3:45	34.04049	31.57613	346.7791138	340.341292	341.2520938	346.1640269	346.1640269	79.44494	2.464355	2.314664	0.149691
113	4/26/2003 4:00	33.87793	31.40262	343.5924988	339.002421	339.7765048	343.0758616	343.0758616	79.31356	2.475308	2.31284	0.162468
114	4/26/2003 4:15	35.97388	33.47845	359.4943237	356.322588	357.4823326	359.0727907	359.0727907	79.18219	2.495422	2.336357	0.159065
115	4/26/2003 4:30	37.86914	35.35375	380.6419983	372.091044	373.5754421	380.3101901	380.3101901	79.05081	2.515386	2.357622	0.157764
116	4/26/2003 4:45	39.11855	36.58958	394.5038147	382.54147	384.2315489	394.2625255	394.2625255	78.91943	2.528971	2.37164	0.157331
117	4/26/2003 5:00	43.05382	40.49081	422.301239	415.744801	418.1347922	422.1556144	422.1556144	78.78806	2.563011	2.415794	0.147217
118	4/26/2003 5:15	47.53027	44.44672	452.1399536	454.045348	452.9232249	452.0908006	452.0908006	78.65668	3.083557	2.46602	0.617537
119	4/26/2003 5:30	50.16081	47.04228	483.9544373	476.815829	475.9729939	483.9996378	483.9996378	78.5253	3.11853	3.025628	0.092903
120	4/26/2003 5:45	53.14583	49.97194	515.6826172	502.891212	502.2032485	517.5636033	517.5636033	75.87036	3.173889	3.08294	0.090949
121	4/26/2003 6:00	55.41387	52.29812	531.8705444	522.871424	523.1915292	533.7260742	533.7260742	75.91868	3.115749	3.126486	-0.010737

2/24/2005



Aux MW Plot


K4 Aux MW Comparison
MW-1 bfw
MW-2 bfw
MW-1 bfw 4/03 Subm
MW-2 bfw 4/03 Subm
ar (Aux MW-1 bfw)
ar (Aux MW-2 bfw)
y = 0.014x + 2.3903
R² = 0.8087
y = 0.0016x + 2.4356
R² = 0.0096
30
40
50
60
70
80
Gr. MW

Net						
EMS	K4-New	39	0.0178	1.826	0.0165	2.2991
85.794213	82.46542					
7.6737417	7.949615					
0.0131897	0.010707					

	EMS	K4-New		Aux MW-1	Aux MW-2	Aux MW-1	Aux MW-2 b/w 4/03 Subm		
25	11,435	11,516							
26	11,316	11,400	29.70398	2.507374		2.354731		29.70398	2.507374
27	11,207	11,293	30.72571	2.547293		2.372918		30.72571	2.547293
28	11,107	11,195	30.79346	2.490845		2.374124		30.79346	2.490845
29	11,015	11,104	31.02588	2.518024		2.378261		31.02588	2.518024
30	10,929	11,020	31.02588	2.518911		2.378261		31.02588	2.518911
31	10,850	10,942	31.18549	2.514771		2.381102		31.18549	2.514771
32	10,777	10,869	31.29639	2.543409		2.383076		31.29639	2.543409
33	10,709	10,802	31.40797	2.444443		2.385062		31.40797	2.444443
34	10,646	10,739	31.43994	2.444977		2.385631		31.43994	2.444977
35	10,587	10,680	31.44629	2.451654		2.385744		31.44629	2.451654
36	10,532	10,626	31.58541	2.444016		2.38822		31.58541	2.444016
37	10,481	10,574	31.58899	2.444733		2.388284		31.58899	2.444733
38	10,433	10,527	31.59644	2.525398		2.388417		31.59644	2.525398
39	10,388	10,482	31.60398	2.454331		2.388551		31.60398	2.454331
40	10,346	10,439	31.62646	2.537201		2.388951		31.62646	2.537201
41	10,307	10,400	31.77686	2.511645		2.391628		31.77686	2.511645
42	10,270	10,363	31.90081	2.527158		2.393834		31.90081	2.527158
43	10,236	10,328	32.01204	2.449912		2.395814		32.01204	2.449912
44	10,204	10,295	32.02051	2.468312		2.395965		32.02051	2.468312
45	10,174	10,264	32.04163	2.502502		2.396341		32.04163	2.502502
46	10,146	10,235	32.07617	2.484614		2.396956		32.07617	2.484614
47	10,119	10,207	32.16035	2.47771		2.398454		32.16035	2.47771
48	10,094	10,181	32.3553	2.522522		2.401924		32.3553	2.522522
49	10,071	10,157	32.41839	2.452623		2.403047		32.41839	2.452623
50	10,049	10,134	32.49683	2.458278		2.404444		32.49683	2.458278
51	10,029	10,113	32.52441	2.446275		2.404935		32.52441	2.446275
52	10,009	10,092	32.61367	2.507996		2.406523		32.61367	2.507996
53	9,992	10,073	32.76758	2.456604		2.409263		32.76758	2.456604
54	9,975	10,055	32.94043	2.562048		2.41234		32.94043	2.562048
55	9,959	10,038	32.94228	2.436663		2.412373		32.94228	2.436663
56	9,944	10,022	32.98457	2.481603		2.413125		32.98457	2.481603
57	9,931	10,007	33.04647	2.490145		2.414227		33.04647	2.490145
58	9,918	9,992	33.12663	2.436635		2.415654		33.12663	2.436635
59	9,906	9,979	33.24707	2.48064		2.417798		33.24707	2.48064
60	9,895	9,966	33.73251	2.495164		2.426439		33.73251	2.495164
61	9,885	9,955	33.87793	2.475308		2.429027		33.87793	2.475308
62	9,875	9,943	34.04049	2.464355		2.431921		34.04049	2.464355
63	9,867	9,933	34.0918	2.466309		2.432834		34.0918	2.466309
64	9,858	9,923	34.71699	2.479114		2.443962		34.71699	2.479114
65	9,851	9,914	34.94287	2.481618		2.447983		34.94287	2.481618
66	9,844	9,906	35.97388	2.495422		2.466335		35.97388	2.495422
67	9,838	9,898	36.39258	2.500076		2.473788		36.39258	2.500076
68	9,832	9,890	36.64648	2.470798		2.478307		36.64648	2.470798
69	9,827	9,883	37.86914	2.515386		2.500071		37.86914	2.515386
70	9,823	9,877	38.2934	2.530402		2.507623		38.2934	2.530402
71	9,819	9,871	39.11855	2.528971		2.52231		39.11855	2.528971
72	9,815	9,866	42.07227		3.154541		2.993292	42.07227	3.154541
73	9,812	9,861	42.19792		3.076294		2.995366	42.19792	3.076294
74	9,809	9,856	42.25195		2.988739		2.996257	42.25195	2.988739
75	9,807	9,852	43.05382		2.563011		3.009488	43.05382	2.563011
76	9,805	9,848	47.53027		3.083557		3.08335	47.53027	3.083557
77	9,804	9,845	47.74968		3.092468		3.08697	47.74968	3.092468
78	9,802	9,842	47.89648		3.04497		3.089392	47.89648	3.04497
79	9,802	9,839	49.78906		3.097931		3.12062	49.78906	3.097931
80	9,801	9,837	50.16081		3.11853		3.126753	50.16081	3.11853
81	9,801	9,835	50.56738		3.255162		3.133462	50.56738	3.255162
82	9,802	9,833	51.67871		3.122638		3.151799	51.67871	3.122638
83	9,802	9,832	52.33691		3.127727		3.162659	52.33691	3.127727
84	9,803	9,831	52.39583		3.158393		3.163631	52.39583	3.158393
85	9,804	9,830	53.14583		3.173889		3.176006	53.14583	3.173889
86	9,806	9,829	53.56348		3.197681		3.182897	53.56348	3.197681
87	9,807	9,829	55.41387		3.115749		3.213429	55.41387	3.115749
88	9,809	9,829	56.57129		3.094352		3.232526	56.57129	3.094352
89	9,812	9,829	60.17383		3.122042		3.291968	60.17383	3.122042
90	9,814	9,829	62.87402		3.173889		3.336521	62.87402	3.173889
			66.65625		3.445374		3.398928	66.65625	3.445374
			66.94531		3.269182		3.403698	66.94531	3.269182
			68.60693		3.392783		3.431114	68.60693	3.392783
			68.69488		3.376435		3.432565	68.69488	3.376435
			68.77002		3.299247		3.433805	68.77002	3.299247
			69.05664		3.364472		3.438535	69.05664	3.364472
			69.1957		3.36924		3.440829	69.1957	3.36924
			69.50781		3.289257		3.445979	69.50781	3.289257
			69.86914		3.36759		3.451941	69.86914	3.36759
			69.88867		3.372753		3.452263	69.88867	3.372753
			70.05391		3.312079		3.45499	70.05391	3.312079
			70.12891		3.383301		3.456227	70.12891	3.383301
			70.45248		3.385448		3.461566	70.45248	3.385448
			70.57227		3.371935		3.463542	70.57227	3.371935
			70.61914		3.378856		3.464316	70.61914	3.378856
			70.72721		3.383301		3.466099	70.72721	3.383301
			70.72852		3.393078		3.466121	70.72852	3.393078
			70.77474		3.398804		3.466883	70.77474	3.398804
			70.92188		3.388014		3.469311	70.92188	3.388014
			70.94922		3.38562		3.469762	70.94922	3.38562
			71.25		3.384362		3.474725	71.25	3.384362
			71.37802		3.398522		3.476837	71.37802	3.398522
			71.62891		3.336464		3.480977	71.62891	3.336464
			71.6321		3.400651		3.48103	71.6321	3.400651
			71.78906		3.398805		3.48362	71.78906	3.398805
			71.82209		3.408985		3.484164	71.82209	3.408985
			72.15039		3.411532		3.489581	72.15039	3.411532
			72.25065		3.409601		3.491236	72.25065	3.409601
			72.36008		3.401453		3.493041	72.36008	3.401453
			72.38965		3.400649		3.493529	72.38965	3.400649
			72.43295		3.456909		3.494244	72.43295	3.456909
			72.56836		3.416735		3.496478	72.56836	3.416735
			72.58984		3.412382		3.496832	72.58984	3.412382
			72.82678		3.414793		3.500742	72.82678	3.414793
			72.91992		3.41309		3.502279	72.91992	3.41309
			72.93642		3.415981		3.502551	72.93642	3.415981
			72.97188		3.419719		3.503136	72.97188	3.419719
			73.01937		3.42076		3.50392	73.01937	3.42076
			73.02031		3.400103		3.503935	73.02031	3.400103
			73.10558		3.418213		3.505342	73.10558	3.418213
			73.14063		3.425964		3.50592	73.14063	3.425964
			73.18945		3.402649		3.506726	73.18945	3.402649
			73.23047		3.418213		3.507403	73.23047	3.418213
			73.23307		3.422962		3.507446	73.23307	3.422962
			73.24789		3.433716		3.50769	73.24789	3.433716
			73.2515		3.41624		3.50775	73.2515	3.41624
			73.27385		3.429443		3.508119	73.27385	3.429443
			73.34654		3.429898		3.509318	73.34654	3.429898
			73.53125		3.424976		3.512366	73.53125	3.424976
			73.84701		3.38989		3.517576	73.84701	3.38989
			73.98047		3.420836		3.519778	73.98047	3.420836
			74.11328		3.429148		3.521969	74.11328	3.429148
			74.25352		3.425086		3.524283	74.25352	3.425086
			74.38021		3.42981		3.526373	74.38021	3.42981
			75.41818		3.42865		3.5435	75.41818	3.42865
			75.77148		3.42981		3.549329	75.77148	3.42981

