CA-IR-205

Ref: T-4, page 42, line 12 – page 43, line 8.

The referenced section of testimony indicates that HECO's cost estimate of the test year Petrospect expense was derived from terms set forth in a contract between Petrospect and HECO dated July 8, 2005.

a. Please provide the calculations used to adjust the cost estimate to 2007 dollars.

b. Please provide the contract between Petrospect and HECO dated July 8, 2005.

HECO Response:

a.

Inspection Expense Computation						
A. LSFO						
1. Recent Hisotorical Expense Incurred On LSFO Purchases					Costing	
			Volume	Inspect Fees	Rate	
Chevron - 1/1/06-6/30/06			2707950.6	$ 18,291.52	$ 0.00675	
Tesoro - 1/1/06-6/30/06			1418325.3	$ 17,556.15	$ 0.01238	
2. Forecast Costing Rates, 2006 Rates @ 2.5% inflation escalation per year						
		2007				
	Chevron	$ 0.00692				
	Tesoro	$ 0.01269				
3. Composite rate of 60% Chevron deliveries and 40% Tesoro deliveries, rounded						
		2007				
	LSFO	$ 0.00920				
B. DIESEL For CT						
1. Recent hisotorical expense incurred purchases for Waiau delivered via pipeline						
					Costing	
			Volume	Inspect Fees	Rate	
Diesel - 1/1/06-6/30/06			27036.0	$ 1,924.98	$ 0.07120	
2. Forecast Costing Rates, 2006 Rates @ 2.5% inflation escalation per year, rounded						
		2007				
	Diesel To Waiau	$ 0.07300				

Following is from HECO-405, page 3 of 3.

Hawaiian Electric Company, Inc.

DERIVATION OF FUEL EXPENSE
(Petrospect Costs)

Line	LSFO	(A) Fuel Consumption (Barrels)	(B)[1] Petrospect Cost ($/bbl)	(C) = (A) x (B) (C) Fuel Expense ($000)
1.	Honolulu	295,205	0.0092	$ 3
2.	Kahe	5,685,644	0.0092	$ 52
3.	Waiau-Steam	2,049,397	0.0092	$ 19
4.	Subtotal	8,030,246		$ 74
5.	Waiau-Diesel	101,195	0.0730	$ 7
6.	Subtotal	101,195		$ 7
7.	Central Station Total	8,131,441		$ 81
8.	Substation DG	40,109	0.0730	$ 3
9.	Grand Total	8,171,550		$ 84

b. See attached file containing the "Petroleum Inspection Services Agreement" by and between Hawaiian Electric Company, Inc. and Petrospect, Inc.

PETROLEUM INSPECTION SERVICES AGREEMENT

BY AND BETWEEN

HAWAIIAN ELECTRIC COMPANY, INC.

AND

PETROSPECT, INC.

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EXHIBITS

Exhibit A Petrospect Inspection Price Schedule Dated July 1, 2004

PETROLEUM INSPECTION SERVICES AGREEMENT

THIS AGREEMENT ("Agreement") is dated as of July 8, 2005 ("Effective Date") by and between **HAWAIIAN ELECTRIC COMPANY, INC.,** ("HECO"), a Hawaii corporation whose principal place of business is 900 Richards Street, Honolulu Hawaii, 96813 and **PETROSPECT, INC.,** ("Petrospect" or "CONTRACTOR"), a Hawaii corporation whose principal place of business is 499 N. Nimitz, Hwy., Pier 21, Honolulu, Hawaii 96817.

W I T N E S S E T H:

WHEREAS, HECO is in the business of generation, transmission, and distribution of electrical power on the Island of Oahu, State of Hawaii, and

WHEREAS, HECO purchases and transports petroleum fuels and owns and operates certain petroleum storage tanks and distribution facilities on Oahu for the receipt, storage and delivery of such petroleum fuels to its generating units producing electrical power; and

WHEREAS, HECO requires certain measurements, sampling, sample delivery, documentation and other such petroleum inspection services be performed with respect to the purchase and transportation of its petroleum fuels and operations of its petroleum facilities; and

WHEREAS, Petrospect has expertise and equipment necessary to perform the petroleum inspection services required by HECO; and

WHEREAS, Petrospect is willing to perform such petroleum inspection services in consideration of the fees and subject to the terms and conditions set forth herein.

NOW, therefore, it is mutually agreed as follows:

ARTICLE 1: DEFINITIONS

Except where otherwise indicated, the following definitions shall apply throughout this Agreement:

Section 1.1 "Call Out" means one of the methods by which HECO orders Services from CONTRACTOR.

Section 1.2 "Equipment" means all equipment, tools, materials and supplies furnished by CONTRACTOR in conjunction with the performance of Services under this Agreement.

Section 1.3 "Hazardous Discharge" means any event involving the disposal, spill, release or discharge of any Hazardous Material connected with any activity related to this Agreement.

Section 1.4 "Hazardous Material" means any substance (1) the presence of which requires investigation or remediation under any law applicable to HECO or to any activity related to this Agreement; or (2) which is to becomes defined as a "hazardous substance," pollutant or contaminant under any present or future law, order, decree, permit, approval, plan, authorization license, agreement and similar items of governmental agencies pertaining to the Work Location and relating to the protection of human health or the environment.

Section 1.5 "Nomination" means one of the methods by which HECO orders Services from CONTRACTOR.

Section 1.6 "Recurring Services" means services provided on an ongoing basis for recurring jobs of the same type or nature such as attendance of all individual product movements involved in a particular supply or exchange agreement.

Section 1.7 "Representative(s)" means the persons designated by HECO and CONTRACTOR respectively to give and accept communications between HECO and CONTRACTOR pertaining to Operations under a Call Out. Such Representative(s) may be changed from time to time.

Section 1.8 "Services", "Operations", and "Work" are used interchangeably to mean all inspection services be performed by CONTRACTOR for HECO pursuant to a Call Out or Recurring Services.

Section 1.9 "Work Location" means the location where the inspection services will be conducted.

ARTICLE 2: TERM AND TERMINATION

Section 2.1 This Agreement shall commence as of the Effective Date and shall remain in effect until June 30, 2010, or until terminated for any reason by either HECO or CONTRACTOR as herein; provided, however, that this Agreement shall be automatically extended by one (1) year at its time of expiration, and all successive times of expiration, unless HECO or CONTRACTOR notifies the other in writing of its intention not to renew at least thirty (30) days prior to expiration.

Section 2.2 Either HECO or CONTRACTOR may terminate this Agreement for convenience by giving written notice of termination to the other party at least thirty (30) days prior to such termination or as otherwise specifically provided herein. Termination of this Agreement for convenience shall not affect the rights and obligations of the parties under Call-Outs in effect at the time of the receipt of the notice of termination. This Agreement shall remain in effect until completion of Work under such Call Outs. Any termination shall be without prejudice to accrued rights.

ARTICLE 3: SERVICES

Section 3.1 It is the intention of the parties that this Agreement apply to the provision of all petroleum inspection and related services including but not limited to those Services identified in the attached Exhibit A provided by CONTRACTOR to HECO. Nothing herein shall obligate HECO to purchase all petroleum inspection services from CONTRACTOR, nor obligate CONTRACTOR to supply all such petroleum inspection services purchased by HECO, except as otherwise provided herein.

Section 3.2 Subsequent to issuance by HECO's Representatives, and acceptance by the CONTRACTOR of a Call-Out to provide Services for a specific job, the CONTRACTOR shall provide the personnel, materials, equipment and supervision to perform such Services subject to the terms and conditions of this Agreement. .

Section 3.3 Subsequent to issuance by HECO's Representatives and acceptance by the CONTRACTOR, of a Nomination to provide ongoing services for a recurring type of job, the CONTRACTOR shall provide the personnel and equipment to perform services subject to the terms and conditions of this Agreement.

Section 3.4 Call-Outs and Nominations may be issued in writing by HECO's Representatives and its designated agents in the form of a Service Order or otherwise in writing sent by facsimile, electronic mail, or they may be issued verbally. HECO shall be responsible for providing instructions regarding particulars, requirements, fee sharing and other pertinent information for the specific job as may be reasonably required by CONTRACTOR. HECO or its designated agents may provide these instructions in writing, including facsimile and electronic mail, or verbally.

Section 3.5 HECO's Representatives and its designated agents shall provide CONTRACTOR with reasonable advance notice of upcoming jobs to allow CONTRACTOR to dispatch personnel and equipment to ~~a~~ Work Locations in a timely and efficient manner. CONTRACTOR shall notify HECO's Representatives within eight (8) business hours of its refusal to accept a Call-Out or Nomination, failing which CONTRACTOR shall be deemed to have accepted the Call-out or Nomination. Such notification may be made in written form sent by facsimile or electronic mail or communicated verbally to HECO personnel and its designated agents.

Section 3.6 If at any time HECO desires CONTRACTOR to provide services in addition to those set forth in Exhibit A and CONTRACTOR is willing to perform such services, said additional services and the compensation payable with respect thereto will be negotiated between the parties, subject to each party's satisfaction.

ARTICLE 4: PERFORMANCE WARRANTY

Section 4.1 CONTRACTOR shall conduct all Services as promptly as conditions permit in a safe, diligent, efficient and workmanlike manner. In carrying out the Services hereunder, CONTRACTOR shall exercise the same degree of skill and care it utilizes in providing the same or equivalent Services to other of its customers and which is customarily provided by other reputable contractors providing the same or equivalent Services to HECO.

Section 4.2 CONTRACTOR further warrants that: it will utilize the technical competence, financial capacity, management skills, competent and qualified personnel and equipment necessary to perform the Services provided under this Agreement in a safe, diligent, skillful and workmanlike manner, in accordance with all applicable generally accepted industry guidelines and practices.

ARTICLE 5: CONTRACTOR PERSONNEL

Section 5.1 CONTRACTOR shall be solely responsible for the scheduling and dispatch of its' personnel. CONTRACTOR shall schedule and dispatch the number of personnel that it deems necessary to carry out the required Services in a safe, efficient and timely manner.

Section 5.2 CONTRACTOR shall furnish at its expense the personnel necessary to perform the Services for which it is engaged. CONTRACTOR's personnel shall be duly trained, experienced and proficient in their respective capacities. CONTRACTOR shall be solely responsible for procuring, processing, and handling of personnel including their salaries, wages, per diem, Worker's Compensation Insurance and all other required insurance or employee benefits under law. Subject to Article 15, CONTRACTOR shall indemnify and hold HECO harmless from any loss, including but not limited to reasonable attorneys' fees and costs, incurred by HECO as a result of the professional acts, errors, or omissions of CONTRACTOR or any of CONTRACTOR's personnel.

Section 5.3 CONTRACTOR warrants that personnel dispatched to a Work Location to perform Services performed for HECO under this Agreement shall have formal job descriptions which include all duties and responsibilities applicable to CONTRACTOR's performance of Services as required by this Agreement. CONTRACTOR also warrants that such responsibilities and duties are set forth in written procedure documents which have been reviewed by such personnel and which are maintained for inspection by HECO on CONTRACTOR's premises. CONTRACTOR further warrants that all personnel have received as of the Effective Date of this Agreement and will continue to receive throughout the term of this Agreement, formal instruction and informal training in conformity with the safety and other operational requirements of HECO, its designated agents, petroleum suppliers and oil distribution facility operators in such general areas as including but not limited to the following: general safety practices and procedures, oil spill control and other emergency procedures and health hazards, including hazardous materials handling.

Section 5.4 Due to the critical nature of HECO's petroleum fuel handling and facility operations, CONTRACTOR agrees that if HECO, in its sole discretion shall have reason to be dissatisfied with the conduct of any CONTRACTOR employee performing Services under this Agreement, CONTRACTOR shall, on receiving particulars of HECO's complaint, investigate the matter promptly and, if necessary, make a change in the appointments, practices or otherwise to comply with HECO's request, which shall be at no cost to HECO.

Section 5.5 CONTRACTOR warrants that it has a policy on Drug and Alcohol Abuse (the "Policy") applicable to its personnel performing Services under this Agreement which meets or exceeds applicable industry standards and which provides that appropriate personnel be tested; the drug/alcohol testing and screening shall include reasonable cause testing, random testing, pre-employment testing and testing during routine medical examinations. CONTRACTOR warrants that the Policy will remain in effect during the full term of this Agreement, and that CONTRACTOR shall exercise due diligence to ensure that the Policy is fully complied with.

Section 5.6 CONTRACTOR warrants that during the term of this Agreement that it shall comply with all applicable requirements of the Federal Government and the State of Hawaii with respect to maintenance of non-segregated facilities, equal employment opportunity, and affirmative action for minorities and handicapped workers including but not limited to 41 CFR 60-1.4 and 41 CFR 60-741.5(a).) CONTRACTOR is aware of and is fully informed of CONTRACTOR responsibilities under Executive Order 11246 (reference to which include amendments and orders superseding in whole or in part) and shall be bound by and agrees to the provisions as contained in Section 202 of said Executive Order and the Equal Opportunity Clause as set forth in 41 CFR 60-1.4 and 41 CFR 60-741.5(a), which clauses are hereby incorporated by reference.

Section 5.7 CONTRACTOR warrants that during the term of this Agreement that it shall comply with the requirements of the Federal Government and the State of Hawaii with respect to equal employment opportunity and affirmative action for veterans and disabled veterans including but not limited to 41 CFR 60-250.4 and 41 CFR 60-741.5.) CONTRACTOR agrees that it is and will remain in compliance with the rules and regulations promulgated under The Vietnam Era Veterans Readjustment Assistance Act of 1974, The Affirmative Action Clause set forth in 41 CFR 60-250.4, the Rehabilitation Act of 1973 and the Equal Opportunity Clause set forth in 41 CFR 60-741.5, which clauses are incorporated by reference herein.

ARTICLE 6: CONTRACTOR EQUIPMENT

Section 6.1 CONTRACTOR shall furnish, maintain and repair the Equipment necessary for the performance of the Services at its' own expense. CONTRACTOR shall maintain calibration records of all equipment requiring calibration in accordance with industry guidelines and manufacturer specifications.

ARTICLE 7: CONTRACTOR DOCUMENTED PROCEDURES

Section 7.1 CONTRACTOR warrants that it has formal written procedures governing personnel Work Location activity such as work vests, hard hats, breathing apparatus, safe access, and smoking. CONTRACTOR also warrants that it has formalized procedures in place which cover operational subjects including, but not limited to, the following: emergency procedures; tank access, lights, machinery, petroleum transfer equipment, gauging procedures; static hazard procedures; transfer shutdown procedures; startup transfer procedures; operating logs; pollution control; tank ventilation and tank entry hazards. CONTRACTOR further warrants that it has an audit or review program in place which includes provision for penalties or other disciplinary actions to assure compliance with prescribed safety practices and operating procedures.

ARTICLE 8: SAFETY, ENVIRONMENTAL AND REGULATORY COMPLIANCE

Section 8.1 CONTRACTOR shall exercise due care and diligence in the performance of this Agreement. CONTRACTOR is responsible for the safe performance of the Services, and shall ensure that the Services are performed in accordance with all applicable present and future federal, State and municipal laws, regulations, codes, and ordinances, including, but not limited to, the Occupational Safety and Health Act of 1970 (OSHA), all amendments, and the agreement for State development and enforcement of Occupational Health and Safety Standards. In addition, CONTRACTOR, at its expense, shall obtain any and all licenses and permits required for the Work. Subject to Article 15, CONTRACTOR shall indemnify and defend HECO from any liability, fines, damages, costs, or expenses arising from CONTRACTOR's failure to comply with this Article 8.

Section 8.2 CONTRACTOR warrants that it has a formal written safety program concerning all procedures. CONTRACTOR is also to maintain formal written procedures to track and communicate to HECO all events involving injuries, oil spills and damage to the facilities, machinery and equipment at the Work Location. This program is intended to inform personnel and HECO as to the causes, findings and recommendations arising from an investigation of such incidents with the objectives for CONTRACTOR of reducing the likelihood of a recurrence and improving the effectiveness and state of readiness of emergency response activity.

Section 8.3 CONTRACTOR warrants that it shall not permit any of its employees, agents, contractors, licensees, or any other person to use, handle, discharge, release, dispose of or allow to exist on, within, under or about the Work Location any petroleum products or Hazardous Materials, except in full compliance with all applicable HECO policies and governmental regulations and that will exercise due care and diligence to prevent the spill or release of petroleum products or any Hazardous Material connected with the rendering of Services to HECO under this Agreement.

Section 8.4 If CONTRACTOR in the performance of Services to HECO under the terms of this Agreement at any time becomes aware of any Hazardous Discharge of petroleum or of any Hazardous Material, which causes or threatens to cause pollution damage, it will immediately so advise HECO and its agents verbally and in writing; and CONTRACTOR personnel shall to the extent practicable promptly assist in whatever measures are necessary to prevent or mitigate such damage if so requested by HECO, provided however, that CONTRACTOR shall not thereby incur any liability solely as a result of it providing such assistance. Furthermore, upon HECO's request, CONTRACTOR shall provide to HECO detailed reports of the event to the extent of its knowledge thereof.

Section 8.5 HECO shall provide CONTRACTOR with all applicable HECO health, safety and environment guidelines, policies and procedures and CONTRACTOR shall follow and abide by all such written HECO health, safety and environmental guidelines, policies and procedures. HECO policies and procedures relative to health, safety and environment matters are intended to supplement and not replace CONTRACTOR policies relative thereto.

ARTICLE 9: COMPENSATION

Section 9.1 HECO shall pay CONTRACTOR for the Services provided under this Agreement as set forth in the "Inspection Price Schedule," dated July 1, 2004, which is attached hereto and incorporated by reference, as Appendix-A of this Agreement and other such additional services as may be agreed by the parties pursuant to Section 3.6. CONTRACTOR warrants that the pricing of Services in Appendix-A are equal to the prices for the same or equivalent Services charged to the other of CONTRACTOR's customers during the period when such prices are effective.

Section 9.2 From time-to-time CONTRACTOR may propose rate and other changes to its' Inspection Price Schedule to HECO for approval. CONTRACTOR shall submit any such rate and other changes to the Inspection Price Schedule to HECO at least thirty (30) days prior to the effective date of such proposed changes. CONTRACTOR warrants that the timing and the proposed changes to rates for Services are equal to the timing and changes in rates proposed for the same or equivalent Services to the other of CONTRACTOR's customers. If and when approved, the revised Inspection Price Schedule will become Appendix-A of this Agreement and the previous Inspection Price Schedule will become null and void.

Section 9.3 In addition to all other amounts payable by HECO under this Agreement, HECO shall reimburse CONTRACTOR for all taxes, assessments, levies and imposts of whatsoever kind or nature imposed on CONTRACTOR by any governmental or quasi-governmental body, as adjusted, modified or revised from time to time, including without limitation the Hawaii General Excise Tax, arising from Services rendered under this Agreement. Notwithstanding the foregoing and any illustrative schedule of prices herein, HECO shall not be required to reimburse CONTRACTOR under this Section 9.4 for any tax measured by or based on the net income of CONTRACTOR.

ARTICLE 10: INVOICES

Section 10.1 Invoices shall be prepared by CONTRACTOR and dated after completion of the Services performed for a specific job or as otherwise agreed by the parties. CONTRACTOR shall submit its' invoice accompanied or otherwise substantiated by an inspection report or other report of the Services rendered HECO. Invoices shall include a breakdown of all of the Services provided for the specific job, charges and allowable expenditures. If requested by HECO, CONTRACTOR shall provide supporting documentation, including but not limited to invoices and receipts, as evidence of said allowable expenditures.

Section 10.2 The invoice shall reference the HECO's Designated Representative, the HECO purchase order or Service Contract number, if any, and any additional information required by HECO to facilitate payment processing. CONTRACTOR shall transmit the invoice and related documentation by first class mail, facsimile or electronic mail to the HECO's addressee in Article 21 or as otherwise agreed between the parties..

ARTICLE 11: PAYMENT

Section 11.1 Payments of CONTRACTOR's invoices shall be made by HECO in U.S. dollars. Subject to Section 11.3, such payments shall be due within thirty (30) calendar days from HECO's receipt of CONTRACTOR's invoice and full documentation.

Section 11.2 Payments of CONTRACTOR's invoices shall be tendered by HECO to CONTRACTOR by means of check or wire transfer to CONTRACTOR'S designated bank as agreed by the parties. HECO may consolidate multiple invoices into a single payment.

Section 11.3 If an invoice is found to be in error or is otherwise disputed by HECO, then HECO shall pay the undisputed portion of such invoice when due and thereupon have the option to withhold payment of the disputed portion of said invoice without penalty until such error or dispute is resolved and HECO shall have received a corrected invoice, debit or credit. HECO shall notify CONTRACTOR as soon as any such error or item of dispute is discovered to expedite resolution and correction. HECO shall make payment for such corrected invoice or debit in accordance with Section 11.1.

ARTICLE 12: INSURANCE

Section 12.1 Without in any way limiting any of CONTRACTOR's obligations, indemnities or liabilities specified elsewhere in this Agreement, CONTRACTOR and anyone acting under its direction or control or on its behalf shall maintain or cause to be maintained, at its own expense during the term of this Agreement, the following insurance and all insurance that may be required under the applicable laws, ordinances, and regulations of any governmental authority:

Workers' Compensation and Employer's Liability Insurance, Temporary Disability and other similar insurance as prescribed by applicable sate or federal laws, regulations or statutes including insurance covering liability under the U.S. Longshore and Harbor Workers' Compensation Act and the Outer Continental Shelf Lands Act with voluntary compensation for marine operations to include transportation, wages, maintenance and cure, and Jones Act Coverage where and if required. Policy limits include: for Employers Liability insurance with minimum limits for bodily injury from accident of Five Hundred Thousand U.S. Dollars ($ 500,000) - each accident; for bodily injury from disease of Five Hundred Thousand U.S. Dollars ($ 500,000) - each employee; and for bodily injury from disease of Five Hundred Thousand U.S. Dollars ($ 500,000).

Commercial General Liability (Bodily Injury and Property Damage) insurance, the policy limits of which shall be the aggregate limits of CONTRACTOR's applicable primary, excess and umbrella policies, but such aggregate policy limits shall not be less than Two Million U.S. Dollars ($2,000,000) per occurrence.

Automobile Bodily Injury and Property Damage Liability insurance extending to owned, non-owned and hired automobiles used in the performance of this Agreement. The policy limits of such insurance shall be the aggregate limits of CONTRACTOR's applicable primary, excess and umbrella policies but not less than those required by applicable law nor less than One Million U.S. Dollars ($1,000.000) bodily injury and property damage combined single limit per occurrence.

Professional Errors and Omissions insurance shall be maintained by CONTRACTOR and anyone acting under its direction or control or on its behalf having a policy limit of Five Hundred Thousand U.S. Dollars ($ 500,000).

With respect to the insurance coverages referenced above, deductible or self-retention amounts must be shown on certificates of insurance and HECO shall be named as additional insured..

Section 12.2 Failure by CONTRACTOR to maintain in full force and effect the insurance required herein shall constitute a breach of this Agreement. CONTRACTOR shall provide to HECO copies of Certificates of Insurance within five (5) working days of signing of this Agreement, on a form satisfactory to HECO, completed by CONTRACTOR's insurance carrier or agent, certifying that minimum insurance coverages, as required above, are in effect and providing that HECO will be given thirty (30) days' written notice of any material change in, cancellation of, or intent not to renew any of the required policies. CONTRACTOR shall provide new insurance certificates reflecting the required policies prior to the expiration date of any coverage. Receipt of any certificate showing less coverage than required is not a waiver of CONTRACTOR's obligation to fulfill the coverage requirement.

Section 12.3 CONTRACTOR and anyone acting under its direction or control or on its behalf will cause its insurers to waive all rights of subrogation which CONTRACTOR or its insurers may have against HECO, its directors, officers, employees, affiliates, agents, contractors, successors and assigns.

ARTICLE 13: BUSINESS POLICY

Section 13.1 CONTRACTOR agrees to comply with all laws and lawful regulations applicable to any activities carried out in the name, or otherwise on behalf, of CONTRACTOR under the provisions of this Agreement. CONTRACTOR agrees that all financial settlements, billings and reports rendered by CONTRACTOR to HECO, as provided for in this Agreement, shall, in reasonable detail, accurately and fairly reflect the facts about all activities and transactions handled for the account of HECO.

Section 13.2 Conflicts of interest related to this Agreement are strictly prohibited. Except as otherwise expressly provided herein, neither party nor any director, employee or agent of a party shall give to or receive from any director, employee or agent of the other party, any material gift, entertainment or other favor of significant value, or any commission, fee or rebate. Likewise, neither party nor any director, employee or agent of a party (or any affiliate), shall enter into any business arrangement with any director, employee or agent of the other party (or any affiliate) unless such director, employee or agent of the other person is acting for and on behalf of the other party, without prior written notification thereof to the other party.

Section 13.3 In the event of any material violation of this Article 13, including any violation occurring prior to the date of this Agreement which resulted directly or indirectly in one party's consent to enter into this Agreement with the other party, such other party may at its sole discretion terminate this Agreement at any time and, except for the obligations to pay in full in United States currency for the outstanding payment obligations hereunder, shall be relieved of any further obligation under this Agreement. Both parties agree to immediately notify the other of any known material violation of this Article 13.

ARTICLE 14: AUDITS

Section 14.1 CONTRACTOR shall maintain true and correct records in connection with the Work and invoice related thereto, including but not limited to detailed records of reimbursable expenses, and shall retain all such records for at least twenty-four (24) months after the date of invoice.

Section 14.2 HECO may from time to time, and at any time within twenty-four (24) months after completion of the Services for a specific job, make an audit of all records of CONTRACTOR in connection with payments made on a cost reimbursement basis. Items of compensation such as service rates shall not be subject to audit under this Article 14. Such audit may also cover CONTRACTOR's procedures and controls with respect to reimbursable costs. Any amount by which payment by HECO to CONTRACTOR exceeds the amount due CONTRACTOR as shown by the audit shall be returned to HECO. In the event CONTRACTOR is unable to provide HECO with records of a vendor which are requested relative to an audit performed under this Article 14, CONTRACTOR shall be obligated to reimburse HECO for such disputed costs for which no verification is available. If CONTRACTOR disagrees with the results of an audit, then CONTRACTOR may have an independent audit conducted at CONTRACTOR's expense, by a third party acceptable to the parties, conducted in accordance with auditing instructions acceptable to the parties and the findings of such audit shall be binding upon the parties.

Section 14.3 HECO, at its sole discretion, may conduct its own audit of CONTRACTOR's policies, procedures for the limited purpose of verifying compliance with Articles 5, 7, and 8. No such audit or inspection, however, shall increase HECO's liabilities or responsibilities nor shall relieve CONTRACTOR of any liability or responsibility which it has assumed pursuant to this Agreement.

Section 14.4 CONTRACTOR shall assist HECO in making the above audits and HECO will endeavor to minimize disruption of CONTRACTOR operations during such audits.

ARTICLE 15: INDEMNITY

Section 15.1 CONTRACTOR shall defend, indemnify and hold harmless HECO from and against any and all loss, damage, injury, liability and claims thereof for injury to or death of any person or for loss of or damage to property (except as limited by Section 15.5 hereof) resulting from CONTRACTOR's fault, negligence, malfeasance and/or wrongful conduct in the performance of this Agreement, by whomever brought, whether based on statute, tort, contract or quasi contract.

Section 15.2 HECO shall defend, indemnify and hold harmless CONTRACTOR from an against any and all loss, damage, injury, liability and claims thereof for injury to or death of any person or for loss of or damage to property (except as limited by Section 15.5 hereof) resulting from HECO's fault, negligence, malfeasance and/or wrongful conduct in the performance of this Agreement, by whomever brought, whether based on statute, tort, contract or quasi contract.

Section 15.3 CONTRACTOR and/or HECO shall have no duty to defend, indemnify and hold harmless the other party to this Agreement where the loss, damage, injury, liability and/or claim is the result of or arises from the sole negligence or willful misconduct of the other party to the Agreement, including their agents, contractors, and/or employees, and is not contributed to by any act of, or by any omission to perform some duty imposed by law or contract of the party against whom defense, indemnification and hold harmless is sought.

Section 15.4 This defense, indemnity and hold harmless provision(s) shall not apply to the extent that it is void or otherwise unenforceable under applicable law in effect or on validly retroactive to the date of this Agreement.

Section 15.5 Notwithstanding any other provision of this Agreement, in no event shall either party be liable to the other for any indirect, punitive or consequential damages which may be suffered by such party, or their indemnitee, in connection with the performance of this Agreement, including, but not limited to, loss of profits or interruption of production, loss of opportunity or business interruption.

Section 15.6 CONTRACTOR and HECO shall report to each other, as soon as practicable, all incidents and occurrences resulting in injuries to employees or third parties, or damage to property or a possible claim under any environmental law or regulation arising out of, or during, the execution of Services performed hereunder, and shall furnish each other with a copy of all reports, including accident reports covering each accident occurring during the term of this Agreement and related to the performance of the Work specified under this Agreement.

Section 15.7 All indemnity obligations in this Agreement, including but not limited to all provisions in Article 15, shall survive the termination of this Agreement, regardless of the cause or reason for termination.

ARTICLE 16: CONFIDENTIALITY AND OWNERSHIP OF WORK PRODUCT

Section 16.1 CONTRACTOR shall treat all information provided by HECO or generated or obtained from CONTRACTOR's rendering of Services under this Agreement (but excluding any proprietary and confidential information, know-how, or trade secrets of CONTRACTOR) as confidential. CONTRACTOR shall not allow any person, other than duly authorized representatives of CONTRACTOR or HECO, to have access to such confidential items and shall not divulge any information obtained in the course of performance of Services to any unauthorized third party nor permit any of its officers, employees, subcontractors or agents to do so unless required by law.

Section 16.2 Data, reports, and other records created pursuant to and as specified in a Call Out or Nomination shall belong solely to HECO but shall be accessible to CONTRACTOR at all reasonable times for use in aid of its performance of this Agreement. All data, reports and other records obtained hereunder and containing technical information shall be returned to HECO or destroyed by CONTRACTOR, with prior notice to HECO, at the completion of the specific job and CONTRACTOR shall have no residual rights in or licenses for same. Notwithstanding the foregoing, CONTRACTOR may, when it is customary for CONTRACTOR to do so, retain one or more copies of reports or data generated for HECO in the course of the Services, subject always to the requirements of Article 14 and provided that any such reports or data shall be destroyed by CONTRACTOR at the written request of HECO.

ARTICLE 17: STATUS OF THE PARTIES

Section 17.1 Nothing in this Agreement shall be construed to constitute either party as a joint venturer, co-venturer, joint operator or partner of the other. In performing Services pursuant to this Agreement, CONTRACTOR is acting solely as an independent contractor maintaining complete control over its employees and operations. Unless otherwise provided in this Agreement, neither CONTRACTOR nor HECO is authorized to take any action in any way whatsoever for or on behalf of the other, except as may be necessary to prevent injury to persons or property, or to contain, reduce or mitigate any spillage or Hazardous Discharge of petroleum or any Hazardous Material that may occur.

Section 17.2 In all Services performed under this Agreement, CONTRACTOR acts as an independent contractor, and CONTRACTOR, its employees, agents and representatives shall not be considered to be employees or agents of HECO. As an independent contractor, CONTRACTOR assumes all legal and contractual obligations arising out of the performance of CONTRACTOR's own personnel or to third persons. CONTRACTOR shall not sublet any portion of the Services performed under this Agreement without receiving HECO's written consent, which consent may be granted or withheld in HECO's sole discretion. Use of subcontractors by CONTRACTOR shall not relieve CONTRACTOR from any liability or obligation under this Agreement. The terms of this Agreement regarding CONTRACTOR's performance warranties, equipment and personnel shall likewise apply to any subcontractor's performance, equipment and personnel.

ARTICLE 18: FORCE MAJEURE

Section 18.1 Force Majeure means any act, circumstance or event beyond the control of either of the parties, including but not limited to earthquakes, hurricanes, fires, storms, tidal waves or other acts of God; riots, strikes, lockouts, picketing, boycotts; insurrections, rebellions, civil disturbances, war, acts of public enemies or sabotage Any failure by a party to comply with the provisions of this Agreement (except for HECO's payment of CONTRACTOR's invoices for a completed specific job) shall be excused if and for so long as compliance by either party is hindered or prevented by Force Majeure. In such event, the Party so hindered shall give prompt written notice to the other party which shall specify the circumstances which such Party believes constitute Force Majeure and the estimated duration thereof. Such party shall make all reasonable efforts to relieve such Force Majeure condition.

ARTICLE 19: PUBLIC UTILITIES COMMISSION

Section 19.1 In the event this Agreement is required to be filed with the Hawaii Public Utilities Commission or any other governmental body properly having jurisdiction in the matter, this Agreement shall then be subject to any and all required regulatory approvals, including those of the Hawaii Public Utilities Commission or such other body.

ARTICLE 20: APPLICABLE LAW AND RESOLUTION OF DISPUTES

Section 20.1 This Agreement shall be governed, construed, interpreted, enforced and the relations between the parties determined in accordance with the laws of the State of Hawaii.

Section 20.2 Each party agrees and consents that any dispute arising out of this Agreement, however defined, shall be brought in the State of Hawaii in a court of competent jurisdiction, provided, however, that HECO, at its option may elect to submit any such dispute to binding arbitration pursuant to the commercial arbitration rules of the American Arbitration Association then in effect.

ARTICLE 21: NOTICES

Section 21.1 Except as otherwise expressly provided herein, all notices shall be given in writing, by letter, facsimile, or electronic mail, to the following addresses, or such other address as the parties may designate by notice, and shall be deemed given upon receipt. . Notices relative to a particular Call Out shall be sent to the address indicated in the particular Call Out.

CONTRACTOR:: Petrospect Inc.
499 N. Nimitz Highway, Pier 21
Honolulu, HI 96817-5336
Phone: D. Harrington (808) 536-6626
R. Grouchenour (808) 536-6631
Facsimile: (808) 531-1359
Electronic mail:
DHarrington@Petrospect.net
OPS@Petrospect.net

HECO: Hawaiian Electric Company, Inc.
Fuels Division
Box 2750
Mail Stop WP-2/IF
Honolulu, HI 96840-0001
Phone: J. Aicken (808) 543-4350
F. Shiroma (808) 543-4353
Facsimile: (808) 543-4207
Electronic mail:
jaicken@heco.com
fshiroma@heco.com
wwatanab@heco.com

ARTICLE 22: GENERAL PROVISIONS

Section 22.1 This Agreement shall constitute the entire understanding between the parties with respect to all matters and things herein mentioned. It is expressly acknowledged and agreed by and between the parties that neither party is now relying upon any collateral, prior or contemporaneous agreement, assurance, representation or warranty, written or oral, pertaining to the subject matter contained herein. This Agreement shall not be modified or changed except by written instrument executed by the duly authorized Representatives of the parties hereto except that it is expressly agreed that either HECO or the CONTACTOR, with the written agreement of the other party, may amend either this Agreement or modify the terms of this Agreement in a Call Out for a particular purpose, so long as any such modification or amendment does not alter the substantive content of this Agreement.

Section 22.2 It is expressly acknowledged and agreed by and between the parties that the terms and conditions set forth in the body of this Agreement, excluding Appendix-A, shall supersede and take precedence over any provision in or attached to prior, contemporaneous or future Inspection Price Schedules such as but not limited to the Notes pertaining to Inspections (N-1), Sampling and Sample Delivery (N-2), Offshore and Sea Berth Work (N-3), Travel Time and Expenses (N-4), Documentation (N-5), Miscellaneous (N-6) and Terms, Conditions and Limitations set forth therein.

Section 22.3 Failure of either party to promptly perform any obligation under this Agreement shall constitute default. If HECO or CONTRACTOR considers the other party (the "Defaulting Party") to be in default of any obligation under this Agreement, such party (the "Non-Defaulting Party") shall give the Defaulting Party prompt notice thereof, describing the particulars of such default. The Defaulting Party shall thereafter have ten (10) days from the receipt of said notice in which to remedy such default. If the default is not cured, the Non-Defaulting Party may, without prejudice to any other right or remedy of such party in respect of such default, terminate its obligations under this Agreement by written notice to the Defaulting Party, except for HECO's obligation to pay in full in United States currency for amounts due under this Agreement.. All rights and remedies hereunder are independent of each other and election of one remedy shall not exclude another.

Section 22.4 If any section or provision of this Agreement or any Exhibit A or rider hereto is held by any court or other competent authority or be illegal, unenforceable or invalid, the remaining terms, provisions, rights and obligations of this Agreement shall not be affected. The failure of a party hereunder to assert a right or enforce an obligation of the other party shall not be deemed a waiver of such right or obligation. In no event shall any waiver by either party of any default under this Agreement operate as a waiver of any further default. All rights and remedies hereunder are independent of each other and election of one remedy shall not exclude another.

Section 22.5 This Agreement shall extend to and be binding upon the successors and assigns of HECO and CONTRACTOR, provided, however, that no assignments of this Agreement, except to HECO's affiliates, including those hereafter acquired or resulting from mergers or sale, shall be made by HECO or CONTRACTOR without the prior written consent of the other party. Such consent shall not be unreasonably withheld.

Section 22.6 This Agreement shall not be deemed to be an asset in either party, and, at the option of a party, shall terminate in the event of any voluntary or involuntary receivership, bankruptcy or insolvency proceedings affecting the other party.

Section 22.7 The headings or captions are for convenient reference only and have no force or effect or legal meaning in the construction or enforcement of this Agreement.

Section 22.8 This Agreement may be executed in as many counterparts as desired by the parties, any one of which shall have the force and effect of an original but all of which together shall constitute the same instrument.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, in duplicate, as of the date above written as evidenced by the following signatures.

HAWAIIAN ELECTRIC COMPANY, INC.:

By: Thomas C. Simmons

Name: Thomas C. Simmons

Title: Vice President, Power Supply

By: Harold K. Kageura

Name: Harold K. Kageura

Title: Vice President, Energy Delivery

PETROSPECT, INC.:

By:

Name: DAVID J. HARRINGTON

Title: PRESIDENT

APPENDIX A

PETROSPECT INSPECTION PRICE SCHEDULE

PETROSPECT, INC.
499 N. Nimitz Hwy., Pier 21 / Honolulu, Hawaii 96817
Telephone (808) 536-6626 / Facsimile (808) 531-1359

INSPECTION PRICE SCHEDULE

EFFECTIVE: JULY 1, 2004

Administration E-mail Address: admin@petrospect.net
Operations E-mail Address: ops@petrospect.net

INSPECTION PRICE SCHEDULE

(1) BULK RATES FOR MARINE TRANSFERS

PRODUCT		Per Long Ton
A.)	Crude Oils	4.20¢
B.)	Residual Fuel Oils and Blended Residual Fuel Oils	7.35¢
C.)	Gasoline, Naphtha and Middle Distillates	8.40¢
D.)	Aviation Fuels	10.50¢
E.)	Base Stocks, Cutter Stocks and Additives	13.90¢
F.)	Liquid Chemicals and Solvents	15.30¢

(2) VESSEL MINIMUMS

A.)	Barges	- per grade / gauged lot	$ 550.00
		- per additional grade / gauged lot	150.00
		- per pipeline fullness survey	150.00
B.)	Motherships	- per grade / gauged lot	715.00
		- per additional grade / gauged lot	230.00
		- per pipeline fullness survey	230.00
C.)	Tankers	- per grade / gauged lot	750.00
		- per additional grade / gauged lot	250.00

- per pipeline fullness survey 250.00

INSPECTION PRICE SCHEDULE

(3) BUNKER DELIVERIES AND SURVEYS

A.)	Bunker delivery / Delivering vessels – only	$ 450.00
B.)	Bunker receipt / Receiving vessels – only	630.00
C.)	Delivering vessel or facility and Receiving vessel	800.00
D.)	Bunker Survey – O.B.Q. / R.O.B. / On Hire / Off Hire	630.00
E.)	Bunker Survey – O.B.Q. / R.O.B. in conjunction with cargo survey	340.00
F.)	Bunker Survey – Receipt in conjunction with cargo survey	450.00
G.)	Per additional grade / gauged lot for above items	110.00

(4) LIGHTERINGS

A.)	Delivering or receiving barges – only	$ 440.00
B.)	Delivering or receiving tankers – only	660.00
C.)	Tanker and barge	880.00
D.)	Tanker and tanker	1,100.00

(5) PIPELINE TRANSFERS

A.)	Minimum per transfer – per facility – first tank	$ 260.00
B.)	Per additional tank / gauged lot – per facility	130.00
C.)	Per pipeline fullness survey	130.00

(6) INVENTORIES

A.)	Per tank	$ 80.00
B.)	Minimum per facility	240.00

INSPECTION PRICE SCHEDULE

(7) SAMPLING

A.)	Minimum per facility visit - first tank	$ 230.00
	Per additional tank	115.00
B.)	Minimum per visit of barges	335.00
	Per additional parcel	170.00
C.)	Minimum for sampling of vessel bunker tanks	375.00
	Per additional grade	190.00
D.)	Minimum per visit of tankers	450.00
	Per additional parcel	220.00
E.)	Additional Samples - per quart / per level	16.00
	Additional Samples - per gallon	48.00

(8) SAMPLE DELIVERY

A.)	Packaging, handling and delivery per hour	$ 47.00
B.)	Minimum for pick up on Oahu	110.00
C.)	Minimum for delivery on Oahu	110.00
D.)	Minimum for pick up and delivery on Oahu	160.00
E.)	Minimum packing and shipping Dangerous Goods (Class 3 only)	
	Domestic – first package	150.00
	Per additional Domestic package	50.00
	Foreign – first package	200.00
	Per additional Foreign package	75.00
F.)	Minimum packing and shipping Non Dangerous Goods – first package	75.00
	Per additional package	25.00

G.) Shipping charges and packaging materials ..... At Cost

INSPECTION PRICE SCHEDULE

(9) OFFSHORE AND SEA BERTH WORK

A.)	Per man – per hour offshore / full attendance	$ 42.00
B.)	Minimum per man – per trip offshore	336.00

(10) HOURLY RATES

A.)	Per hour – after allotted inspection time	$ 47.00
B.)	Per hour – per additional inspector (4 hours minimum)	47.00
C.)	Per hour – research / coordination / documentation	47.00
D.)	Per hour – work conducted by neighbor island personnel (2 hours minimum)	47.00
E.)	Per hour – loss control, quality control and miscellaneous services	85.00
F.)	Per hour – exigent handling	85.00
G.)	Per hour – consultation	125.00
H.)	TEAM INSPECTIONS	
	Per hour – lead inspector	85.00
	Per hour – per additional inspector	47.00

(11) CANCELLATIONS AFTER DEPLOYMENT

A.)	Minimum per trip – not requiring inter-island travel	$ 170.00
B.)	Minimum per trip – requiring inter-island travel	340.00

INSPECTION PRICE SCHEDULE

(12) TRAVEL TIME AND EXPENSES

A.)	Per hour for necessary travel	$ 47.00
B.)	Where mileage is charged - per mile	0.50
C.)	Minimum for neighbor island travel	95.00
D.)	Per hour - after allotted deployment time	47.00
E.)	Overnight stays - after allotted deployment time	95.00
F.)	Per diem	65.00
G.)	Flights, hotels and car rentals	At Cost

(13) HOLIDAYS

A.)	Per man - per inspection	$ 240.00

New Year's Day / Presidents Day / Easter Sunday / Memorial Day

Independence Day / Labor Day / Thanksgiving Day / Christmas Day

(14) DOCUMENTATION

A.)	Additional copies, copies to non-invoiced party or paper splits	$ 40.00
B.)	Copies of archival reports – emailed / faxed / mailed	70.00
C.)	Express Mail	At Cost

NOTES

(N-1) INSPECTIONS

A. ALLOTTED INSPECTION TIME:
Rates include up to four man-hours for pipeline transfers, eight man-hours for barges or bunker surveys, twelve man-hours for motherships and sixteen man-hours for tankers. Hourly rates apply when extra time is incurred by our personnel. (Refer to 10)

B. PARTIAL INSPECTIONS:
Inspection of the vessel portion only, of a marine transfer, will be charged at one half of the applicable vessel minimum. (Refer to 2)

Inspection of the facility portion only, of marine transfers, will be charged at the pipeline transfer rates. (Refer to 5)

C. ADDITIONAL FACILITIES:
Marine transfers involving more than one facility will be charged at the minimum pipeline transfer rate per additional facility. (Refer to 5)

D. SUPPLEMENTAL VISITS:
Visits to vessels or facilities not occurring concurrently with the inspection will be charged at a minimum of $230.00 per trip.

E. SAMPLING:
BULK RATES AND TANKER MINIMUMS INCLUDE:
Vessel: Two – one gallon vessel composites per parcel
Facility: One quart from each facility tank or one gallon shore tank composite per parcel

BARGE MINIMUMS INCLUDE:
Vessel: One gallon vessel composite per parcel
Facility: One quart from each facility tank or one gallon shore tank composite per parcel

PIPELINE TRANSFERS INCLUDE:
Facility: One quart from each facility tank

F. MISCELLANEOUS SERVICES:
An hourly charge will be made, in addition to all other applicable fees, for special services such as tank entry, wall wash testing, gauge calibrations and site inspections. (Refer to 10)

NOTES

(N-2) SAMPLING AND SAMPLE DELIVERY

A. Minimum sampling charges include up to: (Refer to 7)

Facility:	Four Quarts / levels or One Gallon Composite per tank
Barges:	One Quart / level per tank or One Gallon Composite per parcel
Vessel bunker tanks:	One Quart / level per tank or One Gallon per Bunker Grade
Tankers:	One Quart / level per tank or One Gallon Composite per parcel

B. A charge may be made for sample containers furnished by Petrospect.

C. Delivery of samples to facilities, other than those sampled, may be charged.

D. Clients may be responsible for the transportation of samples when their conveyance is governed by the Department of Transportation, Federal Aviation Administration or other regulatory agencies.

E. Petrospect, Inc. will retain samples, at ambient temperature, for ninety days unless otherwise instructed by our clients, in writing. There will be a storage charge of $ 200.00 per month, or portion thereof, per job for samples retained longer than ninety days by client's request. Charges for refrigerated storage will be provided by quotation.

F. Clients will be responsible for the proper disposal of samples and containers retained for their account. Retained samples will be returned to the facility for disposal at the end of the retention period.

G. If Petrospect is required to properly dispose of samples, hourly handling and delivery charges will apply (Refer to 8) and all expenses incurred will be billed at cost.

(N-3) OFFSHORE AND SEA BERTH WORK

A. Petrospect will provide at least one inspector to be on call at the facility throughout transfers occurring at a Sea Berth. Hourly rates will apply after the allotted inspection time, including standby, has been incurred at the facility. (Refer to 10)

B. Petrospect will deploy as many inspectors as is deemed necessary to perform the required work in an efficient and expeditious manner. Charges will be made for deployment of more than one inspector. (Refer to 9 & 10)

Hourly offshore charges are in addition to minimum attendance and / or tonnage rates. (Refer to 9)

C. Clients will be responsible to provide transportation to and from work occurring offshore. Whenever practical, transportation of inspectors will be scheduled to coincide with previously scheduled launches or work boats. Launches scheduled by Petrospect will be for the account of the client.

NOTES

(N-4) TRAVEL TIME AND EXPENSES

A. ALLOTTED DEPLOYMENT TIME:
Inspection rates include up to eight man hours of deployment time for Pipeline Transfers, Sampling or Partial Inspections of Marine Transfers and fourteen man hours for Barge Inspections. Hourly Rates apply when extra time is incurred by our personnel. (Refer to 12) Deployment time commences upon the inspectors' arrival on the neighbor island and ends upon their departure.

B. OVERNIGHT STAYS:
A flat rate may be charged in lieu of Hourly Rates for inspections requiring personnel to remain on a neighbor island overnight. Overnight charges will come into effect when the allotted deployment time has been exceeded due to flight schedules and availability. (Refer to 12)

C. PER DIEM:
There will be a minimum per diem charge per day of deployment. (Refer to 12)

D. All necessary travel expenses, including flights, hotel, and car rentals incurred in the performance of these services, will be charged to the customer at cost. (Refer to 12)

(N-5) DOCUMENTATION

A. Original reports are retained by Petrospect. Copies of signed reports will be sent to invoiced parties via email unless otherwise requested. Upon request, up to two copies of reports will be sent to invoiced parties via first class mail. Clients wishing additional hard copies of reports or requiring special shipping or handling of reports should advise Petrospect at the time of nomination. A charge may be made for express mail, additional copies, copies of reports for non-invoiced parties or paper splits. (Refer to 14)

Originals Certificates are issued to the seller, along with the required number of copies. Copies of Certificates are included with our reports as Enclosures.

B. Requests for hard copies of reports or portions of reports, received by us after issuance of the report may be subject to additional charges. (Refer to 14)

NOTES

(N-6) MISCELLANEOUS

A. Quality Control services are restricted to monitoring and documenting activities. Some Field Testing of materials may be conducted as part of Quality Control services. Petrospect expressly advises that our personnel are not laboratory technicians and are not certified to perform analytical tests on petroleum products. Field Test results are documented for reporting purposes only and in no way constitute certification of quality.

B. Quality Control, Loss Control and Consultation services are undertaken solely for the purpose of advising clients of our findings. Petrospect's responsibility for these or any other advisory service is limited to the exercise of reasonable care. Petrospect, Inc. cannot be held liable for any loss or damage arising out of the performance of these services.

C. Petrospect will deploy as many inspectors as is deemed necessary to perform the required work in an efficient and expeditious manner. Charges will be made for deployment of more than one inspector. (Refer to 10)

D. An hourly charge will be made, in addition to all other applicable fees, for work requiring the immediate and preeminent attention of management and staff. (Refer to 10F)

E. The cost of special equipment or tools required by the customer or deemed necessary by Petrospect may be charged to the customer.

F. Petrospect, Inc. does not release or detain vessels.

G. Petrospect, Inc. does not operate valves, meters, hatches or any other equipment not belonging to Petrospect, Inc.

H. Petrospect, Inc. does not complete or fill out non-Petrospect documents.

I. Invoices are payable upon receipt. Overdue accounts are subject to a finance charge of 1.5% per month.

J. The Hawaii state tax of 4.166% will be added to all charges. This percent may be changed without prior notice.

TERMS, CONDITIONS AND LIMITATIONS

All services rendered by PETROSPECT, INC. for the person or entity being billed for our services, (hereinafter "customer"), are undertaken subject to and all rates are based upon the following terms, conditions and limitations.

1. Petrospect, Inc. warrants that its services shall be performed in a workmanlike manner consistent with that level of care and skill ordinarily exercised by other providers of like services under the same or similar circumstances. Petrospect, Inc. makes no other express warranties. Petrospect, Inc. expressly excludes all implied warranties, including but not limited to, the warranty of fitness for a particular purpose, the warranty of merchantability and/or the warranty of results.

2. The customer shall indemnify, hold harmless and defend Petrospect, Inc., its directors, officers, employees, agents and subcontractors from and against any claim, suit, demand, loss, expense or liability, including but not limited to the cost of suit and reasonable attorney's fees, based on alleged breach of contract by Petrospect, Inc. and/or alleged negligence or fault, including but not limited to the alleged sole negligence or fault of Petrospect, Inc. whether actual or not, arising from: (1) claims or suits by Governmental Authorities or others of any alleged or actual failure of the customer to comply with any law, ordinance, regulation, rule or order of any Governmental or judicial body; (2) claims or suits arising from information supplied by customer and necessarily relied upon by Petrospect, Inc.; (3) any claim, suit and/or demand from, or liability to, or loss or expense by reason of a liability to any person other than the customer, including but not limited to customer's employees, in respect of personal injury or death and/or damage to or destruction of property belonging to any person or in any other respect or manner.

3. Petrospect, Inc. expressly advises that it is neither an insurer nor guarantor of the quality or quantity of any inspected or analyzed product and hereby expressly disclaims any liability therefore or arising therefrom. Customers seeking greater protection from loss or damage than provided herein are responsible for obtaining appropriate coverage as they deem necessary.

4. The terms, limitations and conditions herein shall be deemed independent and severable, and the invalidity or partial invalidity or unenforceability of any provision or portion thereof shall not affect the validity or enforceability of any other provision herein.

5. The acceptance, use and reliance upon Petrospect, Inc. reports by our customers shall be governed by the laws of the State of Hawaii.

6. All claims must be received in writing within forty-five days after issuance of Petrospect, Inc.'s report regarding said work or such claim shall be deemed an irrevocable waiver of said claim, directly or indirectly, in contract, tort or otherwise.

7. Petrospect, Inc. reports are submitted in writing and are for our customers only. Our customers are considered to be only those entities being billed for our services. Acquisition of a Petrospect, Inc. report, by anyone other than our customer, does not constitute a representation by Petrospect, Inc. as to any matter stated in the report or writing. As such, no person or entity, other than our customer, in whose possession a copy of any Petrospect, Inc. report or writing shall come shall have any right against Petrospect, Inc., its directors, officers, employees, agents and/or subcontractors.

8. In no event shall Petrospect, Inc., its directors, officers, employees, agents and/or subcontractors be responsible for incidental, consequential, special or punitive damages of any kind and/or in any amount.

9. No deviation from the terms set forth herein shall bind Petrospect, Inc. unless agreed to in writing and signed by an Officer of Petrospect, Inc. acting in his o

CA-IR-206

Ref: HECO-WP-412, page 27-37, Response to CA-IR-54.

The response to CA-IR-54 provided Pattern Files for H-Power, Kalaeloa, AES and distributed generators at HECO sites.

Please provide all pattern files associated with HECO generating units other than distributed generators.

HECO Response:

Pattern files are not used for the HECO generating units, except for the distributed generators.

CA-IR-207

Ref: HECO-WP-412, page 17.

Please explain how the commitment and dispatch penalty factors were derived for each HECO generating unit and power purchase. Please include all supporting documentation and calculations.

HECO Response:

The commitment and dispatch penalty factors used in the production simulation for this rate case are the same ones used in HECO's prior rate case (Test Year 2005 in Docket No. 04-0113). In that rate case, the Consumer Advocate asked a similar question in CA-IR-506. Attached is HECO's response to CA-IR-506.

CA-IR-506

Ref: CA-IR-124, part e.

a. Please provide copies of all studies, reports, analyses, and work papers for the Penalty Factors, for all generating units provided in the above referenced response.

b. Please explain why the penalty factor of 1.006 for Waiau 3 and Waiau 4 is different than the penalty factor of 1.012 for Waiau 5 through Waiau 10?

HECO Response:

a. The Penalty Factors are calculated using an in-house designed program based on the following paper:

E. F. Hill and W. D. Stevenson, Jr., "An Improved Method Of Determining Incremental Loss Factors From Power System Admittances And Voltages", IEEE Transactions On Power Apparatus And Systems, Vol. PAS-87, No. 6, June 1968.

There are no derivation or calculation worksheets. The most efficient way of understanding this model is to work directly with the Transmission Planning Division staff. Most questions can be quickly answered with either running the model or by explaining how the major inputs are processed and entered into the model.

b. The Penalty Factor for Waiau 3 and 4 is lower because they are connected to the 46 kV transmission lines whereas Waiau 5 through 10 are connected to the 138 kV transmission lines.

CA-IR-208

Ref: HECO-403, page 1 and HECO-WP-412, page 22.

HECO-403, page 1, line 5 indicates that the Net System Input is 8,109.2 GWh. HECO-WP-412, page 22 indicates that the total test year energy is 8,109.33 GWh.

Please indicate which number is the energy amount that was used in the production simulation model.

HECO Response:

The energy used in the production simulation model is input as 8,760 individual hours of MW load, in EEI format. As a convenience (because 8,760 hours of load data can be unwieldy to work with), P-MONTH provides the load summary report provided in HECO-WP-412, page 22. Rounding occurs as the detailed hourly data is summarized by month.

CA-IR-209

Ref: HECO-WP-412, page 24-26 and T-6, page 5, lines 8-13.

The spinning reserve input file H07TYD1.SPN shown in the referenced workpaper contains information for the first week of the month of January, and the spinning reserve criterion is shown to be 180 MW for every hour of the first week of January. T-6, page 5, lines 8-13 indicates that the spinning reserve criterion changes depending on the largest unit operating on the system.

Please provide the spinning reserve criterion for every hour of January through December of the test year.

HECO Response:

The spinning reserve input file H07TYD1.SPN shown in pages 24-26 of HECO-WP-412 represents the test year production simulation for the month of January. This is the complete spinning reserve input file. Since no subsequent dates (February-December) are explicitly coded, P-MONTH will proceed to use the January values (180 MW) for subsequent periods of the test year.

The section of the testimony referred to by the Consumer Advocate (HECO T-6, page 5, lines 8-13) states:

Q. What is the typical HECO SR criterion?

A. It depends on the largest unit operating on the system at any point in time. For example, when AES is on line, the SR criterion would equal 180 MW. When AES is unavailable, i.e., down for maintenance, the next largest unit is K5 or K6 at 142 MW.

(Kalaeloa is considered to be two units, since trip of a single combustion turbine or the steam unit would not result in loss of the facility's entire output.)

The amount of spinning reserve carried on the system when AES is out of service for maintenance depends on what the load is on the system, which units are running and what the load on the largest-loaded unit is. Consideration is given to the amount of quick load pickup ("QLPU") needed to keep the system stable in the event of a sudden trip of the largest-loaded unit. As stated in HECO T-6, page 4, line 23, to page 5, line 2:

> The purpose of having QLPU is to operate the system with sufficient generation reserves to stabilize system frequency immediately following a generating unit forced outage above the point where automatic and/or manual load shedding, or underfrequency trips of baseloaded IPP units, may interrupt customer service.

Hence, the actual amount of spinning reserve carried when AES is out of service for maintenance will vary depending on the factors noted above. Given that the situation is complex and dynamic, the spinning reserve level in the model is kept at 180 MW, even when AES is out of service for maintenance.

This practice of keeping the spinning reserve at a constant 180 MW for production simulation purposes is consistent across the calibration modeling, the direct testimony modeling, and the updated direct testimony modeling (so that, to the extent less spinning reserve is carried when AES is all or partially off-line during the test year, the effect is captured through the calibration factor).

CA-IR-210

Ref: HECO-WP-412, page 23.

The referenced workpaper contains the QLPU Input File H07TYD1.QLP.

a. Please identify each generating unit that is associated with each Unit ID.

b. Please explain how the numbers 1 through 10, listed under Unit Loading Point (MW) and under QLPU Capability (MW), are used by the P-Month production simulation.

c. Please explain how the P-Month production simulation uses this file.

HECO Response:

a. The Unit ID shown corresponds to the column labeled "Id" on the "Thermal Basic Summary" sheet provided in HECO-WP-412, page 16. For example, Unit Id = 1 is Honolulu generating unit 8, while Unit Id = 16 is Kahe generating unit 6.

b. The QLPU Input File facilitates "look-up table" capability, where each column of "Unit Loading Point (MW)" has a corresponding column of "QLPU Capability (MW)". For example, when Honolulu generating unit 8 (Unit Id = 1) is loaded at approximately 38 MW (column 5), then this look-up table tells P-MONTH that the estimated quick load capability for that operating point is about 11 MW (column 5). Using this information, P-MONTH can estimate the available QLPU capability for the system, depending on which units are committed, and their respective dispatch.

c. The following description of the P-MONTH QLPU Algorithm was provided by P Plus, the vendor for P-MONTH:

P-Month QLPU piggybacks on the normal P-Month unit commitment/economic dispatch logic as additional requirements.

After normal unit commitment for an hour, P-Month QLPU algorithm:

1. Assumes the largest on line unit will be fully loaded;
2. Calculates the QLPU requirement;
3. Assumes other committed units are dispatched to maximize the QLPU contribution (not economic dispatch);
4. Calculate the QLPU capability; and
5. If QLPU capability is less than the QLPU requirement, commit the next unit.

After normal economic dispatch for that hour:

1. Calculate the QLPU requirement and capability;
2. If QLPU capability $\geq$ QLPU requirement, done;
3. Otherwise, adjust unit dispatch to reduce the generation of the units with the largest decremental QLPU capabilities and to increase the generation of the units with the lowest incremental QLPU capabilities to increase the net QLPU capability of the system;
4. If the adjustment satisfies the QLPU requirement, done;
5. Otherwise, reduce the generation of the largest on line unit by X, where X = 3 * (QLPU target - QLPU capability) to reduce the QLPU target, and adjust the generation of other units to meet the load and to meet the new QLPU target; and
6. If not possible to provide enough QLPU to meet the target with the committed units and the adjustment, a violation message is written to the diagnostic report.

CA-IR-211

Ref: HECO-404, pages 1-2 and HECO-405, pages 2-3.

a. Please identify the source of Fuel Consumption (Barrels) in column (A) of HECO-404, pages 1 and 2 and HECO-405, pages 2 and 3.

b. Please provide all calculations used to derive the Fuel Consumption (barrels) in column (A) of HECO-404, page 1 and 2 and HECO-405, pages 2 and 3.

HECO Response:

a. The fuel consumption (Barrels) shown in the specified exhibits are calculated from the total MBtu consumption figures provided in HECO-409, page 2.

b. The calculation of barrels from MBtu is based on the heat content of the fuel (as shown on the bottom of HECO-409, the LSFO heat content is 6.2 million Btu per barrel, and the Diesel heat content is 5.86 million Btu per barrel).

Example for Kahe: 35,250,991 MBtu/(6.2 MBtu/bbl) = 5,685,644 bbl

CA-IR-212

Ref: T-4, page 22, lines 16-17, T-4, page 25, lines 12-20.

Please provide all documentation and calculations that show the application of the calibration factors.

HECO Response:

Exhibit HECO-409, page 2, has been updated to illustrate how the calibration factors are applied to the simulated results. This exhibit is provided in response to CA-IR-214 (please refer to page 20). The calibration factors are based on documentation, simulations, and calculations included in HECO's "Calibration Factor Annual Report for Year 2006", Docket No. 04-0113, filed with the Commission on April 16, 2007. As illustrated in Table 1. therein, the Calibration Factors are:

Kahe Power Plant (LSFO)	1.014
Waiau Power Plant (LSFO)	1.012
Waiau Combustion Turbines (Diesel)	1.082
Honolulu Power Plant (LSFO)	0.994

CA-IR-213

Ref: HECO-409, page 2.

Please identify the reference documents or calculations for MBtu Consumption and Net MWh Generation for every month for all HECO generating units in the referenced exhibit.

HECO Response:

In response to CA-IR-212, Exhibit HECO-409, page 2, has been updated to show the simulated P-MONTH results and the multiplication by calibration factors to arrive at the estimated MBtus. The simulated MBtus are derived from the barrels of fuel provided in the P-MONTH report, using the number of MBtus per barrel. Please refer to the response to CA-IR-214 for a new workpaper, HECO-WP-413, which is provided to illustrate the monthly barrels of fuel consumed for the test year.

CA-IR-214

Ref: T-4.

Does the Company plan to update the HECO production simulation model during this proceeding? If so, can the Company provide what information will be updated and provide it at this time?

HECO Response:

Yes, HECO has updated the production simulation model and is providing an updated set of exhibits and workpapers as a part of this IR response. The following items have changed:

1. Unit Ratings (HECO-WP-406, page 1). HECO made refinements to the operating minimum and normal top load ratings used in the production simulation.

Unit	Operating Minimum (Net MW)		Normal Top Load (Net MW)	
	Updated ProdSim	DT ProdSim	Updated ProdSim	DT ProdSim
H8	22.3	22.3	53.4	52.9
H9	22.3	22.5	54.4	54.4
W3	22.3	22.1	46.6	46.2
W4	22.3	22.3	46.6	46.4
W5	22.5	22.6	54.5	54.6
W6	22.5	22.5	53.5	53.7
W7	32.6	32.7	82.9	83.2
W8	32.8	32.7	86.1	86.2
W9	5.9	6.0	52.9	52.9
W10	5.9	6.0	49.9	49.9
K1	32.5	32.6	82.1	82.3
K2	32.7	32.8	82.1	82.4
K3	32.3	32.7	86.1	86.3
K4	32.3	32.7	85.3	85.3
K5	50.7	50.4	134.3	134.7
K6	50.0	49.8	134.4	133.9
Total	441.9	442.7	1185.1	1185.3

2. Company Use (HECO-WP-403, page 1). A new five-year (2002-2006) average was calculated.

	Updated Value (2002-2006 Average)	Direct Testimony Value (2001-2005 Average)
Energy, GWh	15.8	15.4

3. Unaccounted For and System Losses (HECO-WP-403, page 2). A new five-year (2002-2006) average percentage was calculated.

	Updated Value (2002-2006 Average)	Direct Testimony Value (2001-2005 Average)
Percentage of Net-to-System	4.64%	4.60%
Energy, GWh	376.4	373.0

4. Equivalent Forced Outage Rates ("EFOR") (HECO-WP-406, page 3). The forward-looking EFORs have been updated, and are now consistent with the EFORs used in HECO's 2007 Adequacy of Supply report ("2007 AOS"), filed on February 27, 2007, in Table 2, on page 14. An extensive discussion on the derivation of the updated EFORs is provided in Appendix 7 of the 2007 AOS. The updated EFORs are provided below:

Unit	Updated EFOR	Direct Testimony EFOR
Honolulu Units 8 and 9	11.3%	12.8%
Waiau Unit 3	11.3%	33.5%
Waiau Unit 4	11.3%	12.8%
Waiau Units 5 and 6	2.6%	2.9%
Waiau Units 7 and 8	6.6%	7.7%
Waiau Units 9 and 10	12.7%	10.0%
Kahe Units 1 and 2	3.2%	4.3%

Kahe Units 3 and 4	6.6%	7.7%
Kahe Unit 5	4.6%	5.5%
Kahe Unit 6	4.0%	4.9%
H-Power	10.0%	10.0%
Kalaeloa	1.5%	1.5%
AES	1.0%	1.0%

5. Calibration Factors (HECO-WP-404, page 1). HECO has determined updated calibration factors and has reported them in its "Annual Calibration Factor Report for Year 2006," filed with the Commission on April 16, 2007. The update factors are as follows:

Plant	Updated Factor	Direct Testimony Factor
Kahe Power Plant	1.014	1.0144
Waiau Power Plant Steam Units	1.012	1.0164
Waiau Power Plant CTs	1.082	1.0859
Honolulu Power Plant	0.994	0.9721

6. General Excise Tax Rate on HECO Fuel Price (HECO-414). HECO updated the GET to account for an increase in the rate for the test year.

	Updated Value	Direct Testimony Value
GET Adjustment	4.712%	4.166%

7. Timing of HECO-sited DG. HECO updated the in-service date for the HECO-sited DG (HECO-WP-412, page 19).

	Updated Value	Direct Testimony Value
HECO-sited DG	May 2007	March 2007

8. Removal of customer-sited DSG. HECO has removed the increment of DSG (HECO-WP-412, page 19). The DSG is not expected to be operational before the end of 2007.

	Updated Value	Direct Testimony Value
Customer-sited DG	N/A	Aug 2007

As a part of this CA-IR-response, HECO is submitting new workpapers, as follows:

Item	**Description**	**Reason**
HECO-WP-413 (see pages 78-137)	P-MONTH Monthly Report	Supports response to CA-IR-213
HECO-WP-414 (see page 138)	Summary Results	Provides high-level comparison of Direct Testimony and Update
HECO-WP-415 (Confidential) (see page 139)	Fuel Price Calculation	Illustrates application of updated GET

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Hawaiian Electric Company, Inc.

TEST YEAR FUEL EXPENSES

Line	Fuel Type	Reference	TY 2007 Fuel Expense ($000)
1.	**Total Fuel Oil Expense**	UPDATED HECO-401, p. 2, Line 4	$537,767
2.	**Total Fuel Related Expense**	UPDATED HECO-405, p. 1, Line 5	$6,107
3.	**TOTAL FUEL EXPENSE**		$543,874

Hawaiian Electric Company, Inc.

TEST YEAR FUEL EXPENSES
TOTAL FUEL OIL EXPENES

Line	Fuel Type	Reference	TY 2007 Fuel Oil Expense ($000)
1.	**Low Sulfur Fuel Oil**	UPDATED HECO-404, p. 1, Line 4	$526,595
2.	**Diesel Fuel Oil**	UPDATED HECO-404, p. 1, Line 6	$7,367
3.	**Sub. DG Diesel Fuel Oil**	UPDATED HECO-404, p. 1, Line 8	$3,805
4.	**TOTAL FUEL OIL EXPENSE**		$537,767

Note: Totals may not add exactly due to rounding.

Confidential Information Deleted Pursuant to Protective Order No. 23378.

Hawaiian Electric Company, Inc.

FUEL PRICES FOR 2007 TEST YEAR
WEIGHTED AVERAGE FUEL PRICES

This exhibit contains confidential fuel pricing information and is submitted pursuant to Protective Order No. 23378, issued on April 23, 2007.

Hawaiian Electric Company, Inc.

2007 TEST YEAR GENERATION

Line		(A) Energy (GWh)	(B) Percent of Net System Input
1.	**Sales**	7,720.8	
2.	**Company Use**[1]	15.8	
3.	**Sales + NC**	7,736.6	
4.	**Losses**[2]	376.4	
5.	**Net System Input**	8,113.0	100.00%
6.	**- Purchase Power**[3]	3,373.5	41.58%
7.	**Net HECO**	4,739.6	58.42%
7a.	**Central Station**	4,717.7	58.15%
7b.	**Substation DG**[4]	21.8	0.27%

[1] No Charge based on 2002-2006 5 year average, 15.8 MWh. (UPDATED HECO-WP-403, p. 1)
[2] Losses of 4.64% based on 5-year average (2002-2006), UPDATED HECO-WP-403, p. 2
[3] UPDATED HECO-409, page 5
[4] UPDATED HECO-409, page 6

Hawaiian Electric Company, Inc.

DERIVATION OF FUEL EXPENSE
(Contract Fuel Prices)

Line	LSFO	(A) Fuel Consumption (Barrels)	(B)[1] Contract Prices ($/bbl)	(C) = (A) x (B) (C) Fuel Expense ($000)
1.	Honolulu	290,579	65.4412	$ 19,016
2.	Kahe	5,706,486	65.4412	$ 373,439
3.	Waiau-Steam	2,049,775	65.4412	$ 134,140
4.	Subtotal	8,046,839		$ 526,595
5.	Waiau-Diesel	73,687	99.9771	$ 7,367
6.	Subtotal	73,687		$ 7,367
7.	Central Station Total	8,120,527		$ 533,962
8.	Substation DG	38,060	99.9771	$ 3,805
9.	Grand Total	8,158,587		$ 537,767
		Composite Fuel Price		**65.9142** **$/bbl**

[1] UPDATED HECO-402, Line 5.

Hawaiian Electric Company, Inc.

DERIVATION OF FUEL EXPENSE
(Including Trucking and Petrospect Costs)

Line	LSFO	(A) Fuel Consumption (Barrels)	(B)[1] Fuel Costs ($/bbl)	(C) = (A) x (B) (C) Fuel Expense ($000)
1.	Honolulu	290,579	68.5674	$ 19,924
2.	Kahe	5,706,486	65.4504	$ 373,492
3.	Waiau-Steam	2,049,775	65.4504	$ 134,159
4.	Subtotal	8,046,839		$ 527,574
5.	Waiau-Diesel	73,687	100.0501	$ 7,372
6.	Subtotal	73,687		$ 7,372
7.	Central Station Total	8,120,527		$ 534,947
8.	Substation DG	38,060	104.4601	$ 3,976
9.	Grand Total	8,158,587		$ 538,922
		Composite Fuel Price		66.0559 $/bbl

[1] UPDATED HECO-402, Line 9.

Hawaiian Electric Company, Inc.

TEST YEAR FUEL RELATED EXPENSES

Line		Dollars ($000)	Reference
1.	**Fuel Handling Expenses**	$ 4,839	HECO-WP-410
2.	**Fuel Trucking Expenses**	$ 1,074	UPDATED HECO-405, page 2
3.	**Petrospect Expenses**	$ 82	UPDATED HECO-405, page 3
4.	**Kahe 6 Fuel Additive Expense**	$ 113	UPDATED HECO-WP-411
5.	**Total**	$ 6,107	

Hawaiian Electric Company, Inc.

DERIVATION OF FUEL EXPENSE
(Trucking Costs)

Line	LSFO	(A) Fuel Consumption (Barrels)	(B)[1] Trucking Cost ($/bbl)	(C) = (A) x (B) (C) Fuel Expense ($000)
1.	Honolulu	290,579	3.1170	$ 906
2.	Kahe	5,706,486	-	$ -
3.	Waiau-Steam	2,049,775	-	$ -
4.	Subtotal	8,046,839		$ 906
5.	Waiau-Diesel	73,687	-	$ -
6.	Subtotal	73,687		$ -
7.	Central Station Total	8,120,527		$ 906
8.	Substation DG	38,060	4.4100	$ 168
9.	Grand Total	8,158,587		$ 1,074

[1] UPDATED HECO-402, Line 6.

Hawaiian Electric Company, Inc.

DERIVATION OF FUEL EXPENSE
(Petrospect Costs)

Line	LSFO	(A) Fuel Consumption (Barrels)	(B)[1] Petrospect Cost ($/bbl)	(C) = (A) x (B) (C) Fuel Expense ($000)
1.	Honolulu	290,579	0.0092	$ 3
2.	Kahe	5,706,486	0.0092	$ 52
3.	Waiau-Steam	2,049,775	0.0092	$ 19
4.	Subtotal	8,046,839		$ 74
5.	Waiau-Diesel	73,687	0.0730	$ 5
6.	Subtotal	73,687		$ 5
7.	Central Station Total	8,120,527		$ 79
8.	Substation DG	38,060	0.0730	$ 3
9.	Grand Total	8,158,587		$ 82

[1] UPDATED HECO-402, Line 8.

Hawaiian Electric Company, Inc.

TEST YEAR FUEL EFFICIENCY

Line			
	ENERGY		
1.	**Company Generated Energy**	4,738.7	Net GWh
2.	**Central Station Generated Energy**	4,716.9	Net GWh
3.	**Steam Generated Energy**	4,703.9	Net GWh
4.	**CT Generated Energy**	13.0	Net GWh
5.	**Sub. DG Generated Energy**	21.8	Net GWh
6.	**Test Year Sales**	7,720.8	Net GWh
	FUEL CONSUMPTION		
7.	**Total Fuel Consumed**	50,545,243	MBtu
8.	**Central Station Fuel Consumed**	50,322,213	MBtu
9.	**Steam Fuel Consumed**	49,890,404	MBtu
10.	**CT Fuel Consumed**	431,808	MBtu
11.	**Sub. DG Fuel Consumed**	223,030	MBtu
	HEAT RATE		
12.	**Total Heat Rate**	10,666	Btu/kWh
13.	**Central Station Heat Rate**	10,668	Btu/kWh
14.	**Steam Heat Rate**	10,606	Btu/kWh
15.	**CT Heat Rate**	33,290	Btu/kWh
16.	**Sub. DG Heat Rate**	10,212	Btu/kWh
17.	**HECO Central Station Generation of Net System Input**	58.15%	Percent
18.	**Sales Heat Rate - Central Station**	0.011209	MBtu/kWh Sales[1]

Reference
[1] 50,322,213 MBtu / (7,720.8 GWh x 58.15% x 1,000,000 kWh/GWh) = 0.011209 MBtu/kWh Sales.

Source: UPDATED HECO-409, page 2 and 6 and UPDATED HECO-407.

Hawaiian Electric Company, Inc.

HISTORICAL FUEL EFFICIENCY
(Btu/Net kWh)

Line		(A) 2001	(B) 2002	(C) 2003	(D) 2004	(E) 2005	(F) Test Year 2007
1.	**Central Station Steam**	10,387	10,414	10,413	10,540	10,620	10,606 [1]
2.	**Percent Increase**		0.3%	0.0%	1.2%	0.8%	-0.1%
3.	**Central Station Diesel**	29,053	21,106	21,081	21,327	20,985	33,290 [2]
4.	**Percent Increase**		-27.4%	-0.1%	1.2%	-1.6%	58.6%
5.	**Central Station Average**	10,406	10,436	10,452	10,621	10,690	10,668 [3]
6.	**Percent Increase**		0.3%	0.2%	1.6%	0.7%	-0.2%
7.	**Substation DG**					10,081	10,212 [4]
8.	**Percent Increase**						1.3%

[1] UPDATED HECO-406, Line 14.
[2] UPDATED HECO-406, Line 15.
[3] UPDATED HECO-406, Line 13.
[4] UPDATED HECO-406, Line 16.

Hawaiian Electric Company, Inc.

TEST YEAR FUEL OIL INVENTORY

Line	LSFO	(A) Average Barrels[1]	(B) Price per Barrel	(C) = (A) x (B) (C) Fuel Oil Inventory ($000)
1.	**Residual Fuel Oil**	771,615	65.5629	$ 50,589
2.	**Diesel Oil**	24,873	100.3084	$ 2,495
3.	**TOTAL INVENTORY**	796,488		$ 53,084

4.	**AVERAGE RESIDUAL FUEL OIL PRICE**	
5.	**Residual Fuel Oil Expense (UPDATED HECO-404, p. 2, Line 4, Column C)**	$ 527,574
6.	**Barrels of Residual Fuel Oil (UPDATED HECO-404, p. 2, Line 4, Column A)**	8,046,839
7.	**Average Price per Barrel (Line 5 ÷ Line 6)**	$ 65.5629
8.	**AVERAGE DIESEL OIL PRICE**	
9.	**Central Station Diesel Oil Inventory Volume (HECO-411, Line 6)**	23,416
10.	**Substation DG Diesel Oil Inventory Volume (HECO-411, Line 7)**	1,457
11.	**Total Diesel Oil Inventory Volume (Line 9 + Line 10)**	24,873
12.	**Central Station Diesel Oil Price (UPDATED HECO-404, Page 2, Line 5, Column B)**	$ 100.0501
13.	**Substation DG Diesel Oil Price (UPDATED HECO-404, Page 2, Line 8, Column B)**	$ 104.4601
14.	**Central Station Diesel Oil Inventory Value (Line 9 * Line 12)**	$ 2,342,802
15.	**Substation DG Diesel Oil Inventory Value (Line 10 * Line 13)**	$ 152,198
16.	**Total Diesel Oil Inventory Value (Line 14 + Line 15)**	$ 2,495,001
17.	**Average Diesel Oil Price (Line 16 ÷ Line 11)**	$ 100.3084

[1] Residential Fuel Oil - UPDATED HECO-409, line 3
Diesel Oil - HECO-411, line 8

Hawaiian Electric Company, Inc.

DERIVATION OF RESIDUAL FUEL OIL INVENTORY

Line			Energy (GWh)	
1.	**Forecast Residual Fuel Oil Consumption**[1]		8,046,839	Barrels
2.	**Burn Rate (Line 1 / 365 days)**		22,046	Barrels/Day
3.	**35 Day Inventory (Line 2 X 35 days)**		771,615	Barrels
4.	**Fuel Price**[2]	$	65.5629	$/Barrel
5.	**Residual Fuel Oil Inventory (Line 3 x Line 4)**	$	50,589	$000

[1] See UPDATED HECO-404, line 4, column A.
[2] See UPDATED HECO-408, line 7.

Hawaiian Electric Company, Inc.

2007 Production Simulation - (Rate Case - 2007 Test Year - Direct Testimony Update)

Sales and Peak Forecast dated August 2006

Maintenance Schedule dated July 21, 2006 (AES @ 10 Days)

Fuel Prices August 2006 Contract Prices (with G.E.T. correction)

		Calibrated		Calibrated		Calibrated		Calibrated							
	Simulated	1.014	Simulated	1.012	Simulated	0.994	Simulated	1.082	Calibrated						
	Mbtu Consumption									Net MWh Generation					Net Heat
Month	**Kahe**	**Kahe**	**Waiau**	**Waiau**	**Honolulu**	**Honolulu**	**WPP Diesel**	**WPP Diesel**	**Total**	**Kahe**	**Waiau**	**Honolulu**	**Diesel**	**Total**	**Rate**
Jan	2,787,123	2,826,143	982,991	994,787	137,336	136,512	26,100	28,241	3,985,683	275,204	83,387	10,690	770	370,051	10,771
Feb	2,929,884	2,970,903	1,104,555	1,117,809	166,625	165,625	31,550	34,137	4,288,475	292,173	96,935	12,988	977	403,073	10,639
Mar	2,889,101	2,929,548	852,047	862,272	163,500	162,519	21,741	23,523	3,977,863	286,986	73,271	12,649	668	373,574	10,648
Apr	2,906,492	2,947,183	728,903	737,650	87,532	87,006	22,672	24,531	3,796,370	287,782	62,766	6,650	616	357,814	10,610
May	2,630,728	2,667,558	1,195,081	1,209,422	169,911	168,892	23,604	25,540	4,071,412	260,217	104,606	13,303	752	378,878	10,746
Jun	2,726,177	2,764,344	1,181,007	1,195,179	177,735	176,669	31,152	33,706	4,169,898	270,598	104,506	13,878	988	389,970	10,693
Jul	2,875,678	2,915,937	1,247,012	1,261,976	169,744	168,725	33,853	36,629	4,383,268	285,863	110,067	13,223	1,123	410,276	10,684
Aug	2,925,941	2,966,904	1,281,385	1,296,762	212,995	211,717	67,238	72,751	4,548,134	291,133	113,572	16,865	2,446	424,016	10,726
Sep	3,076,849	3,119,925	1,118,895	1,132,322	161,392	160,424	33,484	36,230	4,448,901	305,917	99,203	12,562	1,030	418,712	10,625
Oct	3,168,870	3,213,234	1,165,817	1,179,807	210,453	209,190	64,706	70,012	4,672,243	316,148	103,792	16,619	2,316	438,875	10,646
Nov	2,961,752	3,003,217	907,835	918,729	99,349	98,753	22,204	24,024	4,044,723	293,537	79,733	7,718	673	381,661	10,598
Dec	3,013,132	3,055,316	792,379	801,887	55,893	55,558	20,780	22,483	3,935,244	298,457	66,785	4,148	612	370,002	10,636
Total	34,891,728	35,380,212	12,557,908	12,708,603	1,812,465	1,801,590	399,084	431,808	50,322,213	3,464,015	1,098,623	141,293	12,971	4,716,902	10,668
	10,073	10,214	11,431	11,568	12,828	12,751	30,767	33,290	10,668	73.4%	23.3%	3.0%	0.3%	100.0%	
Sub. DG									223,030					21,840	10,212
HECO w/ DG									50,545,243					4,738,742	10,666

LSFO heat content = 6.2 million BTU per barrel
Diesel heat content = 5.86 million BTU per barrel

AES Hawaii, Inc

2007 Production Simulation - (Rate Case - 2007 Test Year - Direct Testimony Update)

Sales and Peak Forecast dated August 2006

Maintenance Schedule dated July 21, 2006 (AES @ 10 Days)

Fuel Prices August 2006 Contract Prices (with G.E.T. correction)

	2 Boiler Operation			1 Boiler Operation		
Month	**MWh**	**Hrs**	**Avg MW**	**MWh**	**Hrs**	**Avg MW**
Jan	132,883	738	180.01	0	0	0.00
Feb	119,578	664	180.01	0	0	0.00
Mar	132,495	736	180.00	0	0	0.00
Apr	128,563	714	180.01	0	0	0.00
May	132,408	736	180.00	0	0	0.00
Jun	128,477	714	179.99	0	0	0.00
Jul	132,365	735	179.99	0	0	0.00
Aug	132,495	736	180.00	0	0	0.00
Sep	128,909	716	179.99	0	0	0.00
Oct	89,381	497	179.99	21,384	238	90.00
Nov	128,434	714	180.01	0	0	0.00
Dec	132,538	736	180.01	0	0	0.00
Total	1,518,526	8,436	180.00	21,384	238	90.00

Kalaeloa Partners

2007 Production Simulation - (Rate Case - 2007 Test Year - Direct Testimony Update)

Sales and Peak Forecast dated August 2006

Maintenance Schedule dated July 21, 2006 (AES @ 10 Days)

Fuel Prices August 2006 Contract Prices (with G.E.T. correction)

	2 CT Operation			1 CT Operation		
Month	**MWh**	**Hrs**	**Avg MW**	**MWh**	**Hrs**	**Avg MW**
Jan	110,008	556	198.02	15,957	177	90.00
Feb	0	0	0.00	39,328	437	90.00
Mar	111,473	567	196.48	14,627	163	90.00
Apr	119,105	606	196.62	9,308	103	90.00
May	127,780	638	200.19	8,510	95	90.00
Jun	120,628	600	201.09	9,840	109	90.00
Jul	127,502	629	202.57	9,308	103	90.00
Aug	128,368	635	202.05	8,776	98	90.00
Sep	118,523	594	199.55	10,372	115	90.00
Oct	129,688	638	203.18	8,510	95	90.00
Nov	121,574	612	198.75	8,776	98	90.00
Dec	121,913	618	197.40	10,372	115	90.00
Total	1,336,560	6,693	199.68	153,687	1,708	90.00

HPOWER

2007 Production Simulation - (Rate Case - 2007 Test Year - Direct Testimony Update)

Sales and Peak Forecast dated August 2006
Maintenance Schedule dated July 21, 2006 (AES @ 10 Days)
Fuel Prices August 2006 Contract Prices (with G.E.T. correction)

Month	On-Peak MWh	Off-Peak MWh	Total MWh	NonFirm MWh
Jan	14,509	10,364	24,873	500
Feb	14,735	10,525	25,260	452
Mar	17,369	12,406	29,775	500
Apr	16,769	11,978	28,747	484
May	17,369	12,406	29,775	500
Jun	16,808	12,006	28,814	484
Jul	13,556	9,683	23,239	500
Aug	17,369	12,406	29,775	500
Sep	16,808	12,006	28,814	484
Oct	17,369	12,406	29,775	500
Nov	16,808	12,006	28,814	484
Dec	17,369	12,406	29,775	500
Total	196,838	140,598	337,436	5,887

HPOWER EAF of 87%

	MWh
AES	1,539,910
KPLP	1,490,246
HPOWER	337,436
NonFirm	5,887
Total IPP	3,373,479

Substation DG Generation

2007 Production Simulation - (Rate Case - 2007 Test Year - Direct Testimony Update)

Sales and Peak Forecast dated August 2006

Maintenance Schedule dated July 21, 2006 (AES @ 10 Days)

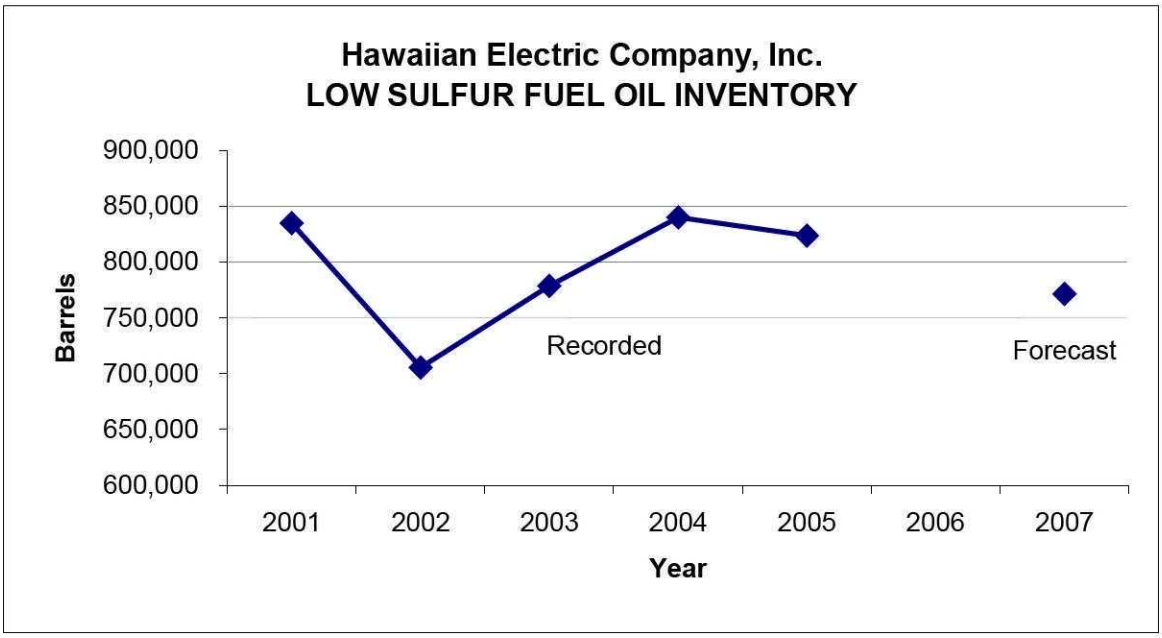
Fuel Prices August 2006 Contract Prices (with G.E.T. correction)

Month	System Level MWh	MBtu
Jan	1,697	17,330
Feb	1,476	15,073
Mar	1,624	16,584
Apr	1,550	15,829
May	2,032	20,751
Jun	1,860	18,994
Jul	1,948	19,893
Aug	2,037	20,802
Sep	1,771	18,085
Oct	2,037	20,802
Nov	1,948	19,893
Dec	1,860	18,994
Total	21,840	223,030
Net Heat Rate (Btu/kWh)	10,212	

Hawaiian Electric Company, Inc.

