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July 27, 2006

William A. Bonnet
Vice President
Government & Community Affairs

The Honorable Chairman and Members of
the Hawaii Public Utilities Commission
465 South King Street
Kekuanaoa Building, 1st Floor
Honolulu, Hawaii 96813

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PUBLIC UTILITIES
COMMISSION
FILED

Dear Commissioners:

Subject: Docket No. 03-0371
Proceeding to Investigate Distributed Generation in Hawaii

This letter sets forth the proposed modifications of Hawaiian Electric Company, Inc. (“HECO”), Hawaii Electric Light Company, Inc. (“HELCO”), and Maui Electric Company, Limited (“MECO”) to each Company’s respective Rule 14H tariff for interconnection of distributed generating facilities operating in parallel with the Company’s electric system. The proposed revisions resulted from the Companies’¹ review and consideration of the requirements that were included in Decision and Order No. 22248 (“D&O 22248”), filed January 27, 2006 in the subject docket, and certain other revisions proposed by HECO/HELCO/MECO, as discussed below.

D&O 22248 ordered the Companies to file their proposed modifications to Rule 14H within 6 months of the issuance of said decision and order. D&O 22248 also stated that the Companies’ current Rule 14H shall continue in effect until the proposed modifications included herein are approved by the Commission.

Attached, as Exhibit A, is a blacklined version of HECO’s proposed revised Rule 14H, including Appendix I, II, and III. Also attached, as Exhibit B, is a clean version of HECO’s proposed revised Rule 14H, including Appendix I, II, and III, which accepts all of the changes identified in the blacklined version.² The revisions made to HECO’s Rule 14H include

¹ HECO, HELCO, and MECO are sometimes referred to collectively as the “Companies”.

² In the interests of administrative economy and efficiency, HELCO and MECO are not including blacklined and clean versions of their respective proposed revised Rule 14, including Appendix I, II, and III. The only differences compared to HECO’s versions would be 1) change references to HECO to HELCO or MECO, where appropriate, 2) change the reference to the City and County of Honolulu Building Code (HECO Sheet No. 34B-6) to the Hawaii County Building Code (HELCO Sheet No. 38B-6) or the Maui County Building Code (MECO Sheet No. 36B-6), 3) include HECO in the indemnification provision 18 (a) (HELCO Sheet No. 38C-5 and MECO Sheet No. 36C-5), and

shall not be allowed to reconnect to the power system until this synchronization requirement (including matching voltage with the utility system within $\pm 5\%$) is met.

By the Standard Interconnection Agreement, the Companies do not require a customer-generator to provide voltage and power support to the distribution system. The Standard Interconnection Agreement is intended for interconnection of generating facilities without a need or requirement for voltage and power support. Generating facilities with the intent of providing voltage and power support will generally enter into a contract with the utility (e.g., a power purchase agreement).

In D&O 22248 (page 32), the Commission stated in relevant part:

Further the guidelines should establish control and monitoring requirements for the distributed generation unit to coordinate its operations with the utility, as well as: (1) allow for automatic control and quick shutdown; (2) meet metering, telemetry, and communications requirements capable of supplying failure reporting data on generation operation; and (3) meet minimum documentation and test result criteria.

HECO/HELCO/MECO Response

Rule 14H, Appendix I, Section 3f (Supervisory Control) establishes control and monitoring requirements for generating facilities, including the capability to allow the utility to trip the interrupting device during emergency conditions. The Companies request amendment of Appendix I, Section 3f to apply to generating facilities with an aggregate capacity greater than or equal to 1MW, as shown in the revised version of Rule 14H, Appendix I (see, e.g., HECO blacklined version, Sheet No. 34B-8). The existing requirement applies to generating facilities with an aggregate export capacity greater than 250kW. The need for control and monitoring of a generating facility is related more to the capacity size of the generating unit rather than its export capability.

Rule 14H, Appendix II (Standard Interconnection Agreement), Exhibit B.4c requires customer-generators to keep logs on unit availability (failure reporting data on generation operation). Rule 14H, Appendix I, Section 3f (Supervisory Control) addresses the extent of the requirements concerning metering, telemetry, and communications for supplying failure reporting data on generation operation.

Rule 14H, Appendix I, Section 3h (Equipment Testing) establishes minimum documentation and test result requirements.

In D&O 22248 (pages 32 to 33), the Commission stated in relevant part:

In addition, the interconnection of distributed generation should not result in



Rule 14H, Appendix II (Standard Interconnection Agreement) is the standard agreement form provided to customer-generators intending to operate in parallel with the utility system, and not planning to export power under a purchase power agreement or net energy metering agreement.

2. Pre-Interconnection Studies

In D&O 22248 (page 36) the Commission stated in relevant part:

Interconnection of new generators to the distribution system affects system reliability. Therefore, customer-generators must coordinate generator additions with the distribution operator. The expense and time associated with these studies can make them a barrier to entry for the new customer-generator. The commission hereby requires each utility to perform pre-interconnection studies for customers at reasonable costs to the customer, and to set forth the terms and conditions of the same in a proposed tariff for approval by the commission. These requirements will require the utility to complete the study within a reasonable time, advise customers of its costs in advance, limit charges for redundant studies, provide the study results in writing, and provide similar features to facilitate customer interconnection.

HECO/HELCO/MECO Response

Rule 14H, Appendix III (Interconnection Process Overview), Section 2 (Technical Review Process) and Section 3 (The Need for Additional Technical Study) include information on pre-interconnection studies and charges. In the technical review process, the Company performs an initial technical screening of the facility impact on the utility system, for which there is no charge to the customer. The initial technical screening will determine if additional technical study is necessary. The scope and cost of the study will depend on the complexity of the utility system that the generating facility is interconnected to which must be modeled, and the degree to which the generating facility will affect the utility system.

Rule 14H, Appendix III (Interconnection Process Overview), Section 2.c (Technical Review Process), states: "Following submission by the Customer of all necessary information regarding the proposed distributed generating facility, the Company will perform an initial technical screening of the impact of the distributed generating facility on the Company's system, for which a charge will not be assessed. The Company shall respond to the Customer with the findings of the initial technical screening within 15 business days of the date the customer materials are deemed complete. If the Company determines that additional technical study of the interconnection proposal is necessary, then the Company will notify the Customer of the Company's target date to complete any required additional technical study." (see, e.g., HECO blacklined version, Sheet No. 34D-8, footnote omitted)



Rule 14H, Appendix III (Interconnection Process Overview), Section 3d (The Need for Additional Technical Study) states: “ A cost estimate and schedule for the analyses to be done as part of the additional technical study will be provided to the Customer before the overall study is started. This generally would be done when the Company responds to the Customer with the findings of the initial technical screening.”

With respect to the Commission requirement for limiting charges for redundant studies, Rule 14H, Appendix III (Interconnection Process Overview), Section 3d (The Need for Additional Technical Study) states: “With respect to additional studies performed by the Company, the Customer will be responsible for the cost of any additional technical study (or such lesser amount as the Company may specify to facilitate the processing of interconnection requests for similarly situated facilities) that needs to be performed in order to evaluate the impacts of the generating facility’s interconnection to the utility system.” The impact of a generating facility on the utility system and the mitigating requirements (if any) to maintain the level of safety and reliability on the system will depend on several factors including the size of the generating facility, the type of technology, and the point on the utility’s system at which the generating facility will be interconnected. To determine the impact of the generating facility, the utility feeder on which the generator will be connected to must be modeled, as well as the generator characteristics. If a particular feeder that a generating facility plans to interconnect has been previously modeled, the labor hours required to update the model with the new generating facility will be less, and this would be reflected in the study cost estimate.

With respect to the Commission requirement for providing the study results in writing, Appendix III, Section 2.c will be amended to provide the study results in writing, as shown in the revised version of Appendix III (see, e.g., HECO blacklined version, Sheet No. 34D-8).

In D&O 22248 (pages 36-37) the Commission stated in relevant part:

These requirements and parameters shall also: (1) allow qualified third parties to perform the studies, and require the utility to accept them under specified conditions; (2) allow third party verification of alternative solutions and technologies; (3) create safe-harbor exemption from the study requirements for smaller projects whose interconnection is unlikely to affect the distribution system; and (4) pre-certify certain equipment that meets certain standards set by such organizations as the UL so as to expedite installation and obviate separately conducted equipment studies.



establish detailed terms and conditions for the foregoing requirements, by proposed tariff for approval by the commission.

HECO/HELCO/MECO Response

The technical review process flowchart in Rule 14H, Appendix III, Section 2.a, includes a screen for photovoltaic inverters systems (less than 250kW) which meets IEEE-929 and UL - 1741 standards to qualify for an expedited review process. In general, equipment which meets IEEE-929 and UL-1741 will expedite the review process and not require separately conducted equipment studies for that equipment.

The Companies will continue training of its personnel in new technologies relating to integration equipment.

With respect to the Commission requirement to propose an allocation of cost responsibility where new equipment is required to facilitate interconnection that recognizes both the costs caused by the generator and the system benefits, if any, derived from the new equipment, Rule 14H, Appendix II (Standard Interconnection Agreement), Exhibit C (Interconnection Facilities Owned by the Company) provides the means for the Companies to itemize and charge the customer for new utility-owned interconnection equipment costs.

In its integrated resource planning ("IRP") process, HECO evaluated distributed generation ("DG") in the context of the integration of this type of resource with other supply-side resources and also demand-side resources in the development of alternative resource plans. See, for example, HECO's IRP-3 Report, filed October 28, 2005, Docket No. 03-0253, Section 9.8.2, DG/CHP in Transmission and Distribution Planning, and Section 10.10.3, Distribution Planning.

Distribution system planning is more dynamic with a shorter planning horizon compared to transmission system planning, due in large part to its need to be responsive to customer service requirements. Distribution system additions are generally driven by the addition of new customers (e.g., new residential developments) which the utility does not control, and forecasts are in large part contingent on information provided by these potential new customers. Consequently, the planning horizon for distribution system planning is generally 1-3 years, and subject to continual update based on the latest available information. By contrast, the transmission system is much more static in nature and is conducive to evaluation of changes resulting from a single change in assumption (such as the addition of a proposed generating unit) over a long period of time.

The dynamic nature of distribution system planning therefore makes it difficult to determine the benefits to the utility system of new equipment that may result from the interconnection of a distributed generation customer. However, if the customer can show that there are benefits to the utility system due to such new equipment, the customer may apply to the utility for a credit reflecting these benefits, subject to Commission approval. For example, if



generation program, the electric utility is allowed to remotely dispatch customer-owned standby generators for limited peaking duty purposes. PGE provides financial payment to the customer for various costs incurred by the customer to enable utility dispatch. According to PGE, the dispatchable standby generation program is a cost-effective resource option for peaking capacity.

The HECO feasibility study will evaluate technical, economic, permitting, and regulatory factors and allow both HECO and DOT Airports to decide whether to proceed with a dispatchable standby generation project at the Honolulu Airport, subject to Commission approval. Should dispatchable standby generation appear viable on a more general scale, HECO will consider additional applications of this DG model to other large customers, and/or development of a dispatchable standby generation program.

5. Indemnification and Liability Insurance

In D&O 22248 (pages 38-39) the Commission stated in relevant part:

Generators create economic risks. Disputes may arise over whether customer-generated generators should have liability insurance, and in what amounts and forms it should be required. Allowing the utility to impose excessively high liability insurance requirements deters small distributed generation facilities.

Accordingly, the commission will not require distributed generators to carry a standardized amount of insurance, and hereby prohibits any utility from imposing a standardized insurance requirement for distributed generation projects. The commission allows each utility, however, to require that distributed generation customers disclose whether they intend to self-insure (and if so their means and capability of self-insuring) or if they intend to obtain an insurance policy (and, if so, in what forms and amounts), as part of the interconnection application process with the utility.

By this Decision and Order, the commission does not intend to eliminate the obligation for distributed generators to carry some form of adequate insurance, as the commission expects distributed generation customers to have insurance in forms and amounts that are commercially reasonable in each particular situation. This approach allows a customer-generator more flexibility in providing for adequate risk management of the project without the burdensome and potentially overly costly standardized insurance requirements.

HECO/HELCO/MECO Response

As shown in the revised version of Appendix II, Section 19 (see, e.g., HECO blacklined version, Sheets No. 34C-6 to 34C-8, and new Exhibit D on Sheet No. 34C-26), the Companies have amended the insurance requirements to remove the standardized insurance

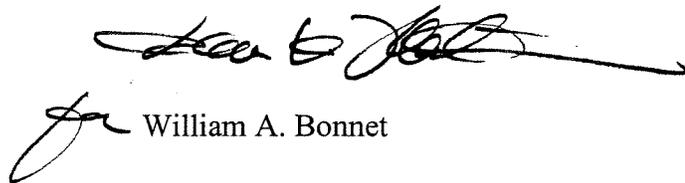


The Companies request amendment of Rule 14H, Appendix III (Interconnection Process Overview), Section 1.c.Step 2 (Steps in the Interconnection Process), as shown in the revised version of Rule 14H, Appendix III (see, e.g., HECO blacklined version, Sheet No. 34D-3), to include language which identifies a timeframe of 15 business days for the Company to review materials submitted by the customer for their proposed generating facility and provide written notification whether the information is complete to enable the technical review.

III. Summary

HECO/HELCO/MECO maintain that the attached proposed modifications to their respective Rule 14H are reasonable, and request that the Commission issue an order approving the proposed modifications³.

Sincerely,



William A. Bonnet

Attachments

cc: Division of Consumer Advocacy
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³ HECO/HELCO/MECO respectfully request that the Commission issue its order at least five business days prior to the effective date of the proposed modification to Rule 14 to allow the Companies time to prepare the tariff sheets.



EXHIBIT A

Blacklined Version of Appendix I, Distributed
Generating Facility Interconnection Standards
Technical Requirements; Appendix II, Standard
Interconnection Agreement; and Appendix III,
Interconnection Process Overview

APPENDIX I

Distributed Generating Facility Interconnection Standards Technical Requirements

The following interconnection standards are intended to provide general technical guidelines and procedures to facilitate the interconnection and parallel operation of distributed generating facilities with Hawaiian Electric Company, Inc.'s (HECO, Company or utility) electrical distribution system. The specific characteristics or needs of each distributed generating facility may reduce or increase its interconnection requirements. The degree of technical review required for a request for interconnection, and the extent to which additional technical study will be needed, will depend on factors such as the size of the generating facility, the type of technology and the point on the utility's system at which the generating facility will be interconnected. (See Interconnection Process Overview, Appendix III.) These technical interconnection requirements have been established to maintain safety, reliability, and power quality standards for all utility customers and personnel under the objectives described below:

Objectives of Good Interconnection Practice

- **Safety** – To protect the safety of utility personnel, utility customers, and the public.
- **Reliability** – To maintain the reliability of the utility system for all utility customers.
- **Power Quality** – To provide for acceptable power quality¹ and voltage regulation on the utility system and for all utility customers.
- **Restoration** – To facilitate restoration of power on the utility system.
- **Protect Utility and Customer Equipment** – To protect utility and customer equipment during steady state and faulted system operating conditions.
- **Protect Generating Facilities** – To protect generating facilities from operation of utility protective and voltage regulation equipment.
- **Utility System Overcurrent Devices** – To maintain proper operation of the utility system's overcurrent protection equipment.
- **Utility System Operating Efficiency** – To ensure operation at appropriate power factors and minimize system losses.