Condenser Adjustment

Small Reheat Unit, HR Adjustment from 75 Degr. F

Temp. Rise		Coefficients x2	x	constant
1	75	2.1476E-07	- 4.0812E-05	1.0027E+00
2	76	4.4654E-07	- 8.4556E-05	1.0055E+00
3	77	6.4158E-07	- 1.2225E-04	1.0083E+00
4	78	8.5921E-07	- 1.6336E-04	1.0112E+00
5	79	1.1974E-06	- 2.2083E-04	1.0147E+00
6	80	1.7181E-06	- 3.0262E-04	1.0190E+00
7	81	2.2406E-06	- 3.8429E-04	1.0234E+00
8	82	2.6258E-06	- 4.4887E-04	1.0273E+00
9	83	2.6804E-06	- 4.7109E-04	1.0300E+00
10	84	2.7406E-06	- 4.9474E-04	1.0328E+00

Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

See HRCondImpact.xls

Auxiliary Calculator-First Ordered Curve-Hourly

Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10	
H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	New based upon ODPM	Adusted H8/9 to 27 MW on 6/7 from 30 MW
H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000		
K1	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
K4	40	0.0122	1.7483	0.0172	2.0823	0.372222	8,933	Rpt 1 2003	
K5	80	0.01397	3.86311	0.02901	3.14307	0.416667	10,000	Previously 90 MW	
K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW	
W10			0.1		0.1	0.025	600		
W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW	
W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW	
W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
W7	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W8	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
W9			0.1		0.1	0.041667	1,000		
H5						0.0625	1,500		
H7						0.083333	2,000		

Check on PI ABC Calculation

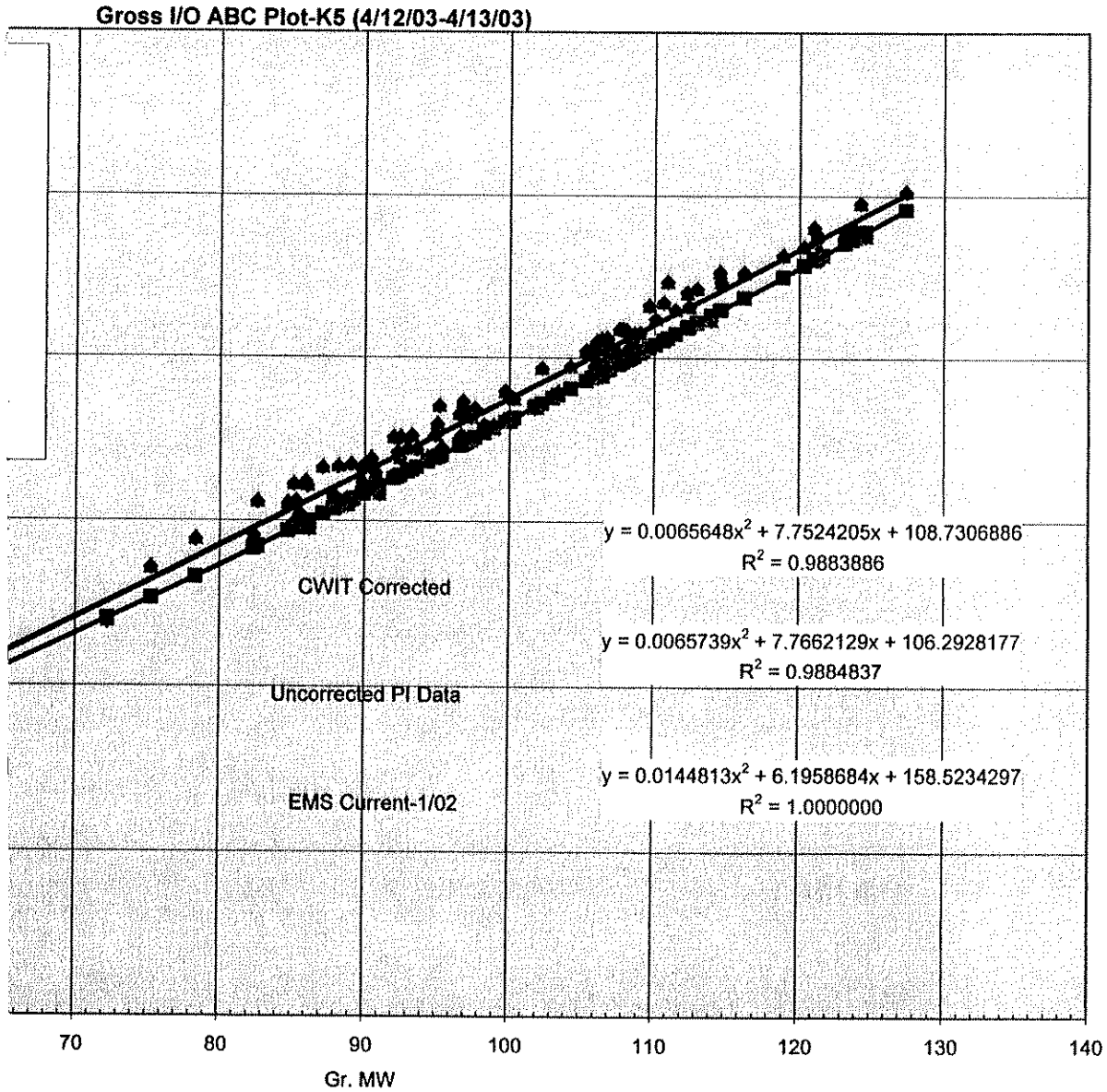
K4 Data

	Actual Net KWHs	Mbtu	NHR	OPNHR Rpt1 ABC	OPNHR EMS	OPNHR PI-Corr	OPNHR Var Rpt1 ABC	OPNHR Var EMS	OPNHR Var PI-Corr	Mbtus Rpt1 ABC	Mbtus EMS	Mbtus PI-Corr	KWH Check Rpt1 ABC	KWH Check EMS	KWH Check PI-Corr
4/10/2003	1631200	16,196	9,929	9,806	9,922	9,992	123	7	(63)	15,732.79	15,877	15,988	1,604,433	1,600,134	1,600,134
4/11/2003	1659100	16,565	9,985	9,787	9,902	9,971	198	82	14	16,370.63	16,522	16,636	1,672,704	1,668,455	1,668,455
4/12/2003	1802000	17,794	9,874	9,707	9,831	9,899	168	43	(24)	17,251.58	17,435	17,554	1,777,312	1,773,410	1,773,410
4/13/2003	1371200	13,579	9,903	9,857	9,996	10,071	46	(93)	(168)	13,505.24	13,632	13,734	1,370,147	1,363,753	1,363,753
4/14/2003	1512900	15,113	9,990	9,875	9,985	10,056	115	4	(67)	14,813.17	14,935	15,041	1,500,123	1,495,716	1,495,716
4/15/2003	1597500	15,747	9,858	9,803	9,920	9,990	55	(63)	(133)	15,617.99	15,763	15,874	1,593,240	1,588,961	1,588,961
4/16/2003	1583500	15,988	10,097	9,801	9,921	9,991	296	176	106	15,379.79	15,525	15,635	1,569,265	1,564,921	1,564,921
4/17/2003	1577300	15,374	9,747	9,797	9,917	9,988	(50)	(170)	(240)	15,429.54	15,576	15,686	1,574,891	1,570,562	1,570,562
4/18/2003	1465500	14,752	10,066	9,806	9,935	10,008	260	131	58	14,443.80	14,586	14,693	1,472,936	1,468,078	1,468,078
4/19/2003	1682100	16,229	9,648	9,704	9,836	9,905	(56)	(188)	(257)	16,182	16,363	16,478	1,667,566	1,663,586	1,663,586
4/20/2003	1488600	14,724	9,891	9,783	9,917	9,990	108	(25)	(98)	14,479	14,630	14,737	1,479,894	1,475,246	1,475,246
4/21/2003	1494800	14,636	9,791	9,805	9,930	10,003	(14)	(139)	(212)	14,564	14,708	14,815	1,485,426	1,481,090	1,481,090
4/22/2003	1430100	14,297	9,997	9,841	9,966	10,039	156	32	(42)	13,983	14,115	14,220	1,420,829	1,416,380	1,416,380
4/23/2003	1385500	13,558	9,786	9,848	9,974	10,049	(63)	(189)	(264)	13,627	13,758	13,861	1,383,740	1,379,270	1,379,270
4/24/2003	1445400	14,460	10,004	9,810	9,938	10,011	194	66	(7)	14,204	14,344	14,450	1,447,875	1,443,421	1,443,421
4/25/2003	1310200	13,256	10,118	9,917	10,038	10,115	201	80	3	12,899	13,009	13,108	1,300,656	1,295,913	1,295,913
4/26/2003	1354900	13,264	9,789	9,848	9,978	10,054	(59)	(188)	(264)	13,316	13,446	13,549	1,352,078	1,347,624	1,347,624
4/27/2003	1270300	12,970	10,210	9,928	10,055	10,133	282	154	76	12,499	12,606	12,704	1,258,930	1,253,681	1,253,681
4/28/2003	1384000	13,881	10,029	9,539	9,659	9,731	491	370	298	13,175	13,298	13,397	1,381,260	1,376,737	1,376,737
Total	28,446,100	282,384.62				Avg.	129	5	(68)	277,471.81	280,127.04	282,161.54	28,313,306	28,226,938	28,226,938
										-1.74%	-0.80%	-0.08%	-0.47%	-0.77%	-0.77%
Recent 4/24-28	6,764,800	67,831				Recent 4/7-10	222	96	21	66,091.91	66,703.72	67,208.15	6,740,799.28	6,717,375.30	6,717,375.30
										-2.56%	-1.66%	-0.92%	-0.35%	-0.70%	-0.70%