LOW SULFUR INVENTORY 2001-2005

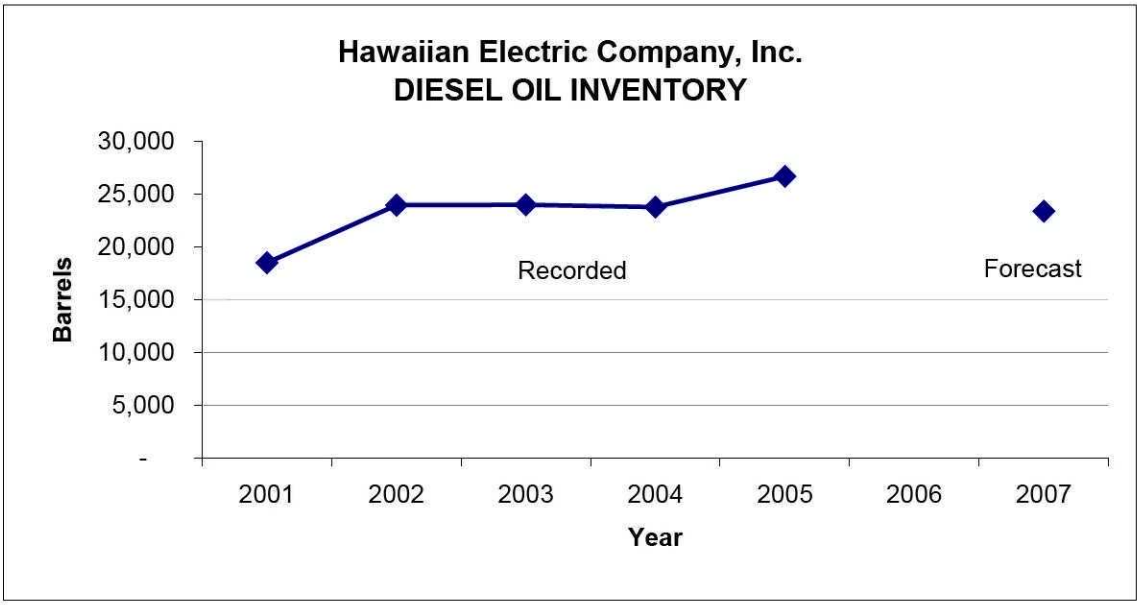
Line	Year	(A) Barrels Consumed Per Day	(B) Average Ending Inventory (Barrel)	(C) = (B) / (A) (C) Average Days Supply
1.	2001	20,272	835,100	41
2.	2002	20,888	705,692	34
3.	2003	20,974	778,717	37
4.	2004	22,290	840,342	38
5.	2005	21,515	823,872	38
6.	2001 - 2005 Average	21,188	796,745	38



Hawaiian Electric Company, Inc.

DIESEL OIL INVENTORY 2001-2005

Line	Year	(A) Barrels Consumed Per Day	(B) Average Ending Inventory (Barrel)	(C) = (B) / (A) (C) Average Days Supply
1.	2001	60	18,522	307
2.	2002	61	23,992	393
3.	2003	79	24,010	306
4.	2004	169	23,827	141
5.	2005	325	26,730	82
6.	2001 - 2005 Average Central Station Inventory	139	23,416	
7.	DG Inventory		1,457	
6.	Total Diesel Oil Inventory		24,873	



Hawaiian Electric Company, Inc.

DERIVATION OF DIESEL FUEL OIL INVENTORY
DERIVED ON DAILY CONSUMPTION BASIS

Line			
1.	**Forecast Diesel Fuel Oil Consumption**	73,687	Barrels
2.	**Burn Rate (Line 1 / 365 days)**	202	Barrels/Day
3.	**35 Day Inventory (Line 2 X 35 days)**	7,066	Barrels
4.	**Continuous 24 Hour Consumption**[1]	5,420	Barrels/Day
5.	**Diesel Fuel Oil Inventory (Line 3 / Line 4)**	1.3	Days

[1] Assumption: W9 and W10 are run at 53 MW and 50 MW respectively for 24 hours.
W9: {[198.6939 + (7.8497 * 53) + (.02922 * 53^2)] * 24} / 5.86 = 2,853.82 Barrels/Day
W10: {[191.3958 + (7.2757 * 50) + (.02851 * 50^2)] * 24} / 5.86 = 2,565.69 Barrels/Day
W9 + W10 combined = 5,419.51 Barrels/Day

Hawaiian Electric Company, Inc.

DAYS OF FULL LOAD CONSUMPTION

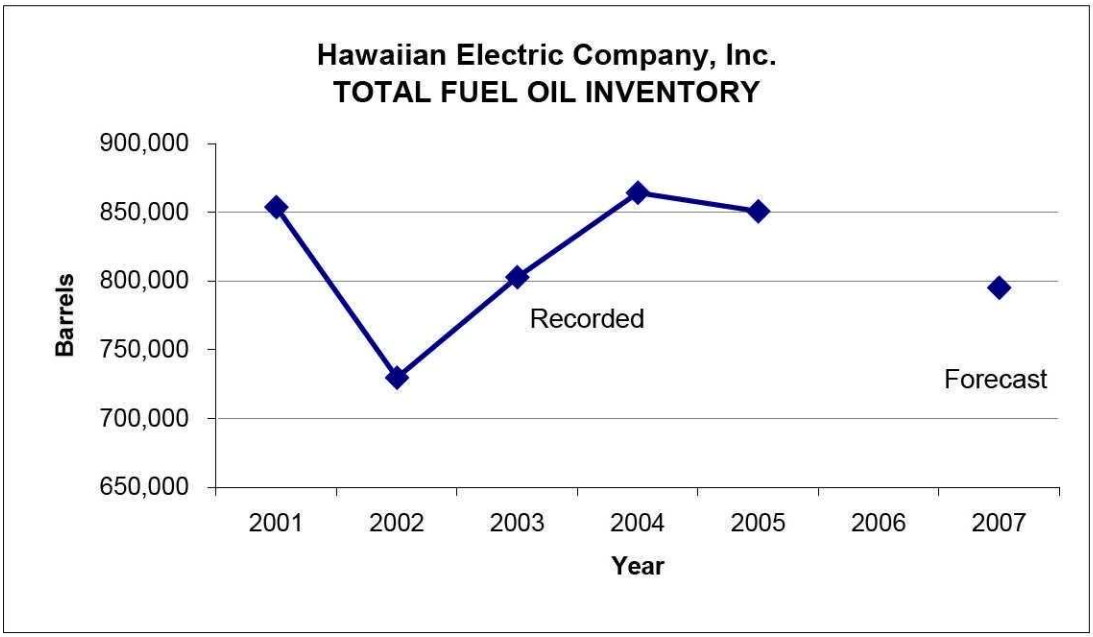
Line			
1.	**HECO's Test Year Diesel Inventory**	24,873	Barrels
2.	**HECO's Full Load Consumption**	5,420	Barrels/Day
3.	**Days at Full Load Consumption**	4.6	Days

[1] Assumption: W9 and W10 are run at 53 MW and 50 MW respectively for 24 hours.
W9: {[198.6939 + (7.8497 * 53) + (.02922 * 53^2)] * 24} / 5.86 = 2,853.82 Barrels/Day
W10: {[191.3958 + (7.2757 * 50) + (.02851 * 50^2)] * 24} / 5.86 = 2,565.69 Barrels/Day
W9 + W10 combined = 5,419.51 Barrels/Day

Hawaiian Electric Company, Inc.

HISTORICAL FUEL INVENTORY COMPARED WITH TEST YEAR AVERAGE MONTHLY INVENTORY

Line	Year	(A) L S F O Barrels	(B) Diesel Barrels	(C) = (A) + (B) (C) Total Barrels
1.	2001	835,100	18,522	853,622
2.	2002	705,692	23,992	729,684
3.	2003	778,717	24,010	802,727
4.	2004	840,342	23,827	864,169
5.	2005	823,872	26,730	850,602
6.	2001 - 2005 Average	796,745	23,416	820,161



Index of Workpapers for HECO Rate Case - Direct Testimony
TEST YEAR 2007

Header	Page(s)	Description
UPDATED HECO - WP - 400	1	Index
UPDATED HECO - WP - 403	1	Company Use (5-yr historical)
UPDATED HECO - WP - 403	2	Unaccounted For and System Losses (5-yr historical)
HECO - WP - 404	1	Blank sheet
UPDATED HECO - WP - 406	1	Generating Unit Load Carrying Capabilities
HECO - WP - 406	2	Generating Unit Heat Rate Constants
UPDATED HECO - WP - 406	3	Equivalent Forced Outage Rates
UPDATED HECO - WP - 407	1	Sales Fuel Efficiency
HECO - WP - 408	1	Historical Net Heat Rate (Central Station Generation)
HECO - WP - 410	1	Fuel Related Expenses
UPDATED HECO - WP - 411	1	Kahe 6 Fuel Additive Calculation
UPDATED HECO - WP - 412	1-6	Raw Output From Production Simulation Model (Yearly file)
UPDATED HECO - WP - 412	7-13	Input File Into the Production Simulation
UPDATED HECO - WP - 412	14-15	Fuel Input File Into Production Simulations
UPDATED HECO - WP - 412	16-21	Unit costs/Performance/Maintenance Files
UPDATED HECO - WP - 412	22	Load Input File
HECO - WP - 412	23	QLPU Input File
HECO - WP - 412	24-26	Spinning Reserve Input File
HECO - WP - 412	27-37	Pattern Files
HECO - WP - 413 *	1-60	Raw Output From Production Simulation Model (monthly file)
HECO - WP - 414 *	1	Summary of Results
HECO - WP - 415 *	1	HECO Contract Prices - Aug 2006 w/ Revised GET (CONFIDENTIAL)

* Added Exhibits/Workpapers

Hawaiian Electric Company, Inc.

TEST YEAR 2007 COMPANY USE

Line	Year	(A) Company No-Charge (MWh)	(B) Sales (MWh)	(C) = (A) ÷ (B) (C) Company Use (Percent)
1.	2002	15,379	7,390,367	0.208%
2.	2003	15,002	7,522,230	0.199%
3.	2004	15,521	7,732,834	0.201%
4.	2005	15,698	7,721,296	0.203%
5.	2006	17,363	7,700,605	0.225%
6.	Total	78,962	38,067,331	0.207%
7.	Average	15,792		

Hawaiian Electric Company, Inc.

TEST YEAR 2007 UNACCOUNTED FOR & SYSTEM LOSSES

Line	Year	(A) Unacct'd & Sys Losses (MWh)	(B) Net-to-System (MWh)	(C) = (A) ÷ (B) (C) System Losses (Percent)
1.	2002	351,953	7,757,699	4.54%
2.	2003	371,726	7,908,957	4.70%
3.	2004	378,644	8,126,998	4.66%
4.	2005	367,309	8,104,303	4.53%
5.	2006	386,904	8,104,872	4.77%
6.	Total	1,856,535	40,002,828	4.64%

HECO-WP-404

As noted in response to CA-IR-212, the calibration factors applied in UPDATED HECO-409 are based on HECO's "Calibration Factor Annual Report for Year 2006", filed with the Commission on April 16, 2007.

Hawaiian Electric Company, Inc.

TEST YEAR 2007 GENERATING UNIT LOAD CARRYING CAPABILITIES

Unit	(A) Operating Minimum (Net MW)	(B) Normal Top Load (Net MW)
Honolulu 8	22.3	53.4
Honolulu 9	22.3	54.4
Waiau 3	22.3	46.6
Waiau 4	22.3	46.6
Waiau 5	22.5	54.5
Waiau 6	22.5	53.5
Waiau 7	32.6	82.9
Waiau 8	32.8	86.1
Waiau 9	5.9 [1]	52.9
Waiau 10	5.9 [1]	49.9
Kahe 1	32.5	82.1
Kahe 2	32.7	82.1
Kahe 3	32.3	86.1
Kahe 4	32.3	85.3
Kahe 5	50.7	134.3
Kahe 6	50.0	134.4
Kalaeloa CT1	32.5	90.0
Kalaeloa CT2	32.5	90.0
Kalaeloa Additional Capacity	0.0	28.0
AES-Hawaii	63.0	180.0
H-POWER	25.0	46.0

[1] Waiau 9 and 10 minimum based on typical EMS settings

Hawaiian Electric Company, Inc.

TEST YEAR 2007 HEAT RATE CONSTANTS

Unit	A Coefficient	B Coefficient	C Coefficient
Honolulu 8	36.4132	10.3115	0.00568
Honolulu 9	69.8920	8.9484	0.02204
Waiau 3	146.5394	4.8113	0.08544
Waiau 4	49.4604	9.3112	0.03203
Waiau 5	61.0595	8.8137	0.02981
Waiau 6	64.1104	8.7407	0.03199
Waiau 7	88.2107	7.9405	0.01961
Waiau 8	86.8712	8.0919	0.01315
Waiau 9	198.6939	7.8497	0.02922
Waiau 10	191.3958	7.2757	0.02851
Kahe 1	73.4991	8.1733	0.01292
Kahe 2	46.0037	9.0952	0.00350
Kahe 3	57.4864	8.5169	0.00634
Kahe 4	75.5539	8.4394	0.00739
Kahe 5	89.3444	8.6434	0.00305
Kahe 6	117.0609	8.1819	0.00769
Kalaeloa CT1	299.0260	4.4288	0.00931
Kalaeloa CT2	299.0260	4.4288	0.00931
Kalaeloa Additional Capacity	0.0100	8.6408	0.00000
AES-Hawaii	258.7479	14.9713	0.00510
H-POWER	10.0000	8.2000	0.00010

Hawaiian Electric Company, Inc.

TEST YEAR 2007 EQUIVALENT FORCED OUTAGE RATE

Unit	2000	2001	2002	2003	2004	2005	Forward-Looking
Honolulu 8	7.2%	10.4%	3.6%	13.0%	23.7%	1.7%	11.3%
Honolulu 9	1.4%	3.0%	3.1%	20.0%	1.0%	12.0%	11.3%
Waiau 3	2.0%	1.9%	6.5%	10.9%	24.7%	42.2%	11.3%
Waiau 4	3.0%	14.8%	5.1%	3.4%	13.4%	5.0%	11.3%
Waiau 5	3.6%	0.8%	2.2%	4.1%	1.0%	1.0%	2.6%
Waiau 6	3.8%	3.9%	0.6%	2.8%	0.3%	2.6%	2.6%
Waiau 7	0.7%	1.6%	1.8%	0.7%	1.2%	0.6%	6.6%
Waiau 8	5.3%	1.5%	0.1%	0.0%	7.7%	23.5%	6.6%
Waiau 9	65.7%	4.1%	49.9%	6.9%	63.2%	69.2%	12.7%
Waiau 10	13.4%	5.0%	13.6%	36.0%	4.4%	7.4%	12.7%
Kahe 1	1.2%	0.7%	2.3%	1.2%	2.6%	5.4%	3.2%
Kahe 2	1.7%	3.1%	1.0%	2.2%	2.9%	2.0%	3.2%
Kahe 3	0.3%	3.9%	0.1%	3.5%	8.8%	8.3%	6.6%
Kahe 4	5.7%	0.9%	3.6%	1.3%	1.4%	4.9%	6.6%
Kahe 5	1.7%	0.4%	1.0%	1.1%	7.6%	3.1%	4.6%
Kahe 6	0.9%	0.4%	0.5%	1.9%	3.3%	5.9%	4.0%
HECO	**2.4%**	**1.6%**	**1.8%**	**2.4%**	**6.2%**	**9.3%**	**5.4%**
Kalaeloa							1.5%
AES-Hawaii	**(See Mr. Ching's Testimony HECO T-5)**						1.0%
H-POWER				Availability Factor			87.0%

Hawaiian Electric Company, Inc.

TEST YEAR 2007 SALES FUEL EFFICIENCY

Line	Description	(A) Net Generation (MWh)	(B)[1] Fuel (Barrels)	(C) Fuel (MBtu)	(D) = (C) ÷ (A) * 1000 (D) Net Heat Rate (Btu/kWh)
1.	Steam	4,703,931	8,046,839	49,890,404	10,606
2.	Diesel - Waiau	12,971	73,687	431,808	33,290
3.	Diesel - DG	(Treated Separately In the ECAF)			
4.	Total	4,716,902	8,120,527	50,322,213	10,668

SALES PROVIDED BY COMPANY GENERATION

5.	Test Year Sales	7,720,800
6.	Company Generated	58.15%
7.	Sales Provided by Company	4,489,636

SALES FUEL EFFICIENCY

		Company Sales	Company MBtu Consumed
8.	Company Sales and Fuel	4,489,636	50,322,213
9.	Sales Heat Rate	0.011209	

[1] Steam's LSFO heat content is 6.2 MBtu/barrel
Diesel's heat content is 5.86 MBtu/barrel

Hawaiian Electric Company, Inc.

HISTORICAL NET HEAT RATE (CENTRAL STATION GENERATION)

Line	Description	(A) 2001	(B) 2002	(C) 2003	(D) 2004	(E) 2005
1.	Total Fuel Consumed (MBtu)					
2.	Steam	46,577,520	48,195,589	48,441,659	51,453,940	49,790,662
3.	Diesel	128,605	205,872	359,213	785,235	678,309
4.	Total	46,706,125	48,401,461	48,800,872	52,239,176	50,468,971
5.	Net Energy Generated (MWh)					
6.	Steam	4,484,084	4,628,152	4,651,903	4,881,864	4,688,606
7.	Diesel	4,427	9,754	17,040	36,819	32,324
8.	Total	4,488,510	4,637,906	4,668,942	4,918,684	4,720,930
9.	Heat Rate (Btu/kWh)					
10.	Steam	10,387	10,414	10,413	10,540	10,620
11.	Diesel	29,053	21,106	21,081	21,327	20,985
12.	Total	10,406	10,436	10,452	10,621	10,690

Hawaiian Electric Company, Inc.

TEST YEAR FUEL RELATED EXPENSES
($000)

Line	Description	(A) Kahe	(B) Waiau	(C) Honolulu	(D) Other	(E) = (A)+(B)+(C)+(D) (E) Total
1.	Facilities Base Fee	613	1,527	-	-	2,140
2.	Pipeline Maintenance	302	133	-	-	435
3.	Tankfarm Management Fee	-	-	-	1,133	1,133
4.	In-House Fuel Handling	279	506		346	1,131
5.	Production	-	-	-	-	-
6.	Environmental	-	-	-	-	-
7.	Total	1,195	2,165	-	1,479	4,839

Hawaiian Electric Company, Inc.

Estimated Annual Usage and Cost
for Calcium Nitrate Fuel Additive at Kahe Unit 6

Based on Kahe 6 estimated annual generation of 714,814 GWH,
and the estimated annual fuel usage at Kahe 6 of 7,498,631 MBTU.

The annual fuel usage in gallons is calculated to be:
7,498,631 MBTU ÷ 6.2 MBTU per bbl x 42 gallons per bbl
= 50,797,178 gallons of Fuel Oil

Fuel additive usage is 1 gallon of additive per 4000 gallons of Fuel Oil

Estimated annual fuel additive usage:
50,797,178 ÷ 4000 = **12,699 gallons fuel additive per year**

Estimated annual cost of the fuel additive.
The calculation of the estimated annual fuel additive cost is shown below:

a) cost of the additive is $6.10 per gallon
$6.10 x 12,699 = $77,464

b) tax = $77,464 x 4.5% = $3,486

c) materials on-cost is 11.05%
($77,464 + $3,486) x 11.05% = $8,945

d) shipping costs approximately $6,500 per container load (3,575 gallons), or $1.818 per gallon
12,699 gallons x $1.818 = $23,087

The total estimated annual cost of the fuel additive is:
$77,464 + $3,486 + $8,945 + $23,087 = **$112,982**

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 1
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:12:45

Case Name: h07tyd2c
Simulation Period: 2007/ 1 - 2007/12

File	Name
Study Data:	h07tyd1.stu
Report Control:	h07tyd1.rfc
Area Data:	h07tyd1.ara
Plant Data:	h07tyd1.plt
Fuel Class Data:	h07tyd1.fcl
Spot Fuel Data:	h07tyd2.sfu
Contract Fuel Data:	
Thermal Basic Data:	h07tyd1.uba
Thermal Cost Data:	h07tyd1.ucs
Thermal Performance Data:	h07tyd2c.upf
Thermal NOx Data:	
Hourly Pattern # 1:	ptn1.hcp
Hourly Pattern # 2:	ptn2.hcp
Hourly Pattern # 3:	ptn3.hcp
Hourly Pattern # 4:	ptn4.hcp
Hourly Pattern # 5:	ptn5.hcp
Hourly Pattern # 6:	ptn6.hcp
Hydro Data:	
Pumped Storage Data:	
Fixed Energy Transaction Data:	h07tyd1.trf
Economy Transaction Data:	
DSM Data:	
Monte Carlo Scenario Data:	h07tyd2c.mcs
Thermal Maintenance Data:	h07tyd1.umt
Hydro Maintenance Data:	
P-S Maintenance Data:	
Load Data:	h07tyd2.eei
CC Data #1:	
CC Data #2:	
CC Data #3:	
CC Data #4:	
CC Maintenance Data:	
Quick Load Pick Up Curve Data:	h07tyd1.qlp
Spinning Reserve Data:	h07tyd1.spn

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 2
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Calendar Year: 2007

Monthly system Load and Capacity Summary

Mnth	Peak Load MW	Mnthly Energy GWh	Load Factor %	Installed Capacity MW	Maint outage MW	Adjusted Capacity MW	Capacity Reserve MW	Capacity Reserve %
Jan	1193	656	73.9	1483.1	82.1	1401	208	17.44
Feb	1186	589.2	73.9	1500.1	0	1500.1	314.1	26.49
Mar	1169	664.1	76.4	1618.1	165	1453.1	284.1	24.3
Apr	1195	645.6	75	1642.7	136.3	1506.4	311.4	26.06
May	1213	680	75.3	1647.6	187.2	1460.4	247.4	20.4
Jun	1207	680.1	78.3	1618.1	132.7	1485.4	278.4	23.07
Jul	1251	705.3	75.8	1601.1	86.1	1515	264	21.1
Aug	1282	726.2	76.1	1618.1	139.6	1478.5	196.5	15.33
Sep	1273	707.6	77.2	1618.1	54.5	1563.6	290.6	22.83
Oct	1288	720.3	75.2	1528.1	54.5	1473.6	185.6	14.41
Nov	1267	671.7	73.6	1618.1	86.1	1532	265	20.92
Dec	1231	667	72.8	1618.1	139.5	1478.6	247.6	20.12

Summary for Period:

Pea	k Load	(MW):	1288
Tot	al Energy	(GWh):	8113.1
Loa	d Factor	(%):	71.91

Month	AM Peak (MW)	PM Peak (MW)	Capacity (MW)	Maint. (MW)	Reserve (MW)	Largest (MW)	LSC (MW)	Diff. (MW)
Jan	1114	1193	1483.1	82.1	208	180	1221	28
Feb	1120	1186	1500.1	0	314.1	180	1320.1	134.1
Mar	1132	1169	1618.1	165	284.1	180	1273.1	104.1
Apr	1185	1195	1642.7	136.3	311.4	180	1326.4	131.4
May	1187	1213	1647.6	187.2	247.4	180	1280.4	67.4
Jun	1196	1207	1618.1	132.7	278.4	180	1305.4	98.4
Jul	1242	1251	1601.1	86.1	264	180	1335	84
Aug	1263	1282	1618.1	139.6	196.5	180	1298.5	16.5
Sep	1257	1273	1618.1	54.5	290.6	180	1383.6	110.6
Oct	1238	1288	1528.1	54.5	185.6	180	1293.6	5.6
Nov	1213	1267	1618.1	86.1	265	180	1352	85
Dec	1144	1231	1618.1	139.5	247.6	180	1298.6	67.6

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 3
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Fiscal Year: 2007

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	3362.7	17.09	79.965	1011.7	280	0	0	11.1879	0	0	132.55	139.91	12652
2	Honolu 9	54.4	1	2385.6	12.86	61.327	800.7	249	0	0	8.8543	0	0	135.85	144.38	13056
3	Waiau 3	46.6	1	1694.8	13.45	54.953	737.8	209	0	0	7.7874	0	0	128.19	141.71	13426
4	Waiau 4	46.6	1	2968.8	17.07	69.717	948.5	292	0	0	10.0111	0	0	128.72	143.6	13605
5	Waiau 5	54.5	1	4661.9	23.59	112.662	1442.4	287	0	0	15.2241	0	0	127.68	135.13	12803
6	Waiau 6	53.5	1	4760.9	24.22	113.568	1483.3	343	0	0	15.6567	0	0	129.02	137.86	13061
7	Waiau 7	82.9	1	6171.6	39.2	284.854	3110.4	5	0	0	32.8307	0	0	114.28	115.25	10919
8	Waiau 8	86.1	1	7606.6	61.34	462.869	4835.5	6	0	0	51.0386	0	0	109.59	110.27	10447
9	Waiau 9	52.9	1	506.2	1.03	4.764	142.5	107	0	0	2.4319	0	0	506.31	510.52	29923
10	Waiau 10	49.9	1	994.2	1.88	8.206	256.5	182	0	0	4.3768	0	0	529.21	533.37	31263
11	Kahe 1	82.1	1	7552.3	53.52	385.137	3988.7	2	0	0	42.1009	0	0	108.97	109.31	10357
12	Kahe 2	82.1	1	8011.7	64.06	460.966	4683.7	4	0	0	49.4363	0	0	106.84	107.24	10161
13	Kahe 3	86.1	1	6143	57.84	436.507	4303.9	4	0	0	45.4278	0	0	103.54	104.07	9860
14	Kahe 4	85.3	1	7876.1	72.01	538.349	5455.5	5	0	0	57.5824	0	0	106.46	106.96	10134
15	Kahe 5	134.3	1	7903.2	78.56	924.73	9064.9	4	0	0	95.6796	0	0	103.25	103.47	9803
16	Kahe 6	134.4	1	8137.4	60.98	718.328	7395.1	4	0	0	78.0552	0	0	108.13	108.66	10295
17	Kala CC	90	1	6694.8	75.93	598.992	5154.2	92	0	0	58.0685	0	0	96.94	96.94	8605
18	Kala CC	90	1	8398.7	94.91	748.704	6450.1	5	0	0	72.668	0	0	97.06	97.06	8615
19	AES	180	1	8673.8	97.61	1539.908	26703.1	2	0	0	42.7959	0	0	27.79	27.79	17341
20	HPOWER	46	1	8758.3	83.69	337.437	2855.3	1	0	0	0	0	0	0	0	8462
21	Kala CC	28	1	6696	58.08	142.546	1231.8	92	0	0	13.8776	0	0	97.35	97.35	8641
23	DG Sub	29.5	1	782.8	8.93	21.84	22.5	261	0	0	0.4016	0	0	18.39	18.39	1032
43	RIDERI	5	1	387.4	0.8	0.35	86.6	85	0	0	0	0	0	0	0.02	247344
	System					8106.679	92165	2521	0	0	715.4932	0	0	87.42	88.26	11369

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 4
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Fiscal Year: 2007

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
--	---	---	---	---	---	---	---
2	Non-Firm	CONSTANT PI	5.881	0.3814	0	0.3814	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 5
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Fiscal Year: 2007

Fuel Type Summary

	Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
-	---	---	---	---	---	---	---	---	---
S	pot:								
1	WLSFO	1098.622	2025.468	Bbl	12557.9	132.5486	120.65	11431	1055.5
2	KLSFO	3464.017	5627.697	Bbl	34891.7	368.2821	106.32	10073	1055.5
3	HLSFO	141.292	292.332	Bbl	1812.5	20.0421	141.85	12828	1105.8
4	DG SUB	21.84	3.847	Bbl	22.5	0.4016	18.39	1032	1781.3
5	DIESEL	12.97	68.102	Bbl	399.1	6.8087	524.98	30771	1706.1
7	AES	1539.908	26703.08	Bbl	26703.1	42.7959	27.79	17341	160.27
8	KALAELOA	1490.243	2139.349	Bbl	12836.1	144.614	97.04	8613	1126.62
10	REFUSE	337.437	460.528	Bbl	2855.3	0	0	8462	0
11	LDMGMT	0.35	86.59	Bbl	86.6	0	0.02	247344	0.01

Fuel Class Summary

	Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
-	---	---	---	---	---	---	---	---	---
1	LSFO	4703.931	7945.497	Bbl	49262.1	520.8729	110.73	10473	1057.4
2	DIESEL	12.97	68.102	Bbl	399.1	6.8087	524.98	30771	1706.1
4	AES	1539.908	26703.08	Bbl	26703.1	42.7959	27.79	17341	160.3
5	KALAELOA	1490.243	2139.349	Bbl	12836.1	144.614	97.04	8613	1126.6
7	REFUSE	337.437	460.528	Bbl	2855.3	0	0	8462	0
8	LdMgmt	0.35	86.59	Bbl	86.6	0	0.02	247344	0
9	DG SUB	21.84	3.847	Bbl	22.5	0.4016	18.39	1032	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 6
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Fiscal Year: 2007

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	8113.13			Therml Gen	8106.68	715.4931	88.26
				Hydro Gen:	0	0	0
P-S Pumping:	0			P-S Gen:	0	0	0
P-S Payback:	0						
F. E. Sale:	0	0	0	F. E. Purc:	5.88	0.3814	64.86
Econ. Sale:	0	0	0	Econ. Purc:	0	0	0
Unit Sale:	0	0	0				
Transm Loss:	0			Rej. Fuel:		0	
Dsm Load:	0			Dsm Reduct	0		
				Emerg Purc	0	0	0
Dumped Engy:	0	0	0	E.U. Energy	0.53	0.0535	100
				Lvl Cost:		0	
Total:	8113.13	0	0	Total:	8113.09	715.928	88.24
				System Net:		715.928	88.24
				LOLH(hr):	12		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 7
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Fiscal Year: 2007

Plant Summary

Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1 Kahe	65.4	3464.017	34891.7	23	0	368.2821	0	106.32
2 Waiau	26.8	1111.592	12957	1431	0	139.3573	0	125.37
3 Kalaeloa	81.8	1490.243	12836.1	189	0	144.614	0	97.04
4 AES	97.7	1539.908	26703.1	2	0	42.7959	0	27.79
5 HPOWER	83.7	337.4367	2855.3	1	0	0	0	0
6 Honolulu	15	141.2923	1812.5	529	0	20.0421	0	141.85
7	0.8	0.3501	86.6	85	0	0	0	0.02
9 DG Sub	8.9	21.8404	22.5	261	0	0.4016	0	18.39

Fiscal Year: 2007

Yearly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
223.9308	348.257416	143.306534	715.4947

Study Period: 2007/Jan - 2007/Dec
Total Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
223.930756	348.257416	143.306534	715.49469(

System Study Summary - Part 1

Yr	Mn	Skip	Mrg Cst flag	Mrg Cst MW	Hydro MW	Monte Carlo	Dsp flag	Ld Band %	Ld Band MW	S. R. %	S. R. MW	# of Wkdays	Weekday On-pk 1st hr	Weekday On-pk Last hr	Weekend On-pk 1st hr	Weekend On-pk Last hr
2007	1	0	-1	10.0	10.0	2		0.0	0.0	0.0	0.0	7	7	20	1	24

System Study Summary - Part 2

Yr	Mn	EUE Cost	EUE Cost esc	Dump Cost	Dump Cost esc	NOx Cost	SOx Cost	CO2 Cost	ROG Cost	POL Cost	Min Resv	Max Resv	Dscn Rate	Base Year
2007	1	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				

Report Control Summary

Yr	Mn	Fiscal Yr Last Mn	Rpt Prd	Yrly Rpt	Stat Rpt	Plant Rpt	Area Rpt	PS Rpt	Cmt/Dsp Diag	Hrly Graph	Wkly Graph	Mnth Graph	Yrly Graph	ALLOC	Capital Expnd	PGEM Opt
2007	1	12	2	0	1	1	0	0	1	1		1	1	0	0	

Report Control Summary - HECO specific

Yr	Mn	MWh or KWh
2007	1	0

Area Summary

Yr	Mn	Id	Name	S.R. %	S.R. MW	Ld Adj %	Ld Adj MW	Emg Tie Cap	Emg Tie Cost	Emg Tie Cost esc	Imp Tie	Exp Tie	Min Gen
2007	1	1	heco	0.0	0.0	0.0	0.0	0.0	0.00	0.0			

Plant Summary

Yr	Mn	Id	Name
2007	1	1	Kahe
2007	1	2	Waiau
2007	1	3	Kalaeloa
2007	1	4	AES
2007	1	5	HPOWER
2007	1	6	Honolulu
2007	1	8	NewSite1
2007	1	9	DG Sub

Plant Summary - HECO specific

Yr	Mn	Id	Name	NOx Cost	SOx Cost	CO2 Cost	ROG Cost	Other Cost
2007	1	1	Kahe	0.00	0.00	0.00	0.00	0.00
2007	1	2	Waiau	0.00	0.00	0.00	0.00	0.00
2007	1	3	Kalaeloa	0.00	0.00	0.00	0.00	0.00
2007	1	4	AES	0.00	0.00	0.00	0.00	0.00
2007	1	5	HPOWER	0.00	0.00	0.00	0.00	0.00
2007	1	6	Honolulu	0.00	0.00	0.00	0.00	0.00
2007	1	8	NewSite1	0.00	0.00	0.00	0.00	0.00
2007	1	9	DG Sub	0.00	0.00	0.00	0.00	0.00

Fuel Class Summary

Yr	Mn	Id	Name	Unit
2007	1	1	LSFO	1 BBL
2007	1	2	DIESEL	1 BBL
2007	1	3	HECOCOAL	3 TON
2007	1	4	AES	1 BBL
2007	1	5	KALAELOA	1 BBL
2007	1	6	NAPHTHA	1 BBL
2007	1	7	REFUSE	1 BBL
2007	1	8	LdMgmt	1 BBL
2007	1	9	DG SUB	1 BBL

Spot Fuel Summary

Yr	Mn	Id	Name	Class	Fuel Cost	Repl Cost	Cost Esc	Heat Content	SOx	CO2	ROG	Other
2007	1	1	WLSFO	1 LSFO	1055.5	0.0	0.0	6.20	0.0000	0.0000	0.0000	0.0000
2007	7	1	WLSFO	1 LSFO	1055.5	0.0	0.0	6.20	0.0000	0.0000	0.0000	0.0000
2007	1	2	KLSFO	1 LSFO	1055.5	0.0	0.0	6.20	0.0000	0.0000	0.0000	0.0000
2007	7	2	KLSFO	1 LSFO	1055.5	0.0	0.0	6.20	0.0000	0.0000	0.0000	0.0000
2007	1	3	HLSFO	1 LSFO	1105.8	0.0	0.0	6.20	0.0000	0.0000	0.0000	0.0000
2007	7	3	HLSFO	1 LSFO	1105.8	0.0	0.0	6.20	0.0000	0.0000	0.0000	0.0000
2007	1	4	DG SUB	9 DG SUB	1781.3	0.0	0.0	5.86	0.0000	0.0000	0.0000	0.0000
2007	7	4	DG SUB	9 DG SUB	1781.3	0.0	0.0	5.86	0.0000	0.0000	0.0000	0.0000
2007	1	5	DIESEL	2 DIESEL	1706.1	0.0	0.0	5.86	0.0000	0.0000	0.0000	0.0000
2007	7	5	DIESEL	2 DIESEL	1706.1	0.0	0.0	5.86	0.0000	0.0000	0.0000	0.0000
2007	1	6	HECOCOAL	3 HECOCOAL	180.0	0.0	0.0	21.60	0.0000	0.0000	0.0000	0.0000
2007	7	6	HECOCOAL	3 HECOCOAL	180.0	0.0	0.0	21.60	0.0000	0.0000	0.0000	0.0000
2007	1	7	AES	4 AES	159.4	0.0	0.0	1.00	0.0000	0.0000	0.0000	0.0000
2007	7	7	AES	4 AES	161.1	0.0	0.0	1.00	0.0000	0.0000	0.0000	0.0000
2007	1	8	KALAELOA	5 KALAELOA	1126.6	0.0	0.0	6.00	0.0000	0.0000	0.0000	0.0000
2007	7	8	KALAELOA	5 KALAELOA	1126.6	0.0	0.0	6.00	0.0000	0.0000	0.0000	0.0000
2007	1	9	NAPHTHA	6 NAPHTHA	400.0	0.0	0.0	5.01	0.0000	0.0000	0.0000	0.0000
2007	7	9	NAPHTHA	6 NAPHTHA	400.0	0.0	0.0	5.01	0.0000	0.0000	0.0000	0.0000
2007	1	10	REFUSE	7 REFUSE	0.0	0.0	0.0	6.20	0.0000	0.0000	0.0000	0.0000
2007	1	11	LDMGMT	8 LdMgmt	0.0	99999.0	0.0	1.00	0.0000	0.0000	0.0000	0.0000

Thermal Basic Summary

Yr	Mn	Id	Name	Area	Plant	# Unit	Hr Cap	Brnh	Firm	Op Type	Qck Strt	FE Der	EnLm SR	Min Dn	Min Up	Ramp Rate	Owner	SR Contrb	VOM Cmt	Ems Cmt	VOM Dsp	Ems Dsp	SOx	Scrub Eff
2007	1	1	Honolu 8	1 heco	6 Honolulu	1	0	0	0	3	0	0		3	3	9999	100.0	100.0	1	0	1	0		0.0
2007	1	2	Honolu 9	1 heco	6 Honolulu	1	0	0	0	3	0	0		3	3	9999	100.0	100.0	1	0	1	0		0.0
2007	1	3	Waiau 3	1 heco	2 Waiau	1	0	0	0	3	0	0		3	3	9999	100.0	100.0	1	0	1	0		0.0
2007	1	4	Waiau 4	1 heco	2 Waiau	1	0	0	0	3	0	0		3	3	9999	100.0	100.0	1	0	1	0		0.0
2007	1	5	Waiau 5	1 heco	2 Waiau	1	0	0	0	3	0	0		3	3	9999	100.0	100.0	1	0	1	0		0.0
2007	1	6	Waiau 6	1 heco	2 Waiau	1	0	0	0	3	0	0		3	3	9999	100.0	100.0	1	0	1	0		0.0
2007	1	7	Waiau 7	1 heco	2 Waiau	1	0	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	8	Waiau 8	1 heco	2 Waiau	1	0	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	9	Waiau 9	1 heco	2 Waiau	1	0	0	0	5	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	10	Waiau 10	1 heco	2 Waiau	1	0	0	0	5	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	11	Kahe 1	1 heco	1 Kahe	1	0	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	12	Kahe 2	1 heco	1 Kahe	1	0	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	13	Kahe 3	1 heco	1 Kahe	1	0	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	14	Kahe 4	1 heco	1 Kahe	1	0	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	15	Kahe 5	1 heco	1 Kahe	1	0	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	16	Kahe 6	1 heco	1 Kahe	1	0	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	17	Kala CC	1 heco	3 Kalaeloa	1	-2	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	18	Kala CC	1 heco	3 Kalaeloa	1	-3	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	19	AES	1 heco	4 AES	1	-5	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	20	HPOWER	1 heco	5 HPOWER	1	-1	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	21	Kala CC	1 heco	3 Kalaeloa	1	-4	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	23	DG Sub	1 heco	9 DG Sub	1	-6	0	0	1	0	0		1	1	9999	100.0	100.0	1	0	1	0		0.0
2007	1	43	RIDERI	1 heco	7	1	0	0	0	5	0	0		0	0	9999	100.0	100.0	1	0	1	0		0.0

Thermal Cost and Variable Summary

Yr	Mn	Id	Name	Spot Fuel	StUp Fuel	Startup Fl Req	Startup Cost	VOM Cost	VOM Esc	FOM Cost	FOM Esc	Capital Cost	Eng Lmt Fuel	VOM Flg	Commit Pnlt	Dsptch Pnlt	Transm Loss	SU Cst Fctr	Hrly VOM
2007	1	1	Honolu 8	3 HLSFO	3 HLSFO	190.	0.	0.00	0.0	0.	0.0	0.00		0	0.99700	0.99700	1.00000	0.00	0.00
2007	1	2	Honolu 9	3 HLSFO	3 HLSFO	190.	0.	0.00	0.0	0.	0.0	0.00		0	0.99700	0.99700	1.00000	0.00	0.00
2007	1	3	Waiau 3	1 WLSFO	1 WLSFO	337.	0.	0.00	0.0	0.	0.0	0.00		0	1.00600	1.00600	1.00000	0.00	0.00
2007	1	4	Waiau 4	1 WLSFO	1 WLSFO	337.	0.	0.00	0.0	0.	0.0	0.00		0	1.00600	1.00600	1.00000	0.00	0.00
2007	1	5	Waiau 5	1 WLSFO	1 WLSFO	277.	0.	0.00	0.0	0.	0.0	0.00		0	1.01200	1.01200	1.00000	0.00	0.00
2007	1	6	Waiau 6	1 WLSFO	1 WLSFO	277.	0.	0.00	0.0	0.	0.0	0.00		0	1.01200	1.01200	1.00000	0.00	0.00
2007	1	7	Waiau 7	1 WLSFO	1 WLSFO	5044.	0.	0.00	0.0	0.	0.0	0.00		0	1.01200	1.01200	1.00000	0.00	0.00
2007	1	8	Waiau 8	1 WLSFO	1 WLSFO	5044.	0.	0.00	0.0	0.	0.0	0.00		0	1.01200	1.01200	1.00000	0.00	0.00
2007	1	9	Waiau 9	5 DIESEL	5 DIESEL	11.	0.	0.00	0.0	0.	0.0	0.00		0	1.01200	1.01200	1.00000	0.00	0.00
2007	1	10	Waiau 10	5 DIESEL	5 DIESEL	11.	0.	0.00	0.0	0.	0.0	0.00		0	1.01200	1.01200	1.00000	0.00	0.00
2007	1	11	Kahe 1	2 KLSFO	2 KLSFO	5044.	0.	0.00	0.0	0.	0.0	0.00		0	1.02600	1.02600	1.00000	0.00	0.00
2007	1	12	Kahe 2	2 KLSFO	2 KLSFO	5044.	0.	0.00	0.0	0.	0.0	0.00		0	1.02600	1.02600	1.00000	0.00	0.00
2007	1	13	Kahe 3	2 KLSFO	2 KLSFO	5044.	0.	0.00	0.0	0.	0.0	0.00		0	1.02600	1.02600	1.00000	0.00	0.00
2007	1	14	Kahe 4	2 KLSFO	2 KLSFO	5044.	0.	0.00	0.0	0.	0.0	0.00		0	1.02600	1.02600	1.00000	0.00	0.00
2007	1	15	Kahe 5	2 KLSFO	2 KLSFO	4586.	0.	0.00	0.0	0.	0.0	0.00		0	1.02600	1.02600	1.00000	0.00	0.00
2007	1	16	Kahe 6	2 KLSFO	2 KLSFO	9274.	0.	0.00	0.0	0.	0.0	0.00		0	1.02600	1.02600	1.00000	0.00	0.00
2007	1	17	Kala CC	8 KALAELOA	8 KALAELOA	0.	0.	0.00	0.0	0.	0.0	0.00		0	1.02900	1.02900	1.00000	0.00	0.00
2007	1	18	Kala CC	8 KALAELOA	8 KALAELOA	0.	0.	0.00	0.0	0.	0.0	0.00		0	1.02900	1.02900	1.00000	0.00	0.00
2007	1	19	AES	7 AES	7 AES	0.	0.	0.00	0.0	0.	0.0	0.00		0	1.02900	1.02900	1.00000	0.00	0.00
2007	1	20	HPOWER	10 REFUSE	10 REFUSE	0.	0.	0.00	0.0	0.	0.0	0.00		0	1.00000	1.00000	1.00000	0.00	0.00
2007	1	21	Kala CC	8 KALAELOA	8 KALAELOA	0.	0.	0.00	0.0	0.	0.0	0.00		0	1.02900	1.02900	1.00000	0.00	0.00
2007	1	23	DG Sub	4 DG SUB	4 DG SUB	0.	0.	0.00	0.0	0.	0.0	0.00		0	1.00000	1.00000	1.00000	0.00	0.00
2007	1	40		11 LDMGMT	11 LDMGMT	999.	0.	0.00	0.0	0.	0.0	0.00		0	1.00000	1.00000	1.00000	0.00	0.00
2007	1	41		11 LDMGMT	11 LDMGMT	999.	0.	0.00	0.0	0.	0.0	0.00		0	1.00000	1.00000	1.00000	0.00	0.00
2007	1	42		11 LDMGMT	11 LDMGMT	999.	0.	0.00	0.0	0.	0.0	0.00		0	1.00000	1.00000	1.00000	0.00	0.00
2007	1	43	RIDERI	11 LDMGMT	11 LDMGMT	999.	0.	0.00	0.0	0.	0.0	0.00		0	1.00000	1.00000	1.00000	0.00	0.00

Thermal Performance Summary

Yr	Mn	Id	Name		State 1	State 2	State 3	State 4	State 5	State 6	State 7	State 8	Avg @ Min	FOR	MOR
2007	1	1	Honolu 8	MW	22.3000000	32.7000000	43.1000000	53.4000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	36.4132000	10.3115000	0.0056800	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		11.30	0.0
2007	1	2	Honolu 9	MW	22.3000000	33.0000000	43.7000000	54.4000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	69.8920000	8.9484000	0.0220400	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		11.30	0.0
2007	1	3	Waiau 3	MW	22.3000000	30.4000000	38.5000000	46.6000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	146.5394000	4.8113000	0.0854400	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		11.30	0.0
2007	1	4	Waiau 4	MW	22.3000000	30.4000000	38.5000000	46.6000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	49.4604000	9.3112000	0.0320300	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		11.30	0.0
2007	1	5	Waiau 5	MW	22.5000000	33.2000000	43.9000000	54.5000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	61.0595000	8.8137000	0.0298100	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		2.60	0.0
2007	1	6	Waiau 6	MW	22.5000000	32.8000000	43.1000000	53.5000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	64.1104000	8.7407000	0.0319900	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		2.60	0.0
2007	1	7	Waiau 7	MW	32.6000000	49.4000000	66.2000000	82.9000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	88.2107000	7.9405000	0.0196100	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		6.60	0.0
2007	1	8	Waiau 8	MW	32.8000000	50.6000000	68.4000000	86.1000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	86.8712000	8.0919000	0.0131500	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		6.60	0.0
2007	1	9	Waiau 9	MW	5.9000000	21.0000000	36.9000000	52.9000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	198.6939000	7.8497000	0.0292200	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		12.70	0.0
2007	1	10	Waiau 10	MW	5.9000000	19.9000000	34.9000000	49.9000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	191.3958000	7.2757000	0.0285100	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		12.70	0.0
2007	1	11	Kahe 1	MW	32.5000000	49.0000000	65.5000000	82.1000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	73.4991000	8.1733000	0.0129200	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		3.20	0.0
2007	1	12	Kahe 2	MW	32.7000000	49.2000000	65.7000000	82.1000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	46.0037000	9.0952000	0.0035000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		3.20	0.0
2007	1	13	Kahe 3	MW	32.3000000	50.2000000	68.1000000	86.1000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	57.4864000	8.5169000	0.0063400	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		6.60	0.0
2007	1	14	Kahe 4	MW	32.3000000	50.0000000	67.7000000	85.3000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	75.5539000	8.4394000	0.0073900	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		6.60	0.0
2007	1	15	Kahe 5	MW	50.7000000	78.6000000	106.5000000	134.3000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	89.3444000	8.6434000	0.0030500	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		4.60	0.0
2007	1	16	Kahe 6	MW	50.0000000	78.1000000	106.2000000	134.4000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	117.0609000	8.1819000	0.0076900	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		4.00	0.0

Thermal Performance Summary

Yr	Mn	Id	Name		State 1	State 2	State 3	State 4	State 5	State 6	State 7	State 8	Avg @ Min	FOR	MOR
2007	1	17	Kala CC	MW	32.5000000	51.6700000	70.8333360	90.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	299.0260000	4.4287730	0.0093080	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		1.50	0.0
2007	1	18	Kala CC	MW	32.5000000	51.6700000	70.8333360	90.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	299.0260000	4.4287730	0.0093080	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		1.50	0.0
2007	1	19	AES	MW	63.0000000	102.0000000	141.0000000	180.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	258.7479000	14.9713000	0.0051019	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		1.00	0.0
2007	1	20	HPOWER	MW	25.0000000	32.0000000	39.0000000	46.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	10.0000000	8.2000000	0.0001000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		0.00	0.0
2007	1	21	Kala CC	MW	0.1000000	9.3000000	18.7000000	28.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	0.0100000	8.6408020	0.0000010	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		1.50	0.0
2007	1	23	DG Sub	MW	0.1000000	8.2000000	16.4000000	24.6000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	1.0000000	0.0000001	0.0000001	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		0.00	0.0
2007	5	23	DG Sub	MW	0.1000000	9.8400000	19.6800000	29.5200000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	1.0000000	0.0000001	0.0000001	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		0.00	0.0
2007	1	43	RIDERI	MW	0.1000000	1.7000000	3.3000000	5.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				I/O Coeff	2.0000000	2.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000			
				Availability	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000		0.00	0.0

Thermal Maintenance Summary

Id	Name	Year	Month	Day	# of Days
1	Honolu 8	2007	4	15	13
1	Honolu 8	2007	11	30	32
2	Honolu 9	2007	1	1	12
2	Honolu 9	2007	11	4	13
3	Waiau 3	2007	4	1	13
4	Waiau 4	2007	6	17	13
5	Waiau 5	2007	9	16	62
6	Waiau 6	2007	8	12	13
7	Waiau 7	2007	2	24	70
7	Waiau 7	2007	12	9	20
8	Waiau 8	2007	1	14	13
8	Waiau 8	2007	11	25	13
9	Waiau 9	2007	5	6	34
11	Kahe 1	2007	1	1	40
12	Kahe 2	2007	3	11	20
13	Kahe 3	2007	6	9	91
14	Kahe 4	2007	10	20	14
15	Kahe 5	2007	5	6	20
16	Kahe 6	2007	5	27	12

Fixed Energy Transaction Summary

Yr	Mn	Id	Name	Type	Area	Firm	Min Cap	Max Cap	Energy	Energy Cost	Energy Cst Esc	Capcty Cost	Capcty Cst Esc	Pk Def	# of Wkdays	Weekday On-pk 1st hr	Weekday On-pk Last hr	Weekend On-pk 1st hr	Weekend On-pk Last hr
2007	1	1	UtilCHP	6 Constant Purchase	1 heco	1	0.00	0.00	0.000	15.06	0.0	0.0	0.0	0					
2007	7	1	UtilCHP	6 Constant Purchase	1 heco	1	0.00	0.00	0.000	15.06	0.0	0.0	0.0	0					
2007	1	2	Non-Firm	6 Constant Purchase	1 heco	1	0.67	0.67	0.000	64.74	0.0	0.0	0.0	0					

Hawaiian Electric Company, Inc.

TEST YEAR 2007
Direct Testimony

Hourly Load Profile Input File - H07TYD2.EEI

Please refer to electronic file provided with HECO's response to CA-IR-214.
The file provides 8760 hours of test year load data and can be viewed with a text editor.

Hawaiian Electric Company, Inc.

TEST YEAR 2007
Direct Testimony

QLPU Input File - H07TYD1.QLP

Unit ID	Unit Loading Point (MW)										QLPU Capability (MW)									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
1	18	23	28	33	38	42	47	52			21	19	16	15	11	8	4	0	0	
2	19	23	28	33	38	43	48	52	57		27	23	19	16	13	9	5	2	0	
3	18	23	28	33	38	42	47	52			24	20	15	12	8	4	1	0		
4	18	23	28	33	38	43	47	52			24	20	15	12	8	4	1	0		
5	19	24	28	33	38	43	48	53	58		24	20	17	15	11	8	4	2	0	
6	19	23	28	33	38	43	48	53	58		24	20	18	15	11	8	4	1	0	
7	23	47	52	57	62	67	72	76	81	86	27	18	16	13	11	8	5	2	1	0
8	23	47	52	57	62	67	72	76	81	86	27	18	16	13	11	8	5	2	1	0
9	5	10	15	20	25	30	35	40	45	50	40	35	31	27	23	18	13	8	1	0
10	5	10	15	20	25	30	35	40	45	50	40	35	31	27	23	18	13	8	1	0
11	23	28	52	57	62	67	72	76	81	86	32	30	16	13	11	8	5	3	1	0
12	23	28	52	57	62	67	72	77	81	86	32	30	16	13	11	8	5	3	1	0
13	23	28	38	42	47	67	72	77	81	86	32	27	21	19	17	9	5	3	1	0
14	23	28	38	42	47	67	72	77	81	86	32	27	21	19	17	9	5	3	1	0
15	50	55	65	75	84	94	104	113	123	134	49	47	41	35	29	23	17	12	6	0
16	41	55	65	75	84	94	104	113	123	134	52	44	38	32	26	20	15	9	3	0
17	33	93									34	0								
18	33	93									34	0								
19	63	180									0	0								
20	10	20	30	46							0	0	0	0						

Hawaiian Electric Company, Inc.

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Direct Testimony

Spinning Reserve Input File - H07TYD1.SPN

Year	Month	Day of Week Monday = 1	Starting Hour	MW
2007	1	1	1	180
2007	1	1	2	180
2007	1	1	3	180
2007	1	1	4	180
2007	1	1	5	180
2007	1	1	6	180
2007	1	1	7	180
2007	1	1	8	180
2007	1	1	9	180
2007	1	1	10	180
2007	1	1	11	180
2007	1	1	12	180
2007	1	1	13	180
2007	1	1	14	180
2007	1	1	15	180
2007	1	1	16	180
2007	1	1	17	180
2007	1	1	18	180
2007	1	1	19	180
2007	1	1	20	180
2007	1	1	21	180
2007	1	1	22	180
2007	1	1	23	180
2007	1	1	24	180
2007	1	2	1	180
2007	1	2	2	180
2007	1	2	3	180
2007	1	2	4	180
2007	1	2	5	180
2007	1	2	6	180
2007	1	2	7	180
2007	1	2	8	180
2007	1	2	9	180
2007	1	2	10	180
2007	1	2	11	180
2007	1	2	12	180
2007	1	2	13	180
2007	1	2	14	180
2007	1	2	15	180

Year	Month	Day of Week Monday = 1	Starting Hour	MW
2007	1	2	16	180
2007	1	2	17	180
2007	1	2	18	180
2007	1	2	19	180
2007	1	2	20	180
2007	1	2	21	180
2007	1	2	22	180
2007	1	2	23	180
2007	1	2	24	180
2007	1	3	1	180
2007	1	3	2	180
2007	1	3	3	180
2007	1	3	4	180
2007	1	3	5	180
2007	1	3	6	180
2007	1	3	7	180
2007	1	3	8	180
2007	1	3	9	180
2007	1	3	10	180
2007	1	3	11	180
2007	1	3	12	180
2007	1	3	13	180
2007	1	3	14	180
2007	1	3	15	180
2007	1	3	16	180
2007	1	3	17	180
2007	1	3	18	180
2007	1	3	19	180
2007	1	3	20	180
2007	1	3	21	180
2007	1	3	22	180
2007	1	3	23	180
2007	1	3	24	180
2007	1	4	1	180
2007	1	4	2	180
2007	1	4	3	180
2007	1	4	4	180
2007	1	4	5	180
2007	1	4	6	180

Hawaiian Electric Company, Inc.

TEST YEAR 2007
Direct Testimony

Spinning Reserve Input File - H07TYD1.SPN

Year	Month	Day of Week Monday = 1	Starting Hour	MW
2007	1	4	7	180
2007	1	4	8	180
2007	1	4	9	180
2007	1	4	10	180
2007	1	4	11	180
2007	1	4	12	180
2007	1	4	13	180
2007	1	4	14	180
2007	1	4	15	180
2007	1	4	16	180
2007	1	4	17	180
2007	1	4	18	180
2007	1	4	19	180
2007	1	4	20	180
2007	1	4	21	180
2007	1	4	22	180
2007	1	4	23	180
2007	1	4	24	180
2007	1	5	1	180
2007	1	5	2	180
2007	1	5	3	180
2007	1	5	4	180
2007	1	5	5	180
2007	1	5	6	180
2007	1	5	7	180
2007	1	5	8	180
2007	1	5	9	180
2007	1	5	10	180
2007	1	5	11	180
2007	1	5	12	180
2007	1	5	13	180
2007	1	5	14	180
2007	1	5	15	180
2007	1	5	16	180
2007	1	5	17	180
2007	1	5	18	180
2007	1	5	19	180
2007	1	5	20	180
2007	1	5	21	180

Year	Month	Day of Week Monday = 1	Starting Hour	MW
2007	1	5	22	180
2007	1	5	23	180
2007	1	5	24	180
2007	1	6	1	180
2007	1	6	2	180
2007	1	6	3	180
2007	1	6	4	180
2007	1	6	5	180
2007	1	6	6	180
2007	1	6	7	180
2007	1	6	8	180
2007	1	6	9	180
2007	1	6	10	180
2007	1	6	11	180
2007	1	6	12	180
2007	1	6	13	180
2007	1	6	14	180
2007	1	6	15	180
2007	1	6	16	180
2007	1	6	17	180
2007	1	6	18	180
2007	1	6	19	180
2007	1	6	20	180
2007	1	6	21	180
2007	1	6	22	180
2007	1	6	23	180
2007	1	6	24	180
2007	1	7	1	180
2007	1	7	2	180
2007	1	7	3	180
2007	1	7	4	180
2007	1	7	5	180
2007	1	7	6	180
2007	1	7	7	180
2007	1	7	8	180
2007	1	7	9	180
2007	1	7	10	180
2007	1	7	11	180
2007	1	7	12	180

Hawaiian Electric Company, Inc.

TEST YEAR 2007
Direct Testimony

Spinning Reserve Input File - H07TYD1.SPN

Year	Month	Day of Week Monday = 1	Starting Hour	MW
2007	1	7	13	180
2007	1	7	14	180
2007	1	7	15	180
2007	1	7	16	180
2007	1	7	17	180
2007	1	7	18	180
2007	1	7	19	180
2007	1	7	20	180
2007	1	7	21	180
2007	1	7	22	180
2007	1	7	23	180
2007	1	7	24	180

Pattern 1

Year	Month	Day of Month	Hour	Capacity Multiplier	VOM Multiplier
2007	1	1	0	0.87	1
2007	1	20	0	0.5	1
2007	2	1	0	0.5	1
2007	2	5	0	0.87	1
2007	3	1	0	0.87	1
2007	4	1	0	0.87	1
2007	5	1	0	0.87	1
2007	6	1	0	0.87	1
2007	7	1	0	0.87	1
2007	7	14	0	0.5	1
2007	7	30	0	0.87	1
2007	8	1	0	0.87	1
2007	9	1	0	0.87	1
2007	10	1	0	0.87	1
2007	11	1	0	0.87	1
2007	12	1	0	0.87	1

Pattern 2

Year	Month	Day of Week Monday = 1	Hour	Capacity Multiplier	VOM Multiplier
2007	1	1	0	1	1
2007	1	5	21	0	1
2007	1	6	9	1	1
2007	1	6	21	0	1
2007	1	7	9	1	1
2007	1	12	21	0	1
2007	1	13	9	1	1
2007	1	13	21	0	1
2007	1	14	9	1	1
2007	1	19	21	0	1
2007	1	20	9	1	1
2007	1	20	21	0	1
2007	1	21	9	1	1
2007	1	26	21	0	1
2007	1	27	9	1	1
2007	1	28	0	0	1
2007	2	1	0	0	1
2007	3	1	0	0	1
2007	3	4	9	1	1
2007	3	9	21	0	1
2007	3	10	9	1	1
2007	3	10	21	0	1
2007	3	11	9	1	1
2007	3	16	21	0	1
2007	3	17	9	1	1
2007	3	17	21	0	1
2007	3	18	9	1	1
2007	3	23	21	0	1
2007	3	24	9	1	1
2007	3	24	21	0	1
2007	3	25	9	1	1
2007	3	30	21	0	1
2007	3	31	9	1	1
2007	3	31	21	0	1
2007	4	1	0	0	1
2007	4	1	9	1	1
2007	4	6	21	0	1
2007	4	7	9	1	1
2007	4	7	21	0	1
2007	4	8	9	1	1
2007	4	13	21	0	1
2007	4	14	9	1	1
2007	4	14	21	0	1
2007	4	15	9	1	1
2007	4	20	21	0	1
2007	4	21	9	1	1
2007	4	21	21	0	1
2007	4	22	9	1	1
2007	4	27	21	0	1
2007	4	28	9	1	1
2007	4	28	21	0	1
2007	4	29	9	1	1
2007	5	1	0	1	1
2007	5	4	21	0	1
2007	5	5	9	1	1
2007	5	5	21	0	1
2007	5	6	9	1	1
2007	5	11	21	0	1
2007	5	12	9	1	1
2007	5	12	21	0	1
2007	5	13	9	1	1
2007	5	18	21	0	1
2007	5	19	9	1	1
2007	5	19	21	0	1
2007	5	20	9	1	1
2007	5	25	21	0	1
2007	5	26	9	1	1
2007	5	26	21	0	1
2007	5	27	9	1	1
2007	6	1	0	1	1
2007	6	1	21	0	1
2007	6	2	9	1	1
2007	6	2	21	0	1
2007	6	3	9	1	1
2007	6	8	21	0	1
2007	6	9	9	1	1
2007	6	9	21	0	1
2007	6	10	9	1	1
2007	6	15	21	0	1
2007	6	16	9	1	1
2007	6	16	21	0	1
2007	6	17	9	1	1
2007	6	22	21	0	1
2007	6	23	9	1	1
2007	6	23	21	0	1
2007	6	24	9	1	1
2007	6	29	21	0	1
2007	6	30	9	1	1
2007	6	30	21	0	1
2007	7	1	0	0	1
2007	7	1	9	1	1
2007	7	6	21	0	1
2007	7	7	9	1	1
2007	7	7	21	0	1
2007	7	8	9	1	1
2007	7	13	21	0	1
2007	7	14	9	1	1
2007	7	14	21	0	1
2007	7	15	9	1	1
2007	7	20	21	0	1
2007	7	21	9	1	1
2007	7	21	21	0	1
2007	7	22	9	1	1
2007	7	27	21	0	1
2007	7	28	9	1	1
2007	7	28	21	0	1
2007	7	29	9	1	1
2007	8	1	0	1	1
2007	8	3	21	0	1
2007	8	4	9	1	1
2007	8	4	21	0	1
2007	8	5	9	1	1
2007	8	10	21	0	1
2007	8	11	9	1	1
2007	8	11	21	0	1
2007	8	12	9	1	1
2007	8	17	21	0	1
2007	8	18	9	1	1
2007	8	18	21	0	1
2007	8	19	9	1	1
2007	8	24	21	0	1
2007	8	25	9	1	1
2007	8	25	21	0	1
2007	8	26	9	1	1
2007	8	31	21	0	1
2007	9	1	0	0	1
2007	9	1	9	1	1
2007	9	1	21	0	1
2007	9	2	9	1	1
2007	9	7	21	0	1
2007	9	8	9	1	1
2007	9	8	21	0	1
2007	9	9	9	1	1
2007	9	14	21	0	1
2007	9	15	9	1	1
2007	9	15	21	0	1
2007	9	16	9	1	1
2007	9	22	0	0	1
2007	9	23	0	1	1
2007	9	29	0	0	1
2007	9	30	0	1	1
2007	10	1	0	1	1
2007	10	5	21	0	1
2007	10	6	9	1	1
2007	10	6	21	0	1
2007	10	7	9	1	1
2007	10	12	21	0	1
2007	10	13	9	1	1
2007	10	13	21	0	1
2007	10	14	9	1	1
2007	10	19	21	0	1
2007	10	20	9	1	1
2007	10	20	21	0	1
2007	10	21	9	1	1
2007	10	26	21	0	1
2007	10	27	9	1	1
2007	10	27	21	0	1
2007	10	28	9	1	1
2007	11	1	0	1	1
2007	11	2	21	0	1
2007	11	3	9	1	1
2007	11	3	21	0	1
2007	11	4	9	1	1
2007	11	9	21	0	1
2007	11	10	9	1	1
2007	11	10	21	0	1
2007	11	11	9	1	1
2007	11	16	21	0	1
2007	11	17	9	1	1
2007	11	17	21	0	1
2007	11	18	9	1	1
2007	11	23	21	0	1
2007	11	24	9	1	1
2007	11	24	21	0	1
2007	11	25	9	1	1
2007	11	30	21	0	1
2007	12	1	0	0	1
2007	12	1	9	1	1
2007	12	1	21	0	1
2007	12	2	9	1	1
2007	12	7	21	0	1
2007	12	8	9	1	1
2007	12	8	21	0	1
2007	12	9	9	1	1
2007	12	14	21	0	1
2007	12	15	9	1	1
2007	12	15	21	0	1
2007	12	16	9	1	1
2007	12	21	21	0	1
2007	12	22	9	1	1
2007	12	22	21	0	1
2007	12	23	9	1	1
2007	12	28	21	0	1
2007	12	29	9	1	1
2007	12	29	21	0	1
2007	12	30	9	1	1

Pattern 3

Year	Month	Day of Month	Hour	Capacity Multiplier	VOM Multiplier
2007	1	1	0	1	1
2007	2	1	0	1	1
2007	2	2	21	0	1
2007	2	3	9	1	1
2007	2	14	0	0	1
2007	2	23	0	1	1
2007	3	1	0	1	1
2007	3	3	21	0	1
2007	3	4	0	1	1
2007	4	1	0	1	1
2007	5	1	0	1	1
2007	6	1	0	1	1
2007	7	1	0	1	1
2007	8	1	0	1	1
2007	9	1	0	1	1
2007	10	1	0	1	1
2007	11	1	0	1	1
2007	12	1	0	1	1

Pattern 4

Year	Month	Day of Week Monday = 1	Hour	Capacity Multiplier	VOM Multiplier
2007	1	1	0	1	1
2007	1	5	21	0	1
2007	1	6	9	1	1
2007	1	6	21	0	1
2007	1	7	9	1	1
2007	1	12	21	0	1
2007	1	13	9	1	1
2007	1	13	21	0	1
2007	1	14	9	1	1
2007	1	19	21	0	1
2007	1	20	9	1	1
2007	1	20	21	0	1
2007	1	21	9	1	1
2007	1	26	21	0	1
2007	1	27	9	1	1
2007	1	28	0	0	1
2007	2	1	0	0	1
2007	3	1	0	0	1
2007	3	4	9	1	1
2007	3	9	21	0	1
2007	3	10	9	1	1
2007	3	10	21	0	1
2007	3	11	9	1	1
2007	3	16	21	0	1
2007	3	17	9	1	1
2007	3	17	21	0	1
2007	3	18	9	1	1
2007	3	23	21	0	1
2007	3	24	9	1	1
2007	3	24	21	0	1
2007	3	25	9	1	1
2007	3	30	21	0	1
2007	3	31	9	1	1
2007	3	31	21	0	1
2007	4	1	0	0	1
2007	4	1	9	1	1
2007	4	6	21	0	1
2007	4	7	9	1	1
2007	4	7	21	0	1
2007	4	8	9	1	1
2007	4	13	21	0	1
2007	4	14	9	1	1
2007	4	14	21	0	1
2007	4	15	9	1	1
2007	4	20	21	0	1
2007	4	21	9	1	1
2007	4	21	21	0	1
2007	4	22	9	1	1
2007	4	27	21	0	1
2007	4	28	9	1	1
2007	4	28	21	0	1
2007	4	29	9	1	1
2007	5	1	0	1	1
2007	5	4	21	0	1
2007	5	5	9	1	1
2007	5	5	21	0	1
2007	5	6	9	1	1
2007	5	11	21	0	1
2007	5	12	9	1	1
2007	5	12	21	0	1
2007	5	13	9	1	1
2007	5	18	21	0	1
2007	5	19	9	1	1
2007	5	19	21	0	1
2007	5	20	9	1	1
2007	5	25	21	0	1
2007	5	26	9	1	1
2007	5	26	21	0	1
2007	5	27	9	1	1
2007	6	1	0	1	1
2007	6	1	21	0	1
2007	6	2	9	1	1
2007	6	2	21	0	1
2007	6	3	9	1	1
2007	6	8	21	0	1
2007	6	9	9	1	1
2007	6	9	21	0	1
2007	6	10	9	1	1
2007	6	15	21	0	1
2007	6	16	9	1	1
2007	6	16	21	0	1
2007	6	17	9	1	1
2007	6	22	21	0	1
2007	6	23	9	1	1
2007	6	23	21	0	1
2007	6	24	9	1	1
2007	6	29	21	0	1
2007	6	30	9	1	1
2007	6	30	21	0	1
2007	7	1	0	0	1
2007	7	1	9	1	1
2007	7	6	21	0	1
2007	7	7	9	1	1
2007	7	7	21	0	1
2007	7	8	9	1	1
2007	7	13	21	0	1
2007	7	14	9	1	1
2007	7	14	21	0	1
2007	7	15	9	1	1
2007	7	20	21	0	1
2007	7	21	9	1	1
2007	7	21	21	0	1
2007	7	22	9	1	1
2007	7	27	21	0	1
2007	7	28	9	1	1
2007	7	28	21	0	1
2007	7	29	9	1	1
2007	8	1	0	1	1
2007	8	3	21	0	1
2007	8	4	9	1	1
2007	8	4	21	0	1
2007	8	5	9	1	1
2007	8	10	21	0	1
2007	8	11	9	1	1
2007	8	11	21	0	1
2007	8	12	9	1	1
2007	8	17	21	0	1
2007	8	18	9	1	1
2007	8	18	21	0	1
2007	8	19	9	1	1
2007	8	24	21	0	1
2007	8	25	9	1	1
2007	8	25	21	0	1
2007	8	26	9	1	1
2007	8	31	21	0	1
2007	9	1	0	0	1
2007	9	1	9	1	1
2007	9	1	21	0	1
2007	9	2	9	1	1
2007	9	7	21	0	1
2007	9	8	9	1	1
2007	9	8	21	0	1
2007	9	9	9	1	1
2007	9	14	21	0	1
2007	9	15	9	1	1
2007	9	15	21	0	1
2007	9	16	9	1	1
2007	9	22	0	0	1
2007	9	23	0	1	1
2007	9	29	0	0	1
2007	9	30	0	1	1
2007	10	1	0	1	1
2007	10	5	21	0	1
2007	10	6	9	1	1
2007	10	6	21	0	1
2007	10	7	9	1	1
2007	10	12	21	0	1
2007	10	13	9	1	1
2007	10	13	21	0	1
2007	10	14	9	1	1
2007	10	19	21	0	1
2007	10	20	9	1	1
2007	10	20	21	0	1
2007	10	21	9	1	1
2007	10	26	21	0	1
2007	10	27	9	1	1
2007	10	27	21	0	1
2007	10	28	9	1	1
2007	11	1	0	1	1
2007	11	2	21	0	1
2007	11	3	9	1	1
2007	11	3	21	0	1
2007	11	4	9	1	1
2007	11	9	21	0	1
2007	11	10	9	1	1
2007	11	10	21	0	1
2007	11	11	9	1	1
2007	11	16	21	0	1
2007	11	17	9	1	1
2007	11	17	21	0	1
2007	11	18	9	1	1
2007	11	23	21	0	1
2007	11	24	9	1	1
2007	11	24	21	0	1
2007	11	25	9	1	1
2007	11	30	21	0	1
2007	12	1	0	0	1
2007	12	1	9	1	1
2007	12	1	21	0	1
2007	12	2	9	1	1
2007	12	7	21	0	1
2007	12	8	9	1	1
2007	12	8	21	0	1
2007	12	9	9	1	1
2007	12	14	21	0	1
2007	12	15	9	1	1
2007	12	15	21	0	1
2007	12	16	9	1	1
2007	12	21	21	0	1
2007	12	22	9	1	1
2007	12	22	21	0	1
2007	12	23	9	1	1
2007	12	28	21	0	1
2007	12	29	9	1	1
2007	12	29	21	0	1
2007	12	30	9	1	1

Pattern 5

Year	Month	Day of Month	Hour	Capacity Multiplier	VOM Multiplier
2007	1	1	0	1	1
2007	2	1	0	1	1
2007	3	1	0	1	1
2007	4	1	0	1	1
2007	5	1	0	1	1
2007	6	1	0	1	1
2007	7	1	0	1	1
2007	8	1	0	1	1
2007	9	1	0	1	1
2007	10	1	0	0.5	1
2007	10	11	0	1	1
2007	11	1	0	1	1
2007	12	1	0	1	1

Pattern 6

Year	Month	Day of Week Monday = 1	Hour	Capacity Multiplier	VOM Multiplier
2007	1	1	0	0	1
2007	1	1	11	1	1
2007	1	1	14	0	1
2007	1	2	0	0	1
2007	1	2	11	1	1
2007	1	2	14	0	1
2007	1	3	0	0	1
2007	1	3	11	1	1
2007	1	3	14	0	1
2007	1	4	0	0	1
2007	1	4	11	1	1
2007	1	4	14	0	1
2007	1	5	0	0	1
2007	1	5	11	1	1
2007	1	5	14	0	1
2007	1	6	0	0	1
2007	1	6	11	0	1
2007	1	6	14	0	1
2007	1	7	0	0	1
2007	1	7	11	0	1
2007	1	7	14	0	1
2007	1	8	0	0	1
2007	1	8	11	1	1
2007	1	8	14	0	1
2007	1	9	0	0	1
2007	1	9	11	1	1
2007	1	9	14	0	1
2007	1	10	0	0	1
2007	1	10	11	1	1
2007	1	10	14	0	1
2007	1	11	0	0	1
2007	1	11	11	1	1
2007	1	11	14	0	1
2007	1	12	0	0	1
2007	1	12	11	1	1
2007	1	12	14	0	1
2007	1	13	0	0	1
2007	1	13	11	0	1
2007	1	13	14	0	1
2007	1	14	0	0	1
2007	1	14	11	0	1
2007	1	14	14	0	1
2007	1	15	0	0	1
2007	1	15	11	1	1
2007	1	15	14	0	1
2007	1	16	0	0	1
2007	1	16	11	1	1
2007	1	16	14	0	1
2007	1	17	0	0	1
2007	1	17	11	1	1
2007	1	17	14	0	1
2007	1	18	0	0	1
2007	1	18	11	1	1
2007	1	18	14	0	1
2007	1	19	0	0	1
2007	1	19	11	1	1
2007	1	19	14	0	1
2007	1	20	0	0	1
2007	1	20	11	0	1
2007	1	20	14	0	1
2007	1	21	0	0	1
2007	1	21	11	0	1
2007	1	21	14	0	1
2007	1	22	0	0	1
2007	1	22	11	1	1
2007	1	22	14	0	1
2007	1	23	0	0	1
2007	1	23	11	1	1
2007	1	23	14	0	1
2007	1	24	0	0	1
2007	1	24	11	1	1
2007	1	24	14	0	1
2007	1	25	0	0	1
2007	1	25	11	1	1
2007	1	25	14	0	1
2007	1	26	0	0	1
2007	1	26	11	1	1
2007	1	26	14	0	1
2007	1	27	0	0	1
2007	1	27	11	0	1
2007	1	27	14	0	1
2007	1	28	0	0	1
2007	1	28	11	0	1
2007	1	28	14	0	1
2007	1	29	0	0	1
2007	1	29	11	1	1
2007	1	29	14	0	1
2007	1	30	0	0	1
2007	1	30	11	1	1
2007	1	30	14	0	1
2007	1	31	0	0	1
2007	1	31	11	1	1
2007	1	31	14	0	1
2007	2	1	0	0	1
2007	2	1	11	1	1
2007	2	1	14	0	1
2007	2	2	0	0	1
2007	2	2	11	1	1
2007	2	2	14	0	1
2007	2	3	0	0	1
2007	2	3	11	0	1
2007	2	3	14	0	1
2007	2	4	0	0	1
2007	2	4	11	0	1
2007	2	4	14	0	1
2007	2	5	0	0	1
2007	2	5	11	1	1
2007	2	5	14	0	1
2007	2	6	0	0	1
2007	2	6	11	1	1
2007	2	6	14	0	1
2007	2	7	0	0	1
2007	2	7	11	1	1
2007	2	7	14	0	1
2007	2	8	0	0	1
2007	2	8	11	1	1
2007	2	8	14	0	1
2007	2	9	0	0	1
2007	2	9	11	1	1
2007	2	9	14	0	1
2007	2	10	0	0	1
2007	2	10	11	0	1
2007	2	10	14	0	1
2007	2	11	0	0	1
2007	2	11	11	0	1
2007	2	11	14	0	1
2007	2	12	0	0	1
2007	2	12	11	1	1
2007	2	12	14	0	1
2007	2	13	0	0	1
2007	2	13	11	1	1
2007	2	13	14	0	1
2007	2	14	0	0	1
2007	2	14	11	1	1
2007	2	14	14	0	1
2007	2	15	0	0	1
2007	2	15	11	1	1
2007	2	15	14	0	1
2007	2	16	0	0	1
2007	2	16	11	1	1
2007	2	16	14	0	1
2007	2	17	0	0	1
2007	2	17	11	0	1
2007	2	17	14	0	1
2007	2	18	0	0	1
2007	2	18	11	0	1
2007	2	18	14	0	1
2007	2	19	0	0	1
2007	2	19	11	1	1
2007	2	19	14	0	1
2007	2	20	0	0	1
2007	2	20	11	1	1
2007	2	20	14	0	1
2007	2	21	0	0	1
2007	2	21	11	1	1
2007	2	21	14	0	1
2007	2	22	0	0	1
2007	2	22	11	1	1
2007	2	22	14	0	1
2007	2	23	0	0	1
2007	2	23	11	1	1
2007	2	23	14	0	1
2007	2	24	0	0	1
2007	2	24	11	0	1
2007	2	24	14	0	1
2007	2	25	0	0	1
2007	2	25	11	0	1
2007	2	25	14	0	1
2007	2	26	0	0	1
2007	2	26	11	1	1
2007	2	26	14	0	1
2007	2	27	0	0	1
2007	2	27	11	1	1
2007	2	27	14	0	1
2007	2	28	0	0	1
2007	2	28	11	1	1
2007	2	28	14	0	1
2007	3	1	0	0	1
2007	3	1	11	1	1
2007	3	1	14	0	1
2007	3	2	0	0	1
2007	3	2	11	1	1
2007	3	2	14	0	1
2007	3	3	0	0	1
2007	3	3	11	0	1
2007	3	3	14	0	1
2007	3	4	0	0	1
2007	3	4	11	0	1
2007	3	4	14	0	1
2007	3	5	0	0	1
2007	3	5	11	1	1
2007	3	5	14	0	1
2007	3	6	0	0	1
2007	3	6	11	1	1
2007	3	6	14	0	1
2007	3	7	0	0	1
2007	3	7	11	1	1
2007	3	7	14	0	1
2007	3	8	0	0	1
2007	3	8	11	1	1
2007	3	8	14	0	1
2007	3	9	0	0	1
2007	3	9	11	1	1
2007	3	9	14	0	1
2007	3	10	0	0	1
2007	3	10	11	0	1
2007	3	10	14	0	1

Pattern 6 (continued)

Year	Month	Day of Week Monday = 1	Hour	Capacity Multiplier	VOM Multiplier
2007	3	11	0	0	1
2007	3	11	11	0	1
2007	3	11	14	0	1
2007	3	12	0	0	1
2007	3	12	11	1	1
2007	3	12	14	0	1
2007	3	13	0	0	1
2007	3	13	11	1	1
2007	3	13	14	0	1
2007	3	14	0	0	1
2007	3	14	11	1	1
2007	3	14	14	0	1
2007	3	15	0	0	1
2007	3	15	11	1	1
2007	3	15	14	0	1
2007	3	16	0	0	1
2007	3	16	11	1	1
2007	3	16	14	0	1
2007	3	17	0	0	1
2007	3	17	11	0	1
2007	3	17	14	0	1
2007	3	18	0	0	1
2007	3	18	11	0	1
2007	3	18	14	0	1
2007	3	19	0	0	1
2007	3	19	11	1	1
2007	3	19	14	0	1
2007	3	20	0	0	1
2007	3	20	11	1	1
2007	3	20	14	0	1
2007	3	21	0	0	1
2007	3	21	11	1	1
2007	3	21	14	0	1
2007	3	22	0	0	1
2007	3	22	11	1	1
2007	3	22	14	0	1
2007	3	23	0	0	1
2007	3	23	11	1	1
2007	3	23	14	0	1
2007	3	24	0	0	1
2007	3	24	11	0	1
2007	3	24	14	0	1
2007	3	25	0	0	1
2007	3	25	11	0	1
2007	3	25	14	0	1
2007	3	26	0	0	1
2007	3	26	11	1	1
2007	3	26	14	0	1
2007	3	27	0	0	1
2007	3	27	11	1	1
2007	3	27	14	0	1
2007	3	28	0	0	1
2007	3	28	11	1	1
2007	3	28	14	0	1
2007	3	29	0	0	1
2007	3	29	11	1	1
2007	3	29	14	0	1
2007	3	30	0	0	1
2007	3	30	11	1	1
2007	3	30	14	0	1
2007	3	31	0	0	1
2007	3	31	11	0	1
2007	3	31	14	0	1
2007	4	1	0	0	1
2007	4	1	11	0	1
2007	4	1	14	0	1
2007	4	2	0	0	1
2007	4	2	11	1	1
2007	4	2	14	0	1
2007	4	3	0	0	1
2007	4	3	11	1	1
2007	4	3	14	0	1
2007	4	4	0	0	1
2007	4	4	11	1	1
2007	4	4	14	0	1
2007	4	5	0	0	1
2007	4	5	11	1	1
2007	4	5	14	0	1
2007	4	6	0	0	1
2007	4	6	11	1	1
2007	4	6	14	0	1
2007	4	7	0	0	1
2007	4	7	11	0	1
2007	4	7	14	0	1
2007	4	8	0	0	1
2007	4	8	11	0	1
2007	4	8	14	0	1
2007	4	9	0	0	1
2007	4	9	11	1	1
2007	4	9	14	0	1
2007	4	10	0	0	1
2007	4	10	11	1	1
2007	4	10	14	0	1
2007	4	11	0	0	1
2007	4	11	11	1	1
2007	4	11	14	0	1
2007	4	12	0	0	1
2007	4	12	11	1	1
2007	4	12	14	0	1
2007	4	13	0	0	1
2007	4	13	11	1	1
2007	4	13	14	0	1
2007	4	14	0	0	1
2007	4	14	11	0	1
2007	4	14	14	0	1
2007	4	15	0	0	1
2007	4	15	11	0	1
2007	4	15	14	0	1
2007	4	16	0	0	1
2007	4	16	11	1	1
2007	4	16	14	0	1
2007	4	17	0	0	1
2007	4	17	11	1	1
2007	4	17	14	0	1
2007	4	18	0	0	1
2007	4	18	11	1	1
2007	4	18	14	0	1
2007	4	19	0	0	1
2007	4	19	11	1	1
2007	4	19	14	0	1
2007	4	20	0	0	1
2007	4	20	11	1	1
2007	4	20	14	0	1
2007	4	21	0	0	1
2007	4	21	11	0	1
2007	4	21	14	0	1
2007	4	22	0	0	1
2007	4	22	11	0	1
2007	4	22	14	0	1
2007	4	23	0	0	1
2007	4	23	11	1	1
2007	4	23	14	0	1
2007	4	24	0	0	1
2007	4	24	11	1	1
2007	4	24	14	0	1
2007	4	25	0	0	1
2007	4	25	11	1	1
2007	4	25	14	0	1
2007	4	26	0	0	1
2007	4	26	11	1	1
2007	4	26	14	0	1
2007	4	27	0	0	1
2007	4	27	11	1	1
2007	4	27	14	0	1
2007	4	28	0	0	1
2007	4	28	11	0	1
2007	4	28	14	0	1
2007	4	29	0	0	1
2007	4	29	11	0	1
2007	4	29	14	0	1
2007	4	30	0	0	1
2007	4	30	11	1	1
2007	4	30	14	0	1
2007	5	1	0	0	1
2007	5	1	11	1	1
2007	5	1	14	0	1
2007	5	2	0	0	1
2007	5	2	11	1	1
2007	5	2	14	0	1
2007	5	3	0	0	1
2007	5	3	11	1	1
2007	5	3	14	0	1
2007	5	4	0	0	1
2007	5	4	11	1	1
2007	5	4	14	0	1
2007	5	5	0	0	1
2007	5	5	11	0	1
2007	5	5	14	0	1
2007	5	6	0	0	1
2007	5	6	11	0	1
2007	5	6	14	0	1
2007	5	7	0	0	1
2007	5	7	11	1	1
2007	5	7	14	0	1
2007	5	8	0	0	1
2007	5	8	11	1	1
2007	5	8	14	0	1
2007	5	9	0	0	1
2007	5	9	11	1	1
2007	5	9	14	0	1
2007	5	10	0	0	1
2007	5	10	11	1	1
2007	5	10	14	0	1
2007	5	11	0	0	1
2007	5	11	11	1	1
2007	5	11	14	0	1
2007	5	12	0	0	1
2007	5	12	11	0	1
2007	5	12	14	0	1
2007	5	13	0	0	1
2007	5	13	11	0	1
2007	5	13	14	0	1
2007	5	14	0	0	1
2007	5	14	11	1	1
2007	5	14	14	0	1
2007	5	15	0	0	1
2007	5	15	11	1	1
2007	5	15	14	0	1
2007	5	16	0	0	1
2007	5	16	11	1	1
2007	5	16	14	0	1
2007	5	17	0	0	1
2007	5	17	11	1	1
2007	5	17	14	0	1
2007	5	18	0	0	1
2007	5	18	11	1	1
2007	5	18	14	0	1
2007	5	19	0	0	1
2007	5	19	11	0	1
2007	5	19	14	0	1
2007	5	20	0	0	1
2007	5	20	11	0	1
2007	5	20	14	0	1

Pattern 6 (continued)