Customers are encouraged to review and discuss these technical interconnection standards with the utility before proceeding with their design and procurement of distributed generating facility equipment.

¹ "Acceptable" power quality is power delivered to customers that does not impair operation of the customers' equipment or cause visible light flickering due to voltage fluctuations under normal operating conditions. One element of power quality is voltage flicker, which is a function of the magnitude of voltage fluctuation and the frequency at which the fluctuation occurs. Voltage flicker is described in Section 4.n. of this Appendix I.

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1. Definitions

- a. Active Anti-Islanding Scheme: A control scheme installed with the generating facility that prevents the formation of an unintended island by accelerating the drift in voltage and/or frequency to the respective trip points when the utility is not connected.
- b. Clearing Time: The time between the abnormal voltage being applied and the generating facility ceasing to energize the utility distribution system.
- c. Dedicated Transformer: A transformer that provides electrical service to a single customer.
- d. Distribution System: All electrical wires, equipment, and other facilities at the distribution voltage levels (such as 25kV, 12kV, or 4kV) owned or provided by the utility, through which the utility provides electrical service to its customers.
- e. Direct Transfer Trip: Automatic remote trip of a generating facility's circuit breaker or interrupting device by means of a communication channel that is acceptable to the utility.²
- f. Generating Facility: Customer or utility-owned electrical power generation that is interconnected to the utility.
- g. Induction Generator: A rotating machine generator that converts mechanical power to electrical power, in which the rotor current creating the magnetic field is supplied by an external AC source, usually the electric utility system.
- h. Inverter System: A machine, device, or system that changes direct-current power to alternating-current power.
- i. Network System: An electrical system in which two or more utility feeder sources are electrically tied together on the primary or secondary voltage level to form one power source for one or more customers. The network system is designed to provide higher reliability for customers connected to it.
- j. Point of Interconnection: The point at which the utility and the customer interface occurs.

² Acceptance of the communications channel depends upon the speed of the operation, availability (up time), reliability, security, and type of electrical interface equipment used. The criteria for selecting the type of acceptable communications are the levels of guaranteed priority for restoration response, maintenance, and system upgrades in order to maximize availability, reliability, and security. Other technical communications channel requirements are determined by the manufacturers of the electrical interface equipment used.

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- k. Short Circuit Contribution Ratio (SCCR): The ratio of the aggregate short circuit contribution of the generating facility to the short circuit contribution of the utility system (including all other generating facility sources), for a three-phase fault at the high side of the customer or utility transformer.
- l. Subtransmission System: All electrical wires, equipment, and other facilities at the subtransmission voltage levels (such as 46kV, 35kV, or 23kV) owned or provided by the utility, through which the utility provides electrical service to its customers.
- m. Supervisory Control: Remote monitoring and/or control of a generating facility's power output and interrupting device status by means of a communication channel (see footnote number 2) that is acceptable to the utility.
- n. Synchronous Generator: A rotating machine generator that converts mechanical power into electrical power, in which the rotor current creating the magnetic field comes from a separate DC source or the generator itself.
- o. Transmission System: All electrical wires, equipment, and other facilities at the transmission voltage levels (such as 138kV or 69kV) owned or provided by the utility, through which the utility provides electrical service to its customers.
- p. Unintended Islanding: Islanding is a condition in which one or more generating facilities deliver power to a utility customer or customers using a portion of the utility's distribution system that is electrically isolated from the remainder of the utility's distribution system. Unintended islanding may occur following an unanticipated loss of a portion of the utility distribution system.
- q. Utility-grade Protective Equipment: Protective equipment that meet requirements defined by:
- ANSI/IEEE C37.90-1989 IEEE Standards for Relays and Relay Systems Associated with Electric Power Apparatus
 - IEEE C37.90.1 IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems
 - IEEE C37.90.2 IEEE Trial-Use Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

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Supervisory control shall include monitoring of: (a) gross generation by the generating facility; (b) feedback of Watts, Vars, WattHours, current and voltage; (c) Vars furnished by the utility; and (d) status of the interrupting device. In addition, the supervisory control will allow the utility to trip the interrupting device during emergency conditions.⁴ Monitoring will be performed by system dispatchers or operators at the Company's control center.

- g. Surge Capability: The generating facility interconnection equipment and relays shall have the capability to withstand voltage and current surges in accordance with IEEE/ANSI Standard C62.41 or IEEE Standard C37.90.1 as appropriate.
- h. Equipment Testing: The generating facility shall provide to the utility the manufacturer's brochures/instruction manuals and technical specifications of their proposed generating facility equipment, and test reports for evaluation by the utility.

In addition, verification tests shall be performed on-site to verify protective settings and functionality to ensure that the equipment will not adversely affect the utility distribution system and that it will cease providing power to the system under abnormal conditions. A verification test shall be performed upon initial parallel operation of the generating facility, or whenever interface hardware or software is changed that can affect the protective functions. These tests shall be done by a qualified individual (hired by the customer) in accordance with the manufacturer's recommended test procedure and in concurrence with the utility. Qualified individuals include professional engineers, factory trained and certified technicians, and licensed electricians with experience in testing protective equipment.⁵ To ensure that verification tests are performed correctly, the utility may request to witness the tests and receive written certification of the results from the qualified individual. The customer must inform the Company of changes in the customer's interconnection hardware or software that are related to the performance, operation, or timing of the protective functions.

⁴ Emergency conditions refer to the need for immediate action in response to a situation that has caused injury, loss of life or property damage. Emergency conditions include, but are not limited to:

- A system emergency or forced outage;
- A potential hazard to Company personnel or the general public;
- A hazardous condition relating to the generating facility;
- The generating facility is interfering with the Company's equipment or equipment belonging to other customers (including non-utility generating equipment);
- The generating facility's protective devices have been tampered with by the customer and/or owner and/or operator of the generating facility; or
- A need for immediate action in response to a situation that has caused (or has the potential to cause) injury, loss of life or property damage.

⁵ Also see the Standard Interconnection Agreement, Exhibit B, paragraph 2.a. (Sheet No. 34C-17).

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- p. Direct Current Injection: The generating facility shall not inject DC current greater than 0.5% of the full rated output current into the utility distribution system at the Point of Interconnection under either normal or abnormal operating conditions. This applies primarily to generating facilities that use an inverter to interconnect with the utility system.
- q. Protection from Electromagnetic Interference (Immunity Protection): The influence of electromagnetic interference (EMI) shall not result in a change in state or misoperation of the generating facility interconnection system.

5. Technology Specific Requirements

- a. Three-Phase Synchronous Generators: The generating facility circuit breakers shall be 3-phase devices with electronic or electromechanical control. The customer shall be responsible for properly synchronizing its generating facility with the utility distribution system by means of either a manual or automatic synchronizing function. Automatic synchronizing is required for all synchronous generators which have an SCCR greater than 5%. For a generating facility whose SCCR exceeds 5%, the customer shall provide protective equipment suitable for detecting loss of synchronism and automatically disconnecting the generating facility from the utility distribution system. Unless otherwise agreed to between the utility and customer, synchronous generators shall automatically regulate power factor, not voltage, while operating in parallel with the utility system.
- b. Induction Generators: Induction generators may be connected and brought up to synchronous speed (as an induction motor) if it can be demonstrated that the initial voltage drop measured at the Point of Interconnection is within the visible flicker limits as defined by IEEE 519-1992 (or latest version). The same requirements also apply to induction generation connected at or near synchronous speed because a similar voltage dip is present due to an inrush magnetizing current. The customer shall submit number of starts per specific time period and maximum starting kVA draw data for the utility to verify that the voltage dip due to starting is within the visible flicker limits and does not degrade the normal voltage provided by the utility.

Induction generators do not require separate synchronizing equipment. Starting or rapid load fluctuations on induction generators can adversely impact the utility's system voltage. Corrective step-switched capacitors or other techniques may be necessary if the voltage fluctuations measured at the Point of Interconnection are not within the visible flicker limits as defined by IEEE 519-1992 (or latest version). These measures can, in turn, cause ferroresonance. If

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- b. Review of Design Drawings: The following engineering drawings/documents are required for review and approval by the utility prior to construction of the generating facility interconnection. Prior to being submitted to the utility, all drawings/documents shall be approved by a Professional Electrical Engineer registered in the State of Hawaii for generating facilities $\geq 30\text{kW}$. That approval shall be indicated by the presence of the Engineer's Professional seal on all drawings and documents.
- A single-line diagram, relay list, trip scheme and settings of the generating facility, which identifies the Point of Interconnection, circuit breakers, relays, switches, synchronizing equipment, monitoring equipment, and control and protective devices and schemes.
 - A three-line diagram which shows the Point of Interconnection, potential transformer (PT) and current transformer (CT) ratios, and details of the generating facility configuration, including relays, meters and test switches. (Not required for generating facilities $< 30\text{kW}$).

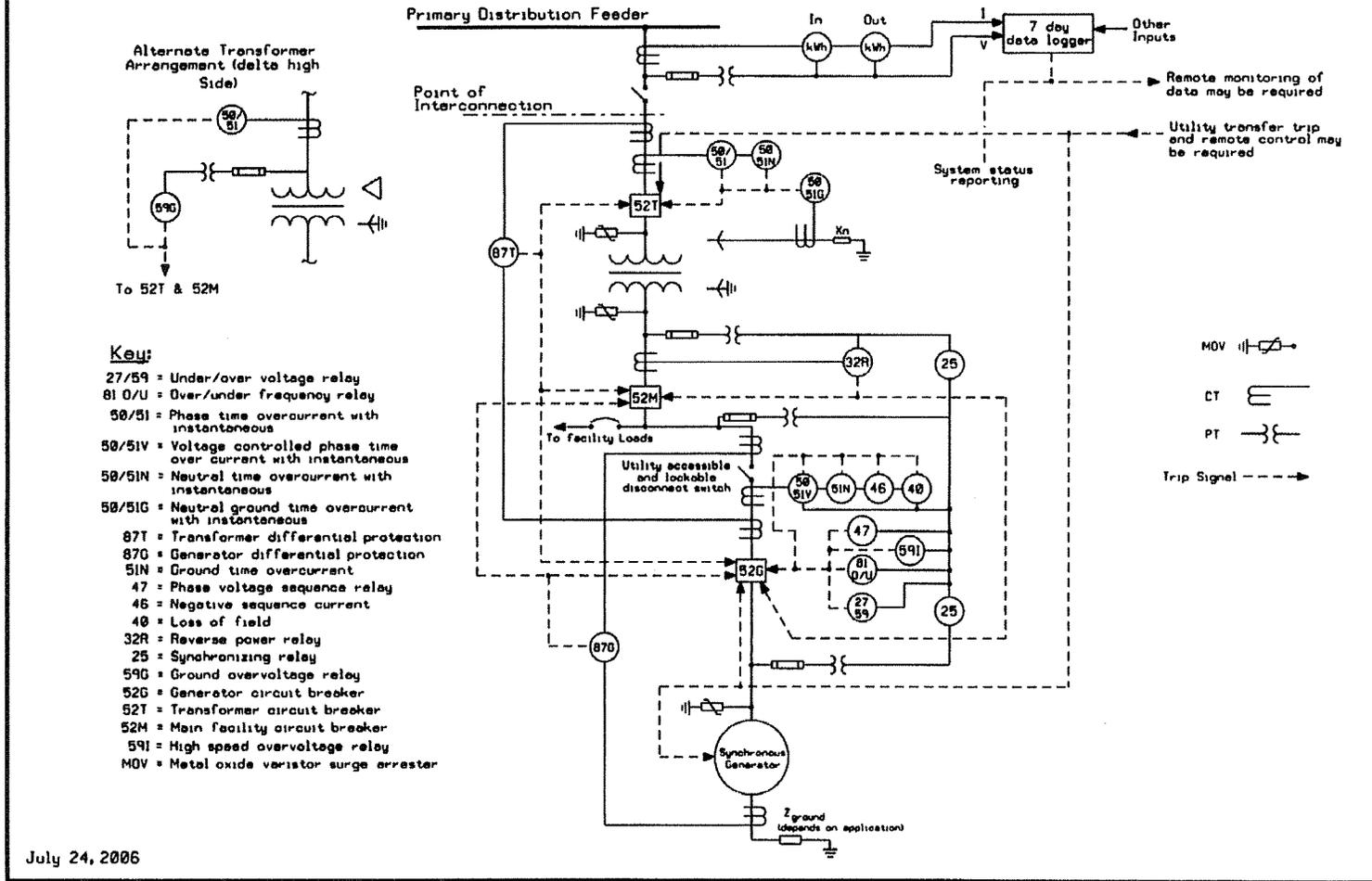
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EXHIBIT A

Typical Equipment and Protective Device Requirements for Large Synchronous, Induction, and Inverter Generators