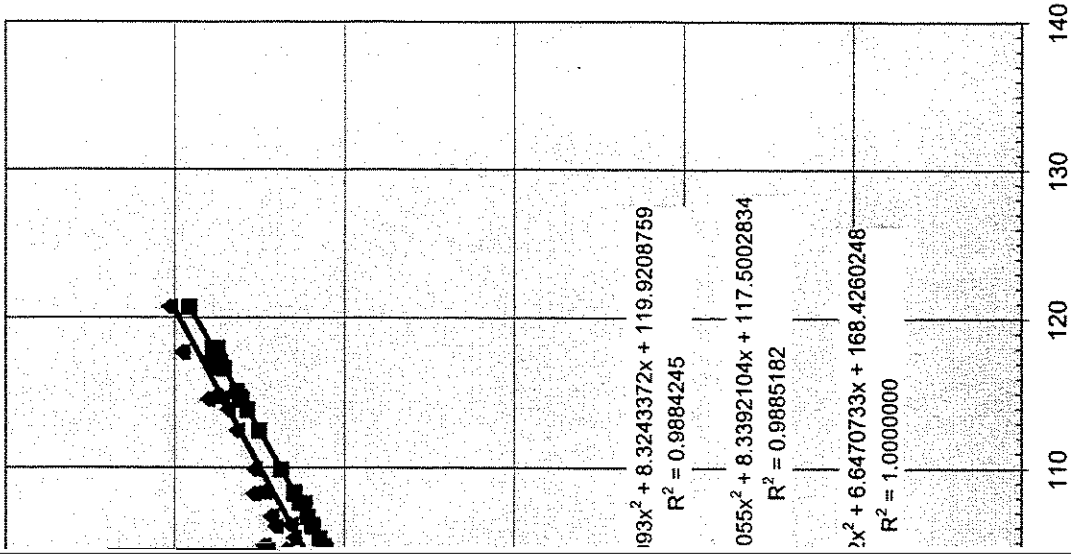
SUPPORTING WORKPAPERS FOR KAHE 5

Gross IO Plot

2/24/2005



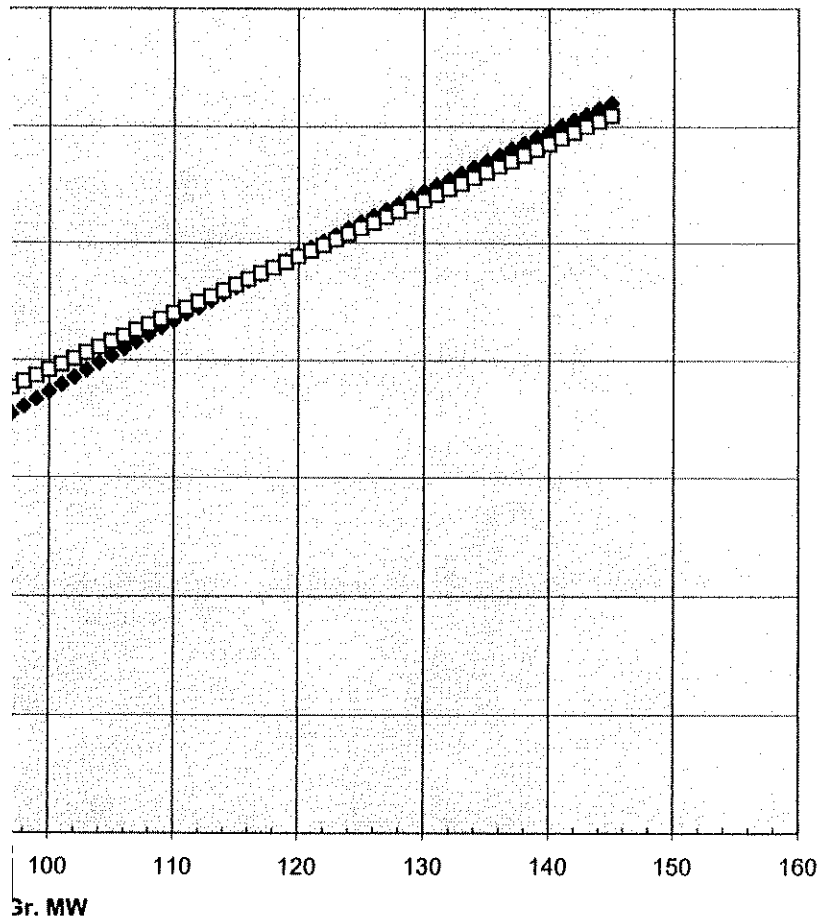
2/24/2005


193x² + 8.3243372x + 119.9208759
R² = 0.9884245
055x² + 8.3392104x + 117.5002834
R² = 0.9885182
2x² + 6.6470733x + 168.4260248
R² = 1.0000000
110
120
130
140

k MW Plot

2/24/2005

Plot-9/02 ABCs



	Net EMS-9/02	(New 4/03	
	168.426	119.9209	
	6.647073	8.324337	
	0.014532	0.005299	
	EMS-9/02	(New 4/03	0
55	10,509	10,796	-
56	10,468	10,763	-
57	10,430	10,730	-
58	10,394	10,699	-
59	10,359	10,670	-
60	10,326	10,641	-
61	10,295	10,614	-
62	10,265	10,587	-
63	10,236	10,562	-
64	10,209	10,537	-
65	10,183	10,514	-
66	10,158	10,491	-
67	10,135	10,469	-
68	10,112	10,448	-
69	10,091	10,428	-
70	10,070	10,408	-
71	10,051	10,390	-
72	10,033	10,371	-
73	10,015	10,354	-
74	9,998	10,337	-
75	9,983	10,321	-
76	9,968	10,305	-
77	9,953	10,290	-
78	9,940	10,275	-
79	9,927	10,261	-
80	9,915	10,247	-
81	9,904	10,234	-
82	9,893	10,221	-
83	9,882	10,209	-
84	9,873	10,197	-
85	9,864	10,186	-
86	9,855	10,175	-
87	9,847	10,164	-
88	9,840	10,153	-
89	9,833	10,143	-
90	9,826	10,134	-
91	9,820	10,124	-
92	9,815	10,115	-
93	9,810	10,107	-
94	9,805	10,098	-
95	9,801	10,090	-
96	9,797	10,082	-
97	9,793	10,075	-
98	9,790	10,067	-
99	9,787	10,060	-
100	9,785	10,053	-
101	9,782	10,047	-
102	9,781	10,041	-
103	9,779	10,034	-
104	9,778	10,029	-
105	9,777	10,023	-
106	9,776	10,017	-
107	9,776	10,012	-
108	9,776	10,007	-
109	9,776	10,002	-
110	9,777	9,997	-
111	9,777	9,993	-
112	9,778	9,989	-
113	9,780	9,984	-
114	9,781	9,980	-
115	9,783	9,977	-
116	9,785	9,973	-
117	9,787	9,969	-
118	9,789	9,966	-
119	9,792	9,963	-
120	9,794	9,960	-
121	9,797	9,957	-
122	9,801	9,954	-
123	9,804	9,951	-
124	9,807	9,949	-
125	9,811	9,946	-
126	9,815	9,944	-
127	9,819	9,942	-
128	9,823	9,940	-
129	9,827	9,938	-
130	9,832	9,936	-
131	9,836	9,934	-
132	9,841	9,932	-
133	9,846	9,931	-
134	9,851	9,929	-
135	9,857	9,928	-
136	9,862	9,927	-
137	9,867	9,926	-
138	9,873	9,925	-
139	9,879	9,924	-
140	9,885	9,923	-

New Gross 4/03
108.7307
7.752421
0.006565

Condenser Adjustment

Large Reheat Unit, HR Adjustment from 75 Degr. F

Temp. Rise	Coefficients shifted temp. down	x2	x	constant	Original temp
1	74	7.4833E-08	- 2.9850E-05	1.0029E+00	76
2	75	1.5401E-07	- 6.1068E-05	1.0059E+00	77
3	76	1.1679E-07	- 6.9344E-05	1.0080E+00	78
4	77	1.5438E-07	- 8.9910E-05	1.0106E+00	79
5	78	2.3223E-07	- 1.1788E-04	1.0136E+00	80
6	79	3.1365E-07	- 1.4699E-04	1.0166E+00	81
7	80	3.9556E-07	- 1.7654E-04	1.0198E+00	82
8	81	4.2408E-07	- 1.9548E-04	1.0226E+00	83
9	82	4.5219E-07	- 2.1503E-04	1.0255E+00	84
10	83	4.8957E-07	- 2.3711E-04	1.0285E+00	85