Year	Month	Day of Week Monday = 1	Hour	Capacity Multiplier	VOM Multiplier
2007	5	21	0	0	1
2007	5	21	11	1	1
2007	5	21	14	0	1
2007	5	22	0	0	1
2007	5	22	11	1	1
2007	5	22	14	0	1
2007	5	23	0	0	1
2007	5	23	11	1	1
2007	5	23	14	0	1
2007	5	24	0	0	1
2007	5	24	11	1	1
2007	5	24	14	0	1
2007	5	25	0	0	1
2007	5	25	11	1	1
2007	5	25	14	0	1
2007	5	26	0	0	1
2007	5	26	11	0	1
2007	5	26	14	0	1
2007	5	27	0	0	1
2007	5	27	11	0	1
2007	5	27	14	0	1
2007	5	28	0	0	1
2007	5	28	11	1	1
2007	5	28	14	0	1
2007	5	29	0	0	1
2007	5	29	11	1	1
2007	5	29	14	0	1
2007	5	30	0	0	1
2007	5	30	11	1	1
2007	5	30	14	0	1
2007	5	31	0	0	1
2007	5	31	11	1	1
2007	5	31	14	0	1
2007	6	1	0	0	1
2007	6	1	11	1	1
2007	6	1	14	0	1
2007	6	2	0	0	1
2007	6	2	11	0	1
2007	6	2	14	0	1
2007	6	3	0	0	1
2007	6	3	11	0	1
2007	6	3	14	0	1
2007	6	4	0	0	1
2007	6	4	11	1	1
2007	6	4	14	0	1
2007	6	5	0	0	1
2007	6	5	11	1	1
2007	6	5	14	0	1
2007	6	6	0	0	1
2007	6	6	11	1	1
2007	6	6	14	0	1
2007	6	7	0	0	1
2007	6	7	11	1	1
2007	6	7	14	0	1
2007	6	8	0	0	1
2007	6	8	11	1	1
2007	6	8	14	0	1
2007	6	9	0	0	1
2007	6	9	11	0	1
2007	6	9	14	0	1
2007	6	10	0	0	1
2007	6	10	11	0	1
2007	6	10	14	0	1
2007	6	11	0	0	1
2007	6	11	11	1	1
2007	6	11	14	0	1
2007	6	12	0	0	1
2007	6	12	11	1	1
2007	6	12	14	0	1
2007	6	13	0	0	1
2007	6	13	11	1	1
2007	6	13	14	0	1
2007	6	14	0	0	1
2007	6	14	11	1	1
2007	6	14	14	0	1
2007	6	15	0	0	1
2007	6	15	11	1	1
2007	6	15	14	0	1
2007	6	16	0	0	1
2007	6	16	11	0	1
2007	6	16	14	0	1
2007	6	17	0	0	1
2007	6	17	11	0	1
2007	6	17	14	0	1
2007	6	18	0	0	1
2007	6	18	11	1	1
2007	6	18	14	0	1
2007	6	19	0	0	1
2007	6	19	11	1	1
2007	6	19	14	0	1
2007	6	20	0	0	1
2007	6	20	11	1	1
2007	6	20	14	0	1
2007	6	21	0	0	1
2007	6	21	11	1	1
2007	6	21	14	0	1
2007	6	22	0	0	1
2007	6	22	11	1	1
2007	6	22	14	0	1
2007	6	23	0	0	1
2007	6	23	11	0	1
2007	6	23	14	0	1
2007	6	24	0	0	1
2007	6	24	11	0	1
2007	6	24	14	0	1
2007	6	25	0	0	1
2007	6	25	11	1	1
2007	6	25	14	0	1
2007	6	26	0	0	1
2007	6	26	11	1	1
2007	6	26	14	0	1
2007	6	27	0	0	1
2007	6	27	11	1	1
2007	6	27	14	0	1
2007	6	28	0	0	1
2007	6	28	11	1	1
2007	6	28	14	0	1
2007	6	29	0	0	1
2007	6	29	11	1	1
2007	6	29	14	0	1
2007	6	30	0	0	1
2007	6	30	11	0	1
2007	6	30	14	0	1
2007	7	1	0	0	1
2007	7	1	11	0	1
2007	7	1	14	0	1
2007	7	2	0	0	1
2007	7	2	11	1	1
2007	7	2	14	0	1
2007	7	3	0	0	1
2007	7	3	11	1	1
2007	7	3	14	0	1
2007	7	4	0	0	1
2007	7	4	11	1	1
2007	7	4	14	0	1
2007	7	5	0	0	1
2007	7	5	11	1	1
2007	7	5	14	0	1
2007	7	6	0	0	1
2007	7	6	11	1	1
2007	7	6	14	0	1
2007	7	7	0	0	1
2007	7	7	11	0	1
2007	7	7	14	0	1
2007	7	8	0	0	1
2007	7	8	11	0	1
2007	7	8	14	0	1
2007	7	9	0	0	1
2007	7	9	11	1	1
2007	7	9	14	0	1
2007	7	10	0	0	1
2007	7	10	11	1	1
2007	7	10	14	0	1
2007	7	11	0	0	1
2007	7	11	11	1	1
2007	7	11	14	0	1
2007	7	12	0	0	1
2007	7	12	11	1	1
2007	7	12	14	0	1
2007	7	13	0	0	1
2007	7	13	11	1	1
2007	7	13	14	0	1
2007	7	14	0	0	1
2007	7	14	11	0	1
2007	7	14	14	0	1
2007	7	15	0	0	1
2007	7	15	11	0	1
2007	7	15	14	0	1
2007	7	16	0	0	1
2007	7	16	11	1	1
2007	7	16	14	0	1
2007	7	17	0	0	1
2007	7	17	11	1	1
2007	7	17	14	0	1
2007	7	18	0	0	1
2007	7	18	11	1	1
2007	7	18	14	0	1
2007	7	19	0	0	1
2007	7	19	11	1	1
2007	7	19	14	0	1
2007	7	20	0	0	1
2007	7	20	11	1	1
2007	7	20	14	0	1
2007	7	21	0	0	1
2007	7	21	11	0	1
2007	7	21	14	0	1
2007	7	22	0	0	1
2007	7	22	11	0	1
2007	7	22	14	0	1
2007	7	23	0	0	1
2007	7	23	11	1	1
2007	7	23	14	0	1
2007	7	24	0	0	1
2007	7	24	11	1	1
2007	7	24	14	0	1
2007	7	25	0	0	1
2007	7	25	11	1	1
2007	7	25	14	0	1
2007	7	26	0	0	1
2007	7	26	11	1	1
2007	7	26	14	0	1
2007	7	27	0	0	1
2007	7	27	11	1	1
2007	7	27	14	0	1
2007	7	28	0	0	1
2007	7	28	11	0	1
2007	7	28	14	0	1
2007	7	29	0	0	1
2007	7	29	11	0	1
2007	7	29	14	0	1
2007	7	30	0	0	1
2007	7	30	11	1	1
2007	7	30	14	0	1

Pattern 6 (continued)

Year	Month	Day of Week Monday = 1	Hour	Capacity Multiplier	VOM Multiplier
2007	7	31	0	0	1
2007	7	31	11	1	1
2007	7	31	14	0	1
2007	8	1	0	0	1
2007	8	1	11	1	1
2007	8	1	14	0	1
2007	8	2	0	0	1
2007	8	2	11	1	1
2007	8	2	14	0	1
2007	8	3	0	0	1
2007	8	3	11	1	1
2007	8	3	14	0	1
2007	8	4	0	0	1
2007	8	4	11	0	1
2007	8	4	14	0	1
2007	8	5	0	0	1
2007	8	5	11	0	1
2007	8	5	14	0	1
2007	8	6	0	0	1
2007	8	6	11	1	1
2007	8	6	14	0	1
2007	8	7	0	0	1
2007	8	7	11	1	1
2007	8	7	14	0	1
2007	8	8	0	0	1
2007	8	8	11	1	1
2007	8	8	14	0	1
2007	8	9	0	0	1
2007	8	9	11	1	1
2007	8	9	14	0	1
2007	8	10	0	0	1
2007	8	10	11	1	1
2007	8	10	14	0	1
2007	8	11	0	0	1
2007	8	11	11	0	1
2007	8	11	14	0	1
2007	8	12	0	0	1
2007	8	12	11	0	1
2007	8	12	14	0	1
2007	8	13	0	0	1
2007	8	13	11	1	1
2007	8	13	14	0	1
2007	8	14	0	0	1
2007	8	14	11	1	1
2007	8	14	14	0	1
2007	8	15	0	0	1
2007	8	15	11	1	1
2007	8	15	14	0	1
2007	8	16	0	0	1
2007	8	16	11	1	1
2007	8	16	14	0	1
2007	8	17	0	0	1
2007	8	17	11	1	1
2007	8	17	14	0	1
2007	8	18	0	0	1
2007	8	18	11	0	1
2007	8	18	14	0	1
2007	8	19	0	0	1
2007	8	19	11	0	1
2007	8	19	14	0	1
2007	8	20	0	0	1
2007	8	20	11	1	1
2007	8	20	14	0	1
2007	8	21	0	0	1
2007	8	21	11	1	1
2007	8	21	14	0	1
2007	8	22	0	0	1
2007	8	22	11	1	1
2007	8	22	14	0	1
2007	8	23	0	0	1
2007	8	23	11	1	1
2007	8	23	14	0	1
2007	8	24	0	0	1
2007	8	24	11	1	1
2007	8	24	14	0	1
2007	8	25	0	0	1
2007	8	25	11	0	1
2007	8	25	14	0	1
2007	8	26	0	0	1
2007	8	26	11	0	1
2007	8	26	14	0	1
2007	8	27	0	0	1
2007	8	27	11	1	1
2007	8	27	14	0	1
2007	8	28	0	0	1
2007	8	28	11	1	1
2007	8	28	14	0	1
2007	8	29	0	0	1
2007	8	29	11	1	1
2007	8	29	14	0	1
2007	8	30	0	0	1
2007	8	30	11	1	1
2007	8	30	14	0	1
2007	8	31	0	0	1
2007	8	31	11	1	1
2007	8	31	14	0	1
2007	9	1	0	0	1
2007	9	1	11	0	1
2007	9	1	14	0	1
2007	9	2	0	0	1
2007	9	2	11	0	1
2007	9	2	14	0	1
2007	9	3	0	0	1
2007	9	3	11	1	1
2007	9	3	14	0	1
2007	9	4	0	0	1
2007	9	4	11	1	1
2007	9	4	14	0	1
2007	9	5	0	0	1
2007	9	5	11	1	1
2007	9	5	14	0	1
2007	9	6	0	0	1
2007	9	6	11	1	1
2007	9	6	14	0	1
2007	9	7	0	0	1
2007	9	7	11	1	1
2007	9	7	14	0	1
2007	9	8	0	0	1
2007	9	8	11	0	1
2007	9	8	14	0	1
2007	9	9	0	0	1
2007	9	9	11	0	1
2007	9	9	14	0	1
2007	9	10	0	0	1
2007	9	10	11	1	1
2007	9	10	14	0	1
2007	9	11	0	0	1
2007	9	11	11	1	1
2007	9	11	14	0	1
2007	9	12	0	0	1
2007	9	12	11	1	1
2007	9	12	14	0	1
2007	9	13	0	0	1
2007	9	13	11	1	1
2007	9	13	14	0	1
2007	9	14	0	0	1
2007	9	14	11	1	1
2007	9	14	14	0	1
2007	9	15	0	0	1
2007	9	15	11	0	1
2007	9	15	14	0	1
2007	9	16	0	0	1
2007	9	16	11	0	1
2007	9	16	14	0	1
2007	9	17	0	0	1
2007	9	17	11	1	1
2007	9	17	14	0	1
2007	9	18	0	0	1
2007	9	18	11	1	1
2007	9	18	14	0	1
2007	9	19	0	0	1
2007	9	19	11	1	1
2007	9	19	14	0	1
2007	9	20	0	0	1
2007	9	20	11	1	1
2007	9	20	14	0	1
2007	9	21	0	0	1
2007	9	21	11	1	1
2007	9	21	14	0	1
2007	9	22	0	0	1
2007	9	22	11	0	1
2007	9	22	14	0	1
2007	9	23	0	0	1
2007	9	23	11	0	1
2007	9	23	14	0	1
2007	9	24	0	0	1
2007	9	24	11	1	1
2007	9	24	14	0	1
2007	9	25	0	0	1
2007	9	25	11	1	1
2007	9	25	14	0	1
2007	9	26	0	0	1
2007	9	26	11	1	1
2007	9	26	14	0	1
2007	9	27	0	0	1
2007	9	27	11	1	1
2007	9	27	14	0	1
2007	9	28	0	0	1
2007	9	28	11	1	1
2007	9	28	14	0	1
2007	9	29	0	0	1
2007	9	29	11	0	1
2007	9	29	14	0	1
2007	9	30	0	0	1
2007	9	30	11	0	1
2007	9	30	14	0	1
2007	10	1	0	0	1
2007	10	1	11	1	1
2007	10	1	14	0	1
2007	10	2	0	0	1
2007	10	2	11	1	1
2007	10	2	14	0	1
2007	10	3	0	0	1
2007	10	3	11	1	1
2007	10	3	14	0	1
2007	10	4	0	0	1
2007	10	4	11	1	1
2007	10	4	14	0	1
2007	10	5	0	0	1
2007	10	5	11	1	1
2007	10	5	14	0	1
2007	10	6	0	0	1
2007	10	6	11	0	1
2007	10	6	14	0	1
2007	10	7	0	0	1
2007	10	7	11	0	1
2007	10	7	14	0	1
2007	10	8	0	0	1
2007	10	8	11	1	1
2007	10	8	14	0	1
2007	10	9	0	0	1
2007	10	9	11	1	1
2007	10	9	14	0	1

Pattern 6 (continued)

Year	Month	Day of Week Monday = 1	Hour	Capacity Multiplier	VOM Multiplier
2007	10	10	0	0	1
2007	10	10	11	1	1
2007	10	10	14	0	1
2007	10	11	0	0	1
2007	10	11	11	1	1
2007	10	11	14	0	1
2007	10	12	0	0	1
2007	10	12	11	1	1
2007	10	12	14	0	1
2007	10	13	0	0	1
2007	10	13	11	0	1
2007	10	13	14	0	1
2007	10	14	0	0	1
2007	10	14	11	0	1
2007	10	14	14	0	1
2007	10	15	0	0	1
2007	10	15	11	1	1
2007	10	15	14	0	1
2007	10	16	0	0	1
2007	10	16	11	1	1
2007	10	16	14	0	1
2007	10	17	0	0	1
2007	10	17	11	1	1
2007	10	17	14	0	1
2007	10	18	0	0	1
2007	10	18	11	1	1
2007	10	18	14	0	1
2007	10	19	0	0	1
2007	10	19	11	1	1
2007	10	19	14	0	1
2007	10	20	0	0	1
2007	10	20	11	0	1
2007	10	20	14	0	1
2007	10	21	0	0	1
2007	10	21	11	0	1
2007	10	21	14	0	1
2007	10	22	0	0	1
2007	10	22	11	1	1
2007	10	22	14	0	1
2007	10	23	0	0	1
2007	10	23	11	1	1
2007	10	23	14	0	1
2007	10	24	0	0	1
2007	10	24	11	1	1
2007	10	24	14	0	1
2007	10	25	0	0	1
2007	10	25	11	1	1
2007	10	25	14	0	1
2007	10	26	0	0	1
2007	10	26	11	1	1
2007	10	26	14	0	1
2007	10	27	0	0	1
2007	10	27	11	0	1
2007	10	27	14	0	1
2007	10	28	0	0	1
2007	10	28	11	0	1
2007	10	28	14	0	1
2007	10	29	0	0	1
2007	10	29	11	1	1
2007	10	29	14	0	1
2007	10	30	0	0	1
2007	10	30	11	1	1
2007	10	30	14	0	1
2007	10	31	0	0	1
2007	10	31	11	1	1
2007	10	31	14	0	1
2007	11	1	0	0	1
2007	11	1	11	1	1
2007	11	1	14	0	1
2007	11	2	0	0	1
2007	11	2	11	1	1
2007	11	2	14	0	1
2007	11	3	0	0	1
2007	11	3	11	0	1
2007	11	3	14	0	1
2007	11	4	0	0	1
2007	11	4	11	0	1
2007	11	4	14	0	1
2007	11	5	0	0	1
2007	11	5	11	1	1
2007	11	5	14	0	1
2007	11	6	0	0	1
2007	11	6	11	1	1
2007	11	6	14	0	1
2007	11	7	0	0	1
2007	11	7	11	1	1
2007	11	7	14	0	1
2007	11	8	0	0	1
2007	11	8	11	1	1
2007	11	8	14	0	1
2007	11	9	0	0	1
2007	11	9	11	1	1
2007	11	9	14	0	1
2007	11	10	0	0	1
2007	11	10	11	0	1
2007	11	10	14	0	1
2007	11	11	0	0	1
2007	11	11	11	0	1
2007	11	11	14	0	1
2007	11	12	0	0	1
2007	11	12	11	1	1
2007	11	12	14	0	1
2007	11	13	0	0	1
2007	11	13	11	1	1
2007	11	13	14	0	1
2007	11	14	0	0	1
2007	11	14	11	1	1
2007	11	14	14	0	1
2007	11	15	0	0	1
2007	11	15	11	1	1
2007	11	15	14	0	1
2007	11	16	0	0	1
2007	11	16	11	1	1
2007	11	16	14	0	1
2007	11	17	0	0	1
2007	11	17	11	0	1
2007	11	17	14	0	1
2007	11	18	0	0	1
2007	11	18	11	0	1
2007	11	18	14	0	1
2007	11	19	0	0	1
2007	11	19	11	1	1
2007	11	19	14	0	1
2007	11	20	0	0	1
2007	11	20	11	1	1
2007	11	20	14	0	1
2007	11	21	0	0	1
2007	11	21	11	1	1
2007	11	21	14	0	1
2007	11	22	0	0	1
2007	11	22	11	1	1
2007	11	22	14	0	1
2007	11	23	0	0	1
2007	11	23	11	1	1
2007	11	23	14	0	1
2007	11	24	0	0	1
2007	11	24	11	0	1
2007	11	24	14	0	1
2007	11	25	0	0	1
2007	11	25	11	0	1
2007	11	25	14	0	1
2007	11	26	0	0	1
2007	11	26	11	1	1
2007	11	26	14	0	1
2007	11	27	0	0	1
2007	11	27	11	1	1
2007	11	27	14	0	1
2007	11	28	0	0	1
2007	11	28	11	1	1
2007	11	28	14	0	1
2007	11	29	0	0	1
2007	11	29	11	1	1
2007	11	29	14	0	1
2007	11	30	0	0	1
2007	11	30	11	1	1
2007	11	30	14	0	1
2007	12	1	0	0	1
2007	12	1	11	0	1
2007	12	1	14	0	1
2007	12	2	0	0	1
2007	12	2	11	0	1
2007	12	2	14	0	1
2007	12	3	0	0	1
2007	12	3	11	1	1
2007	12	3	14	0	1
2007	12	4	0	0	1
2007	12	4	11	1	1
2007	12	4	14	0	1
2007	12	5	0	0	1
2007	12	5	11	1	1
2007	12	5	14	0	1
2007	12	6	0	0	1
2007	12	6	11	1	1
2007	12	6	14	0	1
2007	12	7	0	0	1
2007	12	7	11	1	1
2007	12	7	14	0	1
2007	12	8	0	0	1
2007	12	8	11	0	1
2007	12	8	14	0	1
2007	12	9	0	0	1
2007	12	9	11	0	1
2007	12	9	14	0	1
2007	12	10	0	0	1
2007	12	10	11	1	1
2007	12	10	14	0	1
2007	12	11	0	0	1
2007	12	11	11	1	1
2007	12	11	14	0	1
2007	12	12	0	0	1
2007	12	12	11	1	1
2007	12	12	14	0	1
2007	12	13	0	0	1
2007	12	13	11	1	1
2007	12	13	14	0	1
2007	12	14	0	0	1
2007	12	14	11	1	1
2007	12	14	14	0	1
2007	12	15	0	0	1
2007	12	15	11	0	1
2007	12	15	14	0	1
2007	12	16	0	0	1
2007	12	16	11	0	1
2007	12	16	14	0	1
2007	12	17	0	0	1
2007	12	17	11	1	1
2007	12	17	14	0	1
2007	12	18	0	0	1
2007	12	18	11	1	1
2007	12	18	14	0	1
2007	12	19	0	0	1
2007	12	19	11	1	1
2007	12	19	14	0	1

Pattern 6 (continued)

Year	Month	Day of Week Monday = 1	Hour	Capacity Multiplier	VOM Multiplier
2007	12	20	0	0	1
2007	12	20	11	1	1
2007	12	20	14	0	1
2007	12	21	0	0	1
2007	12	21	11	1	1
2007	12	21	14	0	1
2007	12	22	0	0	1
2007	12	22	11	0	1
2007	12	22	14	0	1
2007	12	23	0	0	1
2007	12	23	11	0	1
2007	12	23	14	0	1
2007	12	24	0	0	1
2007	12	24	11	1	1
2007	12	24	14	0	1
2007	12	25	0	0	1
2007	12	25	11	1	1
2007	12	25	14	0	1
2007	12	26	0	0	1
2007	12	26	11	1	1
2007	12	26	14	0	1
2007	12	27	0	0	1
2007	12	27	11	1	1
2007	12	27	14	0	1
2007	12	28	0	0	1
2007	12	28	11	1	1
2007	12	28	14	0	1
2007	12	29	0	0	1
2007	12	29	11	0	1
2007	12	29	14	0	1
2007	12	30	0	0	1
2007	12	30	11	0	1
2007	12	30	14	0	1
2007	12	31	0	0	1
2007	12	31	11	1	1
2007	12	31	14	0	1

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
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Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:05

Year: 2007 Month: Jan

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	296.1	17.42	6.924	88.1	26.	0.	0.0000	0.9739	0.0000	0.0000	132.78	140.65	12719.
2	Honolu 9	54.4	1	147.3	9.30	3.766	49.3	16.	0.	0.0000	0.5448	0.0000	0.0000	135.91	144.66	13082.
3	Waiau 3	46.6	1	125.0	11.59	4.021	54.5	17.	0.	0.0000	0.5754	0.0000	0.0000	128.26	143.10	13558.
4	Waiau 4	46.6	1	228.4	15.33	5.318	72.7	23.	0.	0.0000	0.7675	0.0000	0.0000	128.77	144.32	13673.
5	Waiau 5	54.5	1	476.2	27.95	11.339	145.9	31.	0.	0.0000	1.5398	0.0000	0.0000	127.86	135.80	12866.
6	Waiau 6	53.5	1	408.2	24.24	9.654	126.7	31.	0.	0.0000	1.3375	0.0000	0.0000	129.12	138.54	13125.
7	Waiau 7	82.9	1	691.7	49.21	30.367	336.1	1.	0.	0.0000	3.5478	0.0000	0.0000	114.74	116.83	11069.
8	Waiau 8	86.1	1	408.5	35.40	22.687	247.0	2.	0.	0.0000	2.6074	0.0000	0.0000	110.24	114.93	10889.
9	Waiau 9	52.9	1	34.3	0.69	0.272	9.2	10.	0.	0.0000	0.1571	0.0000	0.0000	570.85	577.46	33847.
10	Waiau 10	49.9	1	67.3	1.34	0.497	16.9	15.	0.	0.0000	0.2882	0.0000	0.0000	573.67	579.32	33956.
11	Kahe 1	82.1	1	0.0	0.00	0.000	0.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.
12	Kahe 2	82.1	1	720.5	63.13	38.580	397.7	1.	0.	0.0000	4.1974	0.0000	0.0000	107.29	108.80	10308.
13	Kahe 3	86.1	1	694.3	76.17	48.821	485.1	1.	0.	0.0000	5.1200	0.0000	0.0000	103.58	104.87	9936.
14	Kahe 4	85.3	1	695.8	72.31	45.915	470.4	1.	0.	0.0000	4.9652	0.0000	0.0000	106.70	108.14	10245.
15	Kahe 5	134.3	1	708.2	81.95	81.933	807.4	1.	0.	0.0000	8.5219	0.0000	0.0000	103.33	104.01	9854.
16	Kahe 6	134.4	1	718.3	59.93	59.956	626.6	1.	0.	0.0000	6.6136	0.0000	0.0000	108.49	110.31	10451.
17	Kala CC	90.0	1	557.0	73.86	49.483	426.8	8.	0.	0.0000	4.8080	0.0000	0.0000	97.16	97.16	8624.
18	Kala CC	90.0	1	732.7	96.58	64.709	559.2	1.	0.	0.0000	6.2999	0.0000	0.0000	97.36	97.36	8642.
19	AES	180.0	1	738.2	99.17	132.883	2302.5	1.	0.	0.0000	3.6711	0.0000	0.0000	27.63	27.63	17327.
20	HPOWER	46.0	1	744.0	72.64	24.873	211.3	1.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8493.
21	Kala CC	28.0	1	555.5	56.48	11.773	101.7	8.	0.	0.0000	1.1461	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	24.6	1	69.0	9.27	1.697	1.8	23.	0.	0.0000	0.0313	0.0000	0.0000	18.46	18.46	1037.
43	RIDERI	5.0	1	18.1	0.39	0.015	6.1	6.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.04	415031.
	System					655.484	7543.	225.	0.	0.0000	57.7138	0.0000	0.0000	86.62	88.05	11507.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 2
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:05

Year: 2007 Month: Jan

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.499	0.0324	0.0000	0.0324	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 3
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:05

Year: 2007 Month: Jan

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	83.387	158.547	Bbl	983.0	10.3754	124.43	11788.	1055.50
2 KLSFO	275.204	449.536	Bbl	2787.1	29.4181	106.90	10127.	1055.50
3 HLSFO	10.690	22.151	Bbl	137.3	1.5187	142.06	12847.	1105.80
4 DG SUB	1.697	0.300	Bbl	1.8	0.0313	18.46	1037.	1781.30
5 DIESEL	0.770	4.454	Bbl	26.1	0.4453	578.66	33917.	1706.10
7 AES	132.883	2302.484	Bbl	2302.5	3.6711	27.63	17327.	159.44
8 KALAELOA	125.964	181.279	Bbl	1087.7	12.2540	97.28	8635.	1126.62
10 REFUSE	24.873	34.074	Bbl	211.3	0.0000	0.00	8493.	0.00
11 LDMGMT	0.015	6.089	Bbl	6.1	0.0000	0.04	415031.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	369.281	630.233	Bbl	3907.4	41.3122	111.87	10581.	1057.3
2 DIESEL	0.770	4.454	Bbl	26.1	0.4453	578.66	33917.	1706.1
4 AES	132.883	2302.484	Bbl	2302.5	3.6711	27.63	17327.	159.4
5 KALAELOA	125.964	181.279	Bbl	1087.7	12.2540	97.28	8635.	1126.6
7 REFUSE	24.873	34.074	Bbl	211.3	0.0000	0.00	8493.	0.0
8 LdMgmt	0.015	6.089	Bbl	6.1	0.0000	0.04	415031.	0.0
9 DG SUB	1.697	0.300	Bbl	1.8	0.0313	18.46	1037.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 4
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:05

Year: 2007 Month: Jan

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	655.98			Therml Gen:	655.48	57.7138	88.05
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.50	0.0324	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.00	0.0003	100.00
				Lvl Cost:		0.0000	
Total:	655.98	0.0000	0.00	Total:	655.99	57.7465	88.03
				System Net:		57.7465	88.03
				LOLH(hr):	0.16		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 5
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:05

Year: 2007 Month: Jan

Plant Summary

Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1 Kahe	61.2	275.2044	2787.1	6.	0.0000	29.4181	0.0000	106.90
2 Waiau	23.9	84.1562	1009.1	130.	0.0000	10.8207	0.0000	128.58
3 Kalaeloa	81.4	125.9642	1087.7	17.	0.0000	12.2540	0.0000	97.28
4 AES	99.2	132.8833	2302.5	1.	0.0000	3.6711	0.0000	27.63
5 HPOWER	72.7	24.8733	211.3	1.	0.0000	0.0000	0.0000	0.00
6 Honolulu	13.3	10.6901	137.3	42.	0.0000	1.5187	0.0000	142.06
7	0.4	0.0147	6.1	6.	0.0000	0.0000	0.0000	0.04
9 DG Sub	9.3	1.6974	1.8	23.	0.0000	0.0313	0.0000	18.46

Year: 2007 Month: Jan

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
18.600281	27.354656	11.758922	57.713860

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 6
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:24

Year: 2007 Month: Feb

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	326.5	21.53	7.730	97.7	26.	0.	0.0000	1.0804	0.0000	0.0000	132.61	139.78	12640.
2	Honolu 9	54.4	1	205.8	14.38	5.258	68.9	22.	0.	0.0000	0.7621	0.0000	0.0000	135.95	144.93	13107.
3	Waiau 3	46.6	1	146.8	15.20	4.764	64.7	20.	0.	0.0000	0.6824	0.0000	0.0000	128.17	143.26	13572.
4	Waiau 4	46.6	1	264.7	19.78	6.197	84.6	27.	0.	0.0000	0.8925	0.0000	0.0000	128.74	144.02	13645.
5	Waiau 5	54.5	1	454.3	30.20	11.068	141.0	26.	0.	0.0000	1.4885	0.0000	0.0000	127.55	134.49	12742.
6	Waiau 6	53.5	1	415.6	27.70	9.964	129.1	27.	0.	0.0000	1.3632	0.0000	0.0000	128.93	136.81	12962.
7	Waiau 7	82.9	1	516.5	44.25	24.663	267.0	0.	0.	0.0000	2.8178	0.0000	0.0000	113.88	114.25	10824.
8	Waiau 8	86.1	1	625.4	69.58	40.279	418.2	0.	0.	0.0000	4.4142	0.0000	0.0000	109.21	109.59	10383.
9	Waiau 9	52.9	1	41.1	1.00	0.354	11.3	10.	0.	0.0000	0.1924	0.0000	0.0000	537.82	543.26	31842.
10	Waiau 10	49.9	1	79.7	1.86	0.623	20.3	16.	0.	0.0000	0.3459	0.0000	0.0000	550.17	554.98	32529.
11	Kahe 1	82.1	1	442.1	41.92	23.138	243.8	1.	0.	0.0000	2.5736	0.0000	0.0000	108.77	111.23	10538.
12	Kahe 2	82.1	1	649.0	72.21	39.862	402.5	0.	0.	0.0000	4.2482	0.0000	0.0000	106.42	106.57	10097.
13	Kahe 3	86.1	1	628.3	81.28	47.053	461.6	0.	0.	0.0000	4.8726	0.0000	0.0000	103.27	103.56	9811.
14	Kahe 4	85.3	1	627.6	78.83	45.208	455.6	0.	0.	0.0000	4.8093	0.0000	0.0000	106.10	106.38	10079.
15	Kahe 5	134.3	1	640.6	85.29	77.016	753.2	0.	0.	0.0000	7.9498	0.0000	0.0000	103.10	103.22	9780.
16	Kahe 6	134.4	1	642.7	66.28	59.896	613.1	0.	0.	0.0000	6.4715	0.0000	0.0000	107.78	108.05	10236.
17	Kala CC	90.0	1	0.0	0.00	0.000	0.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.
18	Kala CC	90.0	1	437.5	64.99	39.328	337.9	2.	0.	0.0000	3.8070	0.0000	0.0000	96.80	96.80	8592.
19	AES	180.0	1	664.3	98.81	119.578	2071.9	0.	0.	0.0000	3.3035	0.0000	0.0000	27.63	27.63	17327.
20	HPOWER	46.0	1	672.0	81.67	25.260	213.9	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8467.
21	Kala CC	28.0	1	0.0	0.00	0.000	0.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.
23	DG Sub	24.6	1	60.0	8.92	1.476	1.5	20.	0.	0.0000	0.0273	0.0000	0.0000	18.46	18.46	1037.
43	RIDERI	5.0	1	25.5	0.83	0.028	7.5	7.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.03	270879.
	System					588.743	6865.	207.	0.	0.0000	52.1021	0.0000	0.0000	87.53	88.50	11661.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 7
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:24

Year: 2007 Month: Feb

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.451	0.0293	0.0000	0.0293	64.85

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 8
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:24

Year: 2007 Month: Feb

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	96.935	178.154	Bbl	1104.6	11.6586	120.27	11395.	1055.50
2 KLSFO	292.173	472.562	Bbl	2929.9	30.9249	105.84	10028.	1055.50
3 HLSFO	12.988	26.875	Bbl	166.6	1.8425	141.86	12829.	1105.80
4 DG SUB	1.476	0.261	Bbl	1.5	0.0273	18.46	1037.	1781.30
5 DIESEL	0.977	5.384	Bbl	31.6	0.5383	550.73	32280.	1706.10
7 AES	119.578	2071.936	Bbl	2071.9	3.3035	27.63	17327.	159.44
8 KALAELOA	39.328	56.320	Bbl	337.9	3.8070	96.80	8592.	1126.62
10 REFUSE	25.260	34.495	Bbl	213.9	0.0000	0.00	8467.	0.00
11 LDMGMT	0.028	7.519	Bbl	7.5	0.0000	0.03	270879.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	402.096	677.591	Bbl	4201.1	44.4260	110.49	10448.	1057.5
2 DIESEL	0.977	5.384	Bbl	31.6	0.5383	550.73	32280.	1706.1
4 AES	119.578	2071.936	Bbl	2071.9	3.3035	27.63	17327.	159.4
5 KALAELOA	39.328	56.320	Bbl	337.9	3.8070	96.80	8592.	1126.6
7 REFUSE	25.260	34.495	Bbl	213.9	0.0000	0.00	8467.	0.0
8 LdMgmt	0.028	7.519	Bbl	7.5	0.0000	0.03	270879.	0.0
9 DG SUB	1.476	0.261	Bbl	1.5	0.0273	18.46	1037.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 9
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:24

Year: 2007 Month: Feb

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	589.22			Therml Gen:	588.74	52.1021	88.50
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.45	0.0293	64.85
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.03	0.0031	100.00
				Lvl Cost:		0.0000	
Total:	589.22	0.0000	0.00	Total:	589.22	52.1344	88.48
				System Net:		52.1344	88.48
				LOLH(hr):	0.74		

PPC Proprietary Program Licensed to HECO Till 12/2099
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS

HECO PMONTH V.022504
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Year: 2007 Month: Feb

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	71.9	292.1732	2929.9	2.	0.0000	30.9249	0.0000	105.84
2	Waiau	30.8	97.9126	1136.1	127.	0.0000	12.1969	0.0000	124.57
3	Kalaeloa	28.1	39.3285	337.9	2.	0.0000	3.8070	0.0000	96.80
4	AES	98.9	119.5778	2071.9	0.	0.0000	3.3035	0.0000	27.63
5	HPOWER	81.7	25.2595	213.9	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	17.9	12.9878	166.6	49.	0.0000	1.8425	0.0000	141.86
7		0.8	0.0278	7.5	7.	0.0000	0.0000	0.0000	0.03
9	DG Sub	8.9	1.4760	1.5	20.	0.0000	0.0273	0.0000	18.46

Year: 2007 Month: Feb

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
16.264893	25.059963	10.777238	52.102093

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 11
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:46

Year: 2007 Month: Mar

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	347.1	20.06	7.975	101.4	29.	0.	0.0000	1.1215	0.0000	0.0000	133.04	140.63	12717.
2	Honolu 9	54.4	1	193.7	11.54	4.674	62.1	21.	0.	0.0000	0.6865	0.0000	0.0000	137.21	146.87	13282.
3	Waiau 3	46.6	1	108.9	9.95	3.451	46.6	14.	0.	0.0000	0.4924	0.0000	0.0000	128.52	142.66	13515.
4	Waiau 4	46.6	1	258.3	17.06	5.919	81.5	27.	0.	0.0000	0.8605	0.0000	0.0000	128.95	145.39	13775.
5	Waiau 5	54.5	1	522.2	30.05	12.191	156.1	29.	0.	0.0000	1.6478	0.0000	0.0000	128.19	135.17	12806.
6	Waiau 6	53.5	1	465.9	27.11	10.798	141.0	31.	0.	0.0000	1.4881	0.0000	0.0000	129.47	137.81	13057.
7	Waiau 7	82.9	1	0.0	0.00	0.000	0.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.
8	Waiau 8	86.1	1	697.7	63.83	40.913	426.8	0.	0.	0.0000	4.5045	0.0000	0.0000	109.79	110.10	10431.
9	Waiau 9	52.9	1	26.9	0.61	0.240	7.4	6.	0.	0.0000	0.1270	0.0000	0.0000	525.22	530.01	31066.
10	Waiau 10	49.9	1	56.7	1.15	0.429	14.3	11.	0.	0.0000	0.2439	0.0000	0.0000	563.96	568.70	33333.
11	Kahe 1	82.1	1	720.2	57.69	35.260	365.5	0.	0.	0.0000	3.8578	0.0000	0.0000	109.23	109.41	10366.
12	Kahe 2	82.1	1	257.3	23.10	14.117	148.5	1.	0.	0.0000	1.5676	0.0000	0.0000	107.12	111.04	10520.
13	Kahe 3	86.1	1	691.0	76.61	49.105	482.9	0.	0.	0.0000	5.0966	0.0000	0.0000	103.55	103.79	9833.
14	Kahe 4	85.3	1	695.3	73.08	46.405	470.1	0.	0.	0.0000	4.9617	0.0000	0.0000	106.65	106.92	10130.
15	Kahe 5	134.3	1	711.4	82.43	82.406	807.3	0.	0.	0.0000	8.5213	0.0000	0.0000	103.32	103.41	9797.
16	Kahe 6	134.4	1	715.7	59.66	59.693	614.8	0.	0.	0.0000	6.4895	0.0000	0.0000	108.45	108.72	10300.
17	Kala CC	90.0	1	563.0	74.45	49.880	430.6	8.	0.	0.0000	4.8510	0.0000	0.0000	97.25	97.25	8632.
18	Kala CC	90.0	1	726.4	95.68	64.102	554.1	1.	0.	0.0000	6.2427	0.0000	0.0000	97.39	97.39	8644.
19	AES	180.0	1	736.1	98.88	132.495	2295.7	0.	0.	0.0000	3.6603	0.0000	0.0000	27.63	27.63	17327.
20	HPOWER	46.0	1	744.0	86.95	29.775	251.7	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8454.
21	Kala CC	28.0	1	567.0	58.14	12.118	104.7	8.	0.	0.0000	1.1798	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	24.6	1	66.0	8.87	1.624	1.7	22.	0.	0.0000	0.0300	0.0000	0.0000	18.46	18.46	1037.
43	RIDERI	5.0	1	16.4	0.35	0.013	3.7	4.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.03	279670.
	System					663.581	7569.	213.	0.	0.0000	57.6304	0.0000	0.0000	86.02	86.85	11406.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 12
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:46

Year: 2007 Month: Mar

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.499	0.0324	0.0000	0.0324	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 13
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:46

Year: 2007 Month: Mar

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	73.271	137.427	Bbl	852.0	8.9933	122.74	11629.	1055.50
2 KLSFO	286.986	465.984	Bbl	2889.1	30.4944	106.26	10067.	1055.50
3 HLSFO	12.649	26.371	Bbl	163.5	1.8080	142.93	12926.	1105.80
4 DG SUB	1.624	0.287	Bbl	1.7	0.0300	18.46	1037.	1781.30
5 DIESEL	0.668	3.710	Bbl	21.7	0.3709	554.83	32520.	1706.10
7 AES	132.495	2295.747	Bbl	2295.7	3.6603	27.63	17327.	159.44
8 KALAELOA	126.100	181.568	Bbl	1089.4	12.2735	97.33	8639.	1126.62
10 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.00
11 LDMGMT	0.013	3.655	Bbl	3.7	0.0000	0.03	279670.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	372.907	629.781	Bbl	3904.6	41.2958	110.74	10471.	1057.6
2 DIESEL	0.668	3.710	Bbl	21.7	0.3709	554.83	32520.	1706.1
4 AES	132.495	2295.747	Bbl	2295.7	3.6603	27.63	17327.	159.4
5 KALAELOA	126.100	181.568	Bbl	1089.4	12.2735	97.33	8639.	1126.6
7 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.0
8 LdMgmt	0.013	3.655	Bbl	3.7	0.0000	0.03	279670.	0.0
9 DG SUB	1.624	0.287	Bbl	1.7	0.0300	18.46	1037.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 14
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:46

Year: 2007 Month: Mar

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	664.10			Therml Gen:	663.58	57.6304	86.85
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.50	0.0324	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.01	0.0008	100.00
				Lvl Cost:		0.0000	
Total:	664.10	0.0000	0.00	Total:	664.09	57.6636	86.83
				System Net:		57.6636	86.83
				LOLH(hr):	0.32		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 15
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:13:46

Year: 2007 Month: Mar

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	63.8	286.9859	2889.1	2.	0.0000	30.4944	0.0000	106.26
2	Waiau	21.0	73.9400	873.8	118.	0.0000	9.3642	0.0000	126.65
3	Kalaeloa	81.5	126.1002	1089.4	17.	0.0000	12.2735	0.0000	97.33
4	AES	98.9	132.4945	2295.7	0.	0.0000	3.6603	0.0000	27.63
5	HPOWER	87.0	29.7749	251.7	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	15.8	12.6491	163.5	50.	0.0000	1.8080	0.0000	142.93
7		0.4	0.0131	3.7	4.	0.0000	0.0000	0.0000	0.03
9	DG Sub	8.9	1.6236	1.7	22.	0.0000	0.0300	0.0000	18.46

Year: 2007 Month: Mar

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
18.259521	27.727518	11.643613	57.630653

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 16
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:05

Year: 2007 Month: Apr

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	120.1	7.15	2.752	36.0	15.	0.	0.0000	0.3979	0.0000	0.0000	133.08	144.59	13075.
2	Honolu 9	54.4	1	159.5	9.95	3.898	51.6	17.	0.	0.0000	0.5701	0.0000	0.0000	136.95	146.23	13224.
3	Waiau 3	46.6	1	77.7	7.33	2.459	33.0	9.	0.	0.0000	0.3485	0.0000	0.0000	128.53	141.72	13427.
4	Waiau 4	46.6	1	208.9	14.38	4.828	67.1	24.	0.	0.0000	0.7084	0.0000	0.0000	128.86	146.74	13902.
5	Waiau 5	54.5	1	429.5	25.63	10.064	130.0	28.	0.	0.0000	1.3726	0.0000	0.0000	128.14	136.39	12922.
6	Waiau 6	53.5	1	349.5	21.13	8.145	107.9	29.	0.	0.0000	1.1389	0.0000	0.0000	129.39	139.82	13247.
7	Waiau 7	82.9	1	0.0	0.00	0.000	0.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.
8	Waiau 8	86.1	1	673.7	60.09	37.269	390.8	0.	0.	0.0000	4.1251	0.0000	0.0000	110.26	110.68	10486.
9	Waiau 9	52.9	1	33.1	0.62	0.234	8.6	7.	0.	0.0000	0.1465	0.0000	0.0000	619.80	625.09	36639.
10	Waiau 10	49.9	1	57.9	1.06	0.382	14.1	10.	0.	0.0000	0.2403	0.0000	0.0000	624.06	629.00	36868.
11	Kahe 1	82.1	1	695.0	54.43	32.195	335.6	0.	0.	0.0000	3.5425	0.0000	0.0000	109.74	110.03	10425.
12	Kahe 2	82.1	1	698.4	61.32	36.266	370.1	0.	0.	0.0000	3.9060	0.0000	0.0000	107.53	107.70	10204.
13	Kahe 3	86.1	1	677.8	74.37	46.131	455.2	0.	0.	0.0000	4.8047	0.0000	0.0000	103.78	104.15	9868.
14	Kahe 4	85.3	1	671.5	69.53	42.727	434.9	0.	0.	0.0000	4.5908	0.0000	0.0000	107.03	107.45	10180.
15	Kahe 5	134.3	1	684.5	78.43	75.882	745.8	0.	0.	0.0000	7.8719	0.0000	0.0000	103.59	103.74	9828.
16	Kahe 6	134.4	1	686.2	56.37	54.582	564.9	0.	0.	0.0000	5.9621	0.0000	0.0000	108.84	109.23	10349.
17	Kala CC	90.0	1	608.2	83.09	53.874	465.0	9.	0.	0.0000	5.2389	0.0000	0.0000	97.24	97.24	8631.
18	Kala CC	90.0	1	709.2	95.94	62.200	538.7	0.	0.	0.0000	6.0686	0.0000	0.0000	97.57	97.57	8660.
19	AES	180.0	1	714.2	99.15	128.563	2227.6	0.	0.	0.0000	3.5517	0.0000	0.0000	27.63	27.63	17327.
20	HPOWER	46.0	1	718.3	86.75	28.747	243.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8454.
21	Kala CC	28.0	1	608.6	61.17	12.339	106.6	9.	0.	0.0000	1.2013	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	24.6	1	63.0	8.75	1.550	1.6	21.	0.	0.0000	0.0286	0.0000	0.0000	18.46	18.46	1037.
43	RIDERI	5.0	1	19.5	0.28	0.010	4.3	4.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.04	420527.
	System					645.097	7332.	185.	0.	0.0000	55.8154	0.0000	0.0000	85.81	86.52	11366.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 17
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:05

Year: 2007 Month: Apr

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.483	0.0313	0.0000	0.0313	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 18
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:05

Year: 2007 Month: Apr

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	62.766	117.565	Bbl	728.9	7.6935	122.58	11613.	1055.50
2 KLSFO	287.782	468.789	Bbl	2906.5	30.6780	106.60	10100.	1055.50
3 HLSFO	6.650	14.118	Bbl	87.5	0.9679	145.55	13162.	1105.80
4 DG SUB	1.550	0.274	Bbl	1.6	0.0286	18.46	1037.	1781.30
5 DIESEL	0.616	3.869	Bbl	22.7	0.3868	627.52	36781.	1706.10
7 AES	128.563	2227.630	Bbl	2227.6	3.5517	27.63	17327.	159.44
8 KALAELOA	128.413	185.049	Bbl	1110.3	12.5088	97.41	8646.	1126.62
10 REFUSE	28.747	39.198	Bbl	243.0	0.0000	0.00	8454.	0.00
11 LDMGMT	0.010	4.315	Bbl	4.3	0.0000	0.04	420527.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	357.198	600.472	Bbl	3722.9	39.3395	110.13	10423.	1056.7
2 DIESEL	0.616	3.869	Bbl	22.7	0.3868	627.52	36781.	1706.1
4 AES	128.563	2227.630	Bbl	2227.6	3.5517	27.63	17327.	159.4
5 KALAELOA	128.413	185.049	Bbl	1110.3	12.5088	97.41	8646.	1126.6
7 REFUSE	28.747	39.198	Bbl	243.0	0.0000	0.00	8454.	0.0
8 LdMgmt	0.010	4.315	Bbl	4.3	0.0000	0.04	420527.	0.0
9 DG SUB	1.550	0.274	Bbl	1.6	0.0286	18.46	1037.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 19
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:05

Year: 2007 Month: Apr

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	645.56			Therml Gen:	645.10	55.8154	86.52
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.48	0.0313	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.00	0.0003	100.00
				Lvl Cost:		0.0000	
Total:	645.56	0.0000	0.00	Total:	645.58	55.8471	86.51
				System Net:		55.8471	86.51
				LOLH(hr):	0.18		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 20
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:05

Year: 2007 Month: Apr

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	66.1	287.7818	2906.5	1.	0.0000	30.6780	0.0000	106.60
2	Waiau	18.6	63.3822	751.6	108.	0.0000	8.0804	0.0000	127.49
3	Kalaeloa	85.7	128.4129	1110.3	18.	0.0000	12.5088	0.0000	97.41
4	AES	99.2	128.5632	2227.6	0.	0.0000	3.5517	0.0000	27.63
5	HPOWER	86.8	28.7471	243.0	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	8.6	6.6501	87.5	32.	0.0000	0.9679	0.0000	145.55
7		0.3	0.0103	4.3	4.	0.0000	0.0000	0.0000	0.04
9	DG Sub	8.8	1.5498	1.6	21.	0.0000	0.0286	0.0000	18.46

Year: 2007 Month: Apr

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
17.163658	27.329880	11.322046	55.815582

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 21
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:29

Year: 2007 Month: May

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	313.0	19.00	7.551	95.4	27.	0.	0.0000	1.0553	0.0000	0.0000	132.34	139.75	12638.
2	Honolu 9	54.4	1	215.7	14.20	5.752	74.5	22.	0.	0.0000	0.8236	0.0000	0.0000	135.10	143.19	12949.
3	Waiau 3	46.6	1	155.4	14.69	5.096	67.7	18.	0.	0.0000	0.7148	0.0000	0.0000	128.02	140.28	13290.
4	Waiau 4	46.6	1	262.1	18.01	6.249	84.6	25.	0.	0.0000	0.8925	0.0000	0.0000	128.56	142.83	13532.
5	Waiau 5	54.5	1	474.4	28.92	11.732	149.9	30.	0.	0.0000	1.5819	0.0000	0.0000	127.34	134.83	12774.
6	Waiau 6	53.5	1	420.6	25.73	10.248	133.1	29.	0.	0.0000	1.4050	0.0000	0.0000	128.69	137.09	12988.
7	Waiau 7	82.9	1	608.6	46.40	28.634	315.6	1.	0.	0.0000	3.3311	0.0000	0.0000	114.16	116.33	11022.
8	Waiau 8	86.1	1	691.2	66.54	42.646	444.2	0.	0.	0.0000	4.6888	0.0000	0.0000	109.63	109.95	10416.
9	Waiau 9	52.9	1	2.2	0.05	0.021	0.6	0.	0.	0.0000	0.0106	0.0000	0.0000	512.01	515.28	30202.
10	Waiau 10	49.9	1	89.3	1.97	0.731	23.0	16.	0.	0.0000	0.3920	0.0000	0.0000	532.02	536.02	31418.
11	Kahe 1	82.1	1	724.8	62.35	38.109	393.4	0.	0.	0.0000	4.1519	0.0000	0.0000	108.81	108.95	10322.
12	Kahe 2	82.1	1	720.5	69.33	42.372	429.0	0.	0.	0.0000	4.5281	0.0000	0.0000	106.71	106.87	10125.
13	Kahe 3	86.1	1	691.9	77.08	49.406	486.1	0.	0.	0.0000	5.1303	0.0000	0.0000	103.53	103.84	9838.
14	Kahe 4	85.3	1	696.0	74.23	47.134	477.2	0.	0.	0.0000	5.0364	0.0000	0.0000	106.57	106.85	10124.
15	Kahe 5	134.3	1	253.4	28.32	28.311	282.3	1.	0.	0.0000	2.9796	0.0000	0.0000	103.53	105.24	9971.
16	Kahe 6	134.4	1	604.3	54.86	54.885	562.9	0.	0.	0.0000	5.9410	0.0000	0.0000	108.08	108.24	10255.
17	Kala CC	90.0	1	639.8	85.65	57.386	493.4	8.	0.	0.0000	5.5589	0.0000	0.0000	96.87	96.87	8598.
18	Kala CC	90.0	1	735.1	97.62	65.401	563.7	0.	0.	0.0000	6.3511	0.0000	0.0000	97.11	97.11	8620.
19	AES	180.0	1	735.6	98.82	132.408	2294.3	0.	0.	0.0000	3.6580	0.0000	0.0000	27.63	27.63	17327.
20	HPOWER	46.0	1	744.0	86.95	29.775	251.7	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8454.
21	Kala CC	28.0	1	637.2	64.78	13.503	116.7	8.	0.	0.0000	1.3146	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	29.5	1	68.8	9.25	2.032	2.1	23.	0.	0.0000	0.0373	0.0000	0.0000	18.36	18.36	1030.
43	RIDERI	5.0	1	60.6	0.85	0.032	11.8	12.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.04	374584.
	System					679.415	7753.	221.	0.	0.0000	59.5828	0.0000	0.0000	86.81	87.70	11411.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 22
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:29

Year: 2007 Month: May

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.499	0.0324	0.0000	0.0324	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 23
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:29

Year: 2007 Month: May

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	104.606	192.755	Bbl	1195.1	12.6141	120.59	11425.	1055.50
2 KLSFO	260.217	424.311	Bbl	2630.7	27.7673	106.71	10110.	1055.50
3 HLSFO	13.303	27.405	Bbl	169.9	1.8788	141.24	12772.	1105.80
4 DG SUB	2.032	0.357	Bbl	2.1	0.0373	18.36	1030.	1781.30
5 DIESEL	0.752	4.028	Bbl	23.6	0.4027	535.45	31385.	1706.10
7 AES	132.408	2294.250	Bbl	2294.3	3.6580	27.63	17327.	159.44
8 KALAELOA	136.290	195.639	Bbl	1173.8	13.2246	97.03	8613.	1126.62
10 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.00
11 LDMGMT	0.032	11.823	Bbl	11.8	0.0000	0.04	374583.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	378.126	644.470	Bbl	3995.7	42.2602	111.76	10567.	1057.6
2 DIESEL	0.752	4.028	Bbl	23.6	0.4027	535.45	31385.	1706.1
4 AES	132.408	2294.250	Bbl	2294.3	3.6580	27.63	17327.	159.4
5 KALAELOA	136.290	195.639	Bbl	1173.8	13.2246	97.03	8613.	1126.6
7 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.0
8 LdMgmt	0.032	11.823	Bbl	11.8	0.0000	0.04	374583.	0.0
9 DG SUB	2.032	0.357	Bbl	2.1	0.0373	18.36	1030.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 24
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:29

Year: 2007 Month: May

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	680.02			Therml Gen:	679.41	59.5828	87.70
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.50	0.0324	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.09	0.0087	100.00
				Lvl Cost:		0.0000	
Total:	680.02	0.0000	0.00	Total:	680.00	59.6239	87.68
				System Net:		59.6239	87.68
				LOLH(hr):	2.23		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 25
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:29

Year: 2007 Month: May

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	57.9	260.2172	2630.7	2.	0.0000	27.7673	0.0000	106.71
2	Waiau	29.9	105.3577	1218.7	120.	0.0000	13.0167	0.0000	123.55
3	Kalaeloa	88.1	136.2902	1173.8	16.	0.0000	13.2246	0.0000	97.03
4	AES	98.9	132.4081	2294.3	0.	0.0000	3.6580	0.0000	27.63
5	HPOWER	87.0	29.7749	251.7	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	16.6	13.3027	169.9	49.	0.0000	1.8788	0.0000	141.24
7		0.8	0.0316	11.8	12.	0.0000	0.0000	0.0000	0.04
9	DG Sub	9.3	2.0325	2.1	23.	0.0000	0.0373	0.0000	18.36

Year: 2007 Month: May

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
18.025023	29.560495	11.997333	59.582851

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 26
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:52

Year: 2007 Month: Jun

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	335.6	20.76	7.987	100.7	26.	0.	0.0000	1.1141	0.0000	0.0000	132.54	139.49	12615.
2	Honolu 9	54.4	1	232.7	15.03	5.892	77.0	23.	0.	0.0000	0.8513	0.0000	0.0000	136.20	144.50	13067.
3	Waiau 3	46.6	1	150.3	14.51	4.871	65.4	18.	0.	0.0000	0.6902	0.0000	0.0000	128.22	141.72	13427.
4	Waiau 4	46.6	1	151.8	10.68	3.586	48.7	15.	0.	0.0000	0.5136	0.0000	0.0000	128.68	143.23	13570.
5	Waiau 5	54.5	1	481.8	29.81	11.703	149.1	27.	0.	0.0000	1.5739	0.0000	0.0000	127.63	134.49	12742.
6	Waiau 6	53.5	1	431.3	26.90	10.366	134.7	29.	0.	0.0000	1.4219	0.0000	0.0000	128.94	137.17	12995.
7	Waiau 7	82.9	1	673.7	52.33	31.254	339.3	0.	0.	0.0000	3.5810	0.0000	0.0000	114.17	114.58	10855.
8	Waiau 8	86.1	1	672.0	68.89	42.727	443.9	0.	0.	0.0000	4.6849	0.0000	0.0000	109.30	109.65	10388.
9	Waiau 9	52.9	1	34.0	0.78	0.296	9.3	6.	0.	0.0000	0.1590	0.0000	0.0000	533.91	537.90	31528.
10	Waiau 10	49.9	1	85.0	1.93	0.692	21.8	14.	0.	0.0000	0.3724	0.0000	0.0000	534.09	538.01	31534.
11	Kahe 1	82.1	1	692.6	61.67	36.474	376.3	0.	0.	0.0000	3.9715	0.0000	0.0000	108.71	108.88	10316.
12	Kahe 2	82.1	1	695.3	71.47	42.269	427.2	0.	0.	0.0000	4.5091	0.0000	0.0000	106.50	106.68	10107.
13	Kahe 3	86.1	1	180.7	21.45	13.304	130.4	0.	0.	0.0000	1.3764	0.0000	0.0000	103.34	103.46	9802.
14	Kahe 4	85.3	1	673.7	77.75	47.776	482.0	0.	0.	0.0000	5.0876	0.0000	0.0000	106.19	106.49	10089.
15	Kahe 5	134.3	1	685.4	84.67	81.913	801.2	0.	0.	0.0000	8.4564	0.0000	0.0000	103.13	103.24	9781.
16	Kahe 6	134.4	1	531.1	50.47	48.862	509.1	1.	0.	0.0000	5.3738	0.0000	0.0000	107.80	109.98	10420.
17	Kala CC	90.0	1	596.6	82.80	53.686	461.1	9.	0.	0.0000	5.1953	0.0000	0.0000	96.77	96.77	8590.
18	Kala CC	90.0	1	707.8	98.18	63.652	546.8	0.	0.	0.0000	6.1607	0.0000	0.0000	96.79	96.79	8591.
19	AES	180.0	1	713.8	99.08	128.477	2226.1	0.	0.	0.0000	3.5493	0.0000	0.0000	27.63	27.63	17327.
20	HPOWER	46.0	1	720.0	86.95	28.814	243.6	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8454.
21	Kala CC	28.0	1	596.0	65.10	13.130	113.5	9.	0.	0.0000	1.2783	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	29.5	1	63.0	8.75	1.860	1.9	21.	0.	0.0000	0.0341	0.0000	0.0000	18.36	18.36	1030.
43	RIDERI	5.0	1	36.1	0.93	0.034	6.3	6.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.02	188739.
	System					679.624	7715.	208.	0.	0.0000	59.9550	0.0000	0.0000	87.39	88.22	11353.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 27
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:52

Year: 2007 Month: Jun

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.483	0.0313	0.0000	0.0313	64.86

Year: 2007 Month: Jun

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	104.506	190.485	Bbl	1181.0	12.4655	119.28	11301.	1055.50
2 KLSFO	270.598	439.706	Bbl	2726.2	28.7748	106.34	10075.	1055.50
3 HLSFO	13.878	28.667	Bbl	177.7	1.9654	141.62	12807.	1105.80
4 DG SUB	1.860	0.327	Bbl	1.9	0.0341	18.36	1030.	1781.30
5 DIESEL	0.988	5.316	Bbl	31.1	0.5314	537.97	31532.	1706.10
7 AES	128.477	2226.133	Bbl	2226.1	3.5493	27.63	17327.	159.44
8 KALAELOA	130.469	186.906	Bbl	1121.4	12.6343	96.84	8595.	1126.62
10 REFUSE	28.814	39.289	Bbl	243.6	0.0000	0.00	8454.	0.00
11 LDMGMT	0.034	6.343	Bbl	6.3	0.0000	0.02	188739.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	388.983	658.858	Bbl	4084.9	43.2057	111.07	10502.	1057.7
2 DIESEL	0.988	5.316	Bbl	31.1	0.5314	537.97	31532.	1706.1
4 AES	128.477	2226.133	Bbl	2226.1	3.5493	27.63	17327.	159.4
5 KALAELOA	130.469	186.906	Bbl	1121.4	12.6343	96.84	8595.	1126.6
7 REFUSE	28.814	39.289	Bbl	243.6	0.0000	0.00	8454.	0.0
8 LdMgmt	0.034	6.343	Bbl	6.3	0.0000	0.02	188739.	0.0
9 DG SUB	1.860	0.327	Bbl	1.9	0.0341	18.36	1030.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 29
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:52

Year: 2007 Month: Jun

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	680.14			Therml Gen:	679.62	59.9550	88.22
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.48	0.0313	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.02	0.0024	100.00
				Lvl Cost:		0.0000	
Total:	680.14	0.0000	0.00	Total:	680.13	59.9887	88.20
				System Net:		59.9887	88.20
				LOLH(hr):	0.78		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 30
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:14:52

Year: 2007 Month: Jun

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	62.2	270.5981	2726.2	2.	0.0000	28.7748	0.0000	106.34
2	Waiau	31.0	105.4941	1212.2	111.	0.0000	12.9970	0.0000	123.20
3	Kalaeloa	87.1	130.4686	1121.4	18.	0.0000	12.6343	0.0000	96.84
4	AES	99.1	128.4768	2226.1	0.	0.0000	3.5493	0.0000	27.63
5	HPOWER	87.0	28.8144	243.6	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	17.9	13.8783	177.7	50.	0.0000	1.9654	0.0000	141.62
7		0.9	0.0336	6.3	6.	0.0000	0.0000	0.0000	0.02
9	DG Sub	8.8	1.8598	1.9	21.	0.0000	0.0341	0.0000	18.36

Year: 2007 Month: Jun

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
18.887413	29.436098	11.631879	59.955391

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 31
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:15

Year: 2007 Month: Jul

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	321.3	19.11	7.596	96.2	27.	0.	0.0000	1.0633	0.0000	0.0000	132.63	139.99	12660.
2	Honolu 9	54.4	1	220.1	13.90	5.628	73.6	23.	0.	0.0000	0.8137	0.0000	0.0000	135.94	144.59	13076.
3	Waiau 3	46.6	1	146.5	13.62	4.726	63.6	18.	0.	0.0000	0.6713	0.0000	0.0000	128.20	142.04	13457.
4	Waiau 4	46.6	1	265.3	17.95	6.227	84.0	24.	0.	0.0000	0.8862	0.0000	0.0000	128.71	142.31	13482.
5	Waiau 5	54.5	1	485.4	29.15	11.825	150.9	29.	0.	0.0000	1.5927	0.0000	0.0000	127.56	134.69	12761.
6	Waiau 6	53.5	1	418.0	25.22	10.043	131.0	30.	0.	0.0000	1.3829	0.0000	0.0000	128.89	137.71	13047.
7	Waiau 7	82.9	1	691.7	51.98	32.079	348.7	0.	0.	0.0000	3.6808	0.0000	0.0000	114.18	114.74	10871.
8	Waiau 8	86.1	1	697.2	70.47	45.168	468.8	0.	0.	0.0000	4.9483	0.0000	0.0000	109.18	109.55	10379.
9	Waiau 9	52.9	1	43.9	1.03	0.404	12.3	9.	0.	0.0000	0.2093	0.0000	0.0000	513.57	517.71	30345.
10	Waiau 10	49.9	1	82.3	1.93	0.718	21.6	14.	0.	0.0000	0.3683	0.0000	0.0000	508.88	512.63	30047.
11	Kahe 1	82.1	1	722.4	63.12	38.578	397.9	0.	0.	0.0000	4.1997	0.0000	0.0000	108.62	108.86	10314.
12	Kahe 2	82.1	1	718.8	71.60	43.757	442.4	0.	0.	0.0000	4.6691	0.0000	0.0000	106.50	106.70	10109.
13	Kahe 3	86.1	1	0.0	0.00	0.000	0.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.
14	Kahe 4	85.3	1	694.8	78.53	49.863	502.8	0.	0.	0.0000	5.3067	0.0000	0.0000	106.09	106.43	10083.
15	Kahe 5	134.3	1	714.7	86.64	86.619	846.5	0.	0.	0.0000	8.9352	0.0000	0.0000	103.04	103.16	9773.
16	Kahe 6	134.4	1	713.0	67.01	67.046	686.1	0.	0.	0.0000	7.2419	0.0000	0.0000	107.72	108.01	10234.
17	Kala CC	90.0	1	630.7	84.73	56.765	487.6	9.	0.	0.0000	5.4929	0.0000	0.0000	96.77	96.77	8589.
18	Kala CC	90.0	1	735.8	98.85	66.226	568.8	0.	0.	0.0000	6.4083	0.0000	0.0000	96.77	96.77	8589.
19	AES	180.0	1	735.4	98.78	132.365	2293.5	0.	0.	0.0000	3.6948	0.0000	0.0000	27.91	27.91	17327.
20	HPOWER	46.0	1	744.0	67.87	23.239	197.8	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8510.
21	Kala CC	28.0	1	633.3	66.30	13.819	119.4	9.	0.	0.0000	1.3453	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	29.5	1	66.0	8.87	1.948	2.0	22.	0.	0.0000	0.0358	0.0000	0.0000	18.36	18.36	1030.
43	RIDERI	5.0	1	27.4	0.75	0.028	5.5	5.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.02	199202.
	System					704.665	8001.	222.	0.	0.0000	62.9467	0.0000	0.0000	88.57	89.33	11354.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
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Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:15

Year: 2007 Month: Jul

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.499	0.0324	0.0000	0.0324	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 33
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:15

Year: 2007 Month: Jul

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	110.067	201.131	Bbl	1247.0	13.1622	119.58	11330.	1055.50
2 KLSFO	285.863	463.819	Bbl	2875.7	30.3528	106.18	10060.	1055.50
3 HLSFO	13.223	27.378	Bbl	169.7	1.8770	141.95	12837.	1105.80
4 DG SUB	1.948	0.343	Bbl	2.0	0.0358	18.36	1030.	1781.30
5 DIESEL	1.123	5.777	Bbl	33.9	0.5776	514.46	30154.	1706.10
7 AES	132.365	2293.502	Bbl	2293.5	3.6948	27.91	17327.	161.10
8 KALAELOA	136.809	195.963	Bbl	1175.8	13.2465	96.82	8594.	1126.62
10 REFUSE	23.239	31.899	Bbl	197.8	0.0000	0.00	8510.	0.00
11 LDMGMT	0.028	5.535	Bbl	5.5	0.0000	0.02	199202.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	409.154	692.327	Bbl	4292.4	45.3920	110.94	10491.	1057.5
2 DIESEL	1.123	5.777	Bbl	33.9	0.5776	514.46	30154.	1706.1
4 AES	132.365	2293.502	Bbl	2293.5	3.6948	27.91	17327.	161.1
5 KALAELOA	136.809	195.963	Bbl	1175.8	13.2465	96.82	8594.	1126.6
7 REFUSE	23.239	31.899	Bbl	197.8	0.0000	0.00	8510.	0.0
8 LdMgmt	0.028	5.535	Bbl	5.5	0.0000	0.02	199202.	0.0
9 DG SUB	1.948	0.343	Bbl	2.0	0.0358	18.36	1030.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 34
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:15

Year: 2007 Month: Jul

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	705.35			Therml Gen:	704.67	62.9467	89.33
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.50	0.0324	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.18	0.0183	100.00
				Lvl Cost:		0.0000	
Total:	705.35	0.0000	0.00	Total:	705.35	62.9973	89.31
				System Net:		62.9973	89.31
				LOLH(hr):	2.15		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
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Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:15

Year: 2007 Month: Jul

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	63.6	285.8633	2875.7	1.	0.0000	30.3528	0.0000	106.18
2	Waiau	31.6	111.1897	1280.9	125.	0.0000	13.7398	0.0000	123.57
3	Kalaeloa	88.4	136.8090	1175.8	18.	0.0000	13.2465	0.0000	96.82
4	AES	98.8	132.3649	2293.5	0.	0.0000	3.6948	0.0000	27.91
5	HPOWER	67.9	23.2393	197.8	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	16.5	13.2232	169.7	50.	0.0000	1.8770	0.0000	141.95
7		0.7	0.0278	5.5	5.	0.0000	0.0000	0.0000	0.02
9	DG Sub	8.9	1.9483	2.0	22.	0.0000	0.0358	0.0000	18.36

Year: 2007 Month: Jul

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
19.755465	30.991249	12.199996	62.946709

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 36
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:39

Year: 2007 Month: Aug

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	367.7	23.20	9.223	115.3	28.	0.	0.0000	1.2747	0.0000	0.0000	131.82	138.22	12499.
2	Honolu 9	54.4	1	275.0	18.87	7.642	97.7	26.	0.	0.0000	1.0806	0.0000	0.0000	134.35	141.39	12787.
3	Waiau 3	46.6	1	206.9	20.01	6.942	91.8	23.	0.	0.0000	0.9685	0.0000	0.0000	127.78	139.51	13217.
4	Waiau 4	46.6	1	316.9	22.63	7.850	105.0	28.	0.	0.0000	1.1083	0.0000	0.0000	128.27	141.18	13376.
5	Waiau 5	54.5	1	490.9	31.42	12.746	160.9	29.	0.	0.0000	1.6987	0.0000	0.0000	126.74	133.27	12627.
6	Waiau 6	53.5	1	251.8	15.31	6.098	79.4	18.	0.	0.0000	0.8380	0.0000	0.0000	128.77	137.42	13019.
7	Waiau 7	82.9	1	697.4	55.07	33.983	368.2	0.	0.	0.0000	3.8867	0.0000	0.0000	113.96	114.37	10836.
8	Waiau 8	86.1	1	693.6	71.69	45.952	476.1	0.	0.	0.0000	5.0249	0.0000	0.0000	109.08	109.35	10360.
9	Waiau 9	52.9	1	94.8	2.61	1.029	28.0	17.	0.	0.0000	0.4769	0.0000	0.0000	460.34	463.43	27163.
10	Waiau 10	49.9	1	145.0	3.81	1.416	39.3	22.	0.	0.0000	0.6703	0.0000	0.0000	470.30	473.20	27736.
11	Kahe 1	82.1	1	722.2	65.61	40.096	412.5	0.	0.	0.0000	4.3540	0.0000	0.0000	108.44	108.59	10288.
12	Kahe 2	82.1	1	724.8	73.45	44.890	453.1	0.	0.	0.0000	4.7829	0.0000	0.0000	106.40	106.55	10094.
13	Kahe 3	86.1	1	0.0	0.00	0.000	0.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.
14	Kahe 4	85.3	1	696.0	79.73	50.628	509.5	0.	0.	0.0000	5.3781	0.0000	0.0000	105.99	106.23	10064.
15	Kahe 5	134.3	1	707.3	85.50	85.479	835.4	0.	0.	0.0000	8.8177	0.0000	0.0000	103.05	103.16	9773.
16	Kahe 6	134.4	1	718.3	70.01	70.041	715.4	0.	0.	0.0000	7.5506	0.0000	0.0000	107.61	107.80	10213.
17	Kala CC	90.0	1	636.1	85.45	57.251	491.7	8.	0.	0.0000	5.5399	0.0000	0.0000	96.77	96.77	8589.
18	Kala CC	90.0	1	733.7	98.56	66.031	567.1	0.	0.	0.0000	6.3895	0.0000	0.0000	96.77	96.77	8589.
19	AES	180.0	1	736.1	98.88	132.495	2295.7	0.	0.	0.0000	3.6984	0.0000	0.0000	27.91	27.91	17327.
20	HPOWER	46.0	1	744.0	86.95	29.775	251.7	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8454.
21	Kala CC	28.0	1	634.9	66.50	13.862	119.8	8.	0.	0.0000	1.3495	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	29.5	1	69.0	9.27	2.037	2.1	23.	0.	0.0000	0.0374	0.0000	0.0000	18.36	18.36	1030.
43	RIDERI	5.0	1	62.4	2.06	0.077	11.8	12.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.02	154089.
	System					725.542	8228.	242.	0.	0.0000	64.9256	0.0000	0.0000	88.78	89.49	11340.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
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Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:39

Year: 2007 Month: Aug

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.499	0.0324	0.0000	0.0324	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 38
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:39

Year: 2007 Month: Aug

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	113.572	206.675	Bbl	1281.4	13.5250	119.09	11283.	1055.50
2 KLSFO	291.133	471.926	Bbl	2925.9	30.8833	106.08	10050.	1055.50
3 HLSFO	16.865	34.354	Bbl	213.0	2.3553	139.66	12629.	1105.80
4 DG SUB	2.037	0.358	Bbl	2.1	0.0374	18.36	1030.	1781.30
5 DIESEL	2.446	11.474	Bbl	67.2	1.1472	469.09	27495.	1706.10
7 AES	132.495	2295.747	Bbl	2295.7	3.6984	27.91	17327.	161.10
8 KALAELOA	137.144	196.442	Bbl	1178.7	13.2789	96.82	8594.	1126.62
10 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.00
11 LDMGMT	0.077	11.807	Bbl	11.8	0.0000	0.02	154089.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	421.570	712.955	Bbl	4420.3	46.7636	110.93	10485.	1057.9
2 DIESEL	2.446	11.474	Bbl	67.2	1.1472	469.09	27495.	1706.1
4 AES	132.495	2295.747	Bbl	2295.7	3.6984	27.91	17327.	161.1
5 KALAELOA	137.144	196.442	Bbl	1178.7	13.2789	96.82	8594.	1126.6
7 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.0
8 LdMgmt	0.077	11.807	Bbl	11.8	0.0000	0.02	154089.	0.0
9 DG SUB	2.037	0.358	Bbl	2.1	0.0374	18.36	1030.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 39
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:39

Year: 2007 Month: Aug

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	726.19			Therml Gen:	725.54	64.9256	89.49
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.50	0.0324	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.14	0.0136	100.00
				Lvl Cost:		0.0000	
Total:	726.19	0.0000	0.00	Total:	726.18	64.9716	89.47
				System Net:		64.9716	89.47
				LOLH(hr):	3.38		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 40
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:15:39

Year: 2007 Month: Aug

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	64.8	291.1333	2925.9	1.	0.0000	30.8833	0.0000	106.08
2	Waiau	33.0	116.0171	1348.6	137.	0.0000	14.6722	0.0000	126.47
3	Kalaeloa	88.6	137.1438	1178.7	16.	0.0000	13.2789	0.0000	96.82
4	AES	98.9	132.4945	2295.7	0.	0.0000	3.6984	0.0000	27.91
5	HPOWER	87.0	29.7749	251.7	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	21.0	16.8650	213.0	54.	0.0000	2.3553	0.0000	139.66
7		2.1	0.0766	11.8	12.	0.0000	0.0000	0.0000	0.02
9	DG Sub	9.3	2.0369	2.1	23.	0.0000	0.0374	0.0000	18.36

Year: 2007 Month: Aug

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
19.839134	32.393955	12.692661	64.925751

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 41
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:01

Year: 2007 Month: Sep

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	318.2	19.29	7.422	94.1	26.	0.	0.0000	1.0403	0.0000	0.0000	132.81	140.16	12675.
2	Honolu 9	54.4	1	204.1	13.12	5.140	67.3	21.	0.	0.0000	0.7444	0.0000	0.0000	136.23	144.83	13098.
3	Waiau 3	46.6	1	141.4	13.60	4.567	61.1	17.	0.	0.0000	0.6453	0.0000	0.0000	128.23	141.30	13387.
4	Waiau 4	46.6	1	266.6	18.40	6.178	83.7	25.	0.	0.0000	0.8834	0.0000	0.0000	128.82	142.99	13547.
5	Waiau 5	54.5	1	234.5	14.38	5.646	72.3	14.	0.	0.0000	0.7626	0.0000	0.0000	127.70	135.09	12798.
6	Waiau 6	53.5	1	414.3	25.49	9.825	128.4	30.	0.	0.0000	1.3549	0.0000	0.0000	129.08	137.89	13064.
7	Waiau 7	82.9	1	676.1	51.85	30.966	336.4	0.	0.	0.0000	3.5506	0.0000	0.0000	114.27	114.66	10863.
8	Waiau 8	86.1	1	674.2	67.75	42.021	437.1	0.	0.	0.0000	4.6131	0.0000	0.0000	109.40	109.78	10401.
9	Waiau 9	52.9	1	47.1	1.07	0.407	12.9	9.	0.	0.0000	0.2203	0.0000	0.0000	536.53	540.65	31689.
10	Waiau 10	49.9	1	81.4	1.73	0.622	20.6	15.	0.	0.0000	0.3509	0.0000	0.0000	559.73	564.11	33064.
11	Kahe 1	82.1	1	696.2	60.91	36.026	372.1	0.	0.	0.0000	3.9279	0.0000	0.0000	108.84	109.03	10330.
12	Kahe 2	82.1	1	689.8	69.48	41.095	415.7	0.	0.	0.0000	4.3876	0.0000	0.0000	106.62	106.77	10115.
13	Kahe 3	86.1	1	516.7	60.03	37.231	370.7	1.	0.	0.0000	3.9126	0.0000	0.0000	103.47	105.09	9956.
14	Kahe 4	85.3	1	671.3	76.50	47.006	474.7	0.	0.	0.0000	5.0107	0.0000	0.0000	106.30	106.60	10099.
15	Kahe 5	134.3	1	688.6	84.51	81.762	800.0	0.	0.	0.0000	8.4435	0.0000	0.0000	103.16	103.27	9784.
16	Kahe 6	134.4	1	690.0	64.86	62.797	643.7	0.	0.	0.0000	6.7939	0.0000	0.0000	107.91	108.19	10250.
17	Kala CC	90.0	1	590.8	82.00	53.167	456.7	8.	0.	0.0000	5.1448	0.0000	0.0000	96.77	96.77	8589.
18	Kala CC	90.0	1	703.2	97.45	63.182	542.9	0.	0.	0.0000	6.1169	0.0000	0.0000	96.81	96.81	8593.
19	AES	180.0	1	716.2	99.41	128.909	2233.6	0.	0.	0.0000	3.5984	0.0000	0.0000	27.91	27.91	17327.
20	HPOWER	46.0	1	720.0	86.95	28.814	243.6	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8454.
21	Kala CC	28.0	1	593.9	62.20	12.546	108.4	8.	0.	0.0000	1.2214	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	29.5	1	60.0	8.33	1.771	1.8	20.	0.	0.0000	0.0325	0.0000	0.0000	18.36	18.36	1030.
43	RIDERI	5.0	1	26.5	0.51	0.018	6.2	6.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.03	340583.
	System					707.118	7984.	200.	0.	0.0000	62.7560	0.0000	0.0000	88.01	88.75	11291.

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Year: 2007 Month: Sep

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.483	0.0313	0.0000	0.0313	64.86

Year: 2007 Month: Sep

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	99.203	180.467	Bbl	1118.9	11.8099	119.05	11279.	1055.50
2 KLSFO	305.917	496.266	Bbl	3076.8	32.4762	106.16	10058.	1055.50
3 HLSFO	12.562	26.031	Bbl	161.4	1.7847	142.07	12848.	1105.80
4 DG SUB	1.771	0.311	Bbl	1.8	0.0325	18.36	1030.	1781.30
5 DIESEL	1.030	5.714	Bbl	33.5	0.5712	554.83	32520.	1706.10
7 AES	128.909	2233.618	Bbl	2233.6	3.5984	27.91	17327.	161.10
8 KALAELOA	128.894	184.669	Bbl	1108.0	12.4831	96.85	8596.	1126.62
10 REFUSE	28.814	39.289	Bbl	243.6	0.0000	0.00	8454.	0.00
11 LDMGMT	0.018	6.233	Bbl	6.2	0.0000	0.03	340583.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	417.682	702.764	Bbl	4357.1	46.0708	110.30	10432.	1057.4
2 DIESEL	1.030	5.714	Bbl	33.5	0.5712	554.83	32520.	1706.1
4 AES	128.909	2233.618	Bbl	2233.6	3.5984	27.91	17327.	161.1
5 KALAELOA	128.894	184.669	Bbl	1108.0	12.4831	96.85	8596.	1126.6
7 REFUSE	28.814	39.289	Bbl	243.6	0.0000	0.00	8454.	0.0
8 LdMgmt	0.018	6.233	Bbl	6.2	0.0000	0.03	340583.	0.0
9 DG SUB	1.771	0.311	Bbl	1.8	0.0325	18.36	1030.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 44
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:01

Year: 2007 Month: Sep

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	707.59			Therml Gen:	707.12	62.7560	88.75
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.48	0.0313	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.00	0.0000	0.00
				Lvl Cost:		0.0000	
Total:	707.59	0.0000	0.00	Total:	707.60	62.7873	88.73
				System Net:		62.7873	88.73
				LOLH(hr):	0.07		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 45
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:01

Year: 2007 Month: Sep

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	70.3	305.9173	3076.9	2.	0.0000	32.4761	0.0000	106.16
2	Waiau	29.4	100.2324	1152.4	109.	0.0000	12.3812	0.0000	123.52
3	Kalaeloa	86.1	128.8944	1108.0	16.	0.0000	12.4831	0.0000	96.85
4	AES	99.5	128.9088	2233.6	0.	0.0000	3.5984	0.0000	27.91
5	HPOWER	87.0	28.8144	243.6	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	16.2	12.5617	161.4	47.	0.0000	1.7847	0.0000	142.07
7		0.5	0.0183	6.2	6.	0.0000	0.0000	0.0000	0.03
9	DG Sub	8.3	1.7712	1.8	20.	0.0000	0.0325	0.0000	18.36

Year: 2007 Month: Sep

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
19.735796	30.553040	12.467438	62.756275

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
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Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:25

Year: 2007 Month: Oct

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	377.3	23.22	9.229	115.5	27.	0.	0.0000	1.2768	0.0000	0.0000	132.16	138.35	12512.
2	Honolu 9	54.4	1	272.9	18.25	7.390	95.0	26.	0.	0.0000	1.0503	0.0000	0.0000	134.84	142.13	12853.
3	Waiau 3	46.6	1	214.5	20.36	7.061	93.1	22.	0.	0.0000	0.9825	0.0000	0.0000	128.04	139.14	13182.
4	Waiau 4	46.6	1	322.1	22.14	7.680	103.1	28.	0.	0.0000	1.0878	0.0000	0.0000	128.59	141.64	13419.
5	Waiau 5	54.5	1	0.0	0.00	0.000	0.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.
6	Waiau 6	53.5	1	483.0	30.31	12.070	155.0	29.	0.	0.0000	1.6356	0.0000	0.0000	128.41	135.51	12838.
7	Waiau 7	82.9	1	691.0	53.16	32.808	356.0	0.	0.	0.0000	3.7576	0.0000	0.0000	114.08	114.53	10851.
8	Waiau 8	86.1	1	692.4	68.92	44.172	458.7	0.	0.	0.0000	4.8417	0.0000	0.0000	109.25	109.61	10385.
9	Waiau 9	52.9	1	91.6	2.54	1.001	27.1	18.	0.	0.0000	0.4623	0.0000	0.0000	458.58	461.93	27075.
10	Waiau 10	49.9	1	140.5	3.54	1.315	37.6	24.	0.	0.0000	0.6417	0.0000	0.0000	484.55	487.97	28601.
11	Kahe 1	82.1	1	721.7	62.94	38.467	396.8	0.	0.	0.0000	4.1887	0.0000	0.0000	108.67	108.89	10317.
12	Kahe 2	82.1	1	724.1	71.42	43.652	441.6	0.	0.	0.0000	4.6608	0.0000	0.0000	106.55	106.77	10116.
13	Kahe 3	86.1	1	696.5	80.43	51.551	506.2	0.	0.	0.0000	5.3434	0.0000	0.0000	103.32	103.65	9820.
14	Kahe 4	85.3	1	422.9	47.41	30.106	303.8	0.	0.	0.0000	3.2066	0.0000	0.0000	106.15	106.51	10091.
15	Kahe 5	134.3	1	713.3	85.53	85.507	836.1	0.	0.	0.0000	8.8253	0.0000	0.0000	103.11	103.21	9778.
16	Kahe 6	134.4	1	711.6	66.83	66.865	684.3	0.	0.	0.0000	7.2227	0.0000	0.0000	107.73	108.02	10234.
17	Kala CC	90.0	1	644.4	86.56	57.994	498.1	8.	0.	0.0000	5.6119	0.0000	0.0000	96.77	96.77	8589.
18	Kala CC	90.0	1	735.8	98.62	66.070	567.9	0.	0.	0.0000	6.3979	0.0000	0.0000	96.84	96.84	8595.
19	AES	180.0	1	734.2	82.66	110.765	1940.2	0.	0.	0.0000	3.1256	0.0000	0.0000	28.22	28.22	17516.
20	HPOWER	46.0	1	744.0	86.95	29.775	251.7	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8454.
21	Kala CC	28.0	1	638.6	67.81	14.134	122.1	8.	0.	0.0000	1.3760	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	29.5	1	69.0	9.27	2.037	2.1	23.	0.	0.0000	0.0374	0.0000	0.0000	18.36	18.36	1030.
43	RIDERI	5.0	1	59.3	1.82	0.068	13.5	13.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.02	198989.
	System					719.715	8005.	228.	0.	0.0000	65.7325	0.0000	0.0000	90.65	91.33	11123.

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Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:25

Year: 2007 Month: Oct

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.499	0.0324	0.0000	0.0324	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 48
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:25

Year: 2007 Month: Oct

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	103.792	188.035	Bbl	1165.8	12.3052	118.56	11232.	1055.50
2 KLSFO	316.148	511.108	Bbl	3168.9	33.4474	105.80	10023.	1055.50
3 HLSFO	16.619	33.944	Bbl	210.5	2.3272	140.03	12663.	1105.80
4 DG SUB	2.037	0.358	Bbl	2.1	0.0374	18.36	1030.	1781.30
5 DIESEL	2.316	11.042	Bbl	64.7	1.1040	476.71	27942.	1706.10
7 AES	110.765	1940.154	Bbl	1940.2	3.1256	28.22	17516.	161.10
8 KALAELOA	138.197	198.021	Bbl	1188.1	13.3857	96.86	8597.	1126.62
10 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.00
11 LDMGMT	0.068	13.451	Bbl	13.5	0.0000	0.02	198989.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	436.558	733.087	Bbl	4545.1	48.0798	110.13	10411.	1057.8
2 DIESEL	2.316	11.042	Bbl	64.7	1.1040	476.71	27942.	1706.1
4 AES	110.765	1940.154	Bbl	1940.2	3.1256	28.22	17516.	161.1
5 KALAELOA	138.197	198.021	Bbl	1188.1	13.3857	96.86	8597.	1126.6
7 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.0
8 LdMgmt	0.068	13.451	Bbl	13.5	0.0000	0.02	198989.	0.0
9 DG SUB	2.037	0.358	Bbl	2.1	0.0374	18.36	1030.	1781.3

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PPC Proprietary Program Licensed to HECO       Till 12/2099                    HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET            Page:     49
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS           05/18/07    07:16:25

Year: 2007  Month: Oct
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System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	720.31			Therml Gen:	719.72	65.7325	91.33
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.50	0.0324	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.06	0.0057	100.00
				Lvl Cost:		0.0000	
Total:	720.31	0.0000	0.00	Total:	720.27	65.7705	91.31
				System Net:		65.7705	91.31
				LOLH(hr):	1.79		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 50
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:25

Year: 2007 Month: Oct

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	70.3	316.1477	3168.9	1.	0.0000	33.4474	0.0000	105.80
2	Waiau	30.2	106.1074	1230.5	122.	0.0000	13.4092	0.0000	126.37
3	Kalaeloa	89.3	138.1969	1188.1	16.	0.0000	13.3857	0.0000	96.86
4	AES	82.7	110.7649	1940.2	0.	0.0000	3.1256	0.0000	28.22
5	HPOWER	87.0	29.7749	251.7	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	20.7	16.6190	210.5	53.	0.0000	2.3272	0.0000	140.03
7		1.8	0.0676	13.5	13.	0.0000	0.0000	0.0000	0.02
9	DG Sub	9.3	2.0369	2.1	23.	0.0000	0.0374	0.0000	18.36

Year: 2007 Month: Oct

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
20.515846	32.124512	13.092085	65.732445

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
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Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:44

Year: 2007 Month: Nov

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	239.8	14.50	5.578	71.4	23.	0.	0.0000	0.7897	0.0000	0.0000	132.86	141.56	12802.
2	Honolu 9	54.4	1	83.3	5.46	2.139	27.9	9.	0.	0.0000	0.3089	0.0000	0.0000	135.87	144.41	13059.
3	Waiau 3	46.6	1	109.6	10.36	3.479	47.5	15.	0.	0.0000	0.5010	0.0000	0.0000	128.47	143.99	13642.
4	Waiau 4	46.6	1	183.3	12.63	4.239	58.8	21.	0.	0.0000	0.6209	0.0000	0.0000	128.86	146.48	13878.
5	Waiau 5	54.5	1	182.6	10.98	4.310	56.3	15.	0.	0.0000	0.5945	0.0000	0.0000	128.00	137.95	13070.
6	Waiau 6	53.5	1	356.9	21.66	8.348	110.7	30.	0.	0.0000	1.1681	0.0000	0.0000	129.32	139.92	13257.
7	Waiau 7	82.9	1	670.6	48.85	29.172	318.7	0.	0.	0.0000	3.3634	0.0000	0.0000	114.77	115.30	10923.
8	Waiau 8	86.1	1	541.7	48.67	30.185	315.9	0.	0.	0.0000	3.3343	0.0000	0.0000	110.18	110.46	10465.
9	Waiau 9	52.9	1	29.9	0.69	0.263	8.3	7.	0.	0.0000	0.1409	0.0000	0.0000	530.41	535.23	31371.
10	Waiau 10	49.9	1	55.7	1.14	0.409	13.9	12.	0.	0.0000	0.2379	0.0000	0.0000	575.92	581.22	34067.
11	Kahe 1	82.1	1	696.5	56.16	33.215	345.0	0.	0.	0.0000	3.6419	0.0000	0.0000	109.47	109.65	10388.
12	Kahe 2	82.1	1	692.9	62.87	37.182	378.5	0.	0.	0.0000	3.9955	0.0000	0.0000	107.29	107.46	10181.
13	Kahe 3	86.1	1	675.6	75.90	47.081	463.5	0.	0.	0.0000	4.8922	0.0000	0.0000	103.64	103.91	9845.
14	Kahe 4	85.3	1	634.1	67.11	41.236	423.4	1.	0.	0.0000	4.4689	0.0000	0.0000	106.84	108.37	10267.
15	Kahe 5	134.3	1	683.8	80.56	77.937	764.6	0.	0.	0.0000	8.0707	0.0000	0.0000	103.41	103.55	9811.
16	Kahe 6	134.4	1	692.2	58.75	56.887	586.6	0.	0.	0.0000	6.1920	0.0000	0.0000	108.59	108.85	10312.
17	Kala CC	90.0	1	609.5	84.06	54.501	469.0	8.	0.	0.0000	5.2842	0.0000	0.0000	96.96	96.96	8606.
18	Kala CC	90.0	1	709.7	97.37	63.133	544.2	0.	0.	0.0000	6.1312	0.0000	0.0000	97.12	97.12	8620.
19	AES	180.0	1	713.5	99.05	128.434	2225.4	0.	0.	0.0000	3.5851	0.0000	0.0000	27.91	27.91	17327.
20	HPOWER	46.0	1	720.0	86.95	28.814	243.6	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8454.
21	Kala CC	28.0	1	612.1	63.04	12.716	109.9	8.	0.	0.0000	1.2380	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	29.5	1	66.0	9.16	1.948	2.0	22.	0.	0.0000	0.0358	0.0000	0.0000	18.36	18.36	1030.
43	RIDERI	5.0	1	19.7	0.43	0.015	4.9	5.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.03	315223.
	System					671.222	7590.	176.	0.	0.0000	58.5951	0.0000	0.0000	86.60	87.30	11308.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 52
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:44

Year: 2007 Month: Nov

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.483	0.0313	0.0000	0.0313	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 53
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:44

Year: 2007 Month: Nov

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	79.733	146.425	Bbl	907.8	9.5822	120.18	11386.	1055.50
2 KLSFO	293.537	477.702	Bbl	2961.8	31.2613	106.50	10090.	1055.50
3 HLSFO	7.718	16.024	Bbl	99.3	1.0986	142.35	12873.	1105.80
4 DG SUB	1.948	0.343	Bbl	2.0	0.0358	18.36	1030.	1781.30
5 DIESEL	0.673	3.789	Bbl	22.2	0.3788	563.22	33012.	1706.10
7 AES	128.434	2225.385	Bbl	2225.4	3.5851	27.91	17327.	161.10
8 KALAELOA	130.350	187.188	Bbl	1123.1	12.6534	97.07	8616.	1126.62
10 REFUSE	28.814	39.289	Bbl	243.6	0.0000	0.00	8454.	0.00
11 LDMGMT	0.015	4.865	Bbl	4.9	0.0000	0.03	315223.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	380.988	640.151	Bbl	3968.9	41.9421	110.09	10417.	1056.8
2 DIESEL	0.673	3.789	Bbl	22.2	0.3788	563.22	33012.	1706.1
4 AES	128.434	2225.385	Bbl	2225.4	3.5851	27.91	17327.	161.1
5 KALAELOA	130.350	187.188	Bbl	1123.1	12.6534	97.07	8616.	1126.6
7 REFUSE	28.814	39.289	Bbl	243.6	0.0000	0.00	8454.	0.0
8 LdMgmt	0.015	4.865	Bbl	4.9	0.0000	0.03	315223.	0.0
9 DG SUB	1.948	0.343	Bbl	2.0	0.0358	18.36	1030.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 54
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:44

Year: 2007 Month: Nov

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	671.71			Therml Gen:	671.22	58.5951	87.30
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.48	0.0313	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.00	0.0001	100.00
				Lvl Cost:		0.0000	
Total:	671.71	0.0000	0.00	Total:	671.71	58.6266	87.28
				System Net:		58.6266	87.28
				LOLH(hr):	0.13		

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 55
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:16:44

Year: 2007 Month: Nov

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	67.5	293.5369	2961.8	2.	0.0000	31.2613	0.0000	106.50
2	Waiau	23.6	80.4055	930.0	100.	0.0000	9.9610	0.0000	123.88
3	Kalaeloa	87.0	130.3498	1123.1	16.	0.0000	12.6534	0.0000	97.07
4	AES	99.1	128.4335	2225.4	0.	0.0000	3.5851	0.0000	27.91
5	HPOWER	87.0	28.8144	243.6	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	9.9	7.7176	99.3	32.	0.0000	1.0986	0.0000	142.35
7		0.4	0.0154	4.9	5.	0.0000	0.0000	0.0000	0.03
9	DG Sub	9.2	1.9483	2.0	22.	0.0000	0.0358	0.0000	18.36

Year: 2007 Month: Nov

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
18.545237	28.284698	11.765279	58.595211

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 56
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Year: 2007 Month: Dec

Station Summary

	Station	Capacity MW	Unit	Hours	CF %	Energy GWh	MBtu k	Cold Start	Warm Start	Stup Cst M$	Fuel Cst M$	VO&M Cst M$	FO&M Cst M$	Oper Cst $/MWh	Tot Cst $/MWh	Ave Hrt Btu/kWh
1	Honolu 8	53.4	1	0.0	0.00	0.000	0.0	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.
2	Honolu 9	54.4	1	175.4	10.24	4.148	55.9	22.	0.	0.0000	0.6180	0.0000	0.0000	137.65	149.00	13475.
3	Waiau 3	46.6	1	111.8	10.13	3.516	48.8	18.	0.	0.0000	0.5150	0.0000	0.0000	128.62	146.50	13880.
4	Waiau 4	46.6	1	240.5	15.70	5.447	74.8	24.	0.	0.0000	0.7895	0.0000	0.0000	129.07	144.94	13732.
5	Waiau 5	54.5	1	430.0	24.75	10.040	129.9	29.	0.	0.0000	1.3710	0.0000	0.0000	128.19	136.56	12938.
6	Waiau 6	53.5	1	345.9	20.11	8.007	106.4	29.	0.	0.0000	1.1228	0.0000	0.0000	129.48	140.23	13285.
7	Waiau 7	82.9	1	254.4	17.71	10.928	124.5	1.	0.	0.0000	1.3138	0.0000	0.0000	115.06	120.22	11390.
8	Waiau 8	86.1	1	539.0	45.01	28.849	308.0	1.	0.	0.0000	3.2514	0.0000	0.0000	110.47	112.71	10678.
9	Waiau 9	52.9	1	27.4	0.61	0.242	7.6	8.	0.	0.0000	0.1295	0.0000	0.0000	528.54	534.72	31342.
10	Waiau 10	49.9	1	53.4	0.99	0.370	13.2	14.	0.	0.0000	0.2251	0.0000	0.0000	602.03	609.05	35699.
11	Kahe 1	82.1	1	718.6	54.94	33.579	349.7	0.	0.	0.0000	3.6913	0.0000	0.0000	109.63	109.93	10415.
12	Kahe 2	82.1	1	720.5	60.42	36.924	377.5	0.	0.	0.0000	3.9840	0.0000	0.0000	107.62	107.90	10222.
13	Kahe 3	86.1	1	690.2	73.06	46.825	462.2	0.	0.	0.0000	4.8790	0.0000	0.0000	103.78	104.20	9872.
14	Kahe 4	85.3	1	697.2	69.84	44.345	451.0	0.	0.	0.0000	4.7604	0.0000	0.0000	107.00	107.35	10171.
15	Kahe 5	134.3	1	712.1	79.98	79.965	785.1	0.	0.	0.0000	8.2863	0.0000	0.0000	103.50	103.62	9818.
16	Kahe 6	134.4	1	714.0	56.79	56.820	587.6	0.	0.	0.0000	6.2025	0.0000	0.0000	108.82	109.16	10342.
17	Kala CC	90.0	1	618.6	82.10	55.007	474.2	10.	0.	0.0000	5.3428	0.0000	0.0000	97.13	97.13	8621.
18	Kala CC	90.0	1	731.8	96.53	64.671	558.7	0.	0.	0.0000	6.2941	0.0000	0.0000	97.33	97.33	8639.
19	AES	180.0	1	736.3	98.91	132.538	2296.5	0.	0.	0.0000	3.6997	0.0000	0.0000	27.91	27.91	17327.
20	HPOWER	46.0	1	744.0	86.95	29.775	251.7	0.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.00	8454.
21	Kala CC	28.0	1	618.9	60.48	12.607	108.9	10.	0.	0.0000	1.2273	0.0000	0.0000	97.35	97.35	8641.
23	DG Sub	29.5	1	63.0	8.46	1.860	1.9	21.	0.	0.0000	0.0341	0.0000	0.0000	18.36	18.36	1030.
43	RIDERI	5.0	1	16.0	0.36	0.013	5.0	5.	0.	0.0000	0.0000	0.0000	0.0000	0.00	0.04	369525.
	System					666.472	7579.	194.	0.	0.0000	57.7377	0.0000	0.0000	85.77	86.63	11372.