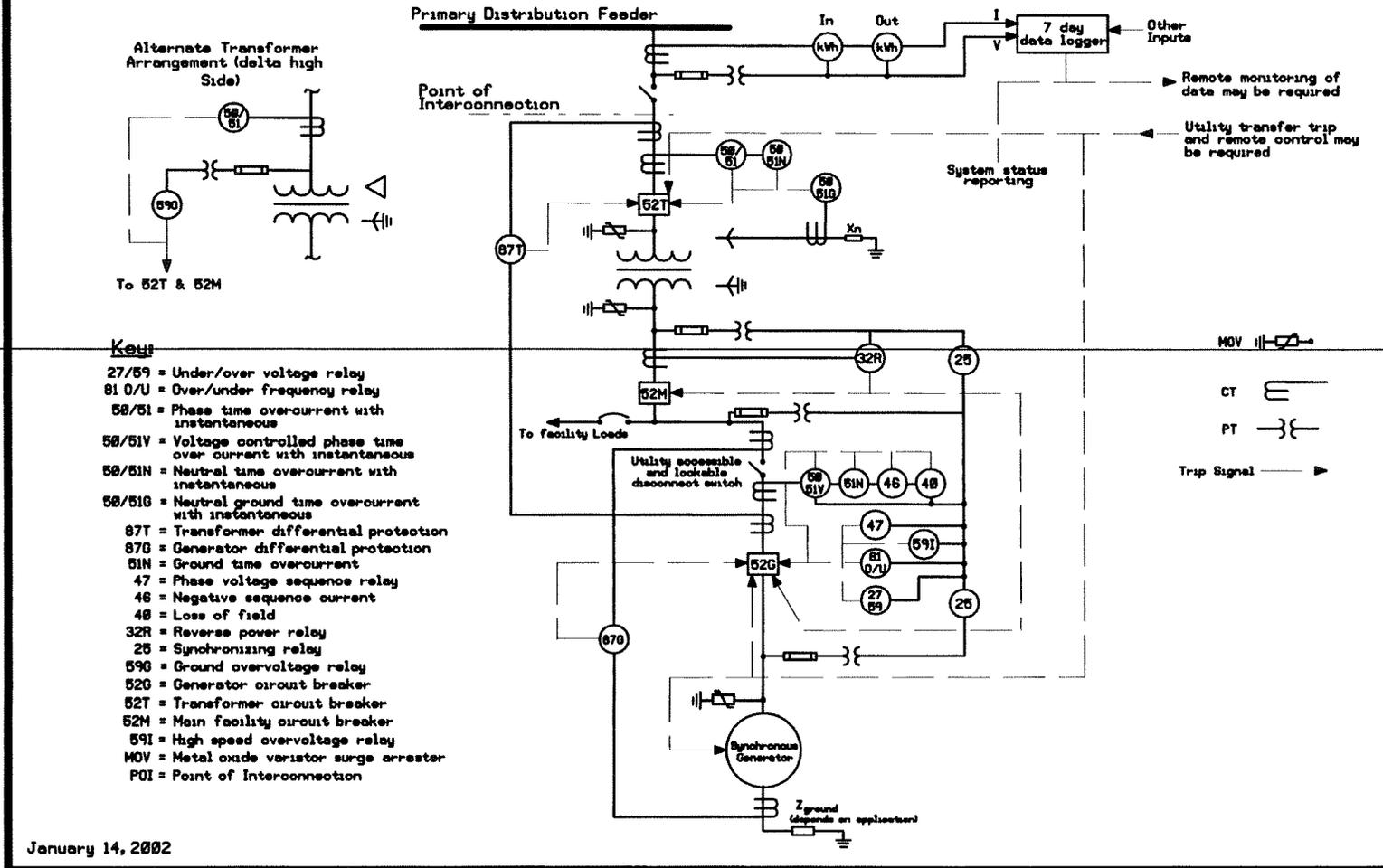
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Figure 1
Large Synchronous Generator (Non-export)
Typical Equipment and Protective Device Requirements



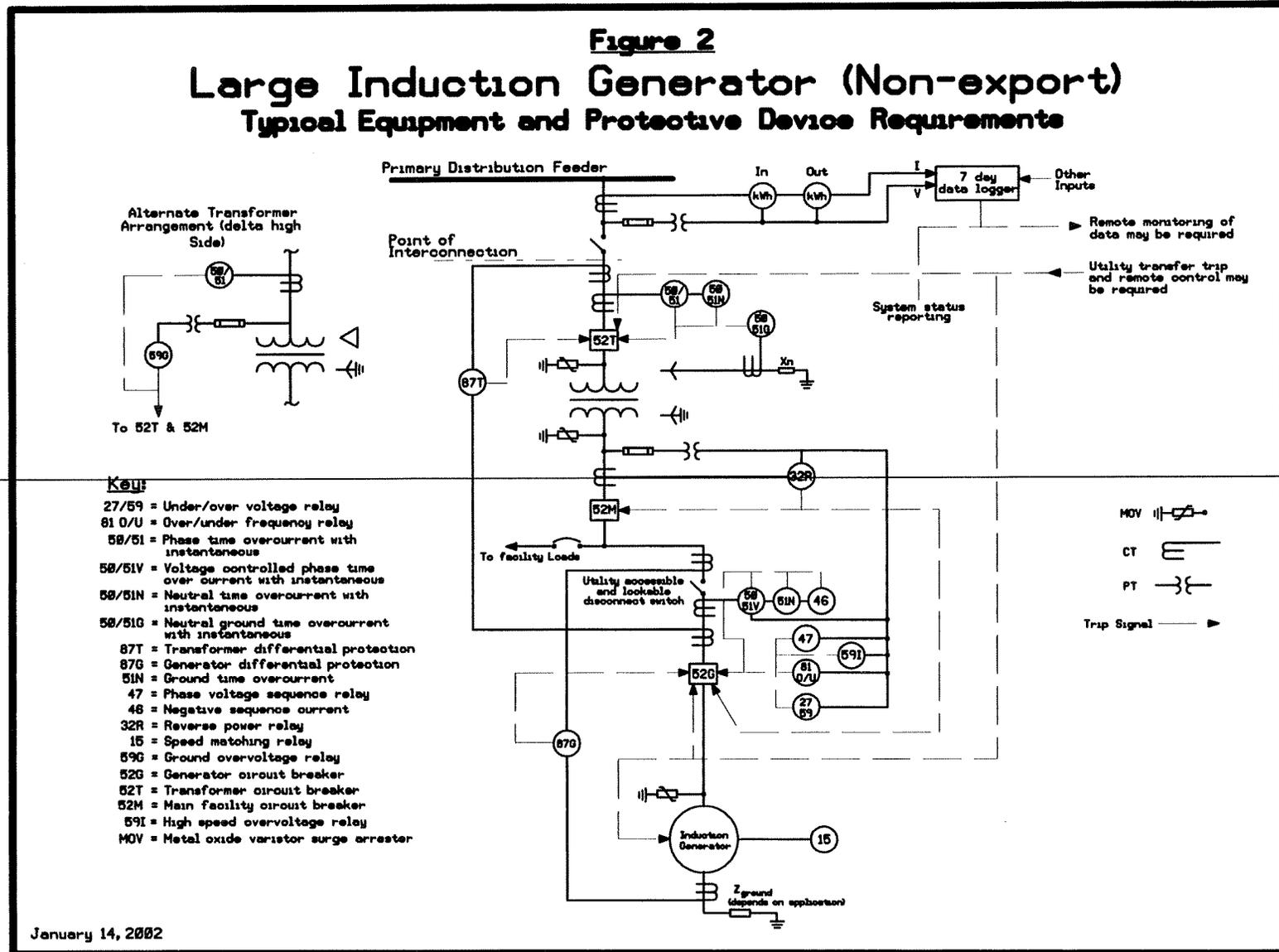
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Figure 1
Large Synchronous Generator (Non-export)
Typical Equipment and Protective Device Requirements



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Figure 2
Large Induction Generator (Non-export)
Typical Equipment and Protective Device Requirements



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SHEET NO. 34B-24
Effective March 21, 2003

HAWAIIAN ELECTRIC COMPANY, INC.

PUC D&O No. 20056 Dated March 6, 2003, Docket No. 02-0051
Transmittal Letter Dated March 14, 2003

equipment); or (e) if the Customer and/or owner and/or operator of the Facility has tampered with any protective device. The Facility shall remain disconnected until such time as the Company is satisfied that the endangering condition(s) as listed above has been corrected, and the Company shall not be obligated to allow parallel operation of the Facility during such period. If the Company disconnects the Facility under this Section 9, it shall as soon as practicable notify the Customer in person or by telephone and provide the reason(s) why the Facility was disconnected from the Company's system.

10. Transmission Service Not Provided with Interconnection: Interconnection with the Company's system under this Agreement does not provide the Customer any rights to utilize the Company's system for the transmission or distribution of electric power.
11. Prevention of Interference: The Customer shall not operate equipment that superimposes a voltage or current upon the Company's system that interferes with the Company's operations, service to the Company's customers, or the Company's communication facilities. Such interference shall include, but not be limited to, overcurrent, voltage imbalance, and abnormal waveforms. If such interference occurs, the Customer must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by the Company. If the Customer does not take timely corrective action, or continues to operate the equipment causing interference without restriction or limit, the Company may, without liability, disconnect the Customer's equipment from the Company's system.
12. Location of Metering: Where Company-owned metering is located on the Customer's premises, the Customer shall provide, at no expense to the Company, a suitable location for and access to all such metering.
13. Design Reviews and Inspections: The Company's review and authorization to allow the Facility to interconnect and operate in parallel with the Company's system shall not be construed as confirming or endorsing the Facility's design or as warranting the Facility's safety, durability or reliability. The Company shall not, by reason of such review or lack of review, be responsible for the equipment, including but not limited to, the safety, strength, adequacy, durability, reliability, performance, or capacity of such equipment.

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parallel interconnection. In the event Customer self insures, documentation describing the Customer's means and capability of self-insuring must be provided to the Company prior to executing the Agreement and any parallel interconnection.

~~A commercial general liability policy, covering bodily injury and property damage combined single limit of at least the following amounts based on the nameplate rating of the generator as indicated in Exhibit A, Section 3, for any occurrence.~~

Amount	Generator Nameplate Rating
\$2,000,000	Greater than 100 kW
\$1,000,000	Greater than 20 kW and less than or equal to 100 kW
\$500,000	Greater than 10 kW and less than or equal to 20 kW
\$100,000	Less than or equal to 10 kW

~~The Customer has responsibility to determine if higher limits are desired and purchased. Said insurance shall name the Company, its directors, officers, agents, and employees as additional insureds, shall include contractual liability coverage for written contracts and agreements including this Agreement, shall include provisions stating that the insurance will respond to claims or suits by additional insureds against the Customer or any other insured thereunder, and shall be non-cancelable and non-alterable without thirty (30) days prior written notice to the Company. "Claims made" policies are not acceptable, unless the Customer agrees to maintain coverage in full effect at all times during the term of this Agreement and for THREE (3) years thereafter. The adequacy of the coverage afforded by the required insurance shall be subject to review by the Company from time to time, and if it appears in such review that risk exposures require an increase in the coverages and/or limits of this insurance, the Customer shall make such increase to that extent and any increased costs shall be borne by the Customer. The insurance required hereunder shall provide that it is primary with respect to the Customer and the Company. The Customer shall provide evidence of such insurance, including insurer's acknowledgement that coverage applies with respect to this Agreement, by providing certificates of insurance to the Company within 30 days of any change. Initially, certificates of insurance must be provided to the Company prior to executing the Agreement and any parallel interconnection. The Customer's indemnity and other obligations shall not be limited by the~~

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~~foregoing insurance requirements~~ this provision. Any deductible shall be the responsibility of the Customer.

~~Alternatively, as a governmental entity, Customer may elect to be self insured for the amounts set forth above in lieu of obtaining insurance coverage to those levels from an insurance company.~~

20. Force Majeure: For purposes of this Agreement, "Force Majeure Event" means any event: (a) that is beyond the reasonable control of the affected party; and (b) that the affected party is unable to prevent or provide against by exercising reasonable diligence, including the following events or circumstances, but only to the extent they satisfy the preceding requirements: acts of war, public disorder, insurrection, or rebellion; floods, hurricanes, earthquakes, lightning, storms, and other natural calamities; explosions or fires; strikes, work stoppages, or labor disputes; embargoes; and sabotage. If a Force Majeure Event prevents a party from fulfilling any obligations under this Agreement, such party will promptly notify the other party in writing, and will keep the other party informed on a continuing basis of the scope and duration of the Force Majeure Event. The affected party will specify in reasonable detail the circumstances of the Force Majeure Event, its expected duration, and the steps that the affected party is taking to mitigate the effects of the event on its performance. The affected party will be entitled to suspend or modify its performance of obligations under this Agreement, other than the obligation to make payments then due or becoming due under this Agreement, but only to the extent that the effect of the Force Majeure Event cannot be mitigated by the use of reasonable efforts. The affected party will use reasonable efforts to resume its performance as soon as possible.

21. Warranties: The Company and the Customer each represents and warrants respectively that:

- (a) It has all necessary right, power and authority to execute, deliver and perform this Agreement.
- (b) The execution, delivery and performance of this Agreement by it will not result in a violation of any law or regulation of any governmental authority, or conflict with, or result in a breach of, or cause a default under, any agreement or instrument to which such party is also a party or by which it is bound.

22. Good Engineering Practice:

HAWAIIAN ELECTRIC COMPANY, INC.

- (a) Each party agrees to install, operate and maintain its respective equipment and facilities and to perform all obligations required to be performed by such party under this Agreement in accordance with good engineering practice in the electric industry and with applicable laws, rules, orders and tariffs.
- (b) Wherever in this Agreement and the attached Exhibits the Company has the right to give specifications, determinations or approvals, such specifications, determinations or approvals shall be given in accordance with the Company's standard practices, policies and procedures, which may include the Company's Electric Service Installation Manual, the Company's Engineering Standard Practice Manual and IEEE Guides and Standards for Protective Relaying Systems.

23. Miscellaneous:

- (a) Amendments. Any amendment or modification of this Agreement or any part hereof shall not be valid unless in writing and signed by the parties. Any waiver hereunder shall not be valid unless in writing and signed by the party against whom waiver is asserted.
- (b) Binding Effect. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors, legal representatives, and permitted assigns.
- (c) Notices. Any written notice provided hereunder shall be delivered personally or sent by registered or certified first class mail, with postage prepaid, to the other party at the following addresses:

Company: _____

Attn: _____

Customer: The mailing address listed in Exhibit A attached hereto.

Notice sent by mail shall be deemed to have been given on the date of actual delivery or at the expiration of the fifth day
HAWAIIAN ELECTRIC COMPANY, INC.

Superseding SHEET NO. 34C-11
Effective March 21, 2003

REVISED SHEET NO. 34C-11
Effective June 6, 2003

IN WITNESS WHEREOF, the Company and the Customer have executed this Agreement as of the day and year first above written.

By _____
Its

"Company"

By _____
Its

"Customer"

HAWAIIAN ELECTRIC COMPANY, INC.

PUC Order No. 20220 Dated May 30, 2003, Docket No. 02-0051
Transmittal Letter Dated June 4, 2003

Type of Qualifying Facility or Nonfossil Fuel Source (if applicable): Solar Wind Hydro
 Biomass Geothermal

Other generator energy source: Diesel Other Fuel Oil Other: _____

Maximum Site Load without Generation: _____ kW Maximum Generating Capability: _____ kW

Minimum Site Load without Generation: _____ kW Maximum Export: _____ kW

Section 3. Generator Technical Information

Type of Generator: Synchronous Induction DC Generator or Solar with Inverter

Generator (or solar collector) Manufacturer, Model Name & Number: _____
(A copy of Generator Nameplate and Manufacturer's Specification Sheet may be substituted)

_____ Nameplate Rating in kW: _____

Operating Power Factor: _____

Inverter Manufacturer, Model Name & Number (if used): _____
(A copy of Inverter Nameplate and Manufacturer's Specification Sheet may be substituted)

_____ Rating in kW: _____

Operating Power Factor: _____

Number of Starts Per Day: _____ Maximum Starting kVA: _____

Generator Grounding Method:

<input type="checkbox"/> Effectively Grounded	<input type="checkbox"/> Resonant Grounded
<input type="checkbox"/> Low-Inductance Grounded	<input type="checkbox"/> High-Resistance Grounded
<input type="checkbox"/> Low-Resistance Grounded	<input type="checkbox"/> Ungrounded

HAWAIIAN ELECTRIC COMPANY, INC.