Small Reheat Unit, HR Adjustment from 75 Degr. F

Temp. Rise	Coefficients	x2	x	constant
1	76	2.1476E-0	- 4.0812E-	1.0027E+00
2	77	4.4654E-0	- 8.4556E-	1.0055E+00
3	78	6.4158E-0	- 1.2225E-	1.0083E+00
4	79	8.5921E-0	- 1.6336E-	1.0112E+00
5	80	1.1974E-0	- 2.2083E-	1.0147E+00
6	81	1.7181E-0	- 3.0262E-	1.0190E+00
7	82	2.2406E-0	- 3.8429E-	1.0234E+00
8	83	2.6258E-0	- 4.4887E-	1.0273E+00
9	84	2.6804E-0	- 4.7109E-	1.0300E+00
10	85	2.7406E-0	- 4.9474E-	1.0328E+00

Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

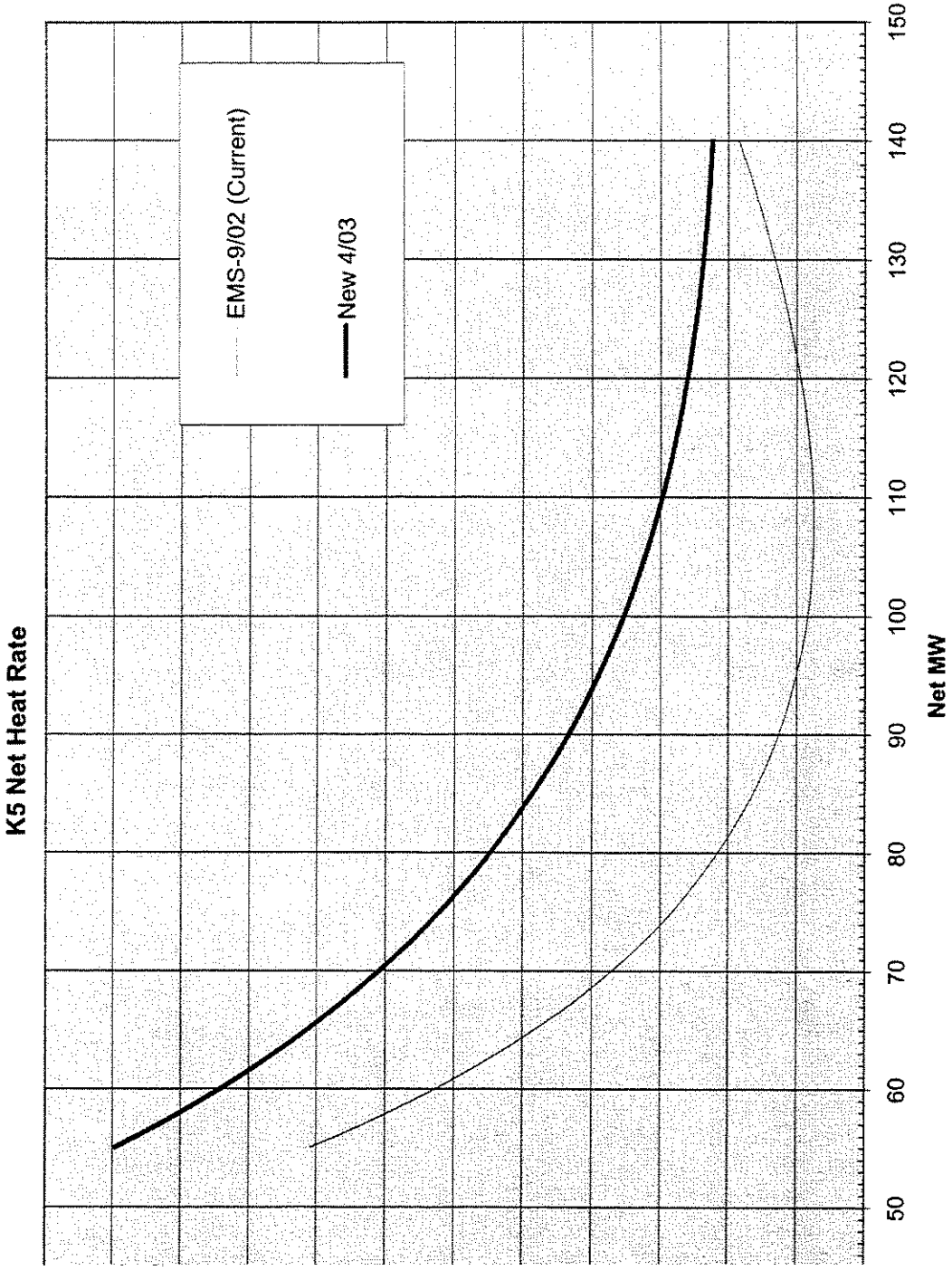
See HRCondImpact.xls

Auxiliary Calculator-First Ordered Curve-Hourly

	Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10	
	H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	Now based upon ODPM	Adusted H8/9 to 27 MW on 6/7 from 30 MW
	H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000		
	K1	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
	K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
	K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
	K4	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
	K5	80	0.01397	3.86311	0.02901	3.14307	0.416667	10,000	Previously 90 MW	
	K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW	
	W10			0.1		0.1	0.025	600		
	W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW	
	W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW	
	W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
	W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
	W7	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
	W8	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
	W9			0.1		0.1	0.041667	1,000		
	H5						0.0625	1,500		
	H7						0.083333	2,000		
New Aux. MW										
	K5	80	0.01756	3.55304	0.02465	3.67696		From 9/01 data		
	K6	80	0.01061	4.80028	0.02452	4.52457				
	K5	80	0.00728	4.025	0.02422	3.53442		From 9/02 data		

2/24/2005

NHR Plot



	80	78.6					
onditions			Adjustment				
High	Interpolated			Adjusted		Aux MW C K5AI-FDSMT-1	
				Gross I/O-CW	Net I/O-CW	IT Corr.	Opacity
1.005591	1.00419637	1.00032472	984.6458052	984.6456	6.08629	Tag not found	
1.005591	1.00419642	1.00032449	984.6378232	984.6378	6.086273	Tag not found	
1.005591	1.00419647	1.00032427	984.6298474	984.6298	6.086257	Tag not found	
1.005591	1.00419653	1.00032404	984.6218105	984.6218	6.08624	Tag not found	
1.005591	1.00419658	1.00032382	984.6138347	984.6138	6.086224	Tag not found	
1.005591	1.00419663	1.00032358	984.6057917	984.6058	6.086207	Tag not found	
1.005591	1.00419668	1.00032336	984.5978158	984.5978	6.086191	Tag not found	
1.005591	1.00419673	1.00032313	984.58984	984.5898	6.086174	Tag not found	
1.005591	1.00419678	1.00032291	984.5818032	984.5818	6.086158	Tag not found	
1.005591	1.00419684	1.00032268	984.5738211	984.5738	6.086141	Tag not found	
1.005591	1.00419689	1.00032245	984.5657843	984.5658	6.086125	Tag not found	
1.005591	1.00419694	1.00032222	984.5578085	984.5578	6.086108	Tag not found	
1.005591	1.00419699	1.000322	984.5498327	984.5498	6.086092	Tag not found	
1.005591	1.00419704	1.00032177	984.5417896	984.5418	6.086075	Tag not found	
1.005591	1.00419709	1.00032154	984.5338137	984.5338	6.086059	Tag not found	
1.005592	1.00419715	1.00032132	984.5257769	984.5258	6.086042	Tag not found	
1.005592	1.0041972	1.00032109	984.5178011	984.5178	6.086026	Tag not found	
1.005592	1.00419725	1.00032086	984.509819	984.5098	6.086009	Tag not found	
1.005592	1.0041973	1.00032063	984.5017821	984.5018	6.085993	Tag not found	
1.005592	1.00419735	1.00032041	984.4938063	984.4938	6.085976	Tag not found	
1.005592	1.00419741	1.00032018	984.4858305	984.4858	6.08596	Tag not found	
1.005592	1.00419746	1.00031995	984.4777874	984.4778	6.085943	Tag not found	
1.005592	1.00419751	1.00031973	984.4698116	984.4698	6.085927	Tag not found	
1.005592	1.00419756	1.0003195	984.4617748	984.4618	6.08591	Tag not found	
1.005592	1.00419761	1.00031928	984.4537989	984.4538	6.085894	Tag not found	
1.005592	1.00419766	1.00031904	984.4458168	984.4458	6.085877	Tag not found	
1.005592	1.00419772	1.00031882	984.43778	984.4378	6.085861	Tag not found	
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1.005593	1.00419808	1.00031723	984.3817598	984.3818	6.085745	Tag not found	
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1.005593	1.00419818	1.00031676	984.365802	984.3658	6.085712	Tag not found	
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1.005593	1.0041986	1.00031496	984.3017386	984.3017	6.08558	Tag not found	
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1.005594	1.00419891	1.0003136	984.2537653	984.2538	6.085481	Tag not found	
1.005594	1.00419898	1.00031337	984.2457732	984.2458	6.085465	Tag not found	
1.005594	1.00419901	1.00031314	984.2377363	984.2377	6.085448	Tag not found	
1.005594	1.00419906	1.00031292	984.2297605	984.2298	6.085432	Tag not found	
1.005594	1.00419911	1.00031269	984.2217236	984.2217	6.085415	Tag not found	
1.005594	1.00419917	1.00031247	984.2137478	984.2137	6.085399	Tag not found	
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1.005594	1.00419927	1.00031201	984.1977288	984.1977	6.085366	Tag not found	
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1.005594	1.00419937	1.00031156	984.181716	984.1817	6.085333	Tag not found	
1.005594	1.00419942	1.00031132	984.173734	984.1737	6.085316	Tag not found	
1.005594	1.00419948	1.0003111	984.1657581	984.1658	6.0853	Tag not found	
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1.005594	1.00419958	1.00031065	984.1497454	984.1497	6.085267	Tag not found	
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1.005595	1.00419979	1.00030974	984.1177137	984.1177	6.085201	Tag not found	
1.005595	1.00419984	1.00030951	984.1097316	984.1097	6.085184	Tag not found	
1.005595	1.00419989	1.00030928	984.1016946	984.1017	6.085168	Tag not found	
1.005595	1.00419994	1.00030906	984.0937168	984.0937	6.085151	Tag not found	
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1.005595	1.0042002	1.00030792	984.0537112	984.0537	6.085069	Tag not found	
1.005595	1.00420025	1.00030769	984.0457291	984.0457	6.085052	Tag not found	
1.005595	1.0042003	1.00030746	984.0376922	984.0377	6.085036	Tag not found	
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1.005596	1.00420041	1.00030701	984.0217405	984.0217	6.085003	Tag not found	
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1.005596	1.00420087	1.00030497	983.9497011	983.9497	6.084854	Tag not found	
1.005596	1.00420093	1.00030474	983.941719	983.9417	6.084838	Tag not found	
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1.005596	1.00420103	1.00030428	983.9257062	983.9257	6.084805	Tag not found	
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	K5		Aux Curves via Elect Rpt
	Sep-02		80
ABCs	Gross	Net	0.00728
A	158.5234	168.426	4.025
B	6.195868	6.647073	0.02422
C	0.014481	0.014532	3.53442
Gr. MW			

