

PACIFIC MISSILE RANGE
FACILITY COMBINED HEAT
AND POWER FEASIBILITY
STUDY

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CONSULTANT

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PURPOSE

EVALUATE FEASIBILITY OF CHP AT
PACIFIC MISSILE RANGE FACILITY
(PMRF), USING METHANE FROM
KEKAHA LANDFILL.

LANDFILL GAS ANALYSIS

- PHASE I SAMPLES COLLECTED AND ANALYZED
- PHASE II DATA FROM PREVIOUS SAMPLING ANALYZED
- CONCLUSION: LFG SUITABLE AS FUEL FOR A CHP PROJECT

KEKAHA LANDFILL

CONCLUSIONS:

- Methane Percentages in the 50-60% range, typical of landfills.
- Landfill Gas is relatively free of any corrosives harmful to boilers or electric generation equipment
 - Low H₂S
 - Low Siloxanes
 - Low Halogenated Compounds

LFG COLLECTION SYSTEM

- CONCEPTUAL DESIGN AND COST ESTIMATE
- LFG GAS COMPRESSION AND MOISTURE REMOVAL FACILITY
- LFG TRANSMISSION PIPELINE FROM KEKAHA LANDFILL TO PMRF POWERPLANT (3.9 MILES AND 6- IN. DIAMETER HDPE PIPE)

PMRF DATA REVIEW

- ELECTRIC POWER CONSUMPTION AND PRODUCTION
- FUEL CONSUMPTION
- ENERGY COSTS
- ELECTRIC POWER PROD. EQUIPMENT
- CHILLED WATER PROD. EQUIPMENT
- HOT WATER PROD. EQUIPMENT
- ON-SITE ELEC. POWER DISTRIBUTION SYSTEM

SIX ALTERNATIVES

- **1-A** FUEL EXISTING ENGINES ON DIESEL; ADDITION OF HEAT RECOVERY...INTERMITTENT OPERATION
- **1-B** FUEL EXISTING ENGINES ON DIESEL; ADDITION OF HEAT RECOVERY...FULL TIME OPERATIONS
- **2-A** NEW LFG RECIPROCATING ENGINES WITH HEAT RECOVERY TO PROD. CHILLED WATER WITH ABSORPTION CHILLER, PLUS MICROTURBINE WITH ABSORPTION CHILLER AT BUILDING 1262.

SIX ALTERNATIVES

- **2-B** NEW LFG RECIPROCATING ENGINES WITH HEAT RECOVERY TO PROD. CHILLED WATER WITH ABSORPTION CHILLER; W/O MICROTURBINE AT BLDG. 1262
- **3** NEW LFG RECIPROCATING ENGINES AT PMRF CLOSE TO LANDFILL
- **4** NEW LFG RECIPROCATING ENGINES AT LANDFILL

EVALUATION CRITERIA

- LIFE CYCLE ENERGY COST REDUCTION
- FOSSIL FUEL CONSUMP. REDUCTION
- QUANTITY OF RENEWABLE POWER GENERATED

PREFERRED ALTERNATIVE

- ALTERNATIVE 2-B

NEW LFG RECIPROCATING ENGINES WITH HEAT RECOVERY TO PROD. CHILLED WATER WITH ABSORPTION CHILLER; W/O MICROTURBINE AT BLDG. 1262

ALTERNATIVE 2-B

- LFG COLLECTION CONSISTING OF 39 EXTRACTION WELLS AND PIPING
- LF GAS PROCESSING SKID...600 SCFM WITH OPERATING PRESSURE OF 25 PSIG.
- 3.9 MILE, 6-INCH DIAMETER PIPELINE FROM LANDFILL TO PMRF POWERPLANT

ALTERNATIVE 2-B

- 1,640 KW LFG FIRED CHP PLANT, LOCATED NEXT TO PMRF POWER PLANT
- CHILLED WATER EQUIP./PIPING TO BLDGS. 130, 105 AND 105ROCS.
- 12.47 kV DISTR. LINE (~13,800') FROM PMRF POWER PLANT TO NAVY HSG.

ESTIMATED COST

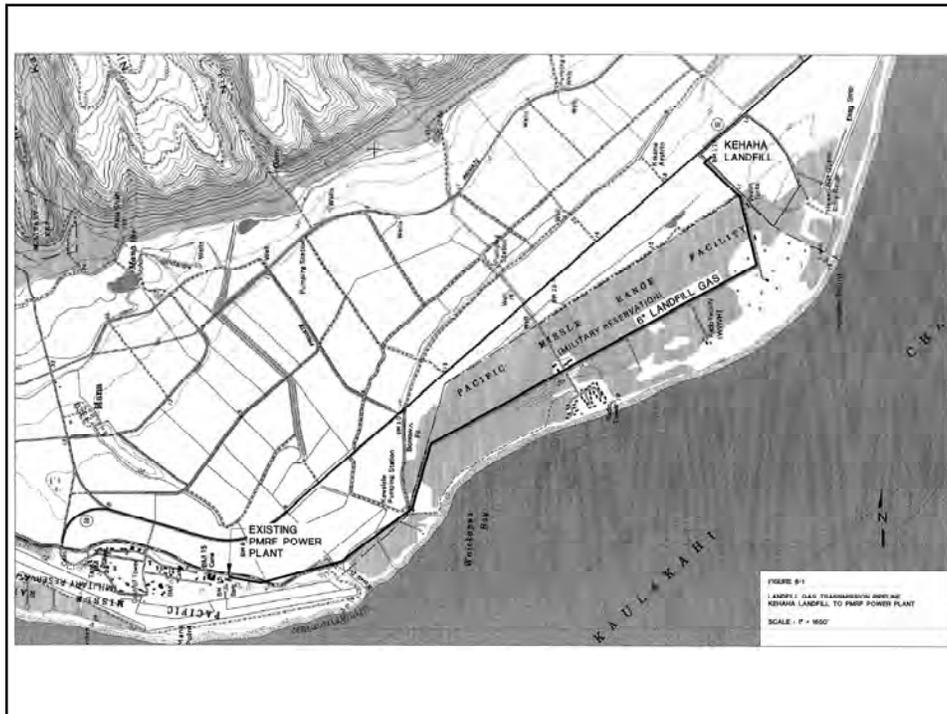
- \$8,231,700
- EXAMPLES OF MAJOR COMPONENTS:
 - LFG COLLECTION SYSTEM...\$479,000
 - LFG SKID...\$460,000
 - LFG PIPING...\$654,000
 - RECIPROCATING ENGINES...\$1,350,000

ECONOMICS

- BASED ON ASSUMPTIONS AND ANALYSES FOR ALL SCENARIOS EVALUATED, THE INVESTMENT IN THE PROJECT WOULD HAVE AN INTERNAL RATE OF RETURN GREATER THAN 25%.

BENEFITS

- 12 MILLION KWH OF RENEWABLE ENERGY PER YEAR OVER 20 YEAR LIFE
- REDUCE DIESEL OIL CONSUMPTION BY ABOUT 800,000 GALLONS PER YEAR
- REDUCE THE RELEASE OF METHANE INTO THE ATMOSPHERE



KEY PLAYERS

- COUNTY: LANDFILL/LFG OWNER
- PMRF: ADJACENT USER
- KIUC: LOCAL ELECTRIC UTILITY

REPORT AVAILABLE AT:

- <http://www.hawaii.gov/dbedt/info/energy/publications/chp-kauai2007.pdf>