Generator Characteristic Data (for rotating machines):
(Not needed if Generator Nameplate and Manufacturer's Specification Sheet are provided)

Direct Axis Synchronous Reactance, X_d : _____ P.U. Negative Sequence Reactance: _____ P.U.
Direct Axis Transient Reactance, X'_d : _____ P.U. Zero Sequence Reactance: _____ P.U.
Direct Axis Subtransient Reactance, X''_d : _____ P.U. KVA Base: _____
Inertia Constant, H: _____ P.U.
Excitation Response Ratio: _____
Direct Axis Open-Circuit Transient Time Constant, T'_{do} : _____ Seconds
Direct Axis Open-Circuit Subtransient Time Constant, T''_{do} : _____ Seconds

Fault Current Contribution of Generator: _____ Amps

Section 4, Interconnecting Equipment Technical Data

Will an interposing transformer be used between the generator and the point of interconnection? Yes No

Transformer Data (if applicable, for Customer Owned Transformer):
(A copy of transformer Nameplate and Manufacturer's Test Report may be substituted)

Size: _____ KVA. Transformer Primary: _____ Volts Delta Wye Wye Grounded
Transformer Secondary: _____ Volts Delta Wye Wye Grounded

Transformer Impedance: _____ % on _____ KVA Base

Transformer Fuse Data (if applicable, for Customer Owned Fuse):
(Attach copy of fuse manufacturer's Minimum Melt & Total Clearing Time-Current Curves)

At Primary Voltage Secondary Voltage

Manufacturer: _____ Type: _____ Size: _____ Speed: _____

Transformer Protection (if not fuse):

Please describe: _____

Interconnecting Circuit Breaker (if applicable):
(A copy of circuit breaker's Nameplate and Specification Sheet may be substituted)

Manufacturer: _____ Type: _____
Continuous Load Rating: _____ (Amps) Interrupting Rating: _____ (Amps) Trip Speed: _____ (Cycles)

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Superseding SHEET NO. 34C-16
Effective March 21, 2003

REVISED SHEET NO. 34C-16
Effective June 6, 2003

Section 6. Installation Details

Installing Electrical Contractor: _____ Firm: _____ License No.: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: Area Code: _____ Number: _____

Installation Date: _____ Interconnection Date: _____

Supply certification that the generating system has been installed and inspected in compliance with the local Building/Electrical code of the county of _____

Signed (Inspector): _____ Date: _____
(In lieu of signature of Inspector, a copy of the final inspection certificate may be attached)

Section 7. Generator/Equipment Certification

Generating systems that utilize inverter technology must be compliant with *Institute of Electrical and Electronics Engineers IEEE Std 929* and *Underwriters Laboratories UL 1741* in effect at the time this Agreement is executed. Generating systems that use a rotating machine must be compliant with applicable National Electrical Code, Underwriters Laboratories, and Institute of Electrical and Electronics Engineers standards and rules and orders of the Hawaii Public Utilities Commission in effect at the time this Agreement is executed. **By signing below, the Applicant certifies that the installed generating equipment meets the appropriate preceding requirement(s) and can supply documentation that confirms compliance.**

Signed (Customer): _____ Date: _____

Section 8. Insurance

Insurance Carrier: _____

HAWAIIAN ELECTRIC COMPANY, INC.

EXHIBIT B

FACILITY OWNED BY THE CUSTOMER OR THIRD PARTY OWNER

1. Facility

- a. Compliance with laws and standards. The Facility, Facility design, and Facility design drawings shall meet all applicable national, state, and local laws, rules, regulations, orders, construction and safety codes, and shall satisfy the Company's Distributed Generating Facility Interconnection Standards, Technical Requirements ("Interconnection Standards"), as set forth in Rule No. 14, Paragraph H.1 of the Company's tariff.
- b. Avoidance of adverse system conditions. The Facility shall be designed, installed, operated and maintained so as to prevent or protect against adverse conditions on the Company's system that can cause electric service degradation, equipment damage, or harm to persons, such as:
- (i) Unintended islanding.
 - (ii) Inadvertent and unwanted re-energization of a Company dead line or bus.
 - (iii) Interconnection while out of synchronization.
 - (iv) Overcurrent.
 - (v) Voltage imbalance.
 - (vi) Ground faults.
 - (vii) Generated alternating current frequency outside of permitted safe limits.
 - (viii) Voltage outside permitted limits.
 - (ix) Poor power factor or reactive power outside permitted limits.
 - (x) Abnormal waveforms.

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- (ii) The Customer shall comply with the Company's Interconnection Standards. If a conflict exists between the Interconnection Standards and this Agreement, this Agreement shall control.
- (iii) A 1) single-line diagram, 2) relay list, trip scheme and settings of the Facility, 3) Facility Equipment List, and 4) three-line diagram (if the Facility's capacity is greater than or equal to 30 kW), which identify the circuit breakers, relays, switches, synchronizing equipment, monitoring equipment, and control and protective devices and schemes, shall, after having obtained prior consent from the Company, be attached to this Exhibit B and made a part hereof at the time the Agreement is signed. The single-line diagram shall include pertinent information regarding operation, protection, synchronizing, control, monitoring and alarm requirements. The single-line diagram and three-line diagram shall expressly identify the point of interconnection of the Facility to the Company's system. The relay list, trip scheme and settings shall include all protection, synchronizing and auxiliary relays that are required to operate the Facility in a safe and reliable manner. The three-line diagram shall show potential transformer and current transformer ratios, and details of the Facility's configuration, including relays, meters, and test switches.

- f. Approval of Design Drawings. If the Facility's capacity is greater than or equal to 30 kW, the single-line diagram, relay list, trip scheme and settings of the Facility, and three-line diagram shall be approved by a Professional Electrical Engineer registered in the State of Hawaii prior to being submitted to the Company. Such approval shall be indicated by the engineer's professional seal on all drawings and documents.

2. Verification Testing.

- a. Upon initial parallel operation of the Facility, or any time interface hardware or software is changed, a verification test shall be performed. A licensed professional engineer or otherwise qualified individual shall perform verification testing in accordance with the manufacturer's published test

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procedure. Qualified individuals include professional engineers, factory trained and certified technicians, and licensed electricians with experience in testing protective equipment. The Company reserves the right to witness verification testing or require written certification that the testing was performed.

- b. Verification testing shall be performed every four years. All verification tests prescribed by the manufacturer shall be performed. If wires must be removed to perform certain tests, each wire and each terminal shall be clearly and permanently marked. The Customer shall maintain verification test reports for inspection by the Company.
- c. Single-phase inverters rated 10 kVA and below (if any) shall be verified once per year as follows: once per year the Customer shall operate the load break disconnect switch and verify the Facility automatically shuts down and does not reconnect with the Company's system until the Company's system continuous normal voltage and frequency have been maintained for a minimum of 5 minutes. The Customer shall maintain a log of these operations for inspection by the Company.
- d. Any system that depends upon a battery for trip power shall be checked once per month for proper voltage. Once every four (4) years the battery shall either be replaced or have a discharge test performed. The Customer shall maintain a log of these operations for inspection by the Company.
- e. Tests and battery replacements as specified in this section 2 of Exhibit B shall be at the Customer's expense.

3. Inspection of the Facility.

- a. The Company may, in its discretion and upon reasonable notice not to be less than 24 hours (unless otherwise agreed to by the Company and the Customer), observe the construction of the Facility (including but not limited to relay settings and trip schemes) and the equipment to be installed therein.
- b. Within fourteen days after receiving a written request from the Customer to begin producing electric energy in parallel with the Company's system, the Company may inspect the

HAWAIIAN ELECTRIC COMPANY, INC.

temporary operating conditions on the Company's system, and these periods shall be specified by the Company's System Operator. Notice shall be given in advance when these are scheduled operating conditions.

- c. Logs shall be kept by the Customer for information on unit availability including reasons for planned and forced outages; circuit breaker trip operations, relay operations, including target initiation and other unusual events. The Company shall have the right to review these logs, especially in analyzing system disturbance.

5. Changes to the Facility, Operating Records, and Operating Procedures.

- a. The Customer agrees that no material changes or additions to the Facility as reflected in the single-line diagram, relay list, trip scheme and settings of the Facility, Facility Equipment List, and three-line diagram (if the Facility's capacity is greater than or equal to 30 kW), shall be made without having obtained prior written consent from the Company.
- b. As a result of the observations and inspections of the Facility (including but not limited to relay list, trip scheme and settings) and the performance of the verification tests, if any changes in or additions to the Facility, operating records, and operating procedures and policies are required by the Company, the Company shall specify such changes or additions to the Customer in writing, and the Customer shall, as soon as practicable, but in no event later than thirty (30) days after receipt of such changes or additions, respond in writing, either noting agreement and action to be taken or reasons for disagreement. If the Customer disagrees with the Company, it shall note alternatives it will take to accomplish the same intent, or provide the Company with a reasonable explanation as to why no action is required by good engineering practice.

(Additional terms and provisions to be added as necessary. Note: This parenthetical phrase should be deleted when the agreement is finalized.)

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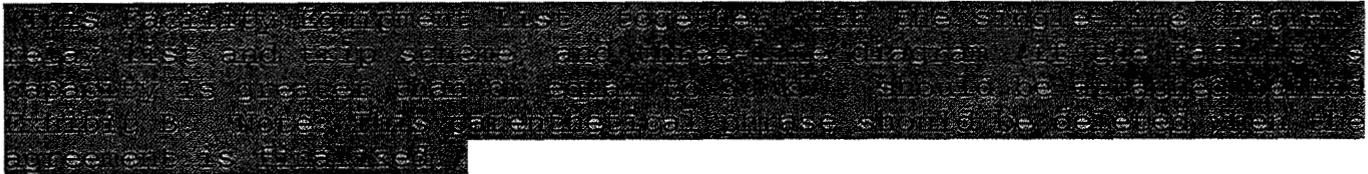
Superseding SHEET NO. 34C-23
Effective March 21, 2003

REVISED SHEET NO. 34C-23
Effective June 6, 2003

Facility Equipment List

The Facility shall include the following equipment:

(Specific items to be added as necessary. Note: This parenthetical phrase should be deleted when the agreement is finalized.)



HAWAIIAN ELECTRIC COMPANY, INC.

PUC Order No. 20220 Dated May 30, 2003, Docket No. 02-0051
Transmittal Letter Dated June 4, 2003

EXHIBIT C

INTERCONNECTION FACILITIES OWNED BY THE COMPANY

1. Description of Company Interconnection Facilities

The Company will purchase, construct, own, operate and maintain all interconnection facilities required to interconnect the Company's system with the Facility at ___ volts, up to the point of interconnection.

The Company Interconnection Facilities, for which the Customer agrees to pay, include:

[Need to specify the interconnection facilities. If no interconnection facilities, state "None".]

2. Customer Payment to Company for Company Interconnection Facilities, Review of Facility, and Review of Verification Testing

The Customer shall pay to the Company the total estimated interconnection cost to be incurred by the Company (Total Estimated Interconnection Cost), which is comprised of (i) the estimated cost of the Company Interconnection Facilities, (ii) the estimated engineering costs associated with a) developing the Company Interconnection Facilities and b) reviewing and specifying those portions of the Facility which allow interconnected operations as such are described in Exhibit B, and iii) reviewing the verification testing. The following summarizes the Total Estimated Interconnection Cost:

<u>Description</u>	<u>Estimated Cost (\$)</u>
[Need to specify the estimated interconnection cost. If no cost, state "None".]	
Total Estimated Interconnection Cost	\$

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The Total Estimated Interconnection Cost, which, except as otherwise provided herein, is non-refundable, shall be paid by the Customer fourteen (14) days after receipt of an invoice from the Company, which shall be provided not less than thirty (30) days prior to start of procurement of the Company Interconnection Facilities.

Within thirty (30) days of receipt of an invoice, which shall be provided within fourteen (14) days of the final accounting, which shall take place within sixty (60) days of completion of construction of the Company Interconnection Facilities, the Customer shall remit to the Company the difference between the Total Estimated Interconnection Cost paid to date and the total actual interconnection cost (Total Actual Interconnection Cost). The latter is comprised of (i) the total costs of the Company Interconnection Facilities, and (ii) the total engineering costs associated with a) developing the Company Interconnection Facilities and b) reviewing and specifying those portions of the Facility which allow interconnected operations as such are described in Exhibit B, and iii) reviewing the verification testing. If in fact the Total Actual Interconnection Cost is less than the payments received by the Company as the Total Estimated Interconnection Cost, the Company shall repay the difference to the Customer within thirty (30) days of the final accounting.

If the Agreement is terminated prior to the Customer's payment for the Total Actual Interconnection Cost (or the portion of this cost which has been incurred) or prior to the Company's repayment of the overcollected amount of the Total Estimated Interconnection Cost (or the portion of this cost which has been paid), such payments shall be made by the Customer or Company, as appropriate. If payment is due to the Company, the Customer shall pay within thirty (30) days of receipt of an invoice, which shall be provided within fourteen (14) days of the final accounting, which shall take place within sixty (60) days of the date the Agreement is terminated. If payment is due to the Customer, the Company shall pay within thirty (30) days of the final accounting.

All Company Interconnection Facilities shall be the property of the Company.

3. Operation, Maintenance and Testing Costs

The Company will bill the Customer monthly and the Customer will, within 30 days after the billing date, reimburse the Company for

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Superseding SHEET NO. 34C-26
Effective March 21, 2003

REVISED SHEET NO. 34C-26
Effective June 6, 2003

any costs incurred in operating, maintaining or testing the Company Interconnection Facilities. The Company's costs will be determined on the basis of outside service costs, direct labor costs, material costs, transportation costs, applicable overheads at time incurred and applicable taxes. Applicable overheads will include such costs as vacation, payroll taxes, non-productive wages, supervision, tools expense, employee benefits, engineering administration, corporate administration, and materials handling. Applicable taxes will include the Public Service Company Tax, and Public Utility Fee.

HAWAIIAN ELECTRIC COMPANY, INC.

PUC Order No. 20220 Dated May 30, 2003, Docket No. 02-0051
Transmittal Letter Dated June 4, 2003

EXHIBIT D

CUSTOMER INSURANCE COVERAGE

In accordance with section 19 of the Agreement, Customer shall maintain the following insurance and under the following conditions:

[Terms and conditions to be set forth in accordance with Section 4 of Appendix III to Rule 14H.]

In the alternative, in accordance with section 19 of the Agreement, Customer shall self insure against risks arising under this Agreement in the following manner and under the following conditions:

[Terms and conditions to be set forth in accordance with Section 4 of Appendix III to Rule 14H.]

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APPENDIX III
Interconnection Process Overview

1. Steps in the Interconnection Process

a. The interconnection process will generally be initiated when a Customer approaches or contacts the Company to discuss the procedure involved to interconnect a distributed generating facility and operate it in parallel with the Company's system. The Company's Marketing Services Division will serve as the centralized point of contact for Standard Interconnection Agreement applications for distributed generation.