	Mbtu/Hr	Net MW	Aux. MW-/	Act. Aux MW
55	543.1021	50.73874	4.261261	4.4254
56	550.9054	51.69788	4.302119	4.43268
57	558.7377	52.65729	4.342705	4.43996
58	566.5989	53.61698	4.383022	4.44724
59	574.4891	54.57693	4.423072	4.45452
60	582.4082	55.53714	4.462859	4.4618
61	590.3563	56.49762	4.502384	4.46908
62	598.3334	57.45835	4.541651	4.47636
63	606.3394	58.41934	4.580662	4.48364
64	614.3744	59.38058	4.619419	4.49092
65	622.4384	60.34207	4.657926	4.4982
66	630.5313	61.30382	4.696184	4.50548
67	638.6532	62.2658	4.734196	4.51276
68	646.804	63.22804	4.771965	4.52004
69	654.9838	64.19051	4.809493	4.52732
70	663.1926	65.15322	4.846782	4.5346
71	671.4303	66.11617	4.883834	4.54188
72	[illegible]	[illegible]	[illegible]	[illegible]
73	687.9927	68.04276	4.95724	4.55644
74	696.3173	69.0064	4.993597	4.56372
75	704.6709	69.97027	5.029727	4.571
76	713.0534	70.93437	5.065632	4.57828
77	721.4649	71.89869	5.101314	4.58556
78	729.9054	72.86323	5.136775	4.59284
79	738.3748	73.82798	5.172017	4.60012
80	746.8732	74.79296	5.207043	5.47202
81	755.4006	75.75815	5.241854	5.49624
82	763.9569	76.72355	5.276453	5.52046
83	772.5422	77.68916	5.310841	5.54468
84	781.1564	78.65498	5.345021	5.5689
85	789.7996	79.62101	5.378994	5.59312
86	798.4718	80.58724	5.412763	5.61734
87	807.1729	81.55367	5.446328	5.64156
88	815.903	82.52031	5.479693	5.66578
89	824.6621	83.48714	5.512859	5.69
90	833.4501	84.45417	5.545828	5.71422
91	842.2671	85.4214	5.578602	5.73844
92	851.113	86.38882	5.611182	5.76266
93	859.988	87.35643	5.64357	5.78688
94	868.8918	88.32423	5.675769	5.8111
95	877.8247	89.29222	5.707779	5.83532
96	886.7865	90.2604	5.739602	5.85954
97	895.7772	91.22876	5.771241	5.88376
98	904.7969	92.1973	5.802697	5.90798
99	913.8456	93.16603	5.833971	5.9322
100	922.9233	94.13493	5.865065	5.95642
101	932.0299	95.10402	5.895981	5.98064
102	941.1655	96.07328	5.926721	6.00486
103	950.33	97.04272	5.957285	6.02908
104	959.5235	98.01232	5.987676	6.0533
105	968.7459	98.98211	6.017894	6.07752
106	977.9974	99.95206	6.047943	6.10174
107	987.2778	100.9222	6.077822	6.12596
108	996.5871	101.8925	6.107534	6.15018
109	1005.925	102.8629	6.13708	6.1744
110	1015.293	103.8335	6.166461	6.19862
111	1024.689	104.8043	6.19568	6.22284
112	1034.114	105.7753	6.224736	6.24706
113	1043.568	106.7464	6.253632	6.27128
114	1053.051	107.7176	6.28237	6.2955
115	1062.563	108.6891	6.31095	6.31972
116	1072.105	109.6606	6.339373	6.34394
117	1081.675	110.6324	6.367642	6.36816
118	1091.274	111.6042	6.395758	6.39238
119	1100.901	112.5763	6.423721	6.4166
120	1110.558	113.5485	6.451533	6.44082
121	1120.244	114.5208	6.479196	6.46504
122	1129.959	115.4933	6.50671	6.48926
123	1139.703	116.4659	6.534077	6.51348
124	1149.476	117.4387	6.561299	6.5377
125	1159.277	118.4116	6.588376	6.56192
126	1169.108	119.3847	6.615309	6.58614
127	[illegible]	[illegible]	[illegible]	[illegible]
128	1188.856	121.3312	6.668751	6.63458
129	1198.774	122.3047	6.695261	6.6588
130	1208.72	123.2784	6.721632	6.68302
131	1218.696	124.2521	6.747867	6.70724
132	1228.7	125.226	6.773964	6.73146
133	1238.734	126.2001	6.799927	6.75568
134	1248.796	127.1742	6.825755	6.7799
135	1258.887	128.1485	6.85145	6.80412
136	[illegible]	[illegible]	[illegible]	[illegible]

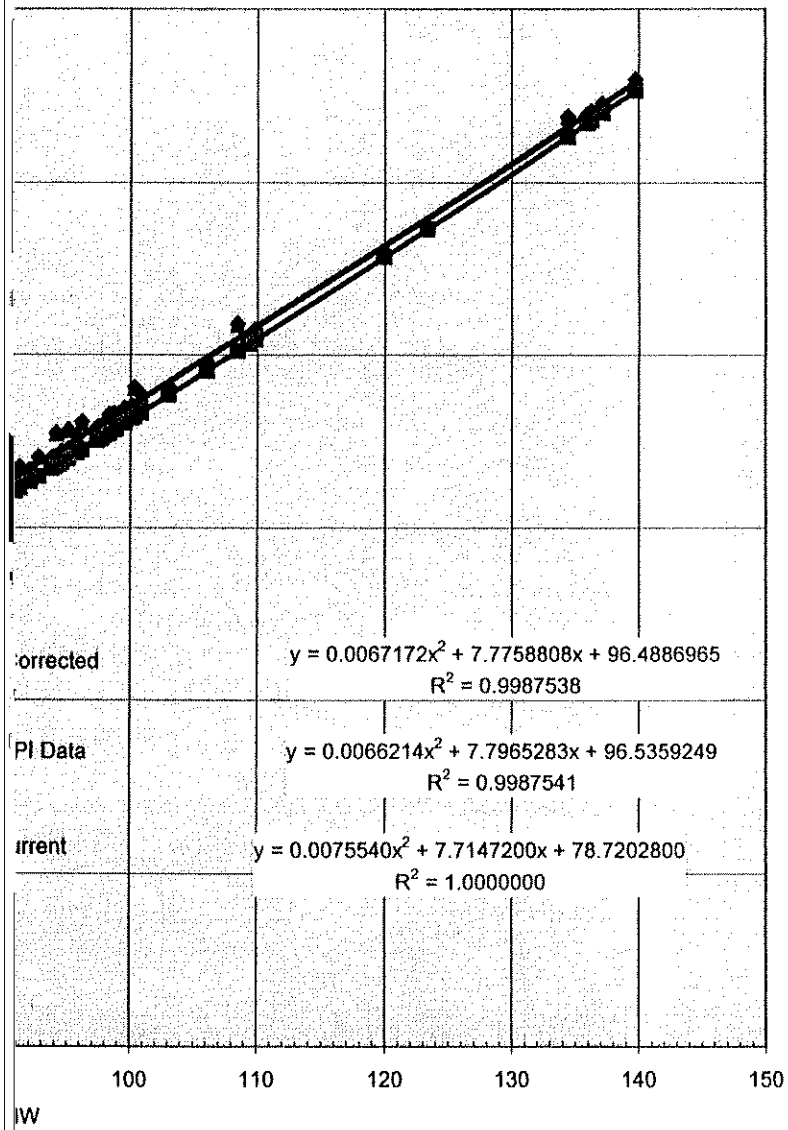
2/24/2005

al Mbtus			Net KWH Check			
	EMS	PI-Corr	Actual	Report1	EMS	PI-Corr
7	23,228	23,779	2,360,000	2,354,259	2,359,160	2,359,160
1	22,117	22,691	2,245,000	2,238,875	2,243,544	2,243,544
1	22,777	23,319	2,294,000	2,303,638	2,308,201	2,308,201
)	25,007	25,523	2,544,000	2,538,745	2,543,723	2,543,723
3	23,827	24,435	2,427,000	2,427,018	2,431,548	2,431,548
5	21,441	22,001	2,185,000	2,163,724	2,168,320	2,168,320
1	21,128	21,664	2,130,000	2,125,453	2,129,734	2,129,734
5	21,207	21,764	2,151,000	2,137,645	2,141,997	2,141,997
9	20,621	21,195	2,089,000	2,078,021	2,082,484	2,082,484
5	21,994	22,526	2,235,000	2,217,685	2,222,133	2,222,133
5	223,348	228,898	22,660,000	22,585,062	22,630,845	22,630,845
%	-1.80%	0.65%		-0.33%	-0.13%	-0.13%