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
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Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Year: 2007 Month: Dec

Transaction Summary

ID	Transaction	Type	Energy GWh	Engy Cost M$	CAP Cost M$	Total Cost M$	Ave Cost $/MWh
2	Non-Firm	CONSTANT PURC	0.499	0.0324	0.0000	0.0324	64.86

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 58
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Year: 2007 Month: Dec

Fuel Type Summary

Type	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
Spot:								
1 WLSFO	66.785	127.803	Bbl	792.4	8.3636	125.23	11865.	1055.50
2 KLSFO	298.457	485.989	Bbl	3013.1	31.8036	106.56	10096.	1055.50
3 HLSFO	4.148	9.015	Bbl	55.9	0.6180	149.00	13475.	1105.80
4 DG SUB	1.860	0.327	Bbl	1.9	0.0341	18.36	1030.	1781.30
5 DIESEL	0.612	3.546	Bbl	20.8	0.3545	579.63	33974.	1706.10
7 AES	132.538	2296.496	Bbl	2296.5	3.6997	27.91	17327.	161.10
8 KALAELOA	132.284	190.307	Bbl	1141.8	12.8642	97.25	8632.	1126.62
10 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.00
11 LDMGMT	0.013	4.954	Bbl	5.0	0.0000	0.04	369525.	0.01

Fuel Class Summary

Class	Energy GWh	Fuel ,000	Fuel Unit	MBtu ,000	Fuel Cost M$	Fuel Cost $/MWh	Heat Rate Btu/kWh	Fuel Cost C/MBtu
1 LSFO	369.391	622.806	Bbl	3861.4	40.7852	110.41	10453.	1056.2
2 DIESEL	0.612	3.546	Bbl	20.8	0.3545	579.63	33974.	1706.1
4 AES	132.538	2296.496	Bbl	2296.5	3.6997	27.91	17327.	161.1
5 KALAELOA	132.284	190.307	Bbl	1141.8	12.8642	97.25	8632.	1126.6
7 REFUSE	29.775	40.599	Bbl	251.7	0.0000	0.00	8454.	0.0
8 LdMgmt	0.013	4.954	Bbl	5.0	0.0000	0.04	369525.	0.0
9 DG SUB	1.860	0.327	Bbl	1.9	0.0341	18.36	1030.	1781.3

PPC Proprietary Program Licensed to HECO Till 12/2099 HECO PMONTH V.022504
HECO Rate Case 2007 Test Year - DT w/2007 AOS EFOR; Fuel Adj for GET Page: 59
Load adj CU & losses (1.0005); No DSG; 5/07 Ewa Nui; Min/max cap; MCS 05/18/07 07:17:03

Year: 2007 Month: Dec

System Energy and Cost Summary

Demand	GWh	Cost M$	Cost $/MWh	Supply	GWh	Cost M$	Cost $/MWh
Load:	666.97			Therml Gen:	666.47	57.7377	86.63
				Hydro Gen:	0.00	0.0000	0.00
P-S Pumping:	0.00			P-S Gen:	0.00	0.0000	0.00
P-S Payback:	0.00						
F. E. Sale:	0.00	0.0000	0.00	F. E. Purc:	0.50	0.0324	64.86
Econ. Sale:	0.00	0.0000	0.00	Econ. Purc:	0.00	0.0000	0.00
Unit Sale:	0.00	0.0000	0.00				
Transm Loss:	0.00			Rej. Fuel:		0.0000	
Dsm Load:	0.00			Dsm Reductn:	0.00		
				Emerg Purc:	0.00	0.0000	0.00
Dumped Engy:	0.00	0.0000	0.00	E.U. Energy:	0.00	0.0002	100.00
				Lvl Cost:		0.0000	
Total:	666.97	0.0000	0.00	Total:	666.97	57.7703	86.62
				System Net:		57.7703	86.62
				LOLH(hr):	0.07		

Year: 2007 Month: Dec

Plant Summary

	Plant	CF %	Energy GWh	MBtu 1000	Start Ups	Stup Cst M$	Fuel Cst M$	O&M Cst M$	Tot Cst $/MWh
1	Kahe	66.4	298.4574	3013.1	1.	0.0000	31.8036	0.0000	106.56
2	Waiau	19.2	67.3970	813.2	124.	0.0000	8.7181	0.0000	129.35
3	Kalaeloa	85.5	132.2842	1141.8	20.	0.0000	12.8642	0.0000	97.25
4	AES	99.0	132.5377	2296.5	0.	0.0000	3.6997	0.0000	27.91
5	HPOWER	87.0	29.7749	251.7	0.	0.0000	0.0000	0.0000	0.00
6	Honolulu	5.2	4.1478	55.9	22.	0.0000	0.6180	0.0000	149.00
7		0.4	0.0134	5.0	5.	0.0000	0.0000	0.0000	0.04
9	DG Sub	8.5	1.8598	1.9	21.	0.0000	0.0341	0.0000	18.36

Year: 2007 Month: Dec

Monthly Fuel & Var O&M Cost by Subperiod (M$)

Off Peak	Shoulder Peak	Priority Peak	Total
18.338491	27.441330	11.958024	57.737846

Hawaiian Electric Company, Inc.

SUMMARY OF RESULTS

	HECO Direct Testimony (A)	HECO Update (B)
Total Fuel Oil Expense ($000)	**$ 536,833**	**$ 537,767**
Total Fuel Related Expense ($000)	**$ 6,128**	**$ 6,107**
Fuel Handling Expense	$ 4,839	$ 4,839
Fuel Trucking Expense	$ 1,092	$ 1,074
Petrospect Expense	$ 84	$ 82
Kahe 6 Fuel Additive Expense	$ 113	$ 113
Total Fuel Expense ($000)	**$ 542,961**	**$ 543,874**
Contract Fuel Prices ($/BBL)		
Honolulu LSFO	65.1012	65.4412
Kahe LSFO	65.1012	65.4412
Waiau-Steam LSFO	65.1012	65.4412
Waiau-Diesel	99.4609	99.9771
Substation DG	99.4609	99.9771
Test Year Sales (GWH)	**7,720.8**	**7,720.8**
Test Year Company Use (GWH)	**15.4**	**15.8**
Test Year Losses (GWH)	**373.0**	**376.4**
Net System Input (GWH)	**8,109.2**	**8,113.0**
Purchased Power (GWH)	**3,372.7**	**3,373.5**
Net HECO (GWH)	**4,736.5**	**4,739.6**
Central Station	4,713.5	4,717.7
Substation DG	23.0	21.8
Total Central Station Net Heat Rate (BTU/Net KWH)	**10,691**	**10,668**
Steam Net Heat Rate (BTU/Net KWH)	**10,609**	**10,606**
Diesel Net Heat Rate (BTU/Net KWH)	**31,015**	**33,290**
Total Central Station Sales Heat Rate (BTU/KWH Sales)	**0.011226**	**0.011209**
Total Fuel Inventory ($000)		
Residual Fuel Oil Inventory	$ 50,224	$ 50,589
Diesel Oil Inventory	$ 2,482	$ 2,495
Total Fuel Inventory (BBL)		
Residual Fuel Oil Inventory	770,024	771,615
Diesel Oil Inventory	24,873	24,873

NOTE: TOTALS MAY NOT ADD EXACTLY DUE TO ROUNDING

This workpaper contains confidential fuel pricing information and is submitted pursuant to Protective Order No. 23378, issued April 23, 2007.

CA-IR-215

Ref: T-4, page 4, line 11.

The referenced testimony indicates that HECO is exploring alternatives other than the Kahe wind farm.

a. Please explain and provide documentation on the other alternatives being explored.

b. Please identify when these other alternatives may go into service.

HECO Response:

a. Please refer to the HECO IRP-3 Evaluation Report to be filed on or before May 31, 2007 pursuant to Order No. 23312, issued March 21, 2007 in Docket No. 03-0253. In addition, by letter dated June 27, 2006, in response to the Commission's Oral Argument Question No. 9 in the Competitive Bidding Investigation, Docket No. 03-0372, Hawaiian Electric Company, Inc., Maui Electric Company, Limited, and Hawaii Electric Light Company, Inc. (collectively, the "Companies") submitted a list of offers to sell energy on an as-available basis by non-fossil fuel generation producers that were presently under review by the respective electric utilities. The Companies' list of offers contains confidential information related to the Companies' negotiations with independent power producers, and the list of offers was provided to the Commission and the Consumer Advocate only pursuant to Protective Order No. 22562, issued June 26, 2006. In their Response to Decision and Order No. 22588 and Comments on the Proposed Framework for Competitive Bidding filed September 11, 2006 in Docket No. 03-0372, the HECO Companies noted that, subsequent to the filing of the HECO Companies' response to the Commission's Oral Argument Question Number 9 on June 27, 2006, (1) the HECO Companies have received or had discussions on

new proposals that were not included in the June 27, 2006 filing, and (2) some of the proposals discussed in the June 27, 2006 filing had been revised. Exhibit A to the response, which also was provided to the Commission and the Consumer Advocate only pursuant to Protective Order No. 22562, contained additional details concerning the projects. Under the Hawaii Public Utilities Commission's Framework for Competitive Bidding, adopted by Decision and Order No. 23121, issued December 8, 2006 in Docket No. 03-0372, the Framework does not apply to: "(ii) offers to sell energy on an as-available basis by non-fossil fuel producers that were submitted to an electric utility before this Framework was adopted; and (iii) offers to sell firm energy and/or capacity by non-fossil fuel producers that were submitted to an electric utility before this Framework was adopted, or that resulted from negotiations with respect to offers to sell energy on an as-available basis by non-fossil fuel producers that were submitted to an electric utility before this Framework was adopted; provided that negotiations with respect to such firm energy and/or capacity offers are concluded no later than December 31, 2007.

b. See response to subpart a. None of the potential projects are expected to be in service in 2007.

CA-IR-216

Ref: T-4, page 5, lines 3 - 4.

Please explain how the photovoltaic project on the Archer substation rooftop was modeled in the production simulation model.

HECO Response:

The production simulation did not include the Archer PV project, primarily because of its small size (approximately 155 kW). (See HECO T-4 at page 5, lines 1-4.)

CA-IR-217

Ref: T-4, page 5, lines 5 – 9.

Please explain how renewables from IPPs were modeled in the production simulation.

HECO Response:

The section of the testimony referenced by the Consumer Advocate states:

> Renewables from Independent Power Producers ("IPP") – HECO will evaluate proposals made by IPPs, such as a potential ocean thermal energy conversion ("OTEC") project off Kahe Point, as identified in the HECO, HELCO and MECO Renewable Portfolio Standard Status Report filed with the Commission on June 27, 2005.

While HECO continues to have discussions with various proposers of IPP renewable energy projects, HECO has not yet signed power purchase agreements with any of them. Therefore, there are no new renewable energy facilities, IPP or utility-owned, on the HECO system, and none are estimated to be installed during the test year. See also response to CA-IR-215. There are no new renewable energy facilities modeled in the production simulation. H-POWER is an existing IPP waste-to-energy facility, which is considered renewable, and is modeled as a must-run thermal unit in the production simulation, consistent with anticipated operation during the test year.

CA-IR-218

Ref: HECO-402 and Response to CA-IR-53.

The response to CA-IR-53 contains fuel pricing information for each HECO generating plant for fuel from Chevron and Tesoro.

Please provide the percentage of fuel from Chevron and the percentage of fuel from Tesoro for each HECO generating unit.

HECO Response:

HECO-402, line 1, provides the Test Year Percent of Purchases for Chevron and Tesoro. This system-level assumption is the same allocation assumption for each HECO generating plant and each HECO generating unit.

CA-IR-219

Ref: T-4, page 9, lines 4 – 6, HECO-WP-412, page 19.

The referenced testimony indicates that the Company has 29.5 MW of distributed generators at substation sites. HECO-WP-412, page 19 indicates that there are 85.28 MW of capacity for the generating units labeled DG Sub.

a. Are these intended to be the same DG units? If so, please explain

b. Please explain how the DG units were modeled in the production simulation.

HECO Response:

a. Yes, these are the same DG units. While HECO-WP-412, page 19 does contain (3) separate records for "DG Sub", the Id for each record is 23, indicating that these are all the same "generating unit". The records are mutually exclusive (based on increases in capacity as installations occur during certain months, "Mn", of the test year), and consequently, the capacities from each record should not be added together (to arrive at 85.28 MW).

b. The DGs were modeled as must-run units in the production simulation, with pattern files configured to dispatch the units 15 hours per week, as described in the response to part b for CA-IR-222.

CA-IR-220

Ref: HECO-WP-404, page 18 and HECO-WP-406, page 1.

HECO-WP-404, page 18 contains the HECO generating unit and purchased power operating minimum capacities and normal top load capacities from the 2005 calibration factor report. HECO-WP-406, page 1 contains the HECO generating unit and purchased power operating minimum capacities and normal top load capacities for test year 2007. Please see the table below. It appears that the operating minimum capacities and normal top load capacities have changed.

	HECO-WP-404, Page 18		HECO-WP-406, Page 1	
Generating Unit	Operating Minimum (MW)	Normal Top Load (MW)	Operating Minimum (MW)	Normal Top Load (MW)
Waiau 6	22.5	55.6	22.5	53.7
Waiau 7	32.7	88.1	32.7	83.2
Waiau 8	32.7	88.1	32.7	86.2
Waiau 9	13.9	51.9	6.0	52.9
Waiau 10	13.9	49.9	6.0	49.9
Kahe 1	27.7	88.2	32.6	82.3
Kahe 2	27.9	86.3	32.8	82.4
Kahe 3	27.8	88.2	32.7	86.3
Kahe 4	27.8	89.2	32.7	85.3
Kahe 5	50.4	134.7	49.8	134.7
Kalaeloa Additional Capacity	0.0	29.0	0.0	28.0

a. Please explain why the above operating minimum capacities and normal top load capacities for the above generating units are different from HECO-WP-404, page 18 to HECO-WP-406, page 1.

b. Please provide the operating minimum capacity and normal top load capacity for the above generating units that were used in the production simulation.

HECO Response:

a. HECO assessed the operating minimum capacity and normal top load during development of the direct testimony, which were the values reflected in HECO-WP-406 (page 1), with the exception of the operating minimum for Kahe 5, which was incorrectly listed at 49.8 MW (while the direct testimony production simulation used 50.4). See also response to CA-IR-197. Subsequent to the filing of direct testimony, HECO refined some of the unit ratings used in the updated production simulation (see the response to part b, below).

b. The updated production simulations ratings are provided in response to CA-IR-214. Ratings are listed within the response narrative (page 1 of CA-IR-214). For reference, they can also be found in the update to HECO-WP-406 (page 34 of CA-IR-214) and in the update to HECO-WP-412 (pages 58 and 59 of CA-IR-214, where the MW row for each unit provides the minimum capacity in the column labeled "State 1", and the normal top load capacity in the column labeled "State 4").

CA-IR-221

Ref: HECO-WP-406, page 2; T-4, page 19 lines 5 – 7; HECO-RWP-406, page 2 (Docket No. 04-0113).

The referenced section of testimony indicates that the heat rate constants provided on HECO-WP-406, page 2 are consistent with the heat rate constants provided in the Company's last rate case, Docket No. 04-0113. Please see the table below:

Generating Unit	HECO-RWP-406, Page 2 (Docket No. 04-0113) B Coefficient	HECO-WP-406, Page 2 (Docket No. 06-0386) B Coefficient
Kalaeloa CT1	4.4109	4.4288
Kalaeloa CT2	4.4109	4.4288
Kalaeloa Additional Capacity	8.6710	8.6408

a. Please explain why the B coefficient for the three Kalaeloa generating units has changed since the rebuttal testimony from HECO's last rate case.

b. Please indicate which B coefficients were used in the production simulation for the three Kalaeloa generating units.

HECO Response:

a. Please refer to the response to CA-IR-223, where an explanation of Kalaeloa (and AES) coefficients is provided. As described therein, the Kalaeloa B coefficient is impacted by, among other things, fuel prices. Since HECO is using different fuel prices in this rate case compared to the last rate case, the Kalaeloa B coefficient is different from the previous value used in the prior rate case.

b. The values provided in the table above, in the column labeled "Docket No. 06-0386", were used in the production simulation for this 2007 Test Year rate case.

CA-IR-222

Ref: Response to CA-IR-54 and HECO-WP-412, pages 32 – 37.

The response to CA-IR-54 indicates in Part 4 that the Distributed Generators are modeled by using a pattern file to approximate the number of hours that the units will run during the test year. The DG pattern file was provided on HECO-WP-412, pages 32 – 37.

a. Please explain how the number of hours that the DG units will run was determined, including all calculations and supporting documentation.

b. Please explain why the DG units were allowed to run during the specific hours listed in the DG pattern file.

HECO Response:

a. HECO's operating departments discussed DG operating scenarios and considered air permit limitations and the need to keep a certain level of hours saved for system emergencies. The air permit allows approximately 1,300 hours of run time for each DG unit in any 12 month window. HECO reasoned that it would be undesirable to operate the units up to this maximum during non-emergency operation, and estimated that approximately 15 hours per week (780 hours per year) could be used for non-emergency conditions, while preserving a fair portion of the permitted hours for use during emergencies.

b. HECO estimated that during non-emergency use, the DGs may be called upon to defer the commitment of Waiau unit 9 or Waiau unit 10, depending on the expected loads for the day. This scenario is an approximation, and actual operation of the system would depend on a variety of factors, including the condition of on-line units (utility and IPP), system issues such as transmission line and substation outages, and the amount of permitted DG hours

available in reserve. Under this representative scenario, the DG units would run for a few hours during the weekday shoulder peak (as indicated in the production simulation pattern file for DG), resulting in approximately 15 hours per week (as described in response to part a. above).

CA-IR-223

Ref: T-5, page 3, line 25 – page 4, line 2.

a. Please identify the second order equation that was derived from the contractual payment provisions for the energy cost and variable O&M cost for the Kalaeloa and AES Hawaii purchases.

b. Please provide all supporting documentation and calculations that were used to derive this equation.

HECO Response:

a. The second order equations for both AES and Kalaeloa are of the form:

$F = A + BL + CL^2$ (see page 3 and page 53 of this response)

Where F = Unit fuel consumption rate in MBtu/Hr

L = Load on the Unit in MW

And for AES, (see page 8 of this response, and HECO-WP-412 page 19)

A = 258.7479

B = 14.9713

C = 0.0051019

The coefficients A, B and C do not change from month to month. Changes in pricing are handled by adjusting the AES fuel price.

For Kalaeloa, (see page 53 through 55 of this response)

A, B and C are developed through a curve-fitting process, whereby LSFO fuel price relationships (for 6.0 MBtu/Bbl fuel), fuel additive price relationships, and GNPIPD price relationships play a factor in the determination of the coefficients. B may change from month to month.

b. Two documents are attached:

1) Modeling of the AES-Hawaii Power Purchase Agreement in PMONTH and EMS (pages 2-48).

2) Economic dispatch of Kalaeloa (pages 49-65).

Modeling of the AES-Hawaii Power Purchase Agreement in PMONTH and EMS

Prepared by: Ross Sakuda
Ross Sakuda, P.E.
Senior Planning Engineer
Power Supply Planning and Engineering Dept.

Approved by:
Jose S. Dizon, P.E.
Director, Generation Planning Division
Power Supply Planning and Engineering Dept.

Approved by: Brenner Munger
R. Brenner Munger, Ph. D., P.E.
Manager
Power Supply Planning and Engineering Dept.

Hawaiian Electric Company, Inc.
Power Supply Planning and Engineering Department
Generation Planning Division

October 14, 1999

1.0 Objective

The objective of this paper is to establish the specific A, B and C coefficients in a second degree polynomial to approximate the contract pricing of the 180 MW AES Hawaii, Inc. (AES-Hawaii) coal unit for economic dispatch and production cost modeling purposes. Values in the formula will be used in System Operation's Energy Management System (EMS) for economic dispatch of the unit and in Generation Planning Division's production simulation model, PMONTH, for long-term planning purposes. The formula needs to be documented and reproducible.

2.0 Background

2.1 Mathematical Basis for Economic Dispatch and Production Simulation

Economic dispatch of generating units on the Oahu system is performed by the HECO Energy Management System (EMS) in the System Operation Department. The EMS requires that the performance of each unit be described mathematically by a second degree polynomial which expresses fuel consumption (in MBtu/hr) as a function of load (in MW). For each HECO unit, this second degree polynomial is of the form:

$F = A + BL + CL^2$, where [Equation 2.1-1]

F = unit fuel consumption rate in MBtu/hour;

A, B and C = constants determined by a least-squares curve-fit method applied to test data; and

L = load on the unit in MW.

The cost rate for fuel, Q, in \$/hour, is the fuel consumption rate, F, multiplied by the fuel price, P, in \$/MBtu. That is,

Q (\$/hr) = F (MBtu/hr) x P (\$/MBtu), or

$Q = (A + BL + CL^2) \times P$ [Equation 2.1-2]

The formula for the marginal fuel cost is determined by taking the derivative of Equation 2.1-2.

$MC = \frac{dQ}{dL} = P \times (B + 2CL)$, where [Equation 2.1-3]

MC = marginal cost, \$/MWh.

For a given system load, the point at which the system can be operated at minimum fuel cost is that point where the marginal costs of all units are equal and the sum of the individual unit loads is equal to the system demand.

In order to forecast future system fuel costs, the production costing computer model, PMONTH, is used. PMONTH simulates the economic dispatch of the system by emulating the function of the EMS. While PMONTH is able to utilize polynomials up to the fourth degree to describe the fuel consumption versus load relationship, the standard practice is to use a second degree polynomial in order to most accurately simulate EMS operation.

2.2 AES-Hawaii Power Purchase Agreement

HECO purchases capacity and energy from AES-Hawaii, which owns and operates a 180 MW coal unit that commenced commercial operation in September 1992. Actual payments to AES-Hawaii for fuel and variable O&M costs are calculated in accordance with a pricing formula given in the Power Purchase Agreement (PPA) between HECO and AES-Hawaii. The pricing formula is a third degree polynomial as specified in Section 3.1 below.

For actual operating dispatch, a second degree approximation of the third degree pricing formula is used in EMS[1]. For production simulation, a second degree approximation is also used. The second degree polynomial approximation is of the form given in Equation 2.1-2.

In 1991, the Generation Planning Division established the A, B and C constants (ABC constants) for the second degree polynomial approximation of the AES-Hawaii PPA to be[2]:

A = 260.2	(superseded)
B = 14.41	(superseded)
C = 0.005483	(superseded)

based on Section 18 of Amendment No. 1, dated August 28, 1989, of the PPA. These constants reflected only fuel consumption and did not include variable O&M costs.

In 1993, a change was made to the AES-Hawaii ABC constants. In addition, the variable O&M cost, escalated to take into account GNPIPD, was applied separately in

[1] EMS can utilize an economic dispatch polynomial up to the fourth order, provided the derivative of the polyonimial is an increasing function. The AES-Hawaii PPA formula does not meet this criterion. Therefore, a second order polynomial is used to approximate the PPA formula. It was shown in "Evaluation of the Use of Third Degree Polynomials for Production Cost Modeling and Economic Dispatch," prepared by the Power Supply Planning & Engineering Department, July 22, 1999, that a second degree polynomial represents a reasonably close approximation of the third degree polynomial.

[2] Generation Planning Division paper "Modelling of Purchase Power Contracts in GEPPS, section titled "Derivation of AES-BP A, B and C Constants and Fuel Price from Contract Pricing," dated March 21, 1991.

EMS. The 1993 AES-Hawaii PPA ABC constants, which were in use in EMS as of this writing, were determined to be:

A = 269.707	(to be superseded by coefficient proposed in this document)
B = 14.344	(to be superseded by coefficient proposed in this document)
C = 0.0057854.	(to be superseded by coefficient proposed in this document)

Unfortunately, these 1993 constants are not verifiable or reproducible because of the lack of documentation of the methodology and data utilized to develop those constants.

Given this, the Power Purchase Division requested assistance from the Generation Planning Division to establish an updated set of documented, verifiable and reproducible ABC constants.

3.0 Development of Formula to Represent AES-Hawaii PPA Pricing

3.1 AES-Hawaii PPA

Section 18 of Amendment No. 1 of the AES-Hawaii PPA provides that the monthly energy charge shall be calculated as follows:

Monthly Energy Charge in July 1987 dollars = Fuel Cost + Variable O&M Cost

+ Fixed O&M Cost

Since economic dispatch of the AES-Hawaii unit is based only upon fuel and variable O&M costs, then for dispatch purposes in EMS and modeling purposes in PMONTH:

Monthly Energy Charge (used for dispatch) in July 1987 dollars =

Fuel Cost + Variable O&M Cost.

The specific formulas given in the PPA for fuel and variable O&M costs in July 1987 dollars are as follows:

$$\text{Fuel cost} = \sum_{i=1}^{i=H} [(0.000016803L_i^2 - 0.0056145L_i + 2.15619) \times (E_i/100)] ,$$

where:

Fuel cost = total dollars for the month

L_i = integrated hourly load of the Facility in megawatts (rounded to the third decimal place) for each hour of the month being invoiced;

E_i = kilowatthours purchased during each specific hour of the month being invoiced;

H = the total number of hours in the month being invoiced; and

i = *ith* hour.

(It should be noted that the letters in this equation were changed from the actual letters used in the PPA to avoid confusion with the ABC constants in the energy pricing and marginal cost formulas.)

Variable O&M cost = ($0.0005/kWh) x (Total kilowatthours purchased in the month being invoiced)

The formula for the monthly energy charge for EMS dispatch and for PMONTH modeling purposes, which includes fuel and variable O&M costs but excludes fixed O&M costs, may thus be written as follows:

Monthly Fuel + Variable O&M Cost in July 1987 dollars

$$= \{ \sum_{i=1}^{i=H} [(0.000016803L_i^2 - 0.0056145L_i + 2.15619) \times (E_i/100)] \} +$$

$$[0.0005 \times (\text{Total kWh purchased})]$$

Total kWh purchased can also be represented by $\sum_{i=1}^{i=H} E_i$.

For each hour *i*, E_i (kWh) = L_i (MW) x 1,000 $\frac{kW}{MW}$ x 1 hour. Therefore, substituting for E_i and Total kWh purchased, the fuel and variable O&M cost for hour *i* in July 1987 dollars

$$= [(0.000016803L_i^2 - 0.0056145L_i + 2.15619) \times (1000\ L_i/100)] +$$

$$[0.0005 \times 1000\ L_i].$$

$$= [(0.000016803L_i^2 - 0.0056145L_i + 2.15619) \times (10\ L_i)]$$

$$+ (0.5\ L_i)$$

$$= 0.00016803\ L_i^3 - 0.056145\ L_i^2 + (21.5619 + 0.5)\ L_i \qquad \text{[Equation 3.1-1]}$$

Next, an allowance for changes in the Gross National Product Implicit Price Deflator (GNPIPD) needs to be incorporated. The last paragraph of Section 5.1A of the original PPA, dated March 25, 1988, states:

> "The total Energy Charge (including reactive power charges) shall be adjusted every six months (on January 1 and July 1) at one-hundred (100) percent of the change in the Gross National Product Implicit Price Deflator ("GNPIPD") as illustrated in Exhibit 5."

To incorporate this provision, let $Q_{AES\ 1987}$ (hour$_i$) = AES fuel and variable O&M cost in hour *i* in July 1987.

$$Q_{AES\ 1987}\ (\text{hour}_i)\ (\$/\text{hr}) = 0.00016803\ L_i^{\ 3} - 0.056145\ L_i^{\ 2} + (21.5619 + 0.5)\ L_i$$

In accordance with the PPA, AES fuel and variable O&M cost in hour *i* in year *k*:

$Q_{AES\ k}$ (hour$_i$) = $Q_{AES\ 1987}$ (hour$_i$) x G_k , where:

G_k = GNPIPD adjustment factor

= $GNPIPD_c$ / $GNPIPD_{1987}$ (rounded to four places after the decimal point, per letter from HECO to AES-Hawaii dated May 27, 1992), where:

$GNPIPD_c$ = GNPIPD value for current period (specifically, the previous year's Third Quarter final GNPIPD (for a January 1 adjustment) or the current year's First Quarter final GNPIPD (for a July 1 adjustment)) and

$GNPIPD_{1987}$ = GNPIPD value for the base year of 1987 (specifically, the final First Quarter 1987 GNPIPD).

Therefore,

$$Q_{AES\ k}\ (\text{hour}_i) = G_k \times [0.00016803\ L_i^{\ 3} - 0.056145\ L_i^{\ 2} + (21.5619 + 0.5)\ L_i]$$

[Equation 3.1-2]

3.2 Determination of ABC Constants for Second Order Approximation

In order for the relationship in Equation 3.1-2 to be used in EMS and PMONTH, the bracketed portion of the equation, which is a third degree polynomial, must be approximated by a second degree polynomial. In other words,

$$Q_{AES\ 1987}\ (hour_i)\ (\$/hr) = 0.00016803\ L_i^{\ 3} - 0.056145\ L_i^{\ 2} + (21.5619 + 0.5)\ L_i$$

[Equation 3.2-1]

must be approximated by an equation of the form:

$$Q_{AES\ 1987}\ (hour_i)\ (\$/hr) \cong C_{AES}\ L_i^{\ 2} + B_{AES}\ L_i + A_{AES}\ ,$$ [Equation 3.2-2]

similar to Equation 2.1-2.

It must be noted that because Equation 3.2-1 includes the variable O&M cost adder, Equation 3.2-2 implicitly includes variable O&M costs.

The ABC constants which provide a good approximation of Equation 3.2-1 by Equation 3.2-2 were derived through a least-squares curve-fit methodology. An explanation of the least-squares curve-fit methodology used can be found in Attachment 5.

First, data points were generated by determining values for $Q_{AES\ 1987}$ ($hour_i$) as a function of L_i using Equation 3.2-1. These data points are shown in Attachment 1. Next, using the least-squares curve-fit methodology, a second order polynomial was derived such that Equation 3.2-2, with appropriate ABC constants, approximated Equation 3.2-1.

Attachment 2, Section 1, shows the calculation of the ABC constants for Case 1 in which a range of data points between the 63 to 180 MW operating range of AES was used. A comparison of the heat rates derived from the PPA formula and the ABC constants is shown in tabular form and graphically in Sections 2 and 3, respectively, of Attachment 2. By definition, this is the "best fit" in which the sum of the squares of the errors between the two curves is minimized. The ABC constants in this case were:

$A_{AES} = 258.7479$
$B_{AES} = 14.9713$
$C_{AES} = 0.0051019$

It was observed that the curve generated by the ABC constants in Case 1 matched the PPA curve quite nicely between 70 to 180 MW where the deviation was less than ±75

Btu/kWh (< 0.5% at 19,000 Btu/kWh). However, the deviation was more noticeable between 63 to 69 MW, where the variance was up to about 200 Btu/kWh (about 1% at 19,400 Btu/kWh).

In order to check whether or not the variance could be reduced within the 63 to 69 MW range without significantly affecting the variance within the rest of the 70 to 180 MW operating range, additional data points were added from 50 to 62 MW in an attempt to bias the ABC curve toward the PPA curve within this range. The results are shown in Attachment 3. It can be seen that although the error has been minimized within the 63 to 69 MW range, the deviation has increased in the 70 to 90 MW range. Also, the range over which the significant deviation occurs had widened. Furthermore, the sum of the squares of the errors over the 63 to 180 MW operating range had increased. This indicates that the Case 2 curve provides a "poorer fit" compared to Case 1 on an overall basis.

Other data sets were tested but none provided a better overall fit than Case 1. It was therefore concluded that the ABC constants derived in Case 1 should be used for dispatch and modeling purposes.

Implicit in the use of ABC constants derived in Case 1 for the dispatch of AES is the possibility of a small "dispatch error" in the 63 to 69 MW range for AES. In other words, use of the polynomial equation may result in the appearance that AES is more expensive than it actually is in the 63 to 69 MW range. The magnitude of this error was estimated in the study, titled "Modeling of the AES-Hawaii Power Purchase Agreement Using a Third Degree versus a Second Degree Polynomial," dated July 22, 1999, and prepared by the Power Supply Planning and Engineering Department. The study concluded that the error is extremely small. It is therefore recommended that the following ABC constants be used in the AES-Hawaii second order approximation of the PPA:

$A_{AES} = 258.7479$
$B_{AES} = 14.9713$
$C_{AES} = 0.0051019$

4.0 Application in PMONTH and EMS

4.1 PMONTH Production Simulation Model

4.1.1 Input Data

The following data must be input to PMONTH:

a) ABC constants for each generating unit;
b) Year-by-year forecasted fuel prices, in cents/MBtu, for each fuel type; and

c) Heat content, in MBtu/bbl for oil and MBtu/ton for coal, for each fuel type.

4.1.2 Output Data

PMONTH will generate the following output data:

a) Total fuel consumed, in bbls (oil) or tons (coal) and in MBtu; and
b) Fuel cost, in total $, $/MWh, and cents/MBtu.

4.1.3 PMONTH Calculations

For a given system demand, the fuel consumption rate, in MBtu/hr, in each hour for each unit is calculated using Equation 2.1-1, the ABC constants for each unit, and the load at which each unit is operating. The cost of the fuel consumed by each unit in that hour is calculated by multiplying the fuel consumption rate for each unit by the cost of the fuel, in $/MBtu, consumed by that unit as given in Equation 2.1-2.

To calculate the total quantity of fuel consumed in a particular hour, in barrels of oil or tons of coal, the fuel consumption rate for that hour, in MBtu/hr, is multiplied by 1 hour and divided by the heat content of the fuel, in MBtu/bbl or MBtu/ton.

4.1.4 Modeling of AES-Hawaii PPA in PMONTH

As noted in Section 3.1 above, AES-Hawaii's cost of fuel and variable O&M billable to HECO in year *k* based on the integrated hourly load L in hour *i* is described by the formula:

$$Q_{AES\ k}(hour_i) = G_k \times [0.00016803\ L_i^{\ 3} - 0.056145\ L_i^{\ 2} + (21.5619 + 0.5)\ L_i] \qquad \text{[Equation 3.1-2]}$$

As discussed in Section 3.2, this must be approximated by the equation

$$Q_{AES\ k}(hour_i) \cong G_k \times [C_{AES}\ L_i^{\ 2} + B_{AES}\ L_i + A_{AES}], \text{ or}$$

$$Q_{AES\ k}(hour_i) \cong G_k \times [0.0051019\ L_i^{\ 2} + 14.9713\ L_i + 258.7479] \qquad \text{[Equation 4.1-1]}$$

in order to be modeled in PMONTH.

As noted in Section 4.1.3, PMONTH calculates the hourly cost of fuel for a given unit operating at a given load by applying the formulas:

Q ($/hr) = F (MBtu/hr) x P ($/MBtu), or

$Q = P \times (A + BL + CL^2)$, where [Equation 2.1-2]

A, B, C and P are inputs to PMONTH as noted in Section 4.1.1.

Since Equation 4.1-1 is similar in form to Equation 2.1-2, Equation 4.1-1 can be modeled in PMONTH if the year-by-year fuel prices, 100 P, are assigned the values of 100 G_k. The factor of 100 is needed to convert P, and therefore G_k, from $/MBtu to the PMONTH input of cents/MBtu.

Equation 3.1-2 defines the amount payable by HECO to AES-Hawaii for fuel and variable O&M in each hour based on the load, L_i, at which AES-Hawaii is dispatched in that hour. The equation is purely a pricing formula for AES-Hawaii's fuel and variable O&M expenses. The amount calculated by the equation is not necessarily tied to the actual quantity of coal burned by AES-Hawaii since the equation is only one portion of a contractual arrangement by which AES-Hawaii recovers its fixed, variable and fuel costs. Since the actual quantity of fuel burned cannot be calculated, the input value for heat content is not needed. However, since PMONTH requires an entry for that parameter, a value of 1 MBtu/bbl is entered as a placeholder. The resulting fuel consumption calculation made by PMONTH using this value is not meaningful.

4.2 Dispatch of AES-Hawaii in EMS

In EMS, the total production cost for a particular unit in a particular hour is determined from the equation:

T = (P x F) + Maintenance Cost, where:

T = Production cost, $/hour

P = Fuel cost, $/MBtu

F = Fuel consumption rate, MBtu/hr, where

$F = A + BL + CL^2$ [Equation 2.1-1]

Maintenance Cost = VOM x L , where

VOM = variable O&M cost ($/MWh)

L = Load, MW

The equation then becomes

$$T = [P \times (A + BL + CL^2)] + (VOM \times L) \qquad \text{[Equation 4.2-1]}$$

It must be noted that <u>Equation 4.2-1 has an explicit adder for variable O&M costs</u>. This is in contrast to <u>Equation 3.2-2</u> which <u>implicitly includes variable O&M costs</u>.

In the case for AES-Hawaii, let the fuel-only portion of the total energy charge be approximated by an equation of the form:

$$Q_{AES\ 1987\ FUEL\ ONLY}(hour_i) = A' + B' L_i + C' L_i^2 . \qquad \text{[Equation 4.2-2]}$$

Equation 4.2-1 can be rewritten as:

$$T_{AES\ 1987} = (A' + B' L_i + C' L_i^2) + (VOM_{1987} \times L_i)$$

$$= A' + (B' L_i + VOM_{1987} \times L_i) + C' L_i^2$$

$$= A' + (B' + VOM_{1987}) L_i + C' L_i^2 \qquad \text{[Equation 4.2-3]}$$

The AES-Hawaii pricing formula (Equation 3.2-1) can be approximated by either Equation 4.1-1 or Equation 4.2-3, provided an adjustment is made for pricing escalation in accordance with the PPA. In other words, the pricing can be represented by:

$$Q_{AES\ k}(hour_i) \cong G_k \times [C_{AES} L_i^2 + B_{AES} L_i + A_{AES}], \qquad \text{[Equation 4.1-1]}$$

or

$$T_{AES\ 1987}(hour\ i) = A' + (B' + VOM_{1987}) L_i + C' L_i^2 \qquad \text{[Equation 4.2-3]}$$

Since $T_{AES\ 1987}$ (hour *i*) is in 1987 dollars, it needs to be adjusted by G_k, the GNPIPD adjustment factor.

In the AES-Hawaii PPA, the variable O&M component must also be escalated by the GNPIPD factor. Also, in EMS as in PMONTH, the fuel prices must be escalated by the GNPIPD factor, i.e., the 1987 base price must be multiplied by G_k, where *k* is the year for which the factor applies. Therefore, Equation 4.2-3 may be rewritten as:

$$Q_{AES\ k}(hour\ i) = G_k \times [A' + (B' + VOM)(L_i) + C' L_i^2]$$

$$= G_k \times [\ A' + (B' + 0.5)(L_i) + C'L_i^2\ ] \qquad \text{[Equation 4.2-4]}$$

since the variable O&M component is $0.5 per MWh as noted in Section 3.1.

The curves defined by Equations 4.1-1 and 4.2-4 will be identical if:

$A_{AES} = A'$
$B_{AES} = (B' + 0.5)$
$C_{AES} = C'$

From Section 3.2:

$A_{AES} = 258.7479$
$B_{AES} = 14.9713$
$C_{AES} = 0.0051019$

If a curve is fit to the equation:

$$Q_{AES\,k}\ (\text{hour } i) = G_k \times [\ A' + (B')(L_i) + C'L_i^2\ ]$$

the resulting coefficients are shown in Attachment 4 and are as follows:

$A' = 258.7479$
$B' = 14.4713$
$C' = 0.0051019$

If the variable O&M component is added to B', then the coefficient would become equal to B_{AES}, i.e.,

$$B' + 0.5 = 14.4713 + 0.5 = 14.9713 = B_{AES}$$

6.0 Conclusions

6.1 Representation of Fuel and Variable O&M Costs for Dispatch and Modeling

Based on the analyses above, it was concluded that the ABC constants derived in Case 1 best represent the PPA formula for fuel and variable O&M costs. Case 1 is based on a least-squares curve-fit in the 63 to 180 MW operating range of AES-Hawaii. The ABC constants are:

$A_{AES} = 258.7479$
$B_{AES} = 14.9713$
$C_{AES} = 0.0051019$

These coefficients may be used in both PMONTH and EMS.

The equation to describe the cost of fuel and variable O&M would be:

$$Q_{AES\ k}(hour_i) = G_k \times [0.0051019\ L_i^2 + 14.9713\ L_i + 258.7479],\ \text{where}$$

G_k = GNPIPD adjustment factor as described in Section 3.1.

6.2 Future Updates

The PPA requires that the total Energy Charge be adjusted every six months (on January 1 and July 1) at one-hundred (100) percent of the change in the GNPIPD. In Equation 4.1-1, the term G_i would capture this change every six months. Therefore, the ABC constants need not be changed in future updates once they are established and approved. Only G_i needs to be updated.

7.0 Recommendation

From the above analysis, it is recommended that the following second order polynomial from Case 1 be used to represent the PPA formula for fuel and variable O&M costs for economic dispatch in EMS and for production costing modeling in PMONTH:

$$\mathbf{Q_{AES\ k}(hour_i)\ (\$/hr) = G_k \times (C_{AES}\ L_i^2 + B_{AES}\ L_i + A_{AES})}$$

$\mathbf{A_{AES} = 258.7479}$
$\mathbf{B_{AES} = 14.9713}$
$\mathbf{C_{AES} = 0.0051019}$

G_k = GNPIPD adjustment factor
= $GNPIPD_c$ / $GNPIPD_{1987}$ (rounded to four places after the decimal point), where:

$GNPIPD_c$ = GNPIPD value for current period (specifically, the previous year's Third Quarter final GNPIPD (for a January 1 adjustment) or the current year's First Quarter final GNPIPD (for a July 1 adjustment)) and

$GNPIPD_{1987}$ = GNPIPD value for the base year of 1987 (specifically, the final First Quarter 1987 GNPIPD).

In PMONTH, the following should be entered into the database:

Heat content = 1 MBtu/bbl
Fuel cost in cents/MBtu for the appropriate six month period $k = 100\ G_k$.

In the EMS, the following should be entered into the database:

Fuel cost in \$/MBtu = P = G_k

Variable O&M cost in \$/MWh = VOM = 0, since the variable O&M is already accounted for in the ABC constants, where:

A_{AES} = 258.7479
B_{AES} = 14.9713
C_{AES} = 0.0051019

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ATTACHMENT 1

Data Points Generated from PPA Formula for Fuel and Variable O and M Costs

AES-Hawaii PPA Formula for Fuel and Variable O&M Costs

Fuel and Variable O&M Cost for One Hour in 1987 ($/hour) =

$0.00016803L^2 - 0.056142L^2 + (21.5639 + 0.5)L$, where

L = Load in MW for that hour

Load, MW	Fuel and Variable O&M Cost, $/hour	Load, MW	Fuel and Variable O&M Cost, $/hour	Load, MW	Fuel and Variable O&M Cost, $/hour	Load, MW	Fuel and Variable O&M Cost, $/hour	Load, MW	Fuel and Variable O&M Cost, $/hour
20	420.1	60	1,157.9	100	1,812.8	140	2,449.3	180	3,132.9
21	440.1	61	1,175.0	101	1,828.6	141	2,465.5	181	3,150.2
22	460.0	62	1,192.1	102	1,844.5	142	2,481.8	182	3,168.5
23	479.8	63	1,209.1	103	1,860.3	143	2,498.1	183	3,186.9
24	499.5	64	1,226.0	104	1,876.2	144	2,514.4	184	3,205.3
25	519.1	65	1,243.0	105	1,892.0	145	2,530.8	185	3,223.8
26	538.6	66	1,259.8	106	1,907.8	146	2,547.2	186	3,242.4
27	558.0	67	1,276.6	107	1,923.7	147	2,563.6	187	3,261.0
28	577.4	68	1,293.4	108	1,939.5	148	2,580.1	188	3,279.8
29	596.7	69	1,310.2	109	1,955.3	149	2,596.6	189	3,298.6
30	615.9	70	1,326.9	110	1,971.1	150	2,613.1	190	3,317.4
31	635.0	71	1,343.5	111	1,986.9	151	2,629.7	191	3,336.4
32	654.0	72	1,360.1	112	2,002.7	152	2,646.3	192	3,355.3
33	672.9	73	1,376.7	113	2,018.5	153	2,663.0	193	3,374.4
34	691.8	74	1,393.2	114	2,034.3	154	2,679.7	194	3,393.5
35	710.6	75	1,409.7	115	2,050.2	155	2,696.4	195	3,413.1
36	729.3	76	1,426.2	116	2,066.0	156	2,713.2	196	3,432.3
37	747.9	77	1,442.6	117	2,081.8	157	2,730.1	197	3,451.9
38	766.5	78	1,459.0	118	2,097.6	158	2,746.9	198	3,471.5
39	785.0	79	1,475.3	119	2,113.5	159	2,763.9	199	3,491.1
40	803.4	80	1,491.7	120	2,129.3	160	2,780.8	200	3,510.8
41	821.7	81	1,507.9	121	2,145.1	161	2,797.9	201	3,530.6
42	840.0	82	1,524.2	122	2,161.0	162	2,814.9	202	3,550.5
43	858.2	83	1,540.4	123	2,176.9	163	2,832.1	203	3,570.5
44	876.3	84	1,556.6	124	2,192.8	164	2,849.2	204	3,590.6
45	894.4	85	1,572.8	125	2,208.7	165	2,866.5	205	3,610.8
46	912.4	86	1,589.0	126	2,224.6	166	2,883.8	206	3,631.1
47	930.3	87	1,605.1	127	2,240.5	167	2,901.1	207	3,651.4
48	948.2	88	1,621.2	128	2,256.4	168	2,918.5	208	3,671.9
49	966.0	89	1,637.2	129	2,272.4	169	2,936.0	209	3,692.5
50	983.7	90	1,653.3	130	2,288.4	170	2,953.5	210	3,713.1
51	1,001.4	91	1,669.3	131	2,304.4	171	2,971.0	211	3,733.9
52	1,019.0	92	1,685.3	132	2,320.4	172	2,988.7	212	3,754.8
53	1,036.6	93	1,701.3	133	2,336.4	173	3,006.4	213	3,775.7
54	1,054.1	94	1,717.3	134	2,352.5	174	3,024.1	214	3,796.8
55	1,071.5	95	1,733.2	135	2,368.5	175	3,041.9	215	3,818.0
56	1,088.9	96	1,749.2	136	2,384.6	176	3,059.8	216	3,839.2
57	1,106.2	97	1,765.1	137	2,400.8	177	3,077.8	217	3,860.6
58	1,123.5	98	1,781.0	138	2,416.9	178	3,095.8	218	3,882.1
59	1,140.7	99	1,796.9	139	2,433.1	179	3,113.8	219	3,903.7

Notes:

(1) Spreadsheet originally prepared by Debbie Higashi 1/26/94 Modified by R. Sakuda, 3/3/99

(2) Load in MW is net delivered to the system

ATTACHMENT 2

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 1 - 63 to 180 MW Data Range

Section 1 - Calculation of ABC Constants

Data Point No	Load, MW (x)	Fuel and Variable O&M Component, $/hr (y)	x^2	x^3	x^4	xy	x^2y
1	63.00	1,209.08	3,969	250,047	15,752,961	76,172	4,798,821
2	64.00	1,226.04	4,096	262,144	16,777,216	78,467	5,021,859
3	65.00	1,242.96	4,225	274,625	17,850,625	80,792	5,251,490
4	66.00	1,259.83	4,356	287,496	18,974,736	83,148	5,487,801
5	67.00	1,276.65	4,489	300,763	20,151,121	85,536	5,730,880
6	68.00	1,293.43	4,624	314,432	21,381,376	87,953	5,980,814
7	69.00	1,310.16	4,761	328,509	22,667,121	90,401	6,237,691
8	70.00	1,326.86	4,900	343,000	24,010,000	92,880	6,501,598
9	71.00	1,343.51	5,041	357,911	25,411,681	95,389	6,772,623
10	72.00	1,360.12	5,184	373,248	26,873,856	97,928	7,050,852
11	73.00	1,376.69	5,329	389,017	28,398,241	100,498	7,336,373
12	74.00	1,393.22	5,476	405,224	29,986,576	103,098	7,629,275
13	75.00	1,409.71	5,625	421,875	31,640,625	105,729	7,929,644
14	76.00	1,426.17	5,776	438,976	33,362,176	108,389	8,237,570
15	77.00	1,442.59	5,929	456,533	35,153,041	111,080	8,553,139
16	78.00	1,458.98	6,084	474,552	37,015,056	113,801	8,876,440
17	79.00	1,475.33	6,241	493,039	38,950,081	116,551	9,207,563
18	80.00	1,491.66	6,400	512,000	40,960,000	119,332	9,546,594
19	81.00	1,507.94	6,561	531,441	43,046,721	122,144	9,893,624
20	82.00	1,524.20	6,724	551,368	45,212,176	124,985	10,248,742
21	83.00	1,540.43	6,889	571,787	47,458,321	127,856	10,612,037
22	84.00	1,556.63	7,056	592,704	49,787,136	130,757	10,983,599
23	85.00	1,572.81	7,225	614,125	52,200,625	133,688	11,363,518
24	86.00	1,588.95	7,396	636,056	54,700,816	136,650	11,751,885
25	87.00	1,605.07	7,569	658,503	57,289,761	139,641	12,148,790
26	88.00	1,621.17	7,744	681,472	59,969,536	142,663	12,554,325
27	89.00	1,637.24	7,921	704,969	62,742,241	145,714	12,968,582
28	90.00	1,653.29	8,100	729,000	65,610,000	148,796	13,391,652
29	91.00	1,669.32	8,281	753,571	68,574,961	151,908	13,823,628
30	92.00	1,685.33	8,464	778,688	71,639,296	155,050	14,264,603
31	93.00	1,701.31	8,649	804,357	74,805,201	158,222	14,714,671
32	94.00	1,717.28	8,836	830,584	78,074,896	161,425	15,173,925
33	95.00	1,733.24	9,025	857,375	81,450,625	164,657	15,642,460
34	96.00	1,749.17	9,216	884,736	84,934,656	167,921	16,120,372
35	97.00	1,765.09	9,409	912,673	88,529,281	171,214	16,607,755
36	98.00	1,781.00	9,604	941,192	92,236,816	174,538	17,104,706
37	99.00	1,796.89	9,801	970,299	96,059,601	177,892	17,611,322
38	100.00	1,812.77	10,000	1,000,000	100,000,000	181,277	18,127,700
39	101.00	1,828.64	10,201	1,030,301	104,060,401	184,692	18,653,939
40	102.00	1,844.50	10,404	1,061,208	108,243,216	188,139	19,190,136
41	103.00	1,860.34	10,609	1,092,727	112,550,881	191,615	19,736,393
42	104.00	1,876.18	10,816	1,124,864	116,985,856	195,123	20,292,808
43	105.00	1,892.02	11,025	1,157,625	121,550,625	198,662	20,859,483
44	106.00	1,907.84	11,236	1,191,016	126,247,696	202,231	21,436,519
45	107.00	1,923.66	11,449	1,225,043	131,079,601	205,832	22,024,020
46	108.00	1,939.48	11,664	1,259,712	136,048,896	209,464	22,622,087
47	109.00	1,955.29	11,881	1,295,029	141,158,161	213,127	23,230,825
48	110.00	1,971.10	12,100	1,331,000	146,410,000	216,821	23,850,339
49	111.00	1,986.91	12,321	1,367,631	151,807,041	220,547	24,480,735
50	112.00	2,002.72	12,544	1,404,928	157,351,936	224,305	25,122,119
51	113.00	2,018.53	12,769	1,442,897	163,047,361	228,094	25,774,599

No. of Data Points
= 118
118

det = 2.05257E+15

Adjusted
A = 258.7479
B = 14.9713
C = 0.0051019

ATTACHMENT 2

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 1 - 63 to 180 MW Data Range

Section 1 - Calculation of ABC Constants

Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr (y)	x^2	x^3	x^4	xy	x^2y
52	114.00	2,034.34	12,996	1,481,544	168,896,016	231,915	26,438,283
53	115.00	2,050.15	13,225	1,520,875	174,900,625	235,768	27,113,280
54	116.00	2,065.97	13,456	1,560,896	181,063,936	239,653	27,799,701
55	117.00	2,081.79	13,689	1,601,613	187,388,721	243,570	28,497,657
56	118.00	2,097.62	13,924	1,643,032	193,877,776	247,519	29,207,259
57	119.00	2,113.45	14,161	1,685,159	200,533,921	251,501	29,928,622
58	120.00	2,129.30	14,400	1,728,000	207,360,000	255,516	30,661,860
59	121.00	2,145.15	14,641	1,771,561	214,358,881	259,563	31,407,088
60	122.00	2,161.01	14,884	1,815,848	221,533,456	263,643	32,164,422
61	123.00	2,176.88	15,129	1,860,867	228,886,641	267,756	32,933,979
62	124.00	2,192.76	15,376	1,906,624	236,421,376	271,902	33,715,879
63	125.00	2,208.66	15,625	1,953,125	244,140,625	276,082	34,510,242
64	126.00	2,224.56	15,876	2,000,376	252,047,376	280,295	35,317,187
65	127.00	2,240.49	16,129	2,048,383	260,144,641	284,542	36,136,837
66	128.00	2,256.43	16,384	2,097,152	268,435,456	288,823	36,969,316
67	129.00	2,272.38	16,641	2,146,689	276,922,881	293,138	37,814,747
68	130.00	2,288.36	16,900	2,197,000	285,610,000	297,487	38,673,257
69	131.00	2,304.35	17,161	2,248,091	294,499,921	301,870	39,544,972
70	132.00	2,320.36	17,424	2,299,968	303,595,776	306,288	40,430,021
71	133.00	2,336.40	17,689	2,352,637	312,900,721	310,741	41,328,533
72	134.00	2,352.45	17,956	2,406,104	322,417,936	315,229	42,240,640
73	135.00	2,368.53	18,225	2,460,375	332,150,625	319,752	43,166,472
74	136.00	2,384.63	18,496	2,515,456	342,102,016	324,310	44,106,164
75	137.00	2,400.76	18,769	2,571,353	352,275,361	328,904	45,059,850
76	138.00	2,416.91	19,044	2,628,072	362,673,936	333,534	46,027,668
77	139.00	2,433.09	19,321	2,685,619	373,301,041	338,200	47,009,753
78	140.00	2,449.30	19,600	2,744,000	384,160,000	342,902	48,006,247
79	141.00	2,465.53	19,881	2,803,221	395,254,161	347,640	49,017,289
80	142.00	2,481.80	20,164	2,863,288	406,586,896	352,416	50,043,021
81	143.00	2,498.10	20,449	2,924,207	418,161,601	357,228	51,083,588
82	144.00	2,514.43	20,736	2,985,984	429,981,696	362,077	52,139,133
83	145.00	2,530.79	21,025	3,048,625	442,050,625	366,964	53,209,804
84	146.00	2,547.18	21,316	3,112,136	454,371,856	371,889	54,295,748
85	147.00	2,563.61	21,609	3,176,523	466,948,881	376,851	55,397,117
86	148.00	2,580.08	21,904	3,241,792	479,785,216	381,852	56,514,060
87	149.00	2,596.58	22,201	3,307,949	492,884,401	386,891	57,646,731
88	150.00	2,613.12	22,500	3,375,000	506,250,000	391,969	58,795,284
89	151.00	2,629.70	22,801	3,442,951	519,885,601	397,085	59,959,877
90	152.00	2,646.32	23,104	3,511,808	533,794,816	402,241	61,140,665
91	153.00	2,662.98	23,409	3,581,577	547,981,281	407,437	62,337,811
92	154.00	2,679.69	23,716	3,652,264	562,448,656	412,672	63,551,473
93	155.00	2,696.43	24,025	3,723,875	577,200,625	417,947	64,781,817
94	156.00	2,713.22	24,336	3,796,416	592,240,896	423,263	66,029,006
95	157.00	2,730.06	24,649	3,869,893	607,573,201	428,619	67,293,207
96	158.00	2,746.94	24,964	3,944,312	623,201,296	434,016	68,574,589
97	159.00	2,763.87	25,281	4,019,679	639,128,961	439,455	69,873,322
98	160.00	2,780.84	25,600	4,096,000	655,360,000	444,935	71,189,578
99	161.00	2,797.87	25,921	4,173,281	671,898,241	450,457	72,523,530
100	162.00	2,814.94	26,244	4,251,528	688,747,536	456,021	73,875,355
101	163.00	2,832.07	26,569	4,330,747	705,911,761	461,627	75,245,231
102	164.00	2,849.25	26,896	4,410,944	723,394,816	467,276	76,633,337

ATTACHMENT 2

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case I - 63 to 180 MW Data Range

Section I - Calculation of ABC Constants

Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr (y)	x^2	x^3	x^4	xy	x^2y
103	165.00	2,866.48	27,225	4,492,125	741,200,625	472,969	78,039,854
104	166.00	2,883.76	27,556	4,574,296	759,333,136	478,705	79,464,966
105	167.00	2,901.10	27,889	4,657,463	777,796,321	484,484	80,908,859
106	168.00	2,918.50	28,224	4,741,632	796,594,176	490,308	82,371,720
107	169.00	2,935.95	28,561	4,826,809	815,730,721	496,176	83,853,739
108	170.00	2,953.46	28,900	4,913,000	835,210,000	502,089	85,355,106
109	171.00	2,971.03	29,241	5,000,211	855,036,081	508,047	86,876,017
110	172.00	2,988.67	29,584	5,088,448	875,213,056	514,050	88,416,666
111	173.00	3,006.36	29,929	5,177,717	895,745,041	520,100	89,977,252
112	174.00	3,024.11	30,276	5,268,024	916,636,176	526,195	91,557,974
113	175.00	3,041.93	30,625	5,359,375	937,890,625	532,337	93,159,034
114	176.00	3,059.81	30,976	5,451,776	959,512,576	538,526	94,780,637
115	177.00	3,077.76	31,329	5,545,233	981,506,241	544,763	96,422,989
116	178.00	3,095.77	31,684	5,639,752	1,003,875,856	551,047	98,086,299
117	179.00	3,113.85	32,041	5,735,339	1,026,625,681	557,379	99,770,777
118	180.00	3,131.99	32,400	5,832,000	1,049,760,000	563,759	101,476,637
	14,337.00	254,761	1,878,855	261,549,891	38,127,489,819	33,172,955	4,596,411,965

ATTACHMENT 2

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 1 - 63 to 180 MW Data Range

Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference[2]
1	63.00	1,209.1	$19.192	1,222.2	$19.400	$0.208	0.04332
2	64.00	1,226.0	$19.157	1,237.8	$19.341	$0.184	0.03381
3	65.00	1,243.0	$19.122	1,253.4	$19.284	$0.161	0.02600
4	66.00	1,259.8	$19.088	1,269.1	$19.228	$0.140	0.01965
5	67.00	1,276.6	$19.054	1,284.7	$19.175	$0.121	0.01453
6	68.00	1,293.4	$19.021	1,300.4	$19.123	$0.102	0.01047
7	69.00	1,310.2	$18.988	1,316.1	$19.073	$0.085	0.00729
8	70.00	1,326.9	$18.955	1,331.7	$19.025	$0.070	0.00486
9	71.00	1,343.5	$18.923	1,347.4	$18.978	$0.055	0.00305
10	72.00	1,360.1	$18.891	1,363.1	$18.932	$0.042	0.00175
11	73.00	1,376.7	$18.859	1,378.8	$18.888	$0.029	0.00087
12	74.00	1,393.2	$18.827	1,394.6	$18.845	$0.018	0.00033
13	75.00	1,409.7	$18.796	1,410.3	$18.804	$0.008	0.00006
14	76.00	1,426.2	$18.765	1,426.0	$18.764	-$0.002	0.00000
15	77.00	1,442.6	$18.735	1,441.8	$18.724	-$0.010	0.00011
16	78.00	1,459.0	$18.705	1,457.5	$18.687	-$0.018	0.00034
17	79.00	1,475.3	$18.675	1,473.3	$18.650	-$0.025	0.00065
18	80.00	1,491.7	$18.646	1,489.1	$18.614	-$0.032	0.00102
19	81.00	1,507.9	$18.617	1,504.9	$18.579	-$0.038	0.00142
20	82.00	1,524.2	$18.588	1,520.7	$18.545	-$0.043	0.00183
21	83.00	1,540.4	$18.559	1,536.5	$18.512	-$0.047	0.00223
22	84.00	1,556.6	$18.531	1,552.3	$18.480	-$0.051	0.00262
23	85.00	1,572.8	$18.504	1,568.2	$18.449	-$0.055	0.00298
24	86.00	1,589.0	$18.476	1,584.0	$18.419	-$0.057	0.00330
25	87.00	1,605.1	$18.449	1,599.9	$18.389	-$0.060	0.00358
26	88.00	1,621.2	$18.422	1,615.7	$18.361	-$0.062	0.00382
27	89.00	1,637.2	$18.396	1,631.6	$18.333	-$0.063	0.00401
28	90.00	1,653.3	$18.370	1,647.5	$18.305	-$0.064	0.00415
29	91.00	1,669.3	$18.344	1,663.4	$18.279	-$0.065	0.00425
30	92.00	1,685.3	$18.319	1,679.3	$18.253	-$0.066	0.00431
31	93.00	1,701.3	$18.294	1,695.2	$18.228	-$0.066	0.00432
32	94.00	1,717.3	$18.269	1,711.1	$18.204	-$0.065	0.00429
33	95.00	1,733.2	$18.245	1,727.1	$18.180	-$0.065	0.00422
34	96.00	1,749.2	$18.221	1,743.0	$18.156	-$0.064	0.00412
35	97.00	1,765.1	$18.197	1,759.0	$18.134	-$0.063	0.00399
36	98.00	1,781.0	$18.173	1,774.9	$18.112	-$0.062	0.00383
37	99.00	1,796.9	$18.150	1,790.9	$18.090	-$0.060	0.00365
38	100.00	1,812.8	$18.128	1,806.9	$18.069	-$0.059	0.00345
39	101.00	1,828.6	$18.105	1,822.9	$18.048	-$0.057	0.00324
40	102.00	1,844.5	$18.083	1,838.9	$18.028	-$0.055	0.00301

RHS

ATTACHMENT 2

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 1 - 63 to 180 MW Data Range

Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference[2]
41	103.00	1,860.3	$18.062	1,854.9	$18.009	-$0.053	0.00278
42	104.00	1,876.2	$18.040	1,870.9	$17.990	-$0.050	0.00254
43	105.00	1,892.0	$18.019	1,887.0	$17.971	-$0.048	0.00230
44	106.00	1,907.8	$17.999	1,903.0	$17.953	-$0.045	0.00206
45	107.00	1,923.7	$17.978	1,919.1	$17.935	-$0.043	0.00183
46	108.00	1,939.5	$17.958	1,935.2	$17.918	-$0.040	0.00160
47	109.00	1,955.3	$17.938	1,951.2	$17.901	-$0.037	0.00139
48	110.00	1,971.1	$17.919	1,967.3	$17.885	-$0.034	0.00118
49	111.00	1,986.9	$17.900	1,983.4	$17.869	-$0.031	0.00099
50	112.00	2,002.7	$17.881	1,999.5	$17.853	-$0.028	0.00081
51	113.00	2,018.5	$17.863	2,015.6	$17.838	-$0.025	0.00065
52	114.00	2,034.3	$17.845	2,031.8	$17.823	-$0.022	0.00050
53	115.00	2,050.2	$17.827	2,047.9	$17.808	-$0.019	0.00038
54	116.00	2,066.0	$17.810	2,064.1	$17.794	-$0.016	0.00027
55	117.00	2,081.8	$17.793	2,080.2	$17.780	-$0.013	0.00018
56	118.00	2,097.6	$17.776	2,096.4	$17.766	-$0.010	0.00011
57	119.00	2,113.5	$17.760	2,112.6	$17.753	-$0.007	0.00005
58	120.00	2,129.3	$17.744	2,128.8	$17.740	-$0.004	0.00002
59	121.00	2,145.1	$17.728	2,145.0	$17.727	-$0.001	0.00000
60	122.00	2,161.0	$17.713	2,161.2	$17.715	$0.001	0.00000
61	123.00	2,176.9	$17.698	2,177.4	$17.702	$0.004	0.00002
62	124.00	2,192.8	$17.684	2,193.6	$17.691	$0.007	0.00005
63	125.00	2,208.7	$17.669	2,209.9	$17.679	$0.010	0.00010
64	126.00	2,224.6	$17.655	2,226.1	$17.668	$0.012	0.00015
65	127.00	2,240.5	$17.642	2,242.4	$17.657	$0.015	0.00022
66	128.00	2,256.4	$17.628	2,258.7	$17.646	$0.017	0.00030
67	129.00	2,272.4	$17.615	2,274.9	$17.635	$0.020	0.00039
68	130.00	2,288.4	$17.603	2,291.2	$17.625	$0.022	0.00049
69	131.00	2,304.4	$17.590	2,307.5	$17.615	$0.024	0.00059
70	132.00	2,320.4	$17.579	2,323.9	$17.605	$0.026	0.00070
71	133.00	2,336.4	$17.567	2,340.2	$17.595	$0.028	0.00081
72	134.00	2,352.5	$17.556	2,356.5	$17.586	$0.030	0.00092
73	135.00	2,368.5	$17.545	2,372.9	$17.577	$0.032	0.00103
74	136.00	2,384.6	$17.534	2,389.2	$17.568	$0.034	0.00113
75	137.00	2,400.8	$17.524	2,405.6	$17.559	$0.035	0.00123
76	138.00	2,416.9	$17.514	2,421.9	$17.550	$0.036	0.00133
77	139.00	2,433.1	$17.504	2,438.3	$17.542	$0.038	0.00142
78	140.00	2,449.3	$17.495	2,454.7	$17.534	$0.039	0.00150
79	141.00	2,465.5	$17.486	2,471.1	$17.526	$0.040	0.00158
80	142.00	2,481.8	$17.477	2,487.5	$17.518	$0.040	0.00164

ATTACHMENT 2

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 1 - 63 to 180 MW Data Range

Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

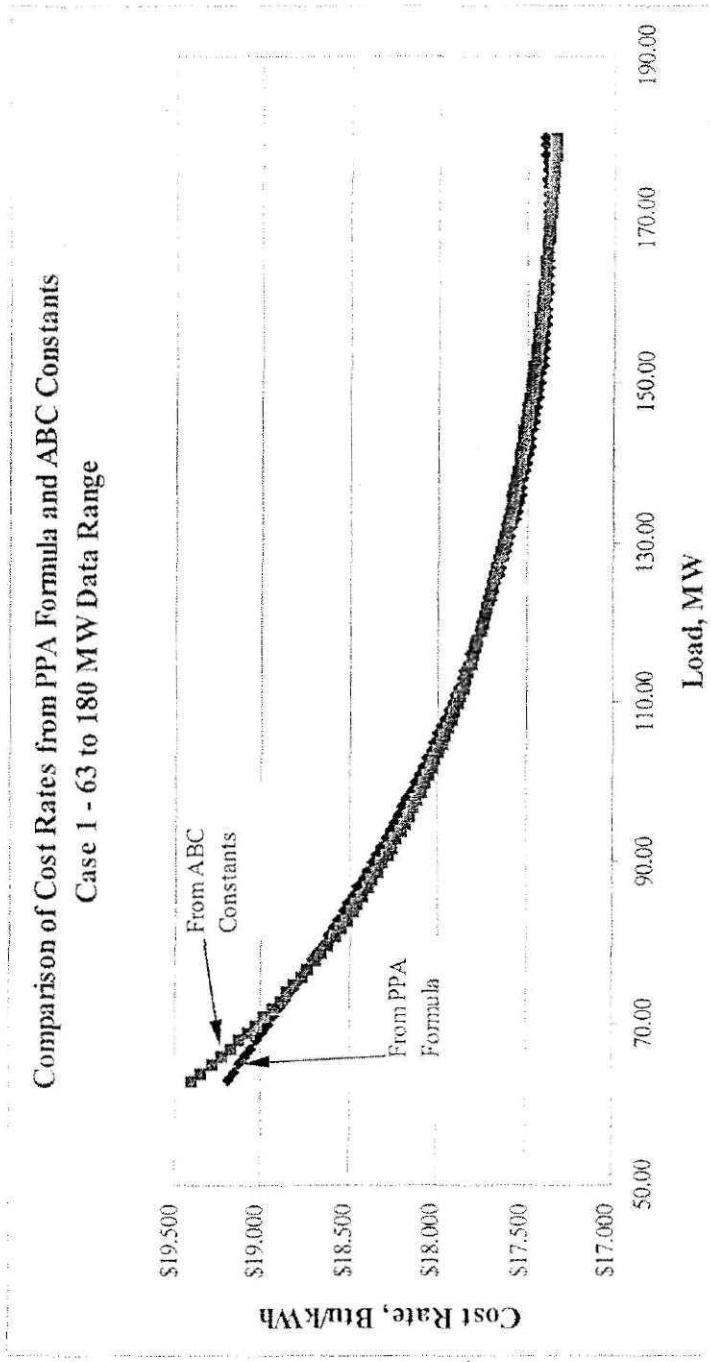
		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference^2
81	143.00	2,498.1	$17.469	2,504.0	$17.510	$0.041	0.00169
82	144.00	2,514.4	$17.461	2,520.4	$17.503	$0.042	0.00173
83	145.00	2,530.8	$17.454	2,536.9	$17.496	$0.042	0.00175
84	146.00	2,547.2	$17.446	2,553.3	$17.488	$0.042	0.00176
85	147.00	2,563.6	$17.440	2,569.8	$17.481	$0.042	0.00176
86	148.00	2,580.1	$17.433	2,586.3	$17.475	$0.042	0.00174
87	149.00	2,596.6	$17.427	2,602.7	$17.468	$0.041	0.00171
88	150.00	2,613.1	$17.421	2,619.2	$17.462	$0.041	0.00166
89	151.00	2,629.7	$17.415	2,635.7	$17.455	$0.040	0.00160
90	152.00	2,646.3	$17.410	2,652.3	$17.449	$0.039	0.00152
91	153.00	2,663.0	$17.405	2,668.8	$17.443	$0.038	0.00144
92	154.00	2,679.7	$17.401	2,685.3	$17.437	$0.037	0.00134
93	155.00	2,696.4	$17.396	2,701.9	$17.431	$0.035	0.00123
94	156.00	2,713.2	$17.392	2,718.4	$17.426	$0.033	0.00111
95	157.00	2,730.1	$17.389	2,735.0	$17.420	$0.031	0.00099
96	158.00	2,746.9	$17.386	2,751.6	$17.415	$0.029	0.00086
97	159.00	2,763.9	$17.383	2,768.2	$17.410	$0.027	0.00073
98	160.00	2,780.8	$17.380	2,784.8	$17.405	$0.025	0.00060
99	161.00	2,797.9	$17.378	2,801.4	$17.400	$0.022	0.00047
100	162.00	2,814.9	$17.376	2,818.0	$17.395	$0.019	0.00035
101	163.00	2,832.1	$17.375	2,834.6	$17.390	$0.016	0.00025
102	164.00	2,849.2	$17.373	2,851.3	$17.386	$0.012	0.00015
103	165.00	2,866.5	$17.373	2,867.9	$17.381	$0.009	0.00008
104	166.00	2,883.8	$17.372	2,884.6	$17.377	$0.005	0.00002
105	167.00	2,901.1	$17.372	2,901.2	$17.373	$0.001	0.00000
106	168.00	2,918.5	$17.372	2,917.9	$17.369	-$0.003	0.00001
107	169.00	2,936.0	$17.372	2,934.6	$17.365	-$0.008	0.00006
108	170.00	2,953.5	$17.373	2,951.3	$17.361	-$0.013	0.00016
109	171.00	2,971.0	$17.374	2,968.0	$17.357	-$0.018	0.00031
110	172.00	2,988.7	$17.376	2,984.7	$17.353	-$0.023	0.00052
111	173.00	3,006.4	$17.378	3,001.5	$17.350	-$0.028	0.00080
112	174.00	3,024.1	$17.380	3,018.2	$17.346	-$0.034	0.00115
113	175.00	3,041.9	$17.382	3,035.0	$17.343	-$0.040	0.00158
114	176.00	3,059.8	$17.385	3,051.7	$17.339	-$0.046	0.00211
115	177.00	3,077.8	$17.388	3,068.5	$17.336	-$0.052	0.00273
116	178.00	3,095.8	$17.392	3,085.3	$17.333	-$0.059	0.00347
117	179.00	3,113.8	$17.396	3,102.1	$17.330	-$0.066	0.00432
118	180.00	3,132.0	$17.400	3,118.9	$17.327	-$0.073	0.00531
						sum =	0.32901

Highlighted area indicates 63 to 180 MW range of AES operation.