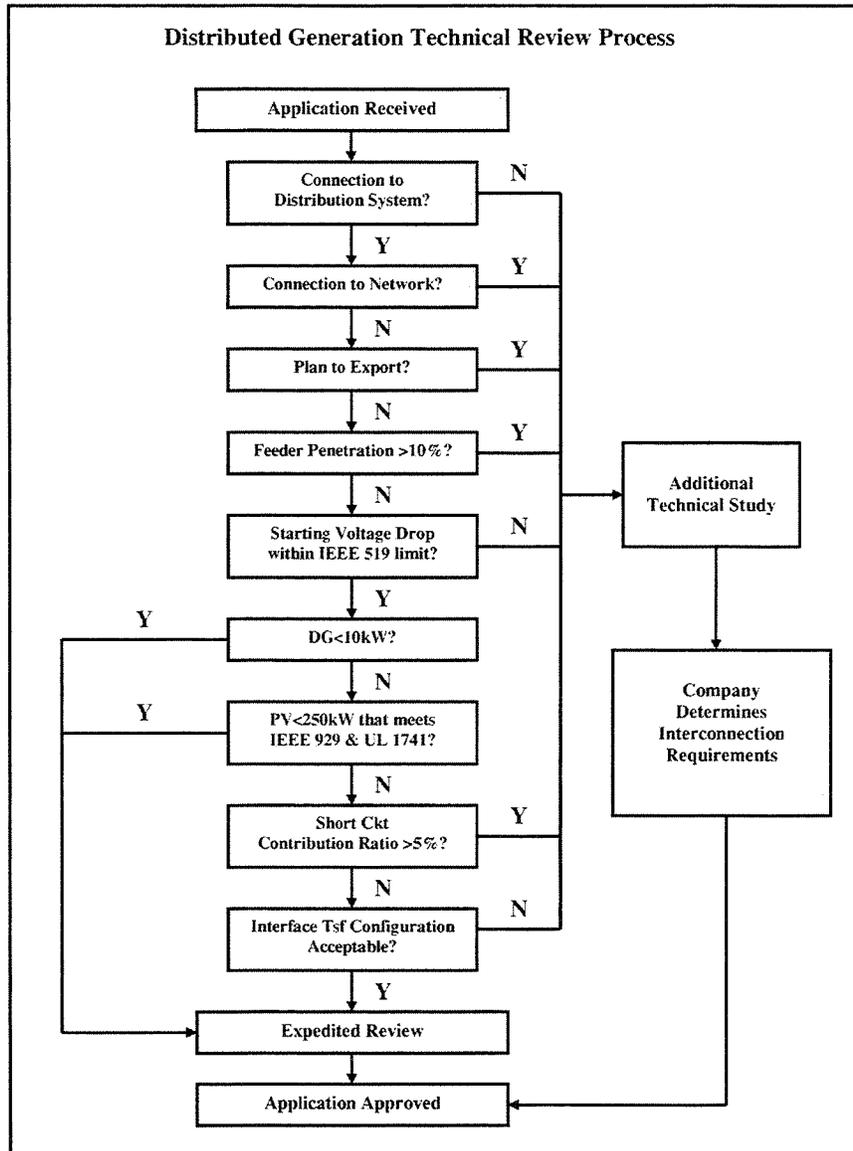
HAWAIIAN ELECTRIC COMPANY, INC.

provided pursuant to Section 1.e.(iii) of Exhibit B to the Standard Interconnection Agreement. The Customer will also provide the Company with items required under the Standard Interconnection Agreement that are used in determining the protection, synchronizing and control requirements, such as the operating manuals, manufacturer's brochures/instruction manual and technical specifications, manufacturer's test reports and bill of material, as referred to in Section 1.c. of Exhibit B to the Standard Interconnection Agreement. The Company shall maintain the confidentiality of information the Customer deems confidential, unless the Commission determines that disclosure is necessary to protect the public or as otherwise determined by the Commission. The Company will review the materials submitted by the customer and provide written notification of its general completeness, or alternatively, incompleteness, within 15 business days of the initial receipt of the Customer materials.¹ If the Customer materials are deemed incomplete, the Company will specify in the written notice what additional information is needed. The completeness determination cycle will be repeated as necessary until sufficient information is submitted by the Customer to enable the initial technical screening.

Step 3: The Company does the technical review of the information submitted by the Customer in Step 2. An initial technical screening is completed within 15 business days of the date the Customer materials are deemed complete.¹ The technical review process is discussed in greater detail in Section 2 and 3 of this Interconnection Process Overview.

¹ The Company, for good cause, may modify the time limit. If the Company modifies the time limit, it shall notify the Customer in writing of the modification and the cause for the modification.

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b. The degree of technical review required for a request for interconnection, and the extent to which additional technical study will be needed, will depend on factors such as (1) complexity of the utility system that the generating facility is proposed to be interconnected to that must be modeled (i.e., the distribution, subtransmission or transmission system); (2) connection to a network system; (3) plan to export power; (4) feeder penetration greater than 10%; (5) starting voltage drop; (6) generating facility

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capacity; (7~~5~~) short circuit contribution ratio greater than 5%; and (8~~6~~) other
circumstances type of interface transformer. (For example, photovoltaic systems less than
250 kW interconnecting through inverters that meet UL 1741, or latest version (the
Standard for Inverters, Converters and Controllers for Use in Independent Power
Systems) and IEEE 929-2000, or latest version (the Recommended Practice for Utility
Interface of Photovoltaic Systems) ~~would~~ may qualify for an expedited review process.
Self-excited synchronous generators present more interconnection issues.)

c. Following submission by the Customer of all necessary information regarding the
proposed distributed generating facility, the Company will perform an initial technical
screening of the impact of the distributed generating facility on the Company's system,
for which a charge will not be assessed. The Company shall respond to the Customer
with the findings of the initial technical screening within 15 business days of the date the
customer materials are deemed complete.³ If the Company determines that additional
technical study of the interconnection proposal is necessary, then the Company will
notify the Customer of the Company's target date to complete any required additional
technical study. Upon completion of the technical study, the final results will be
provided in writing to the Customer.

d. The initial technical screening or additional technical study may identify the need for
Company interconnection facilities required to facilitate interconnection of the generating
facility. The Company interconnection facilities and estimated cost shall be listed in

³ The Company, for good cause, may modify the time limit. If the Company modifies the time limit, it shall notify the Customer in writing of the modification and the cause for the modification.

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Appendix II (Standard Interconnection Agreement), Exhibit C (Interconnection Facilities Owned by the Company). The Customer will be responsible for the cost of any Company interconnection facilities associated with the interconnection of its generating facility. If the Customer can show that there are benefits to the utility system due to the Company interconnection facilities, the Customer may apply to the utility for a credit reflecting these benefits, subject to Commission approval. For example, if there is a planned distribution system addition that may be deferred or displaced due to the addition of the Company interconnection facilities associated with interconnection of a generating facility, the dollar value of the deferral or displacement would be determined and proposed to be credited to the Customer (subject to Commission approval) as a line item in Appendix II (Standard Interconnection Agreement), Exhibit C (Interconnection Facilities Owned by the Company), Section 2 (Customer Payment to Company for Company Interconnection Facilities, Review of Facility, and Review of Verification Testing). The calculation of the benefits to the utility system would have to be examined on a case-by-case basis taking into account what distribution system addition(s) would have been deferred or displaced by the Company interconnection facilities that resulted from the interconnection of a distributed generation customer. The Company would then calculate a dollar value of the deferral or displacement, and propose to credit the Customer for that deferral or displacement value. The Company shall file a letter providing the Commission with sufficient information to document the proposed credit to be provided to the Customer for said deferral or displacement value. The proposed deferral or displacement value would not be credited to the Customer until the Commission approves such credit.

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study will be provided to the Customer before the overall study is started. This generally would be done when the Company responds to the Customer with the findings of the initial technical screening.

4. Insurance Coverage

Prior to execution of the standard interconnection agreement, the Customer shall disclose if it will be self-insured (and if so its means and capability to self insure) or if it will obtain an insurance policy (and if so in what forms and amounts). The Customer must have insurance in forms and amounts that are commercially reasonable for each particular situation.

45. Resolution of Disputes

a. If there is a dispute between the Customer and the Company as to whether additional technical study is required, or as to the scope and cost of the study, then the Company generally would use the following procedures: (1) The Company's Contact Person (who generally would be from the Company's Marketing Services Division~~energy services~~ department) would inform the Customer of the reasons for and scope of the study required; (2) If the Customer disagrees with the conclusion, then the Customer would meet with representatives from the Company's engineering department to discuss the matter; (3) If the Customer continues to disagree with the conclusion, then the Customer would write to the Company's Contact Person explaining the position of the Customer,

HAWAIIAN ELECTRIC COMPANY, INC.

resolve the matter by filing a written request with the Commission attaching the relevant information and correspondence, and serving the request on the other party and the Division of Consumer Advocacy of the Department of Commerce and Consumer Affairs of the State of Hawaii.

c. Customers are not required to exhaust the Company's dispute resolution procedures set forth above before proceeding under provisions applicable to informal or formal complaints under the Rules of Practice and Procedure before the Public Utilities Commission, currently codified in Title 6, Chapter 61, Subchapter 5 of the Hawaii Administrative Rules. If an informal or formal complaint proceeding is initiated, the Customer would write to the Company's Contact Person and state whether the Customer desires to continue the Company's dispute resolution procedures.

HAWAIIAN ELECTRIC COMPANY, INC.

EXHIBIT B

Clean Version of Rule 14H, Interconnection of Distributed Generating Facilities Operating in Parallel with the Company's Electric System; Appendix I, Distributed Generating Facility Interconnection Standards Technical Requirements; Appendix II, Standard Interconnection Agreement; and Appendix III, Interconnection Process Overview

Superseding SHEET NO. 34A-3
Effective March 21, 2003

REVISED SHEET NO. 34A-3
Effective June 17, 2005

3. Interconnection Process

- a. Customer requests to interconnect and operate distributed generating facilities in parallel with the Company's electric system under the Standard Interconnection Agreement provided in Appendix II of this Rule, will be processed in accordance with the procedures in the Interconnection Process Overview, which is included in Appendix III of this Rule.
- b. The Interconnection Process Overview addresses the steps in the interconnection process, the technical review process, the need for additional study, and the resolution of disputes.

HAWAIIAN ELECTRIC COMPANY, INC.

Docket No. 05-0037, D&O No. 21877 Dated June 17, 2005,
Transmittal Letter Dated June 24, 2005.

b. Review of Design Drawings..... 16
Exhibit A – Typical Equipment & Protective Device Requirements for Large Synchronous,
Induction, and Inverter Generators..... 17

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1. Definitions

- a. Active Anti-Islanding Scheme: A control scheme installed with the generating facility that prevents the formation of an unintended island by accelerating the drift in voltage and/or frequency to the respective trip points when the utility is not connected.
- b. Clearing Time: The time between the abnormal voltage being applied and the generating facility ceasing to energize the utility distribution system.
- c. Dedicated Transformer: A transformer that provides electrical service to a single customer.
- d. Distribution System: All electrical wires, equipment, and other facilities at the distribution voltage levels (such as 25kV, 12kV, or 4kV) owned or provided by the utility, through which the utility provides electrical service to its customers.
- e. Direct Transfer Trip: Automatic remote trip of a generating facility's circuit breaker or interrupting device by means of a communication channel that is acceptable to the utility.²
- f. Generating Facility: Customer or utility-owned electrical power generation that is interconnected to the utility.
- g. Induction Generator: A rotating machine generator that converts mechanical power to electrical power, in which the rotor current creating the magnetic field is supplied by an external AC source, usually the electric utility system.
- h. Inverter System: A machine, device, or system that changes direct-current power to alternating-current power.
- i. Network System: An electrical system in which two or more utility feeder sources are electrically tied together on the primary or secondary voltage level to form one power source for one or more customers. The network system is designed to provide higher reliability for customers connected to it.
- j. Point of Interconnection: The point at which the utility and the customer interface occurs.

² Acceptance of the communications channel depends upon the speed of the operation, availability (up time), reliability, security, and type of electrical interface equipment used. The criteria for selecting the type of acceptable communications are the levels of guaranteed priority for restoration response, maintenance, and system upgrades in order to maximize availability, reliability, and security. Other technical communications channel requirements are determined by the manufacturers of the electrical interface equipment used.

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- k. Short Circuit Contribution Ratio (SCCR): The ratio of the aggregate short circuit contribution of the generating facility to the short circuit contribution of the utility system (including all other generating facility sources), for a three-phase fault at the high side of the customer or utility transformer.
- l. Subtransmission System: All electrical wires, equipment, and other facilities at the subtransmission voltage levels (such as 46kV, 35kV, or 23kV) owned or provided by the utility, through which the utility provides electrical service to its customers.
- m. Supervisory Control: Remote monitoring and/or control of a generating facility's power output and interrupting device status by means of a communication channel (see footnote number 2) that is acceptable to the utility.
- n. Synchronous Generator: A rotating machine generator that converts mechanical power into electrical power, in which the rotor current creating the magnetic field comes from a separate DC source or the generator itself.
- o. Transmission System: All electrical wires, equipment, and other facilities at the transmission voltage levels (such as 138kV or 69kV) owned or provided by the utility, through which the utility provides electrical service to its customers.
- p. Unintended Islanding: Islanding is a condition in which one or more generating facilities deliver power to a utility customer or customers using a portion of the utility's distribution system that is electrically isolated from the remainder of the utility's distribution system. Unintended islanding may occur following an unanticipated loss of a portion of the utility distribution system.
- q. Utility-grade Protective Equipment: Protective equipment that meet requirements defined by:
- ANSI/IEEE C37.90-1989 IEEE Standards for Relays and Relay Systems Associated with Electric Power Apparatus
 - IEEE C37.90.1 IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems
 - IEEE C37.90.2 IEEE Trial-Use Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

HAWAIIAN ELECTRIC COMPANY, INC.

2. General Interconnection Guidelines

- a. Compliance with Laws and Codes: The generating facility, protection, interconnection equipment, design, and design drawings shall meet all applicable national, state, and local laws, including construction and safety codes. The following construction and safety codes shall be followed for the design and construction of all distributed generating facility installations to ensure the safety of the public, customer, and utility personnel. These codes include, but are not limited to, the following:
- National Electric Code (NEC)
 - National Electrical Safety Code (NESC)
 - National Fire Protection Association (NFPA) Building Code
 - City & County of Honolulu Building Code
 - Uniform Building Code (UBC)
 - American Concrete Institute (ACI)
 - American Institute of Steel Construction (AISC)
 - American Association of State Highways & Transportation Officials (AASHTO)
- b. Export of Power: Generating facilities intending to export power to the utility may require additional technical study that will be identified by the Company to evaluate the impacts of the export power on equipment ratings and protective relay settings. Analyses such as a Feeder Load Flow, Dynamic Stability Analysis, Transient Overvoltage, Short Circuit and Relay Coordination may need to be performed in order to evaluate the impacts of the export of power on equipment ratings and protective relay settings.³
- c. Utility Feeder Penetration: As the penetration of generating capacity increases on the utility distribution feeder, there is increased risk of voltage regulation problems, adverse interactions with the utility's protection system, and unintended islanding. Therefore, additional technical study to examine the risk of voltage regulation problems, protection malfunction from reverse power flow, and unintended islanding may be required when the aggregate generating capacity per distribution feeder exceeds 10% of the peak annual KVA load of the feeder. Analyses such as a Feeder Load Flow, Dynamic Stability Analysis, Transient Overvoltage, Short Circuit and Relay Coordination may need to be performed in order to evaluate the risk of voltage regulation problems, protection malfunction from reverse power flow and unintended islanding. The need for such study will be identified by the Company.