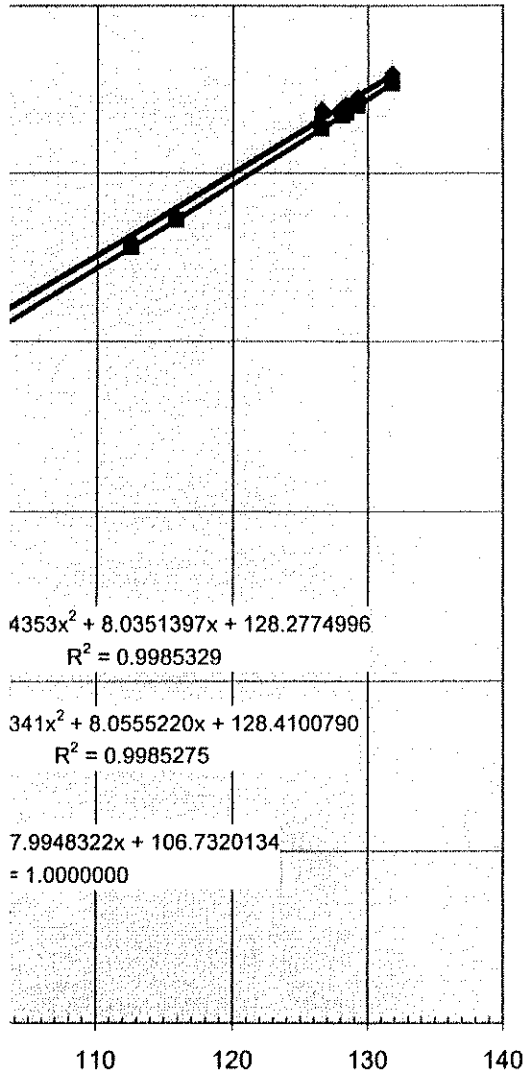
SUPPORTING WORKPAPERS FOR KAHE 6

Plot 2/24/2005

6 (9/22-26)



2/24/2005


4353x² + 8.0351397x + 128.2774996
R² = 0.9985329
341x² + 8.0555220x + 128.4100790
R² = 0.9985275
7.9948322x + 106.7320134
= 1.0000000
110
120
130
140

sted ss I/O-CW	Net I/O-CW	MW Check Corr.
.4539855	705.454	587912
.2808986	690.2809	555747
.9797412	583.9797	439231
.7725696	548.7726	384495
1.111562	531.1116	359852
.7042185	457.7042	282602
.8838836	512.8839	349322
.3688854	641.3689	508114
.1307444	818.1307	640964
.2338526	863.2339	751771
.1989276	941.1989	979934
.7797018	990.7797	124283
4.294238	1034.294	183649
.2931405	962.2931	051046
.3267386	918.3267	927772
.9012206	886.9012	.85743
.7449819	912.745	856666
.1430083	885.143	.84399
.6539649	877.654	.83842
017.0698	1017.07	204841
.9067552	787.9068	524931
.5122788	804.5123	651542
.2353915	792.2354	581205
.7804038	763.7804	488181
.2717797	626.2718	486068
.5057014	526.5057	361274
.4198547	453.4199	282297
.0730169	449.073	240952
.6333768	468.6334	281196
.5686526	461.5687	275731
.7403218	474.7403	284369
.7739608	573.774	420778
.0843971	693.0844	563542
.7894935	792.7895	518891
.6256786	730.6257	607193
.1172695	698.1173	587095
6.387895	736.3879	624752
.5787249	737.5787	624705
.5251664	746.5252	627961
.0540091	741.054	629031
.8609877	737.861	631069
.9782266	751.9782	.63224
.4993988	754.4994	646744
.8461317	880.8461	824433
.5194344	839.5194	699076
.6374939	790.6375	499831
.2599787	711.26	591935
.1268193	589.1268	.44154
.7044837	443.7045	262602
.9160398	455.916	.27329
.8762862	445.8763	266874
.5308187	442.5308	268933
.6952452	470.6952	282128
.1151733	455.1152	266654
.5085761	536.5086	374217
.5316704	727.5317	616409
.2560599	777.2561	518867
.1959487	870.1959	761661
.9723223	834.9723	712962
.0824793	849.0825	724929
.5256303	882.5256	829172
.0390611	916.0391	912825
.8038859	915.8039	921453
.2677774	889.2678	854102
19.300617	1119.301	7.46612
39.143582	1289.144	887797
17.486328	1317.486	7.95176
28.249695	1028.25	217352
53.635768	953.6358	.99739
.4944143	807.4944	659606
805.45561	805.4556	618372
.9482302	521.9482	348138
.4425216	439.4425	251634
.7798452	452.7798	261798
.4678293	448.4678	259813
.2729641	443.273	258935
.7300373	444.73	262716
.0019544	449.002	260096
.3992253	509.3992	345967
.1208039	698.1208	578949
.9141796	726.9142	616403
.8753333	808.8753	6.6027
.8920647	844.8921	679373
.4722519	866.4723	782573
06.281722	906.2817	873396
931.50519	931.5052	944659
.7422333	937.7422	966285
.4771716	930.4772	949368
.5835832	930.5836	935763
.6829851	881.683	.79862
.8502954	814.8503	571098
24.989274	924.9893	.93304
.0793065	909.0793	832593
.0313015	840.0313	697012
.4992177	888.4992	843937
.3046036	574.3046	431243
.6247219	471.6247	283452
.4436089	455.4436	265017
.4854647	459.4855	271028
54.259654	454.2597	270198
.5099086	465.5099	.27877
.5159625	453.516	276155
.3773344	543.3773	399245
.5178062	765.5178	640848
.9438512	744.9439	631657
769.8095	769.8095	501479
39.472942	839.4729	.71168
.0112525	922.0113	882929
.5017866	917.5018	91805
20.849376	920.8494	93170
.0677167	942.0677	99578
74.182037	1274.182	819984
30.123502	1280.124	866593
75.090551	1275.091	857925
77.738821	1277.739	859649
46.987083	1146.987	549545
.6289098	961.6289	984795
.6704303	824.6704	6.67541
.5412311	851.5412	.75416
0.3413129	600.3413	.44825
5.4348899	465.4349	.27328