RHS

aesmodeling xls - ABC Constants - Case 1 Sheet 3 3/3/99

ATTACHMENT 2
Section 3



ATTACHMENT 3

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 2 - 50 to 180 MW Data Range

Section 1 - Calculation of ABC Constants

Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr (y)	x^2	x^3	x^4	xy	x^2y
1	50.00	983.74	2,500	125,000	6,250,000	49,187	2,459,341
2	51.00	1,001.41	2,601	132,651	6,765,201	51,072	2,604,675
3	52.00	1,019.03	2,704	140,608	7,311,616	52,990	2,755,455
4	53.00	1,036.59	2,809	148,877	7,890,481	54,939	2,911,768
5	54.00	1,054.08	2,916	157,464	8,503,056	56,920	3,073,704
6	55.00	1,071.52	3,025	166,375	9,150,625	58,934	3,241,354
7	56.00	1,088.90	3,136	175,616	9,834,496	60,979	3,414,804
8	57.00	1,106.23	3,249	185,193	10,556,001	63,055	3,594,145
9	58.00	1,123.50	3,364	195,112	11,316,496	65,163	3,779,464
10	59.00	1,140.72	3,481	205,379	12,117,361	67,303	3,970,850
11	60.00	1,157.89	3,600	216,000	12,960,000	69,473	4,168,391
12	61.00	1,175.00	3,721	226,981	13,845,841	71,675	4,372,175
13	62.00	1,192.06	3,844	238,328	14,776,336	73,908	4,582,289
14	63.00	1,209.08	3,969	250,047	15,752,961	76,172	4,798,821
15	64.00	1,226.04	4,096	262,144	16,777,216	78,467	5,021,859
16	65.00	1,242.96	4,225	274,625	17,850,625	80,792	5,251,490
17	66.00	1,259.83	4,356	287,496	18,974,736	83,148	5,487,801
18	67.00	1,276.65	4,489	300,763	20,151,121	85,536	5,730,880
19	68.00	1,293.43	4,624	314,432	21,381,376	87,953	5,980,814
20	69.00	1,310.16	4,761	328,509	22,667,121	90,401	6,237,691
21	70.00	1,326.86	4,900	343,000	24,010,000	92,880	6,501,598
22	71.00	1,343.51	5,041	357,911	25,411,681	95,389	6,772,623
23	72.00	1,360.12	5,184	373,248	26,873,856	97,928	7,050,852
24	73.00	1,376.69	5,329	389,017	28,398,241	100,498	7,336,373
25	74.00	1,393.22	5,476	405,224	29,986,576	103,098	7,629,275
26	75.00	1,409.71	5,625	421,875	31,640,625	105,729	7,929,644
27	76.00	1,426.17	5,776	438,976	33,362,176	108,389	8,237,570
28	77.00	1,442.59	5,929	456,533	35,153,041	111,080	8,553,139
29	78.00	1,458.98	6,084	474,552	37,015,056	113,801	8,876,440
30	79.00	1,475.33	6,241	493,039	38,950,081	116,551	9,207,563
31	80.00	1,491.66	6,400	512,000	40,960,000	119,332	9,546,594
32	81.00	1,507.94	6,561	531,441	43,046,721	122,144	9,893,624
33	82.00	1,524.20	6,724	551,368	45,212,176	124,985	10,248,742
34	83.00	1,540.43	6,889	571,787	47,458,321	127,856	10,612,037
35	84.00	1,556.63	7,056	592,704	49,787,136	130,757	10,983,599
36	85.00	1,572.81	7,225	614,125	52,200,625	133,688	11,363,518
37	86.00	1,588.95	7,396	636,056	54,700,816	136,650	11,751,885
38	87.00	1,605.07	7,569	658,503	57,289,761	139,641	12,148,790
39	88.00	1,621.17	7,744	681,472	59,969,536	142,663	12,554,325
40	89.00	1,637.24	7,921	704,969	62,742,241	145,714	12,968,582
41	90.00	1,653.29	8,100	729,000	65,610,000	148,796	13,391,652
42	91.00	1,669.32	8,281	753,571	68,574,961	151,908	13,823,628
43	92.00	1,685.33	8,464	778,688	71,639,296	155,050	14,264,603
44	93.00	1,701.31	8,649	804,357	74,805,201	158,222	14,714,671
45	94.00	1,717.28	8,836	830,584	78,074,896	161,425	15,173,925
46	95.00	1,733.24	9,025	857,375	81,450,625	164,657	15,642,460
47	96.00	1,749.17	9,216	884,736	84,934,656	167,921	16,120,372
48	97.00	1,765.09	9,409	912,673	88,529,281	171,214	16,607,755
49	98.00	1,781.00	9,604	941,192	92,236,816	174,538	17,104,706
50	99.00	1,796.89	9,801	970,299	96,059,601	177,892	17,611,322

No. of Data Points	
=	131
	131
det =	5.25819E+15
	Adjusted
A =	205.8179
B =	15.8278
C =	0.0018

ATTACHMENT 3

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 2 - 50 to 180 MW Data Range

Section 1 - Calculation of ABC Constants

Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr (y)	x^2	x^3	x^4	xy	x^2y
51	100.00	1,812.77	10,000	1,000,000	100,000,000	181,277	18,127,700
52	101.00	1,828.64	10,201	1,030,301	104,060,401	184,692	18,653,939
53	102.00	1,844.50	10,404	1,061,208	108,243,216	188,139	19,190,136
54	103.00	1,860.34	10,609	1,092,727	112,550,881	191,615	19,736,393
55	104.00	1,876.18	10,816	1,124,864	116,985,856	195,123	20,292,808
56	105.00	1,892.02	11,025	1,157,625	121,550,625	198,662	20,859,483
57	106.00	1,907.84	11,236	1,191,016	126,247,696	202,231	21,436,519
58	107.00	1,923.66	11,449	1,225,043	131,079,601	205,832	22,024,020
59	108.00	1,939.48	11,664	1,259,712	136,048,896	209,464	22,622,087
60	109.00	1,955.29	11,881	1,295,029	141,158,161	213,127	23,230,825
61	110.00	1,971.10	12,100	1,331,000	146,410,000	216,821	23,850,339
62	111.00	1,986.91	12,321	1,367,631	151,807,041	220,547	24,480,735
63	112.00	2,002.72	12,544	1,404,928	157,351,936	224,305	25,122,119
64	113.00	2,018.53	12,769	1,442,897	163,047,361	228,094	25,774,599
65	114.00	2,034.34	12,996	1,481,544	168,896,016	231,915	26,438,283
66	115.00	2,050.15	13,225	1,520,875	174,900,625	235,768	27,113,280
67	116.00	2,065.97	13,456	1,560,896	181,063,936	239,653	27,799,701
68	117.00	2,081.79	13,689	1,601,613	187,388,721	243,570	28,497,657
69	118.00	2,097.62	13,924	1,643,032	193,877,776	247,519	29,207,259
70	119.00	2,113.45	14,161	1,685,159	200,533,921	251,501	29,928,622
71	120.00	2,129.30	14,400	1,728,000	207,360,000	255,516	30,661,860
72	121.00	2,145.15	14,641	1,771,561	214,358,881	259,563	31,407,088
73	122.00	2,161.01	14,884	1,815,848	221,533,456	263,643	32,164,422
74	123.00	2,176.88	15,129	1,860,867	228,886,641	267,756	32,933,979
75	124.00	2,192.76	15,376	1,906,624	236,421,376	271,902	33,715,879
76	125.00	2,208.66	15,625	1,953,125	244,140,625	276,082	34,510,242
77	126.00	2,224.56	15,876	2,000,376	252,047,376	280,295	35,317,187
78	127.00	2,240.49	16,129	2,048,383	260,144,641	284,542	36,136,837
79	128.00	2,256.43	16,384	2,097,152	268,435,456	288,823	36,969,316
80	129.00	2,272.38	16,641	2,146,689	276,922,881	293,138	37,814,747
81	130.00	2,288.36	16,900	2,197,000	285,610,000	297,487	38,673,257
82	131.00	2,304.35	17,161	2,248,091	294,499,921	301,870	39,544,972
83	132.00	2,320.36	17,424	2,299,968	303,595,776	306,288	40,430,021
84	133.00	2,336.40	17,689	2,352,637	312,900,721	310,741	41,328,533
85	134.00	2,352.45	17,956	2,406,104	322,417,936	315,229	42,240,640
86	135.00	2,368.53	18,225	2,460,375	332,150,625	319,752	43,166,472
87	136.00	2,384.63	18,496	2,515,456	342,102,016	324,310	44,106,164
88	137.00	2,400.76	18,769	2,571,353	352,275,361	328,904	45,059,850
89	138.00	2,416.91	19,044	2,628,072	362,673,936	333,534	46,027,668
90	139.00	2,433.09	19,321	2,685,619	373,301,041	338,200	47,009,753
91	140.00	2,449.30	19,600	2,744,000	384,160,000	342,902	48,006,247
92	141.00	2,465.53	19,881	2,803,221	395,254,161	347,640	49,017,289
93	142.00	2,481.80	20,164	2,863,288	406,586,896	352,416	50,043,021
94	143.00	2,498.10	20,449	2,924,207	418,161,601	357,228	51,083,588
95	144.00	2,514.43	20,736	2,985,984	429,981,696	362,077	52,139,133
96	145.00	2,530.79	21,025	3,048,625	442,050,625	366,964	53,209,804
97	146.00	2,547.18	21,316	3,112,136	454,371,856	371,889	54,295,748
98	147.00	2,563.61	21,609	3,176,523	466,948,881	376,851	55,397,117
99	148.00	2,580.08	21,904	3,241,792	479,785,216	381,852	56,514,060
100	149.00	2,596.58	22,201	3,307,949	492,884,401	386,891	57,646,731

ATTACHMENT 3

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 2 - 50 to 180 MW Data Range

Section 1 - Calculation of ABC Constants

Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr (y)	x^2	x^3	x^4	xy	x^2y
101	150.00	2,613.12	22,500	3,375,000	506,250,000	391,969	58,795,284
102	151.00	2,629.70	22,801	3,442,951	519,885,601	397,085	59,959,877
103	152.00	2,646.32	23,104	3,511,808	533,794,816	402,241	61,140,665
104	153.00	2,662.98	23,409	3,581,577	547,981,281	407,437	62,337,811
105	154.00	2,679.69	23,716	3,652,264	562,448,656	412,672	63,551,473
106	155.00	2,696.43	24,025	3,723,875	577,200,625	417,947	64,781,817
107	156.00	2,713.22	24,336	3,796,416	592,240,896	423,263	66,029,006
108	157.00	2,730.06	24,649	3,869,893	607,573,201	428,619	67,293,207
109	158.00	2,746.94	24,964	3,944,312	623,201,296	434,016	68,574,589
110	159.00	2,763.87	25,281	4,019,679	639,128,961	439,455	69,873,322
111	160.00	2,780.84	25,600	4,096,000	655,360,000	444,935	71,189,578
112	161.00	2,797.87	25,921	4,173,281	671,898,241	450,457	72,523,530
113	162.00	2,814.94	26,244	4,251,528	688,747,536	456,021	73,875,355
114	163.00	2,832.07	26,569	4,330,747	705,911,761	461,627	75,245,231
115	164.00	2,849.25	26,896	4,410,944	723,394,816	467,276	76,633,337
116	165.00	2,866.48	27,225	4,492,125	741,200,625	472,969	78,039,854
117	166.00	2,883.76	27,556	4,574,296	759,333,136	478,705	79,464,966
118	167.00	2,901.10	27,889	4,657,463	777,796,321	484,484	80,908,859
119	168.00	2,918.50	28,224	4,741,632	796,594,176	490,308	82,371,720
120	169.00	2,935.95	28,561	4,826,809	815,730,721	496,176	83,853,739
121	170.00	2,953.46	28,900	4,913,000	835,210,000	502,089	85,355,106
122	171.00	2,971.03	29,241	5,000,211	855,036,081	508,047	86,876,017
123	172.00	2,988.67	29,584	5,088,448	875,213,056	514,050	88,416,666
124	173.00	3,006.36	29,929	5,177,717	895,745,041	520,100	89,977,252
125	174.00	3,024.11	30,276	5,268,024	916,636,176	526,195	91,557,974
126	175.00	3,041.93	30,625	5,359,375	937,890,625	532,337	93,159,034
127	176.00	3,059.81	30,976	5,451,776	959,512,576	538,526	94,780,637
128	177.00	3,077.76	31,329	5,545,233	981,506,241	544,763	96,422,989
129	178.00	3,095.77	31,684	5,639,752	1,003,875,856	551,047	98,086,299
130	179.00	3,113.85	32,041	5,735,339	1,026,625,681	557,379	99,770,777
131	180.00	3,131.99	32,400	5,832,000	1,049,760,000	563,759	101,476,637
	15,065.00	268,912	1,919,805	263,863,475	38,258,767,329	33,968,552	4,641,340,381

ATTACHMENT 3

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 2 - 50 to 180 MW Data Range

Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference^2
1	50.00	983.7	$19.675	1,001.8	$20.035	$0.361	
2	51.00	1,001.4	$19.636	1,017.8	$19.957	$0.321	
3	52.00	1,019.0	$19.597	1,033.8	$19.881	$0.284	
4	53.00	1,036.6	$19.558	1,049.8	$19.808	$0.250	
5	54.00	1,054.1	$19.520	1,065.8	$19.738	$0.218	
6	55.00	1,071.5	$19.482	1,081.9	$19.670	$0.188	
7	56.00	1,088.9	$19.445	1,097.9	$19.605	$0.161	
8	57.00	1,106.2	$19.408	1,113.9	$19.543	$0.135	
9	58.00	1,123.5	$19.371	1,130.0	$19.482	$0.111	
10	59.00	1,140.7	$19.334	1,146.0	$19.424	$0.090	
11	60.00	1,157.9	$19.298	1,162.1	$19.368	$0.069	
12	61.00	1,175.0	$19.262	1,178.1	$19.313	$0.051	
13	62.00	1,192.1	$19.227	1,194.2	$19.261	$0.034	
14	63.00	1,209.1	$19.192	1,210.2	$19.210	$0.018	0.00033
15	64.00	1,226.0	$19.157	1,226.3	$19.161	$0.004	0.00001
16	65.00	1,243.0	$19.122	1,242.3	$19.113	-$0.010	0.00009
17	66.00	1,259.8	$19.088	1,258.4	$19.067	-$0.022	0.00046
18	67.00	1,276.6	$19.054	1,274.5	$19.022	-$0.032	0.00105
19	68.00	1,293.4	$19.021	1,290.5	$18.979	-$0.042	0.00179
20	69.00	1,310.2	$18.988	1,306.6	$18.937	-$0.051	0.00263
21	70.00	1,326.9	$18.955	1,322.7	$18.896	-$0.059	0.00351
22	71.00	1,343.5	$18.923	1,338.8	$18.856	-$0.066	0.00441
23	72.00	1,360.1	$18.891	1,354.9	$18.818	-$0.073	0.00529
24	73.00	1,376.7	$18.859	1,371.0	$18.780	-$0.078	0.00613
25	74.00	1,393.2	$18.827	1,387.1	$18.744	-$0.083	0.00691
26	75.00	1,409.7	$18.796	1,403.2	$18.709	-$0.087	0.00762
27	76.00	1,426.2	$18.765	1,419.3	$18.675	-$0.091	0.00824
28	77.00	1,442.6	$18.735	1,435.4	$18.641	-$0.094	0.00878
29	78.00	1,459.0	$18.705	1,451.5	$18.609	-$0.096	0.00922
30	79.00	1,475.3	$18.675	1,467.6	$18.577	-$0.098	0.00957
31	80.00	1,491.7	$18.646	1,483.7	$18.547	-$0.099	0.00983
32	81.00	1,507.9	$18.617	1,499.8	$18.517	-$0.100	0.01000
33	82.00	1,524.2	$18.588	1,516.0	$18.487	-$0.100	0.01008
34	83.00	1,540.4	$18.559	1,532.1	$18.459	-$0.100	0.01008
35	84.00	1,556.6	$18.531	1,548.2	$18.431	-$0.100	0.01000
36	85.00	1,572.8	$18.504	1,564.4	$18.404	-$0.099	0.00985
37	86.00	1,589.0	$18.476	1,580.5	$18.378	-$0.098	0.00964
38	87.00	1,605.1	$18.449	1,596.7	$18.352	-$0.097	0.00937
39	88.00	1,621.2	$18.422	1,612.8	$18.327	-$0.095	0.00905

ATTACHMENT 3

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 2 - 50 to 180 MW Data Range

Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference^2
40	89.00	1,637.2	$18.396	1,628.9	$18.303	-$0.093	0.00868
41	90.00	1,653.3	$18.370	1,645.1	$18.279	-$0.091	0.00827
42	91.00	1,669.3	$18.344	1,661.3	$18.256	-$0.089	0.00784
43	92.00	1,685.3	$18.319	1,677.4	$18.233	-$0.086	0.00738
44	93.00	1,701.3	$18.294	1,693.6	$18.211	-$0.083	0.00690
45	94.00	1,717.3	$18.269	1,709.8	$18.189	-$0.080	0.00641
46	95.00	1,733.2	$18.245	1,725.9	$18.168	-$0.077	0.00591
47	96.00	1,749.2	$18.221	1,742.1	$18.147	-$0.074	0.00542
48	97.00	1,765.1	$18.197	1,758.3	$18.127	-$0.070	0.00492
49	98.00	1,781.0	$18.173	1,774.5	$18.107	-$0.067	0.00444
50	99.00	1,796.9	$18.150	1,790.7	$18.087	-$0.063	0.00396
51	100.00	1,812.8	$18.128	1,806.8	$18.068	-$0.059	0.00350
52	101.00	1,828.6	$18.105	1,823.0	$18.050	-$0.055	0.00307
53	102.00	1,844.5	$18.083	1,839.2	$18.032	-$0.052	0.00265
54	103.00	1,860.3	$18.062	1,855.4	$18.014	-$0.048	0.00226
55	104.00	1,876.2	$18.040	1,871.7	$17.997	-$0.044	0.00190
56	105.00	1,892.0	$18.019	1,887.9	$17.980	-$0.040	0.00157
57	106.00	1,907.8	$17.999	1,904.1	$17.963	-$0.036	0.00126
58	107.00	1,923.7	$17.978	1,920.3	$17.947	-$0.032	0.00099
59	108.00	1,939.5	$17.958	1,936.5	$17.931	-$0.027	0.00076
60	109.00	1,955.3	$17.938	1,952.7	$17.915	-$0.023	0.00055
61	110.00	1,971.1	$17.919	1,969.0	$17.900	-$0.019	0.00038
62	111.00	1,986.9	$17.900	1,985.2	$17.885	-$0.015	0.00024
63	112.00	2,002.7	$17.881	2,001.4	$17.870	-$0.012	0.00013
64	113.00	2,018.5	$17.863	2,017.7	$17.855	-$0.008	0.00006
65	114.00	2,034.3	$17.845	2,033.9	$17.841	-$0.004	0.00001
66	115.00	2,050.2	$17.827	2,050.2	$17.827	$0.000	0.00000
67	116.00	2,066.0	$17.810	2,066.4	$17.814	$0.004	0.00001
68	117.00	2,081.8	$17.793	2,082.7	$17.800	$0.007	0.00005
69	118.00	2,097.6	$17.776	2,098.9	$17.787	$0.011	0.00012
70	119.00	2,113.5	$17.760	2,115.2	$17.775	$0.014	0.00021
71	120.00	2,129.3	$17.744	2,131.4	$17.762	$0.018	0.00032
72	121.00	2,145.1	$17.728	2,147.7	$17.750	$0.021	0.00045
73	122.00	2,161.0	$17.713	2,164.0	$17.738	$0.024	0.00059
74	123.00	2,176.9	$17.698	2,180.3	$17.726	$0.027	0.00075
75	124.00	2,192.8	$17.684	2,196.5	$17.714	$0.030	0.00092
76	125.00	2,208.7	$17.669	2,212.8	$17.702	$0.033	0.00111
77	126.00	2,224.6	$17.655	2,229.1	$17.691	$0.036	0.00129
78	127.00	2,240.5	$17.642	2,245.4	$17.680	$0.039	0.00149

ATTACHMENT 3

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 2 - 50 to 180 MW Data Range

Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference^2
79	128.00	2,256.4	$17.628	2,261.7	$17.669	$0.041	0.00168
80	129.00	2,272.4	$17.615	2,278.0	$17.659	$0.043	0.00188
81	130.00	2,288.4	$17.603	2,294.3	$17.648	$0.046	0.00207
82	131.00	2,304.4	$17.590	2,310.6	$17.638	$0.048	0.00226
83	132.00	2,320.4	$17.579	2,326.9	$17.628	$0.049	0.00244
84	133.00	2,336.4	$17.567	2,343.2	$17.618	$0.051	0.00262
85	134.00	2,352.5	$17.556	2,359.5	$17.608	$0.053	0.00278
86	135.00	2,368.5	$17.545	2,375.8	$17.599	$0.054	0.00293
87	136.00	2,384.6	$17.534	2,392.2	$17.589	$0.055	0.00306
88	137.00	2,400.8	$17.524	2,408.5	$17.580	$0.056	0.00318
89	138.00	2,416.9	$17.514	2,424.8	$17.571	$0.057	0.00328
90	139.00	2,433.1	$17.504	2,441.1	$17.562	$0.058	0.00336
91	140.00	2,449.3	$17.495	2,457.5	$17.553	$0.058	0.00342
92	141.00	2,465.5	$17.486	2,473.8	$17.545	$0.059	0.00346
93	142.00	2,481.8	$17.477	2,490.2	$17.536	$0.059	0.00347
94	143.00	2,498.1	$17.469	2,506.5	$17.528	$0.059	0.00347
95	144.00	2,514.4	$17.461	2,522.9	$17.520	$0.059	0.00344
96	145.00	2,530.8	$17.454	2,539.2	$17.512	$0.058	0.00339
97	146.00	2,547.2	$17.446	2,555.6	$17.504	$0.058	0.00331
98	147.00	2,563.6	$17.440	2,571.9	$17.496	$0.057	0.00321
99	148.00	2,580.1	$17.433	2,588.3	$17.489	$0.056	0.00309
100	149.00	2,596.6	$17.427	2,604.7	$17.481	$0.054	0.00296
101	150.00	2,613.1	$17.421	2,621.1	$17.474	$0.053	0.00280
102	151.00	2,629.7	$17.415	2,637.4	$17.466	$0.051	0.00262
103	152.00	2,646.3	$17.410	2,653.8	$17.459	$0.049	0.00243
104	153.00	2,663.0	$17.405	2,670.2	$17.452	$0.047	0.00222
105	154.00	2,679.7	$17.401	2,686.6	$17.445	$0.045	0.00201
106	155.00	2,696.4	$17.396	2,703.0	$17.439	$0.042	0.00178
107	156.00	2,713.2	$17.392	2,719.4	$17.432	$0.039	0.00155
108	157.00	2,730.1	$17.389	2,735.8	$17.425	$0.036	0.00133
109	158.00	2,746.9	$17.386	2,752.2	$17.419	$0.033	0.00110
110	159.00	2,763.9	$17.383	2,768.6	$17.412	$0.030	0.00088
111	160.00	2,780.8	$17.380	2,785.0	$17.406	$0.026	0.00067
112	161.00	2,797.9	$17.378	2,801.4	$17.400	$0.022	0.00048
113	162.00	2,814.9	$17.376	2,817.8	$17.394	$0.018	0.00032
114	163.00	2,832.1	$17.375	2,834.2	$17.388	$0.013	0.00018
115	164.00	2,849.2	$17.373	2,850.7	$17.382	$0.009	0.00008
116	165.00	2,866.5	$17.373	2,867.1	$17.376	$0.004	0.00001
117	166.00	2,883.8	$17.372	2,883.5	$17.371	-$0.001	0.00000

ATTACHMENT 3

Calculation of ABC Constants and Comparison of Hourly Cost Rates
Case 2 - 50 to 180 MW Data Range

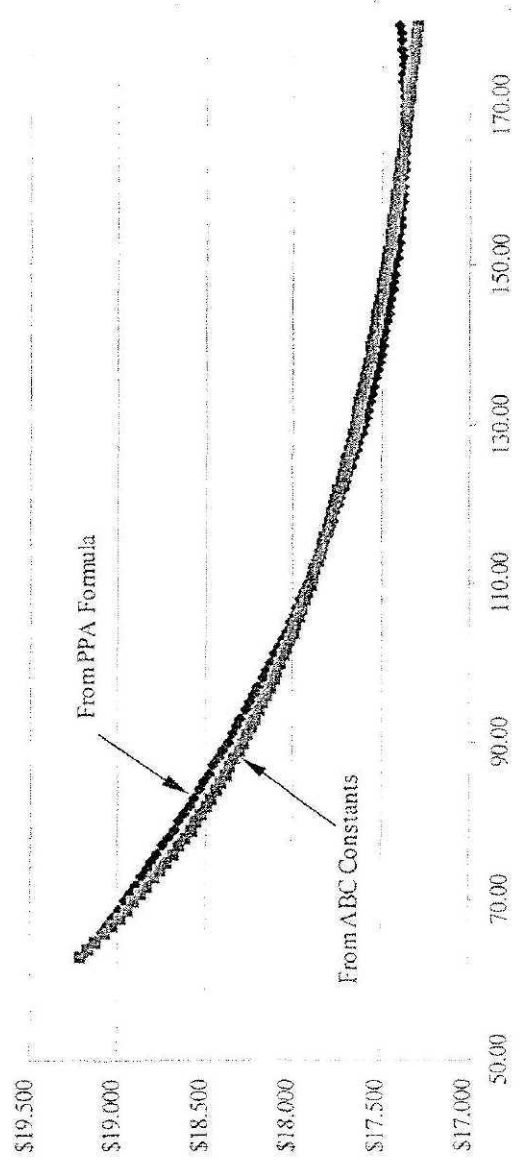
Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference^2
118	167.00	2,901.1	$17.372	2,900.0	$17.365	-$0.007	0.00005
119	168.00	2,918.5	$17.372	2,916.4	$17.360	-$0.012	0.00016
120	169.00	2,936.0	$17.372	2,932.8	$17.354	-$0.018	0.00034
121	170.00	2,953.5	$17.373	2,949.3	$17.349	-$0.025	0.00060
122	171.00	2,971.0	$17.374	2,965.7	$17.344	-$0.031	0.00096
123	172.00	2,988.7	$17.376	2,982.2	$17.338	-$0.038	0.00141
124	173.00	3,006.4	$17.378	2,998.7	$17.333	-$0.045	0.00198
125	174.00	3,024.1	$17.380	3,015.1	$17.328	-$0.052	0.00267
126	175.00	3,041.9	$17.382	3,031.6	$17.323	-$0.059	0.00350
127	176.00	3,059.8	$17.385	3,048.1	$17.318	-$0.067	0.00446
128	177.00	3,077.8	$17.388	3,064.5	$17.314	-$0.075	0.00559
129	178.00	3,095.8	$17.392	3,081.0	$17.309	-$0.083	0.00688
130	179.00	3,113.8	$17.396	3,097.5	$17.304	-$0.091	0.00836
131	180.00	3,132.0	$17.400	3,114.0	$17.300	-$0.100	0.01004
						sum =	0.39298

Highlighted area indicates 63 to 180 MW range of AES operation.

ATTACHMENT 3
Section 3

Comparison of Cost Rates from PPA Formula and ABC Constants
Case 2 - 50 to 180 MW Data Range



ATTACHMENT 4

Calculation of ABC Constants and Comparison of Heat Rates
Case Without Variable O and M Component

Section 1 - Calculation of ABC Constants Without Variable O&M Component

Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr (y)	x^2	x^3	x^4	xy	x^2y
1	63.00	1,177.58	3,969	250,047	15,752,961	74,187	4,673,798
2	64.00	1,194.04	4,096	262,144	16,777,216	76,419	4,890,787
3	65.00	1,210.46	4,225	274,625	17,850,625	78,680	5,114,177
4	66.00	1,226.83	4,356	287,496	18,974,736	80,970	5,344,053
5	67.00	1,243.15	4,489	300,763	20,151,121	83,291	5,580,499
6	68.00	1,259.43	4,624	314,432	21,381,376	85,641	5,823,598
7	69.00	1,275.66	4,761	328,509	22,667,121	88,021	6,073,437
8	70.00	1,291.86	4,900	343,000	24,010,000	90,430	6,330,098
9	71.00	1,308.01	5,041	357,911	25,411,681	92,869	6,593,667
10	72.00	1,324.12	5,184	373,248	26,873,856	95,336	6,864,228
11	73.00	1,340.19	5,329	389,017	28,398,241	97,834	7,141,865
12	74.00	1,356.22	5,476	405,224	29,986,576	100,360	7,426,663
13	75.00	1,372.21	5,625	421,875	31,640,625	102,916	7,718,707
14	76.00	1,388.17	5,776	438,976	33,362,176	105,501	8,018,082
15	77.00	1,404.09	5,929	456,533	35,153,041	108,115	8,324,872
16	78.00	1,419.98	6,084	474,552	37,015,056	110,759	8,639,164
17	79.00	1,435.83	6,241	493,039	38,950,081	113,431	8,961,043
18	80.00	1,451.66	6,400	512,000	40,960,000	116,132	9,290,594
19	81.00	1,467.44	6,561	531,441	43,046,721	118,863	9,627,904
20	82.00	1,483.20	6,724	551,368	45,212,176	121,623	9,973,058
21	83.00	1,498.93	6,889	571,787	47,458,321	124,411	10,326,144
22	84.00	1,514.63	7,056	592,704	49,787,136	127,229	10,687,247
23	85.00	1,530.31	7,225	614,125	52,200,625	130,076	11,056,456
24	86.00	1,545.95	7,396	636,056	54,700,816	132,952	11,433,857
25	87.00	1,561.57	7,569	658,503	57,289,761	135,857	11,819,539
26	88.00	1,577.17	7,744	681,472	59,969,536	138,791	12,213,589
27	89.00	1,592.74	7,921	704,969	62,742,241	141,754	12,616,097
28	90.00	1,608.29	8,100	729,000	65,610,000	144,746	13,027,152
29	91.00	1,623.82	8,281	753,571	68,574,961	147,768	13,446,843
30	92.00	1,639.33	8,464	778,688	71,639,296	150,818	13,875,259
31	93.00	1,654.81	8,649	804,357	74,805,201	153,898	14,312,492
32	94.00	1,670.28	8,836	830,584	78,074,896	157,007	14,758,633
33	95.00	1,685.74	9,025	857,375	81,450,625	160,145	15,213,773
34	96.00	1,701.17	9,216	884,736	84,934,656	163,313	15,678,004
35	97.00	1,716.59	9,409	912,673	88,529,281	166,509	16,151,418
36	98.00	1,732.00	9,604	941,192	92,236,816	169,736	16,634,110
37	99.00	1,747.39	9,801	970,299	96,059,601	172,992	17,126,172
38	100.00	1,762.77	10,000	1,000,000	100,000,000	176,277	17,627,700
39	101.00	1,778.14	10,201	1,030,301	104,060,401	179,592	18,138,788
40	102.00	1,793.50	10,404	1,061,208	108,243,216	182,937	18,659,532
41	103.00	1,808.84	10,609	1,092,727	112,550,881	186,311	19,190,029
42	104.00	1,824.18	10,816	1,124,864	116,985,856	189,715	19,730,376
43	105.00	1,839.52	11,025	1,157,625	121,550,625	193,149	20,280,671
44	106.00	1,854.84	11,236	1,191,016	126,247,696	196,613	20,841,011
45	107.00	1,870.16	11,449	1,225,043	131,079,601	200,107	21,411,498
46	108.00	1,885.48	11,664	1,259,712	136,048,896	203,632	21,992,231
47	109.00	1,900.79	11,881	1,295,029	141,158,161	207,186	22,583,311
48	110.00	1,916.10	12,100	1,331,000	146,410,000	210,771	23,184,839
49	111.00	1,931.41	12,321	1,367,631	151,807,041	214,387	23,796,920
50	112.00	1,946.72	12,544	1,404,928	157,351,936	218,033	24,419,655
51	113.00	1,962.03	12,769	1,442,897	163,047,361	221,709	25,053,151

No. of Data Points	
=	118
	118
det =	2.05257E+15
	Adjusted
A =	258.7479
B =	14.4713
C =	0.0051019

ATTACHMENT 4

Calculation of ABC Constants and Comparison of Heat Rates
Case Without Variable O and M Component

Section I - Calculation of ABC Constants Without Variable O&M Component

Data Point No	Load, MW (x)	Fuel and Variable O&M Component, $/hr (y)	x^2	x^3	x^4	xy	x^2y
52	114.00	1,977.34	12,996	1,481,544	168,896,016	225,417	25,697,511
53	115.00	1,992.65	13,225	1,520,875	174,900,625	229,155	26,352,843
54	116.00	2,007.97	13,456	1,560,896	181,063,936	232,925	27,019,253
55	117.00	2,023.29	13,689	1,601,613	187,388,721	236,725	27,696,850
56	118.00	2,038.62	13,924	1,643,032	193,877,776	240,557	28,385,743
57	119.00	2,053.95	14,161	1,685,159	200,533,921	244,421	29,086,043
58	120.00	2,069.30	14,400	1,728,000	207,360,000	248,316	29,797,860
59	121.00	2,084.65	14,641	1,771,561	214,358,881	252,242	30,521,307
60	122.00	2,100.01	14,884	1,815,848	221,533,456	256,201	31,256,498
61	123.00	2,115.38	15,129	1,860,867	228,886,641	260,191	32,003,546
62	124.00	2,130.76	15,376	1,906,624	236,421,376	264,214	32,762,567
63	125.00	2,146.16	15,625	1,953,125	244,140,625	268,269	33,533,679
64	126.00	2,161.56	15,876	2,000,376	252,047,376	272,357	34,316,999
65	127.00	2,176.99	16,129	2,048,383	260,144,641	276,478	35,112,646
66	128.00	2,192.43	16,384	2,097,152	268,435,456	280,631	35,920,740
67	129.00	2,207.88	16,641	2,146,689	276,922,881	284,817	36,741,403
68	130.00	2,223.36	16,900	2,197,000	285,610,000	289,037	37,574,757
69	131.00	2,238.85	17,161	2,248,091	294,499,921	293,290	38,420,927
70	132.00	2,254.36	17,424	2,299,968	303,595,776	297,576	39,280,037
71	133.00	2,269.90	17,689	2,352,637	312,900,721	301,896	40,152,215
72	134.00	2,285.45	17,956	2,406,104	322,417,936	306,251	41,037,588
73	135.00	2,301.03	18,225	2,460,375	332,150,625	310,639	41,936,284
74	136.00	2,316.63	18,496	2,515,456	342,102,016	315,062	42,848,436
75	137.00	2,332.26	18,769	2,571,353	352,275,361	319,520	43,774,174
76	138.00	2,347.91	19,044	2,628,072	362,673,936	324,012	44,713,632
77	139.00	2,363.59	19,321	2,685,619	373,301,041	328,539	45,666,944
78	140.00	2,379.30	19,600	2,744,000	384,160,000	333,102	46,634,247
79	141.00	2,395.03	19,881	2,803,221	395,254,161	337,700	47,615,679
80	142.00	2,410.80	20,164	2,863,288	406,586,896	342,334	48,611,377
81	143.00	2,426.60	20,449	2,924,207	418,161,601	347,003	49,621,484
82	144.00	2,442.43	20,736	2,985,984	429,981,696	351,709	50,646,141
83	145.00	2,458.29	21,025	3,048,625	442,050,625	356,452	51,685,491
84	146.00	2,474.18	21,316	3,112,136	454,371,856	361,231	52,739,680
85	147.00	2,490.11	21,609	3,176,523	466,948,881	366,047	53,808,855
86	148.00	2,506.08	21,904	3,241,792	479,785,216	370,900	54,893,164
87	149.00	2,522.08	22,201	3,307,949	492,884,401	375,790	55,992,756
88	150.00	2,538.12	22,500	3,375,000	506,250,000	380,719	57,107,784
89	151.00	2,554.20	22,801	3,442,951	519,885,601	385,685	58,238,401
90	152.00	2,570.32	23,104	3,511,808	533,794,816	390,689	59,384,761
91	153.00	2,586.48	23,409	3,581,577	547,981,281	395,732	60,547,022
92	154.00	2,602.69	23,716	3,652,264	562,448,656	400,814	61,725,341
93	155.00	2,618.93	24,025	3,723,875	577,200,625	405,935	62,919,880
94	156.00	2,635.22	24,336	3,796,416	592,240,896	411,095	64,130,798
95	157.00	2,651.56	24,649	3,869,893	607,573,201	416,295	65,358,261
96	158.00	2,667.94	24,964	3,944,312	623,201,296	421,534	66,602,433
97	159.00	2,684.37	25,281	4,019,679	639,128,961	426,814	67,863,483
98	160.00	2,700.84	25,600	4,096,000	655,360,000	432,135	69,141,578
99	161.00	2,717.37	25,921	4,173,281	671,898,241	437,496	70,436,890
100	162.00	2,733.94	26,244	4,251,528	688,747,536	442,899	71,749,591
101	163.00	2,750.57	26,569	4,330,747	705,911,761	448,343	73,079,857
102	164.00	2,767.25	26,896	4,410,944	723,394,816	453,828	74,427,865

ATTACHMENT 4

Calculation of ABC Constants and Comparison of Heat Rates
Case Without Variable O and M Component

Section 1 - Calculation of ABC Constants Without Variable O&M Component

Data Point No	Load, MW (x)	Fuel and Variable O&M Component, $/hr (y)	x^2	x^3	x^4	xy	x^2y
103	165.00	2,783.98	27,225	4,492,125	741,200,625	459,356	75,793,791
104	166.00	2,800.76	27,556	4,574,296	759,333,136	464,927	77,177,818
105	167.00	2,817.60	27,889	4,657,463	777,796,321	470,540	78,580,127
106	168.00	2,834.50	28,224	4,741,632	796,594,176	476,196	80,000,904
107	169.00	2,851.45	28,561	4,826,809	815,730,721	481,895	81,440,334
108	170.00	2,868.46	28,900	4,913,000	835,210,000	487,639	82,898,606
109	171.00	2,885.53	29,241	5,000,211	855,036,081	493,426	84,375,912
110	172.00	2,902.67	29,584	5,088,448	875,213,056	499,258	85,872,442
111	173.00	2,919.86	29,929	5,177,717	895,745,041	505,135	87,388,394
112	174.00	2,937.11	30,276	5,268,024	916,636,176	511,057	88,923,962
113	175.00	2,954.43	30,625	5,359,375	937,890,625	517,025	90,479,347
114	176.00	2,971.81	30,976	5,451,776	959,512,576	523,038	92,054,749
115	177.00	2,989.26	31,329	5,545,233	981,506,241	529,098	93,650,373
116	178.00	3,006.77	31,684	5,639,752	1,003,875,856	535,205	95,266,423
117	179.00	3,024.35	32,041	5,735,339	1,026,625,681	541,358	96,903,108
118	180.00	3,041.99	32,400	5,832,000	1,049,760,000	547,559	98,560,637
	14,337.00	247,593	1,878,855	261,549,891	38,127,489,819	32,233,527	4,465,637,019

ATTACHMENT 4

Calculation of ABC Constants and Comparison of Heat Rates
Case Without Variable O and M Component

Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference^2
1	63.00	1,177.6	$18.692	1,190.7	$18.900	$0.208	0.04332
2	64.00	1,194.0	$18.657	1,205.8	$18.841	$0.184	0.03381
3	65.00	1,210.5	$18.622	1,220.9	$18.784	$0.161	0.02600
4	66.00	1,226.8	$18.588	1,236.1	$18.728	$0.140	0.01965
5	67.00	1,243.1	$18.554	1,251.2	$18.675	$0.121	0.01453
6	68.00	1,259.4	$18.521	1,266.4	$18.623	$0.102	0.01047
7	69.00	1,275.7	$18.488	1,281.6	$18.573	$0.085	0.00729
8	70.00	1,291.9	$18.455	1,296.7	$18.525	$0.070	0.00486
9	71.00	1,308.0	$18.423	1,311.9	$18.478	$0.055	0.00305
10	72.00	1,324.1	$18.391	1,327.1	$18.432	$0.042	0.00175
11	73.00	1,340.2	$18.359	1,342.3	$18.388	$0.029	0.00087
12	74.00	1,356.2	$18.327	1,357.6	$18.345	$0.018	0.00033
13	75.00	1,372.2	$18.296	1,372.8	$18.304	$0.008	0.00006
14	76.00	1,388.2	$18.265	1,388.0	$18.264	-$0.002	0.00000
15	77.00	1,404.1	$18.235	1,403.3	$18.224	-$0.010	0.00011
16	78.00	1,420.0	$18.205	1,418.5	$18.187	-$0.018	0.00034
17	79.00	1,435.8	$18.175	1,433.8	$18.150	-$0.025	0.00065
18	80.00	1,451.7	$18.146	1,449.1	$18.114	-$0.032	0.00102
19	81.00	1,467.4	$18.117	1,464.4	$18.079	-$0.038	0.00142
20	82.00	1,483.2	$18.088	1,479.7	$18.045	-$0.043	0.00183
21	83.00	1,498.9	$18.059	1,495.0	$18.012	-$0.047	0.00223
22	84.00	1,514.6	$18.031	1,510.3	$17.980	-$0.051	0.00262
23	85.00	1,530.3	$18.004	1,525.7	$17.949	-$0.055	0.00298
24	86.00	1,546.0	$17.976	1,541.0	$17.919	-$0.057	0.00330
25	87.00	1,561.6	$17.949	1,556.4	$17.889	-$0.060	0.00358
26	88.00	1,577.2	$17.922	1,571.7	$17.861	-$0.062	0.00382
27	89.00	1,592.7	$17.896	1,587.1	$17.833	-$0.063	0.00401
28	90.00	1,608.3	$17.870	1,602.5	$17.805	-$0.064	0.00415
29	91.00	1,623.8	$17.844	1,617.9	$17.779	-$0.065	0.00425
30	92.00	1,639.3	$17.819	1,633.3	$17.753	-$0.066	0.00431
31	93.00	1,654.8	$17.794	1,648.7	$17.728	-$0.066	0.00432
32	94.00	1,670.3	$17.769	1,664.1	$17.704	-$0.065	0.00429
33	95.00	1,685.7	$17.745	1,679.6	$17.680	-$0.065	0.00422
34	96.00	1,701.2	$17.721	1,695.0	$17.656	-$0.064	0.00412
35	97.00	1,716.6	$17.697	1,710.5	$17.634	-$0.063	0.00399
36	98.00	1,732.0	$17.673	1,725.9	$17.612	-$0.062	0.00383
37	99.00	1,747.4	$17.650	1,741.4	$17.590	-$0.060	0.00365
38	100.00	1,762.8	$17.628	1,756.9	$17.569	-$0.059	0.00345
39	101.00	1,778.1	$17.605	1,772.4	$17.548	-$0.057	0.00324
40	102.00	1,793.5	$17.583	1,787.9	$17.528	-$0.055	0.00301

ATTACHMENT 4

Calculation of ABC Constants and Comparison of Heat Rates
Case Without Variable O and M Component

Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference[2]
41	103.00	1,808.8	$17.562	1,803.4	$17.509	-$0.053	0.00278
42	104.00	1,824.2	$17.540	1,818.9	$17.490	-$0.050	0.00254
43	105.00	1,839.5	$17.519	1,834.5	$17.471	-$0.048	0.00230
44	106.00	1,854.8	$17.499	1,850.0	$17.453	-$0.045	0.00206
45	107.00	1,870.2	$17.478	1,865.6	$17.435	-$0.043	0.00183
46	108.00	1,885.5	$17.458	1,881.2	$17.418	-$0.040	0.00160
47	109.00	1,900.8	$17.438	1,896.7	$17.401	-$0.037	0.00139
48	110.00	1,916.1	$17.419	1,912.3	$17.385	-$0.034	0.00118
49	111.00	1,931.4	$17.400	1,927.9	$17.369	-$0.031	0.00099
50	112.00	1,946.7	$17.381	1,943.5	$17.353	-$0.028	0.00081
51	113.00	1,962.0	$17.363	1,959.1	$17.338	-$0.025	0.00065
52	114.00	1,977.3	$17.345	1,974.8	$17.323	-$0.022	0.00050
53	115.00	1,992.7	$17.327	1,990.4	$17.308	-$0.019	0.00038
54	116.00	2,008.0	$17.310	2,006.1	$17.294	-$0.016	0.00027
55	117.00	2,023.3	$17.293	2,021.7	$17.280	-$0.013	0.00018
56	118.00	2,038.6	$17.276	2,037.4	$17.266	-$0.010	0.00011
57	119.00	2,054.0	$17.260	2,053.1	$17.253	-$0.007	0.00005
58	120.00	2,069.3	$17.244	2,068.8	$17.240	-$0.004	0.00002
59	121.00	2,084.6	$17.228	2,084.5	$17.227	-$0.001	0.00000
60	122.00	2,100.0	$17.213	2,100.2	$17.215	$0.001	0.00000
61	123.00	2,115.4	$17.198	2,115.9	$17.202	$0.004	0.00002
62	124.00	2,130.8	$17.184	2,131.6	$17.191	$0.007	0.00005
63	125.00	2,146.2	$17.169	2,147.4	$17.179	$0.010	0.00010
64	126.00	2,161.6	$17.155	2,163.1	$17.168	$0.012	0.00015
65	127.00	2,177.0	$17.142	2,178.9	$17.157	$0.015	0.00022
66	128.00	2,192.4	$17.128	2,194.7	$17.146	$0.017	0.00030
67	129.00	2,207.9	$17.115	2,210.4	$17.135	$0.020	0.00039
68	130.00	2,223.4	$17.103	2,226.2	$17.125	$0.022	0.00049
69	131.00	2,238.9	$17.090	2,242.0	$17.115	$0.024	0.00059
70	132.00	2,254.4	$17.079	2,257.9	$17.105	$0.026	0.00070
71	133.00	2,269.9	$17.067	2,273.7	$17.095	$0.028	0.00081
72	134.00	2,285.5	$17.056	2,289.5	$17.086	$0.030	0.00092
73	135.00	2,301.0	$17.045	2,305.4	$17.077	$0.032	0.00103
74	136.00	2,316.6	$17.034	2,321.2	$17.068	$0.034	0.00113
75	137.00	2,332.3	$17.024	2,337.1	$17.059	$0.035	0.00123
76	138.00	2,347.9	$17.014	2,352.9	$17.050	$0.036	0.00133
77	139.00	2,363.6	$17.004	2,368.8	$17.042	$0.038	0.00142
78	140.00	2,379.3	$16.995	2,384.7	$17.034	$0.039	0.00150
79	141.00	2,395.0	$16.986	2,400.6	$17.026	$0.040	0.00158
80	142.00	2,410.8	$16.977	2,416.5	$17.018	$0.040	0.00164

ATTACHMENT 4

Calculation of ABC Constants and Comparison of Heat Rates
Case Without Variable O and M Component

Section 2 - Comparison of Heat Rates from PPA Formula and ABC Constants

		By PPA Formula		By ABC Constants			
Data Point No.	Load, MW (x)	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Fuel and Variable O&M Component, $/hr	Cost Rate, $/MWh	Difference in Cost Rates ABC - PPA	Difference^2
81	143.00	2,426.6	$16.969	2,432.5	$17.010	$0.041	0.00169
82	144.00	2,442.4	$16.961	2,448.4	$17.003	$0.042	0.00173
83	145.00	2,458.3	$16.954	2,464.4	$16.996	$0.042	0.00175
84	146.00	2,474.2	$16.946	2,480.3	$16.988	$0.042	0.00176
85	147.00	2,490.1	$16.940	2,496.3	$16.981	$0.042	0.00176
86	148.00	2,506.1	$16.933	2,512.3	$16.975	$0.042	0.00174
87	149.00	2,522.1	$16.927	2,528.2	$16.968	$0.041	0.00171
88	150.00	2,538.1	$16.921	2,544.2	$16.962	$0.041	0.00166
89	151.00	2,554.2	$16.915	2,560.2	$16.955	$0.040	0.00160
90	152.00	2,570.3	$16.910	2,576.3	$16.949	$0.039	0.00152
91	153.00	2,586.5	$16.905	2,592.3	$16.943	$0.038	0.00144
92	154.00	2,602.7	$16.901	2,608.3	$16.937	$0.037	0.00134
93	155.00	2,618.9	$16.896	2,624.4	$16.931	$0.035	0.00123
94	156.00	2,635.2	$16.892	2,640.4	$16.926	$0.033	0.00111
95	157.00	2,651.6	$16.889	2,656.5	$16.920	$0.031	0.00099
96	158.00	2,667.9	$16.886	2,672.6	$16.915	$0.029	0.00086
97	159.00	2,684.4	$16.883	2,688.7	$16.910	$0.027	0.00073
98	160.00	2,700.8	$16.880	2,704.8	$16.905	$0.025	0.00060
99	161.00	2,717.4	$16.878	2,720.9	$16.900	$0.022	0.00047
100	162.00	2,733.9	$16.876	2,737.0	$16.895	$0.019	0.00035
101	163.00	2,750.6	$16.875	2,753.1	$16.890	$0.016	0.00025
102	164.00	2,767.2	$16.873	2,769.3	$16.886	$0.012	0.00015
103	165.00	2,784.0	$16.873	2,785.4	$16.881	$0.009	0.00008
104	166.00	2,800.8	$16.872	2,801.6	$16.877	$0.005	0.00002
105	167.00	2,817.6	$16.872	2,817.7	$16.873	$0.001	0.00000
106	168.00	2,834.5	$16.872	2,833.9	$16.869	-$0.003	0.00001
107	169.00	2,851.5	$16.872	2,850.1	$16.865	-$0.008	0.00006
108	170.00	2,868.5	$16.873	2,866.3	$16.861	-$0.013	0.00016
109	171.00	2,885.5	$16.874	2,882.5	$16.857	-$0.018	0.00031
110	172.00	2,902.7	$16.876	2,898.7	$16.853	-$0.023	0.00052
111	173.00	2,919.9	$16.878	2,915.0	$16.850	-$0.028	0.00080
112	174.00	2,937.1	$16.880	2,931.2	$16.846	-$0.034	0.00115
113	175.00	2,954.4	$16.882	2,947.5	$16.843	-$0.040	0.00158
114	176.00	2,971.8	$16.885	2,963.7	$16.839	-$0.046	0.00211
115	177.00	2,989.3	$16.888	2,980.0	$16.836	-$0.052	0.00273
116	178.00	3,006.8	$16.892	2,996.3	$16.833	-$0.059	0.00347
117	179.00	3,024.3	$16.896	3,012.6	$16.830	-$0.066	0.00432
118	180.00	3,042.0	$16.900	3,028.9	$16.827	-$0.073	0.00531
						sum =	0.32901

Highlighted area indicates 63 to 180 MW range of AES operation.

RHS
10/8/99

aesmodeling wo vom.xls - ABC Constants - Case wo VOM Sheet 3

ATTACHMENT 4

Data Points Generated from PPA Formula for Fuel Component Only

AES-Hawaii PPA Formula for Fuel Component, EXCLUDING Variable O&M Costs

Fuel Cost for One Hour in 1987 ($/hour) =

$0.00016803L^3 - 0.056145L^2 + 621.56194L$, where

L = Load in MW

Load, MW	Fuel Component, $/hour	Load, MW	Fuel Component, $/hour	Load, MW	Fuel Component, $/hour	Load, MW	Fuel Component, $/hour	Load, MW	Fuel Component, $/hour
20	410.1	60	1,127.9	100	1,762.8	140	2,379.3	180	3,042.0
21	429.6	61	1,144.5	101	1,778.1	141	2,395.0	181	3,059.7
22	449.0	62	1,161.1	102	1,793.5	142	2,410.8	182	3,077.5
23	468.3	63	1,177.6	103	1,808.8	143	2,426.6	183	3,095.4
24	487.5	64	1,194.0	104	1,824.2	144	2,442.4	184	3,113.3
25	506.6	65	1,210.5	105	1,839.5	145	2,458.3	185	3,131.3
26	525.6	66	1,226.8	106	1,854.8	146	2,474.2	186	3,149.4
27	544.5	67	1,243.1	107	1,870.2	147	2,490.1	187	3,167.5
28	563.4	68	1,259.4	108	1,885.5	148	2,506.1	188	3,185.8
29	582.2	69	1,275.7	109	1,900.8	149	2,522.1	189	3,204.1
30	600.9	70	1,291.9	110	1,916.1	150	2,538.1	190	3,222.4
31	619.5	71	1,308.0	111	1,931.4	151	2,554.2	191	3,240.9
32	638.0	72	1,324.1	112	1,946.7	152	2,570.3	192	3,259.5
33	656.4	73	1,340.2	113	1,962.0	153	2,586.5	193	3,278.1
34	674.8	74	1,356.2	114	1,977.3	154	2,602.7	194	3,296.8
35	693.1	75	1,372.2	115	1,992.7	155	2,618.9	195	3,315.6
36	711.3	76	1,388.2	116	2,008.0	156	2,635.2	196	3,334.5
37	729.4	77	1,404.1	117	2,023.3	157	2,651.6	197	3,353.4
38	747.5	78	1,420.0	118	2,038.6	158	2,667.9	198	3,372.5
39	765.5	79	1,435.8	119	2,054.0	159	2,684.4	199	3,391.6
40	783.4	80	1,451.7	120	2,069.3	160	2,700.8	200	3,410.8
41	801.2	81	1,467.4	121	2,084.6	161	2,717.4	201	3,430.1
42	819.0	82	1,483.2	122	2,100.0	162	2,733.9	202	3,449.5
43	836.7	83	1,498.9	123	2,115.4	163	2,750.6	203	3,469.0
44	854.3	84	1,514.6	124	2,130.8	164	2,767.2	204	3,488.6
45	871.9	85	1,530.3	125	2,146.2	165	2,784.0	205	3,508.3
46	889.4	86	1,546.0	126	2,161.6	166	2,800.8	206	3,528.1
47	906.8	87	1,561.6	127	2,177.0	167	2,817.6	207	3,547.9
48	924.2	88	1,577.2	128	2,192.4	168	2,834.5	208	3,567.9
49	941.5	89	1,592.7	129	2,207.9	169	2,851.5	209	3,588.0
50	958.7	90	1,608.3	130	2,223.4	170	2,868.5	210	3,608.1
51	975.9	91	1,623.8	131	2,238.9	171	2,885.5	211	3,628.4
52	993.0	92	1,639.3	132	2,254.4	172	2,902.7	212	3,648.8
53	1,010.1	93	1,654.8	133	2,269.9	173	2,919.9	213	3,669.2
54	1,027.1	94	1,670.3	134	2,285.5	174	2,937.1	214	3,689.8
55	1,044.0	95	1,685.7	135	2,301.0	175	2,954.4	215	3,710.5
56	1,060.9	96	1,701.2	136	2,316.6	176	2,971.8	216	3,731.2
57	1,077.7	97	1,716.6	137	2,332.3	177	2,989.3	217	3,752.1
58	1,094.5	98	1,732.0	138	2,347.9	178	3,006.8	218	3,773.1
59	1,111.2	99	1,747.4	139	2,363.6	179	3,024.3	219	3,794.2

Attachment 5

Methodology for Least-Squares Curve-Fit

This attachment describes the least-squares curve-fit method used to determine the ABC constants in the equation:

$$FCR = A + BL + CL^2, \qquad \text{[Equation 2]}$$

where: FCR = fuel consumption rate in MBtu/hour,
L = load in MW, and
A, B and C are coefficients determined from the least-squares curve-fit,

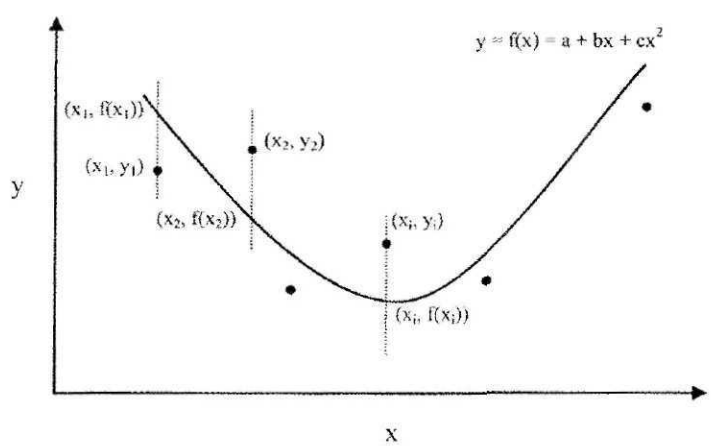
such that the curve defined by this formula closely approximates the PPA pricing formula for energy and variable O&M defined by the following equation:

$$f(L) = 0.00016803L^3 - 0.056145L^2 + [(21.5619 + 0.5) \times L],$$

where: f(L) = equivalent fuel consumption rate in MMBtu/hour, including energy and variable O&M, and
L = load in MW.

A least-squares curve-fit is determined by minimizing the sum of the squares of the differences between a set of data points and a curve "fitted" to the data points. For example, in Figure 1, consider the second order polynomial, f(x), being fitted onto the data points to represent a functional relationship between x and y.

Figure 1



At x_1, the distance between the data point and the curve is $f(x_1) - y_1$; at x_2, the distance is $f(x_2) - y_2$, and at x_i, the distance is $f(x_i) - y_i$. The method of least-squares consists of choosing the polynomial f(x) for which the sum of the squares of the distances is the least. If, taking *n* data points into account, D^2 is the sum of the squares of the distances, i.e.,:

$$D^2 = [f(x_1) - y_1]^2 + [f(x_2) - y_2]^2 + \ldots + [f(x_n) - y_n]^2 \text{ or}$$

$$D^2 = \sum_{i=1}^{n} [f(x_i) - y_i]^2 ,$$

then f(x) must be chosen such that D^2 is minimized. Since a second order polynomial has been selected to represent f(x), then:

$$D^2 = \sum_{i=1}^{n} [(a + bx_i + cx_i^2) - y_i]^2 .$$

Using techniques from calculus and linear algebra, the values for a, b and c can be determined such that D^2 is minimized. Refer to the attached material from the following references:

1. Agnew, Jeanne L., and Robert Knapp, Linear Algebra with Applications, Third Edition, © 1989, 1983, 1978, Brooks/Cole Publishing Company, Pacific Grove, CA.

2. Beyer, William H., CRC Standard Mathematical Tables, 26th Edition, © 1981, CRC Press, Boca Raton, FL.

A summary of the technique is as follows:

From calculus and linear algebra, it can be shown that for a second order polynomial, f(x), of the form shown in Figure 1, the values of a, b and c, which minimize D^2, can be determined by solving the following set of simultaneous equations[1]:

$$n \cdot a + (\sum x_i) \cdot b + (\sum x_i^2) \cdot c = \sum y_i \qquad \text{[Equation 4-1]}$$

$$(\sum x_i) \cdot a + (\sum x_i^2) \cdot b + (\sum x_i^3) \cdot c = \sum x_i y_i \qquad \text{[Equation 4-2]}$$

$$(\sum x_i^2) \cdot a + (\sum x_i^3) \cdot b + (\sum x_i^4) \cdot c = \sum x_i^2 y_i \qquad \text{[Equation 4-3]}$$

[1] The equations are derived by setting the partial derivative of D^2 with respect to *a* equal to zero, the partial derivative of D^2 with respect to *b* equal to zero, and the partial derivative of D^2 with respect to *c* equal to zero.

Solving the three equations for the three unknowns using matrices:

$$\begin{bmatrix} n & \sum x_i & \sum x_i^2 \\ \sum x_i & \sum x_i^2 & \sum x_i^3 \\ \sum x_i^2 & \sum x_i^3 & \sum x_i^4 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} \sum y_i \\ \sum x_i y_i \\ \sum x_i^2 y_i \end{bmatrix}$$

The determinant, DET,

$$= \{n \cdot [\sum x_i^2 \sum x_i^4 - (\sum x_i^3)^2]\} - \{\sum x_i \cdot [\sum x_i \sum x_i^4 - \sum x_i^2 \sum x_i^3]\}$$

$$+ \{\sum x_i^2 \cdot [\sum x_i \sum x_i^3 - (\sum x_i^2)^2]\}$$

$$a = \frac{\begin{vmatrix} \sum y_i & \sum x_i & \sum x_i^2 \\ \sum x_i y_i & \sum x_i^2 & \sum x_i^3 \\ \sum x_i^2 y_i & \sum x_i^3 & \sum x_i^4 \end{vmatrix}}{\text{DET}}$$

$$= [\{\sum y_i \cdot [\sum x_i^2 \sum x_i^4 - (\sum x_i^3)^2]\} - \{\sum x_i y_i \cdot [\sum x_i \sum x_i^4 - \sum x_i^2 \sum x_i^3]\}$$

$$+ \{\sum x_i^2 y_i \cdot [\sum x_i \sum x_i^3 - (\sum x_i^2)^2]\}] / (\text{DET})$$

$$b = \frac{\begin{vmatrix} n & \sum y_i & \sum x_i^2 \\ \sum x_i & \sum x_i y_i & \sum x_i^3 \\ \sum x_i^2 & \sum x_i^2 y_i & \sum x_i^4 \end{vmatrix}}{\text{DET}}$$

$$= - [\{\sum y_i \cdot [\sum x_i \sum x_i^4 - \sum x_i^2 \sum x_i^3]\} - \{\sum x_i y_i \cdot [n \cdot \sum x_i^4 - (\sum x_i^2)^2]\}$$

$$+ \{\sum x_i^2 y_i \cdot [n \cdot \sum x_i^3 - \sum x_i \sum x_i^2]\}] / (DET)$$

Solve for c by substituting a and b into Equation 4-1:

$$n \cdot a + (\sum x_i) \cdot b + (\sum x_i^2) \cdot c = \sum y_i$$

$$c = \frac{\sum y_i - (n \cdot a) - (\sum x_i) \cdot b}{\sum x_i^2}$$

where a and b are solved above.[2]

RHS
3/5/99

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[2] Derivation provided by M. Fukuji.

Linear Algebra with Applications *Third Edition*

Jeanne L. Agnew
Oklahoma State University

Robert C. Knapp
University of Wisconsin, Whitewater

Brooks/Cole Publishing Company
Pacific Grove, California

Consulting Editor: *Robert J. Wisner*

Brooks/Cole Publishing Company
A Division of Wadsworth, Inc.

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Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

Library of Congress Cataloging-in-Publication Data
Agnew, Jeanne, [date]
Linear algebra with applications / Jeanne L. Agnew, Robert C. Knapp.—3rd ed.
p. cm.
Bibliography: p.
Includes indexes.
ISBN 0-534-09456-2
1. Algebra, Linear. I. Knapp, Robert C., [date]. II. Title
QA184.A36 1988
512.5—dc19 88-15432
CIP

Sponsoring Editor: *Jeremy Hayhurst*
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Art Coordinator: *Lisa Torri*
Interior Illustration: *Lori Heckelman*
Typesetting: *The Alden Press, London, England*
Cover Printing: *The Lehigh Press Company, Pennsauken, NJ*
Printing and Binding: *R.R. Donnelley & Sons, Harrisonburg, PA*

b. Write the matrix of each transformation used, and obtain the matrix of T.
c. Write the transformation T in matrix form.

34. Use the result of Problem 33 to write $T\left(\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\right)$. Verify that $T\left(\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\right)$ gives the coordinates of the matrix that is the inverse of $\begin{bmatrix} 2 & 5 \\ 1 & 1 \end{bmatrix}$.

35. Show that:
a. $(T_{a,b})^{-1} = T_{-a,-b}$
b. $(R_{\theta,P})^{-1} = R_{-\theta,P}$
c. $(S_{c,d})^{-1} = S_{1/c,1/d}$

5.4 *Applications: The Method of Least Squares, Differential Equations, Robotics, The Scrambler Transformation*

The Method of Least Squares

In Section 5.2 we illustrated the use of a transformation from P_n to R^m in finding a polynomial graph that passes through m distinct points. Whether such a graph exists depends on the relative size of m and n. If $m > n + 1$, it is possible that there is no polynomial of degree n with a graph that passes through all these points. It is still useful, however, to ask what polynomial of degree n comes nearest to passing through the m points. A method frequently used for deciding the "best" choice of the polynomial p is referred to as the *method of least squares*.

Let the m points be $(x_1, y_1), (x_2, y_2), \ldots, (x_m, y_m)$. Then $p(x_i) - y_i$ is the vertical distance from the point (x_i, y_i) to the graph of p. (See Figure 5.8.) The method of least squares consists of choosing the polynomial p for which the sum of the squares of these distances is the least. Let

$$D^2 = [p(x_1) - y_1]^2 + [p(x_2) - y_2]^2 + \cdots + [p(x_m) - y_m]^2$$

We want to choose p so that D^2 is a minimum.

Let T be the transformation from P_n to R^m defined by $T(p) = (p(x_1), p(x_2), \ldots, p(x_m))$, and let $\mathbf{y} = (y_1, y_2, \ldots, y_m)$. The number D^2 is the square of the length of the vector $T(p) - \mathbf{y}$. If $\mathbf{y}$ is not in the range of T, we have to find an element $T(p)$ in the range such that $\|T(p) - \mathbf{y}\|$ is a minimum. Example 19 illustrates how this can be done.

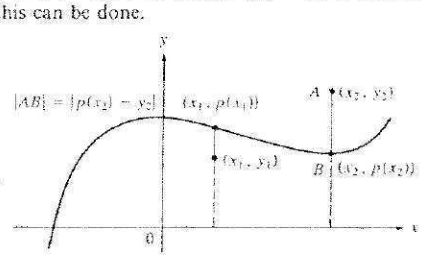

FIGURE 5.8

Example 19 Find the first-degree polynomial that is the best fit for the set of points (x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4).

Solution The transformation T is from P_1 to R^4 in this case. Its matrix is

$$\mathbf{A} = \begin{bmatrix} 1 & x_1 \\ 1 & x_2 \\ 1 & x_3 \\ 1 & x_4 \end{bmatrix}$$

We want to choose p so that $\|T(p) - \mathbf{y}\|$ is a minimum. Now $T(p) = \mathbf{A}[p]$ and

$$\mathbf{A}[p] - [\mathbf{y}] = \mathbf{A}\begin{bmatrix} a_0 \\ a_1 \end{bmatrix} - [\mathbf{y}] = \begin{bmatrix} a_0 + a_1x_1 - y_1 \\ a_0 + a_1x_2 - y_2 \\ a_0 + a_1x_3 - y_3 \\ a_0 + a_1x_4 - y_4 \end{bmatrix}$$

so that

$$\begin{aligned} D^2 = {} & (a_0 + a_1x_1 - y_1)^2 + (a_0 + a_1x_2 - y_2)^2 \\ & + (a_0 + a_1x_3 - y_3)^2 + (a_0 + a_1x_4 - y_4)^2 \end{aligned}$$

From calculus, we know that the values of a_0 and a_1 that make D^2 a minimum can be found by setting the partial derivative of D^2 with respect to a_0 equal to zero and the partial derivative of D^2 with respect to a_1 equal to zero. The equations are

$$a_0 + a_1x_1 - y_1 + a_0 + a_1x_2 - y_2 + a_0 + a_1x_3 - y_3 + a_0 + a_1x_4 - y_4 = 0$$

and

$$\begin{aligned} & x_1(a_0 + a_1x_1 - y_1) + x_2(a_0 + a_1x_2 - y_2) \\ & + x_3(a_0 + a_1x_3 - y_3) + x_4(a_0 + a_1x_4 - y_4) = 0 \end{aligned}$$

In matrix form, these equations are

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ x_1 & x_2 & x_3 & x_4 \end{bmatrix}\begin{bmatrix} a_0 + a_1x_1 - y_1 \\ a_0 + a_1x_2 - y_2 \\ a_0 + a_1x_3 - y_3 \\ a_0 + a_1x_4 - y_4 \end{bmatrix} = \mathbf{0}$$

or

$$\mathbf{A}^T(\mathbf{A}[p] - [\mathbf{y}]) = \mathbf{0}$$

In this example, the matrix $\mathbf{A}^T\mathbf{A}$ is a 2×2 matrix. If the values x_1, x_2, x_3, x_4 are distinct, $\mathbf{A}^T\mathbf{A}$ is nonsingular (Exercises 7–10). We can solve for $[p]$:

$$[p] = (\mathbf{A}^T\mathbf{A})^{-1}\mathbf{A}^T[\mathbf{y}]$$

Remember that $(\mathbf{A}^T\mathbf{A})^{-1}$ cannot be simplified, since $\mathbf{A}^T$ and $\mathbf{A}$ individually do not have inverses. ∎

nearly tangent to the x-axis), one may improve the grouped data approximation to the variance by adding Sheppard's correction $-\frac{c^2}{12}$. Thus

$$\text{corrected variance} = \text{grouped data variance} - \frac{c^2}{12}$$

Analogous corrections for grouped data sample moments

$$m'_r = \frac{1}{n}\sum_{i=1}^{k} f_i x_i^r \qquad \text{and} \qquad m_r = \frac{1}{n}\sum_{i=1}^{k} f_i(x_i - \bar{x})^r$$

yield improved estimates m'_{r_c} and m_{r_c} given by

$$m'_{1_c} = m'_1 \qquad m_{1_c} = m_1$$

$$m'_{2_c} = m'_2 - \frac{c^2}{12} \qquad m_{2_c} = m_2 - \frac{c^2}{12}$$

$$m'_{3_c} = m'_3 - \frac{c^2}{4}m'_1 \qquad m_{3_c} = m_3$$

$$m'_{4_c} = m'_4 - \frac{c^2}{2}m'_1 + \frac{7c^4}{240} \qquad m_{4_c} = m_4 - \frac{c^2}{2}m_2 + \frac{7c^4}{240}$$

Curve Fitting, Regression, and Correlation

The following formulas apply to a set of n ordered pairs $\{(x_i, y_i)\}$, $i = 1, 2, \ldots, n$. The assumptions of normal regression analysis are that the x's are fixed variables, and the y's are independent random variables having normal distributions with common variance σ^2. The assumptions of normal correlation analysis are that $\{(x_i, y_i)\}$ constitute a random sample from a bivariate normal population.

Curve Fitting

1. Polynomial Function

$$y = b_0 + b_1 x + b_2 x^2 + \cdots + b_m x^m$$

For a polynomial function fit by the method of least squares, the values of $b_0, b_1, \ldots, b_m$ are obtained by solving the system of $m + 1$ normal equations

$$\begin{aligned} nb_0 + b_1\Sigma x_i + b_2\Sigma x_i^2 + \cdots + b_m\Sigma x_i^m &= \Sigma y_i \\ b_0\Sigma x_i + b_1\Sigma x_i^2 + b_2\Sigma x_i^3 + \cdots + b_m\Sigma x_i^{m+1} &= \Sigma x_i y_i \\ \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \\ b_0\Sigma x_i^m + b_1\Sigma x_i^{m+1} + b_2\Sigma x_i^{m+2} + \cdots + b_m\Sigma x_i^{2m} &= \Sigma x_i^m y_i \end{aligned}$$

2. Straight Line

$$y = b_0 + b_1 x$$

For a straight line fit by the method of least squares, the values b_0 and b_1 are obtained by solving the normal equations

$$\begin{aligned} nb_0 + b_1\Sigma x_i &= \Sigma y_i \\ b_0\Sigma x_i + b_1\Sigma x_i^2 &= \Sigma x_i y_i \end{aligned}$$

The solutions of these normal equations are

$$b_1 = \frac{n\Sigma x_i y_i - (\Sigma x_i)(\Sigma y_i)}{n\Sigma x_i^2 - (\Sigma x_i)^2}$$

$$b_0 = \frac{\Sigma y_i}{n} - b_1\frac{\Sigma x_i}{n} = \bar{y} - b_1\bar{x}$$

WILLIAM H. BEYER, CRC Standard Mathematical Tables, 26th Edition (Boca Raton, Florida: CRC Press, 1981)

3. Exponential Curve

$$y = ab^x$$

or

$$\log y = \log a + (\log b)x$$

For an exponential curve fit by the method of least squares, the values $\log a$ and $\log b$ are obtained by fitting a straight line to the set of ordered pairs $\{(x_i, \log y_i)\}$.

4. Power Function

$$y = ax^b$$

or

$$\log y = \log a + b \log x$$

For a power function fit by the method of least squares, the values $\log a$ and b are obtained by fitting a straight line to the set of ordered pairs $\{(\log x_i, \log y_i)\}$.

Regression and Correlation

1. Simple Linear Regression.

For a regression of y on x

$$E(y/x) = b_0 + b_1 x,$$

where $E(y/x)$ is the mean of the distribution of y for a given x.

Standard Error of Estimate

$$s_e = \sqrt{\frac{\Sigma[y_i - (b_0 + b_1 x_i)]^2}{n-2}},$$

where b_0 and b_1 are given by

$$b_1 = \frac{n\Sigma x_i y_i - (\Sigma x_i)(\Sigma y_i)}{n\Sigma x_i^2 - (\Sigma x_i)^2}$$

$$b_0 = \frac{\Sigma y_i}{n} - b_1 \frac{\Sigma x_i}{n} = \bar{y} - b_1 \bar{x}$$

2. Correlation.

An estimate of the population correlation coefficient ρ is given by

$$r = \frac{\Sigma(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{[\Sigma(x_i - \bar{x})^2][\Sigma(y_i - \bar{y})^2]}}$$

or by the computing formula

$$r = \frac{n\Sigma x_i y_i - (\Sigma x_i)(\Sigma y_i)}{\sqrt{[n\Sigma x_i^2 - (\Sigma x_i)^2][n\Sigma y_i^2 - (\Sigma y_i)^2]}}$$

For grouped data

$$r = \frac{n\Sigma f x_i y_i - (\Sigma f_x x_i)(\Sigma f_y y_i)}{\sqrt{[n\Sigma f_x x_i^2 - (\Sigma f_x x_i)^2][n\Sigma f_y y_i^2 - (\Sigma f_y y_i)^2]}}$$

where f_x and f_y denote the frequencies corresponding to the class marks x and y, and f denotes the frequency of the corresponding cell of the correlation table.

If the data is coded

$$r = \frac{n\Sigma f uv - (\Sigma f_u u)(\Sigma f_v v)}{\sqrt{[n\Sigma f_u u^2 - (\Sigma f_u u)^2][n\Sigma f_v v^2 - (\Sigma f_v v)^2]}}$$

where the u's and v's are coded class marks. The frequencies f_u and f_v are defined analogous to f_x and f_y.

WILLIAM H. BEYER, CRC Standard Mathematical Tables, 26th Edition (Boca Raton, Florida: CRC Press, 1981

GENPP
KALAELOA
XA/R

Hawaiian Electric Company, Inc.

Economic Dispatch of Kalaeloa

Prepared by: Allyn Tam
Allyn Tam
Planning Applications Engineer

Approved by: Thomas C. Simmons
Thomas C. Simmons
Sr. Planning Engineer

Alva K. Nakamura
Manager, System Planning

System Planning Department

December 1990

Economic Dispatch of Kalaeloa

Summary

This study recommends a dispatch model of the Kalaeloa units which represents conditions of the Kalaeloa contract within the GEPPS and EMS environments. The model characterizes Kalaeloa as two identical "half" combined cycle units, each with a dispatch curve representing half of the two gas turbine operation cost curve.

Since the dispatch coefficients for Kalaeloa will change whenever the GNPIPD, LSFO price, or PPI for magnesium ingot change, and whenever the minimum energy purchase amount is achieved, a computer program was developed to provide System Operations with a quick way to update the Kalaeloa dispatch coefficients in EMS.

Since GEPPS permits only one set of dispatch coefficients in each run, dispatch coefficients "averaged" over the forecasted GNPIPD, LSFO prices, and PPI will be used to model Kalaeloa in GEPPS. System Planning will further explore the possibility of modifying GEPPS to allow more than one set of dispatch coefficients in each run.

Introduction

The purpose of this study is to develop a model of the Kalaeloa units for use in both EMS and GEPPS. In EMS, the model will be used for economic dispatch. In GEPPS, the model will be used for economic dispatch, and also affects the calculation of risk and the scheduling of planned maintenance.

The contract conditions to be modeled are:

- There are two cost curves, one for one gas turbine operation, and another for two gas turbine operation. Since only one of these curves may be entered into GEPPS or EMS, the two gas turbine operation curve will be used since it represents the dominant mode of operation. Consideration will be given to modifying GEPPS to allow both dispatch curves to be entered for Kalaeloa.

- The Kalaeloa unit consists of two gas turbine-generators (GTG), each exhausting to a Heat Recovery Steam Generator (HRSG), and a steam turbine-generator (STG) supplied by the two HRSG's. In order to tie the operation of the STG to that of the GTG's, Kalaeloa will be modeled as two "half" units, each composed of a GTG and "half" of the STG.

- The Kalaeloa cost curves are made up of various components which are escalated at different rates. Therefore the input-output curve for Kalaeloa will vary as a function of the escalation factors. This can be accomplished in EMS by changing the dispatch coefficients every time the escalation factors change, which is analogous to changing the fuel price values whenever fuel prices change. In GEPPS, an "averaged" set of dispatch coefficients, similar to the "averaged" dispatch coefficients used for existing utility units, will be used to model Kalaeloa.

- There is a floor price of 2.77 ¢/KWH on the fuel component of the cost curves.

- If HECO purchases less than a specified minimum energy amount, the non-fuel component (0.96 ¢/KWH) must be paid for the energy not purchased. (Although it is unclear from the wording of the contract, this analysis assumes that it is intended that the payment be escalated by the GNPIPD.) Since HECO pays the non-fuel component, whether or not it takes the energy, up until the specified minimum energy amount is purchased, the non-fuel cost will be treated as a fixed cost (i.e. considered to be a 0 ¢/KWH variable cost) until that minimum purchase is achieved. Once HECO achieves the a specified minimum energy purchase amount purchase, the non-fuel cost will then be treated as a variable cost. For EMS, the dispatch coefficients will have to be changed after the specified minimum energy purchase amount has been achieved. For GEPPS, a "weighted average" dispatch curve will be used to model Kalaeloa.

- If HECO purchases less than a specified minimum energy purchase amount, a penalty of 0.08 ¢/KWH must be paid for the energy not purchased. (Although it is unclear from the wording of the contract whether this penalty is escalated by any index, this analysis assumes that no escalation is intended since the penalty does not appear to be connected with any material component.) Since HECO can reduce this cost by deciding to take the energy, the penalty should be treated as a negative variable cost until the specified minimum energy purchase amount is achieved. Once HECO achieves the specified minimum energy purchase amount, the penalty disappears and should not be treated as a variable cost. For EMS, the dispatch coefficients will have to be changed after the specified minimum energy purchase amount has been achieved. For GEPPS, a "weighted average" dispatch curve will be used to model Kalaeloa.

The following section develops the mathematical derivation of the Kalaeloa dispatch coefficients.

Analysis

The method of economic dispatch used in GEPPS and EMS requires a dispatch curve, for each dispatched unit, which expresses the mathematical relationship between input and output:

$$INPUT = A + (B)(L) + (C)(L)^2 \qquad \text{(Eq. 1)}$$

where: INPUT = Unit input in MBTU/Hr
A, B, C = Derived coefficients
L = Unit output in MW

For HECO units, the equation coefficients (A, B, and C) are obtained by fitting a second-order polynomial curve to actual input-output values obtained by field testing. In the case of Kalaeloa, the input-output relationship can be derived from the contract. In order to develop a relationship that can be used for economic dispatch, the energy charge given in the Kalaeloa contract must first be converted to an hourly cost:

$$COST = (10)(L)(CHARGE) \qquad \text{(Eq. 2)}$$

where: COST = Unit cost in $/Hr
L = Unit load in MW
CHARGE = Energy charge in ¢/KWH

This hourly cost can then be converted to MBTU/Hr by noting that the contract is based on an LSFO price adjusted to a gross heating value of 6 MBTU/BBL:

$$INPUT = COST/(LFSO/6) = (6)(COST)/LSFO \qquad \text{(Eq. 3)}$$

where: INPUT = Unit input in MBTU/Hr
COST = Unit cost in $/Hr
LSFO = Current LSFO price in $/BBL @ 6 MBTU/BBL

Substituting Eq. 2 into Eq. 3 yields the following expression:

$$INPUT = (60)(L)(CHARGE)/LSFO \qquad \text{(Eq. 4)}$$

The energy charge is obtained from the Kalaeloa contract:

$$CHARGE = (F)(LSFO/LSFO\ BASE) + (NF)(GNPIPD/GNPIPD\ BASE) + (ADD)(PPIMG/PPIMG\ BASE) + PENALTY \qquad \text{(Eq. 5)}$$

where: CHARGE = Unit energy charge in ¢/KWH
F = Fuel component
LSFO = Current LSFO price in $/BBL @ 6 MBTU/BBL
LSFO BASE = Base LSFO price, 19.50 $/BBL @ 6 MBTU/BBL

NF	=	Non-fuel component, 0 ¢/KWH for energy <= min purchase 0.96 ¢/KWH for energy > min purchase
GNPIPD	=	Current GNPIPD
GNPIPD BASE	=	Base GNPIPD, 1.214 on 01/01/88
ADD	=	Additive component, 0.144 ¢/KWH
PPIMG	=	Current PPI for Mg ingot
PPIMG BASE	=	Base PPI for Mg ingot, 114.2 on 01/01/88
PENALTY	=	Penalty for minimum energy purchase, -0.08 ¢/KWH for energy <= min purchase 0 ¢/KWH for energy > min purchase

This equation can be simplified:

$$\text{CHARGE} = (F)(\text{LSFO/LSFO BASE}) + G \qquad \text{(Eq. 6)}$$

where:

$$G = (NF)(\text{GNPIPD/GNPIPD BASE}) + (\text{ADD})(\text{PPIMG/PPIMG BASE}) + \text{PENALTY} \qquad \text{(Eq. 7)}$$

By substituting Eq. 6 into Eq. 4, we obtain:

$$\text{INPUT} = (60)(L)((F/\text{LSFO BASE}) + (G/\text{LSFO})) \qquad \text{(Eq. 8)}$$

From the contract, the Fuel Component, F, is a function of only the unit load:

$$F = 7.308436 - (0.06425951)(L) + (0.0003206926)(L)^2 - (0.000000577144)(L)^3 \qquad \text{(Eq. 9)}$$

when two gas turbines are in operation.

$$F = 6.866031 - (0.07354662)(L) + (0.0003659949)(L)^2 \qquad \text{(Eq. 10)}$$

when one gas turbine is in operation.

Substitution of either Eq. 9 or Eq. 10 into Eq. 8 yields expressions for INPUT which are either third or fourth-order polynomial curves, instead of the second-order curve required by the dispatch algorithm in GEPPS and EMS. Therefore, neither expressions can be used directly in the GEPPS or EMS economic dispatch. In order to obtain the second-order curve, Eq. 1, required by the dispatch algorithms in GEPPS and EMS, Eq. 8, with

either Eq. 9 or Eq. 10 substituted, can be used to determine data points for fitting a second-order curve. The curve obtained for one gas turbine operation may be used directly for either "half" unit running alone. However, when dispatching for two gas turbine operation, the dispatch curve, Eq. 1, must be modifed to account for the fact that each "half" unit will be dispatched at only half the load and produce only half the energy of Kalaeloa as a whole. The modification is derived in a straightforward manner by observing that, while Eq. 1 for the whole of Kalaeloa can be written as:

$$INPUT = A + (B)(L) + (C)(L)^2 \qquad \text{(Eq. 1)}$$

where: INPUT = Kalaeloa input in MBTU/Hr
A, B, C = Kalaeloa dispatch curve coefficients
L = Kalaeloa output in MW

the equivalent equation for a half unit can be written as:

$$(INPUT/2) = A^* + (B^*)(L/2) + (C^*)(L/2)^2 \qquad \text{(Eq. 11)}$$

where: A*, B*, C* = Dispatch curve coefficients for a half unit

Rearranging Eq. 11 yields:

$$INPUT = (2)(A^*) + (B^*)(L) + (C^*/2)(L)^2 \qquad \text{(Eq. 12)}$$

Expressions for A*, B*, and C* are obtained by comparing terms in Eq. 12 to those in Eq. 1:

$$A^* = (A/2) \quad , \quad B^* = B \quad , \quad C^* = (2)(C)$$

A program, derived from the HECO timesharing system CURVEFIT program, was developed to provide a convenient means of calculating the dispatch curve coefficients for the Kalaeloa (half) units. The source code listing for the Kalaeloa dispatch coefficient program, called KALAELOA, is provided in the Appendix.

Discussion

Since the minimum energy purchase amount is based on the current-year annual availability of Kalaeloa, it will not be known until after the fact when HECO achieves the minimum energy purchase amount. Therefore, a continuously updated record of Kalaeloa year-to-date availability should be maintained by the Kalaeloa contract administrator. This record will enable the administrator to estimate when the minimum energy purchase is achieved. Each year, when the administrator estimates that the minimum energy purchase has been achieved, the administrator should inform System Operations that the dispatch coefficients should be changed.

Initially, the "weighted average" dispatch curve used in GEPPS will be based on the contract base of 85% Kalaeloa availability. Eventually, HECO will record enough historical data on Kalaeloa availability to develop a "weighted average" dispatch curve based on actual data.

Recommendations

1. Model Kalaeloa as two half units based on two gas turbine operation fuel component energy charges.

2. System Operations should change the EMS dispatch coefficients for Kalaeloa whenever the escalation factors change or whenever the minimum energy purchase requirement is met. The dispatch coefficients can be calculated using the KALAELOA computer program in the Appendix.