³ Generating facilities that export power to the utility system will change the direction of power flow on the utility system. The magnitude of the change in power flow will be a function of the aggregate amount of export power on a feeder, the location of the generating facilities exporting power on a feeder, the feeder load, and the location of loads on a feeder. The need for the additional analyses listed above will depend on these factors.

HAWAIIAN ELECTRIC COMPANY, INC.

- b. Transformer Winding Configuration: The transformer winding configuration of the customer or utility distribution transformer serving the generating facility shall be reviewed by the Company in its initial technical screening to determine the potential impact to the utility system and generating facility, and subsequent interconnection requirements. Refer to typical single-line diagrams in Figures 1-3. Based upon the results of the initial technical screening, the Company may determine that additional technical study of the transformer winding configuration is necessary.
- c. Isolation Device: The customer shall furnish and install a manual disconnect device that has a visible break to isolate their generating facility from the utility distribution system. The device must be accessible to utility personnel and be capable of being locked by utility personnel in the open position. For generating facilities that do not have a circuit breaker or interrupting device, the disconnect device must be capable of interrupting load. An existing service disconnect device may be used if it meets these requirements. A label provided by the utility (indicating "Customer Generating Facility") shall be attached to the generator disconnect device.
- d. Interrupting Device: Applicable circuit breakers or interrupting devices at the generating facility must be capable of interrupting the maximum available fault current at the site, including any contribution from the generating facility. For generating facilities that are greater than 10kW, the interrupting device must be accessible to utility personnel at all times.
- e. Dedicated Transformer: The utility may require the generating facility to install a dedicated transformer, where the generating facility is served from the same transformer secondary as another utility customer and if inverter-based technology is used that does not meet IEEE 929-2000 and IEEE 519-1992 (or latest versions) specifications. A dedicated transformer or other current-limiting device is needed for any type of generating facility where the increase in available short circuit current could adversely impact other utility customers on the same secondary circuit (i.e., the short circuit contribution of the generating facility must not increase the available short circuit current to the other utility customers on the same secondary circuit such that the ratings of their equipment and protective devices are exceeded). The Company will determine whether an adverse impact may occur.
- f. Supervisory Control: For generating facilities with an aggregate capacity greater than 1MW, computerized supervisory control may be required to ensure the safety of working personnel and prompt response to system abnormalities in case of islanding of the generating facility. The Company shall determine the need for supervisory control based upon the results of the initial technical screening and/or additional technical study.

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exist on the utility system; (c) if a hazardous condition relating to the generating facility is observed by the utility's inspection; (d) if the generating facility interferes with the utility's equipment or equipment belonging to other utility customers (including non-utility generating equipment); or (e) if the customer or a party with whom the customer has contracted for ownership and/or operation of the generating facility has tampered with any protective device. The generating facility shall remain disconnected until such time as the utility is satisfied that the endangering condition(s) has been corrected, and the utility shall not be obligated to allow parallel operation of the generating facility during such period. If the utility disconnects the generating facility under this Section 4b, it shall as soon as practicable notify the customer in person or by telephone and provide the reason(s) why the generating facility was disconnected from the Company's system.

- c. Synchronization: Upon connection, the generating facility shall synchronize with the utility distribution system. Synchronization means that at the Point of Interconnection, the frequency difference shall be less than 0.2 Hz, the voltage difference shall be less than 5%, and the phase angle difference shall be less than 10 degrees.
- d. Voltage Regulation: Unless specifically requested by the utility, the generating facility shall not attempt to control or regulate the utility system voltage while operating in parallel with the utility distribution system.

The generating facility shall not degrade the normal voltage provided by the utility outside the limits stated in the utility tariff ($\pm 5\%$ of nominal voltage).

- e. Unintended Islanding: For public and utility personnel safety and to prevent possible damage to customer equipment, the generating facility shall be equipped with protective equipment designed to prevent the generating facility from being connected in parallel with a de-energized utility line. The generating facility must automatically disconnect from the utility distribution system upon loss of utility source, and remain disconnected until the voltage and frequency have stabilized (see Section 4j). Protective device requirements, such as direct transfer trip, grounding bank, or active anti-islanding scheme, shall be determined by the Company based upon the results of the initial technical screening and/or additional technical study.
- f. Disconnect for Faults: The generating facility shall be equipped with protective equipment designed to automatically disconnect the generating facility from the utility distribution system for faults on the utility distribution circuit to which it is connected, and remain disconnected until the voltage and frequency have stabilized (see Section 4j).

HAWAIIAN ELECTRIC COMPANY, INC.

- g. **Voltage Disturbances:** The generating facility shall be equipped with protective equipment designed to automatically disconnect the generating facility from the utility distribution system for voltages outside the normal operating range within the clearing time as indicated in the table below, and remain disconnected until the voltage and frequency have stabilized (see Section 4j). The protective equipment shall measure the RMS (root-mean-square) voltage at the Point of Interconnection.

<u>Voltage (% of base voltage)</u>	<u>Voltage (120V base)</u>	<u>Clearing Time</u>
$V < 50\%$	$V < 60$ volts	10 cycles
$50\% \leq V < 88\%$	$60 \text{ volts} \leq V < 106$ volts	120 cycles
$88\% \leq V \leq 110\%$	$106 \text{ volts} \leq V \leq 132$ volts	Normal Range
$110\% < V < 120\%$	$132 \text{ volts} < V < 144$ volts	60 cycles
$120\% \leq V$	$144 \text{ volts} \leq V$	10 cycles

For generating facilities $\geq 30\text{kW}$, the voltage setpoints and clearing times shall be adjustable to accommodate utility system requirements.

- h. **Frequency Disturbances:** The generating facility shall be equipped with protective equipment designed to automatically disconnect the generating facility from the utility distribution system when the frequency at the Point of Interconnection deviates outside the normal operating range of 59.3 – 60.5 Hz, and remain disconnected until the voltage and frequency have stabilized (see Section 4j). The frequency settings and time delay can be selected by the utility to provide system security.

For generating facilities less than 30kW, the protective equipment shall disconnect the generating facility within 10 cycles. For generating facilities $\geq 30\text{kW}$, the protective equipment shall: (1) disconnect the generating facility within 10 cycles if the frequency exceeds 60.5 Hz, (2) be capable of time delayed disconnection with adjustable under-frequency settings in the range of 57.0 – 59.3 Hz, and (3) disconnect the generating facility within 10 cycles if the frequency is less than 57.0 Hz.

- i. **Inadvertent Energization:** The generating facility shall not energize a de-energized utility circuit for any reason. For synchronous generators, automatic lockout of the customer circuit breaker or interrupting device shall be required with manual reset. The generating facility may be operated during a utility outage of the distribution system that serves the Point of Interconnection only with an open tie to the utility system which can be locked by utility personnel.
- j. **Required Delay on Reconnection:** The generating facility shall be equipped with automatic means to prevent reconnection of the generating facility with the utility distribution system until the utility service voltage and frequency are within the

HAWAIIAN ELECTRIC COMPANY, INC.

utility tariff normal operating ranges and stable for at least 5 minutes, unless earlier directed by the utility.

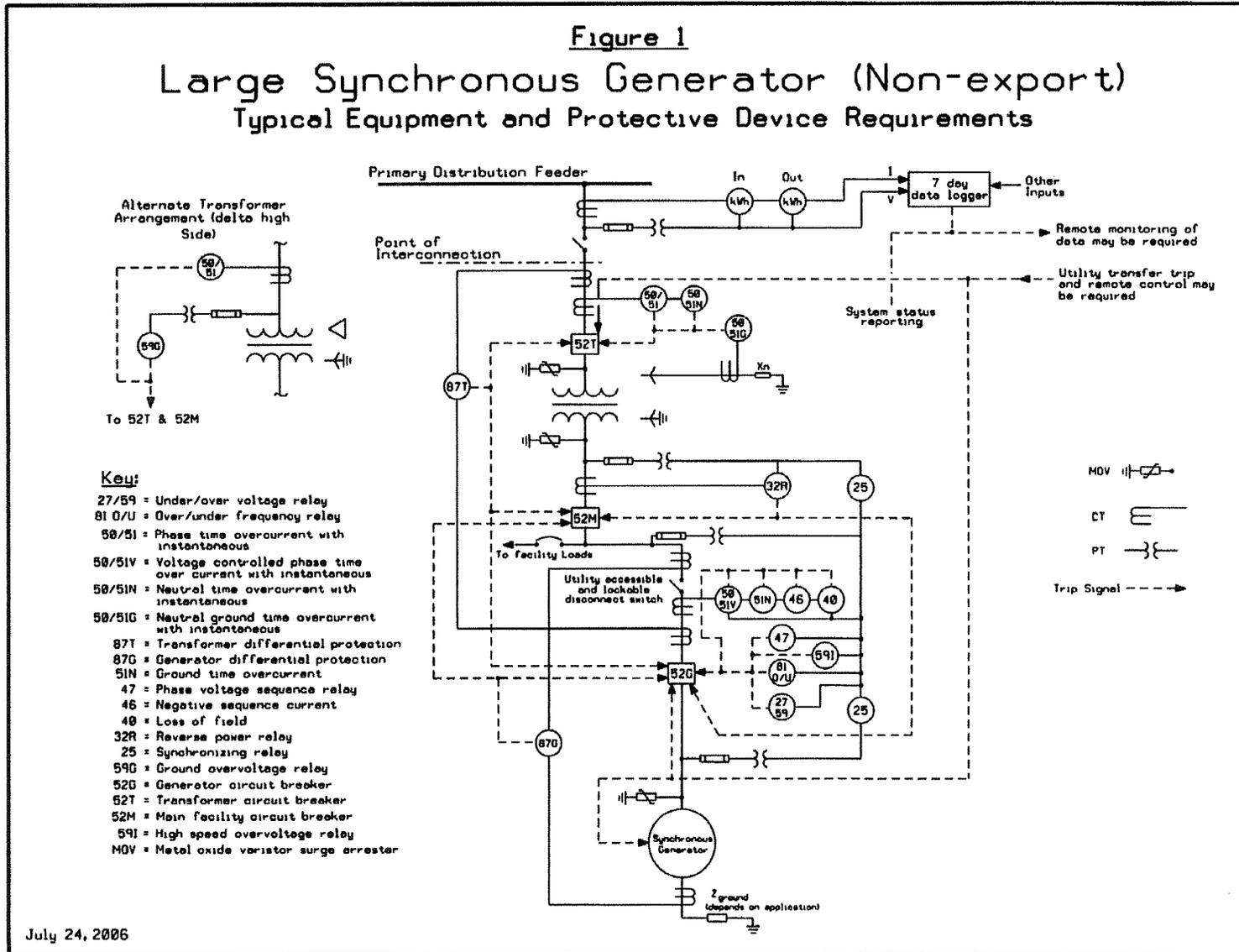
- k. Loss of Protection: Failure of the generating facility interconnection protection equipment, including loss of control power, shall result in the automatic disconnection of the generating facility from the utility distribution system until such time that the interconnection protection equipment has been restored. Such failure shall initiate a signal to trip a generating facility circuit breaker or shutdown an inverter. Automatic disconnection may be waived by the utility if there is supplemental protection such as direct transfer trip maintained by the utility.
- l. Reclosing Coordination: The generating facility shall be coordinated with the utility system reclosing devices, by disconnecting from the utility distribution system within the first reclose interval and remaining disconnected until the voltage and frequency have stabilized (see Section 4j).
- m. Power Factor: The generating facility shall not adversely impact the power factor at the Point of Interconnection. Synchronous and induction generating facilities shall operate at a power factor ≥ 0.85 (lagging or leading). Inverter-based generating facilities shall operate at a power factor ≥ 0.85 (lagging or leading) when output is greater than 10% of rating in accordance with IEEE Std 929-2000 (or latest version).

Operation outside this range is acceptable provided the reactive power of the generating facility is used to meet the reactive power needs of the customer's internal loads or that reactive power is otherwise provided under utility tariff, and it does not adversely impact the utility system voltage as specified in section 4.d. above.

- n. Voltage Flicker: Any voltage flicker at the Point of Interconnection caused by the generating facility shall not exceed the limits defined by the "Borderline of Visibility Curve" identified in IEEE Standard 519-1992 "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems" (or latest version). This requirement is necessary to minimize the adverse voltage effects upon other utility customers on the utility distribution system.
- o. Harmonics: Harmonic distortion at the Point of Interconnection caused by the generating facility shall not exceed the limits stated in IEEE Standard 519-1992 "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems" (or latest version). The customer is responsible for the installation of any necessary controls or hardware to limit the voltage and current harmonics generated from their generating facility to levels defined in IEEE Standard 519-1992.