	Number	K6GrMW	K6NtMW	K6MBtuperHr Pl Uncorr	EMS Gr I/O	EMS Net I/O	Gross I/O-CWIT Corr.	Net I/O-CWIT Corr.	CWIT	Aux MW	Manually Adjust Target Aux	Diff.
					78.72028	106.7320134						
					7.71472	7.994832215						
					0.007554	0.008373585	Adjusted-Mbtu/Hr		Checks			
###########	1	74.23486	68.64695	706.855835	693.05016	695.0125869	705.4539855	705.4539855	80.07909	5.587912	5.395512	0.1924
###########	2	71.20329	65.64754	691.5940552	666.331772	667.6598642	690.2808986	690.2808986	79.96178	5.555747	5.345794	0.209953
###########	3	60.22156	54.78233	585.1351318	570.708343	569.8375193	583.9797412	583.9797412	79.84447	5.439231	5.165694	0.273537
###########	4	55.06266	49.67817	549.815918	526.416265	524.5659828	548.7725696	548.7725696	79.72716	5.384495	5.081088	0.303407
###########	5	52.74007	47.38022	532.0557861	506.60672	504.3266443	531.111562	531.111562	79.62663	5.359852	5.042997	0.316855
###########	6	45.45923	40.17663	458.6362915	445.036154	441.4537149	457.7042185	457.7042185	79.68436	5.282602	4.923591	0.359011
###########	7	51.74756	46.39824	513.909668	498.166381	495.704757	512.8838836	512.8838836	79.7421	5.349322	5.02672	0.322602
###########	8	66.71387	61.20575	642.5028687	627.019976	627.4303968	641.3688854	641.3688854	79.79984	5.508114	5.272167	0.235947
###########	9	86.31299	79.67202	819.3259888	800.877603	796.8489072	818.1307444	818.1307444	79.85758	6.640964	6.427892	0.213072
###########	10	90.83203	84.08026	864.4807129	841.787927	838.1365601	863.2338526	863.2338526	79.91532	6.751771	6.562921	0.18885
###########	11	100.1372	93.15727	942.4616699	926.998228	924.1770728	941.1989276	941.1989276	79.97306	6.979934	6.84096	0.138975
###########	12	106.0242	98.89989	992.0635986	981.592519	979.3236254	990.7797018	990.7797018	80.0308	7.124283	7.016862	0.10742
###########	13	108.4453	101.2617	1035.638672	1004.18346	1002.164131	1034.294238	1034.294238	80.08443	7.183649	7.089206	0.094443
###########	14	103.0374	95.98631	963.6447144	953.823135	951.2753854	962.2931405	962.2931405	80.0992	7.051046	6.927616	0.12343
###########	15	98.00989	91.08212	919.7139893	907.402377	904.3850999	918.3267386	918.3267386	80.11397	6.927772	6.777395	0.150377
###########	16	95.14111	88.28368	888.3032227	881.084864	877.8090427	886.9012206	886.9012206	80.12874	6.85743	6.691676	0.165754
###########	17	95.10996	88.2533	914.201416	880.799776	877.5211842	912.7449819	912.7449819	80.14351	6.856666	6.690746	0.165921
###########	18	94.59297	87.74898	886.5773926	876.070482	872.7460351	885.1430083	885.1430083	80.15828	6.84399	6.675298	0.168692
###########	19	94.36582	87.5274	879.0929565	873.993651	870.6493267	877.6539649	877.6539649	80.17305	6.83842	6.668511	0.169909
###########	20	109.3096	102.1047	1018.46051	1012.2726	1010.339966	1017.0698	1017.0698	80.18782	7.204841	7.11503	0.089811
###########	21	81.58081	75.05598	789.4629517	758.368499	753.9628016	787.9067552	787.9067552	80.21573	6.524931	6.286495	0.238437
###########	22	86.74438	80.09284	806.0113525	804.76966	800.7762548	804.5122788	804.5122788	80.22665	6.651542	6.440782	0.21076
###########	23	83.87582	77.29461	793.7064209	778.94226	774.7170854	792.2353915	792.2353915	80.16024	6.581205	6.355069	0.226136
###########	24	80.08203	73.59385	765.2068481	744.975525	740.4542899	763.7804038	763.7804038	80.09383	6.488181	6.241711	0.24647
###########	25	64.63599	59.14992	627.6207275	608.927999	608.9224572	626.2717797	626.2717797	80.02743	5.486068	5.23809	0.247978
###########	26	52.8741	47.51283	527.744751	507.747682	505.49222	526.5057014	526.5057014	79.96102	5.361274	5.045195	0.316079
###########	27	45.43042	40.14812	454.522583	444.794124	441.2066674	453.4198547	453.4198547	79.89462	5.282297	4.923119	0.359178
###########	28	45.30371	40.02276	450.1105957	443.729753	440.120239	449.0730169	449.0730169	79.82821	5.280952	4.921041	0.359912
###########	29	45.32666	40.04546	469.6573486	443.922511	440.3169907	468.6333768	468.6333768	79.7618	5.281196	4.921417	0.359779
###########	30	44.81157	39.53584	462.538147	439.598033	435.9030455	461.5686526	461.5686526	79.71053	5.275731	4.91297	0.362761
###########	31	45.62573	40.34136	475.6903687	446.435249	442.8818318	474.7403218	474.7403218	79.66756	5.284369	4.926322	0.358047
###########	32	58.48242	53.06164	574.7275391	555.731933	554.5270962	573.7739608	573.7739608	79.6246	5.420778	5.137172	0.283607
###########	33	71.93799	66.37445	694.0264893	672.794227	674.2749653	693.0843971	693.0843971	79.58163	5.563542	5.357843	0.205699
###########	34	81.33447	74.81558	793.7088013	756.164912	751.7400976	792.7894935	792.7894935	79.53866	6.518891	6.279134	0.239757
###########	35	76.05212	70.44493	731.4879761	709.132896	711.4812349	730.6256786	730.6256786	79.49569	5.607193	5.425315	0.181878
###########	36	74.15788	68.57078	699.9198608	692.369917	694.3160883	698.1172695	698.1172695	79.45272	5.587095	5.394249	0.192846
###########	37	77.70703	72.08228	737.157959	723.822211	726.525679	736.387895	736.387895	79.40975	5.624752	5.452455	0.172296
###########	38	77.70264	72.07793	738.3378296	723.783149	726.4856697	737.5787249	737.5787249	79.3969	5.624705	5.452383	0.172322
###########	39	78.00952	72.38156	747.2941284	726.511653	729.2804129	746.5251664	746.5251664	79.40056	5.627961	5.457416	0.170545
###########	40	78.11035	72.48132	741.8198853	727.40844	730.1989909	741.0540091	741.0540091	79.40422	5.629031	5.45907	0.169961
###########	41	78.30241	72.67134	738.6252441	729.11701	731.9491012	737.8609877	737.8609877	79.40788	5.631069	5.462219	0.168849
###########	42	78.41284	72.7806	752.7595825	730.099725	732.955725	751.9782266	751.9782266	79.41154	5.63224	5.464031	0.16821
###########	43	79.77979	74.13304	755.2738647	742.27879	745.4320201	754.4993988	754.4993988	79.41521	5.646744	5.486448	0.160295
###########	44	93.79541	86.97098	881.609375	868.782518	865.387765	880.8461317	880.8461317	79.41887	6.824433	6.651467	0.172967
###########	45	88.68295	81.98387	840.2983398	822.294049	818.4611304	839.5194344	839.5194344	79.42253	6.699076	6.498706	0.200369
###########	46	80.55713	74.0573	791.4078979	749.217287	744.7324743	790.6374939	790.6374939	79.38127	6.499831	6.255907	0.243924
###########	47	74.61401	69.02208	711.9421997	696.401518	698.44411	711.2599787	711.2599787	79.31537	5.591935	5.40173	0.190205
###########	48	60.43921	54.99767	589.7335815	572.585846	571.7570968	589.1268193	589.1268193	79.24947	5.44154	5.169263	0.272277
###########	49	43.57422	38.31162	444.2008972	429.226051	425.3175377	443.7044837	443.7044837	79.18357	5.262602	4.892677	0.369925
###########	50	44.58154	39.30825	456.3635559	437.668082	433.9332498	455.9160398	455.9160398	79.11767	5.27329	4.909197	0.364093
###########	51	43.97681	38.70993	446.2607727	432.59816	428.7589036	445.8762862	445.8762862	79.05177	5.266874	4.89928	0.367594
###########	52	44.1709	38.90197	443.8532715	434.224763	430.418971	442.5308187	442.5308187	80.17287	5.268933	4.902463	0.36647
###########	53	45.41455	40.13242	471.1494751	444.660808	441.0705878	470.6952452	470.6952452	79.11361	5.282128	4.922859	0.35927
###########	54	43.95605	38.6894	455.6175537	432.42428	428.5814486	455.1151733	455.1151733	79.17818	5.266654	4.898939	0.367714
###########	55	54.09399	48.71978	537.0966797	518.144513	516.114136	536.5085761	536.5085761	79.24276	5.374217	5.065202	0.309016
###########	56	76.92074	71.30433	728.2026367	716.837745	719.3720416	727.5316704	727.5316704	79.30733	5.616409	5.43956	0.176849
###########	57	81.3335	74.81463	777.9972534	766.156178	751.7312881	777.2560599	777.2560599	79.37191	6.518867	6.279105	0.239762
###########	58	91.23535	84.47369	870.991272	845.454132	841.8372628	870.1959487	870.1959487	79.43649	6.761661	6.574972	0.186689
###########	59	89.24927	82.53631	835.8150024	827.424261	823.6398134	834.9723223	834.9723223	79.50106	6.712962	6.515628	0.197334
###########	60	89.7373	83.01238	849.9952393	831.849188	828.1048626	849.0824793	849.0824793	79.56564	6.724929	6.530211	0.194718
###########	61	93.98865	87.15948	883.4598013	870.547401	867.1696337	882.5256303	882.5256303	79.6017	6.829172	6.657241	0.171931
###########	62	97.40029	90.48747	916.9979248	901.79967	898.726884	916.0390611	916.0390611	79.63503	6.912825	6.759181	0.153644
###########	63	97.75215	90.8307	916.7890015	905.032878	901.9920937	915.8038859	915.8038859	79.66835	6.921453	6.769694	0.151758
###########	64	95.00537	88.15127	890.2868184	879.842676	876.5547894	889.2677774	889.2677774	79.70168	6.854102	6.68762	0.166481
###########	65	119.9653	112.4992	1120.270752	1112.93398	1112.12104	1119.300617	1119.300617	79.735	7.46612	7.433424	0.032696
###########	66	137.1626	129.2748	1290.088867	1279.00909	1280.201492	1289.143582	1289.143582	79.76833	7.887797	7.947278	-0.059482
###########	67	139.7712	131.8194	1318.453613	1304.5909	1306.108866	1317.486328	1317.486328	79.80165	7.95176	8.025224	-0.073464
###########	68	109.8198	102.6025	1029.348511	1017.05369	1015.172531	1028.249695	1028.249695	79.83498	7.217352	7.130276	0.087076
###########	69	100.8491	93.85173	954.7215576	933.57131	930.816624	953.635768	953.635768	79.77573	6.99739	6.862232	0.135159
###########	70	87.07324	80.41364	808.5236816	807.738499	803.7720993	807.4944143	807.4944143	79.70762	6.659606	6.450608	0.208997
###########	71	85.3916	78.77323	806.4394531	792.574272	788.4707178	805.45561	805.45561	79.6395	6.618372	6.400361	0.218011
###########	72	51.63599	46.28785	522.8372192	497.218498	494.7365455	521.9482302	521.9482302	79.57139	5.348138	5.02489	0.323248
###########	73	42.54041	37.28677	440.2121277	420.577964	416.4925578	439.4425216	439.4425216	79.50327	5.251634	4.875723	0.375911
###########	74	43.49839	38.23659	453.5054016	428.591179	424.6696442	452.7798452	452.7798452	79.43516	5.261798	4.891434	0.370364
###########	75	43.31134	38.05153	449.1292114	427.025482	423.0718578	448.4678293	448.4678293	79.36704	5.259813	4.888366	0.371447
###########	76	43.22852	37.96958	443.8691711	426.332368	422.3645496	443.2729641	443.2729641	79.29893	5.258935	4.887008	0.371927
###########	77	43.5849	38.32218	445.3634644	429.315486	425.4088071	444.7300373	444.7300373	79.34301	5.262716	4.892852	0.369863
###########	78	43.33798	38.07789	449.6517639	427.248455	423.2993984	449.0019544	449.0019544	79.35294	5.260096	4.888803	0.371293
###########	79	51.4314	46.08543	510.1695557	495.480857	492.9616681	509.3992253	509.3992253	79.46049	5.345967	5.021535	0.324432
###########	80	73.39014	67.81119	699.0404053	685.591327	687.3758133	698.1208039	698.1208039	79.56803	5.578949	5.381658	0.197291
###########	81	76.92017	71.30376	727.9335938	716.832665	719.3668394	726.9141796	726.9141796	79.67558	5.616403	5.439551	0.176852
###########	82	84.75244	78.14974	810.0087891	786.821838	782.6667682	808.8753333	808.8753333	79.78312	6.6027	6.381263	0.221437
###########	83	87.87939	81.20002	846.1344604	815.023143	811.1233236	844.8920647	844.8920647	79.89066	6.679373	6.474696	0.204676
###########	84	92.08822	85.30565	867.7819214	853.214836	849.6713603	866.4722519	866.4722519	79.99821	6.782573	6.600456	0.182117
###########	85	95.79224	88.91884	907.6826782	887.047218	883.8294801	906.281722	906.281722	80.10575	6.873396	6.711132	0.162264
###########	86	98.69857	91.75391	932.9418335	913.738708	910.7845118	931.50519	931.50519	80.16279	6.944659	6.797973	0.146686
###########	87	99.58057	92.61428	939.1264038	921.864116	918.9912806	937.7422333	937.7422333	80.10871	6.966285	6.824327	0.141958
###########	88	98.89063	91.94126	931.8166504	915.507016	912.5704807	930.4771716	930.4771716	80.05463	6.949368	6.803712	0.145656
###########	89	98.33578	91.40001	931.8862305	910.399882	907.412406	930.5835832	930.5835832	80.00056	6.935763	6.787133	0.14863
###########	90	92.74268	85.94406	882.9558716	859.17755	855.6908026	881.6829851	881.6829851	79.94648	6.79862	6.620011	0.178609
###########	91	83.46362	76.89253	816.1176147	775.241258	770.9833395	814.8502954	814.8502954	79.8924	6.571096	6.342753	0.228345
###########	92	98.22473	91.29169	926.1357422	909.378311	906.380671	924.989274	924.989274	79.83833	6.93304	6.783815	0.149225
###########	93	94.12817	87.29558	910.2137451	871.82208	868.4565962	909.0793065	909.0793065	79.78425	6.832593	6.66141	0.171183
###########	94	88.59879	81.90178	841.1132202	821.532143	817.6921928	840.0313015	840.0313015	79.74062	6.697012	6.496192	0.20082
###########	95	94.59082	87.74688	889.541748	876.050809	872.7261719	888.4992177	888.4992177	79.71999	6.843937	6.675234	0.168703
###########	96	59.46875	54.03751	575.3171387	564.219999	563.2041164	574.3046036	574.3046036	79.69936	5.431243	5.153348	0.277896
###########	97	45.53931	40.25585	472.5793152	445.70898	442.1404944	471.6247219	471.6247219	79.67873	5.283452	4.924905	0.358547
###########	98	43.80176	38.53674	456.3652039	431.131636	427.2622403	455.4436089	455.4436089	79.6581	5.265017	4.896409	0.368608
###########	99	44.36836	39.09733	460.3914795	435.88018	432.1084819	459.4854647	459.4854647	79.63747	5.271028	4.905701	0.365327
###########	100	44.29012	39.01992	455.1383057	435.224185	431.4389723	454.259654	454.259654	79.61684	5.270198	4.904418	0.36578
###########	101	45.09798	39.81921	466.3842773	442.002108	438.3568253	465.5099086	465.5099086	79.59621	5.27877	4.917667	0.361103
###########	102	44.85156	39.57541	454.3756104	439.933626	436.2455723	453.5159625	453.5159625	79.60263	5.276155	4.913626	0.362529
###########	103	56.45288	51.05364	544.3413086	538.312501	536.722795	543.3773344	543.3773344	79.66855	5.399245	5.103887	0.295358
###########	104	79.22412	73.58327	766.6187744	737.324581	740.3566965	765.5178062	765.5178062	79.73447	5.640848	5.477336	0.163512
###########	105	78.35791	72.72625	746.0895386	729.61089	732.4549959	744.9438512	744.9438512	79.80038	5.631657	5.46313	0.168528
###########	106	80.62435	74.12287	771.024292	749.817738	745.3380944	769.8095	769.8095	79.8663	6.501479	6.257916	0.243563
###########	107	89.19698	82.4853	840.7263794	826.950355	823.1605133	839.472942	839.472942	79.93222	6.71168	6.514066	0.197614
###########	108	96.18103	89.2981	923.335083	890.61047	887.4275822	922.0112525	922.0112525	79.99814	6.882929	6.722749	0.16018
###########	109	97.61361	90.69555	918.8521118	903.759604	900.7062071	917.5017866	917.5017866	80.06406	6.918056	6.765555	0.152501
###########	110	98.17041	91.2387	922.2195435	908.878649	905.8760395	920.849376	920.849376	80.09274	6.931708	6.782192	0.149517
###########	111	100.7836	93.78779	943.3791504	932.965753	930.2049285	942.0677167	942.0677167	80.03952	6.995783	6.860273	0.13551
###########	112	134.397	126.577	1275.323853	1251.99977	1252.853155	1274.182037	1274.182037	79.9863	7.819984	7.864642	-0.044658
###########	113	136.2979	128.4313	1281.204346	1270.55149	1271.637211	1280.123502	1280.123502	79.93307	7.866593	7.92144	-0.054846
###########	114	135.9443	128.0864	1276.128052	1267.0972	1268.13949	1275.090551	1275.090551	79.87985	7.857925	7.910877	-0.052952
###########	115	136.0146	128.155	1278.734497	1267.78409	1268.835011	1277.738821	1277.738821	79.82663	7.859649	7.912976	-0.053329
###########	116	123.3677	115.8181	1147.973755	1145.43609	1145.000458	1146.987083	1146.987083	79.77341	7.549545	7.535086	0.014459
###########	117	100.3354	93.35065	962.678833	928.827823	926.025135	961.6289098	961.6289098	79.72018	6.984795	6.846883	0.137912
###########	118	87.71777	81.04236	825.6525879	813.561897	809.6486867	824.6704303	824.6704303	79.64323	6.67541	6.469867	0.205543
###########	119	90.92969	84.17552	852.3949585	842.675403	839.0323761	851.5412311	851.5412311	79.51408	6.754166	6.565839	0.188327
###########	120	61.07235	55.62409	601.0831299	578.051474	577.3454655	600.3413129	600.3413129	79.38493	5.448258	5.179646	0.268611
###########	121	44.58142	39.30813	466.0136414	437.667058	433.9322048	465.4348899	465.4348899	79.25578	5.273289	4.909195	0.364094