3. Consider modifications to GEPPS that will permit the use of more than one dispatch curve for each unit.

Appendix

```
C*********************************************************************
C*********************************************************************
C**                                                                 **
C**   KALAELOA      KALAELOA DISPATCH CURVE COEFFICIENTS            **
C**                                                                 **
C*********************************************************************
C*********************************************************************
C**   VERSION 1                                A. TAM  09/1990      **
C*********************************************************************
C     I/O VARIABLES
      INTEGER LUOT, LUTER, LUOT2
C
C     KURFIT VARIABLES
      INTEGER NP
      REAL COEFF(11), RESIDS, RSQRD, STDERR, X(200), Y(200)
C
C     KALAELOA VARIABLES
      INTEGER HEADER(2), NGT
      INTEGER LMIN(2), LMAX(2)
      REAL LSFO, LSFOB
      REAL GNPIPD, GNPIPB
      REAL PPIMG, PPIMGB
      REAL ADD, F, NF(2), PENALT(2)
      REAL A(2), B(2), C(2), D(2)
C
C     I/O ASSIGNMENTS
      DATA LUOT, LUTER, LUOT2 / 3, 6, 8 /
C
C     BASE DATA
C     NOTE:  MAGNESIUM, PIG INGOT IS PPI COMMODITY CODE 1022 0151
      DATA LSFOB / 19.50 /, GNPIPB / 1.214 /, PPIMGB / 114.2 /
      DATA ADD / 0.144 /, NF / 0., 0.96 /, PENALT / -0.08, 0. /
      DATA HEADER / 'ONE', 'TWO' /
C
C     FUEL COMPONENT EQUATION COEFFICIENTS AND LOAD RANGE
      DATA A /  6.866031     ,  7.308436 /,
     &     B / -0.07354662   , -0.06425951 /,
     &     C /  0.0003659949,  0.0003206926 /,
     &     D /  0.           , -0.000000577144 /
      DATA LMIN / 65, 90 /, LMAX / 90, 180 /
C
C     INPUT CURRENT PRICE AND ESCALATION DATA
      CALL CLTERM
      WRITE (LUTER, 1000)
   10 WRITE (LUTER, 1010)
      READ (5, *, END=991, ERR=991) LSFO
   20 WRITE (LUTER, 1020)
      READ (5, *, END=992, ERR=992) GNPIPD
   30 WRITE (LUTER, 1030)
      READ (5, *, END=993, ERR=993) PPIMG
C
C     INPUT NUMBER OF GTS
   40 WRITE (LUTER, 1040)
      READ (5, *, END=994, ERR=994) NGT
      IF ((NGT .NE. 1) .AND. (NGT .NE. 2)) GO TO 994
      MIN = LMIN(NGT)
      MAX = LMAX(NGT)
C
C     START TERMINAL AND PRINTED OUTPUT
      CALL CLTERM
      WRITE (LUTER, 2010) HEADER(NGT),
     &                    LSFO, LSFOB, GNPIPD, GNPIPB, PPIMG, PPIMGB
      WRITE (LUOT,  2010) HEADER(NGT),
     &                    LSFO, LSFOB, GNPIPD, GNPIPB, PPIMG, PPIMGB
C
C     DO BEFORE & AFTER MEETING MINIMUM PURCHASE REQUIREMENT
      DO 100 I = 1, 2
      G = NF(I)*GNPIPD/GNPIPB + ADD*PPIMG/PPIMGB + PENALT(I)
C
C     CALCULATE POINTS FOR THE CURVEFIT
      NP = 0
C     IF (I .EQ. 1) WRITE (LUOT2, 2500) HEADER(NGT)
C     IF (I .EQ. 2) WRITE (LUOT2, 2501) HEADER(NGT)
      DO 200 J = MIN, MAX
      NP = NP + 1
```

```
      X(NP) = J                                                         KAL00760
      F = A(NGT) + B(NGT)*X(NP) + C(NGT)*X(NP)**2 + D(NGT)*X(NP)**3     KAL00770
      IF (F .LT. 2.77) F = 2.77                                         KAL00780
      Y(NP) = 60.*X(NP)*((F/LSFOB) + (G/LSFO))                          KAL00790
C     INCOST = LSFO*Y(NP)/(60.*X(NP))                                   KAL00800
      WRITE (LUOT2, 2502) X(NP), Y(NP)                                  KAL00810
  200 CONTINUE                                                          KAL00820
C     IF (I .EQ. 1) WRITE (LUOT2, 2503)                                 KAL00830
C     IF (I .EQ. 2) WRITE (LUOT2, 2504)                                 KAL00840
C                                                                       KAL00850
C     CALCULATE CURVEFIT COEFFICIENTS                                   KAL00860
      CALL KURFIT (NP, X, Y, COEFF, RESIDS, STDERR, RSQRD)              KAL00870
      IF (NGT .EQ. 2) COEFF(1) = COEFF(1)/2.                            KAL00880
      IF (NGT .EQ. 2) COEFF(3) = 2.*COEFF(3)                            KAL00890
C                                                                       KAL00900
C     TERMINAL OUTPUT                                                   KAL00910
      IF (I .EQ. 1) WRITE (LUTER, 2011)                                 KAL00920
      IF (I .EQ. 2) WRITE (LUTER, 2012)                                 KAL00930
      WRITE (LUTER, 2020) (COEFF(K), K = 1, 3)                          KAL00940
      WRITE (LUTER, 2603) RESIDS, STDERR                                KAL00950
      WRITE (LUTER, 2607) RSQRD                                         KAL00960
C     PRINTED OUTPUT                                                    KAL00970
      IF (I .EQ. 1) WRITE (LUOT, 2011)                                  KAL00980
      IF (I .EQ. 2) WRITE (LUOT, 2012)                                  KAL00990
      WRITE (LUOT, 2020) (COEFF(K), K = 1, 3)                           KAL01000
      WRITE (LUOT, 2603) RESIDS, STDERR                                 KAL01010
  100 WRITE (LUOT, 2607) RSQRD                                          KAL01020
      STOP                                                              KAL01030
C                                                                       KAL01040
C     HANDLE ERRORS ON INPUT                                            KAL01050
  991 REWIND 5                                                          KAL01060
      CALL CLTERM                                                       KAL01070
      WRITE (LUTER, 1000)                                               KAL01080
      GO TO 10                                                          KAL01090
  992 REWIND 5                                                          KAL01100
      CALL CLTERM                                                       KAL01110
      WRITE (LUTER, 1000)                                               KAL01120
      GO TO 20                                                          KAL01130
  993 REWIND 5                                                          KAL01140
      CALL CLTERM                                                       KAL01150
      WRITE (LUTER, 1000)                                               KAL01160
      GO TO 30                                                          KAL01170
  994 REWIND 5                                                          KAL01180
      CALL CLTERM                                                       KAL01190
      WRITE (LUTER, 1000)                                               KAL01200
      GO TO 40                                                          KAL01210
C                                                                       KAL01220
C     FORMAT STATEMENTS                                                 KAL01230
 1000 FORMAT ('0     KALAELOA DISPATCH CURVE PROGRAM'/)                 KAL01240
 1010 FORMAT (/' PLEASE ENTER THE CURRENT LSFO PRICE IN $/BBL')         KAL01250
 1020 FORMAT (/' PLEASE ENTER THE CURRENT GNPIPD')                      KAL01260
 1030 FORMAT (/' PLEASE ENTER THE CURRENT PPI FOR MAGNESIUM')           KAL01270
 1040 FORMAT (/' PLEASE ENTER THE NUMBER OF GAS TURBINES OPERATING - ', KAL01280
     &         '1 OR 2')                                                KAL01290
 2010 FORMAT ('0       KALAELOA DISPATCH CURVE - ', A3,                 KAL01300
     &        ' GAS TURBINE OPERATION'//                                KAL01310
     &        '    LSFO $/BBL', T29, F8.3, 16X, '(BASE = ', F8.3, ')'/  KAL01320
     &        '    GNPIPD    ', T29, F8.3, 16X, '(BASE = ', F8.3, ')'/  KAL01330
     &        '    PPI FOR MG', T29, F8.1, 16X, '(BASE = ', F8.1, ')')  KAL01340
 2011 FORMAT (/' BEFORE MEETING MINIMUM PURCHASE REQUIREMENT')          KAL01350
 2012 FORMAT (/' AFTER MEETING MINIMUM PURCHASE REQUIREMENT')           KAL01360
 2020 FORMAT (/4X, 'A = ', F11.6,                                       KAL01370
     &        10X, 'B = ', F11.6,                                       KAL01380
     &        10X, 'C = ', F11.8)                                       KAL01390
 2500 FORMAT (A3, ' GAS TURBINE OPERATION BEFORE 1235 GWH'/             KAL01400
     &        '        0.        1.  0  1  2    2')                    KAL01410
 2501 FORMAT (A3, ' GAS TURBINE OPERATION AFTER 1235 GWH'/              KAL01420
     &        '        0.        1.  0  1  2    2')                    KAL01430
 2502 FORMAT (2F10.5)                                                   KAL01440
 2503 FORMAT ('                    1')                                  KAL01450
 2504 FORMAT ('                    1'/)                                 KAL01460
 2603 FORMAT(/'    RESID S OF S',F20.6/'    STD ERR',F25.6)             KAL01470
 2607 FORMAT('    R SQUARED',F15.2,' PERCENT')                          KAL01480
      END                                                               KAL01490
C*********************************************************************** KAL01500
```

```
C*********************************************************************
C**                                                                 **
C**   CURVEFIT      POLYNOMIAL CURVE FIT                            **
C**                                                                 **
C*********************************************************************
C*********************************************************************
C*********************************************************************
C** IBM 1800 PROGRAM EM200              R. BELT, G. WILD  4/1970    **
C*********************************************************************
C** CONVERTED TO VM/CMS FORTRAN G                R. BELT 11/1980    **
C*********************************************************************
C** CONVERTED TO SUBROUTINE                      A. TAM  09/1990    **
C*********************************************************************
      SUBROUTINE KURFIT (NP, DATX, DATY, COEFF, YSQ, Q, RSQRD)
C
      DIMENSION A(11,12),ITITL(40),COEFF(11),IDVAL(10),DATX(200),DATY(20
     10),NORD(11)
C
      DATA IBLNK,IDBL/' ','0'/
      DATA LUIN,LUOT,LUTER/1,3,6/
C
C     DEFAULT VALUES
      DATA ITITL / 'KA', 'LA', 'EL', 'OA', ' D', 'IS', 'PA', 'TC', 'H ',
     &             'CU', 'RV', 'E ', ' C', 'OE', 'FF', 'IC', 'EN', 'TS',
     &             22*' ' /
      DATA XMN, XRA / 0., 1. /
      DATA MIND, INC, MAXD / 0, 1, 2 /
      DATA ILN / ' ' /
      DATA IDVAL / 10*0 /
      DATA XPMIN, XPINC, XPMAX / 3*0. /
C
C     PROGRAM STARTS, TELL THE USER
C     WRITE (LUTER,9010)
C
C     READ TITLE CARD, GET OUT IF BLANK OR END OF FILE
C  10 READ (LUIN,500,END=14,ERR=750) ITITL
C     DO 13 I=1,40
C     IF(ITITL(I)-IBLNK)15,13,15
C  13 CONTINUE
C  14 GO TO 9000
C
C     READ CONTROL
C  15 READ(LUIN,501,END=700,ERR=750) XMN,XRA,MIND,INC,MAXD,ILN,IDVAL,
C    1XPMIN,XPINC,XPMAX
      INDPX=0
C
C     CHECK IF PREDICTIONS WERE REQUESTED
      IF(XPINC)16,19,17
   16 IF(XPMIN-XPMAX)19,18,18
   17 IF(XPMIN-XPMAX)18,18,19
   18 INDPX=1
   19 JV=12
      LEFT=46
      ARX=1.0/XRA
      IF(MIND)20,21,21
   20 MIND=0
   21 MAXI=MAXD+1
      IF(JV-MAXI)23,23,24
   23 MAXI=JV-1
   24 KMIN=MIND+1
      IF(INC)26,26,30
   26 INC=1
C
C     CLEAR TOTAL BOXES
   30 A(1,JV)=0.0
      YSQ=0.0
C     NP=0
      YTOTL=0.0
      DO 34 J=2,MAXI
      A(J,JV)=0.0
      M=J-1
      DO 34 I=M,J
   34 A(I,J)=0.0
C
C     READ DATA AND ACCUMULATE SUMS OF POWERS
C  37 READ (LUIN,502,END=700,ERR=750) P,Q,J
```

```
C     WRITE (LUOT,600) ITITL,XMN,XRA,MIND,INC
      IF(ILN-IBLNK)64,65,64
   64 CONTINUE
C  64 WRITE (LUOT,601)
      LEFT=LEFT-1
   65 D=NP
      A(1,1)=D
      N=(MAXI-KMIN)/INC
      IF(NP-N)69,69,70
   69 N=NP-1
   70 MAXD=N*INC+MIND
      MAXI=MAXD+1
C
C     SPREAD TOTALS THROUGHTOUT TOP HALF OF MATRIX
      M1=MAXI-2
      DO 82 I=KMIN,M1,INC
      DO 82 J=I,MAXI,INC
      IF(J-I-2)82,78,78
   78 L=I+J
      K=L/2
      L=L-K
      A(I,J)=A(K,L)
   82 CONTINUE
C     WRITE (LUOT,602) MAXD,NP,YSQ
C
C     SET UP TO SOLVE EQUATIONS
      DO 191 K=KMIN,MAXI,INC
      P=1.0/A(K,K)
      A(K,K)=A(K,JV)*P
C
C     SOLVE FOR RESIDUALS
      YSQ=YSQ-A(K,K)*A(K,JV)
      D=D-1.0
      IF(D)94,94,96
   94 Q=0.9999E35
      GO TO 100
   96 IF(YSQ)97,97,99
   97 Q=0.0
      GO TO 100
   99 Q=SQRT(YSQ/D)
  100 J=K-1
      IPRC=IDBL
```

```
      LEFT=LEFT-4                                                       KAL03010
      IF(J)1002,1002,1001                                               KAL03020
 1001 LEFT=LEFT-1                                                       KAL03030
 1002 IF(LEFT)101,102,102                                               KAL03040
  101 IPRC=IDBL                                                         KAL03050
      LEFT=53                                                           KAL03060
C     WRITE(LUOT,611)ITITL                                              KAL03070
  102 CONTINUE                                                          KAL03080
C 102 WRITE (LUOT,603) IPRC ,J,YSQ,Q                                    KAL03090
      IF(J)106,106,103                                                  KAL03100
  103 RSQRD=1.0-YSQ/TVARN                                               KAL03110
      IF(RSQRD)1103,1104,1104                                           KAL03120
 1103 RSQRD=0.0                                                         KAL03130
 1104 IF(RSQRD-1.0)105,105,104                                          KAL03140
  104 RSQRD=1.0                                                         KAL03150
  105 RSQRD=RSQRD*100.0+0.005                                           KAL03160
C     WRITE (LUOT,607) RSQRD                                            KAL03170
C                                                                       KAL03180
C     SOLVE FOR COEFFICIENTS                                            KAL03190
  106 M1=K+INC                                                          KAL03200
      M=MAXI-M1                                                         KAL03210
      IF(M)110,107,107                                                  KAL03220
  107 DO 109 J=M1,MAXI,INC                                              KAL03230
      A(J,K)=A(K,J)                                                     KAL03240
  109 A(K,J)=A(K,J)*P                                                   KAL03250
  110 L=1                                                               KAL03260
      N=KMIN                                                            KAL03270
      T=1.0                                                             KAL03280
      DO 111 I=1,11                                                     KAL03290
  111 NORD(I)=0                                                         KAL03300
      DO 132 I=1,MAXI                                                   KAL03310
      IF(N-I)9000,116,131                                               KAL03320
  116 N=N+INC                                                           KAL03330
      IF(I-K)119,125,118                                                KAL03340
  118 M1=I                                                              KAL03350
  119 P=A(I,K)                                                          KAL03360
      IF(M)123,121,121                                                  KAL03370
  121 DO 122 J=M1,MAXI,INC                                              KAL03380
  122 A(I,J)=A(I,J)-A(K,J)*P                                            KAL03390
  123 A(I,K)=A(I,JV)-A(K,K)*P                                           KAL03400
      GO TO (126,132),L                                                 KAL03410
  125 L=2                                                               KAL03420
  126 J=I-1                                                             KAL03430
      R=A(I,K)*T                                                        KAL03440
      IPRC=IBLNK                                                        KAL03450
      LEFT=LEFT-1                                                       KAL03460
      IF(LEFT)127,128,128                                               KAL03470
  127 IPRC=IDBL                                                         KAL03480
      LEFT=55                                                           KAL03490
C     WRITE(LUOT,611)ITITL                                              KAL03500
  128 IF(J-10)129,1290,1290                                             KAL03510
  129 CONTINUE                                                          KAL03520
C 129 WRITE (LUOT,604) IPRC,J,R                                         KAL03530
      GO TO 130                                                         KAL03540
 1290 CONTINUE                                                          KAL03550
C1290 WRITE (LUOT,6040) IPRC,J,R                                        KAL03560
  130 NORD(J+1)=1                                                       KAL03570
      COEFF(J+1)=R                                                      KAL03580
  131 T=T*ARX                                                           KAL03590
  132 CONTINUE                                                          KAL03600
C                                                                       KAL03610
C     IS EVALUATION REQUIRED FOR THIS POLYNOMIAL                        KAL03620
      NPOL=K-1                                                          KAL03630
      IF(NPOL)191,191,137                                               KAL03640
  137 DO 138 IX=1,10                                                    KAL03650
      IF(IDVAL(IX).EQ.NPOL) GO TO 139                                   KAL03660
  138 CONTINUE                                                          KAL03670
      GO TO 191                                                         KAL03680
  139 IPRC=IDBL                                                         KAL03690
      LEFT=LEFT-2                                                       KAL03700
      IF(LEFT)140,141,141                                               KAL03710
  140 IPRC=IDBL                                                         KAL03720
      LEFT=55                                                           KAL03730
      WRITE(LUOT,611)ITITL                                              KAL03740
  141 WRITE (LUOT,605) IPRC                                             KAL03750
```