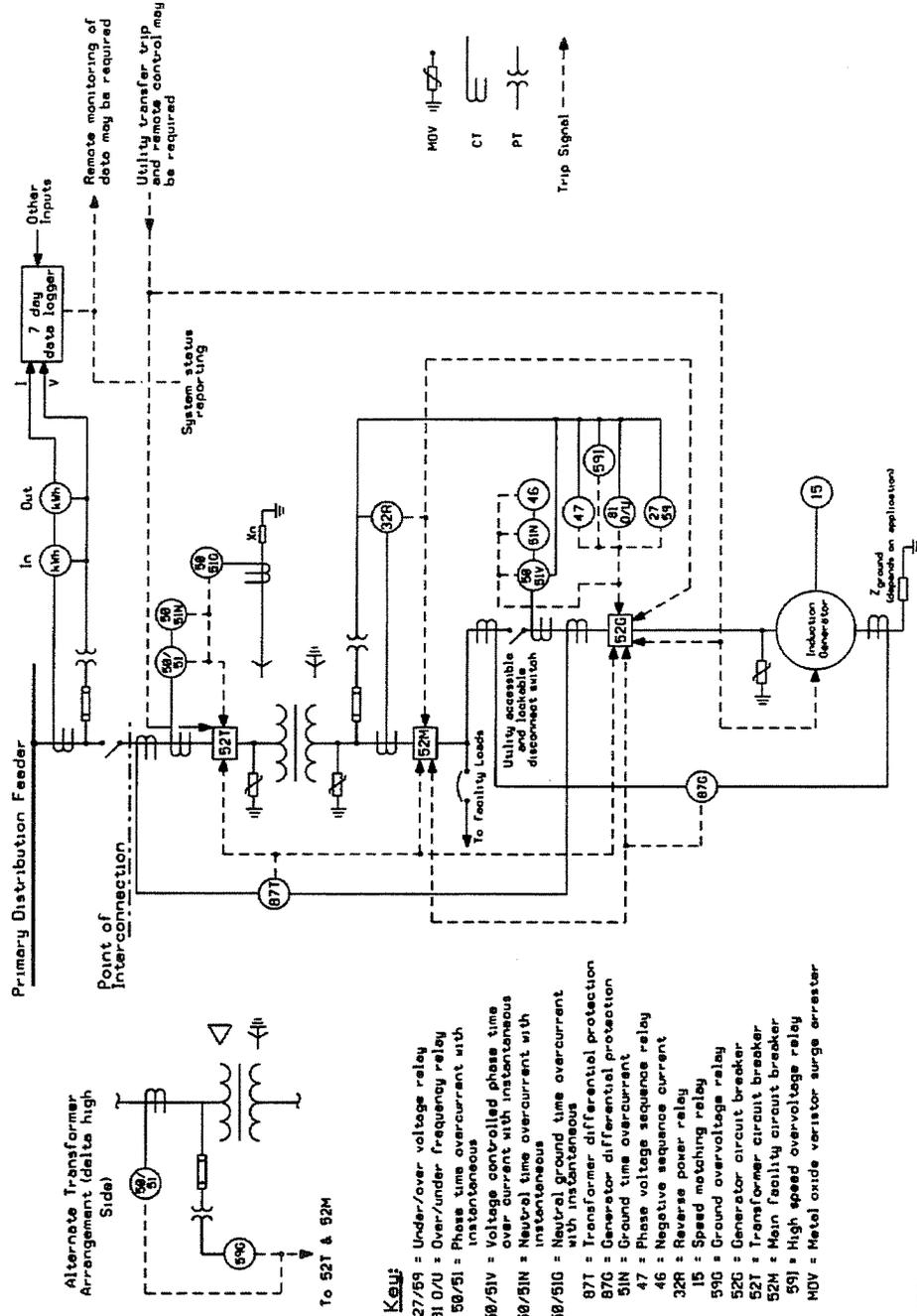
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Figure 1
Large Synchronous Generator (Non-export)
Typical Equipment and Protective Device Requirements



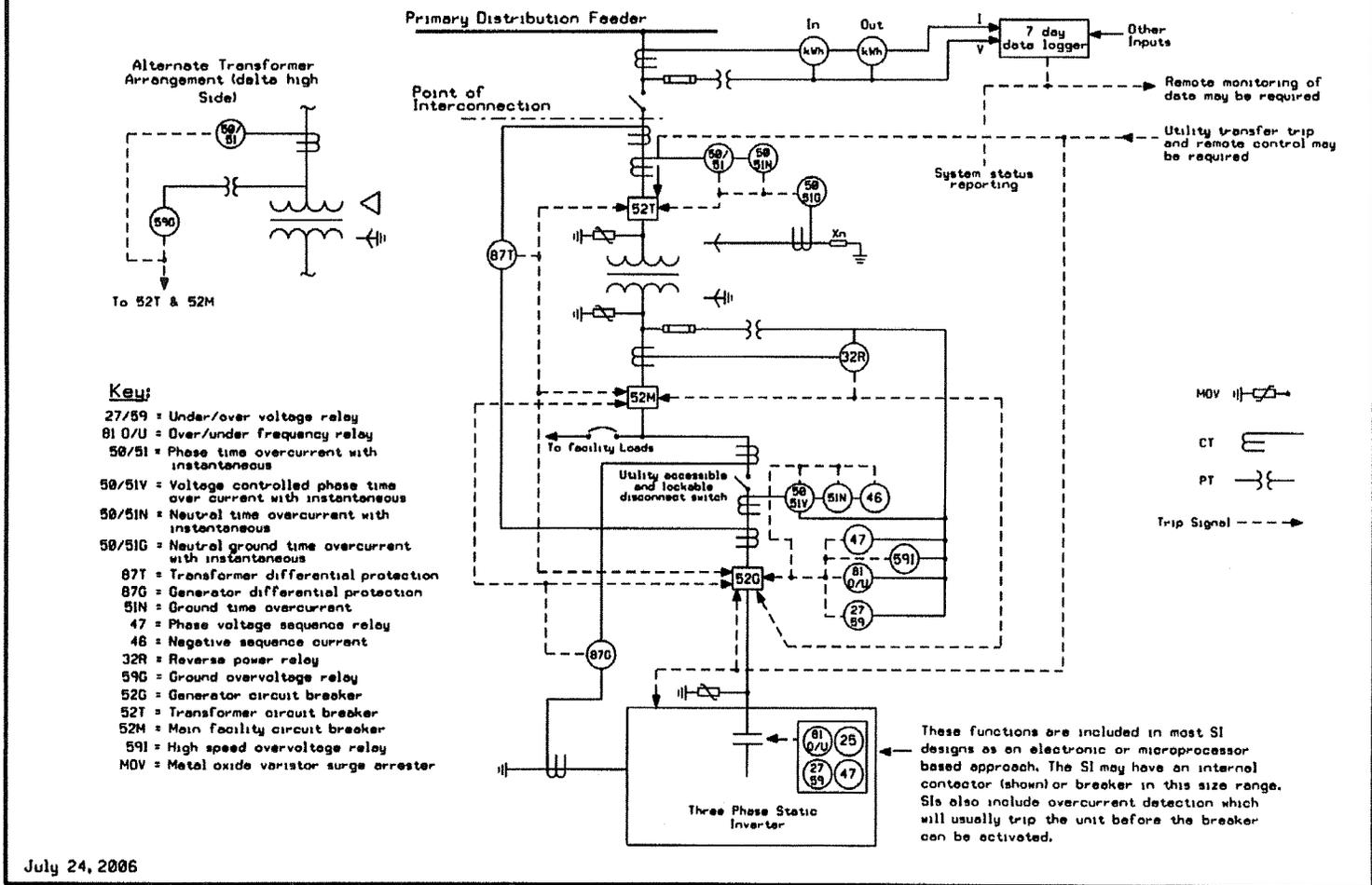
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Figure 2
Large Induction Generator (Non-export)
Typical Equipment and Protective Device Requirements



July 24, 2006

Figure 3
Large Static Inverter (Non-export)
Typical Equipment and Protective Device Requirements



schemes) identified in Exhibit B hereto ("Customer Interconnection Facilities").

- (c) The point of interconnection is shown on the single-line diagram and three-line diagram (provided by the Customer and reviewed by the Company) which are attached to Exhibit B (provided that the three-line diagram is not required if the Facility's capacity is less than 30 kW).
- (d) The Customer agrees to test the Facility, to maintain operating records, and to follow such operating procedures, as may be specified by the Company to protect the Company's system from damages resulting from the parallel operation of the Facility, including such testing, records and operating procedures as more fully described in Exhibit B attached hereto and made a part hereof.
- (e) The Company may inspect the Facility, as more fully described in Exhibit B.

4. Interconnection Facilities Owned by the Company: The Company agrees to furnish, install, operate and maintain such interconnection facilities on its side of the point of interconnection with the Facility as required for parallel operation with the Facility and as more fully described in Exhibit C attached hereto and made a part hereof ("Company Interconnection Facilities"). All such interconnection facilities shall be the property of the Company. Where portions of the Company Interconnection Facilities are located on the Customer's premises, the Customer shall provide, at no expense to the Company, a suitable location for and access to all such equipment. If a 120/240 Volt power source or sources are required, the Customer shall provide these at no expense to the Company.

5. Customer Payments: The Customer agrees to pay to the Company a non-refundable contribution for the Company's investment in the interconnection facilities described in Exhibit C, subject to the terms and conditions included in Exhibit C, and to pay for other interconnection costs. The interconnection costs will not include the cost of an initial technical screening of the impact of the Facility on the Company's system, but will include the actual cost (or such lesser amount as the Company may specify to facilitate the processing of interconnection requests for similarly situated facilities) of additional technical study for the Facility.

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equipment); or (e) if the Customer and/or owner and/or operator of the Facility has tampered with any protective device. The Facility shall remain disconnected until such time as the Company is satisfied that the endangering condition(s) as listed above has been corrected, and the Company shall not be obligated to allow parallel operation of the Facility during such period. If the Company disconnects the Facility under this Section 9, it shall as soon as practicable notify the Customer in person or by telephone and provide the reason(s) why the Facility was disconnected from the Company's system.

10. Transmission Service Not Provided with Interconnection: Interconnection with the Company's system under this Agreement does not provide the Customer any rights to utilize the Company's system for the transmission or distribution of electric power.
11. Prevention of Interference: The Customer shall not operate equipment that superimposes a voltage or current upon the Company's system that interferes with the Company's operations, service to the Company's customers, or the Company's communication facilities. Such interference shall include, but not be limited to, overcurrent, voltage imbalance, and abnormal waveforms. If such interference occurs, the Customer must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by the Company. If the Customer does not take timely corrective action, or continues to operate the equipment causing interference without restriction or limit, the Company may, without liability, disconnect the Customer's equipment from the Company's system.
12. Location of Metering: Where Company-owned metering is located on the Customer's premises, the Customer shall provide, at no expense to the Company, a suitable location for and access to all such metering.
13. Design Reviews and Inspections: The Company's review and authorization to allow the Facility to interconnect and operate in parallel with the Company's system shall not be construed as confirming or endorsing the Facility's design or as warranting the Facility's safety, durability or reliability. The Company shall not, by reason of such review or lack of review, be responsible for the equipment, including but not limited to, the safety, strength, adequacy, durability, reliability, performance, or capacity of such equipment.

HAWAIIAN ELECTRIC COMPANY, INC.

14. Permits, Approvals, and Licenses: The Customer shall obtain, at its expense, any and all authorizations, approvals, permits, and licenses required for the construction and operation of the Facility and the interconnection with the Company's system, including but not limited to environmental permits, building permits, rights-of-way, or easements.
15. Term: This Agreement shall become effective when executed by the Customer and the Company and shall continue in effect until terminated.
16. Termination: This Agreement may be terminated as follows: (a) The Customer may terminate this Agreement at any time, by giving the Company at least sixty (60) days written notice, provided that the Facility is disconnected from the Company's system and no longer operating in parallel with the Company's system at the time this Agreement is terminated; (b) The Company may terminate this Agreement upon failure by the Customer to generate energy from the Facility in parallel with the Company's system within twelve (12) months after completion of the interconnection; (c) Either party may terminate this Agreement by giving the other party at least thirty (30) days prior written notice that the other party is in default of any of the material terms and conditions of the Agreement, provided that the notice specifies the basis for the termination and there is a reasonable opportunity to cure the default; (d) The Company may terminate this Agreement if the Facility is removed from permanent service; or (e) The Company may terminate this Agreement by giving the Customer at least sixty (60) days prior written notice in the event that there is a material change in an applicable statute, rule or tariff.
17. Disconnection and Survival of Obligations: Upon termination of this Agreement the Facility shall be disconnected from the Company's system. The termination of this Agreement shall not relieve the parties of their liabilities and obligations, owed or continuing at the time of the termination.
18. Indemnification:
 - (a) The Customer shall indemnify, defend and hold harmless the Company and its officers, directors, agents and employees, from and against all liabilities, damages, losses, fines, penalties, claims, demands, suits, costs and expenses (including reasonable attorney's fees and expenses) to or by third persons, including the Company's employees or subcontractors, for injury or death,
HAWAIIAN ELECTRIC COMPANY, INC.

Superseding SHEET NO. 34C-10
Effective March 21, 2003

REVISED SHEET NO. 34C-10
Effective June 6, 2003

IN WITNESS WHEREOF, the Company and the Customer have executed this Agreement as of the day and year first above written.

By _____
Its

"Company"

By _____
Its

"Customer"

HAWAIIAN ELECTRIC COMPANY, INC.

PUC Order No. 20220 Dated May 30, 2003, Docket No. 02-0051
Transmittal Letter Dated June 4, 2003

EXHIBIT A

DESCRIPTION OF CUSTOMER'S GENERATING FACILITY

Section 1, Applicant Information

Customer

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Daytime): Area Code _____ Number _____ (Evening) Area Code _____ Number _____

Facility Location (if different from above): _____

Owner (if different from Customer)

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Daytime): Area Code _____ Number _____ (Evening) Area Code _____ Number _____

Operator (if different from Customer)

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Daytime): Area Code _____ Number _____ (Evening) Area Code _____ Number _____

Section 2, Generator Qualifications

Is the generator a Qualifying Facility as defined under Subpart B, Section 201 of the Federal Energy Regulatory Commission's regulations per the Public Utility Regulatory Policies Act of 1978, or the PUC's Standards for Small Power Production and Cogeneration (Hawaii Administrative Rules Title 6, Chapter 74)?

Yes No

Is Generator powered from a Nonfossil Fuel Source?

Yes No

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Generator Characteristic Data (for rotating machines):
(Not needed if Generator Nameplate and Manufacturer's Specification Sheet are provided)

Direct Axis Synchronous Reactance, X_d : _____ P.U. Negative Sequence Reactance: _____ P.U.
Direct Axis Transient Reactance, X'_d : _____ P.U. Zero Sequence Reactance: _____ P.U.
Direct Axis Subtransient Reactance, X''_d : _____ P.U. KVA Base: _____
Inertia Constant, H: _____ P.U.
Excitation Response Ratio: _____
Direct Axis Open-Circuit Transient Time Constant, T'_{do} : _____ Seconds
Direct Axis Open-Circuit Subtransient Time Constant, T''_{do} : _____ Seconds

Fault Current Contribution of Generator: _____ Amps

Section 4, Interconnecting Equipment Technical Data

Will an interposing transformer be used between the generator and the point of interconnection? Yes No

Transformer Data (if applicable, for Customer Owned Transformer):
(A copy of transformer Nameplate and Manufacturer's Test Report may be substituted)

Size: _____ KVA. Transformer Primary: _____ Volts Delta Wye Wye Grounded
Transformer Secondary: _____ Volts Delta Wye Wye Grounded
Transformer Impedance: _____ % on _____ KVA Base

Transformer Fuse Data (if applicable, for Customer Owned Fuse):
(Attach copy of fuse manufacturer's Minimum Melt & Total Clearing Time-Current Curves)

At Primary Voltage Secondary Voltage
Manufacturer: _____ Type: _____ Size: _____ Speed: _____

Transformer Protection (if not fuse):

Please describe: _____

Interconnecting Circuit Breaker (if applicable):
(A copy of circuit breaker's Nameplate and Specification Sheet may be substituted)

Manufacturer: _____ Type: _____
Continuous Load Rating: _____ (Amps) Interrupting Rating: _____ (Amps) Trip Speed: _____ (Cycles)

HAWAIIAN ELECTRIC COMPANY, INC.

Superseding SHEET NO. 34C-16
Effective March 21, 2003

REVISED SHEET NO. 34C-15
Effective June 6, 2003

Section 6, Installation Details

Installing Electrical Contractor: _____ Firm: _____ License No.: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: Area Code: _____ Number: _____

Installation Date: _____ Interconnection Date: _____

Supply certification that the generating system has been installed and inspected in compliance with the local Building/Electrical code of the county of _____ .