Outliers

Condenser Adjustment

Large Reheat Unit, HR Adjustment from 75 Degr. F

Temp. Rise	Coefficients x2	x	constant
1	76 7.4833E-08	- 2.9850E-05	1.0029E+00
2	77 1.5401E-07	- 6.1068E-05	1.0059E+00
3	78 1.1679E-07	- 6.9344E-05	1.0080E+00
4	79 1.5438E-07	- 8.9910E-05	1.0106E+00
5	80 2.3223E-07	- 1.1788E-04	1.0136E+00
6	81 3.1365E-07	- 1.4699E-04	1.0166E+00
7	82 3.9556E-07	- 1.7654E-04	1.0198E+00
8	83 4.2408E-07	- 1.9548E-04	1.0226E+00
9	84 4.5219E-07	- 2.1503E-04	1.0255E+00
10	85 4.8957E-07	- 2.3711E-04	1.0285E+00

Small Reheat Unit, HR Adjustment from 75 Degr. F

Temp. Rise	Coefficients x2	x	constant
1	76 2.1476E-0	- 4.0812E-	1.0027E+00
2	77 4.4654E-0	- 8.4556E-	1.0055E+00
3	78 6.4158E-0	- 1.2225E-	1.0083E+00
4	79 8.5921E-0	- 1.6336E-	1.0112E+00
5	80 1.1974E-0	- 2.2083E-	1.0147E+00
6	81 1.7181E-0	- 3.0262E-	1.0190E+00
7	82 2.2406E-0	- 3.8429E-	1.0234E+00
8	83 2.6258E-0	- 4.4887E-	1.0273E+00
9	84 2.6804E-0	- 4.7109E-	1.0300E+00
10	85 2.7406E-0	- 4.9474E-	1.0328E+00

Kahe Avg CWIT is 78.6 Degr. F
Waiau Avg. CWIT is 79.8 Degr. F

See HRCondImpact.xls

Auxiliary Calculator-First Ordered Curve-Hourly

	Unit	Break MW	Slope 1	Intercept 1	Slope 2	Intercept 2	MW-Turnir	Daily-MWH	Comments-Adj. Made on 2/11/00 for 2/10	
	H8	27	0.01622	1.18997	0.02307	1.30268	0.375	9,000	Now based upon ODPM	Adusted H8/9 to 27 MW on 6/7 fro
	H9	27	0.01622	1.18997	0.02307	1.30268	0.166667	4,000		
	K1	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
	K2	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
	K3	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
	K4	50	0.01122	1.93273	0.0192	2.06254	0.372222	8,933		
	K5	80	0.01397	3.86311	0.02901	3.14307	0.416667	10,000	Previously 90 MW	
	K6	80	0.0164	4.17806	0.02988	3.84886	0.416667	10,000	Previously 90 MW	
	W10			0.1		0.1	0.025	600		
	W3	28	0.02029	1.1098	0.03095	1.00018	0.208333	5,000	Previously 27 MW	
	W4	28	0.02029	1.1098	0.03095	1.00018	0.333333	8,000	Previously 27 MW	
	W5	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
	W6	35	0.01824	1.03642	0.01997	1.23921	0.208333	5,000	Previously 30 MW	
	W7	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
	W8	48	0.01122	1.93273	0.0192	2.06254	0.372222	8,933	Previously 50 MW	
	W9			0.1		0.1	0.041667	1,000		
	H5						0.0625	1,500		
	H7						0.083333	2,000		
New Aux. MW	K5	80	0.01756	3.55304	0.02465	3.67696				
	K6	80	0.01061	4.80028	0.02452	4.52457				

Check on PI ABC Calculation

K6 Data

	Mbtu	NHR	OPNHR Rpt1 ABC	PI-CWIT Co	PI-Uncorr	OPNHR Var Rpt1 ABC	PI-CWIT Corr	PI-Uncorr
9/22/2001	18941.46	10,250	10,062	10,280	10,294	188	(30)	(44)
9/23/2001	16003.6	10,419	10,203	10,483	10,498	216	(64)	(79)
9/24/2001	18704.07	10,288	10,113	10,329	10,343	175	(41)	(55)
9/25/2001	17614.12	10,355	10,147	10,388	10,403	208	(33)	(47)
9/26/2001	19490.14	10,285	10,092	10,293	10,306	193	(8)	(21)
9/27/2001	19467.96	10,262	10,102	10,307	10,320	161	(44)	(57)
9/28/2001	19946.77	10,255	10,059	10,255	10,268	197	(0)	(13)
9/29/2001	18858.89	10,211	10,057	10,276	10,290	154	(66)	(80)
9/30/2001	18341.56	10,247	10,089	10,320	10,334	158	(73)	(88)
					Avg. 9/22-28	178	(38)	(52)