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      RESID=0.0                                                         KAL03760
      DO 150 IX=1,NP                                                    KAL03770
      XVAL=DATX(IX)-XMN                                                 KAL03780
      YVAL=0.0                                                          KAL03790
      DO 146 IY=1,11                                                    KAL03800
      IF(NORD(IY))146,146,145                                           KAL03810
  145 YVAL=YVAL+COEFF(IY)*XVAL**(IY-1)                                  KAL03820
  146 CONTINUE                                                          KAL03830
      YACT=DATY(IX)                                                     KAL03840
      IF(ILN-IBLNK)148,149,148                                          KAL03850
  148 YVAL=EXP(YVAL)                                                    KAL03860
      YACT=EXP(YACT)                                                    KAL03870
  149 DIFF=YVAL-YACT                                                    KAL03880
      RESID=RESID+DIFF*DIFF                                             KAL03890
      LEFT=LEFT-1                                                       KAL03900
      IF(LEFT)1490,150,150                                              KAL03910
 1490 WRITE(LUOT,611)ITITL                                              KAL03920
      WRITE(LUOT,605)IDBL                                               KAL03930
      LEFT=54                                                           KAL03940
  150 WRITE (LUOT,606) XVAL,YACT,YVAL,DIFF                              KAL03950
      WRITE(LUOT,608)RESID                                              KAL03960
      LEFT=LEFT-1                                                       KAL03970
C                                                                       KAL03980
C     CHECK IF PREDICTIONS WERE REQUESTED                               KAL03990
      IF(INDPX)191,191,151                                              KAL04000
  151 IF(LEFT-3)152,154,154                                             KAL04010
  152 WRITE(LUOT,611)ITITL                                              KAL04020
      WRITE(LUOT,609)IDBL                                               KAL04030
      LEFT=55                                                           KAL04040
      GO TO 155                                                         KAL04050
  154 WRITE(LUOT,609)IDBL                                               KAL04060
      LEFT=LEFT-2                                                       KAL04070
  155 XPRED=XPMIN                                                       KAL04080
 1555 XVAL=XPRED-XMN                                                    KAL04090
      YVAL=0.0                                                          KAL04100
      DO 159 IY=1,11                                                    KAL04110
      IF(NORD(IY))159,159,156                                           KAL04120
  156 YVAL=YVAL+COEFF(IY)*XVAL**(IY-1)                                  KAL04130
  159 CONTINUE                                                          KAL04140
      IF(ILN-IBLNK)162,1162,162                                         KAL04150
  162 YVAL=EXP(YVAL)                                                    KAL04160
 1162 IF(LEFT)163,163,165                                               KAL04170
  163 WRITE(LUOT,611)ITITL                                              KAL04180
      WRITE(LUOT,609)IDBL                                               KAL04190
      LEFT=55                                                           KAL04200
  165 WRITE( LUOT,610)XPRED,YVAL                                        KAL04210
      LEFT=LEFT-1                                                       KAL04220
      XPRED=XPRED+XPINC                                                 KAL04230
      IF(XPINC)167,167,169                                              KAL04240
  167 IF(XPRED-XPMAX)191,1555,1555                                      KAL04250
  169 IF(XPRED-XPMAX)1555,1555,191                                      KAL04260
  191 JV=K                                                              KAL04270
C     GO TO 10                                                          KAL04280
C                                                                       KAL04290
C     END OF FILE ERROR                                                 KAL04300
C 700 WRITE(LUTER,710)                                                  KAL04310
C     GO TO 9000                                                        KAL04320
C                                                                       KAL04330
C     INPUT FORMAT ERROR                                                KAL04340
C 750 WRITE(LUTER,760)                                                  KAL04350
C     GO TO 9000                                                        KAL04360
C                                                                       KAL04370
C     PROGRAM EXIT, TELL THE USER                                       KAL04380
 9000 CONTINUE                                                          KAL04390
C9000 WRITE (LUTER,9020)                                                KAL04400
      RETURN                                                            KAL04410
C                                                                       KAL04420
  500 FORMAT(40A2)                                                      KAL04430
  501 FORMAT(2E10.0,3I3,1X,A1,1X,10I2,E10.0,E8.0,E10.0)                 KAL04440
  502 FORMAT(2E10.0,I1)                                                 KAL04450
  600 FORMAT('1',40A2/'0SCALING VALUES'/' X MEAN',E21.6/' X RANGE',E20.6KAL04460
     1/'0MINIMUM DEGREE',I3,', INCREMENTED BY',I3)                      KAL04470
  601 FORMAT('0CAUTION, POLYNOMIALS GIVE LN(Y) NOT Y')                  KAL04480
  602 FORMAT('0MAXIMUM DEGREE',I3/'0NO OF POINTS',I4/'0RAW S OF S',E20.6KAL04490
     1)                                                                 KAL04500
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  603 FORMAT(A1,'POLY DEG',I3/' RESID S OF S',E20.6/' STD ERR',E25.6)   KAL04510
  604 FORMAT(A1,6X,'COEFF  A(',I1,')',E20.6)                            KAL04520
 6040 FORMAT(A1,6X,'COEFF A(',I2,')',E20.6)                             KAL04530
  605 FORMAT(A1,7X,'X ACTUAL',7X,'Y ACTUAL',9X,'Y CALC',11X,'DIFF')     KAL04540
  606 FORMAT(' ',4E15.6)                                                KAL04550
  607 FORMAT(' R SQUARED',F15.2,' PERCENT')                             KAL04560
  608 FORMAT(20X,'SUM OF DIFFERENCES SQUARED',E15.6)                    KAL04570
  609 FORMAT(A1,5X,'X EXTENDED',24X,'Y CALC')                           KAL04580
  610 FORMAT(' ',E15.6,15X,E15.6)                                       KAL04590
  900 FORMAT('0TOO MANY OBSERVATIONS ENTERED')                          KAL04600
  611 FORMAT('1',40A2)                                                  KAL04610
  710 FORMAT(' END OF INPUT FILE ENCOUNTERED IN WRONG PLACE'/           KAL04620
     1' PROGRAM ABORT')                                                 KAL04630
  760 FORMAT(' ERROR IN READING INPUT FILE'/' PROGRAM ABORT')           KAL04640
 9010 FORMAT(' CURVEFIT EXECUTION BEGINS')                              KAL04650
 9020 FORMAT(' CURVEFIT EXECUTION ENDS')                                KAL04660
      END                                                               KAL04670
```

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Ref: T-5, page 2, lines 4-14.

Please provide all pages to the Purchase Power Agreement with Chevron, including all amendments, attachments and exhibits.

HECO Response:

See Attachment 1 for a copy of the Purchase Power Contract For Unscheduled Energy Made Available From A Qualifying Facility dated May 3, 1990 between Hawaiian Electric Company, Inc. ("HECO") and Chevron U.S.A, Inc. See also Attachment 2 for a copy of the Sales Agreement and Bill of Sale dated June 1, 2004 between HECO and Chevron Products Company, a division of Chevron U.S.A., Inc.

PURCHASE POWER CONTRACT FOR UNSCHEDULED ENERGY
MADE AVAILABLE FROM A QUALIFYING FACILITY

This Contract is made this 3rd day of May, 1990, by and between Hawaiian Electric Company, Inc., hereinafter called the Company and Chevron U.S.A., Inc., hereinafter called the Seller.

WHEREAS, the Company is an operating electric public utility on the Island of Oahu subject to the Hawaii Public Utilities Law (Hawaii Revised Statutes, Chapter 269) and the rules and regulations of the Hawaii Public Utilities Commission, hereinafter called the PUC;

WHEREAS, the Seller is the:

(check one)

|X| Owner and operator

|__| Owner only

|__| Operator only (with a lease with the facility's owner which gives the Seller full rights of possession and use of the facility during the term of this Contract)

of a cogeneration facility or a small power production facility which is a qualifying facility under Subchapter 2 of the PUC's Standards for Small Power Production and Cogeneration in the State of Hawaii, Chapter 74 of Title 6; and

WHEREAS, the Seller's facility is located at 91-480 Malakole Street, Ewa Beach, Hawaii and is more fully described in Appendix A attached hereto and made a part hereof; and

WHEREAS, the Seller desires to sell to the Company electric energy generated by the Seller's facility, and the Company wishes to purchase such energy from the Seller, upon the terms and conditions set forth herein;

NOW, THEREFORE, in consideration of the premises and the respective promises herein, the Company and the Seller hereby agree as follows:

1. Parallel Operation:

The Company agrees to allow the Seller to interconnect and operate in parallel with the Company's system.

2. Purchase and Sale of Energy; Rate for Purchase and Sale: Billing and Payment:

(a) The Company agrees to purchase energy from the Seller pursuant to the terms and conditions of which are more fully described in Appendix D attached hereto and made a part hereof.

(b) Sales of energy by the Company to the Seller shall be governed by an applicable rate schedule filed with the PUC and not by this Contract.

(c) A statement for energy purchased will be rendered by the Company and payment will be made for such energy by the Company in the same manner as provided in the Rules of the Company for service to its customers.

3. Facilities Owned and/or Operated by the Seller:

The Seller agrees to furnish, install, operate, and maintain suitable and sufficient equipment and 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 Seller's facility, including such equipment, records and operating procedures as more fully described in Appendix B attached hereto and made a part hereof. The Seller agrees that no material changes or additions to its facility shall be made without prior written consent by the Company.

The point of interconnection is shown on the single line diagram which is attached to Appendix B.

4. Interconnection Facilities Owned by the Company:

The Company agrees to furnish, install, own, operate and maintain such interconnection facilities on its side of the point of interconnection with the Seller's facility as required to accept energy from the Seller's facility and for parallel operation with the Seller's facility and as more fully described in Appendix C attached hereto and made a part hereof.

5. Seller Payments:

The Seller agrees to pay the Company for the Company's investment in the interconnection facilities described in Appendix C; and for any costs incurred in operating, maintaining, replacing, or relocating Company-owned interconnection facilities; and a monthly Metering Charge of $25.00 per month; subject to the terms and conditions included in Appendix C.

6. Continuity of Service:

(a) The Company may require the Seller to temporarily curtail, interrupt or reduce deliveries of energy when necessary in order for the Company to construct, install, maintain, repair, replace, remove, investigate or inspect any of its equipment or any part of its system; or if the Company determines that such curtailment, interruption or reduction is necessary because of a system emergency, forced outage, operating conditions on its system, or compliance with good engineering practices. In any such event, the Company shall not be obligated to accept or pay for any energy from the Seller except for such energy that the Company notifies the Seller that it is able to take during this period due to the aforesaid circumstances. The Company shall take all reasonable steps to minimize the number and duration of interruptions, curtailments or reductions.

(b) The Company shall not be required to purchase energy during any period during which, due to operational circumstances, purchases from the Seller will result in costs greater than those which the Company would incur if it did not make those purchases, but instead generated an equivalent amount of energy itself. The Company shall provide the Seller with at least twenty-four hours advance oral or written notice of any such period to allow the Seller to cease the delivery of energy to the Company. If the Company fails to provide such notice, it will pay the same rate for such purchase of energy as would be required had the period not occurred.

7. Personnel and System Safety:

Notwithstanding any other provisions of this Contract, if at any time the Company reasonably determines that the Seller's facility may endanger the Company personnel, and/or the continued operation of the Seller's facility may endanger the integrity of the Company's electric system or have an adverse effect on the Company's other customers' electric service, the Company shall have the right to disconnect the Seller's facility from the Company's electric system. The Seller's facility shall remain disconnected until such time as the Company is satisfied that the condition(s) referred to above have been corrected, and the Company shall not be obligated to accept or pay for any energy from the Seller during such period. If the Company disconnects the Seller from the Company's system for personnel or system safety reasons, it shall immediately notify the Seller by telephone.

8. Metering:

The Company shall supply, own, and maintain all necessary meters and associated equipment utilized for billing and energy purchase. The meters shall be tested and read in accordance with the Rules of the Company and PUC rules as either may be amended from time to time. The Seller shall supply, at no expense to the Company, a suitable location for meters and associated equipment used for billing and energy purchase.

9. Permits and Licenses:

The Seller shall obtain, at its expense, any and all authorizations, permits and licenses required for the construction and operation of its facility, including but not limited to rights-of-way or easements. The Seller shall install, operate and maintain its facility safely and in compliance with all applicable laws and regulations.

10. Term:

This Contract shall not become effective until the PUC has, by appropriate decision and order satisfactory to the Company, authorized the energy charges to be paid by the Company to the Seller hereunder to be included in the Company's Fuel Adjustment Clause computations for the term of this Contract.

The Contract shall remain in effect for an initial term of one year from the date of PUC approval, and shall continue in effect after the initial term until terminated by either party as provided for herein. Either the Company or the Seller may terminate the Contract at any time after the end of the initial term upon not less than ninety (90) days advance written notice to the other party. Notwithstanding any of the foregoing, the Company may terminate the Contract at any time upon the occurrence of any condition described in Appendix E attached hereto and made a part hereof.

11. Indemnification:

The Seller shall indemnify, defend and hold harmless the Company and its directors, officers, employees and agents, and their respective heirs, successors, legal representatives and assigns, from and against any and all liabilities, damages, costs, expenses (including attorneys' fees), losses, claims, demands, actions, causes of action, suits and proceedings of every kind, including those for damage to the property of any person or entity (including the Seller) and/or for injury to or death of any person (including the Seller's employees and agents), which directly or indirectly result from or arise out of or in connection with the interconnection or parallel operation of the Seller's facility with the Company's electrical system, except as are attributable to the negligence or willful misconduct of the Company, and/or the breach of any of Seller's representations or warranties herein.

12. Insurance:

The Seller shall, at its own expense and during the term of the Contract and during any other time that the Seller's facility is interconnected with the Company's system, secure and maintain in effect with a responsible insurance company authorized to do insurance business in Hawaii comprehensive general liability insurance with respect to the Seller's facility, the Seller's operations, and the Seller's interconnection with the Company's system, with limits of liability of at least $1,000,000.00 per occurrence and $1,000,000.00 annual aggregate for bodily injury and $1,000,000.00 for property damage. Said insurance shall name the Company as an additional insured, shall include contractual liability coverage for written contracts and agreements including this Contract, and shall be non- cancellable and nonalterable without thirty (30) days prior written notice to the Company. 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 a prudent businessman in Hawaii operating a business similar to that operated by the Seller would increase the coverages and/or limits of his liability insurance, the Seller shall forthwith increase such coverages and/or limits to that extent and the costs of such increased coverages and/or limits shall be borne by the Seller. The insurance required hereunder shall provide that it is primary with respect to the Seller and the Company. The Seller shall provide evidence of such insurance by providing certificates of insurance to the Company prior to any parallel interconnection. The Seller's indemnity and other obligations shall not be limited by the foregoing insurance requirements. Any deductible shall be the responsibility of the Seller.

13. Assignment:

This Contract may not be assigned by either the Company or the Seller without the written consent of the other party. Such consent shall not be unreasonably withheld.

14. Sale of Energy to Third Parties:

The Company shall have the first right to purchase all Energy produced for sale by Seller at the price and on the terms and conditions stated in this Contract; provided, however, that Seller may consume Energy for its own use.

15. Force Majeure:

If the Company shall be wholly or partially prevented from performing any of its obligations under this Contract by reason of or through strikes, lightning, rain, earthquake, wind, riots, fire, flood, invasion, insurrection, lava flow or volcanic activity, tidal wave, civil commotion, accident, the order of any court, judge or civil authority, war, any act of God or the public enemy, or any other similar or dissimilar cause reasonably beyond its exclusive control and not attributable to its neglect, then and in any such event, the Company shall be excused from whatever performance is prevented by such event to the extent so prevented, and the Company shall not be liable for any damage or loss resulting therefrom.

16. Warranties

Both the Company and the Seller represent and warrant, respectively, that:

(a) Each respective party has all necessary right, power and authority to execute, deliver and perform this Contract.

(b) The execution, delivery and performance of this Contract by each respective party 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.

17. Good Engineering Standard

(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 Contract in accordance with good engineering practice in the electric industry and with applicable laws, rules, orders and tariffs.

(b) Wherever in this Contract and the attached Appendices 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.

18. Miscellaneous

(a) Amendments. Any amendment or modification of this Contract 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 Contract 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 address:

Company: Hawaiian Electric Company, Inc.
P. O. Box 2750
Honolulu, Hawaii 96840-0001
Attn: Marketing Department Manager

Seller: The mailing address listed in Appendix 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 after the date of mailing, whichever is earlier. Any party hereto may change its address for written notice by giving written notice of such change to the other party hereto.

(d) Effect of Section and Appendix Headings. The headings or titles of the several sections and appendices hereof are for convenience of reference and shall not affect the construction or interpretation of any provision of this Contract.

(e) Non-Waiver. No delay or forbearance of the Company or the Seller in the exercise of any remedy or right will constitute a waiver thereof, and the exercise or partial exercise of a remedy or right shall not preclude further exercise of the same or any other remedy or right.

(f) Relationship of the Parties. Nothing in this Contract shall be deemed to constitute either party hereto as partner, agent or representative of the other party or to create any fiduciary relationship between the parties. The Seller does not hereby dedicate any part of its facility to serve the Company, the Company's customers or the public.

(g) Entire Agreement. This Contract constitutes the entire understanding and agreement between the parties.

(h) Governing Law. This Contract shall be governed by and construed in accordance with the laws of the State of Hawaii. The venue for a civil action related to this Contract shall be the judicial circuit in which the Seller's facility is located.

(i) Hawaii Plain Language Law. The purpose of this Contact is to permit the Seller to interconnect and operate in parallel with the Company's system and to provide for purchase by the Company of electric energy and/or capacity from the Seller for retail sale to the public. This Contract is not for the retail sale of electricity by the Company to the Seller. Accordingly, the parties agree that the Hawaii Plain Language Law does not apply to this agreement.

(j) Limitations. Nothing in this Contract shall limit the Company's ability to exercise its rights as specified in the Company's Tariff as filed with the PUC, or as specified in General Order No. 7 of the PUC's Standards for Electric Utility Service in the State of Hawaii, as either may be amended from time to time.

(k) Approvals. Wherever either the Company's or Seller's approval is required in this Contract, it is understood that such approvals shall not be unreasonably withheld, unless otherwise stated.

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

By George T. Iwahiro	By Karl O. Mol
Its Vice President Date 5.8.90	Its Refinery Manager Date 5/7/90
By Vern E. Cockhute	By
Its Sr. Vice President Date 5/11/90	Its Date
"Company"	"Seller"

APPENDIX A

DESCRIPTION OF SELLER'S GENERATION AND CONVERSION FACILITIES

1. Name of facility: Chevron U.S.A. Hawaiian Refinery

   a. Location: 91-480 Malakole

   b. Telephone number (for system emergencies): 682-4711

   c. Company billing account no.: 31-983-702-57

2. Owner*: Chevron U.S.A.

3. Operator*: Chevron U.S.A.

4. Name of person to whom payments are to be made: Chevron U.S.A., Inc.

   a. Mailing address: P. O. Box 29789
      Honolulu, Hawaii 96820

   b. Hawaii Gross Excise Tax License Number: 10311049

5. Equipment:

   a. Type of facility and conversion equipment: Multi-unit combustion turbine, synchronous generators, heat recovery steam generators

   b. Design capacity (If applicable):**

Boiler:	N/A lb/hr steam flow; N/A psig, N/A F to provide maximum turbine capacity.	
Turbine:	Maximum capacity 3,200 kw each	
Generator:	Maximum capacity 3,130 kw at 90 % power factor and 4.160 kv.	
Number of Units:	Three	

   c. Single or 3 phase: 3

   d. Name of manufacturer: Solar Turbines, Incorporated

   e. Date of installation: 1990

* Attach a letter signed by an officer of the corporation or general partner of a partnership, whichever is applicable, warranting that the corporation or partnership is in good standing with the Hawaii Department of Commerce and Consumer Affairs.

** The "Allowed Capacity" of this Contract shall be the lower of 9,600 KW or the installed and operating capacity of the Seller's facility interconnected with the Company's system on the date which is six months after the Operational Date of this Contract as set forth in paragraph 6 of this Appendix A.

6. Projected date of operation in parallel to Company's system ("Operational Date"): June 11, 1990

7. Insurance carrier: Self Insured meeting the requirements of Section 12 of this Contract.

8. If the land on which the facilities are located is not owned by the facility's owner, attach a copy of the agreement with the owner of the land which establishes the right of the facility's owner to put the facility on the land and the existence of required rights of way and easements.

STATE OF HAWAII

DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS

Honolulu

I, the undersigned Director of Commerce and Consumer Affairs of the State of Hawaii, do hereby certify that

CHEVRON U.S.A. INC.

a Pennsylvania corporation, duly registered to do business in Hawaii as a foreign corporation on September 17, 1965, and that, as far as the records of this Department reveal, it has complied with all the provisions of Chapter 415, Hawaii Revised Statutes, as amended, regulating foreign profit corporations.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of the Department of Commerce and Consumer Affairs, at Honolulu, Hawaii.

Dated: April 9, 1990

Director of Commerce and Consumer Affairs

By _____
Commissioner of Securities

Rev. 12/88

Chevron

Chevron Corporation
225 Bush Street, Suite 474, San Francisco, California • Phone (415) 894-3101
Mail Address: P.O. Box 7137, San Francisco, CA 94120-7137
TWX 9103727340 CHEVCORP SFO • FAX (415) 894-6169

Treasurer's Department
Insurance Division
Edward J. Kettel
Assistant Treasurer
H. Derrill Millar
Manager, Risk Management
David V. Barksdale
Manager, Corporate Programs

April 11, 1990

Contract between Chevron U.S.A. Inc.
and Hawaiian Electric Company

Hawaiian Electric Company
Attn: Mr. James Kerber
P.O. Box 2750
Honolulu, HI 96840

Gentlemen:

Chevron Corporation and its subsidiaries are covered for property and liability exposures through major worldwide insurance programs with large deductibles. Losses that fall within these deductible levels, including those for which a Chevron company is contractually liable, are paid through the financial resources of the Company and are administered by Chevron Corporation under its Self-Administered Claims Program, hereinafter referred to as the Program.

This is to advise you that the property/liability insurance requirements of the subject contract(s) fall within the deductible levels of Chevron's insurance programs. Therefore, losses for which Chevron is responsible under the contract will be handled under the above-described Program. The scope of this Program is equal to the insurance requirements of the subject contract.

We further advise you that Workers' Compensation insurance requirements for Chevron companies are satisfied through insured/self-insured programs depending upon the location of the employee's workplace. U.S. Longshore and Harbor Workers' Act coverage is self-insured.

Unless cancelled earlier, this letter will remain in effect until the expiration or earlier termination of the subject contract (or any renewal thereof). If this Program is cancelled or materially changed, we will provide you with 30 days' written notice.

Yours truly,

David V. Barksdale

HDM:klz

Chevron

Chevron U.S.A. Inc.
P.O. Box 29789, Honolulu, HI 96820 • Phone (808) 682-5711

K. O. Mohn
Manager
Hawaiian Refinery
Manufacturing Department

Attention: Accounting Department

Gentlemen:

Effective, April 1, 1990 the Chevron U.S.A. Inc. (Chevron) refinery at Ewa Beach, Hawaii will activate as a Foreign Trade Zone (FTZ) as designated by the Foreign Trade Zones Board of the U.S. Department of Commerce. Hawaii law provides that General Excise Tax and Use Tax do not generally apply to transactions taking place within the refinery FTZ premises. Accordingly, please adhere to the following guidelines on your invoices to Chevron for services and materials provided after March 31, 1990:

1) Where services are performed entirely within the refinery FTZ premises, no General Excise Tax will apply.

2) Where materials and equipment are delivered to the refinery FTZ premises on a FOB destination basis, no General Excise Tax will apply.

In situations other than those identified above, the ordinarily applicable Hawaii taxes will be due.

Chevron will reimburse you for any General Excise Tax imposed on you by the State of Hawaii in respect of services and materials claimed as exempt due to the refinery's FTZ status, provided that you notify Chevron within ten days of your receipt of any notice from the State regarding the possible assessment of any such tax and allow Chevron to participate in the defense of the assessment.

Should you have any questions or need any additional information, please contact your Chevron purchasing representative.

Very truly yours,

K. O. MOHN

RGB:vso

APPENDIX B

Facilities Owned by the Seller

1. Seller's Facilities

a. For the purposes of this Contract, the "Seller's facility" is defined as those equipment and devices, and associated appurtenances owned by the Seller, which produce electric energy and are required to interconnect and deliver energy to the Company's system. A single-line diagram, relay list and trip scheme of the Seller's facility shall, after having obtained prior written consent from the Company, be attached to this Contract and made a part hereof at the time the Contract is signed. The single-line diagram shall expressly identify the point of interconnection of the Seller's facility to the Company's system. The Seller agrees that no material changes or additions to its generating and interconnection facilities as reflected in the single-line diagram, relay list or trip scheme shall be made without first having obtained prior written consent from the Company pursuant to Section 3 of this Contract. The Seller is also responsible for maintaining compliance with the "Hawaiian Electric Company Guidelines for Off-Frequency Protection of Non-Utility Owned Generators."

b. The Seller shall furnish, install, operate and maintain facilities such as breakers, relays, switches, synchronizing equipment, monitoring equipment and control and protective devices designated by the Company as suitable for parallel operation with the Company system. Such facilities shall be accessible at all times to authorized Company personnel.

c. The Company shall review and accept the design drawings and Bill of Material for the Seller's facility and the Company shall have the right to specify the type of electrical equipment, the type of protective relaying equipment (which equipment shall be mutually agreeable to the parties) and the settings that affect the reliability and safety of operation of the Company's and Seller's interconnected system. The Company, at its option, may request to witness the Seller's operation of control, synchronizing, and protection schemes.

d. The Seller shall continue to maintain the three 12.47 KV air circuit breakers on the Seller's side of the substation transformers such that they may continue to be racked out to provide a visible break disconnect between the Seller's system and the substation transformer.

e. The Seller shall lease telecommunication lines required to connect the Communications RTU with the Company's Load Dispatch Office.

2. Operating Procedures

a. The Company may require periodic reviews of the Seller's facilities, maintenance records, available operating procedures and policies, and relay settings, and request changes it deems necessary for parallel operation and to protect the Company's system from damages resulting from the Seller's parallel operation.

b. The Seller must separate from the Company's system whenever requested to do so by the Company's System Load Dispatcher pursuant to Sections 6 and 7 of the Contract. It is understood and agreed that at times it may not be possible for the Company to accept electric energy due to temporary operating conditions on the Company's system and these periods shall be specified by the Company's System Load Dispatcher. Notice shall be given in advance when these are scheduled operating conditions.

c. Logs must be kept by the Seller 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 disturbances.

d. Under no circumstances shall the Seller, when separated from the Company system for any reason, reclose into the Company system without first obtaining specific approval to do so from the Company's System Load Dispatcher.

e. The Company may request the Seller to furnish reactive kilovarhours to it in the amount that the Seller can supply and the Company's system can accept from them. At times when the Company's system cannot accept the available kilovars, the Seller shall reduce the amount delivered to that specified by the Company's System Load Dispatcher.

f. The Seller shall notify the Company's System Load Dispatcher prior to putting a generator on or taking a generator off the system. Such notice should be as far in advance as reasonably possible and the circumstances causing the action.

g. The Seller shall limit its facility's ramp rate to less than 2 MW/minute.

h. The Seller must notify the Company's System Load Dispatcher two (2) months in advance of any planned maintenance of the Seller's generators which will necessitate the sale of energy by the Company to the Seller. The Company may request deferral of such maintenance to a period specified by the Company after reviewing anticipated operating conditions. The Company shall not unreasonably delay maintenance of the Seller's facility.

i. The Seller must notify the Company's System Load Dispatcher in advance (when possible) of any unplanned outage of the Seller's generators. Such notification will be made at the earliest opportunity, and include the number of units affected, outage start date, expected outage duration, and the reason for the outage. In the event of a unit trip, the Seller must notify the Company's System Load Dispatcher of the cause of the trip within 30 minutes of the occurrence.

j. The Company may have limited ability to integrate energy produced by the Seller into its system for engineering and/or operating reasons and may be required to curtail energy deliveries by the Seller. When the Company determines that curtailment of unscheduled energy becomes necessary due to such engineering and/or operating reasons, curtailments shall be made to the extent possible in reverse chronological order of the chronological seniority dates determined by the Company for the contracts, with deliveries under the contract with the most recent chronological seniority date being the first curtailed, and deliveries under the contract with the earliest chronological seniority date being the last curtailed subject, however, to the Company's rights under Sections 6 and 7 of this Contract. The Company shall not be liable to the Seller for any such curtailments. The chronological seniority date shall be the date of PUC approval as described in Section 10 of this Contract.

Page 17 contains confidential information and is being provided subject to Protective Order No. 23378, dated April 23, 2007.

APPENDIX C

INTERCONNECTION FACILITIES OWNED BY THE COMPANY

1. The Company shall bill the Seller monthly and the Seller shall, within thirty (30) days after the billing date, reimburse the Company for any costs incurred in operating, maintaining, replacing or relocating the Company owned interconnection facilities. The Company's costs will be determined on the basis of direct payroll, material costs, applicable overheads at the time incurred and applicable taxes.

2. The interconnection facilities owned by the Company for which the Seller has agreed to pay include:

A.	Grounding transformer and protective relay scheme installed at existing substation	furnished by Seller
B.	Communications RTU	$140,000 (Approx.)
C.	Protective relays	$80,000 (Approx.)
D.	Non-Refundable contribution for substation	$78,720

The Seller will also pay for leased telecommunications lines and facilities for the communications RTU to be connected to the Company's Load Dispatch office.

3. The Seller will obtain an agreement with Hawaiian Telephone Company which is effective at all times during the period that the Seller is interconnected by the 44 kv circuit for the protection of Hawaiian Telephone Company system equipment in the Campbell Industrial Park area. The Seller shall provide a copy of this agreement to the Company.

4. The Seller assumes liability for any damages caused by Seller's interconnection at 44 kv, as reasonably determined by the Company.

5. The Company will continue to own and maintain the substation at the Seller's facility in its present configuration subject to the following provisions:

   A. The Company will obtain the Seller's permission to replace any major piece of equipment (such as a transformer, disconnect switch, lightning arrestor, fuse, load tap changer contact, etc.) that fails in service, unless the replacement is necessary to insure safe, reliable and/or adequate quality service to the Company's other customers. In this event, the Company will proceed directly with replacing the failed component.

   B. The Seller will reimburse the Company for expenses incurred in paragraph A above.

   C. The Company will be responsible for the costs of all routine operation, maintenance and testing of the substation.

APPENDIX D

ENERGY PURCHASES BY COMPANY

1. Subject to the other provisions of this Contract, the Company shall accept and pay for energy generated by the Seller's facility and delivered by the Seller to the Company at the rates set forth in paragraph 3 of this Appendix D, provided, however, that the rate of delivery of such energy shall not exceed the Allowed Capacity as set forth in Appendix A at any given time.

2. Energy furnished by the Seller to the Company shall be metered by a time-of-day meter. The on-peak hours shall be those between 7:00 a.m. and 9:00 p.m. daily, and the off-peak hours shall be those between 9:00 p.m. on one day and 7:00 a.m. on the following day.

3. The respective on-peak and off-peak energy rates for the delivery of energy for sale to the Company shall be 100% of the Company's on-peak and off-peak avoided costs for unscheduled energy in cents per kilowatthour as shown by the Company's system cost data on file with the PUC pursuant to Subchapter 3 of the PUC's Standards for Small Power Production and Cogeneration in the State of Hawaii, Chapter 74 of Title 6, at the time the energy is delivered.

4. The purpose of the following adjustment is to enable the Seller to reimburse the Company for substation transformer Kwh losses associated with the Seller's facility without the expense or inconvenience of installing a new 44 KV metering system.

The measured energy furnished to the Company by the Seller shall be reduced by the monthly adjustment formula below, in the proportion of 14/24 deducted from the on-peak energy furnished and 10/24 deducted from the off-peak energy furnished, to determine the amount of on-peak and off-peak energy purchased by the Company. This reduction is to compensate the Company for the fixed transformer core losses (18,440 Kwh/mo.) and the variable transformer winding losses.

$$\text{Monthly Adjustment} = 1350 \text{ Kwh} \times \left[\frac{\text{Kwh Sold} + \text{Kwh Purchased}}{1{,}200{,}000 \text{ Kwh}}\right]^2 + 18{,}440 \text{ Kwh}$$

In the event the Seller furnishes less than the kilowatthours from the above formula during a month, the balance of kilowatthours due will be applied to the subsequent month. This reduction of measured energy for determining the amount of energy purchased by the Company shall become effective either three months after the first customer generator is synchronized, or the month following the first instance of the Seller delivering energy to the Company, whichever occurs first. The Company will continue metering at the 12.47 kilovolt side of the transformers, and will maintain the two existing 44 to 12.47 kilovolt, 10,000 kilovolt ampere transformers subject to provisions in Appendix C of this contract.

The Company will apply a "Distribution Voltage" discount to its monthly energy billing for the electric power that it provides to the Seller.

5. Reactive Amount. Each energy payment will be adjusted for reactive kilovarhours furnished to the Seller by the Company as follows:

The reactive kilovarhours less than or more than 62 percent of the kilowatthours furnished to the Seller by the Company for the applicable payment period shall be credited (if less) or charged (if more) at the rate of 0.2 cents per kilovarhour. (Adjustment = 0.2¢ x [Rkvah - 0.62 Kwh].)

The Seller shall furnish not less than 0.5 Rkvah for every Kwh that the Seller furnishes to the Company or other amount of Rkvah as mutually agreed to by the Seller and the Company's Supervising Load Dispatcher.

The Company will not be obligated to accept reactive kilovarhours from the Seller.

The KVARH meters shall be ratcheted to prevent reversal.

This reactive Rkvah adjustment shall apply regardless of the rate schedule under which the Company furnishes electricity to the Seller. If such schedule has a power factor clause, this provision will supersede the application of such clause.

If the adjustment results in a balance owed to the Company after reduction of the energy payment, the Company's payments to the Seller shall be reduced accordingly.

APPENDIX E

TERMINATION EVENTS

The Company may terminate the Contract at any time if any of the following conditions occur:

1. The Seller fails to use reasonable diligence in maintaining and repairing the Seller's facility; or

2. The Seller fails to be a qualifying facility under Subchapter 2 of the PUC's Standards for Small Power Production and Cogeneration in the State of Hawaii, Chapter 74 of Title 6; or

3. The Seller by act or omission breaches or defaults on any covenant, condition or other provision of this Contract, and fails to cure such breach or default within thirty (30) days after written notice of such breach or default from the Company.

4. The Seller does not begin to operate and to offer energy to the Company within 6 months after the Operational Date of the Contract.

SALES AGREEMENT
AND
BILL OF SALE

THIS SALES AGREEMENT AND BILL OF SALE ("Agreement") is made by and between Chevron Products Company, a division of Chevron U.S.A. Inc.("Seller"), a Pennsylvania corporation, and Hawaiian Electric Company, Inc., a Hawaii corporation ("BUYER"), as of the 1st day of JUNE, 2004. SELLER and BUYER agree as follows:

1. SELLER hereby sells to BUYER, at the price and under the terms and conditions set forth in this Agreement, all SELLER's right, title, and interest in the equipment listed and described in Exhibits "A-1," "A-2," and "A-3" attached hereto and made a part hereof ("Equipment").

2. The Equipment is sold, assigned, conveyed, transferred and delivered by SELLER to BUYER, and BUYER accepts the Equipment, and BUYER does hereby agree that the Equipment is sold, assigned, conveyed, transferred and delivered to BUYER **"AS IS", "WHERE IS"** and **"WITH ALL FAULTS"** and that **"SELLER" MAKES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, EXPRESSED OR IMPLIED (INCLUDING THOSE IMPLIED BY THE TERMS "SELL," "TRANSFER," "CONVEY," "DELIVER," OR "ASSIGN," OR THOSE IMPLIED BY ANY OTHER TERM HEREIN), OR ARISING BY OPERATION OF LAW WITH RESPECT TO THE TITLE, MAINTENANCE, REPAIR, CONDITION, DESIGN, VALUE, MERCHANTABILITY, SUITABILITY, OR MARKETABILITY OF THE EQUIPMENT INCLUDING, WITHOUT LIMITATION, (A) ANY IMPLIED OR EXPRESS WARRANTY OF MERCHANTABILITY, (B) ANY IMPLIED OR EXPRESS WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, (C) ANY IMPLIED OR EXPRESS WARRANTY OF CONFORMITY TO ANY MODELS OR SPECIFICATIONS, (D) ANY IMPLIED OR EXPRESS WARRANTY CONCERNING THE MANNER OR QUALITY OF CONSTRUCTION OF, OR MATERIALS INCORPORATED**

INTO, THE EQUIPMENT AND THE MANNER, QUALITY, STATE OF REPAIR OR LACK OF REPAIR OF THE EQUIPMENT AND (E) ANY CLAIM BY "BUYER" FOR DAMAGES BECAUSE OF DEFECTS, WHETHER KNOWN OR UNKNOWN, WITH RESPECT TO SUCH EQUIPMENT, IT BEING THE EXPRESS INTENTION OF "SELLER" AND "BUYER" THAT THE EQUIUPMENT BE CONVEYED TO, AND ACCEPTED BY, "BUYER" IN THE EQUPMENT'S PRESENT CONDITION AND STATE OF REPAIR.

3. In consideration of the sale and transfer of the Equipment set forth in Exhibits "A-1," "A-2," and "A-3," BUYER hereby agrees to pay SELLER, ONE AND NO/100 DOLLARS ($1.00), receipt of which is hereby acknowledged by SELLER.

4. It is intended that the obligations agreed to herein shall be binding on the successors and assigns of Seller and Buyer.

5. This Agreement shall be governed by and construed in accordance with the laws of the State of Hawaii.

BUYER:
HAWAIIAN ELECTRIC COMPANY, INC.

By Thomas C. Simmons
Its: Vice President, Power Supply
pr

SELLER:
CHEVRON PRODUCTS COMPANY,
a division of Chevron U.S.A. Inc.

By: Tom Stroffe

Its: Resources Superintendent

Bus Ducts connecting Transformers to Switchgears
Standard Oil (Chevron) Substation

Enclosed bus ducts connect HECO Transformer #1 & Chevron Switchgear Comp't #5, and HECO Transformer #2 & Chevron Switchgear Comp't #12. Originally both bus ducts were of identical design and furnished by the switchgear vendor.

Each bus duct assembly includes three 1,200A aluminum bus bars, internal isolation barriers, two space heaters and connecting wires, one flexible bus duct section, two steel support columns, two concrete support column foundations, and approximately 12-1/2 horizontal linear feet and 2 vertical linear feet of bus duct housing. See Exhibits A-2 and A-3.

The existing Demarcation point between HECO and Chevron ownership is at the flange connection between the transformer throat and the 1,200A bus duct.

The new Demarcation point between HECO and Chevron ownership is defined as the exterior flange at the switchgear – 1,200A bus duct housing interface <u>and</u> at the lower connection of the metering CT to the 1,200A Bus Bars. HECO metering PTs and CTs in the switchgear are on the HECO side of the Demarcation point. See Exhibits A-2 and A-3.

Steel covers of horizontal bus duct housings were replaced with stainless steel covers prior to relocation of Demarcation point.

Note:
Exhibit A-2, dated 9/24/03, Partial Single Line Diagram, Standard Oil Substation, portion of reference drawing S-17709, Rev. 10.
Exhibit A-3, dated 9/24/03, Bus Duct Section BB-BB, Standard Oil Substation, portion of reference drawing 30-HA-27, Rev. 3.

EXHIBIT A-1

Pages 4-5 contain confidential information and are being provided subject to Protective Order No. 23378, dated April 23, 2007.

CA-IR-225

Ref: T-5, page 2, lines 4-14.

Please provide all pages to the Purchase Power Agreement with Tesoro, including all amendments, attachments and exhibits.

HECO Response:

See the following attachments to this response:

- Attachment 1, a copy of the Purchase Power Contract for Unscheduled Energy Made Available from a Qualifying Facility, dated December 28, 1983, between Hawaiian Electric Company, Inc. ("HECO") and Hawaiian Independent Refinery, Inc. ("HIRI") which specifies the rates at which HECO purchases energy from Tesoro on an as-available basis;
- Attachment 2, a copy of an Agreement dated August 15, 1991 between HECO and HIRI which amends the PPA (Attachment 1) with respect to certain interconnection facilities described in the Agreement, but does not affect the terms under which HECO buys energy from Tesoro or the 2007 Test Year purchased power expense estimate;
- Attachment 3, a copy of a letter dated March 11, 1993, from BHP Petroleum Americas Refining, Inc. to HECO announcing the name change from HIRI to BHP Petroleum Americans Refining Inc.; and
- Attachment 4, a copy of a letter dated "June 17, 1997", received by HECO on June 19, 1998, from Tesoro Hawaii Corporation to HECO notifying HECO that on May 29, 1998, Tesoro Petroleum Corporation purchased all of the capital stock and related operating assets of BHP Petroleum Americas Refining Inc., and that on June 5, 1998, BHP Petroleum Americas Refining Inc. filed with the State of Hawaii Department of Commerce and Consumer Affairs,

Business Registration Division, Articles of Amendment to Change Corporate Name from BHP Petroleum Americas Refining Inc. to Tesoro Hawaii Corporation

PURCHASE POWER CONTRACT FOR UNSCHEDULED ENERGY MADE AVAILABLE FROM A QUALIFYING FACILITY

This contract is made this 28th day of December, 1983, by and between Hawaiian Electric Company, Inc., hereinafter called the Company and Hawaiian Independent Refinery, Inc., hereinafter called the Seller.

WHEREAS, the Company is an operating electric public utility on the Island of Oahu subject to the Hawaii Public Utilities Law (Hawaii Revised Statutes, Chapter 269) and the rules and regulations of the Hawaii Public Utilities Commission, hereinafter called the PUC;

WHEREAS, the Seller is the:

(check one)

|__| Owner and operator

|__| Owner only

|X| Operator only (with a lease with the facility's owner which gives the Seller full rights of possession and use of the facility during the term of this Contract)

of a cogeneration facility or a small power production facility which is a qualifying facility under Subchapter 2 of the PUC's Standards for Small Power Production and Cogeneration in the State of Hawaii, Chapter 74 of Title 6; and

WHEREAS, the Seller's facility is located at 91-325 Komohana Street, Ewa Beach, HI is more fully described in Appendix A attached hereto and made a part hereof; and

WHEREAS, the Seller desires to sell to the Company electric energy generated by the Seller's facility, and the Company wishes to purchase such energy from the Seller, upon the terms and conditions set forth herein;

NOW, THEREFORE, in consideration of the premises and the respective promises herein, the Company and the Seller hereby agree as follows:

1. Parallel Operation:

The Company agrees to allow the Seller to interconnect and operate in parallel with the Company's system provided that such interconnection and operation shall not adversely affect the Company's property or the operations of its customers and shall not present safety hazards to the Company's system, property or employees or the Company's customers or the customers' property or employees.

2. Purchase and Sale of Energy; Rate for Purchase and Sale; Billing and Payment:

(a) The Company agrees to purchase energy from the Seller pursuant to the terms and conditions of which are more fully described in Appendix D attached hereto and made a part hereof.

(b) Sales of energy by the Company to the Seller shall be governed by an applicable rate schedule filed with the PUC and not by this Contract.

(c) A statement for energy purchased will be rendered and payment will be made for such energy in accordance with the Rules of the Company for service to its customers.

3. Facilities Owned and/or Operated by the Seller:

The Seller agrees to furnish, install, operate, and maintain suitable and sufficient equipment and 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 Seller's facility, including such equipment, records and operating procedures as more fully described in Appendix B attached hereto and made a part hereof. The Seller agrees that no changes or additions to its facility will be made without prior written approval by the Company and amendment of this Contract.

Without limiting the foregoing, Seller shall install, operate and maintain its facility in accordance with sound engineering practice. Seller's operation and maintenance schedules shall be established to provide adequate staffing by qualified personnel at all times.

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 Seller's facility as required to accept energy from the Seller's facility and for parallel operation with the Seller's facility and as more fully described in Appendix C attached hereto and made a part hereof. All such interconnection facilities shall be the property of the Company. The interconnection point is shown on the diagram which is attached hereto and referred to in Appendix B attached hereto.

5. Seller Payments:

The Seller agrees to pay to the Company for the Company's investment in the interconnection facilities described in Appendix C for any costs incurred in operating, maintaining, replacing, or relocating Company-owned interconnection facilities; and a monthly Metering Charge of $25.00 per month; subject to the terms and conditions included in Appendix C.

6. Continuity of Service:

(a) The Company may require the Seller to temporarily curtail, interrupt or reduce deliveries of energy (i) when necessary in order for the Company to construct, install, maintain, repair, replace, remove, investigate or inspect any of its equipment or any part of its system; or (ii) if the Company determines that such curtailment, interruption or reduction is necessary because of a system emergency, forced outage, operating conditions on its system, or compliance with prudent electrical practices. In any such event, the Company shall not be obligated to accept or pay for any energy from the Seller except for such energy that the Company notifies the Seller that it is able to take during this period due to the aforesaid circumstances. The Company shall take all reasonable steps to minimize the number and duration of interruptions, curtailments or reductions.

(b) The Company shall not be required to purchase energy during any period during which, due to operational circumstances, purchases from any qualifying facility will result in costs greater than those which the Company would incur if it did not make those purchases, but instead generated an equivalent amount of energy itself, provided that the Company shall provide the Seller with at least twenty-four hours advance oral or written notice of any such period to allow the Seller to cease the delivery of energy to the Company. If the Company fails to provide such notice, it will pay the same rate for such purchase of energy as would be required had the period not occurred.

7. Personnel and System Safety:

Notwithstanding any other provisions of this Contract, if at any time the Company reasonably determines that (i) the facility may endanger the Company personnel, and/or (ii) the continued operation of the Seller's facility may endanger the integrity of the Company's electric system or have an adverse effect on the Company's other customers, the Company shall have the right to disconnect the Seller's facility from the Company's electric system. The Seller's facility shall remain disconnected until such time as the Company is satisfied that the condition(s) referred to in (i) and/or (ii) of this Section have been corrected, and the Company shall not be obligated to accept or pay for any energy from the Seller during such period. If the Company disconnects the Seller from the Company's system, it shall immediately notify the Seller by telephone and confirm in writing the reasons for the disconnection within three working days.

8. Metering:

The Company will supply, own, and maintain all necessary meters and associated equipment utilized for billing and energy purchase. The meters will be tested and read in accordance with the Rules of the Company and PUC rules. The Seller shall supply, at no expense to the Company, a suitable location for meters and associated equipment used for billing and energy purchase.

9. Permits and Licenses:

The Seller shall obtain, at its expense, any and all authorizations, permits and licenses required for the construction and operation of its facility, including but not limited to rights-of-way or easements. The Seller shall install, operate and maintain its facility safely and in compliance with all applicable laws and regulations. As used in this Contract, the term "facility" includes all interconnection equipment owned by the Seller.

10. Term:

This Contract shall not become effective until the PUC has, by appropriate decision and order satisfactory to the Company, given its approval of this Contract in exactly the form in which it was executed, and in such approval has authorized the energy charges to be paid by the Company to the Seller hereunder to be included in the Company's Fuel Adjustment Clause computations for the term of this Contract.

The Contract shall remain in effect for a minimum term of one year from the date of PUC approval, and shall continue in effect after the minimum term on a year-to-year basis until terminated by either party. Either the Company or the Seller may terminate the Contract at any time after the end of the minimum term upon ninty (90) days advance written notice to the other party. Notwithstanding any of the foregoing, the Company may terminate the Contract at any time upon the occurrence of any condition described in Appendix E attached hereto and made a part hereof.

11. Indemnification:

The Seller shall indemnify, defend and hold harmless the Company and its directors, officers, employees and agents, and their respective heirs, successors, legal representatives and assigns, from and against any and all liabilities, damages, costs, expenses (including attorneys' fees), losses, claims, demands, action, causes of action, suits and proceedings of every kind, including those for damage to the property of any person or entity (including the Seller) and/or for injury to or death of any person (including the Seller's employees and agents), which directly or indirectly result from or arise out of or in connection with (i) the interconnection or parallel operation of the Seller's facility with the Company's electrical system, except as are attributable to the negligence or willful misconduct of the Company, and/or (ii) the breach of any of Seller's representations or warranties herein.

12. Insurance:

The Seller shall, at its own expense and during the term of the Contract and during any other time that the Seller's facility is interconnected with the Company's system, secure and maintain in effect with a responsible insurance company authorized to do insurance business in Hawaii the following insurance that will protect the Seller and the Company: The Seller shall maintain comprehensive general liability insurance with respect to the Seller's facility, the Seller's operations, and the Seller's interconnection

with the Company's system, with limits of liability of at least $1,000,000.00 per occurrence and $1,000,000.00 annual aggregate for bodily injury and $1,000,000.00 for property damage. Said insurance shall name the Company as an additional insured, shall include contractual liability coverage for written contracts and agreements including this Contract, and shall be non-cancellable and nonalterable without thirty (30) days prior written notice to the Company. 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 a prudent businessman in Hawaii operating a business similar to that operated by the Seller would increase the coverages and/or limits of his liability insurance, the Seller shall forthwith increase such coverages and/or limits to that extent and the costs of such increased coverages and/or limits shall be borne by the Seller. The insurance required hereunder shall provide that it is primary with respect to the Seller and the Company. The Seller shall provide evidence of such insurance 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 any parallel interconnection. The Seller's indemnity and other obligations shall not be limited by the foregoing insurance requirements.

13. Assignment:

This Contract may not be assigned by either the Company or the Seller without the consent of the other party and the Commission. Such consent shall not be unreasonably withheld.

14. Right of First Refusal:

The Company shall have the right of first refusal to purchase all electric energy produced for sale by the Seller. The Seller shall not sell electricity to any other person or business entity unless it has satisfied all applicable legal requirements, including but not limited to the Hawaii Public Utilities Law and the rules and regulations of the PUC.

15. Hawaii Public Utilities Commission:

(a) This Contract is subject to and contingent upon approval by the PUC, as more fully set forth in Section 10 hereof.

(b) This Contract shall, at all times, be subject to such changes or modifications by the PUC as said PUC may, from time to time, direct in the exercise of its jurisdiction.

(c) Notwithstanding any other provisions of this Contract, the Company shall have the right to unilaterally file with the PUC, pursuant to the PUC's rules and regulations, an application for a change in rates, charges, classification, or service, or any rule, regulation, or other contract relating hereto.

16. Force Majeure:

If the Company shall be wholly or partially prevented from performing any of its obligations under this Contract by reason of or through strikes, lightning, rain, earthquake, wind, riots, fire, flood, invasion, insurrection, lava flow or volcanic activity, tidal wave, civil commotion, accident, equipment failures, the order of any court, judge or civil authority, war, any act of God or the public enemy, or any other similar or dissimilar cause reasonably beyond its exclusive control and not attributable to its neglect, then and in any such event, the Company shall be excused from whatever performance is prevented by such event to the extent so prevented, and the Company shall not be liable for any damage or loss resulting therefrom.

17. Seller's Warranties

The Seller represents and warrants as follows:

(a) The Seller has all necessary right, power and authority to execute, deliver and perform this Contract.

(b) The execution, delivery and performance of this Contract by the Seller 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 the Seller is a party or by which it is bound.

18. Miscellaneous

(a) Amendments. Any waiver, alteration, amendment or modification of this Contract or any part hereof shall not be valid unless in writing and signed by the parties.

(b) Binding Effect. This Contract 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 address:

Company:	Hawaiian Electric Company, Inc. P. O. Box 2750 Honolulu, Hawaii 96840 Attn:
Seller:	The mailing address listed in Appendix 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 after the date of mailing, whichever is earlier. Any party hereto may change its address for written notice by giving written notice of such change to the other party hereto.

(d) Effect of Section and Appendix Headings. The headings or titles of the several sections and appendices hereof are for convenience of reference and shall not affect the construction or interpretation of any provision of this Contract.

(e) Non-Waiver. No delay or forbearance of the Company or the Seller in the exercise of any remedy or right will constitute a waiver thereof, and the exercise or partial exercise of a remedy or right shall not preclude further exercise of the same or any other remedy or right.

(f) Relationship of the Parties. Nothing in this Contract shall be deemed to constitute either party hereto as partner, agent or representative of the other party or to create any fiduciary relationship between the parties. The Seller does not hereby dedicate any part of its facility to serve the Company, Company's customers or the public.

(g) Entire Agreement. This Contract constitutes the entire understanding and agreement between the parties.

(h) Governing Law. This Contract shall be governed by and construed in accordance with the laws of the State of Hawaii.

(i) Hawaii Plain Language Law. The purpose of this Contact is to permit the Seller to interconnect and operate in parallel with the Company's system and to provide for purchase by the Company of electric energy and/or capacity from the Seller for retail sale to the public. Furthermore, this Contract is not for the retail sale of electricity by the Company to the Seller. Accordingly, the parties agree that the Hawaii Plain Language Law does not apply to this agreement.

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

Hawaiian Electric Company, Inc.	Hawaiian Independent Refinery, Inc.
By Howard D. Williams 12/28/83	By [illegible] 12/22/83
Its VICE PRESIDENT Date	Its Vice President Date
By	By
Its Date	Its Date
"Company"	"Seller"

APPENDIX A

DESCRIPTION OF SELLER'S GENERATION AND CONVERSION FACILITIES

1. Name of facility: HIRI Cogeneration Unit

   a. Location: 91-325 Komohana Street, Ewa Beach, HI

   b. Telephone number (for system emergencies): (808) 682-4698 (Shift Supervisor)

   c. Company billing account no.:

2. Owner*: First Hawaiian Bank, a Trustee

3. Operator*: Hawaiian Independent Refinery, Inc.

4. Name of person to whom payments are to be made: Hawaiian Independent Refinery, Inc.

   a. Mailing address: P. O. Box 3379
   Honolulu, Hawaii 96842
   Attn: Mr. Lewis N. Levy

   b. Hawaii Gross Excise Tax License Number: 10007504

* Attach a Certificate of Good Standing issued by the DCCA and dated no earlier than 30 days prior to the date of this Contract.

5. Equipment:

   a. Type of facility and conversion equipment: General Electric Combustion Turbine/Brush 13.8 Kv Generator

   b. Design capacity:** 18,500 Kw @ 90°F

   c. Single or 3 phase: 3 Phase

   d. Name of manufacturer: Stewart & Stevenson

   e. Date of installation: December 22, 1983

6. Projected date of operation in parallel to Company's system ("Operational Date"): December 28, 1983

7. Insurance carrier: Lloyds of London

8. If the owner is not the operator, attach a letter from the owner that the Seller, as Lessee, is entitled to operate the Seller's facility.

9. If the land on which the facilities are located is not owned by the facility's owner, attach a letter from the owner of the land which establishes the right of the facility's owner to put the facility on the land and the existence of required rights of way and easements.

**The "Allowed Capacity" of this Contract shall be the installed and operating capacity of the Seller's facility interconnected with the Company's system on the date which is six months after the Operational Date of this Contract as set forth in this Appendix A.

STATE OF HAWAII

DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS

Honolulu

I, MARY G. F. BITTERMAN, Director of Commerce and Consumer Affairs, being the appropriate officer under the laws of the State of Hawaii to make this certification, do hereby certify that HAWAIIAN INDEPENDENT REFINERY, INC. was incorporated under the laws of the State of Hawaii on May 1, 1979 under the name of PROMA, INC.; that the corporate name was changed on May 7, 1979 to HAWAIIAN INDEPENDENT REFINERY-HAWAII, INC.; that the corporate name was changed on July 11, 1979 to HAWAIIAN INDEPENDENT REFINERY, INC.; that it is an existing corporation in good standing, and is duly authorized to transact business; and that the following is a list of all charter documents on file in this Department:

Document	Filed
1. Articles of Incorporation and Affidavit of Officers, dated May 1, 1979.	May 1, 1979
2. Certificate of Amendment of Articles of Incorporation, dated May 7, 1979.	May 7, 1979

Document	Filed
3. Merger Agreement and Certificate of Vice President and Secretary of Hawaiian Independent Refinery, Inc. and Certificate of Vice President and Secretary of Hawaiian Independent Refinery-Hawaii, Inc., dated July 9, 1979.	July 11, 1979

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of the Department of Commerce and Consumer Affairs, at Honolulu, this 15th day of December, 1983.

Mary J. J. Bitterman
Director of Commerce and Consumer Affairs

By _____
Corporation and Securities Administrator

STATE OF HAWAII
DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS
Honolulu

I, the undersigned Director of Commerce and Consumer Affairs of the State of Hawaii, do hereby certify that according to the records of this Department

FIRST HAWAIIAN BANK

was incorporated under the laws of Hawaii on February 4, 1974 ; that it is an existing corporation in good standing, and is duly authorized to transact business.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of the Department of Commerce and Consumer Affairs, at Honolulu, Hawaii.

Dated: December 6, 1983

Mary J. F. Butterworth

Director of Commerce and Consumer Affairs

By

Corporation and Securities Administrator

Rev. 2/83

Hawaiian Independent Refinery, Inc.
A Pacific Resources, Inc. Company

PRI Tower 733 Bishop Street
P. O. Box 3379 Honolulu, Hawaii 96842
Telephone 808 547-3222 Telex 0634238

December 28, 1983

Hawaiian Electric Company, Inc.
Post Office Box 2750
Honolulu, Hawaii 96840
Attn: Mr. H. D. Williamson
Vice President - Planning

Subject: HIRI Representations In Compliance With Appendix A Of Purchase Power Contract.

Sir:

Pursuant to Appendix A of the Purchase Power Contract (Agreement), dated December 28, 1983, by and between Hawaiian Electric Company, Inc. (HECO) and Hawaiian Independent Refinery, Inc. (HIRI), HECO requests certain written confirmations regarding the power facilities and real property more particularly described in said Appendix A.

In lieu of and pending the procurement of the aforesaid written representations from the appropriate parties, HIRI hereby states that, in its considered opinion based on conveyance and collateral transaction documents executed by and among HIRI, the fee owner of the pertinent real property and the owner of the power facilities, (i) HIRI had the right to construct the power facilities, (ii) necessary rights of way and easements to operate the power facilities are appurtenant to HIRI's interests in and to said facilities; and (iii) HIRI has the right to operate the power facilities.

HIRI further states that it will apply all reasonable efforts to acquire written confirmation of the foregoing statements from the applicable parties as soon as possible.

Very truly yours,

Lewis N. Levy
Vice President

LNL/jc

ROLLINS BURDICK HUNTER

Rollins Burdick Hunter of Hawaii, Inc.
Suite 6B, 1221 Kapiolani Boulevard, Honolulu, Hawaii 96814
Mailing Address: P. O. Box 3650, Honolulu, Hawaii 96811
Telephone: (808) 523-6931 Telex: 7430567

CERTIFICATE OF INSURANCE

Name and Address of Certificate Holder	Name and Address of Insured
HAWAIIAN ELECTRIC COMPANY, INC.	HAWAIIAN INDEPENDENT REFINERY, INC. C/O PACIFIC RESOURCES, INC. P. O. BOX 3379 HONOLULU, HAWAII 96842

This is to certify that policies of insurance listed below have been issued to the insured named above and are in force at this time.

TYPE OF INSURANCE	COMPANY AND POLICY NUMBER	POLICY EXPIRATION DATE	Limits of Liability in Thousands (000)		
				Each Occurrence	Aggregate
General Liability [X] Comprehensive Form [X] Premises — Operations [X] Explosion and Collapse Hazard [X] Underground Hazard [X] Products/Completed Operations Hazard [X] Contractual Insurance [X] Broad Form Property Damage [X] Independent Contractors [X] Personal Injury	LLOYDS' OF LONDON RENEWAL OF ML825485	12/31/86	Bodily Injury	$	$ *
			Property Damage	$	$
			Bodily Injury and Property Damage Combined	$ 1,000	$ 1,000
			*Applies to Products/Completed Operations Hazard.		$ (Personal Injury)
Automobile Liability [ ] Comprehensive Form [ ] Owned [ ] Hired [ ] Non-Owned			Bodily Injury (Each Person)	$	
			Bodily Injury (Each Occurrence)	$	
			Property Damage	$	
			Bodily Injury and Property Damage Combined	$	
Excess Liability [ ] Umbrella Form [X] Other Than Umbrella Form	ASSOCIATED ELECTRIC & GAS INSURANCE SERVICES 244 NJ	7/1/86	Bodily Injury and Property Damage Combined	$ 5,000	$ 5,000
Workers' Compensation and Employers' Liability			Statutory		
				$	(Each Accident)
Other					

Description of Operations / Locations / Vehicles RE: PURCHASE POWER CONTRACT

IT IS AGREED THAT HAWAIIAN ELECTRIC COMPANY, INC. IS HEREBY NAMED AS AN ADDITIONAL INSURED BUT ONLY AS RESPECTS LIABILITY ARISING OUT OF OPERATIONS PERFORMED BY THE NAMED INSURED AS PER THE REFERENCED CONTRACT.

This certificate is not a policy and of itself does not afford any insurance. Nothing contained in this certificate shall be construed to amend, extend or alter the coverage limits, terms or conditions of the policies it certificates.

Cancellation: Should any of the above described policies be cancelled before the expiration date thereof, the issuing company will ~~endeavor to~~ mail 30 days written notice to the above named certificate holder~~, but failure to mail such notice shall impose no obligation or liability of any kind upon the company.~~

... of Hawaii, Inc.

Date Issued: DECEMBER 21, 1983 cr

PU32712

Authorized Representative

APPENDIX B
FACILITIES OWNED BY THE SELLER

SELLER'S FACILITIES

1. The Seller shall furnish, install, operate and maintain facilities such as breakers, relays, switches, synchronizing equipment, monitoring equipment and control and protective devices designated by the Company as suitable for parallel operation with the Company System. Such facilities shall be accessible at all times to authorized Company personnel.

2. For the purpose of this agreement the "Seller's facility" is defined as those equipment and devices, and associated appurtenances owned by the Seller, which produce electric energy and are required to interconnect and deliver the energy to the Company's system. A single-line diagram, relay list, and trip scheme, reviewed and accepted by the Company, of the Seller's facility at the time the Contract is signed, shall be attached to this agreement and made a part hereof. Material changes or additions to the Seller's generating and interconnection facilities reflected in the single-line diagram, relay list, and trip scheme shall be approved by the Company pursuant to paragraph 3 of the Contract.

3. The Company shall review the design drawings and Bill of Material for the Seller's facility. The Company shall have the right to specify the type of electrical equipment, the type of protective relaying equipment (which equipment shall be mutually agreeable to the parties) and the settings that affect the reliability and safety of operation of the Company's and Seller's interconnected systems.

4. The Seller shall purchase the Company's existing facilities which are used exclusively for the delivery of energy to the Seller, with the exception of metering equipment. These facilities include the 46 kv substation and appurtenances, other than metering, known as HIRI substation and shall be part of the Seller's facility. The purchase price is $515,000.00, payable upon approval of the Contract and approval of the sale by the Public Utilities Commission.

5. The Company's approval of material changes or additions to the Seller's facilities required by Section 3 of this Contract and paragraph 2 of this Appendix will not be unreasonably withheld by the Company.

OPERATING PROCEDURES

1. The Company may require periodic reviews of the Seller's facilities, maintenance records, available operating procedures and policies, and relay settings, and request changes it deems necessary to protect the Company's system from damages resulting from the Seller's parallel operation.

2. The Seller must notify the Company's System Load Dispatcher prior to putting a generator on or taking a generator off the system. Such notification should be as far in advance as reasonably possible under the circumstances causing the action.

3. The Seller must separate from the Company's system whenever requested to do so by the Company's System Load Dispatcher pursuant to paragraphs 6 and 7 of the Contract. It is understood and agreed that at times it will not be possible for the Company to accept electric energy due to temporary operating conditions on the Company's system and these periods will be specified by the Company's Load Dispatcher. Notice will be given in advance when these are scheduled operating conditions.

4. During the startup phase of the Seller's facility, the Company may require temporary rearrangement of loads on its system. It is understood and agreed that the Company may have to limit times during which Seller's loads can be served from a single source from the Company's system. Seller agrees to pay for all costs associated with switching and related activities by the Company to accommodate testing and startup of Seller's equipment.

5. Until the 138 kv interconnection is completed, it is understood and agreed that the Company may have to limit times during which Seller's loads can be served from a single source from the Company's system during emergency conditions and during periods of prolonged outages of the Seller's generating equipment. Seller agrees to pay for all costs associated with switching and related activities by the Company to accommodate service to Seller's loads as mutually agreeable between the Seller and the Company.

6. Logs must be kept by the Seller 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 disturbances.

7. The Seller must notify the Company's system Load Dispatcher two (2) months in advance of any planned maintenance of the Seller's facility which will necessitate the sale of energy by the Company to the Seller. The Company may request deferral of such maintenance to a period specified by the Company after reviewing anticipated operating conditions. The Company shall not unreasonably delay maintenance of the Seller's facility.

APPENDIX C
INTERCONNECTION FACILITIES OWNED BY THE COMPANY

46 KV FACILITIES

1. The Company will temporarily interconnect the Seller's facility with the Company's system with an existing 46 kv circuit, known as the CEIP-42 46 kv circuit. The Company will design and construct modifications as follows:

   a. Receive, test, and install revenue metering including low-voltage wiring at the Seller's facility. In addition to design and construction of all other elements of Seller's facility, the Seller shall install Westinghouse type MTP metering units, cut panels for revenue meters and test switches, and provide conduits and pull lines for wiring. The revenue meters will be owned and maintained by the Company.

   b. Make an overhead reconnection between the Company's CEIP-46 46 kv circuit and the CEIP-42 46 kv circuit.

   c. Install a potential transformer to block closing on the Company's oil circuit breaker number 5156 except for deadline only.

   d. Install a synchroverifier relay on the Company's Kahe-CEIP 138 kv circuit to block closing except for 1) dead bus and or dead line, and 2) voltages of equal magnitude and phase.

   e. Design and install a dead-end pole in Seller's facility and realign the incoming tap to the dead-end pole as required.

   f. Design and install supervisory and communication equipment for remote control and metering (a Remote Terminal Unit) at the Seller's facility. Seller shall install and the Company shall test transducers, metering, AC and DC sources, and telephone lines for supervisory and communications equipment. Seller shall provide interconnecting wiring up to the supervisory and communications equipment, and make provisions for telephone connections to communication equipment. This equipment will be retained for use with the permanent facilities.

2. The Seller will obtain an agreement with Hawaiian Telephone Company which is effective at all times during the period that the Seller is interconnected by the 46 kv circuit for the protection of Hawaiian Telephone Company system equipment in the Campbell Industrial Park area. The Seller shall provide a copy of this agreement to the Company.

3. The Seller assumes liability for any damages caused by Seller's interconnection at 46 kv, as reasonably determined by the Company.

4. The 46 kv interconnection facility arrangement between Seller and the Company shall terminate upon completion of the 138 kv interconnection facilities or 6/1/86, whichever occurs first.

5. The Company will bill the Seller and the Seller will, within 30 days after the billing date, reimburse the Company for all costs incurred in installing, operating, maintaining and removing the 46 kv interconnection facilities. The Company's costs will be determined on the basis of outside services costs, direct labor costs, material costs, transportation costs, applicable overheads at the 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.

138 KV FACILITIES

1. The Company will construct, own, operate and maintain all facilities required to interconnect the Company's system with the Seller's facility at 138 kv, up to the Interconnection Point.

   These facilities include a single 138 kv line between the Company's CEIP Substation and the Seller's Facility, appurtenances at the Company's CEIP Substation, and associated equipment, including pilot wire cables, telemetry, and supervisory and communication equipment for remote control and metering. It is understood that the facilities are and shall remain the property of the Company for its use as described, including service to other customers.

2. The Seller agrees to pay the Company a contribution for the Company's investment in the 138 kv interconnection facilities. Such contribution will be made monthly, as costs are incurred. The Company shall reimburse the Seller a pro rata share of any contributions applicable to any portion of the 138 kv interconnection facilities used to serve other customers.

3. The Company will bill the Seller monthly and the Seller will, within 30 days after the billing date, reimburse the Company for any costs incurred in operating, maintaining, replacing, or relocating the Company-owned interconnection facilities. The Company's costs will be determined on the basis of outside services costs, direct labor costs, material costs, transportation costs, applicable overheads at the 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 TELEPHONE
GTE

December 14, 1983

Mr. Edward J. Lui
Hawaiian Independent Refinery, Inc.
PRI Tower 733 Bishop Street
P.O. Box 3379
Honolulu, Hawaii 96842

Dear Mr. Lui:

HIRI Interconnection With HECo 46KV Feeder (CEIP-42)

We have completed a review of your December 5, 1983 letter concerning the following mutual agreements:

1. HIRI agrees to pay all protection costs to upgrade HTCo's Outside Plant (OSP) sufficient to provide equivalent protection if the MGN and the associated 12KV circuit are removed by HECo.

2. The timing of the protective relaying scheme shown in your Exhibit I is acceptable.

Based on the power data received to date, our OSP is adequately protected for the proposed CEIP-42 interconnection and we have no major objection at this time.

As a reminder, HTCo. must be notified of any deviation on the existing power data or target dates.

If you have any questions, please call Harold Karimoto, Senior Supervising Engineer, at 546-3352.

Sincerely,

B A Daida

Brian A. Daida
Engineering Manager
Transmission & Customer Systems

cc: T. Simmons (HECo.)

PU32712

Hawaiian Telephone Company • PO Box 2200 • Honolulu, Hawaii 96841 • Phone (808) 537-7111

APPENDIX D

ENERGY PURCHASES BY COMPANY

1. Subject to the other provisions of this Contract, including but not limited to Sections 6. and 7., the Company shall accept and pay for, at the respective on-peak and off-peak rates set forth below, unscheduled energy generated by the Seller's facility and delivered by the Seller to the Company; provided, however, that the rate of delivery of such energy shall not exceed the Allowed Capacity as set forth in Appendix A at any given time.

2. Energy furnished by the Seller to the Company shall be metered by a time-of-day meter. The on-peak hours shall be those between 7:00 a.m. and 9:00 p.m. daily, and the off-peak hours shall be those between 9:00 p.m. on one day and 7:00 a.m. on the following day.

The respective on-peak and off-peak energy rates for the delivery of energy for sale to the Company shall be 100% of the Company's on-peak and off-peak avoided costs for unscheduled energy in cents per kilowatthour as shown by the Company's system cost data on file with the PUC pursuant to Subchapter 3 of the PUC's Standards for Small Power Production and Cogeneration in the State of Hawaii, Chapter 74 ot Title 6, at the time the energy is delivered. In such data, the avoided cost rates for the demand nearest the Seller's installed capacity shall be applicable.

3. Each energy payment determined by the rates in 2. will be adjusted for reactive kilovarhours furnished by the Company as follows:

The reactive kilovarhours less than or more than 62 percent of the kilowatthours furnished to the Seller by the Company for the applicable payment period shall be credited (if less) or charged (if more) at the rate of 0.2 cents per kilovarhour. (Adjustment = 0.2¢ x [Rkvah - 0.62 Kwh])

The adjustment shall apply regardless of the rate schedule under which the Company furnishes electricity to the Seller. If such schedule has a power factor clause, this provision will supersede the application of such clause.

If the adjustment results in a balance owed to the Company after reduction of the energy payment, the Seller shall forthwith pay such balance to the Company.

APPENDIX E

TERMINATION EVENTS

The Company may terminate the Contract at any time if any of the following conditions occur:

1. The Seller's facility fails to be a qualifying facility under Subchapter 2 of the PUC's Standards for Small Power Production and Cogeneration in the State of Hawaii, Chapter 74 of Title 6;

2. The Seller by act or omission breaches or defaults on any covenant, condition or other provision of this Contract, and fails to cure such breach or default within thirty (30) days after written notice of such breach or default from the Company; or

3. The Seller's facility does not begin to operate and to offer energy to the Company within 6 months after the Operational Date of the Contract.

AGREEMENT

This Agreement is made and agreed to as of the 15th day of August, 1991, by and between **HAWAIIAN ELECTRIC COMPANY, INC.** ("HECO"), and **HAWAIIAN INDEPENDENT REFINERY, INC.** ("HIRI").

R E C I T A L S:

WHEREAS, on December 28, 1983, HIRI and HECO entered into a Purchase Power Contract For Unscheduled Energy Made Available From A Qualifying Facility ("Purchase Power Contract"); and

WHEREAS, as part of the Purchase Power Contract, HIRI and HECO agreed as to certain interconnection facilities described in Appendices B and C thereto; and

WHEREAS, HIRI and HECO's predecessor-in-interest, Malama Property Investment Corp. ("MPIC") entered into a Purchase and Sale Agreement dated March 3, 1989 which provides for, among other things, the granting of certain rights and the assumption of certain obligations with respect to the interconnection facilities described in the Purchase Power Contract; and

WHEREAS, this Agreement is intended to set forth those rights and obligations under the Purchase and Sale Agreement, to amend the Purchase Power Contract with respect to the interconnection facilities described in Appendices B and C thereto, and to reflect amendment of the Purchase and Sale Agreement to replace MPIC with HECO as purchaser;

NOW, THEREFORE, in consideration of the premises and the mutual agreements and covenants herein contained and for other good

and valuable consideration, the parties hereto agree to the following:

1. PURPOSE.

HIRI is the owner of the fee simple interest in the land shown outlined with a heavy line on the map attached hereto as Exhibit A and by this reference made a part hereof. Pursuant to the Purchase and Sale Agreement dated March 3, 1989, HIRI intended to sell to MPIC, and pursuant to an amendment to the Purchase and Sale Agreement HIRI now intends to sell to HECO the land shown outlined and cross-hatched on Exhibit A. In conjunction with that sale, HIRI shall grant to HECO a perpetual easement with no relocation (except at HIRI's expense) in the form attached hereto as Exhibit B and by this reference made a part hereof over the lands shown outlined and filled with dots on Exhibit A to construct, reconstruct, operate, maintain, repair and remove pole and wire lines, guy wires and anchors and such other appliances and equipment as may be necessary for the transmission and distribution of electricity. HECO hereby grants to HIRI: 1) the right to construct a new 46 KV circuit from HECO's Kalaeloa substation to HIRI's existing substation by attaching a single circuit 46 KV line using 336.4 AAC conductors (and a messenger-supported communications cable) on HECO's poles (P2 to P7) as shown on Attachment A; 2) the right to construct a new 138/46 KV substation adjacent to HECO's Kalaeloa substation; and 3) the right to tie into its new 46 KV circuit as desired by HIRI, and as approved by HECO, and upon the terms and conditions contained herein. This

arrangement is intended to provide HECO with an efficient routing for its poles and lines in conjunction with its Kalaeloa project and to provide HIRI with the right to attach a 46 KV line and supervisory communications circuit on certain of HECO's poles in the easement area in conjunction with its development of a dedicated 46 KV circuit. The facilities described herein are also the transmission and interconnection facilities referred to in the Purchase Power Contract.

2. **ADDITIONAL FACILITIES REQUIRED TO ACCOMMODATE 138 KV CONNECTION BETWEEN HECO'S KALAELOA SUBSTATION AND HIRI'S EXISTING SUBSTATION.**

A. As shown in Attachment A, HECO shall design and construct, and HIRI will own and maintain a new 46 KV circuit from HIRI's new substation, to be constructed adjacent to HECO's Kalaeloa substation, that will terminate at the 46 KV breaker "A" (HECO No. 5319) at HIRI's existing substation. The parties agree that this new 46 KV circuit shall be for the sole use of HIRI and that HIRI's new and existing substations, all equipment, wire lines and appliances necessary for this new 46 KV circuit shall be the property of HIRI, except as otherwise expressly provided herein. HECO shall route this new 46 KV circuit on HECO's poles P2 through P7 at HIRI's cost. Routing of this new 46 KV circuit from pole P7 to HIRI's existing substation will be via steel poles designed, constructed and maintained by HIRI at HIRI's cost. Routing of this new 46 KV circuit from pole P2 to HIRI's new substation will be designed, constructed and maintained by HIRI at HIRI's cost. Routing of the supervisory communications circuit from HECO's

Kalaeloa substation to HIRI's existing substation will be via HECO's poles P2 through P7, and from P7 to HIRI's existing substation will be via HIRI's steel poles. This circuit will be designed, constructed and maintained by HIRI at HIRI's cost. Cable clearances to 46 KV phase conductors and ground and cable attachments to the poles will be submitted by HIRI to HECO for design approval.

B. At HIRI's cost, HECO shall make modifications to its existing supervisory equipment (Remote Terminal Unit or "RTU") at its Kalaeloa substation and HIRI's new and existing substations to perform the functions listed in paragraphs 3A and 3C.

C. HIRI shall purchase and install all additional meter sockets and related equipment necessary for the additional revenue meters needed to register energy from HIRI to HECO via the new 46 KV circuit. This equipment shall be located in the existing meter cabinet at HIRI's existing substation. HIRI shall cut meter cabinet panels for the revenue meters and test switches. HECO shall supply and install all revenue meters and recorders, and perform the necessary tests.

D. HIRI shall design, purchase, install and test all additional relays at HIRI's existing substation. HECO shall witness testing, trip testing, and load readings. HECO shall have reasonable access to HIRI's maintenance records on such relays.

E. HIRI shall design, purchase, install and test all protective relaying at HIRI's new substation as shown in Attachment B. HECO shall witness testing, trip testing, and load readings.

HIRI shall submit the protective relaying system design to HECO for design approval. Upon reasonable notice to HIRI, HECO shall have access to the protective relaying installation within HIRI's new substation. HIRI will furnish to HECO copies of all protective relaying calibration, test data, and AC/DC schematic diagrams. HECO shall have design approval for any changes and modifications to the protective relaying system in addition to initial installation. HIRI shall comply with the HECO underfrequency protection guideline for independent power producers.

F.(a) HIRI shall design, purchase and install or construct at HECO's Kalaeloa substation the following equipment:

138 KV Breaker, Disconnect Switches, and associated equipment

Associated civil and structural work to accommodate the 138 KV Breaker and Disconnect Switches

Prior to approval for service, HECO shall witness breaker tests performed by HIRI. Tests include breaker timing, compressor checks, etc. which are normally recommended by the manufacturer, and proper operation and installation of the disconnect switches.

(b) HIRI shall design, purchase and install or construct at HIRI's new substation the following equipment:

25/33 MVA 138-46 KV Transformer (New HIRI #1)

46 KV Breaker and Disconnect Switches

Associated civil and structural work to accommodate the 25/33 MVA Transformer, 46 KV breaker, interconnecting buswork to the 138 KV

breaker, protective relaying and deadend structures required for 46 KV connection to HECO's pole P2. Power for station-service will be separately metered with metering facilities provided by HIRI.

(c) At HIRI's cost, HECO shall design, purchase and install or construct at HECO's Kalaeloa substation the following equipment:

Protective Relaying, Metering and associated equipment as shown in Attachment B. This relay design will provide external annunciation to HIRI of all distinct manual/automatic breaker trip and close events resulting from HECO supervision of Breaker B and C operations. The annunciation design will be coordinated with HIRI to satisfy HIRI monitoring requirements.

G. HIRI shall provide auto-synchronizing at Breaker A with interlock to close only if Breaker 5287 is open. If existing auto-synch circuit remains at Breaker 5287, closing must be interlocked to close only if Breaker A is open.

H. HIRI shall provide breaker auxiliary contacts of Breakers A, B and C to connect to the respective RTUs.

I. HIRI shall install and HECO shall test all necessary transducers as specified by HECO. HIRI shall provide interconnecting control wiring up to the RTUs at HIRI's new and existing substations and HECO's Kalaeloa substation, and HECO shall make the final electrical connections.

J. The final electrical connections to HECO's 138 KV bus at its Kalaeloa substation, including any existing equipment or relay panels, shall be made by HECO's substation personnel. HIRI shall pull cables as required.

3. OPERATING REQUIREMENTS.

A. HECO's existing RTU at HIRI's existing substation shall continue to monitor all quantities now being monitored. In addition, this RTU shall monitor the following quantities at Breaker A, as shown in Attachment A: 1) megawatts (both directions), 2) megavars (both directions), 3) voltage, 4) current, 5) status of Breaker A.

B. HIRI shall have trip capability over Breakers A, B and C. HIRI shall have close capability over Breakers A and B. HIRI shall provide protective relaying interlocks to prevent closing Breaker B when Breaker C is open. HIRI shall provide a synchro-check relay, in addition to the auto-synchronizing equipment as stated in 2G, to supervise closing Breaker A.

C. The RTU installed by HECO at HECO's Kalaeloa substation shall be able to trip and close Breaker C and trip only Breaker B; the closing function of Breaker C, however, will be interlocked to close only if Breaker B is open.

D. Close transition transfer between the new 46 KV circuit and the existing CEIP 42-46 KV circuit presently serving HIRI shall be performed by HIRI only upon the approval and under the supervision of HECO's load dispatcher.

4. Before beginning any construction or other work within HECO's Kalaeloa substation, HIRI shall submit its plans and design to HECO for approval. No such construction or other work will be

commenced by HIRI in HECO's Kalaeloa substation without HECO's prior written approval.

HIRI shall arrange for and pay for a HECO observer who shall be present whenever HIRI is doing any work within HECO's Kalaeloa substation. The observer shall be authorized to stop work in the event that work in the energized substation is unsafe or a risk to the continuous operation of the substation.

5. All equipment and materials provided by HIRI hereunder in the installation and construction of facilities listed under Section 2-F(a) above shall meet the standards reasonably required by HECO to ensure the integrity and reliability of HECO's power transmission system. All such equipment and materials shall be approved in writing by HECO before installation in HECO's Kalaeloa substation. HECO may refuse to approve these facilities unless and until all such facilities are made to conform with HECO's own standards for similar facilities on HECO's system. All equipment and materials purchased by HECO on HIRI's account shall be approved in writing by HIRI before installation.

6. Any approval or acceptance by either party hereunder of design, plans, material, equipment or of completed construction by the other party shall not for any purpose be deemed an endorsement or guarantee of the competency or adequacy of the design, plans, material, equipment or construction nor a waiver by either party of any of the other party's obligations or liabilities. In the event

any approval is required by any provision hereof, such approval shall not be unreasonably withheld and it shall be conclusively presumed that the party from whom the approval is sought has approved of the matter submitted for approval if twenty-one (21) days after submission, no written disapproval with reasons therefor stated has been delivered to the submitting party.

7. All equipment and materials provided by HIRI hereunder or purchased by HECO on HIRI's account to complete the facilities described in Sections 2-B, 2-F(a), and 2-F(c) shall be dedicated to HECO's ownership upon completion of the installation and acceptance by HECO. Upon such dedication and acceptance, HECO shall assume full responsibility for all maintenance, repair and operation of these facilities; provided, however, that HIRI shall be and remain liable for any damages, losses or claims whatsoever resulting from defective or negligent design, materials or workmanship and provided further that HIRI shall reimburse HECO for all costs incurred in such maintenance, repair and operation of the facilities described in Sections 2-B, 2-F(a), and 2-F(c).

All equipment and materials provided by HECO as described in Section 2-A shall be dedicated to HIRI's ownership upon completion of the installation and acceptance by HIRI. Upon such dedication and acceptance, HIRI shall assume full responsibility for all maintenance, repair and operation of those facilities; provided, however, that HECO shall be and remain liable for any

damages, losses or claims whatsoever resulting from defective or negligent design, materials or workmanship.

8. HIRI recognizes the inherent dangers and accepts all the risks attendant in the construction, installation, and maintenance of the facilities described in Sections 2-A and 2-F(a) surrounding the KALAELOA-CEIP 138KV line and within HECO's Kalaeloa substation and, in particular, the work that will be done while the 138KV line and substation are energized. In consideration of being allowed to conduct the construction, installation, and maintenance of the facilities described herein, each party hereby agrees to indemnify and hold the other party, its officers, directors, agents and employees harmless from and against any and all claims, losses, damages, liabilities, penalties, demands, suits, costs, expenses (including reasonable attorney's fees and expenses) and proceedings of any nature whatsoever for bodily injury (including death) or property damage that result from each party's construction, installation, and maintenance of the facilities or the presence of each party's employees, agents or contractors on the other's property in conjunction with their obligations hereunder, regardless of the negligence or fault (but not gross negligence) of the other party, its officers, directors, agents or employees.

9. COSTS.

A. Except as noted in the following paragraph, HIRI shall reimburse to HECO thirty (30) days after invoice the costs

set forth in Exhibit C attached hereto and by this reference incorporated herein, incurred by HECO in engineering design and review, purchase, construction, testing and inspection of all work that HECO must perform as described in paragraph 2. All costs must be substantiated to HIRI's satisfaction by copies of invoices for materials and equipment and such other data as HIRI may reasonably require.

HIRI shall pay the construction cost of the new 46 KV circuit ($35,400) as follows: ten percent (10%) ($3,540) upon execution of this Agreement by HIRI and the balance thirty (30) days prior to start of construction by HECO. Upon completion of such construction, HECO shall render to HIRI a statement for the balance due, if any, and HIRI shall pay the balance to HECO within thirty (30) days after the construction has been accepted by HIRI.

B. As long as the facilities described in Sections 2-B, 2-F(a) and 2-F(c) are utilized to service HIRI's power needs, HECO will bill HIRI monthly and HIRI shall within thirty (30) days after the billing date, reimburse HECO for all reasonable costs incurred in operating, maintaining or replacing these facilities. HECO's costs will be determined on the basis of outside services costs, direct labor costs, material costs, transportation costs, applicable overheads at the 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, corporation administration,

and materials handling. Applicable taxes will include the Public Service Company Tax and Public Utility Fee.

10. In the event that the HECO/HIRI Purchase Power Contract is terminated for any reason, the facilities of Sections 2-A, 2-B, 2-F(a), and 2-F(c) provided for in this Agreement shall remain in place for the service of HIRI's continuing power needs.

The existing revenue meters measuring energy and reactive power from HECO to HIRI and vice versa shall also remain.

11. In calculating payments for energy received by HECO, the electrical losses of the new HIRI #1 step-up transformer shall be treated as deductions from energy registered on the revenue meter. The electrical loss factor shall be calculated on a percentage basis with reference to the demonstrated or expected average current flow from HIRI and the electrical impedance (real component) of the new HIRI #1 step-up transformer. The energy received by HECO for calculating payment shall be calculated as:

Energy received for payment = Metered energy X (1 - A/B) where A = transformer losses in KW; B = net electrical energy output in KW; and transformer losses are calculated based on the demonstrated or expected average current flow of HIRI's facility.

In calculating payments for energy received by HIRI, the demand and energy charges will be decreased by the appropriate factor in the rate schedule applicable to HIRI. In addition, HIRI will reimburse HECO for the electrical losses of the new HIRI #1 step-up transformer. The reimbursement will be based on the demonstrated or expected average current flow from HECO to HIRI,

the electrical impedance (real component) of the new HIRI #1 step-up transformer, and the rate schedule applicable to HIRI.

IN WITNESS WHEREOF, the parties have caused this Agreement to be signed by appropriate representatives of each as of the date indicated.

HAWAIIAN INDEPENDENT REFINERY, INC.

By Dennis A. Rogers
Its

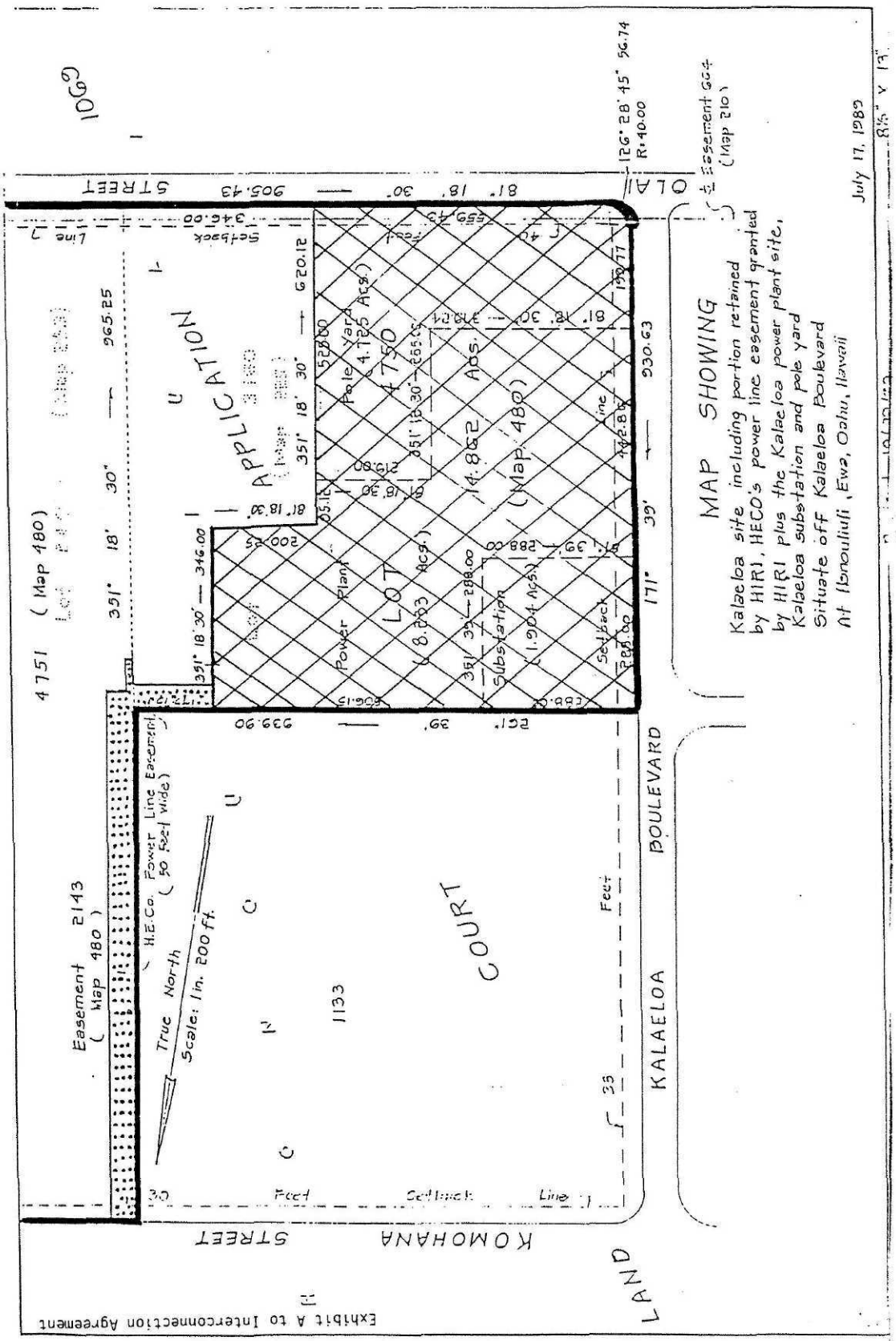
"HIRI"

HAWAIIAN ELECTRIC COMPANY, INC.

By Richard K. McJunkin
Its Vice President

By Paul Oyer
Its Vice President

"HECO"


MAP SHOWING
Kalaeloa site including portion retained by HIRI, HECO's power line easement granted by HIRI plus the Kalaeloa power plant site, Kalaeloa substation and pole yard
Situate off Kalaeloa Boulevard
At Honouliuli, Ewa, Oahu, Hawaii
July 17, 1989
APPLICATION
LOT 4750
(Map 480)
14.862 Acs.
Pole Yard
Power Plant
Substation
Setback
Line
Easement 2143
(Map 480)
H.E.Co. Power Line Easement
(50 Feet wide)
True North
Scale: 1in. 200 ft.
COURT
KALAELOA BOULEVARD
KOMOHANA STREET
LAND
OLAI
Easement 664
(Map 210)
Exhibit A to Interconnection Agreement

grant1.sla

Exhibit B to Interconnection Agreement

LAND COURT SYSTEM : REGULAR SYSTEM

AFTER RECORDATION, RETURN BY MAIL [ ] PICKUP [ ]

GRANT OF EASEMENT

THIS INSTRUMENT made this ____ day of _____, 1991, by and between HAWAIIAN INDEPENDENT REFINERY, INC., a Hawaii corporation, whose principal place of business is 733 Bishop Street, Honolulu, Hawaii 96813, hereinafter referred to as the "Grantor," and HAWAIIAN ELECTRIC COMPANY, INC., a Hawaii corporation, whose principal place of business and post office address are: 820 Ward Avenue, Honolulu, Hawaii 96814, and P. O. Box 2750, Honolulu, Hawaii 96840-0001, respectively, hereinafter referred to as the "Grantee."

W I T N E S S E T H T H A T:

The Grantor, in exchange for good and valuable consideration paid to the Grantor, the receipt of which is acknowledged, and of the covenants herein made by the Grantee, grants and conveys unto the Grantee a perpetual right and easement to construct, reconstruct, operate, maintain, repair and remove pole and wire lines, guy wires and anchors, and/or such other appliances and equipment as may be necessary for the transmission and distribution of electricity to be used for light and power and/or communications and control circuits (provided such activities do not unreasonably interfere with Grantor's business), including, without limiting the generality of the foregoing, the right to trim and keep trimmed any trees in the way of its lines, appliances and equipment and the right of entry upon the Grantor's land for the aforesaid purposes, over, under, across and through those certain premises situate off Komohana Street at Honouliuli, Ewa, Oahu, in the Campbell Estate Industrial Park, described as follows:

(1) Easement 2143 within Lot 4751 as shown on Map 480 filed with Land Court Application 1069, comprising an area of 58,376 square feet.

Being a portion of the land described in Transfer Certificate of Title No. 327,773 issued to the Grantor.

(2) Two easements comprising areas of 1,337 square feet and 1,169 square feet, as shown cross-hatched on Hawaiian Electric Company, Inc. Right of Way Map 73-52B, attached hereto as Exhibit "A," being within Lot 3167-B as shown on Map 369 filed with application aforesaid.

Being a portion of the land described in Transfer Certificate of Title No. 307,864 issued to the Grantor.

RESERVING, HOWEVER, unto the Grantor and its tenants and licensees, the right to cultivate and use for all purposes any portions of the granted premises not occupied by the appliances and equipment of the Grantee, including rights of way over, under and across the granted premises; provided, however, that such reserved rights shall be used in a manner that will not unreasonably interfere with the Grantee's lines, appliances and equipment and that no structure, including Grantor's control house within the easement area, shall be erected on the granted premises over the height of twelve (12) feet above the surface of the ground without the written consent of the Grantee.

AND RESERVING ALSO unto the Grantor the right to construct a new 46 KV circuit from Grantee's Kalaeloa substation to Grantor's existing substation by attaching a single circuit 46 KV line using equipment and facilities reasonably approved by Grantee (the Grantee having approved as of the date hereof 336.4 AAC

conductors and a messenger-supported communications cable) on the poles owned by Grantee (P2 to P7) on and over and across Easement 2143, in conformance with the agreement of even date herewith, between Grantor and Grantee, relating to the interconnection of certain of Grantor's and Grantee's facilities; provided, however, that such reserved rights shall be used in a manner that will not unreasonably interfere with Grantee's lines, appliances and equipment; and provided further that each party hereby agrees to indemnify and hold the other party, its officers, directors, agents and employees harmless from and against all claims, losses, damages, liabilities, penalties, demands, suits, costs, expenses (including reasonable attorneys' fees and expenses) and proceedings of any nature whatsoever for bodily injury (including death) or property damage that result from each party's construction, installation or maintenance of its respective facilities, regardless of the negligence or fault (but not gross negligence) of the other party, its officers, directors, agents or employees.

AND SUBJECT, HOWEVER, to all encumbrances of record imposed on Lot 4751 and Lot 3167-B.

TO HAVE AND TO HOLD the same unto the Grantee, its successors and assigns, forever; provided, however, that should any portion or portions of the granted premises be abandoned by the Grantee or remain unused for a period of one (1) year after installation of Grantee's lines, appliances and equipment, then all

rights hereby granted shall thereupon cease and terminate as to the portion or portions so abandoned or unused.

AND the Grantee, in consideration of the foregoing grant, does hereby covenant and agree with the Grantor that:

1. DUE CARE AND DILIGENCE. The Grantee will use due care and diligence in the construction and operation of its lines and appurtenances, in keeping and maintaining them in good and safe condition and repair and in the exercise of its rights hereunder, and will at all times exercise its rights hereunder in a manner that will occasion the least possible interference with or interruption of the use of the premises by the Grantor and its tenants or any other occupants.

2. TAXES. The Grantee will pay when and as due all taxes and assessments levied and assessed against the lines and appurtenances or the easement hereby granted, whether assessed to or payable by the Grantor or Grantee, but this covenant shall not require the payment of taxes or assessments levied against any land subject to this easement.

3. PLACEMENT OF LINES. The Grantee will place and maintain its lines so that the clearance of the wires, conduits and appurtenances will be in accordance with rules established by the Public Utilities Commission of the State of Hawaii.

4. INDEMNITY. The Grantee will indemnify and hold harmless the Grantor, its tenants and all persons occupying the premises or land immediately adjacent thereto, either under lease from or by permission of the Grantor, (a) from any and all claims and demands against them or any of them for loss or damage or injury to persons or property, including the claims of their respective agents and employees, arising out of the use or occupation by Grantee, its agents and employees of the granted premises and the construction, maintenance, operation or removal of the lines and appurtenances not caused by the negligence of the party to be indemnified or their agents or employees acting within the course and scope of their employment, and (b) from and against all damages, costs, counsel fees, expenses and liabilities incurred in or resulting from any such claim or demand or any action or proceeding brought thereon.

5. ASSIGNMENT. The Grantee will not, without the prior written consent of the Grantor, assign or mortgage this grant or sublet or part with the control of the easement or interest therein or rights hereby granted or any part thereof, provided, however, that without such consent this grant may be assigned as security to Hawaiian Trust Company, Limited, Trustee for the Bondholders of the Grantee, and may be assigned by the Trustee upon foreclosure to a purchaser thereof.

6. RESTORATION OF SURFACE. After construction or repair or removal of the lines and appurtenances, the Grantee will restore the surface of the land as nearly as is reasonably possible to the condition existing immediately prior thereto.

7. REMOVAL. The Grantee shall have the right to, and upon abandonment of the easement it will remove all said poles, wires, guys, equipment and appurtenances from the granted premises and will upon such removal restore the surface of the land as nearly as is reasonably possible to its condition immediately prior to the construction or installation of such improvements, the Grantor hereby consenting to such removal; provided, however, that upon abandonment of the easement, Grantee shall leave in place all of Grantor's wires, equipment and appurtenances then located upon the granted premises until Grantor consents to their removal, which consent shall not be unreasonably withheld. In the event Grantee leaves in place its poles at Grantor's request, Grantor shall assume ownership thereof and liability therefor, and shall be obligated to undertake all future removal at Grantor's expense.

8. CLEAR GRANTOR'S TITLE. In the event of abandonment of the easement, the Grantee will prepare, execute and record at its expense an appropriate instrument evidencing the same.

9. NOTICE OF ENTRY. The Grantee shall give twenty-four (24) hours' prior notice to the occupants of the land across which

this easement passes of its intent to enter upon the land for the purpose of constructing, maintaining, repairing or operating its lines, appliances and equipment, except in the event of an emergency, in which case notice will be given as soon as reasonably possible.

10. RELOCATION. If Lot 4751 or Lot 3167-B or any part thereof shall be subdivided or otherwise developed and the lines shown in the easements hereinabove set forth shall in any way interfere with such subdivision, the Grantee, at the expense of Grantor, shall relocate its lines or such portion or portions thereof as interfere, to such substitute easement area or areas as shall be granted by the Grantor to Grantee, or to such public roadways as may be located in the vicinity of the easements hereinabove set forth, and in case of any such relocation the minimum clearance of the wires shall be as hereinabove provided.

11. GRANTOR'S SUBSTATION. In the event that Grantor or an affiliate of Grantor loses possession or control of Lot 1133 as shown on Map 128 filed with Land Court Application 1069, Grantor shall have the right to relocate its electrical substation within the premises of Grantee's electrical substation on Lot 4750; provided, however, that (a) Grantee shall not be obligated to provide an area greater than two thousand one hundred (2,100) square feet for Grantor's substation, (b) said relocation of Grantor's substation shall not unreasonably interfere with

Grantee's equipment or operations, and (c) the 46 kV line between Grantor's 46 kV circuit breaker within said relocated substation and pole P2 shall be underground.

IT IS HEREBY UNDERSTOOD AND AGREED by and between the parties hereto that:

A. CONDEMNATION. If the premises affected by this right of way and easement shall be taken or condemned in whole or in part by any authority having the power of eminent domain, all compensation and damages awarded on account of the condemnation or taking shall be payable to the Grantor, its lessees and tenants, if any, as their interests appear, without any apportionment to the Grantee, except that the Grantee may claim and recover only from the condemning authority full compensation for its lines and equipment and any severance or other damages to its right of way, including the cost of obtaining and relocating to a substitute right of way.

B. LANDSCAPING. The Grantor shall install and maintain or cause to be installed and maintained without expense to the Grantee any screening or landscaping of the Grantee's facilities which may now or hereafter be required by law or governmental agency or regulation or by requirement of the Trustees Under the Will and of the Estate of James Campbell, and will indemnify the

Grantee from all loss and liability arising from the breach of this covenant.

C. PARTIES IN INTEREST. The covenants contained herein shall inure to the benefit of and be binding upon the parties and their respective heirs, personal representatives, successors in trust and assigns. Whenever the term "Grantee" refers to more than one person, each such person covenants for itself and not for the other.

D. DEFINITIONS. All defined terms (words such as Grantor, Grantee, etc.) and pronouns used in the singular shall mean and include the plural and include the masculine, feminine or neuter gender, as the context of this grant shall require. The term "person" shall mean an individual, partnership, association, trust, corporation or other entity as the context may require.

IN WITNESS WHEREOF, the undersigned have executed this instrument as of the date first above mentioned.

HAWAIIAN INDEPENDENT REFINERY, INC.

By_____

Its_____

Grantor

HAWAIIAN ELECTRIC COMPANY, INC., a Hawaii corporation

By_____

Its_____

By_____

Its_____

Grantee

grant1.sla

STATE OF HAWAII)
)SS:
CITY AND COUNTY OF HONOLULU)

On this day of _____, 1991 before me appeared _____ and _____ who, being by me duly sworn, did say that they are the _____ and _____, respectively, of HAWAIIAN ELECTRIC COMPANY, INC., a Hawaii corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation, and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and said officers severally acknowledged said instrument to be the free act and deed of said corporation.

_____
Notary Public
State of Hawaii

My commission expires:

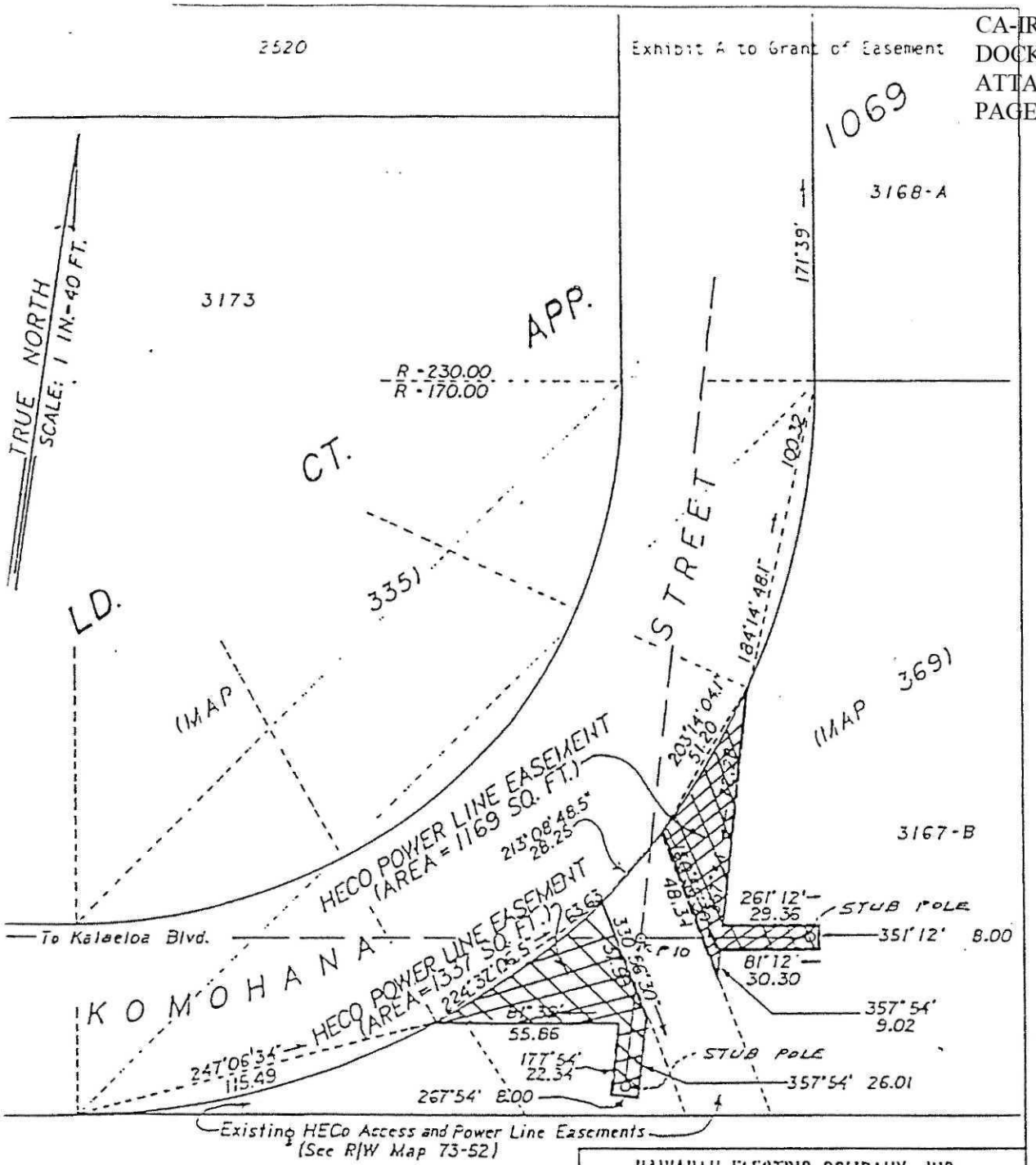
STATE OF HAWAII)
)SS:
CITY AND COUNTY OF HONOLULU)

On this _____ day of _____, 1991 before me appeared _____, to me personally known, who, being by me duly sworn, did say that he is the _____ of HAWAIIAN INDEPENDENT REFINERY, INC., a Hawaii corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation, and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and said officer acknowledged said instrument to be the free act and deed of said corporation.

_____
Notary Public
State of Hawaii

My commission expires:

Exhibit A to Grant of Easement



HAWAIIAN ELECTRIC COMPANY, INC.
HONOLULU, HAWAII

RIGHT OF WAY FOR A. POWER LINE EASEMENT THRU LOT 3167-B (MAP 369) OF LD. CT. APP. 1069. SITUATE OFF KOMOHANA STREET AT HONOULIULI, EWA, OAHU, HAWAII

DESIGNED BY: E.L.	CHECKED BY:
SURVEYED BY: R.J.	DATE: 2/22/89
DRAWN BY: G.H.	SCALE: 1 in.-40 Ft.
TRACED BY:	APPROVED BY:

73-52 B

Note:

Lot 3167-B is owned by
Hawaiian Independent Refinery, Inc.
Cert. of Title: 307,865

TMK: 9-1-52:84

EXHIBIT C

ESTIMATED CONSTRUCTION COSTS TO BE INCURRED BY HECO

HECO Component Number	HECO Component Name	Estimated Cost
	Estimated costs to be reimbursed upon invoicing:	
PC6870	Kalaeloa (HIRI) 25/33MVA #1 Tsf.	$176,900
PC6871	Kalaeloa (HIRI) SS #1 Supervisory Control	60,500
		$237,400
	Estimated costs to be paid prior to construction:	
PS6872	Kalaeloa-HIRI 46KV Overhead Line	35,400
	TOTAL	$272,800

Description of Work:

6870 Design, purchase and install protective relays, meters, and associated equipment; extend existing 138 KV bus and make final electrical connections to the new 138 KV bus; construct ducts from new 138 KV breaker to control house; witness and inspect installation and testing work done by HIRI; review all of HIRI's plans and design; coordinate project conceptual design and HECO/HIRI contract agreements.

6871 Expand HECO's supervisory equipment at the existing HIRI substation and the existing Kalaeloa substation; accommodate the supervisory points from the newly proposed HIRI substation.

6872 Design and install a new 46 KV overhead circuit from pole 2 to pole 7 beneath the existing 138 KV circuit of the Kalaeloa-CEIP 138 KV line.

Page 30 contains confidential information and is being provided subject to Protective Order No. 23378, dated April 23, 2007.

BHP Petroleum Americas Refining Inc.
91-325 Komohana Street
Ewa Beach, Hawaii 96707
Telephone (808) 547-3800
Fax (808) 547-3066

BHP
Petroleum Americas

March 11, 1993

HAWAIIAN ELECTRIC COMPANY INC.
Marketing Services Division
P.O. Box 2750
Honolulu, Hawaii 96840-0001

Dear Mr. Kaneshiro,

BHP Petroleum Americas (Hawaii) Inc. formerly known as Pacific Resources, Inc. (PRI) proudly announces the new name of its subsidiary, **BHP Petroleum Americas Refining Inc.** formerly Hawaiian Independent Refinery, Inc. Just the name has changed all other aspects of the refinery will remain the same.

Please inform your accounting department of this change.
Our account number for sales of electrcity from our cogen unit is 8800-6849-075.

Thank you for your assistance in this matter.

Sincerely,

Ronald Sasaki

Ronald Sasaki

cc: Accounting Department

JUN 1 9 1998 P.2

TESORO

Tesoro Hawaii Corporation
733 Bishop Street Suite 2700
P.O. Box 3379
Honolulu, Hawaii 96842-0001
808 547-3111
808 547-3145 Fax

June 17, 1997

Stephanie A. Gonsalves, Esq.
Hawaiian Electric Company
P.O. Box 2750
Honolulu, HI 96840

BHPPARI Change of Name and Ownership

Dear Stephanie:

I enjoyed seeing you today at the HSBA meeting and I'm glad that we had a chance to talk briefly about the recent changes at my company.