Signed (Inspector): _____ Date: _____
(In lieu of signature of Inspector, a copy of the final inspection certificate may be attached)

Section 7, Generator/Equipment Certification

Generating systems that utilize inverter technology must be compliant with *Institute of Electrical and Electronics Engineers IEEE Std 929* and *Underwriters Laboratories UL 1741* in effect at the time this Agreement is executed. Generating systems that use a rotating machine must be compliant with applicable National Electrical Code, Underwriters Laboratories, and Institute of Electrical and Electronics Engineers standards and rules and orders of the Hawaii Public Utilities Commission in effect at the time this Agreement is executed. **By signing below, the Applicant certifies that the installed generating equipment meets the appropriate preceding requirement(s) and can supply documentation that confirms compliance.**

Signed (Customer): _____ Date: _____

Section 8, Insurance

Insurance Carrier: _____

HAWAIIAN ELECTRIC COMPANY, INC.

PUC Order No. 20220 Dated May 30, 2003, Docket No. 02-0051
Transmittal Letter Dated June 4, 2003

The Total Estimated Interconnection Cost, which, except as otherwise provided herein, is non-refundable, shall be paid by the Customer fourteen (14) days after receipt of an invoice from the Company, which shall be provided not less than thirty (30) days prior to start of procurement of the Company Interconnection Facilities.

Within thirty (30) days of receipt of an invoice, which shall be provided within fourteen (14) days of the final accounting, which shall take place within sixty (60) days of completion of construction of the Company Interconnection Facilities, the Customer shall remit to the Company the difference between the Total Estimated Interconnection Cost paid to date and the total actual interconnection cost (Total Actual Interconnection Cost). The latter is comprised of (i) the total costs of the Company Interconnection Facilities, and (ii) the total engineering costs associated with a) developing the Company Interconnection Facilities and b) reviewing and specifying those portions of the Facility which allow interconnected operations as such are described in Exhibit B, and iii) reviewing the verification testing. If in fact the Total Actual Interconnection Cost is less than the payments received by the Company as the Total Estimated Interconnection Cost, the Company shall repay the difference to the Customer within thirty (30) days of the final accounting.

If the Agreement is terminated prior to the Customer's payment for the Total Actual Interconnection Cost (or the portion of this cost which has been incurred) or prior to the Company's repayment of the overcollected amount of the Total Estimated Interconnection Cost (or the portion of this cost which has been paid), such payments shall be made by the Customer or Company, as appropriate. If payment is due to the Company, the Customer shall pay within thirty (30) days of receipt of an invoice, which shall be provided within fourteen (14) days of the final accounting, which shall take place within sixty (60) days of the date the Agreement is terminated. If payment is due to the Customer, the Company shall pay within thirty (30) days of the final accounting.

All Company Interconnection Facilities shall be the property of the Company.

3. Operation, Maintenance and Testing Costs

The Company will bill the Customer monthly and the Customer will, within 30 days after the billing date, reimburse the Company for

HAWAIIAN ELECTRIC COMPANY, INC.

Superseding SHEET NO. 34C-25
Effective March 21, 2003

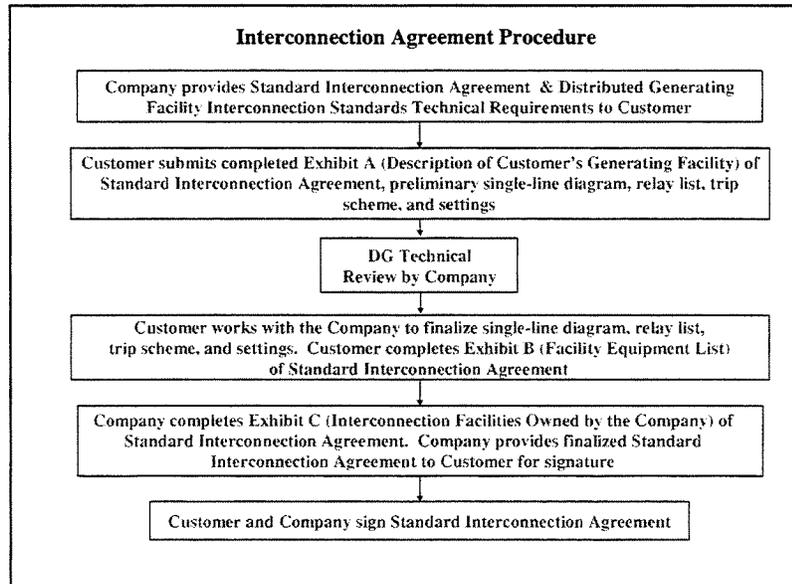
REVISED SHEET NO. 34C-25
Effective June 6, 2003

any costs incurred in operating, maintaining or testing the Company Interconnection Facilities. The Company's costs will be determined on the basis of outside service costs, direct labor costs, material costs, transportation costs, applicable overheads at time incurred and applicable taxes. Applicable overheads will include such costs as vacation, payroll taxes, non-productive wages, supervision, tools expense, employee benefits, engineering administration, corporate administration, and materials handling. Applicable taxes will include the Public Service Company Tax, and Public Utility Fee.

HAWAIIAN ELECTRIC COMPANY, INC.

PUC Order No. 20220 Dated May 30, 2003, Docket No. 02-0051
Transmittal Letter Dated June 4, 2003

b. The following flowchart provides for illustrative purposes the major steps in the finalization of an interconnection agreement:



c. The activities in each step shown in the flowchart include the following:

Step 1: The Customer is provided with the Distributed Generating Facility Interconnection Standards Technical Requirements (Appendix I) and Standard Interconnection Agreement (Appendix II). The Distributed Generating Facility Interconnection Standards Technical Requirements (Appendix I), Standard Interconnection Agreement (Appendix II) and Interconnection Process Overview (Appendix III) normally will be transmitted to the Customer within 5 business days of receiving a Customer request.

Step 2: The Customer submits a completed Exhibit A to the Standard Interconnection Agreement (Description of Customer's Generating Facility), and a preliminary single-line diagram, relay list, trip scheme and settings, and three-line diagram (required in specified circumstances), which is the information required to be

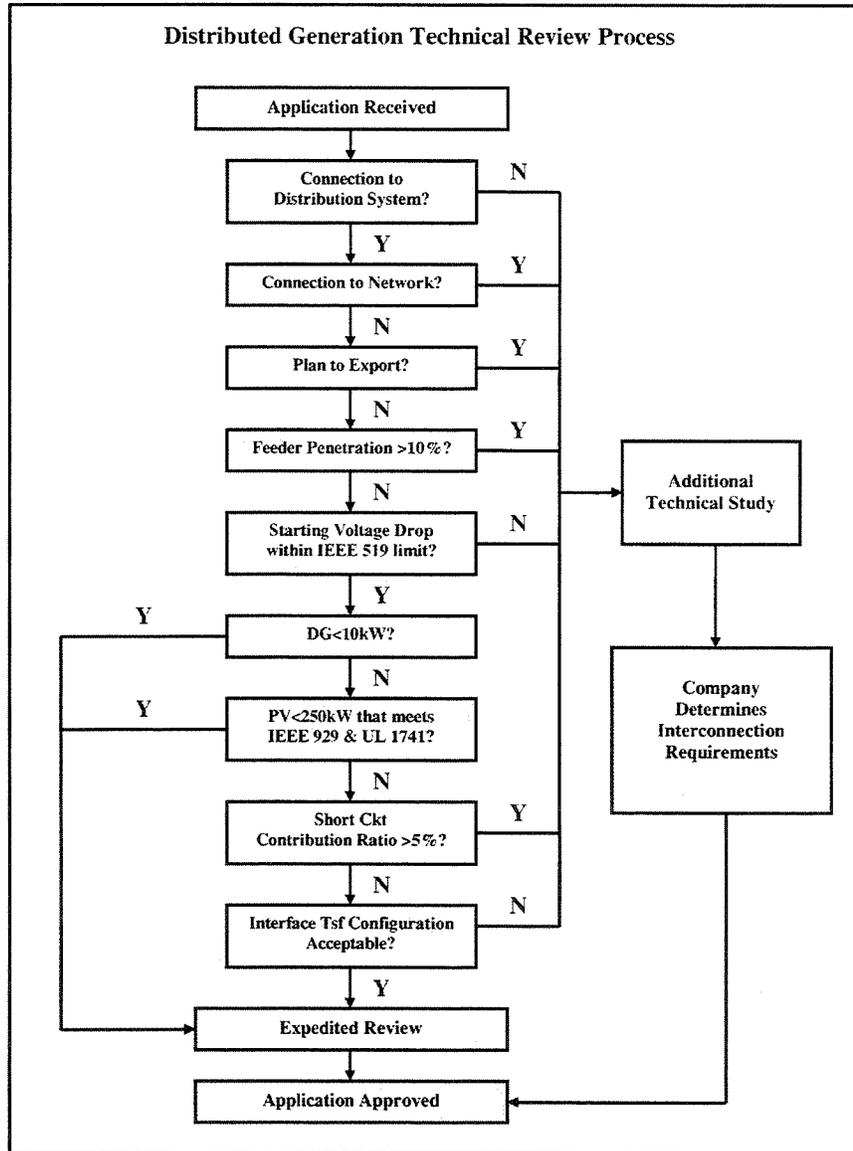
HAWAIIAN ELECTRIC COMPANY, INC.

d. The Company and Customer shall mutually agree to a schedule by which the interconnection facilities will be constructed and when the Customer's generating facility shall be connected to the Company's electric system. The interconnection facilities are project-specific, and the time to complete the facilities will depend on the complexity of the required interconnection facilities.

HAWAIIAN ELECTRIC COMPANY, INC.

2. Technical Review Process

a. The following flowchart provides for illustrative purposes the major steps in the technical review process:



b. The degree of technical review required for a request for interconnection, and the extent to which additional technical study will be needed, will depend on factors such as

HAWAIIAN ELECTRIC COMPANY, INC.

(1) complexity of the utility system that the generating facility is proposed to be interconnected to that must be modeled (i.e., the distribution, subtransmission or transmission system); (2) connection to a network system; (3) plan to export power; (4) feeder penetration greater than 10%; (5) starting voltage drop; (6) generating facility capacity; (7) short circuit contribution ratio greater than 5%; and (8) type of interface transformer. (For example, photovoltaic systems less than 250 kW interconnecting through inverters that meet UL 1741, or latest version (the Standard for Inverters, Converters and Controllers for Use in Independent Power Systems) and IEEE 929-2000, or latest version (the Recommended Practice for Utility Interface of Photovoltaic Systems) may qualify for an expedited review process. Self-excited synchronous generators present more interconnection issues.)

c. Following submission by the Customer of all necessary information regarding the proposed distributed generating facility, the Company will perform an initial technical screening of the impact of the distributed generating facility on the Company's system, for which a charge will not be assessed. The Company shall respond to the Customer with the findings of the initial technical screening within 15 business days of the date the customer materials are deemed complete.³ If the Company determines that additional technical study of the interconnection proposal is necessary, then the Company will notify the Customer of the Company's target date to complete any required additional technical study. Upon completion of the technical study, the final results will be provided in writing to the Customer.

³ The Company, for good cause, may modify the time limit. If the Company modifies the time limit, it shall notify the Customer in writing of the modification and the cause for the modification.

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d. The initial technical screening or additional technical study may identify the need for Company interconnection facilities required to facilitate interconnection of the generating facility. The Company interconnection facilities and estimated cost shall be listed in Appendix II (Standard Interconnection Agreement), Exhibit C (Interconnection Facilities Owned by the Company). The Customer will be responsible for the cost of any Company interconnection facilities associated with the interconnection of its generating facility. If the Customer can show that there are benefits to the utility system due to the Company interconnection facilities, the Customer may apply to the utility for a credit reflecting these benefits, subject to Commission approval. For example, if there is a planned distribution system addition that may be deferred or displaced due to the addition of the Company interconnection facilities associated with interconnection of a generating facility, the dollar value of the deferral or displacement would be determined and proposed to be credited to the Customer (subject to Commission approval) as a line item in Appendix II (Standard Interconnection Agreement), Exhibit C (Interconnection Facilities Owned by the Company), Section 2 (Customer Payment to Company for Company Interconnection Facilities, Review of Facility, and Review of Verification Testing). The calculation of the benefits to the utility system would have to be examined on a case-by-case basis taking into account what distribution system addition(s) would have been deferred or displaced by the Company interconnection facilities that resulted from the interconnection of a distributed generation customer. The Company would then calculate a dollar value of the deferral or displacement, and propose to credit the Customer for that deferral or displacement value. The Company shall file a letter

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providing the Commission with sufficient information to document the proposed credit to be provided to the Customer for said deferral or displacement value. The proposed deferral or displacement value would not be credited to the Customer until the Commission approves such credit.

3. The Need for Additional Technical Study

a. The Company's engineering department will determine if additional technical study of the interconnection proposal is necessary. The need for additional technical study of the interconnection proposal may be triggered by considerations such as: (1) complexity of the utility system that the generating facility is proposed to be interconnected to that must be modeled (i.e., the distribution, subtransmission or transmission system); (2) connection to a network system; (3) plan to export power; (4) feeder penetration greater than 10%; (5) starting voltage drop; (6) generating facility capacity; (7) short circuit contribution ratio greater than 5%; and (8) type of interface transformer.

b. The Company may perform the analyses included in the additional technical study. The analyses or parts of the analyses may be contracted to an outside consultant specializing in such analyses for complex situations or in situations where the Company's engineering department does not have available resources to conduct the analyses in a time frame mutually agreeable to both the Company and the Customer. In the alternative, a third-party consultant may be used to perform the additional technical study (or verify alternative solutions and technologies), at the Customer's sole cost, provided the consultant meets the following qualifications: (1) experience and familiarity with electric

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generating facilities already operating in parallel with the Company's system on March 21, 2003 will not be charged for any additional technical studies. A cost estimate and schedule for the analyses to be done as part of the additional technical study will be provided to the Customer before the overall study is started. This generally would be done when the Company responds to the Customer with the findings of the initial technical screening.

4. Insurance Coverage

Prior to execution of the standard interconnection agreement, the Customer shall disclose if it will be self-insured (and if so its means and capability to self insure) or if it will obtain an insurance policy (and if so in what forms and amounts). The Customer must have insurance in forms and amounts that are commercially reasonable for each particular situation.

5. Resolution of Disputes

a. If there is a dispute between the Customer and the Company as to whether additional technical study is required, or as to the scope and cost of the study, then the Company generally would use the following procedures: (1) The Company's Contact Person (who generally would be from the Company's Marketing Services Division) would inform the Customer of the reasons for and scope of the study required; (2) If the Customer disagrees with the conclusion, then the Customer would meet with representatives from the Company's engineering department to discuss the matter; (3) If the Customer continues to disagree with the conclusion, then the Customer would write to the

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