On May 29, 1998, Tesoro Petroleum Corporation purchased all of the capital stock and related operating assets of BHP Petroleum Americas Refining Inc. On June 5, 1998, BHP Petroleum Americas Refining Inc. changed its name to Tesoro Hawaii Corporation. I am attaching a copy of the DCCA Name Change Certificate for your use and further distribution within HEI.

Please let me know if you need any further information and I hope to see you again soon.

Yours very truly,

David H. Leonard, P.E., Esq.

Attachment

Submit Original and One True Copy

NAME CHANGE ONLY

STATE OF HAWAII
DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS
Business Registration Division
1010 Richards Street
Mailing Address: P. O. Box 40, Honolulu, Hawaii 96810

RECEIVED
JUN - 5 1998
12:19 pm
Dept of Commerce & Consumer Affairs
STATE OF HAWAII

ARTICLES OF AMENDMENT TO CHANGE CORPORATE NAME
(Section 415-61, Hawaii Revised Statutes)

The undersigned, duly authorized officers of the corporation submitting these Articles of Amendment, certify as follows:

1. The present name of the corporation is:

   BHP Petroleum Americas Refining Inc.

2. The name of the corporation is changed to:

   Tesoro Hawaii Corporation

3. Total number of shares outstanding is: 500.

4. If adoption of the amendment to change the corporate name was at a meeting, complete the following:

   The meeting of the shareholders was held on _____ (Month Day Year).

Class/Series	Number Voting For Amendment	Number Voting Against Amendment

5. If adoption of the amendment to change the corporate name was by unanimous written consent of the shareholders, complete the following:

   By written consent dated May (Month) 29 (Day) 1998 (Year), the shareholders unanimously adopted the amendment to change the corporate name.

We certify under the penalties of Section 415-136, Hawaii Revised Statutes, that we have read the above statements, and that the same are true and correct.

Witness our hands this 29th day of May, 19 98.

James C. Reed, Jr.
Executive Vice President
(Type/Print Name & Title)

Charles L. Magee
Vice President, General Counsel and Assistant Secretary
(Type/Print Name & Title)

James C. Reed
(Signature of Officer)

Charles L. Magee
(Signature of Officer)

(See Reverse Side For Instructions)

DL-4
Rev. 10/91

BT4 (Fax)
AMD (W/SH)

CA-IR-226

Ref: T-5, page 5, lines 4 – 7, HECO-WP-412, pages 20 and 27.

The referenced section of testimony indicates that H-Power is shut down for routine maintenance every year, HECO-WP-412, page 20 does not include H-Power in the Thermal Maintenance Summary input to the production simulation. The pattern file for H-Power, Pattern 1 found on HECO-WP-412, page 27, indicates that H-Power has no maintenance outages as described in the referenced testimony.

a. Were maintenance outages for H-Power modeled in the production simulation?

b. If so, please explain how the maintenance outages for H-Power were modeled in the production simulation.

HECO Response:

a. Yes, two 23 MW outages were modeled for H-Power in the production simulation, as noted in the table in response to part c. of CA-IR-250.

b. As noted in the question, HECO-WP-412, page 27, provides the applicable pattern file for H-Power (Pattern 1). When "Capacity Multiplier = 0.5", it means that H-Power is being modeled with a 23 MW outage for the applicable period (refer to sections of pattern file beginning on January 20 and July 14).

CA-IR-227

Ref: Response to CA-IR-37, Attachment 1, pages 44 and 45 (Figures 9 and 10: Lost MWH).

Please provide the following information:

a. Input data and adjustments used to prepare these tables, including normalization adjustments made "for 2004 and 2005 Events at Waiau 8, 9 and Kahe 5, 6" (Excel file format, if available).

b. Updated calculations and Figures 9 and 10 to include actual 2006 information.

c. Estimated Lost MWH for test year 2007, based upon scheduled outages and an assumed 5 percent EFOR rate.

d. State and explain HECO's objective management target(s) for Lost MWH in a representative year.

HECO Response:

a. HECO is unable to provide the data requested as ESI did not provide HECO with the input data and adjustments used in the tables and charts in the ESI report. ESI had independent access to data from the North American Electric Reliability Corporation Generating Availability Data System (NERC GADS). Accordingly, ESI independently accessed NERC GADS to perform their analysis of HECO's historical EAF and EFOR statistics.

While not confirmed with ESI, HECO has attempted to reconstruct the normalization adjustments made by ESI for Waiau 8 and 9 and Kahe 5 and 6 in Figures 9 and 10 of the ESI report. (ESI was a for-profit subsidiary of EPRI, engaged in consulting work. ESI was

discontinued as a separate entity in late 2006, and was absorbed into EPRI. The consultants who prepared the ESI report are no longer with EPRI.) The adjustments were as follows:

	2004			2005		
	ESI Fig 9	ESI Fig 10	delta	ESI Fig 9	ESI Fig 10	delta
FO	243535	140241	103294	548028	251044	296984
Derate	285142	285142	0	243350	243350	0
PO+MO	995163	815163	180000	895298	755298	140000

- ESI's Forced Outage MWH reduction of 103,294 in 2004 exactly equals HECO's records for forced outage lost MWH by W9 during the period 10/11/04 to 12/31/04 (103,294 MWH lost).
- ESI's Forced Outage MWH reduction of 296,984 in 2005 exactly equals HECO's records for the sum of forced outage lost MWH by W9 during the period 01/01/05 to 04/11/05 (126,947 MWH lost) and for Waiau 8 during the period 10/14/05 to 12/31/05 (170,037 MWH lost).
- ESI's PO + MO lost MWH reduction of 180,000 in 2004 is approximately 50% of the planned outage lost MWH for Kahe 5 during the period 02/01/04 to 05/15/04 (353,291 MWH lost).
- ESI's PO + MO lost MWH reduction of 140,000 in 2005 is approximately 50% of the planned outage lost MWH for Kahe 6 during the period 05/01/05 to 07/31/05 (277,087 MWH lost).

The HECO data file included as Attachment 1 to this response contains data similar to that used by ESI in their plots. This file is also provided in electronic format, filename "CA-IR-227 Attachment 1 History.xls".

b. Attachments 2 and 3 to this response are updated calculations, and updated Figures 9 and 10 to include 2006 actual information. These calculations and charts utilize HECO data for all

years and differ slightly from the values in ESI's charts. The differences are small and do not materially affect the conclusions of the ESI Report. When comparing PO, MO, and FO lost MWHs, HECO includes D4 lost MWHs with PO lost MWHs. For the purposes of this update to ESI's figures, D4 lost MWHs are not included with PO lost MWHs but with D1, D2, and D3 lost MWHs as was likely done by ESI in their report figures.

c. The estimated lost MWH due to PO and MO, based upon the scheduled outages reflected on the 2/14/06, 7/21/06, and 11/21/06 revisions of the 2007 Planned Maintenance Schedules, are reflected in CA-IR-64, Attachment 2, and also in HECO's response to CA-IR-229. HECO does not forecast MWH lost due to EFOR for maintenance schedule planning purposes. The amount of lost MWH corresponding to an EFOR of 5% would be determined by performing a Production Simulation Run. HECO has not performed such a simulation and is unable to provide the lost MWH due to a 5% EFOR.

d. HECO does not have an objective management target for Lost MWH in any year. As described in HECO T-6, pages 18, line 18, to page 20, line 20, and in HECO's response to CA-IR-64, it is difficult to predict when equipment will fail with certainty, and significant changes in PO and MO scheduling can occur as the year progresses. However, as described in CA-IR-64, during the development of the Planned Maintenance Schedule for any future year, HECO reviews the historical lost MWH total due to PO + D4 and MO and uses those amounts as a reference for a reasonable level of PO and MO lost MWH to plan for in the future schedule. As stated in HECO's response to CA-IR-64 in Attachment 2, the total of PO + D4 and MO lost MWH has ranged from 893,234 to 1,056,099 in the past 5 years from 2002 to 2006.

Also, in HECO's 2007 Adequacy of Supply (AOS) filing, page 16, HECO states that "the unavailable MWh from the (2007) Planned Maintenance Schedule were used as a benchmark for levelizing unavailable MWh for years 2008 and beyond." The 07/21/07 revision of the 2007 Planned Maintenance Schedule was used for the AOS and rate case production simulation. As shown in HECO's response to CA-IR-64, the total lost MWH for PO and MO for this schedule is 602,592 and 337,920, respectively, for a total of 940,512. Lost MWH due to forced outages (FO) are not a consideration in the development of Planned Maintenance Schedules, but are a consideration in the development of HECO's AOS.

Hawaiian Electric Company Inc.
2007 Rate Case
filename: CA-IR-227 Attachment 1_History.xls

	Planned Outage	Maintenance Outage	Scheduled Outage Extention	Startup Failure	Unplanned Outage - Immediate	Unplanned Outage - Delayed	Unplanned Outage - Postponed	Reserve Shutdown	Planned Derating	Unplanned Derating - Immediate	Unplanned Derating - Delayed	Unplanned Derating - Postponed	Unplanned Derating - Deferred	Noncurtailing Equipment Outage	Grand Total	Year-to-Date Grand Total
	PO	**MO**	**SE**	**SF**	**U1**	**U2**	**U3**	**RS**	**PD**	**D1**	**D2**	**D3**	**D4**	**NC**		
Jan-85	69,133.1	-	-	-	6,471.8	410.1	1,252.8	-	-	4,857.5	1,471.7	236.8	-	-	83,833.9	83,833.9
Feb-85	38,423.5	4,285.7	-	-	4,184.7	2,109.0	996.6	-	-	3,908.8	1,119.9	1,097.6	3,808.5	-	59,934.3	143,768.2
Mar-85	49,962.4	11,017.4	-	442.7	25,968.8	740.3	2,499.6	-	-	6,126.7	901.5	480.4	-	-	98,139.6	241,907.8
Apr-85	76,350.7	312.5	-	568.5	6,562.6	161.7	8,868.8	-	-	2,342.0	1,995.7	817.0	944.0	-	98,923.5	340,831.3
May-85	63,984.0	30,069.5	-	14.7	6.4	273.7	2,835.6	-	-	2,633.8	2,962.7	36.3	-	-	102,816.6	443,647.9
Jun-85	40,506.0	18,927.4	-	-	79.2	-	-	-	-	2,160.0	3,656.2	-	319.1	-	65,647.8	509,295.7
Jul-85	54,135.0	21,534.5	-	2,031.2	240.3	1,000.4	-	-	-	-	6,158.4	-	321.3	-	85,421.2	594,716.9
Aug-85	40,086.0	26,240.8	-	22.1	672.3	111.7	-	-	-	1,761.8	7,747.6	-	2,078.4	-	78,720.7	673,437.6
Sep-85	969.0	59,505.0	-	53.9	395.0	-	-	-	-	254.0	6,709.1	-	1,398.0	-	69,284.1	742,721.7
Oct-85	41,346.5	19,010.4	-	400.2	246.1	-	-	-	-	-	7,354.3	-	2,421.7	-	70,779.3	813,501.0
Nov-85	39,600.0	-	-	16,620.0	4,754.4	-	2,625.9	-	1,192.8	837.2	5,816.5	188.5	294.1	-	71,929.4	885,430.4
Dec-85	40,920.0	7,454.1	-	16,273.7	556.9	-	743.3	-	2,821.1	7,552.1	7,073.7	-	12.2	-	83,407.2	968,837.6
Jan-86	44,239.8	20,140.1	-	9,372.7	1,302.2	-	405.0	-	-	750.5	1,435.8	-	330.0	-	77,976.1	77,976.1
Feb-86	61,015.1	10,732.8	-	201.2	-	19,557.4	-	-	2,702.3	-	3,813.0	2,392.1	720.2	-	101,134.1	179,110.2
Mar-86	60,059.0	4,364.1	6,045.8	3,647.6	-	-	641.9	-	-	173.1	257.8	-	830.8	-	76,020.3	255,130.5
Apr-86	84,649.2	5,065.7	-	1,101.7	617.2	776.2	-	-	-	-	2,054.7	975.0	-	-	95,239.8	350,370.2
May-86	63,921.3	3,884.4	-	182.4	-	-	1,012.2	-	-	-	1,887.5	211.8	-	-	71,099.6	421,469.9
Jun-86	49,307.3	6,882.3	-	-	712.6	6,840.2	-	-	1,485.2	393.5	4,546.8	-	-	-	70,167.8	491,637.6
Jul-86	12,482.9	20,654.9	20,581.2	1,366.7	-	-	2,838.5	-	539.8	3,364.0	4,689.0	220.4	-	-	66,737.3	558,375.0
Aug-86	37,577.3	11,731.0	-	98.6	289.2	353.3	-	-	-	13,758.3	1,790.1	-	711.5	-	66,309.3	624,684.3
Sep-86	41,040.0	11,073.5	-	931.3	581.1	190.0	-	-	269.0	240.3	1,545.6	-	134.5	-	56,005.2	680,689.6
Oct-86	42,408.0	3,709.2	-	-	759.5	298.7	-	-	151.2	-	931.1	879.0	-	-	49,136.7	729,826.3
Nov-86	41,040.0	3,518.5	-	780.4	-	3,301.4	2,937.0	-	-	-	2,190.9	261.0	398.7	-	54,427.8	784,254.1
Dec-86	36,911.7	6,234.1	-	-	42.5	565.8	117.8	-	150.0	-	169.8	147.3	53.1	-	44,392.1	828,646.2
Jan-87	36,456.0	2,810.0	-	36.2	524.9	-	-	-	-	362.0	134.3	69.3	957.7	-	41,350.5	41,350.5
Feb-87	56,010.0	2,360.4	6,624.8	-	149.1	2,078.3	266.9	-	-	-	171.5	242.1	217.4	-	68,120.6	109,471.1
Mar-87	68,145.1	10,390.9	-	-	5,211.1	31,992.0	2,777.0	-	-	6,016.0	92.7	-	38.3	-	124,663.0	234,134.1
Apr-87	102,240.0	1,609.6	-	49.2	367.5	4,198.2	-	-	-	122.7	1,211.8	-	-	-	109,799.1	343,933.2
May-87	70,739.3	19,617.4	-	60.8	15.5	-	1,194.4	-	-	-	10,835.7	447.9	230.5	-	103,141.6	447,074.8
Jun-87	17,765.7	25,256.3	-	-	375.5	542.3	-	-	-	-	20,414.0	-	-	-	64,353.9	511,428.7
Jul-87	-	9,744.9	-	279.8	435.5	1,749.9	-	-	-	-	810.0	430.9	193.4	-	13,644.4	525,073.1
Aug-87	33,230.1	543.0	-	-	1,107.6	757.9	-	-	-	-	118.3	-	1,323.5	-	37,080.3	562,153.4
Sep-87	3,250.0	34,390.2	-	-	302.9	-	-	-	-	-	45.6	24.5	279.1	-	38,292.4	600,445.8
Oct-87	3,417.5	37,543.7	-	-	34,084.5	1,580.1	418.5	-	-	170.7	421.2	360.4	247.8	-	78,244.4	678,690.3
Nov-87	25,593.0	4,501.4	-	1,216.4	22,819.5	2,319.5	1,467.3	-	-	27.0	790.6	35.5	118.0	-	58,888.1	737,578.4
Dec-87	42,408.0	3,474.9	-	1,418.6	93.8	346.7	254.6	-	-	1.2	199.7	272.8	118.2	-	48,588.5	786,166.9
Jan-88	42,408.0	9,940.4	-	701.4	229.6	-	3,007.2	-	-	-	1,157.6	72.7	953.1	-	58,469.9	58,469.9
Feb-88	51,951.2	10,966.7	-	43.7	-	492.5	-	-	-	-	1,243.0	-	-	-	64,697.2	123,167.1
Mar-88	43,803.5	16,146.4	-	10,791.0	12,228.5	-	-	-	-	11,842.9	7,738.3	1,700.7	15,926.7	-	120,177.9	243,345.0
Apr-88	28,596.2	4,668.1	-	26,531.2	-	234.7	-	-	-	-	9,746.2	-	27,689.3	-	97,465.6	340,810.6
May-88	105,648.0	1,654.9	-	2,161.8	1,734.3	589.5	-	-	-	-	10,570.9	229.0	478.3	-	123,066.8	463,877.4
Jun-88	60,501.5	10,371.4	-	208.4	3,860.3	21,052.5	-	-	-	12.5	12,930.3	-	-	-	108,936.8	572,814.2
Jul-88	31,054.6	5,850.9	-	164.3	-	29,255.1	-	-	-	-	17,905.4	85.9	-	-	84,316.2	657,130.4
Aug-88	63,984.0	5,346.6	-	628.5	-	596.6	-	-	-	-	15,005.9	-	394.3	-	85,956.0	743,086.4
Sep-88	57,401.2	8,586.2	-	271.5	11,181.5	-	5,824.4	-	-	1,917.9	9,084.9	61.1	-	-	94,328.6	837,415.0
Oct-88	39,432.0	3,729.5	-	199.2	11.6	-	1,602.5	-	-	-	7,507.2	-	3,069.9	-	55,551.8	892,966.8
Nov-88	32,847.8	4,980.2	-	227.5	1,603.7	3,820.6	2,012.9	-	-	-	3,222.8	978.3	239.8	-	49,933.5	942,900.4
Dec-88	36,456.0	4,536.7	-	417.8	8,331.1	-	757.9	-	-	248.0	62.1	3,015.4	1,238.2	-	55,063.3	997,963.7

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	Planned Outage	Maintenance Outage	Scheduled Outage Extention	Startup Failure	Unplanned Outage - Immediate	Unplanned Outage - Delayed	Unplanned Outage - Postponed	Reserve Shutdown	Planned Derating	Unplanned Derating - Immediate	Unplanned Derating - Delayed	Unplanned Derating - Postponed	Unplanned Derating - Deferred	Noncurtailing Equipment Outage	Grand Total	Year-to-Date Grand Total
	PO	**MO**	**SE**	**SF**	**U1**	**U2**	**U3**	**RS**	**PD**	**D1**	**D2**	**D3**	**D4**	**NC**		
Jan-89	38,754.2	7,901.2	-	317.5	982.2	-	-	-	-	-	727.7	1,660.0	767.9	-	51,110.7	51,110.7
Feb-89	50,523.0	3,372.7	-	220.8	112.5	-	-	-	-	-	408.5	943.4	2,250.9	-	57,831.9	108,942.6
Mar-89	64,503.0	6,322.6	-	35.0	2,301.5	1,508.4	13,216.1	-	-	-	535.8	1,683.3	120.6	-	90,226.4	199,169.0
Apr-89	30,911.0	4,853.8	-	116.5	7,773.0	14,523.0	25,359.9	-	-	-	1,420.3	1,388.0	132.0	-	86,477.6	285,646.6
May-89	77,109.7	5,898.1	-	-	229.2	-	516.7	-	-	-	568.8	1,375.3	1,297.9	-	86,995.6	372,642.2
Jun-89	61,920.0	3,139.7	-	-	935.3	-	-	-	-	-	71.6	580.3	680.5	-	67,327.5	439,969.7
Jul-89	44,249.8	3,821.4	-	-	719.5	-	-	-	-	-	690.1	964.8	560.2	-	51,005.6	490,975.3
Aug-89	17,594.2	17,945.0	-	1,889.8	1,848.9	163.4	-	-	-	-	1,133.3	79.5	77.1	-	40,731.1	531,706.4
Sep-89	14,945.0	18,230.2	-	78.3	76.3	-	4,136.9	-	-	-	3,151.2	2,926.3	-	-	43,544.1	575,250.5
Oct-89	36,456.0	3,088.6	-	-	579.8	-	-	-	-	-	11.1	1,568.2	714.0	-	42,417.7	617,668.3
Nov-89	24,550.5	2,906.9	-	10,375.6	1.6	-	7,120.7	-	-	-	-	343.5	776.1	-	46,075.0	663,743.3
Dec-89	30,593.8	1,185.6	-	35.0	10,563.0	766.7	-	-	-	-	598.7	1,114.5	76.3	-	44,933.6	708,676.9
Jan-90	56,385.0	85.8	-	8,690.6	250.8	3,357.3	-	-	-	634.1	1,420.4	188.4	60.8	-	71,073.3	71,073.3
Feb-90	56,911.7	5,149.6	-	-	401.5	16,593.0	-	-	-	-	2,992.9	2,325.1	892.1	-	85,266.0	156,339.3
Mar-90	63,952.2	4,302.2	-	374.7	3,892.4	12,493.9	-	-	-	2,820.0	2,471.7	213.5	358.7	-	90,879.4	247,218.7
Apr-90	58,220.0	2,867.3	-	-	20,281.1	1,466.0	-	-	-	(47.4)	853.0	452.3	4,018.3	-	88,110.6	335,329.3
May-90	36,991.0	2,403.9	-	-	25,661.9	45.8	5,330.1	-	-	21,516.1	294.5	511.3	2,902.9	-	95,657.6	430,986.9
Jun-90	33,747.3	5,625.8	-	30.9	36,000.0	-	4,619.7	-	-	6,020.6	56.0	605.3	3,681.5	-	90,387.2	521,374.0
Jul-90	66,216.0	-	-	-	37,594.9	-	-	-	-	7,944.5	-	-	3,062.6	-	114,818.0	636,192.0
Aug-90	55,191.3	1,644.2	1,082.6	-	10,696.1	-	6,626.3	-	-	980.3	297.2	17,051.7	3,084.3	-	96,653.8	732,845.9
Sep-90	28,348.0	5,840.8	31.8	-	415.4	4,457.3	-	-	-	105.6	-	514.1	1,531.4	-	41,244.3	774,090.2
Oct-90	29,492.0	4,907.4	-	465.5	-	-	208.3	-	40.3	52.3	127.5	1,482.1	-	-	36,775.3	810,865.5
Nov-90	36,394.2	5,587.2	-	-	210.2	1,391.2	3,521.9	-	-	-	605.0	297.1	99.6	-	48,106.4	858,972.0
Dec-90	-	1,850.2	-	2,071.5	1,942.2	704.0	17,874.9	-	-	-	708.2	1,551.8	64.2	-	26,767.0	885,739.0
Jan-91	34,394.0	3,317.0	-	1,303.7	2,489.0	-	1,676.6	-	-	2,595.7	2,984.6	2,325.0	3,236.4	-	54,322.1	54,322.1
Feb-91	38,976.0	8,148.7	-	17.5	492.5	282.2	1,462.1	-	-	2,897.5	13.3	11.1	140.6	-	52,441.4	106,763.5
Mar-91	34,256.7	6,809.0	-	963.7	6,446.8	-	-	-	-	2,976.0	977.4	124.1	-	-	52,553.7	159,317.2
Apr-91	34,045.4	11,368.2	-	3,028.5	12,089.8	-	-	-	-	8,935.6	899.0	-	128.8	-	70,495.4	229,812.6
May-91	25,038.9	9,950.0	-	-	67.5	-	196.8	-	-	5,842.1	18.0	9,955.4	323.6	-	51,392.3	281,204.8
Jun-91	60,224.7	3,168.9	-	24.7	393.0	3,158.9	9,037.4	-	-	2,880.0	599.7	3,694.0	89.1	-	83,270.5	364,475.3
Jul-91	66,960.0	4,489.8	-	1,575.0	1,000.3	6,385.3	-	-	-	3,681.5	642.5	1,133.0	19.2	-	85,886.5	450,361.9
Aug-91	77,558.5	1,965.0	-	2,625.0	18.3	1,385.1	1,386.0	-	-	4,527.8	986.8	319.9	74.4	-	90,846.9	541,208.8
Sep-91	79,534.3	965.1	-	10,463.0	316.3	-	-	-	-	3,718.2	1,931.0	880.0	19.0	-	97,827.0	639,035.8
Oct-91	63,462.3	1,010.4	-	-	2,464.0	-	-	-	-	1,488.0	86.0	55.3	418.3	-	68,984.3	708,020.2
Nov-91	24,695.0	21,106.0	-	-	120.0	1,130.8	1,447.8	-	-	1,440.0	85.3	158.0	527.4	-	50,710.4	758,730.5
Dec-91	40,920.0	1,500.0	-	-	-	239.2	-	-	-	1,488.0	-	1,408.9	224.6	-	45,780.7	804,511.2
Jan-92	63,379.2	-	-	2,692.3	132.0	1,282.3	36.7	-	-	1,488.0	6,913.9	296.0	1,434.9	-	77,655.2	77,655.2
Feb-92	39,672.0	7,198.6	-	3,560.0	5,255.2	-	3,694.4	-	-	1,426.1	6,535.1	-	115.7	-	67,457.1	145,112.3
Mar-92	15,793.8	4,971.5	-	-	-	3,617.2	-	-	-	1,488.0	380.6	37.8	77.9	-	26,366.7	171,479.0
Apr-92	38,149.5	4,405.7	-	389.3	155.2	-	5,900.1	-	-	1,440.0	9.2	491.9	582.1	-	51,522.8	223,001.8
May-92	77,052.6	6,689.7	-	65.0	589.3	846.8	-	-	-	1,488.0	357.0	528.8	35.2	-	87,652.4	310,654.2
Jun-92	82,689.9	1,968.6	-	-	153.8	-	-	-	-	1,440.0	1,675.5	-	-	-	87,927.8	398,582.0
Jul-92	59,372.0	10,369.8	-	-	1,035.8	435.9	3,253.6	-	-	1,488.0	904.5	-	2,178.9	-	79,038.6	477,620.6
Aug-92	63,984.0	2,360.7	-	42.5	1,604.8	810.2	1,191.6	-	-	1,488.0	303.9	13.5	375.0	-	72,174.1	549,794.7
Sep-92	44,653.0	2,461.9	-	4,482.5	1,518.6	159.5	4,910.8	-	-	-	70.0	24.0	333.2	-	58,613.5	608,408.2
Oct-92	42,408.0	24,239.5	-	643.5	362.4	-	1,435.5	-	-	-	1,293.9	860.2	1,677.8	-	72,920.8	681,328.9
Nov-92	41,926.9	430.7	-	-	-	-	38,629.5	-	-	-	-	67.0	-	-	81,054.1	762,383.0
Dec-92	46,607.7	822.0	-	-	339.6	814.5	-	-	-	2,593.9	-	238.0	127.5	-	51,543.2	813,926.2

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	Planned Outage	Maintenance Outage	Scheduled Outage Extention	Startup Failure	Unplanned Outage - Immediate	Unplanned Outage - Delayed	Unplanned Outage - Postponed	Reserve Shutdown	Planned Derating	Unplanned Derating - Immediate	Unplanned Derating - Delayed	Unplanned Derating - Postponed	Unplanned Derating - Deferred	Noncurtailing Equipment Outage	Grand Total	Year-to-Date Grand Total
	PO	**MO**	**SE**	**SF**	**U1**	**U2**	**U3**	**RS**	**PD**	**D1**	**D2**	**D3**	**D4**	**NC**		
Jan-93	30,850.0	5,622.1	-	3,355.1	6,852.6	-	2,486.6	-	-	2,728.1	11.3	840.2	3,720.8	-	56,466.8	56,466.8
Feb-93	76,672.5	2,244.8	-	502.0	990.0	-	-	-	-	-	630.4	-	24.5	-	81,064.2	137,531.0
Mar-93	46,935.0	16,315.6	-	-	203.3	136.5	2,399.7	-	-	-	-	-	745.9	-	66,736.0	204,267.0
Apr-93	64,800.0	6,697.1	-	2,802.8	290.3	137.8	-	-	-	90.5	835.6	38.6	634.3	-	76,327.0	280,594.0
May-93	82,872.5	20,724.6	-	38.0	-	153.0	-	-	-	-	3,162.1	-	72.7	-	107,022.9	387,616.9
Jun-93	102,240.0	956.5	-	-	203.5	-	-	-	-	-	228.4	228.9	24.7	-	103,882.1	491,499.0
Jul-93	58,259.1	16,482.6	-	123.0	783.4	-	-	-	-	-	718.2	95.0	28.8	-	76,490.1	567,989.1
Aug-93	41,322.0	4,708.0	-	17,791.0	6,228.4	-	-	-	-	1,503.0	1,001.6	38.3	296.4	-	72,888.7	640,877.7
Sep-93	39,600.0	13,161.6	-	407.1	53.8	975.4	-	-	-	8,463.5	-	-	14.9	-	62,676.3	703,554.0
Oct-93	36,524.6	2,473.7	-	53.9	760.3	785.5	-	-	-	6,017.7	-	381.2	438.8	-	47,435.6	750,989.7
Nov-93	66,912.2	732.3	-	-	-	6,908.7	-	-	-	2,525.3	-	122.7	206.2	-	77,407.3	828,397.0
Dec-93	26,643.6	20,578.8	-	38.5	633.2	-	-	-	-	12,090.0	47.4	36.8	1,394.9	-	61,463.2	889,860.2
Jan-94	34,472.5	653.3	-	-	1,435.1	1,416.6	-	-	-	670.6	41.4	1,467.0	5,706.6	-	45,863.2	45,863.2
Feb-94	51,673.8	4,403.2	-	93.4	355.5	5,376.8	-	-	-	9,470.1	838.1	7,833.0	126.6	-	80,170.4	126,033.7
Mar-94	81,357.9	24,709.8	-	749.8	4,943.6	856.4	-	-	-	2,646.4	1,599.9	3,130.1	58.2	-	120,052.1	246,085.7
Apr-94	94,586.2	8,071.0	-	-	1,700.4	-	-	-	-	105.5	1,437.5	264.0	377.7	-	106,542.3	352,628.0
May-94	63,457.0	2,622.8	-	-	19.9	-	-	-	-	-	220.5	-	37.9	-	66,358.1	418,986.1
Jun-94	64,080.0	3,948.5	-	-	-	22.9	-	-	-	-	-	-	396.6	-	68,448.0	487,434.1
Jul-94	66,216.0	67.1	-	-	2,556.5	-	1,111.5	-	-	4,223.0	-	-	6,590.7	-	80,764.9	568,199.0
Aug-94	14,466.7	8,618.4	-	88.0	1,098.0	-	-	-	-	1,521.7	7,453.6	-	108.9	-	33,355.3	601,554.4
Sep-94	33,801.0	28,046.2	-	14.7	1,046.3	5.0	-	-	-	8,189.7	3,863.6	728.2	585.0	-	76,279.7	677,834.1
Oct-94	62,529.0	22,609.9	-	-	182.2	-	-	-	-	-	272.5	4.0	560.1	-	86,157.7	763,991.8
Nov-94	74,856.4	865.8	-	1,009.7	30.0	-	-	-	-	-	27.9	-	86.2	-	76,876.1	840,868.0
Dec-94	42,920.0	22,862.9	-	865.7	270.9	-	-	-	-	21.2	9.3	623.3	1,094.4	-	68,667.7	909,535.7
Jan-95	63,697.5	11,818.4	-	-	971.9	-	-	-	-	-	-	-	332.6	-	76,820.3	76,820.3
Feb-95	65,872.7	5,943.4	-	-	2,550.0	-	-	-	-	-	639.9	113.1	335.6	-	75,454.7	152,274.9
Mar-95	129,686.0	2,016.2	-	1,287.9	125.9	-	9,122.4	-	-	-	90.3	140.7	148.0	-	142,617.4	294,892.4
Apr-95	117,034.2	5,843.7	-	-	376.3	2,681.7	-	-	-	2,652.5	273.5	-	655.1	-	129,517.1	424,409.5
May-95	169,030.0	2,769.5	-	-	676.7	2,338.9	-	-	-	2,355.2	123.3	93.9	80.6	-	177,468.0	601,877.5
Jun-95	116,190.0	9,782.7	-	151.2	-	-	-	-	-	-	15.8	-	112.7	-	126,252.5	728,130.0
Jul-95	63,984.0	33,078.2	-	90.0	-	-	-	-	-	-	912.0	-	1,191.9	-	99,256.2	827,386.1
Aug-95	6,564.6	25,216.1	-	783.3	1,409.2	-	-	-	-	-	13,481.2	-	914.3	-	48,368.7	875,754.8
Sep-95	36,017.8	61,229.6	-	219.4	-	603.2	-	-	-	-	-	-	42.1	-	98,112.2	973,867.1
Oct-95	60,830.3	2,564.7	-	116.8	8.5	-	-	-	-	-	414.2	9.7	513.0	-	64,457.3	1,038,324.4
Nov-95	31,869.4	1,865.9	-	-	-	-	-	-	-	-	-	-	1,242.5	-	34,977.8	1,073,302.2
Dec-95	14,384.0	7,050.0	-	1,853.5	2,709.8	-	1,552.7	-	-	-	503.1	-	-	-	28,053.0	1,101,355.2
Jan-96	126,814.8	1,990.0		45.8	184.4	3,322.4	750.5					152.7	218.4		133,479.0	133,479.0
Feb-96	43,301.7	22,332.1		878.9		13,119.0					5,773.3	314.3	503.7		86,223.0	219,702.0
Mar-96	40,920.0	27,873.1		326.9			312.4				195.2		7,517.2		77,144.8	296,846.8
Apr-96	41,144.2	29,538.7		1,216.0						12.9	387.2		11,386.9		83,685.8	380,532.7
May-96	23,166.0	24,627.8		682.6	1,216.5						666.4		109.0		50,468.3	431,001.0
Jun-96	44,057.0	770.5		168.2		584.4				2,033.9	578.5		29.0		48,221.6	479,222.6
Jul-96	63,984.0	1,679.4			393.1					134.8	564.5				66,755.8	545,978.4
Aug-96	63,984.0	1,240.5		1,083.0	8,946.6						543.5		873.7		76,671.3	622,649.7
Sep-96	74,968.7	9,869.1		510.1	68.1						32.4		403.6		85,852.0	708,501.7
Oct-96	51,079.4	28,921.0		2,853.0							243.5	195.2	1,189.8		84,481.8	792,983.5
Nov-96	64,636.9	35,917.2			1,360.8						513.4	504.6	1,468.5		104,401.3	897,384.8
Dec-96	36,456.0	46,977.5			1,344.1	1,900.4	1,148.6			1,784.3	472.6	326.6	1,644.3		92,054.5	989,439.3

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	Planned Outage	Maintenance Outage	Scheduled Outage Extention	Startup Failure	Unplanned Outage - Immediate	Unplanned Outage - Delayed	Unplanned Outage - Postponed	Reserve Shutdown	Planned Derating	Unplanned Derating - Immediate	Unplanned Derating - Delayed	Unplanned Derating - Postponed	Unplanned Derating - Deferred	Noncurtailing Equipment Outage	Grand Total	Year-to-Date Grand Total
	PO	**MO**	**SE**	**SF**	**U1**	**U2**	**U3**	**RS**	**PD**	**D1**	**D2**	**D3**	**D4**	**NC**		
Jan-97	108,788.3	14,859.3			5,857.5	4,944.0	2,585.7			338.1	33.3	505.6			137,911.8	137,911.8
Feb-97	38,340.0	13,339.1		149.3	163.2	7,130.5				26.4	553.1				59,701.6	197,613.4
Mar-97	101,799.1	9,400.2	-	1,453.5	1,440.7	-	-	-	-	-	217.1	-	29.9	-	114,340.4	311,953.8
Apr-97	23,087.6	30,474.9	-	-	7,263.9	1,968.0	-	-	-	21.0	7,044.9	-	645.9	-	70,506.3	382,460.1
May-97	101,918.1	10,105.5	-	58.8	1,845.4	-	-	-	-	-	2,465.6	-	142.1	-	116,535.6	498,995.6
Jun-97	102,240.0	9,448.6	-	203.3	-	-	-	-	-	-	132.9	-	234.4	-	112,259.3	611,254.9
Jul-97	134,347.4	2,801.7	-	26.7	303.0	3,024.7	-	-	-	-	1,292.5	-	58.8	-	27,254.9	638,509.8
Aug-97	123,448.8	105.2	-	-	903.4	-	-	-	-	-	298.1	-	326.7	-	131,089.4	769,599.2
Sep-97	16,353	47,375	-	-	745	793	-	-	-	233	289	-	1,659	-	83,801	853,400
Oct-97	37,584	20,814	-	-	1,716	-	-	-	-	-	904	-	2,038	-	100,640	954,040
Nov-97	41,760	39,792	-	-	952	-	-	-	-	-	285	-	672	-	125,221	1,079,261
Dec-97	22,718	34,201	-	-	197	186	-	-	-	-	120	-	438	-	80,577	1,159,838
Jan-98	44,972.3	43,025.0	-	-	199.1	-	-	-	-	-	986.6	-	1,002.6	-	90,185.6	90,185.6
Feb-98	55,707.4	13,597.5	-	-	-	-	-	-	-	-	139.0	-	268.6	-	69,712.5	159,898.1
Mar-98	6,645.8	6,397.7	-	141.3	273.2	-	-	-	-	17.6	227.9	-	183.0	-	8,724.5	168,622.6
Apr-98	12,993.0	24,525.9	-	-	289.3	617.5	-	-	-	-	15.5	-	212.4	-	25,660.5	194,283.1
May-98	66,960.0	-	-	192.5	-	1,969.0	-	-	-	-	3,063.1	959.9	688.4	-	73,832.9	268,116.0
Jun-98	5,616.0	42,364.0	-	304.2	1,411.6	-	545.9	-	-	6.2	45.1	3,125.7	-	-	53,412.6	321,528.6
Jul-98	63,984.0	9,180.9	-	-	248.3	-	-	-	-	7.1	204.3	-	108.0	-	73,732.6	395,261.2
Aug-98	58,720.8	924.4	-	45.8	-	-	-	-	-	979.8	4,460.7	-	2,823.4	-	67,954.9	463,216.1
Sep-98	-	28,876	-	-	85	-	-	-	-	-	11,102	-	3,117	-	43,180.3	506,396.3
Oct-98	-	124,055	-	-	145.366667	-	-	-	-	243.583333	270.1	-	192	-	124,906.4	631,302.7
Nov-98	-	78,749	-	-	651	-	-	-	-	-	206	-	890	-	80,496.8	711,799.5
Dec-98	-	107,672	-	304	3,036	1,072	-	-	-	-	610	-	4,471	-	117,166	828,965.4
Jan-99	36,456.0	42,411.3	-	123.3	4,379.1	-	-	-	-	-	6,513.7	186.6	428.1	-	90,498.1	90,498.1
Feb-99	13,843.2	10,229.1	-	1,009.2	1,936.1	-	123.3	-	-	-	8,973.9	1,907.6	310.0	-	27,388.4	117,886.5
Mar-99	42,408.0	-	-	-	1,009.3	-	-	-	-	34.5	1,618.9	637.8	156.6	-	45,864.9	163,751.4
Apr-99	50,150.4	31,812.8	-	-	4,801.7	-	7,055.0	-	-	364.0	797.1	233.9	2,590.9	-	97,805.9	261,557.3
May-99	63,984.0	-	-	-	741.5	-	2,793.0	-	-	45.8	552.3	-	-	-	68,116.7	329,674.0
Jun-99	48,815.4	6,990.2	-	-	3,635.2	11,398.8	-	-	-	1,812.7	-	-	513.1	-	73,165.3	402,839.3
Jul-99	66,216.0	19,342.7	-	87.6	2,148.7	422.8	2,324.8	-	-	1,540.4	2,561.6	-	424.0	-	95,068.7	497,907.9
Aug-99	90,471.8	31,618.0	-	1,242.8	340.5	9,244.7	-	-	-	-	6,195.0	-	833.9	-	133,024.3	630,932.2
Sep-99	-	65,585.0	-	132.5	39,568.3	34,932.2	-	-	-	-	24,636.7	-	-	-	162,833.5	793,765.7
Oct-99	105,648.0	541.4	-	7,437.7	9,948.2	10,508.2	3,139.1	-	-	87.1	1,768.5	-	-	-	139,078.3	932,843.9
Nov-99	61,080.8	41,159.3	-	838.3	2,900.2	2,832.3	-	-	-	3,762.4	220.3	1,257.3	-	-	114,050.9	1,046,894.9
Dec-99	36,607.6	3,423.8	-	-	11,091.5	925.9	-	-	-	11,870.1	-	-	191.8	-	64,110.7	1,111,005.5
Jan-00	58,558.5	37,622.3	-	-	3,485.4	261.7	4,550.8	-	-	1,966.3	23,847.3	300.2	-	-	130,592.5	130,592.5
Feb-00	62,640.0	35,464.9	-	-	11,286.8	2,962.7	-	-	-	-	2,400.9	-	-	-	114,755.3	245,347.8
Mar-00	43,037	1,117	-	-	15,584	4,638	3,997	-	-	-	10,201	-	-	-	78,573	323,920.9
Apr-00	-	25,420.0	-	-	11,802.2	300.7	1,045.3	-	-	-	1,261.7	56.7	971.1	-	40,857.7	364,778.6
May-00	40,858.1	8,679.4	-	-	20.0	317.7	93.1	-	-	-	92.9	-	213.5	-	50,274.7	415,053.3
Jun-00	98,358.7	8,012.0	-	-	4,681.7	184.5	2,179.5	-	-	506.7	-	-	-	-	113,923.1	528,976.4
Jul-00	42,875.8	16,716.7	-	29.2	397.5	-	637.0	-	-	6,607.5	-	-	300.3	-	67,563.9	596,540.3
Aug-00	35,788.4	1,292.6	-	-	445.8	20,618.3	1,490.5	-	-	6,119.4	-	-	550.0	-	65,886.6	662,426.9
Sep-00	42,547.4	2,811.7	-	818.4	3,402.3	18,196.3	-	-	-	20.5	-	-	1,364.9	-	69,161.4	731,588.4
Oct-00	64,728.0	4,087.8	-	49.0	401.9	-	2,896.8	-	-	151.2	108.2	-	454.0	-	72,876.9	804,465.3
Nov-00	47,788.6	34,671.2	-	-	15.5	-	-	-	-	-	225.8	-	545.5	-	83,246.7	887,712.0
Dec-00	18,760.1	1,813.5	-	126.3	5,184.9	262.6	3,386.8	-	-	69.2	15.5	-	324.7	-	29,943.5	917,655.5

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	Planned Outage	Maintenance Outage	Scheduled Outage Extention	Startup Failure	Unplanned Outage - Immediate	Unplanned Outage - Delayed	Unplanned Outage - Postponed	Reserve Shutdown	Planned Derating	Unplanned Derating - Immediate	Unplanned Derating - Delayed	Unplanned Derating - Postponed	Unplanned Derating - Deferred	Noncurtailing Equipment Outage	Grand Total	Year-to-Date Grand Total
	PO	**MO**	**SE**	**SF**	**U1**	**U2**	**U3**	**RS**	**PD**	**D1**	**D2**	**D3**	**D4**	**NC**		
Jan-01	39,233.3	449.3	-	29.2	398.5	380.0	441.7	-	-	44.0	116.9	54.6	4,500.2	-	45,648	45,647.8
Feb-01	35,448.4	22,681.8	-	-	517.7	-	-	-	-	-	-	-	4,099.0	-	62,747	108,394.8
Mar-01	7,239	50,289	-	-	275	2,300	-	-	-	2,560	1,025	7,393	3,215	-	74,296	182,690.7
Apr-01	37,392.8	22,159.5	-	-	6,373.8	-	-	-	-	512.3	163.2	-	4,350.5	-	70,952.1	253,642.8
May-01	36,910.3	19,970.2	-	-	693.3	12,589.7	4,505.3	-	-	110.8	906.8	2,234.3	4,588.9	-	82,509.6	336,152.4
Jun-01	796.3	32,312.7	-	-	2,044.6	3,601.5	5,028.2	-	-	-	106.4	18.2	1,513.8	-	45,421.7	381,574.1
Jul-01	37,110.4	1,060.4	-	-	105.5	387.6	152.0	-	-	-	37.0	-	552.6	-	39,405.5	420,979.6
Aug-01	63,984.0	143.7	-	-	396.9	1,052.0	3,474.5	-	-	945.5	-	-	753.4	-	70,750.1	491,729.7
Sep-01	31,959.2	6,137.7	-	-	-	3,248.0	1,715.1	-	-	-	13,043.2	-	557.5	-	56,794.2	548,524.0
Oct-01	72,673.6	32,799.5	-	-	-	730.9	825.9	-	-	4,373.4	-	89.1	598.6	-	112,090.9	660,614.8
Nov-01	64,800.0	13,105.7	-	-	1,444.7	1,448.3	-	-	-	-	14,166.4	-	395.2	-	94,520.3	755,135.1
Dec-01	33,445.5	5,010.8	-	342.6	110.0	4,932.2	-	-	-	-	12,923.0	-	16,029.2	-	72,793.4	827,928.5
Jan-02	55,695.0	8,914.3	-	-	735.5	-	372.8	-	-	-	23,318.0	-	6,578.2	-	95,614	95,613.7
Feb-02	47,021.9	14,560.5	-	2,218.1	15,896.4	7,376.3	-	-	-	-	394.8	490.8	53.4	-	88,012	183,626.0
Mar-02	61,842	35,526	-	29	1,530	601	-	-	-	535	347	1,032	1,232	-	102,675	286,300.5
Apr-02	-	2,936.9	-	30.9	-	-	-	-	-	734.0	47.9	89.0	2,410.3	-	6,249.1	292,549.5
May-02	95,308.0	2,029.2	-	-	1,580.1	-	-	-	-	-	397.0	238.5	105.5	-	99,658.4	392,207.9
Jun-02	102,240.0	13,506.7	-	-	2,286.5	762.7	-	-	-	-	5,881.8	797.3	-	-	125,474.9	517,682.8
Jul-02	105,648.0	5,887.0	-	169.2	49.3	-	831.3	-	-	412.1	4,443.6	810.9	53.7	-	118,305.0	635,987.8
Aug-02	29,356.1	49,363.0	-	426.6	3,574.4	1,590.3	641.2	-	-	9,753.7	2,301.7	74.3	271.9	-	97,353.4	733,341.2
Sep-02	24,225.0	34,160.0	-	2,122.0	437.8	2,118.8	-	-	-	-	2,439.9	2,643.2	583.8	-	68,730.5	802,071.6
Oct-02	42,408.0	4,202.5	-	98.0	12,710.3	281.3	-	-	-	125.1	3,546.4	1,673.4	571.6	-	65,616.5	867,688.1
Nov-02	41,040.0	7,739.0	-	-	696.8	-	7,000.4	-	-	1,440.7	355.6	-	713.1	-	58,985.6	926,673.8
Dec-02	42,408.0	65,105.9	-	-	1,956.9	-	-	-	-	-	521.5	28.6	2,112.6	-	112,133.6	1,038,807.4
Jan-03	84,816.0	23,413.7	-	173.1	749.1	-	7,395.1	-	-	-	1,983.7	740.3	1,344.4	-	120,615	120,615.4
Feb-03	81,263.0	6,639.5	-	-	925.0	-	6,342.5	-	-	-	-	44.4	10,183.7	-	105,398	226,013.5
Mar-03	72,935.5	4,740.9	-	3,557.8	2,781.0	219.4	-	-	-	-	1,594.7	1,633.1	566.5	-	88,029	314,042.4
Apr-03	13,469.5	20,362.9	-	1,247.2	14,685.3	7,201.8	1,136.7	-	-	1,113.2	377.3	1,547.6	408.4	-	61,549.7	375,592.2
May-03	70,330.8	45,403.5	-	495.6	3,422.0	-	-	-	-	3,302.9	882.5	1,588.8	3,223.2	-	128,649.1	504,241.3
Jun-03	62,882.5	6,578.3	-	-	5,114.5	-	3,782.5	-	-	3,600.0	621.1	15,426.1	220.0	-	98,224.9	602,466.2
Jul-03	43,152.0	31,411.3	-	215.4	1,303.8	-	-	-	-	8,275.8	293.9	1,488.0	460.0	-	86,600.2	689,066.4
Aug-03	103,387.5	270.7	-	610.8	7,540.1	-	-	-	-	4,323.9	-	50.1	504.7	-	116,687.9	805,754.3
Sep-03	41,760.0	45,970.6	-	-	2,907.0	78.8	5,981.8	-	-	-	37.6	8,773.0	3,301.5	-	108,810.3	914,564.6
Oct-03	43,152.0	71,751.6	-	-	3,924.4	-	-	-	-	12.6	8,431.7	3,299.9	572.4	-	131,144.5	1,045,709.1
Nov-03	58,833.2	18,719.7	-	-	637.6	-	-	-	-	67.5	6,071.0	922.8	1,046.8	-	86,298.6	1,132,007.7
Dec-03	76,828.1	5,986.2	-	37.5	3,861.1	-	5,540.4	-	-	-	13,615.8	1,534.9	208.5	-	107,612.6	1,239,620.2
Jan-04	57,590.4	24,329.1	-	-	5,515.7	-	7,024.6	-	-	29.4	12,630.2	1,421.2	6,594.0	-	115,134.6	115,134.6
Feb-04	95,696.2	37,167.3	-	-	150.3	-	-	-	-	-	14,685.4	885.1	1,344.5	-	149,928.7	265,063.3
Mar-04	105,648.0	6,575.4	-	-	1,073.9	5,063.7	-	-	-	-	19,090.1	1,013.2	2,617.8	-	141,082.1	406,145.4
Apr-04	102,240.0	26,960.6	-	-	61.7	7,842.2	-	-	-	-	12,331.4	709.4	1,688.1	-	151,833.5	557,978.9
May-04	49,707.1	11,732.5	-	-	6,646.2	5,044.9	-	-	-	-	12,987.3	6,300.8	504.2	-	92,922.9	650,901.8
Jun-04	32,775.2	42,639.1	-	-	1,721.7	11,909.6	-	-	-	3,984.7	16,528.2	15,054.0	378.7	-	124,991.2	775,893.0
Jul-04	36,456.0	42,565.4	-	-	253.2	314.5	10,614.0	-	-	-	32,364.2	13,327.0	706.4	-	136,600.7	912,493.7
Aug-04	58,686.0	26,782.7	-	7,972.5	270.4	-	-	-	-	161.8	21,619.5	744.0	1,439.2	-	117,676.2	1,030,169.9
Sep-04	100,080.0	1,054.9	-	10,894.3	2,167.2	712.5	-	-	-	-	14,709.9	685.1	1,148.6	-	131,452.5	1,161,622.4
Oct-04	76,143.4	2,452.1	-	-	27,055.6	450.0	5,733.2	-	-	45.9	7,827.2	1,565.3	4,641.0	-	125,913.8	1,287,536.2
Nov-04	3,268.5	36,580.1	-	50.0	39,096.2	23,818.5	-	-	-	-	8,877.3	1,972.0	972.0	-	114,634.6	1,402,170.8
Dec-04	11,508.2	7,430.9	-	444.5	55,011.2	6,623.2	-	-	-	125.2	26,455.6	11,996.2	1,096.9	-	120,692.0	1,522,862.8

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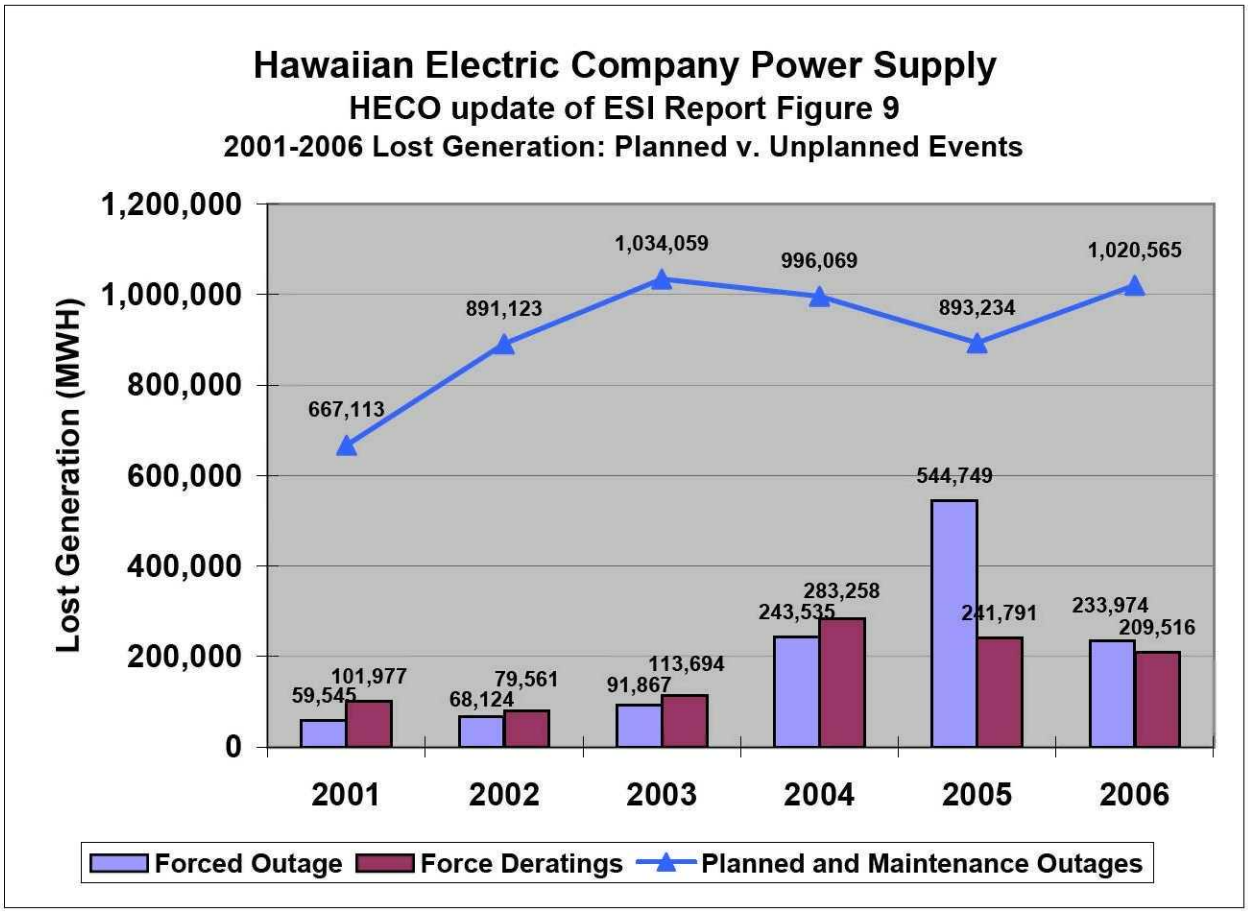
	Planned Outage	Maintenance Outage	Scheduled Outage Extention	Startup Failure	Unplanned Outage - Immediate	Unplanned Outage - Delayed	Unplanned Outage - Postponed	Reserve Shutdown	Planned Derating	Unplanned Derating - Immediate	Unplanned Derating - Delayed	Unplanned Derating - Postponed	Unplanned Derating - Deferred	Noncurtailing Equipment Outage	Grand Total	Year-to-Date Grand Total
	PO	**MO**	**SE**	**SF**	**U1**	**U2**	**U3**	**RS**	**PD**	**D1**	**D2**	**D3**	**D4**	**NC**		
Jan-05	92,324.3	2,264.3	-	-	45,715.9	-	-	-	-	-	21,840.1	757.7	985.3	-	163,887.7	163,887.7
Feb-05	38,953.5	5,003.9	-	-	37,855.5	25,529.0	-	-	-	284.7	8,062.6	578.2	4,098.1	-	120,365.6	284,253.3
Mar-05	40,920.0	37,063.0	-	-	42,427.9	44,833.2	-	-	-	-	16,781.7	262.9	528.6	-	182,817.3	467,070.6
Apr-05	22,254.8	27,476.8	-	-	15,825.0	22,580.9	3,680.0	-	-	335.4	20,044.9	423.9	269.1	-	112,890.8	579,961.4
May-05	104,897.8	23,747.4	-	62.7	3,466.9	-	-	-	-	3,105.4	8,525.3	-	1,212.0	-	145,017.5	724,978.9
Jun-05	102,240.0	19,975.0	-	210.2	2,370.9	-	2,902.4	-	-	-	18,975.7	388.5	3,342.9	-	150,405.6	875,384.5
Jul-05	69,949.2	21,172.6	-	40.6	14,980.8	389.5	357.7	-	-	-	12,999.6	1,881.2	567.3	-	122,338.7	997,723.1
Aug-05	-	56,397.0	-	208.8	14,840.9	3,519.9	3,251.8	-	-	116.1	40,369.8	3,116.3	567.4	-	122,388.0	1,120,111.1
Sep-05	22,580.7	2,388.7	-	-	3,655.6	36,245.2	-	-	-	-	9,298.3	10,309.6	139.1	-	84,617.2	1,204,728.3
Oct-05	63,984.0	5,111.2	-	-	40,372.8	-	1,058.5	-	-	172.0	10,404.4	-	1,284.0	-	122,386.8	1,327,115.1
Nov-05	61,920.0	42.1	-	-	66,497.3	42,849.7	131.7	-	-	-	21,245.1	213.7	4,567.9	-	197,467.4	1,524,582.5
Dec-05	34,830.0	37,737.7	-	-	68,887.3	-	-	-	-	-	13,142.3	594.1	-	-	155,191.3	1,679,773.8
Jan-06	-	43,105.3	-	-	77,688.3	698.3	451.4	-	-	13,001.1	8,788.4	33.6		-	143,766.3	143,766.3
Feb-06	71,140.5	30,691.6	-	-	14,806.5	657.4	-	-	-	6,359.0	7,861.1	-	244.7	-	131,760.8	275,527.1
Mar-06	62,228.0	51,211.0	-	-	3,105.3	10,284.7	30,724.1	-	-	2,163.8	13,476.2	-	1,371.6	-	174,564.6	450,091.7
Apr-06	36,000.0	65,338.4	-	200.5	1,712.7	6,760.7	-	-	-	9,475.9	3,901.9	-	4,643.1	-	128,033.1	578,124.9
May-06	18,261.4	55,668.4	-	-	1,267.3	2,178.7	1,225.5	-	-	3,989.9	19,669.8	1,770.4	4,812.7	-	108,844.1	686,969.0
Jun-06	37,111.6	45,263.7	-	-	741.8	5,920.3	-	-	-	-	3,059.0	2,160.0	1,236.7	-	95,493.2	782,462.2
Jul-06	36,456.0	44,824.5	-	-	1,576.6	-	-	-	-	-	8,609.9	2,459.7	749.4	-	94,676.1	877,138.3
Aug-06	51,739.4	23,001.8	-	-	993.9	8,461.5	-	-	-	13,471.3	8,032.9	2,057.9	116.8	-	107,875.2	985,013.5
Sep-06	53,462.3	23,005.6	-	79.8	3,267.3	-	-	-	-	1,774.8	1,958.2	2,160.0	943.8	-	86,651.7	1,071,665.2
Oct-06	82,176.0	970.1	-	390.8	25,428.9	-	5,609.1	-	-	6,785.8	3,693.2	1,351.5	452.1	-	126,857.6	1,198,522.8
Nov-06	61,119.4	13,403.0	-	4,600.3	3,269.4	8,553.0	5,555.2	-	-	10,459.9	2,041.0	12,553.0	3,055.3	-	124,609.5	1,323,132.3
Dec-06	106,392.0	7,995.3	-	-	1,518.7	6,245.6	-	-	-	13,290.0	744.0	-	4,737.3	-	140,922.9	1,464,055.2

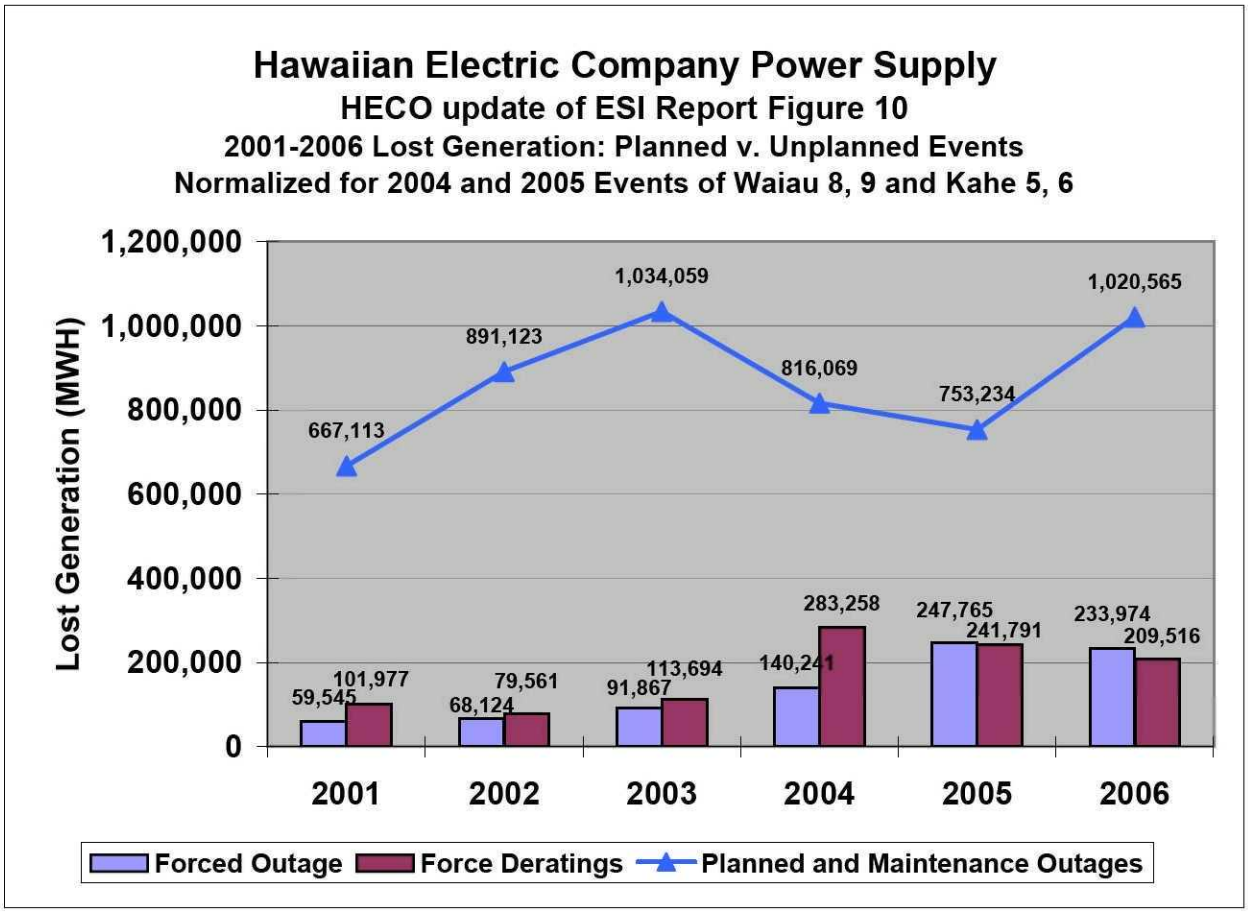
Hawaiian Electric Company Inc.
2007 Rate Case



	2001	2002	2003	2004	2005	2006
Forced Outage	59545	68124	91867	243535	544749	233974
Force Deratings	101977	79561	113694	283258	241791	209516
Planned and Maintenance Outages	667113	891123	1034059	996069	893234	1020565
Total	828635	1038808	1239620	1522862	1679774	1464055

Source file: CA-IR-227 Attachment 1_History.xls

Hawaiian Electric Company Inc.
2007 Rate Case



	2001	2002	2003	2004	2005	2006
Forced Outage	59545	68124	91867	140241	247765	233974
Force Deratings	101977	79561	113694	283258	241791	209516
Planned and Maintenance Outages	667113	891123	1034059	816069	753234	1020565
Total	828635	1038808	1239620	1239568	1242790	1464055

Source file: CA-IR-227 Attachment 1_History.xls

CA-IR-228

Ref: Response to CA-IR-37, Confidential Attachment 3, pages 18 and 19 (Figures 9 and 10: Historical EAF/EFOR Performance).

Please provide the following information:

a. Input data and adjustments used to prepare these tables (Excel file format, if available).

b. Updated calculations and Figures 9 and 10 to include actual 2005 and 2006 information, as available.

c. State and explain HECO's objective management target(s) for Equivalent Availability and EFOR in a representative year.

HECO Response:

a. Response to CA-IR-37, Confidential Attachment 3 is a draft of the ESI Report. Figures 9 and 10 in the draft report do not refer to sources of data. However, the final ESI Report provided in HECO's response to CA-IR-37, Attachment 1, Figure 4 (Historical EAF Performance) contains a reference to HECO-602 in Docket No. 04-0113, and Figure 5 (Historical EFOR Performance) contains a reference to HECO-603 in Docket No. 04-0113. See response to CA-IR-37, Attachment 1, pages 24 and 25. In responding to CA-IR-228, HECO will assume that the Consumer Advocate intended to refer to Figures 4 and 5 in the final ESI Report.

The final ESI Report provided in response to CA-IR-37 refers to using exhibits HECO-602 and -603 from HECO's 2005 Rate Case (Docket No. 04-0113). (See the References page of CA-IR-37, Attachment 1, page 65, references #7 and #8.) While HECO is unable to verify that the input data used by ESI in the preparation of Figures 4 and 5 were

taken from HECO-602 and -603, the data for 1990 and the following years appears to be very similar. The numeric data used in Docket No. 04-0113, HECO-602 and -603 was provided in HECO's response to CA-IR-28 and -30 of Docket No. 04-0113. This data is provided in Attachments 1 and 2 to this response, along with the data which was provided in HECO's response to CA-IR-62, for the years 1990-2006. Also included is data for comparative Industry data through 2005, the latest available year. (ESI was a for-profit subsidiary of EPRI, engaged in consulting work. ESI was discontinued as a separate entity in late 2006, and was absorbed into EPRI. The consultants who prepared the ESI report are no longer with EPRI.)

b. Please refer to Attachments 1 and 2.

c. As stated in the direct testimony, T-6, pages 11 and 12, "adequate amounts of preventive and corrective maintenance must be performed on a continuing basis to sustain the reliability of HECO's generating units at acceptable levels." In 2006, the composite EFOR for the HECO generating units was 5.3%. As stated in HECO's 2007 Adequacy of Supply ("AOS") Report, the Forward Looking EFOR for 2007 is 5.4%. In 2007, HECO's objective management target for EFOR is to be at or below 5.4%. HECO's annual composite EAF will vary based on the duration and generating capabilities of units scheduled for maintenance outages, and unscheduled (i.e., "forced") outages that occur during the year. Hence, EAF targets change from year to year. For 2007, HECO's objective target for EAF is to be at or above 84%.

The forward-looking (at least in the near-term) EFORs (5.4% overall for HECO's generating units) that were developed for HECO's 2007 AOS Report, which were used for the 2007 test year rate case production simulation, were estimated using a blend of historical

data, experience, and judgment. The estimated EFORs used in the 2007 AOS analysis and the rationale for them are described in pages 3-5 of Appendix 7 of the 2007 AOS Report.

One of HECO's objectives (included as one of the action plan items in its recent AOS Reports), however, is to pursue initiatives designed to improve the EFORs for HECO's generating units in the longer term, to the extent practical given the age and operating conditions of the units.

As stated in Appendix 3 to HECO's 2007 AOS Report, HECO's 2006 EFOR performance of 5.3% was better than the 6.8% forecast in the 2006 AOS Report and represented a turnaround from the higher level experienced in 2005. Restoring the reserve margin (which should be helped by adding generation as expected in 2009, as approved in Docket No. 05-0145) and managing load will help improve the EFOR of HECO generating units, by providing HECO with more flexibility to schedule and perform maintenance on our aging generation assets. In addition, HECO needs to be able to carry out its staffing and training plans, and to be provided with sufficient non-labor resources, so the staffing and other assets necessary are in place to effectively perform its reliability programs and initiatives.

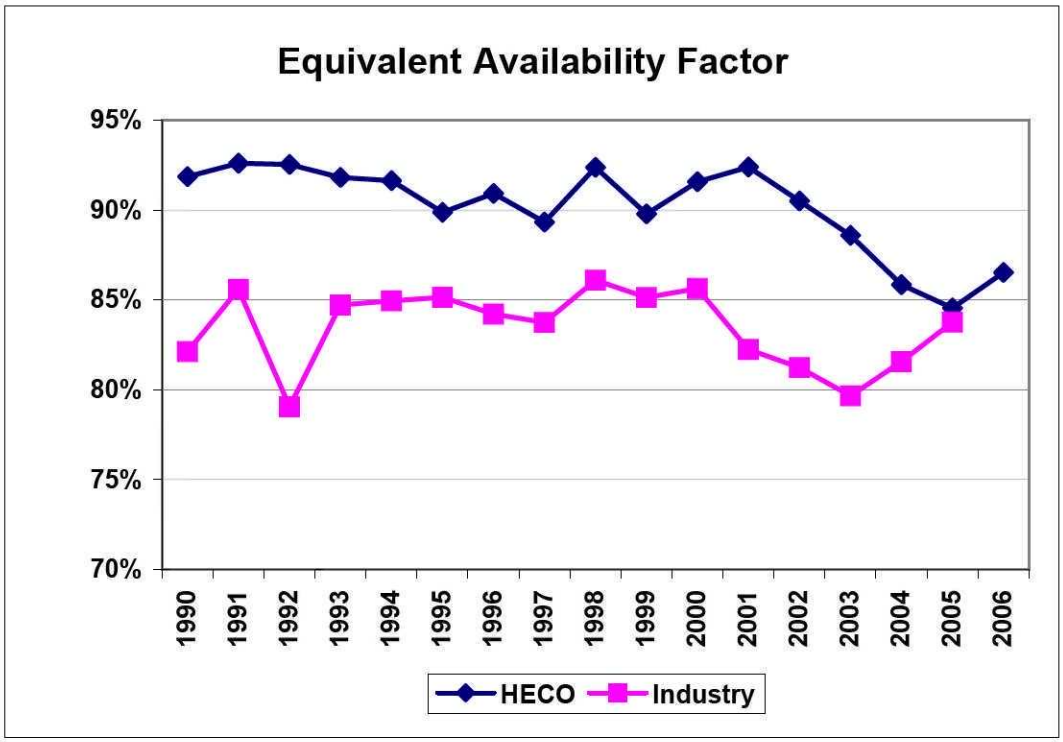
As explained on pages 19-22 of the ESI Report (see response to CA-IR-37, Attachment 1), several factors have contributed to lower EAF and higher EFOR trends in the HECO system in recent years, including (1) reduced flexibility for scheduling maintenance; (2) age of generating units and associated infrastructure; (3) operating duty; (4) human factors; and (5) environmental, safety and other regulations. See Appendix 7 to HECO's 2007 AOS Report, pages 1-3.

At pages 32-37, the report compared and contrasted the performance of the HECO's generating unit fleet and individual generating units with respect to peers within the industry, based on two metrics used in the electric power industry - the Equivalent Availability Factor (EAF) and Equivalent Forced Outage Rate (EFOR).

At pages 37-42, the report examined the various aspects of power generation that would account for the recent trends in capacity, availability, and reliability. At pages 45-58, the report presented the results of ESI's assessment of the HECO Power Supply operations, maintenance, and outage management programs to determine whether there were potential improvements that could be made in those processes that would lead to improved EAF and EFOR performance. The results of the assessment were a set of comments, observations, and potential candidate actions for HECO review. ESI identified 26 candidate actions for consideration by HECO relative to their potential to improve HECO's generation availability and reliability, including recommendations regarding staffing and training.

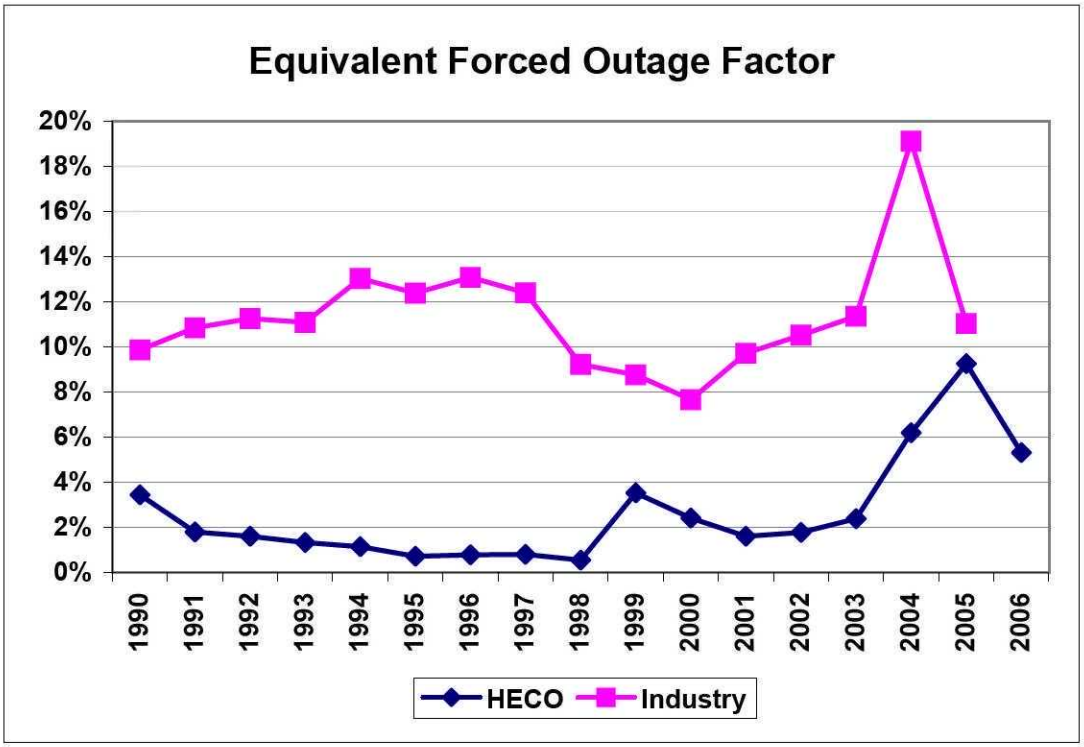
The planned level of 2007 Production O&M expenses includes the programs and projects HECO already has in place, as well as the organizational, staffing, and other initiatives HECO was and is undertaking to maintain and ultimately improve (to the extent practical) HECO's generation availability and reliability.

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE
HECO & Industry EAF 1990-2006



	HECO	Industry
1990	91.85%	82.12%
1991	92.59%	85.58%
1992	92.53%	79.05%
1993	91.81%	84.71%
1994	91.63%	84.94%
1995	89.86%	85.14%
1996	90.92%	84.20%
1997	89.32%	83.74%
1998	92.37%	86.09%
1999	89.77%	85.13%
2000	91.57%	85.63%
2001	92.39%	82.24%
2002	90.49%	81.23%
2003	88.59%	79.66%
2004	85.84%	81.56%
2005	84.54%	83.76%
2006	86.52%	

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE
HECO & Industry EFOR 1990-2006



	HECO	Industry
1990	3.43%	9.86%
1991	1.78%	10.84%
1992	1.59%	11.25%
1993	1.31%	11.08%
1994	1.13%	13.02%
1995	0.70%	12.38%
1996	0.77%	13.07%
1997	0.79%	12.39%
1998	0.53%	9.21%
1999	3.51%	8.75%
2000	2.40%	7.65%
2001	1.59%	9.71%
2002	1.76%	10.51%
2003	2.37%	11.35%
2004	6.18%	19.11%
2005	9.25%	11.03%
2006	5.30%	

CA-IR-229

Ref: Responses to CA-IR-37, Attachment 1 and CA-IR-64, Attachment 2 (Lost MWH).

Please provide the following information:

a. For IR-64, Attachment 2, provide a breakdown of the 2/14/2006 Rev outage schedule for 2007 by unit, indicating how the PO, D4 and MO lost MWH were calculated for the test year.

b. Information required to reconcile annual lost MWH amounts shown in CA-IR-64, Attachment 2 for historical periods 2001 through 2005 to the comparable Figure 9 calculations of Lost MWH at CA-IR-37, Attachment 1, page 38.

c. State whether or not (and why) CA-IR-64 Lost MWH calculations have been "normalized for 2004 and 2005 events at Waiau 8, 9 and Kahe 5, 6 as presented in Figure 10 of CA-IR-37, Attachment 1.

HECO Response:

a. Please refer to Attachment 1 to this response (also provided in Excel format, filename: "CA-IR-229 Attachment 1_PO+MO Analysis.xls"). The calculation for PO and MO lost MWH for the 02/14/06 revision of the 2007 Planned Maintenance Schedule was performed by following the steps below:

   1. Starting with the Planned Maintenance Schedule, the breaker open ("Brk Op") dates for Honolulu 9 and Kahe 1 were changed to 01/01/07 and the breaker close ("Brk Cl") date for Honolulu 8 was changed to 12/31/07. This was done to limit the calculation period from 01/01/07 to 12/31/07.

2. The type of outage, PO or MO, was identified for each outage in the column "Type". HECO does not schedule D4 outages.
3. The number of days of outage duration was determined by subtracting the breaker open date from the breaker close date in the column "Days".
4. The unit rating is indicated in the column "Rating".
5. The lost MWH for each outage is calculated by multiplying the outage duration by the unit rating and by 24 hours in a day in the column "Lost MWH".
6. The lost MWH due to MO outages is summed in the column "MO Tot".
7. The lost MWH due to PO outages is summed in the column "PO Tot".
8. As a check, the lost MWH column is summed and compared to the sum in "MO Tot" and "PO Tot".

b. HECO is unable to provide the information requested as ESI did not provide HECO with the input data and adjustments used by the ESI consultants to prepare tables and charts in the ESI report. ESI had independent access to data from the North American Electric Reliability Corporation Generating Availability Data System (NERC GADS). Accordingly, ESI independently accessed NERC GADS to perform their analysis of HECO's historical PO, MO, and FO lost generation statistics. (ESI was a for-profit subsidiary of EPRI, engaged in consulting work. ESI was discontinued as a separate entity in late 2006, and was absorbed into EPRI. The consultants who prepared the ESI report are no longer employed by EPRI.)

The data file used by HECO to construct CA-IR-64, Attachment 2, was provided in HECO's response to CA-IR-227.

c. The data presented in CA-IR-64, Attachment 2, reflects lost MWH due to Planned Outages (PO) plus Planned Deratings (D4) and Maintenance Outages (MO). The data does not include MWH lost due to Forced Outages (FO) and, therefore, excludes the impact of the Waiau 9 forced outage from 10/11/04 to 04/11/05 and the Waiau 8 forced outage from 10/14/05 to 02/08/06. (NERC GADS data counts Waiau 9 and Waiau 8 as Forced Outages and not a PO or MO. It should be noted, however, that certain overhaul work was done during the extended outages for Waiau 9 and Waiau 8.) The entire contributions from the Planned Outages of 02/01/04 to 05/15/04 and 05/01/05 to 07/17/05, respectively, for Kahe 5 and Kahe 6 are included in the compilation of lost MWH presented in CA-IR-64, Attachment 2.

HECO did not adjust the planned outages of Kahe 5 and Kahe 6, as the ESI consultants did in Figure 10 of their study report, (see HECO's response to CA-IR-37, Attachment 1, page 45) because the chart of CA-IR-64 Attachment 2 is intended to show the relative level of lost MWH due to planned and scheduled work (i.e., PO + D4 + MO). As described in HECO's response to CA-IR-64, on page 3, HECO uses this comparative information in the planning and scheduling of unit outages to confirm that a Planned Maintenance Schedule has a "normal" amount of outage time for POs and MOs. Adjusting Kahe 5 and Kahe 6 planned outages to one-half would be in conflict with the purpose of the HECO analysis. If the K5 or K6 outages had actually been shorter in duration, the time period that would have become free could have been utilized to perform a PO or MO on one or more additional units. Because of the number of units needing scheduled outages and the limited scheduling opportunities, there are few, if any, gaps in the Planned Maintenance Schedule.

ESI normalized Kahe 5 and Kahe 6 planned outages for the purposes of their independent cooperative analysis of steam unit availabilities. (See ESI Report, page 34. ESI presented the data without the adjustment, Figure 9 of its report, and with the adjustment, Figure 10, of its report. See HECO's response to CA-IR-37, Attachment 1, pages 44-45.)

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE
PO + MO Lost MWH Analysis

POWER SUPPLY OPERATION & MAINTENANCE
2007 PLANNED MAINTENANCE
SCHEDULE 6 YEAR CYCLE
Peaks as of: 5/1/2005
Revision date: 2/14/2006

UNIT	DATE				Duration	REMARKS							
	Brk Op	Start	Bkr Cl	Firm	(Wks.Days)		Type	Days	Rating	Lost MWH	MO Tot	PO Tot	Check
H9	1/1/2007		1/13/2007		13.0	Outage (con't. from 2006)	PO	12	57	16416	206904	550992	757896
K1	1/1/2007		2/2/2007		14.1	Overhaul (con't. from 2006)	PO	32	86	66048			
W8	1/14/2007		1/26/2007		1.6	Tunnel Cleaning	MO	12	90	25920			
KPLP-					1.0	104.5 MW Loss		0		0			
KPLP					1.0	209 MW Loss		0		0			
KPLP-					3.0	104.5 MW Loss		0		0			
W7	2/9/2007		4/20/2007		10.1	Overhaul (Cond refurb, Exc/Reg, Annur	PO	70	87	146160			
K5	3/4/2007		3/9/2007		0.6	Blr Inspection (exp 4/7/07)	MO	5	142	17040			
K2	3/11/2007		3/30/2007		2.6	Maintenance Outage ()	MO	19	86	39216			
HRRV-					1.3	23 MW Loss		0		0			
HRRV					0.4	46 MW Loss		0		0			
HRRV-					1.4	23 MW Loss		0		0			
W3	4/1/2007		4/7/2007		1.0	Blr Inspection (exp 9/7/07)	MO	6	49	7056			
K6	4/28/2007		5/11/2007		2.0	Blr Wash	MO	13	142	44304			
W9	5/13/2007		6/15/2007		4.6	Combustion Inspection	MO	33	53	41976			
AES-					2.0	90 MW Loss		0		0			
W5	5/27/2007		5/31/2007		0.5	Blr Inspection (exp 8/2/07)	MO	4	57	5472			
K3	6/16/2007		9/14/2007		13.0	Overhaul (Blr Ctrls, S/B Ctrls, Exc/Reg,	PO	90	90	194400			
KPLP-					0.1	104.5MW Loss		0		0			
W5	9/29/2007		11/30/2007		9.0	Overhaul (CCI, Exc/Reg, HP/LP, Chem	PO	62	57	84816			
KPLP-					0.1	104.5 MW Loss		0		0			
HRRV-					1.6	23 MW Loss		0		0			
H8	11/30/2007		12/31/2007		10.1	Overhaul (Annun, Volt Reg, Sootblw Ct	PO	31	58	43152			
W8	12/2/2007		12/14/2007		1.6	Tunnel Cleaning	MO	12	90	25920			
										757896	Check		

CA-IR-229
DOCKET NO. 2006-0386
ATTACHMENT 1
PAGE 1 OF 1

CA-IR-230

Ref: Response to CA-IR-63 (Generating Unit Utilization).

According to the response, all three measures of unit utilization appear to have peaked in 2004 (capacity factor, starts, operating hours) and declined thereafter. Please provide the following information:

a. Explain whether moderating electric sales growth rates, better performance by IPP units (AES, HPOWER, Kalealoa) and/or other (identified) factors are contributing to these changes.

b. Provide test year simulation values for capacity factor, starts and operating hours for each unit, and

c. Explain any individually significant changes in the values provided in your response to part (b) of this information request and the data tables provided for each unit within CA-IR-63.

HECO Response:

a. As shown in the response to CA-IR-62, page 22, annual net generation for the generating units (i.e., HECO's 14 steam-electric units and two combustion turbines) was 4,919,786 MWH in 2004, approximately 6% higher than it was for the two previous years, about 4% higher than it was in 2005, and about 1.5% higher than it was for 2006. The corresponding values for total system net generation, including IPPs, were somewhat similar. As shown in Attachment 1 to this response, total system net generation including IPPs was 8,126,998 MWH in 2004, approximately 3% to 4% higher than it was for the two previous years. However, total HECO system net generation was approximately the same in 2005 and 2006,

and only 0.3% lower than in 2004. For the HECO generating units the corresponding trends were similar for capacity factors, starts, and service hours over these same periods.

It may be generally concluded, however, that annual system load growth and not improved performance of the IPPs was the primary reason for these factors increasing and peaking in 2004, and then being relatively unchanged in the following years when annual system load growth was relatively flat.

Differences in capacity factors, starts, and service hours that occurred in the 2004 to 2006 time period (when annual system loads were relatively constant), particularly on individual generating units, were primarily related to the number and duration of scheduled and forced outages of HECO and IPP generating units. For example, the cycling steam unit and combustion turbine starts, service hours, and capacity factors were higher in 2004 and 2005 because of the extended unplanned forced outages of Waiau 9 from October 11, 2004 to April 11, 2005, and Waiau 8 from October 14, 2005 to February 8, 2006. Other situations that have contributed to variations in unit capacity factors, number of starts, and operating hours include the following:

1. A unit will record fewer service hours and a lower annual capacity factor in a year in which it has an overhaul (i.e., planned outage of several weeks). Depending on the specific generating units that are available at any particular time, baseloaded units may be dispatched at lower loads than normal in order to comply with spinning reserve and quick load pick up criteria. Such dispatch conditions will affect the annual capacity factor for the baseload units.
2. Baseloaded generating units will experience more starts when they experience more forced outages.

3. Cycling unit starts are generally impacted by the unit's availability. That is, if the cycling unit is scheduled down for an overhaul or other outage, during that outage period the unit will not record starts. The longer the period of unavailability, generally the lower the number of starts.
4. If one or more baseloaded units are shutdown for scheduled and/or forced outages, all available cycling and peaking units will generally experience higher operating hours and higher capacity factors. The cycling and peaking unit starts may be greater or lower, depending on whether or not system conditions dictated that the cycling unit stay running or be shut down every day.
5. If a baseloaded unit experiences a significant and extended derating, the cycling and peaking units may experience higher starts, service hours, and capacity factors.
6. If a cycling unit experiences a problem that prevents it from shutting down, as with Waiau 3 in 2005, the unit will experience lower starts but higher service hours and capacity factors.
7. Extended periods of no trade winds during the summer will generally increase available cycling unit and CT starts, service hours, and capacity factors. However, extended periods of no trade winds during the summer may also lead to a decrease in the starts, service hours, and capacity factors of Honolulu 8 and 9 for environmental reasons.

b. The table below corresponds to the updated workpapers provided in response to CA-IR-214. Only the reported service hours and reported capacity factor are provided, as the number of starts reported by P-MONTH is not accurate (and is not used to justify or illustrate costs in this rate

case).

Test Year Hours & Capacity Factor
Extract of P-MONTH report, as provided in HECO-WP-412, page 3 (in response to CA-IR-214)

Fiscal Year: 2007

Station Summary

Station MW	Hours	CF %
Honolu 8	3362.7	17.09
Honolu 9	2385.6	12.86
Waiau 3	1694.8	13.45
Waiau 4	2968.8	17.07
Waiau 5	4661.9	23.59
Waiau 6	4760.9	24.22
Waiau 7	6171.6	39.2
Waiau 8	7606.6	61.34
Waiau 9	506.2	1.03
Waiau 10	994.2	1.88
Kahe 1	7552.3	53.52
Kahe 2	8011.7	64.06
Kahe 3	6143	57.84
Kahe 4	7876.1	72.01
Kahe 5	7903.2	78.56
Kahe 6	8137.4	60.98

c. With the exception of the generating units noted below, the simulated run hours and capacity factors do not appear to be significantly different from the corresponding values provided in CA-IR-63. The extended duration outages described below are listed in the Planned Maintenance Schedule (Rev July 21, 2006), provided as HECO-611.

1. Waiau 7. The simulated run hours and capacity factor are significantly lower, which is consistent with the 10-week overhaul for Waiau 7 (as modeled in HECO-WP-412, page 20).

2. Kahe 3. The simulated run hours and capacity factor are significantly lower, which is consistent with the 13-week overhaul for Kahe 3 (as modeled in HECO-WP-412, page 20).

3. Kahe 5. The simulated capacity factor is high compared to the historical data. The high capacity factor is a consequence of the ABC coefficients used to represent the unit's performance in the test year (please see page 35 of the response to CA-IR-214). Using these ABC coefficients, the average heat rate of Kahe 5 from the production simulation (uncalibrated) is 9,803 Btu/kWh (please see page 43 of the response to CA-IR-214). This value is the lowest of all utility baseload units (Waiau 7-8, Kahe 1-4, and Kahe 6). Accordingly, Kahe 5 is dispatched the highest amount by the model among all the baseload units.

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

HECO & IPP Net MWH Generation

Year	HECO	IPP	Total
2001	4,488,510,430	3,154,777,580	7,643,288,010
2002	4,637,906,050	3,119,792,621	7,757,698,671
2003	4,668,942,420	3,240,014,357	7,908,956,777
2004	4,918,683,630	3,208,314,423	8,126,998,053
2005	4,721,428,302	3,382,874,780	8,104,303,082
2006	4,854,843,826	3,250,027,770	8,104,871,596

Source: HECO: CA-IR-62, page 22.
IPP: 2001-2005 from CA-IR-60; 2006 from CA-IR-57.

CA-IR-231

Ref: Response to CA-IR-64, Attachment 1 (Long Range Outage Schedule).

Please provide the following information regarding the HECO Long Range Planning Schedule for generating unit outages:

a. Define the scope of work for each of the listed types of work; BlrStd, BlrCC, HP, LP, GEN for the steam units, Major, HotGas, CI, Gen for combustion turbines.

b. Provide an order of magnitude estimate of outage duration for each of the listed types of work; BlrStd, BlrCC, HP, LP, GEN for the steam units, Major, HotGas, CI, Gen for combustion turbines.

c. Provide the desired number of years interval for each of the listed types of work per unit; BlrStd, BlrCC, HP, LP, GEN for the steam units, Major, HotGas, CI, Gen for combustion turbines.

d. Explain the X, F and I codes used in certain cells of the table.

e. Provide information needed to populate the "No. Majrs" row at the top of the table for all years.

f. Provide information needed to populate the "HECO Wks" row at the top of the table for all years.

g. Explain why 2007 is assumed to represent a normal level of work, given the maintenance intervals stated in response to part c. of this information request and the types of work planned in the test year.

HECO Response:

a. The scope for each type of outage in the HECO Long Range Planning Schedule can include but is not limited to the following:

BlrStd – Boiler Standard

1. Boiler & Air Pre-Heater wash and debris disposal

2. Steam drum cleaning and inspection

3. Boiler access doors-inspect, replace door gaskets

4. Boiler observation ports-inspect, clean and lube
5. Boiler hydrostatic tests-pre & post-hydro
6. Calibrate pressure gage outside control room
7. Boiler air leakage tests-pre & post-Overhaul
8. Boiler refractory-inspect, repair, replace
9. Burner front equipment-clean, adjust, inspect, lubricate
10. Air Pre-Heater: cold end baskets-inspect, remove and clean; seals-inspect and replace; rotor to diaphragm connections-Visual Test & Penetrant Test inspect; wash & Sand Blast nozzles-inspect and replace;
11. Forced Draft Fan & Gas Re-Circulation Fan: Wheel-Visual Test & Penetrant Test welds; clean; inspect, clean & lubricate dampers
12. Ducts and Ejectors: inspect clean and repair
13. Stack: Custodis inspection
14. Blow-off Tank: Open, inspect and clean
15. Air tanks: Open Manway or inspection ports-clean and inspect for corrosion.
16. Air ejector: inspect and clean
17. Hog jet ejector: inspect & clean

<u>BlrCC – Boiler Chemical Clean</u>

1. Tube samples: Remove 2 per overhaul
2. Chemically Clean piping and equipment set-up
3. Assist with waste processing
4. Dismantle piping and equipment
5. Restore tubing and Hand Hole plugs

HP/LP/GEN – High Pressure Steam Turbine/Low Pressure Steam Turbine/Generator

1. Complete disassembly
2. Dimensional evaluation
3. Clean
4. Inspection
5. Component condition evaluation & assessment
6. Repairs & modifications
7. Reassembly
8. Startup & Testing

Major - Compressor/Combustion Turbine/Generator

1. Disassembly
2. Dimensional evaluation
3. Clean
4. Inspection
5. Component condition evaluation & assessment
6. Repairs & modifications
7. Reassembly
8. Startup & Testing

HotGas – Compressor/Combustion Turbine

1. Compressor Disassembly
2. Dimensional evaluation
3. Clean
4. Turbine Nozzle/Buckets Inspected

5. Component condition evaluation & assessment

6. Repairs & modifications

7. Reassembly

8. Startup & Testing

CI – Combustor Inspection/Combustion Turbine

1. Disassembly & Inspection

    a. Fuel Nozzles

    b. Liners

    c. Transition Pieces

    d. Cross-fire Tubes Disassembly

2. Repairs

3. Reassembly

4. Startup & Testing

GEN – (Combustion Turbine)

1. Disassembly

2. Dimensional evaluation

3. Clean

4. Inspection

5. Component condition evaluation & assessment

6. Repairs & modifications

7. Reassembly

8. Startup & Testing

b. The duration of each unit outage is based on the scope of work to be accomplished. For planning purposes, the nominal duration of each type of outage on the HECO Long Range Planning Schedule is as follows:

BlrStd – 3-4 weeks

BlrCC – 3-4 weeks

HP/LP – 6 weeks

HP/LP/GEN – 7-9 weeks

HP – not typical as stand alone

LP – not typical as stand alone

GEN – 4 weeks

Major (Combustion Turbine) – 8 weeks

HotGas (Combustion Turbine) – 6 weeks

CI (Combustion Turbine) – 2 weeks

Gen (Combustion Turbine) – included in Major

c. The nominal planning intervals for types of outages in the HECO Long Range Planning Schedule are as follows:

BlrStd – every 3 years

BlrCC – 6-9 years, evaluation based

HP/LP – 6 years

GEN – 9 years

Major (Combustion Turbine) – 8 years

HotGas (Combustion Turbine) – 8 years

CI (Combustion Turbine) – 4 years

Gen (Combustion turbine) – Included in Major

Each of the nominal planning intervals can vary based on unit specific condition evaluation, operation, machine type, etc. Experience gained from problems found at each inspection or during operation is also utilized in making future maintenance decisions, including re-evaluation of the nominal planning intervals. HECO also reviews and evaluates the number of run hours and number of starts in making maintenance decisions on the combustion turbine maintenance intervals. Although the run hours and number of starts are a factor, HECO finds that the relatively low number of hours and number of starts experienced by Waiau 9 and Waiau 10 cannot form the sole basis for maintenance decisions.

d. The "X" identifies the equipment sector intended to be overhauled. The "FIN" (vertically inputted) references an equipment sector of that was started in one calendar year and completed in the next.

e. "No. Majrs" was intended to reflect the count of the number of major overhauls for the year. The row is no longer utilized.

f. "HECO Wks" was intended to sum the total number of outage weeks for HECO units and is no longer utilized.

g. Please refer to HECO's response to CA-IR-244, part f. The 2007 Planned Maintenance Schedule includes three full and two partial steam turbine overhauls. While this number suggests a greater than "normal" amount of steam turbine overhauls per year, expenses were forecast for only one full and one partial steam turbine overhaul in the 2007 test year estimate. Two to three steam turbine overhauls per year would be more representative of a

"normal" year based on the fact that there are 14 steam electric units and each one is scheduled to have a steam turbine overhaul every six years.

As discussed in CA-IR-243 and -234, HECO's 2007 test year estimates under-estimate the expenses for steam turbine overhauls by an amount approximately equivalent to that for one steam turbine overhaul. The 2007 test year estimate includes material and outside service expenses for Waiau 5 and Honolulu 8 (proportional amount for 2007), and the expenses for HP/LP steam turbine overhauls for Kahe 1 (proportional amount for 2007), Waiau 7, and Kahe 3 were not included in the 2007 test year estimate. The unforecast HP/LP steam turbine overhauls will be performed at Kahe 1, Waiau 7, and Kahe 3, and consequently, lower priority discretionary work will be deferred to offset these unforecast, non-discretionary expenses.

HECO's responses to CA-IR-240, -241, and -242 quantify the overruns that can occur in overhaul project and outage project expenses. HECO's response to CA-IR-235 describes how discretionary work or lower priority work can be deferred to offset increased expenses caused by unforecast work or overruns. If the Production O&M budget did not include discretionary work, all unbudgeted work that had to be performed would result in overrun relative to the budget. Accordingly, being able to offset unbudgeted work with the deferral of discretionary work helps to manage resources and expenses.

CA-IR-232

Ref: Response to CA-IR-72, Attachment 2 (Operation Div. Hours).

Please explain for each station all the known reasons why the Company believes that test year "2007 Budget" total hours (Overtime plus Straight Time) should be significantly higher than the annual actual hours that were required to maintain 24x7 staffing at the Company's generating stations throughout 2006:

a. IK Kahe in 2006 was 116,627 hours, versus test year 124,982 hours.

b. PIH Honolulu in 2006 was 50,171 hours, versus test year 54,828 hours.

c. PIW Waiau in 2006 was 128,739 hours, versus test year 135,270 hours.

d. Provide copies of all analyses, workpapers, calculations and supporting documents associated with your response to parts a. through c. of this information request.

HECO Response:

HECO's response to this information request is revised to correct calculation errors. The errors were in Attachment 1, pages 3, 4, and 5, where (1) the "Hours/year" was incorrectly input as 2096 instead of 2088, and (2) the "Holiday Tot" was incorrectly input as 112 instead of 104. These corrections alter the calculation of holiday overtime hours for all three RAs. Also, the cost calculation on page 1 was corrected to include an adjustment for non-productive labor cost. As a result of these corrections, the total proposed labor adjustment in PIK, PIW, and PIH changes from a reduction of $325,000 to a reduction of $402,000.

The primary reason for the increased labor hours in PIK, PIH, and PIW is the increase in staffing level from 2006 to 2007 test year. This increase is described in HECO T-6, page 44, and

HECO's response to CA-IR-72. As described in HECO T-6, page 45, line 14 to page 46, line 5, it is possible to staff the plants for 24X7 with a reduced workforce. When this occurs, however, there are consequences including elevated operator overtime, deferred training, and cancelled or restricted vacations. As described in HECO T-6 (page 46, line 2 to line 5; page 55, line 14 to 18; and page 56, line 3 to 6), the increase in the Operations Division workforce will enable more training of personnel than in recent years. Providing the necessary training is critical because the workforce has relatively less experience due, in parts, to the expansion of the staff to accommodate 24X7 operations and the higher than normal turnover of personnel that HECO has experienced. HECO is expanding its training effort and staff to respond to this training need. However, due to the difficulties in hiring discussed in HECO T-6, page 38 to 40, and the higher than expected turnover in Operator personnel, in 2006 HECO was unable to achieve the staffing level required to fully implement the training effort. Without the staffing level to support the training effort, total recorded labor hours in 2006 were lower than they would have been with full staffing due to a combination of the less than full staffing level, and the subsequent reduction in straight time and overtime labor hours available for training activities. Examples of training activities that were impacted by the less than full staffing levels include the following:

1. Line of Progression (LOP) Training: There was less than the desired level of Line of Progression (LOP) qualification training.
2. Refresher Training: The amount of refresher training conducted fell below the desired level.
3. First Day Off Training: Certain training activities like First Day Off (FDO) training (as described in CA-IR-73, page 3) were not conducted. In 2006, only 3 of 4 sessions of FDO training were conducted.

4. Skill Development Training: As described earlier, the younger and less experienced workforce creates a need for increased training to develop skill level. Without the staffing to support this training effort, operators could not be removed from the shift rotation to facilitate this training if the training was scheduled during the operator's regular shift. This type of training could also be performed on an OJT basis, on overtime, to allow an operator to witness or experience an evolution at the plant that he would otherwise miss.
5. Experienced Operator Training Support: Qualified operators could not be removed from the shift schedule to assist the training effort with the development of and to conduct the training as instructors. A pool of replacements would be needed to support this. The two additional operators on the LOP at Kahe Power Plant and Waiau Power Plant, and the one additional at Honolulu Power Plant, were added to support this effort as well as to support other training requirements.
6. On-the-Job Training (OJT): Technical training or on-the-job training on the plant and equipment was not scheduled, in part, to manage the level of overtime being worked by operating personnel. Additional staffing would help alleviate this situation.

In reviewing the budgeted labor hours for RA's PIK, PIH, and PIW for 2007, HECO discovered that a forecasting error had been made for RA PIW. In CA-IR-73, HECO describes the "42-hour work week" shift schedule utilized at Waiau Power Plant. This schedule builds in an average of two hours of overtime per rotating shift operator per week. While this schedule increases overtime requirements, its advantage is a reduction in staffing count requirements to staff the schedule. HECO's 2007 test year estimates for PIW erroneously included both the

overtime for the 42-hour work week schedule as well as the full staffing count to support a regular 40-hour shift schedule.

The move to the 42-hour work week schedule was made on a trial basis. However, in response to employee concerns of excessive overtime, HECO recently decided to review returning to a regular 40-hour work week schedule at Waiau Power Plant. HECO proposes a revision to the 2007 PIW labor forecast to remove the additional overtime needed to achieve the 42-hour work week schedule while retaining the staffing count reflective of a 40-hour work week schedule.

Also, while developing the revised labor forecast for PIW, HECO incorporated a reduced training schedule for PIK, PIH, and PIW based on on-going training activities. HECO's plans to increase technical training are still being formulated, and are not included in the revised schedule.

HECO's proposed reduction in labor expenses for PIK, PIH, and PIW is shown in Attachment 1 to this response. As shown on page one of Attachment 1, labor hours for PIK, PIH, and PIW are reduced by a total of 10,030 hours. PIO was not adjusted in this review. The total proposed reduction in labor expense is $402,000. Pages two through five of Attachment 1 provide the assumptions and details of the labor hour calculations. This revised labor adjustment for Operating Division corrects the Operator Overtime adjustment previously reported in HECO T-6's June 2007 Update filed on June 29, 2007.

a. Please refer to the discussion above and Attachment 1 to this response.

b. Please refer to the discussion above and Attachment 1 to this response.

c. Please refer to the discussion above and Attachment 1 to this response.

d. Please refer to the discussion above and Attachment 1 to this response.

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

2007 Operating Division Labor Adjustment

	ST	OT	Tot	
PIK - Kahe	108570	12735	121306	
PIH - Honolulu	47756	5239	52995	
PIW - Waiau	119118	11631	130749	
PIO - Admin	7297	368	7665	
Total	282742	29973	312715	2007 Revised Labor Hours

	2004	2005	2006	2007TY	2007 Rev	07Rev-07TY	
PIK - Kahe	116842	119258	116624	124982	121306	-3676	
PIH - Honolulu	39598	46201	50171	54828	52995	-1833	
PIW - Waiau	119452	131684	128739	135270	130749	-4521	
PIO - Admin	1576	5581	3652	7665	7665	0	
Total	277468	302724	299186	322745	312714.8	**-10030**	2007TY-2007 Rev

Labor OT Reduction By Labor Class

PIK		Total Reduction	-3676		Std Labor	Reduction	
Proportion	Lab Class	%	Reduction		Rate	Amount	
(8/60)	_TCS-I	13.3%	-490		$41.32	($20,255)	
(52/60)	_BUTCI	86.7%	-3186		$34.87	($111,103)	
	_BUOCI	0.0%	0				
			-3676	Check		($131,358)	Subtot PIK

PIH		Total Reduction	-1833				
Proportion	Lab Class	%	Reduction				
(6/27)	_TCS-I	22.2%	-407		$41.32	($16,831)	
(21/27)	_BUTCI	77.8%	-1426		$34.87	($49,713)	
			-1833	Check		($66,544)	Subtot PIH

PIW		Total Reduction	-4521				
Proportion	Lab Class	%	Reduction				
(8/65)	_TCS-I	12.3%	-556		$41.32	($22,991)	
(57/65)	_BUTCI	87.7%	-3964		$34.87	($138,238)	
	_BUOCI	0.0%	0				
			-4521	Check		($161,229)	Subtot PIW

Total Adjusted Hours	**-10030**		
Apply Non-Productive Hourly Rate	$4.26		
	($42,729) →	($42,729)	
		($401,859)	Total Ops Reduction

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

Operating Division OT Re-estimate for 2007 Labor

Payroll Recap Summary for (PIK, PIH, PIW):

	2006	2007	
Base Hours	292974	321552	[154 total X 2088)
Holiday	11968	16016	[12 full day + 2 1/2 day Holidays]
"Productive"	281006	305536	
Sick	7809		
Sick %	2.8%		
Vacation	19530		
Vac %	7.0%		

Assumptions:
1.) Assume full count of staff all year.
-- ALL vacation replacements to be covered by "EXTRA" Operator without OT.
-- ALL refresher training replacement to be covered by "RELIEF" on non-relief days w/o OT.
-- ALL LOP training replacements to be covered by "RELIEF" on non-relief days w/o OT.
2.) Use sick percentage indicated for individual RA's (based on 2006 actual).
3.) Use vacation percentage indicated for individual RA's (based on 2006 actual).
4.) IO remains the same.

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

PIK - Kahe Shift Staffing

			Avail Hrs	Hours/year	2088	2006 Base Hours	116687.4
Sr+Supv Supply		8	16704	Holiday Tot	104	2006 Non-Prod Hours	18051.69
Oper Supply		52	108576			2006 Productive	98635.66
Clerk Supply		1	2088			2006 Holiday Hours	6258.5
Tot Supply		61	127368			2006 "Productive"	110428.9
						2006 Vac Hours	7637.94
						2006 Vac/"Prod" %	6.9%
Sr +Supv	Base		16704			2006 Sick Hours	3725.5
	Holiday		832			2006 Sick/"Prod" %	3.4%
	"Productive"		15872			Holiday OT %	80%
	Holiday OT		475	4 of 7 Supvs due to 12-hr shift			
	Sick Repl OT		268	Assume 50% OT due to 12-hr shift			
	S/S 12-hr OT		520	4 supvs X4 hrs/pay period X 26 pay periods			
	S/S Mtg OT		168	1 time/month X 7 guys X 2hrs (Does not count Sr.)			
	Sched OT		0	Full Staff implies "R" and"X" can cover			
	S/S Ohaul OT		320	# Overhaul Weeks X 2((K2=8, K5=8)			
	S/S Incidental O		0	2 hrs per month X 7 guys X 12 months			
	S/S OJT OT		112	4 hrs X 7 guys X 4 time per year			
	Tech Train OT		45	50% of Tech Train + Carb & proportioned			
	FDO OT		101	Proportioned & reduced by 50% due to 12-hr shift			
	SubTot OT =		2008	2006=1784			
Operator	Base		108576				
	Holiday		5408				
	"Productive"		103168				
	Holiday OT		4326				
	Sick Repl OT		3481				
	Sched OT		0	Full Staff implies "R" and"X" can cover			
	Oper Incidental (		312	2 hrs per month X 25% of crew X 12			
	EO Train OT		0	Full Staff implies "R" and"X" can cover			
	Oper OJT		624	for unit Startup; 50% of guys X 2 hrs/month X 12			
	Mil Leave OT		384	50% of 4 guys X 16 hours/mo			
	Tech Trn OT		289	50% of Tech Train + Carb & proportioned			
	FDO OT		1310	Proportioned			
	SubTot OT =		10727				
Clerk	Base		2088				
	Holiday		104				
	"Productive"		1984				
	Holiday OT		0				
	Sick Repl OT		0				
	Sched OT		0				
	SubTot OT =		0				
	TOT OT =		12735	10.5%	Ref to "Prod ST"	2006 OT	17989
	Avail		127368				
	Holiday		6344				
	Sick		4083				
	Vac		8371				
	Prod ST =		108570	121306	ST+OT		
PIK	OT% =		11.7%				

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

PIW - Waiau Shift Staffing

			Avail Hrs					
				Hours/year	2088	2006 Base Hours	124117.09
Sr+Supv Supply		8	16704	Holiday Tot	104	2006 Non-Prod Hours	18010.59
Oper Supply		57	119016			2006 Productive	106106.5
Clerk Supply		1	2088			2006 Holiday Hours	6598.5
Tot Supply		66	137808			2006 "Productive"	117518.59
						2006 Vac Hours	7705.42
Sr +Supv	Base		16704			2006 Vac/"Prod" %	6.6%
	Holiday		832			2006 Sick Hours	2907.92
	"Productive"		15872			2006 Sick/"Prod" %	2.5%
	Holiday OT		666			Holiday OT %	80%
	Sick Repl OT		393				
	S/S 12-hr OT		0	4 supvs X4 hrs/pay period X 26 pay periods			
	S/S Mtg OT		0	1 time/month X 7 guys X 2hrs (Does not count Sr.)			
	Sched OT		0	Full Staff implies "R" and"X" can cover & NO 42-hr Sched OT			
	S/S Ohaul OT		420	# Overhaul Weeks X 2((W5=3, W8=9, W10=9)			
	S/S Incidental O		0	2 hrs per month X 7 guys X 12 months			
	S/S OJT OT		336	4 hrs X 7 guys X 12 months			
	Tech Train OT		58	50% 0f Tech Train + Carb & proportioned			
	FDO OT		138	Proportioned			
	SubTot OT =		2010	2006=2804			
Operator	Base		119016				
	Holiday		5928				
	"Productive"		113088				
	Holiday OT		4742				
	Sick Repl OT		2798				
	Sched OT		0	Full Staff implies "R" and"X" can cover & NO 42-hr Sched OT			
	Oper Incidental (		342	2 hrs per month X 25% guys X 12			
	EO Train OT		0	Full Staff implies "R" and"X" can cover			
	Oper OJT		342	for unit Startup; 25% guys X 2 hrs/month X 12			
	Mil Leave OT		0	4 guys X 16 hours/mo			
	Tech Trn OT		412	50% of Tech Train + Carb & proportioned			
	FDO OT		984	Proportioned			
	SubTot OT =		9621				
Clerk	Base		2088				
	Holiday		104				
	"Productive"		1984				
	Holiday OT		0				
	Sick Repl OT		0				
	Sched OT		0				
	SubTot OT =		0				
	TOT OT =		11631	8.9%	Ref to "Prod ST"	2006 OT	22633
	Avail		137808				
	Holiday		6864				
	Sick		3240				
	Vac		8586				
	Prod ST =		119118	130749	ST+OT		
PIW	OT% =		9.8%				

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

PIH - Honolulu Shift Staffing

			Avail Hrs	Hours/year	2088	2006 Base Hours	52169.2
Sr+Supv Supply		6	12528	Holiday Tot	104	2006 Non-Prod Hours	8202.2
Oper Supply		21	43848			2006 Productive	43967
Clerk Supply		0	0			2006 Holiday Hours	2741.5
Tot Supply		27	56376			2006 "Productive"	49427.7
						2006 Vac Hours	4186.7
Sr +Supv	Base		12528			2006 Vac/"Prod" %	8.5%
	Holiday		624			2006 Sick Hours	1176
	"Productive"		11904			2006 Sick/"Prod" %	2.4%
	Holiday OT		499			Holiday OT %	80%
	Sick Repl OT		283				
	S/S 12-hr OT		0	4 supvs X4 hrs/pay period X 26 pay periods			
	S/S Mtg OT		0	1 time/month X 5 guys X 2hrs (Does not count Sr.)			
	Sched OT		0	Full Staff implies "R" and"X" can cover			
	S/S Ohaul OT		200	# Overhaul Weeks X 2((H8=10)			
	S/S Incidental O		0	2 hrs per month X 5 guys X 12 months			
	S/S OJT OT		240	4 hrs X 5 guys X 12 months			
	Tech Train OT		95	50% 0f Tech Train + Carb + Pipeline & proportioned			
	FDO OT		133	Proportioned			
	SubTot OT =		1450	2006=1850			
Operator	Base		43848				
	Holiday		2184				
	"Productive"		41664				
	Holiday OT		1747				
	Sick Repl OT		991				
	Sched OT		0	Full Staff implies "R" and"X" can cover			
	Oper Incidental (		126	2 hrs per month X 25% guys X 12			
	EO Train OT		0	Full Staff implies "R" and"X" can cover			
	Oper OJT		126	for unit Startup; 25% guys X 2 hrs/month X 12			
	Mil Leave OT		0	4 guys X 16 hours/mo			
	Tech Trn OT		332	50% 0f Tech Train + Carb + Pipeline & proportioned			
	FDO OT		466	Proportioned			
	SubTot OT =		3788				
Clerk	Base		0				
	Holiday		0				
	"Productive"		0				
	Holiday OT		0				
	Sick Repl OT		0				
	Sched OT		0				
	SubTot OT =		0				
	TOT OT =		5239	9.8%	ref to "Prod ST"	2006 OT	6204
	Avail		56376				
	Holiday		2808				
	Sick		1275				
	Vac		4537				
	Prod ST =		47756	52995	ST+OT		
PIH	OT% =		11.0%				

CA-IR-232

Ref: Response to CA-IR-72, Attachment 2 (Operation Div. Hours).

Please explain for each station all the known reasons why the Company believes that test year "2007 Budget" total hours (Overtime plus Straight Time) should be significantly higher than the annual actual hours that were required to maintain 24x7 staffing at the Company's generating stations throughout 2006:

a. IK Kahe in 2006 was 116,627 hours, versus test year 124,982 hours.

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d. Provide copies of all analyses, workpapers, calculations and supporting documents associated with your response to parts a. through c. of this information request.

HECO Response:

The primary reason for the increased labor hours in PIK, PIH, and PIW is the increase in staffing level from 2006 to 2007 test year. This increase is described in HECO T-6, page 44, and HECO's response to CA-IR-72. As described in HECO T-6, page 45, line 14 to page 46, line 5, it is possible to staff the plants for 24X7 with a reduced workforce. When this occurs, however, there are consequences including elevated operator overtime, deferred training, and cancelled or restricted vacations. As described in HECO T-6 (page 46, line 2 to line 5; page 55, line 14 to 18; and page 56, line 3 to 6), the increase in the Operations Division workforce will enable more training of personnel than in recent years. Providing the necessary training is critical because the workforce has relatively less experience due, in parts, to the expansion of the staff to accommodate 24X7 operations and the higher than normal turnover of personnel that HECO has

experienced. HECO is expanding its training effort and staff to respond to this training need. However, due to the difficulties in hiring discussed in HECO T-6, page 38 to 40, and the higher than expected turnover in Operator personnel, in 2006 HECO was unable to achieve the staffing level required to fully implement the training effort. Without the staffing level to support the training effort, total recorded labor hours in 2006 were lower than they would have been with full staffing due to a combination of the less than full staffing level, and the subsequent reduction in straight time and overtime labor hours available for training activities. Examples of training activities that were impacted by the less than full staffing levels include the following:

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4. Skill Development Training: As described earlier, the younger and less experienced workforce creates a need for increased training to develop skill level. Without the staffing to support this training effort, operators could not be removed from the shift rotation to facilitate this training if the training was scheduled during the operator's regular shift. This type of training could also be performed on an OJT basis, on overtime, to allow an operator to witness or experience an evolution at the plant that he would otherwise miss.
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the shift schedule to assist the training effort with the development of and to conduct the training as instructors. A pool of replacements would be needed to support this. The two additional operators on the LOP at Kahe Power Plant and Waiau Power Plant, and the one additional at Honolulu Power Plant, were added to support this effort as well as to support other training requirements.

6. On-the-Job Training (OJT): Technical training or on-the-job training on the plant and equipment was not scheduled, in part, to manage the level of overtime being worked by operating personnel. Additional staffing would help alleviate this situation.

In reviewing the budgeted labor hours for RAs PIK, PIH, and PIW for 2007, HECO discovered that a forecasting error had been made for RA PIW. In CA-IR-73, HECO describes the "42-hour work week" shift schedule utilized at Waiau Power Plant. This schedule builds in an average of two hours of overtime per rotating shift operator per week. While this schedule increases overtime requirements, its advantage is a reduction in staffing count requirements to staff the schedule. HECO's 2007 test year estimates for PIW erroneously included both the overtime for the 42-hour work week schedule as well as the full staffing count to support a regular 40-hour shift schedule.

The move to the 42-hour work week schedule was made on a trial basis. However, in response to employee concerns of excessive overtime, HECO recently decided to review returning to a regular 40-hour work week schedule at Waiau Power Plant. HECO proposes a revision to the 2007 PIW labor forecast to remove the additional overtime needed to achieve the 42-hour work week schedule while retaining the staffing count reflective of a 40-hour work week schedule.

Also, while developing the revised labor forecast for PIW, HECO incorporated a reduced

training schedule for PIK, PIH, and PIW based on on-going training activities. HECO's plans to increase technical training are still being formulated, and are not included in the revised schedule.

HECO's proposed reduction in labor expenses for PIK, PIH, and PIW is shown in Attachment 1 to this response. As shown on page one of Attachment 1, labor hours for PIK, PIH, and PIW are reduced by a total of 9,072 hours. PIO was not adjusted in this review. The total proposed reduction in labor expense is $325,000. Pages two through five of Attachment 1 provide the assumptions and details of the labor hour calculations. This labor adjustment for Operating Division will be included in HECO's June 2007 Update.

a. Please refer to the discussion above and Attachment 1 to this response.

b. Please refer to the discussion above and Attachment 1 to this response.

c. Please refer to the discussion above and Attachment 1 to this response.

d. Please refer to the discussion above and Attachment 1 to this response.

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

2007 Operating Division Labor Adjustment

	ST	OT	Tot	
PIK - Kahe	108570	13105	121675	
PIH - Honolulu	47756	5412	53168	
PIW - Waiau	119118	12047	131165	
PIO - Admin	7297	368	7665	
Total	282742	30931	313673	2007 Revised Labor Hours

	2004	2005	2006	2007TY	2007 Rev	07Rev-07TY	
PIK - Kahe	116842	119258	116624	124982	121675	-3307	
PIH - Honolulu	39598	46201	50171	54828	53168	-1660	
PIW - Waiau	119452	131684	128739	135270	131165	-4105	
PIO - Admin	1576	5581	3652	7665	7665	0	
Total	277468	302724	299186	322745	313673	-9072	2007TY-2007 Rev

Labor OT Reduction By Labor Class

PIK	Total Reduction		-3307		Std Labor	Reduction	
Proportion	Lab Class	%	Reduction		Rate	Amount	
(8/60)	_TCS-I	13.3%	-441		$41.32	($18,220)	
(52/60)	_BUTCI	86.7%	-2866		$34.87	($99,941)	
	_BUOCI	0.0%	0				
			-3307	Check		($118,160)	Subtot PIK

PIH	Total Reduction		-1660				
Proportion	Lab Class	%	Reduction				
(6/27)	_TCS-I	22.2%	-369		$41.32	($15,244)	
(21/27)	_BUTCI	77.8%	-1291		$34.87	($45,026)	
			-1660	Check		($60,271)	Subtot PIH

PIW	Total Reduction		-4105				
Proportion	Lab Class	%	Reduction				
(8/65)	_TCS-I	12.3%	-505		$41.32	($20,875)	
(57/65)	_BUTCI	87.7%	-3600		$34.87	($125,517)	
	_BUOCI	0.0%	0				
			-4105	Check		($146,392)	Subtot PIW

($324,823) Total Ops Reduction

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

Operating Division OT Re-estimate for 2007 Labor

Payroll Recap Summary for (PIK, PIH, PIW):

	2006	2007	
Base Hours	292974	326976	[154 total X 2096)
Holiday	11968	17472	[13 full day + 2 1/2 day Holidays]
"Productive"	281006	309504	
Sick	7809		
Sick %	2.8%		
Vacation	19530		
Vac %	7.0%		

Assumptions:
1.) Assume full count of staff all year.
-- ALL vacation replacements to be covered by "EXTRA" Operator without OT.
-- ALL refresher training replacement to be covered by "RELIEF" on non-relief days w/o OT.
-- ALL LOP training replacements to be covered by "RELIEF" on non-relief days w/o OT.
2.) Use sick percentage indicated for individual RA's (based on 2006 actual).
3.) Use vacation percentage indicated for individual RA's (based on 2006 actual).
4.) IO remains the same.

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE
PIK - Kahe Shift Staffing

		Avail Hrs	Hours/year	2096	2006 Base Hours	11668.24
					2006 Non-Prod Hours	18051.69
Sr+Supv Supply	8	16768	Holiday Tot	112	2006 Productive	98635.66
Oper Supply	52	108992			2006 Holiday Hours	6258.5
Clerk Supply	1	2096			2006 "Productive"	110428.9
Tot Supply	61	127856			2006 Vac Hours	7637.94
					2006 Vac/"Prod" %	6.9%
Sr +Supv	Base	16768			2006 Sick Hours	3725.5
	Holiday	896			2006 Sick/"Prod" %	3.4%
	"Productive"	15872			Holiday OT %	0.8
	Holiday OT	512	4 of 7 Supvs due to 12-hr shift			
	Sick Repl OT	268	Assume 50% OT due to 12-hr shift			
	S/S 12-hr OT	520	4 supvs X4 hrs/pay period X 26 pay periods			
	S/S Mtg OT	168	1 time/month X 7 guys X 2hrs (Does not count Sr.)			
	Sched OT	0	Full Staff implies "R" and"X" can cover			
	S/S Ohaul OT	320	# Overhaul Weeks X 20 (K2=8, K5=8)			
	S/S Incidental O	0	2 hrs per month X 7 guys X 12 months			
	S/S OJT OT	112	4 hrs X 7 guys X 4 time per year			
	Tech Train OT	45	50% of Tech Train + Carb & proportioned			
	FDO OT	101	Proportioned & reduced by 50% due to 12-hr shift			
	SubTot OT =	2045	2006=1784			
Operator	Base	108992				
	Holiday	5824				
	"Productive"	103168				
	Holiday OT	4659				
	Sick Repl OT	3481				
	Sched OT	0	Full Staff implies "R" and"X" can cover			
	Oper Incidental (	312	2 hrs per month X 25% of crew X 12			
	EO Train OT	0	Full Staff implies "R" and"X" can cover			
	Oper OJT	624	for unit Startup; 50% of guys X 2 hrs/month X 12			
	Mil Leave OT	384	50% of 4 guys X 16 hours/mo			
	Tech Trn OT	289	50% of Tech Train + Carb & proportioned			
	FDO OT	1310	Proportioned			
	SubTot OT =	11060				
Clerk	Base	2096				
	Holiday	112				
	"Productive"	1984				
	Holiday OT	0				
	Sick Repl OT	0				
	Sched OT	0				
	SubTot OT =	0				
	TOT OT =	13105	10.8%	Ref to "Prod ST"	2006 OT	17989
	Avail	127856				
	Holiday	6832				
	Sick	4083				
	Vac	8371				
	Prod ST =	108579	121675	ST+OT		
PIK	OT% =	12.1%				

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE
PIW - Waiau Shift Staffing

			Avail Hrs	Hours/year	2096	2006 Base Hours	124117.09
Sr+Supv Supply		8	16768	Holiday Tot	112	2006 Non-Prod Hours	18010.5
Oper Supply		57	119472			2006 Productive	106107.5
Clerk Supply		1	2096			2006 Holiday Hours	6598.5
Tot Supply		66	138336			2006 "Productive"	117518.59
						2006 Vac Hours	7705.42
Sr +Supv	Base		16768			2006 Vac/"Prod" %	6.6%
	Holiday		896			2006 Sick Hours	2907.92
	"Productive"		15872			2006 Sick/"Prod" %	2.5%
	Holiday OT		717			Holiday OT %	0.8
	Sick Repl OT		393				
	S/S 12-hr OT		0	4 supvs X4 hrs/pay period X 26 pay periods			
	S/S Mtg OT		0	1 time/month X 7 guys X 2hrs (Does not count Sr.)			
	Sched OT		0	Full Staff implies "R" and"X" can cover & NO 42-hr Sched OT			
	S/S Ohaul OT		420	# Overhaul Weeks X 20 (W5=5, W8=9, W10=9)			
	S/S Incidental O		0	2 hrs per month X 7 guys X 12 months			
	S/S OJT OT		336	4 hrs X 7 guys X 12 months			
	Tech Train OT		58	50% 0f Tech Train + Carb & proportioned			
	FDO OT		138	Proportioned			
	SubTot OT =		2061	2006=2804			
Operator	Base		119472				
	Holiday		6384				
	"Productive"		113088				
	Holiday OT		5107				
	Sick Repl OT		2798				
	Sched OT		0	Full Staff implies "R" and"X" can cover & NO 42-hr Sched OT			
	Oper Incidental (		342	2 hrs per month X 25% guys X 12			
	EO Train OT		0	Full Staff implies "R" and"X" can cover			
	Oper OJT		342	for unit Startup; 25% guys X 2 hrs/month X 12			
	Mil Leave OT		0	4 guys X 16 hours/mo			
	Tech Trn OT		112	50% of Tech Train + Carb & proportioned			
	FDO OT		984	Proportioned			
	SubTot OT =		9986				
Clerk	Base		2096				
	Holiday		112				
	"Productive"		1984				
	Holiday OT		0				
	Sick Repl OT		0				
	Sched OT		0				
	SubTot OT =		0				
	TOT OT =		12047	9.2%	Ref to "Prod ST"	2006 OT	22633
	Avail		138336				
	Holiday		7392				
	Sick		3240				
	Vac		8586				
	Prod ST =		110118	121165	ST+OT		
PIW	OT% =		10.1%				

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE
PIH - Honolulu Shift Staffing

			Avail Hrs	Hours/year	2096	2006 Base Hours		52169.2
Sr+Supv Supply		6	12576	Holiday Tot	112	2006 Non-Prod Hours		8202.2
Oper Supply		21	44016			2006 Productive		43967
Clerk Supply		0	0			2006 Holiday Hours		2741.5
Tot Supply		27	56592			2006 "Productive"		49427.7
						2006 Vac Hours		4186.7
Sr +Supv	Base		12576			2006 Vac/"Prod" %		8.5%
	Holiday		672			2006 Sick Hours		1176
	"Productive"		11904			2006 Sick/"Prod" %		2.4%
	Holiday OT		538			Holiday OT%		0.8
	Sick Repl OT		283					
	S/S 12-hr OT		0	4 supvs X4 hrs/pay period X 26 pay periods				
	S/S Mtg OT		0	1 time/month X 5 guys X 2hrs (Does not count Sr.)				
	Sched OT		0	Full Staff implies "R" and"X" can cover				
	S/S Ohaul OT		200	# Overhaul Weeks X 20 (48=10)				
	S/S Incidental O		0	2 hrs per month X 5 guys X 12 months				
	S/S OJT OT		240	4 hrs X 5 guys X 12 months				
	Tech Train OT		95	50% 0f Tech Train + Carb + Pipeline & proportioned				
	FDO OT		133	Proportioned				
	SubTot OT =		1489	2006=1850				
Operator	Base		44016					
	Holiday		2352					
	"Productive"		41664					
	Holiday OT		1882					
	Sick Repl OT		991					
	Sched OT		0	Full Staff implies "R" and"X" can cover				
	Oper Incidental (		126	2 hrs per month X 25% guys X 12				
	EO Train OT		0	Full Staff implies "R" and"X" can cover				
	Oper OJT		126	for unit Startup; 25% guys X 2 hrs/month X 12				
	Mil Leave OT		0	4 guys X 16 hours/mo				
	Tech Trn OT		332	50% 0f Tech Train + Carb + Pipeline & proportioned				
	FDO OT		466	Proportioned				
	SubTot OT =		3923					
Clerk	Base		0					
	Holiday		0					
	"Productive"		0					
	Holiday OT		0					
	Sick Repl OT		0					
	Sched OT		0					
	SubTot OT =		0					
	TOT OT =		5412	10.1% ref to "Prod ST"			2006 OT	6204
	Avail		56592					
	Holiday		3024					
	Sick		1275					
	Vac		4537					
	Prod ST =		47756	53168 ST+OT				
PIH	OT% =		11.3%					

CA-IR-233

Ref: Response to CA-IR-72, Attachment 2 (Maintenance Labor Hours.

Please explain for each station all the known reasons why the Company believes that test year "2007 Budget" total hours (Overtime plus Straight Time) should be significantly higher than the annual actual hours that were required to adequately maintain the Company's generating stations throughout 2006:

a. PIL Kahe in 2006 was 59,482 hours, versus 66,320 test year hours.

b. PIN Honolulu in 2006 was 16,490 hours, versus test year 24,540 hours.

c. PIX Waiau in 2006 was 61,346 hours, versus test year 67,046 hours.

d. PIT Traveling Maintenance in 2006 was 157,098 hours, versus test year 185,484 hours.

e. Provide copies of all analyses, workpapers, calculations and supporting documents associated with your response to parts a. through d. of this information request.

HECO Response:

Note: The reference should be to Response to CA-IR-74, Attachment 6.

a. As discussed in HECO's response to CA-IR-74 and CA-IR-234, the overall level of maintenance effort has been increasing since 2001. The increased effort is needed to perform necessary preventative maintenance work, manage the backlog of maintenance work, minimize the deferral of work, and perform forecast capital projects. To satisfy these work demands, labor resource requirements are met by a combination of HECO trades and crafts personnel working straight time and overtime, and contracting outside services. HECO's estimates for straight time and overtime labor hours are based on the anticipated level of maintenance effort and capital projects. The exercise considers several factors, including the specific requirements of the work, schedule and duration of outages in which the work will be performed, cost, and work priority.

In general, more straight time is budgeted for PIL in 2007 than was incurred in 2006 because of the higher staffing level assumed. Less total overtime hours are budgeted in 2007 than were incurred in 2006, 2005, or 2004. See HECO's response to CA-IR-236 for discussion on the overtime forecast. If staffing goals cannot be met then that level of effort will be made up with contractors or additional overtime, and/or some work would have to be deferred. See HECO T-6, pages 49-52.

b. Please refer to a. above. The reasons for the increase in labor hours for PIN are the same as those discussed above for PIL. In general, more straight time is budgeted for PIN in 2007 than was incurred in 2006 because of the higher staffing level. Because of the small staff count at PIN, the additional staff added to the count for PIN represents a large percentage increase in straight time labor hours. The increase, however, is consistent with the increase in staffing level to support the anticipated work demands. Overtime hours for PIN in 2007 are higher than 2006 by 2,259 hours. See HECO's response to CA-IR-236 for discussion of the overtime forecast. As described in CA-IR-236, in forecasting the overtime for maintenance, the three functionally similar station maintenance RAs, PIL, PIN, and PIX, were grouped together and the same 15% factor was applied to each. (As described in CA-IR-236, other departments then add labor demand for capital projects. The added capital labor demand for PIL was 500 hours as shown on CA-IR-1, Attachment 12D, page 1; 725 hours for PIN as shown on CA-IR-1, Attachment 12F, page 1; and 1,910 hours for PIX as shown on CA-IR-1, Attachment 12K, page 1. These additional labor hours increase the OT percentage slightly above 15%.) Because of this grouping, when viewed alone the overtime labor hours included in the PIN labor forecast are higher than historical overtime labor hours. However, the overtime labor hours for the group are considered to be

reasonable, and at an amount needed to sustain the reliability of HECO's generating units at acceptable levels. If staffing goals cannot be met then that level of effort will be made up with contractors, and/or additional overtime or some work would have to be deferred.

c. Please refer to a. above. The reasons for the increase in labor hours for PIX are the same as those discussed above for PIL. In general, more straight time is budgeted for PIX in 2007 than was incurred in 2006 because of the higher staffing level. Less total overtime hours are budgeted in 2007 than were incurred in 2006 and the prior years. See HECO's response to CA-IR-236 for discussion of the overtime forecast. If staffing goals cannot be met then that level of effort will be made up with contractors, and/or additional overtime or some work would have to be deferred.

d. Please refer to a. above. The reasons for the increase in labor hours for PIT are the same as those discussed above for PIL. In general, more straight time is budgeted for PIT in 2007 than was incurred in 2006 because of the higher assumed staffing level. More overtime hours are budgeted in 2007 than were incurred in 2006 and the prior years. See HECO's response to CA-IR-236 for discussion on the overtime forecast. The total maintenance overtime for all of the groups, however, is less than was incurred in 2006, and the percentage of overtime to straight time hours is less than was incurred in the 2004 to 2006 period. If staffing goals cannot be met then that level of effort will be made up with contractors, and/or additional overtime or some work would have to be deferred.

e. Please refer to HECO T-6 and HECO's response to CA-IR-1.

CA-IR-234

Ref: Response to CA-IR-74, Attachment 10 (Maintenance Labor + Outside Service Supplementary Maintenance Labor).

According to the Total column of Attachment 10, combined actual internal and contract maintenance labor costs have increased at a rate of 10% to 12% per year in 2004, 2005 and 2006. However, for the test year the proposed combined maintenance labor costs are projected to grow by 16% over 2006 actual levels. Please respond to the following:

a. Provide the most detailed available explanation of work requirements known to be increasing at an accelerating percentage in 2007, relative to all prior years shown.

b. Identify and quantify each incremental work project or process anticipated to be done in 2007 that was deferred from prior years.

c. Explain and quantify each known specific instance where work performed in prior years was not sufficient to adequately maintain the Company's generating units and describe additional efforts projected by each RA work group in 2007 to remedy such deficiencies.

HECO Response:

a. As shown in CA-IR-74, Attachment 10, the total expense for Maintenance Labor plus Outside Services Supplementary Labor increased by $2,404,000 from actual expenses of $14,991,000 in 2006 to an estimate of $17,395,000 for the 2007 test year. This increase is primarily due to HECO Maintenance Labor. The Maintenance Labor 2007 test year estimate was primarily impacted both by the 2007 test year estimated staffing levels and by the general wage rates for 2007. The in-house labor staffing estimate for the 2007 test year assumes that there are 161 employees in the Maintenance Division, whereas the actual

number of employees in the Maintenance Division in 2006 was approximately 134. See HECO's response to CA-IR-74. In addition, the 2007 test year estimate for labor expense reflects higher wage rates applied to the estimated staffing level of 161 employees. As a result of the projected wage increases, on an annual basis, general wage rates for Test Year 2007 are expected to be 6.53% (for bargaining unit employees) and 7.64% (for merit employees) higher than the respective 2005 wage rates. Ms. Nanbu in HECO T-10 discusses the relative wage rates between 2005 and 2007 based on the wage increase assumptions for bargaining unit and merit employees discussed by Ms. Price in HECO T-12. See HECO T-6, pages 62-63.

Outside Services Supplemental Labor decreased between the 2006 actual expense and the 2007 estimated expense. However, it should be noted that from 2004 to 2007 the outside service labor hour rates have increased, with increases of a few percent for general laborers, to 28% for instrument technicians, and to 38% for insulators.

As discussed in CA-IR-74, part g., the budgeted staffing level and associated straight time and overtime coupled with budgeted outside services are the level of maintenance effort needed to manage the backlog of work, perform needed maintenance work, and minimize the deferral of work. Consequently, since the Maintenance Division is not fully staffed in 2007 as of this date, the actual labor expense for HECO Maintenance Division is expected to be less than estimated and the corresponding actual outside service expense is expected to be higher than estimated.

While HECO is performing work at a level which results in a reasonable and acceptable level of reliability, decisions often must be made, as described in HECO's responses to CA-IR-240, -241, and -242, to divert resources from the performance of discretionary work to

manage more important emergent work that is deemed non-discretionary. As resources are shifted away from discretionary work, that discretionary work is deferred. Deferral of discretionary work, if not managed, could result in the added expense of the deferred work becoming higher when it is finally performed.

Examples of lower priority deferred work was presented in HECO T-6, page 52, and discussed further in HECO's response to CA-IR-76. There are more examples of work that has been deferred or not acted upon in the work order backlog. As a consequence of deferring discretionary work, more maintenance would be performed on the items such as:

1. Instrument calibration,
2. valve repairs,
3. soot blower maintenance,
4. traveling screen maintenance,
5. wastewater treatment facility maintenance,
6. air preheater hopper repairs,
7. waste oil maintenance,
8. general housekeeping,
9. boiler cold pressurized pipeline repair work,
10. drain trap maintenance,
11. plugged drain line maintenance,
12. deck grating maintenance, and
13. traveling screen piping maintenance.

b. Please see Attachment 1 for work that was deferred from prior years and is expected to be done in 2007.

c. HECO has done a good job of maintaining its generating system and performing the critical work necessary to maintain the reliability of its generating system, given the situation it has faced in recent years. Nonetheless, HECO needs to do (and is taking steps to enable it to do) an even better job (i.e., be in a position to do more work) now and in the future. This has been addressed at length in HECO T-6 and related IR responses in HECO's 2005 test year rate case, in recent Adequacy of Supply Reports, in the 2006 ESI Report (provided in response to CA-IR-37 on Attachment 1), in HECO T-6 in this rate case, and in various responses to IR's in this rate case (such as the response to CA-IR-228).

The premise of CA-IR-234, part c., that "work performed in prior years was not sufficient to adequately maintain the Company's generating units" is not supported by the facts presented by HECO in this proceeding. To the contrary, as stated in HECO's response to CA-IR-74, part e., "the combination of HECO labor expense for straight time and overtime hours, plus the expense for outside contractor support, reflects a level of spending needed to operate and maintain the Company's generating plants at adequate levels of performance and reliability." As discussed in the 2006 AOS and restated in HECO T-6, pages 9 and 10, the Forward Looking EFOR for 2006 was projected to be 6.8% and this projection is considered to have been reasonable based on a variety of factors including the ages of the generating units and the expectation of more catastrophic forced outages and deratings that relate to the current operating duties of the units and auxiliary equipment. The actual EFOR for 2006 was 5.3%, and is considered to be indicative of acceptable reliability for the HECO fleet in 2006. As stated in the 2007 AOS, the Forward Looking EFOR for 2007 is projected to be approximately 5.4%. HECO T-6, pages 11 and 12, notes that, "adequate amounts of preventive and corrective maintenance must be performed on a

continuing basis to sustain the reliability of HECO's generating units at acceptable levels." As reserve margins have decreased over recent years, it has been necessary to operate most of the aging units more hours and at higher capacity factors, except in years when significant Planned Outages (i.e., "overhaul") occur.

The costs to perform the necessary levels of preventive and corrective maintenance have increased significantly in recent years. Following are a few examples of maintenance work related to the age of the units that add significantly to maintenance costs.

1. Boiler convection heat transfer sections are at or near the end of their useful lives. Not all areas of the same convection pass deteriorate at the same rate. Recently the Kahe 1 reheater lower half was replaced due to its poor condition. The upper half of the Kahe 1 reheater was not replaced because its tubes were in acceptable condition. If the entire reheater had been replaced, it would have been performed as a capital project and there would be no corresponding O&M expense. The total cost for replacing the lower half of the reheater on Kahe 1 was an O&M expense.
2. The waterwall corner tubes on the Combustion Engineering boilers (i.e., Waiau 7, Waiau 8, Kahe 3, and Kahe 4) are at the end of their useful lives and need to be replaced. If not replaced, chronic tube failures and forced outages can be expected. These tubes are being replaced in Waiau 7 and Kahe 3 in 2007 and in Waiau 8 and Kahe 4 in subsequent years. The total cost for these tube replacements are O&M expenses.
3. Waiau 3 and 4 front waterwalls need to be replaced in part or in total.
4. Waiau 3 and 4 and Honolulu 8 and 9 have extensive amounts of thermal insulation that contain asbestos. The insulation is deteriorating and must be removed and replaced as

it deteriorates. Deteriorating insulation must be replaced during overhauls or extended maintenance outages on all units, not only Waiau 3 and 4, and Honolulu 8 and 9.

5. In the last 5 years on Waiau 3 and Honolulu 9, major cracks were found in the steam turbine casings. The cracks were cut out and replaced with weld material.

6. The amount of non-destructive testing (NDT) that is performed on each steam and combustion turbine has increased significantly. NDT is used to determine potential repairs that are necessary to ensure that the turbines are safe to run.

7. There are other concerns in the aging plants that will have to be addressed in the near future, including the 2,300V and 480 V breakers, and the power and signal wiring throughout all of the power plants.

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

2005 and 2006 work budgeted but not done
Expect to do in 2007
Waiau Bathroom/Shower/Locker room Refurbishment
Waiau Travel Screens
Waiau Gantry Crane Mech/Hydraulic Repairs
Waiau BFP Overhaul / Motor Service
Waiau Condensate Pump Overhaul / Motor Service
Waiau Waste Water Treatment Facility Repairs
Waiau Shop Bldg Repairs
Waiau Waste Water Treatment Facility Repairs - General
Kahe Culvert Drain Maintenance
Kahe Waste Water Structural Maint
Kahe Demin Structural Maint
Kahe Locker Room Lockers/Replace/Realign
Kahe Intake Bar Grills Insp & Cln
Kahe Basin Intake Dredging
Kahe Distilled Water Tanks Insp & Rpr.
Kahe 5&6 ACW Lines/ Inspect, Repair, Replace
Kahe Discharge Shoebox Repairs
Kahe Turbine Deck Drains
Kahe Turbine Deck Coating Repairs
Hon Building Repairs
Hon Waste Water Pit Repairs

CA-IR-235

Ref: Response to CA-IR-76, (Lower Priority Deferred Work).

According to the response, the listed cathodic protection and spalling repairs at page 52 of T-6 were deferred in prior years and "will not likely be done in 2007." Please provide the following information with respect to this statement:

a. Explain the considerations that make this type of work discretionary, indicating impacts upon reliability, employee safety, asset protection and any other criteria.

b. Which, if any, of the projects were included within the 2005 rate case expense projections?

c. Explain how the Company creates and prioritizes its list of projects and other work orders at each generating station.

d. Provide a detailed listing of all projects and other maintenance work orders at each generating station that were determined to be lower priority and were budgeted expenditures, but were ultimately not incurred as expenses in the year 2005.

e. Provide a detailed listing of all projects and other maintenance work orders at each generating station that were determined to be lower priority and were budgeted expenditures, but were ultimately not incurred as expenses in the year 2006.

HECO Response:

a. Discretionary work typically has the following characteristics:

   1. Not performing the work does not pose an immediate safety or health risk,
   2. The work is not mandated by State or Federal law or regulations, and not mandated by any HECO permit issued by any State or Federal agency,

3. Not performing the work does not pose a significant probability of serious adverse environmental impact,
4. The work is not required by an existing contract or agreement,
5. Not performing the work does not pose a significant probability of a forced outage or forced derate, or
6. The work can be deferred at least one year with no significant adverse consequences.

The specific cathodic protection work and spall repairs in question had all the characteristics listed above.

b. The work activities noted on HECO T-6, page 52, were included in the initial 2005 budget, upon which the test year expense estimates were based. As stated in HECO's response to CA-IR-76, the Cathodic Protection work for Honolulu, Kahe, and Waiau, and the Waiau Circulating Water Spalling Repairs, were not included in the 2007 Production O&M test year expense estimate.

As noted in testimony and in numerous information responses in the 2005 test year rate case and in this rate case, there are expected to be, and normally are, differences between specific work included in the budget for a particular year, and the work that actually is done. For example, HECO's 2005 test year expense estimate for Production O&M was based on the 2005 budget estimate prepared in 2004 before making the adjustments discussed in direct and rebuttal testimonies. HECO's 2005 test year rebuttal estimate, after the adjustments, was $56,497,000. (See Attachment 1 to this response.) The Stipulated Settlement amount for 2005 test year was $53,269,000. (See pages 27 to 28 of HECO's Opening Brief filed with the Commission on December 2, 2005 in Docket No. 04-0113.) In total, the final recorded Production O&M expenses for 2005 were $57,129,000 (the sum

of 2005 Operations Expense of $22,458,000 and 2005 Maintenance Expense of $34,671,000 from HECO-622 and HECO-623, respectively). Actual 2005 expenses were $3,860,000 greater than the 2005 test year Stipulated Settlement amount.

	2005 Actual	2005 TY Rebuttal	2005 TY Settlement
Production Operations			
1 Labor	$12,304	$13,398	$13,180
2 Non-Labor	$10,154	$10,240	$ 9,229
3 TOTAL	$22,458	$23,638	$22,409
Production Maintenance			
1 Labor	$10,519	$12,372	$11,159
2 Non-Labor	$24,151	$20,487	$19,797
3 TOTAL	$34,671	$32,859	$30,956
TOTAL	$57,129	$56,497	$53,365
Production Labor Adj.			($96)
Settlement Total			$53,269

c. HECO has several stakeholders who participate in the annual budget process to create and initially prioritize lists of projects and other work for each generating station. The stakeholders include, but are not limited to, PSO&M Department Manager, Maintenance Superintendent, the Station Maintenance Supervisors, Predictive Maintenance Specialists, Station Superintendents, and Senior Supervisors for Operations, Resource Planners, System Owners, and O&M Engineers. At mid-year, the stakeholders create a list of projects and work for the following year based, in part, on: 1) review the current year's work list and identification of work that needs to recur on an annual basis; 2) review of the current year's work list and identification of work that is not expected to be performed or completed in the

current year; and 3) new work that they are aware of that needs to be performed. That list is then prioritized in accordance with the prioritization legend shown on CA-IR-2, Attachment 13D, page 6. Prioritization is performed by following the steps below:

1. Classify the work as Discretionary or Non-Discretionary by reviewing it against the 6 characteristics listed in part a. of this response.
2. Identify the area of impact (Safety/Security, Legal/Regulatory, Reliability, Heat Rate, Plant and Property, and Work Environment). Impact area 1 (Safety/Security) will generally be given a higher priority than 2 (Legal/Regulatory) and so on.
3. Identify if the impact is major or minor. Activities with a major impact will generally be given a higher priority over an activity with a minor impact.
4. Assign a priority from 1 to 5, with 1 being the lowest priority.

As the year progresses, HECO has several stakeholders who participate in the daily/weekly scheduling and prioritization of work orders to be addressed for each generating station. The stakeholders include, but are not limited to, the Station Resource Planners, the Station Maintenance Supervisors, Station Superintendents, and Senior Supervisors for Operations, and System Owners. Each work order is assigned a priority (e.g., "emergency", "high", "medium", or "low") by the creator of the work order that corresponds with the priority assigned to the project or work in the four-step process described above. The Station Resource Planners prepare a four-week schedule of work orders to be addressed based on the assigned priority, confirm that all materials are on hand, and that trades and crafts personnel are available to perform the work. The four-week schedule is reviewed and updated based on priorities discussed among the stakeholders at meetings that occur as often as daily at each generating station.

Work can also be reprioritized based on budget. As described in part b., above, there are expected to be, and normally are, differences between specific work included in the budget for a particular year and the work that actually is done. Unbudgeted work requirements due to forecast overruns or unforeseen equipment failure can and will occur during the year. Budgeted but lower priority work activities are then deferred to allow funds to be diverted to perform the higher priority unbudgeted or emergent work. HECO's response to CA-IR-240 d. describes $5,886,000 of unbudgeted expenses for overhaul or outage project expenses in 2007. The lower priority work and other discretionary work described in HECO's responses to CA-IR-240, -241, and -242 will be deferred to allow the funds initially allocated to that work to be used to offset the unbudgeted increases in these overhaul and outage projects.

If the Production O&M budget did not include discretionary work, all unbudgeted work that had to be performed would result in overrun relative to the budget. Accordingly, being able to offset this type of work with the deferral of discretionary work helps to manage resources and expenses. Attachments 2 and 3 to this response list discretionary or lower priority work that were budgeted but not performed in 2005 and 2006 to offset overruns in expenses.

HECO notes that lower priority work cannot be postponed indefinitely. As reflected in CA-IR-240, -241, and -242, discretionary work items, if deferred, may eventually be elevated in priority and may become reclassified as "non-discretionary." Moreover, unbudgeted non-discretionary work that was not scheduled (e.g., corrective maintenance to repair broken equipment that is causing a forced outage) could be more expensive to perform than similar work planned in advance.

d. Please refer to Attachment 2 for lower priority discretionary or lower priority work budgeted for 2005, but not performed that year. As described above, funds for deferred work are used to offset the cost of unforecasted work or overruns in other higher priority work. Also, lower priority discretionary work can be deferred, but may eventually become elevated in priority and may become reclassified as "non-discretionary".

e. Please refer to Attachment 3 and the discussion in part d., above. As described above, funds for deferred work are used to offset the cost of unforecasted work or overruns in other higher priority work. Also, lower priority discretionary work can be deferred, but may eventually become elevated in priority and may become reclassified as "non-discretionary".

Hawaiian Electric Company, Inc.
2005 TEST YEAR

OTHER PRODUCTION OPERATION & MAINTENANCE EXPENSES
($ Thousands)

Line		(A) HECO Direct	(B) Adjust-ments	(C) HECO Rebuttal
	PRODUCTION OPERATION			
1	Labor	13,398	0	13,398
2	Non-Labor	10,479	(239)	10,240
3	Total Operation	23,877	(239)	23,638
	PRODUCTION MAINTENANCE			
4	Labor	12,372	0	12,372
5	Non-Labor	18,792	1,695	20,487
6	Total Maintenance	31,164	1,695	32,859
7	TOTAL PRODUCTION O&M	55,041	1,456	56,497

Source: Column A: HECO-615
Column B, Line 1: HECO-R-603, Line 1
Column B, Line 2: HECO-R-603, Line 2 - 8
Column B, Lines 4: HECO-R-604, Line 1
Column B, Lines 5: HECO-R-604, Lines 2 - 6
Column C: Column A + Column B

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

2005 lower priority work budgeted but not performed
Waiau Turbine deck coating
Waiau 7/8 Corrosion Control
Waiau Building Repairs Units 3&4
Waiau Bathroom/Shower/Locker room Refurbishment
Waiau Cathodic Protection
Waiau Travel Screens
Waiau Gantry Crane Mech/Hydraulic Repairs
Waiau Two (2) BFP Overhaul / Motor Service
Waiau Two (2) Condensate Pump Overhaul / Motor Service
Waiau Station Fencing Repairs
Waiau Waste Water Treatment Facility Repairs
K1-6 Structural Painting
Kahe IK Soot blower Repairs
Kahe Culvert Drain Maintenance
Kahe Roadside Landscaping
Kahe Cathodic Protection
Kahe Screen Wash Water Piping
Kahe Condensate. PP OH
Kahe Discharge Shoebox Repairs
Kahe Waste Water Structural Maint
Kahe Demin Structural Maint
Hon Building Repairs
Hon CWP or CDP or BFP overhaul
Hon Cathodic Protection

HAWAIIAN ELECTRIC COMPANY INC.
2007 RATE CASE

2006 Production O&M lower priority work budgeted but not performed
Hon Install Energy Efficient Lighting
Hon Building Repairs
Hon Condenser Corrosion (Repairs External)
Iwilei Truck Station Modifications
Hon Cathodic Protection Repairs
Hon Waste Water Pit Repairs
Waiau Paint - Corrosion Control
Waiau Shop Bldg Repairs
Waiau Building Repairs Units 3&4
Waiau Roll-up Door Maintenance
Waiau Gate Maintenance
Waiau Cathodic Protection
Waiau Circ Water Spall Repairs
Waiau Distilled Water Tank Maintenance
Waiau Waste Water Treatment Facility Repairs - General
Waiau Waste Water Treatment Facility Maintenance - Batch/Sludge Tank
Waiau Diesel Oil Tank A clean & inspect interior
Kahe 1-6 Corrosion Control
Kahe Demin Structural Maint
Kahe Waste Water Structural Maint
Kahe Locker Room Lockers/Replace/Realign
Kahe Intake Bar Grills Insp & Cln
Kahe Admin Office/Refurbish, Paint, Ceiling Panels
Kahe Basin Intake Dredging
Kahe Culvert Drain Maintenance
Kahe Distilled Water Tanks Insp & Rpr.
Kahe Boiler Feed Pump OH (1)
Kahe Circ Water Pump OH (1)
Kahe Condensate Pump OH
Kahe Cathodic Protection
Kahe Screen Wash Water Piping
Kahe 5&6 ACW Lines/ Inspect, Repair, Replace
Kahe Discharge Shoebox Repairs
Kahe Turbine Deck Coating Repairs
Kahe Turbine Deck Drains
Kahe Pond 2A & 2B Sludge Removal