APPENDIX A TABLES

Table A.1 Hawaii Crude Oil Imports (Barrels/Year), 1990-1997

Source	1990	1991	1992	1993	1994	1995	1996	1997
Foreign Crude Oil Imports								
Asia								
Australia	8,431,500	3,945,650	1,992,900	2,819,000	4,096,000	5,068,000	7,617,000	9,022,000
China	1,938,150	1,237,350	3,595,250	829,000		1,013,000	6,155,000	5,846,000
Indonesia	16,837,450	18,636,900	15,731,500	19,295,000	25,797,000	20,983,000	11,577,000	15,636,000
Malaysia	2,332,350	4,223,050	2,452,800	1,014,000		1,400,000	502,000	649,000
Papua NG			740,950	993,000	3,475,000	1,669,000	2,707,000	1,375,000
Vietnam						346,000	4,949,000	1,557,000
Americas								
Argentina			372,300					721,000
Canada			175,200	128,000				390,000
Colombia								218,000
Ecuador	974,550		693,500	703,000	672,000		200,000	
Venezuela		171,550	160,600	352,000	166,000	200,000	182,000	197,000
Mideast						1,391,000		
Oman			197,100	611,000				240,000
Foreign Subtotal	**30,514,000**	**28,214,500**	**26,112,100**	**26,744,000**	**34,206,000**	**32,070,000**	**33,889,000**	**35,851,000**
Domestic Imports	**17,630,553**	**23,909,420**	**20,755,738**	**22,321,911**	**21,049,157**	**19,070,492**	**18,149,220**	**14,999,609**
Total	**48,144,553**	**52,123,920**	**46,867,838**	**49,065,911**	**55,255,157**	**51,140,492**	**52,038,220**	**50,850,609**

Sources: 1990-1992, Pacific West Oil Data cited in EWC 1993; 1993-1997 DBEDT 1999

Table A.2 Hawaii Refined Petroleum Product Trade, 1997

	Imports			Exports		
Barrels of Product	**Domestic**	**Foreign**	**Total**	**Domestic**	**Foreign**	**Total**
Distillates	62,786		62,786	668,000	11,000	679,000
Jet Fuel	311,084	5,134,912	5,445,996	126,000		126,000
Naphtha					1,201,000	1,201,000
Residual Fuel Oil				42,000	415,000	457,000
Other	1,153,940		1,153,940	2,663,388	1,709,000	4,372,388

Table A.3 Average Hawaii Refined Product Imports and Exports, 1990-1997

	Imports			Exports		
Barrels of Product	**Domestic**	**Foreign**	**Total**	**Domestic**	**Foreign**	**Total**
Distillates	395,382	19,500	414,882	939,500	190,934	1,130,434
Jet Fuel	1,021,871	1,312,664	2,334,535	82,375	240,286	322,661
Motor Gasoline	96,775	0	96,775	272,276	183,520	455,796
Naphtha	33,083	0	33,083	365,568	1,055,504	1,421,072
Residual Fuel Oil	1,015,592	470,750	1,486,342	508,089	987,092	1,495,180
Other	163,618	74,500	238,118	404,674	303,625	708,299
Total	2,726,320	1,877,414	4,603,734	2,572,480	2,960,961	5,533,441

Table A.4 Coal Use in Hawaii (Short Tons), 1990 - 1997

	1990	1991	1992	1993	1994	1995	1996	1997
Cement	26,369	30,000	28,659	29,943	34,697	35,697	22,544	0
Sugar Ind	7,809	9,365	56,654	65,337	49,781	14,216	42,534	50,946
AES Hawaii	0	0	175,000	579,000	563,365	620,286	664,190	673,998
HCPC		included with sugar industry				82,900	96,556	93,455
Total	34,178	39,365	260,313	674,280	647,843	753,099	825,824	818,399

Sources: Hawaiian Cement, HARC Unpublished Data, DBEDT Data

Table A.5 Hawaii Coal Imports, 1990-1997

Country	1990	1991	1992	1993	1994	1995	1996	1997
Australia	34,178	39,365	85,313	98,947	109,737	211,099	147,294	155,632
Indonesia	0	0	175,000	561,332	560,268	633,686	662,882	603,753
Total	34,178	39,365	260,313	660,279	670,005	844,785	810,176	759,385

Sources: 1990-1992: DBEDT; and 1993-1997: EIA 1999a

Table A.6 Hawaii Electricity Production from Bagasse (GWh), 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Hawaii	168	162	158	127	113	11	2	closed
Kauai	124	111	90	86	79	77	94	78
Maui	146	152	163	152	166	152	143	133
Oahu	93	82	79	88	88	56	31	closed
Statewide	531	507	490	453	446	296	270	211

Source: Unpublished data, Hawaii Agricultural Research Center

Table A.7 Percentage of Hawaii Sugar Industry-Generated Electricity Sold to Utilities, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Hawaii	72%	72%	71%	65%	69%	0%	0%	closed
Kauai	53%	54%	55%	57%	49%	48%	57%	49%
Maui	43%	40%	42%	42%	43%	37%	32%	36%
Oahu	17%	37%	32%	33%	51%	53%	61%	closed
Statewide	51%	48%	52%	49%	52%	42%	42%	40%

Source: Unpublished data, Hawaii Agricultural Research Center

Table A.8 Geothermal Electricity Generation and Avoided Oil Use and CO2 Emissions, 1992-1997

	1992	1993	1994	1995	1996	1997	Total
Electricity Sold to HELCO							
KWh	1,261,141	142,523,997	174,761,434	223,000,772	228,041,630	228,668,755	998,257,729
Savings Compared to Fossil-Fueled Generation on HELCO System							
Barrels Oil	3,802	395,624	449,377	456,356	416,883	407,443	2,129,485
Tons CO_2	1,127	154,779	189,479	243,085	245,588	240,842	1,074,900

Table A.9 Hydroelectric Power Plants in Hawaii, 1997

Island	Location	Stream	MW Capacity	Gross Generation (MWh)	Oil Equiv.* (1000 Bbl)	Owner
HAWAII	Hilo	Wailuku	1.50	9,281	15.47	HELCO Puueo
	Hilo	Wailuku	0.75	2,964	4.94	HELCO Puueo
	Hilo	Wailuku	0.75	5,235	8.72	HELCO Waiau
	Hilo	Wailuku	0.35	1,609	2.68	HELCO Waiau
	Hilo	Ainako	0.007	28	0.05	Wenko Energy
	Hawi	Kohala Ditch	0.20	956	1.59	Hawi Ag & Energy
	Waimea	Waimea/ Waikoloa Pipeline	0.04	74	0.12	Hawaii County
	Hilo	Wailuku	11.00	30,445	50.74	Wailuku River Hydro
	North Hilo		0.08	339	0.57	Hoowaiwai Farms
		Subtotal	**14.68**	**50,932**	**84.32**	
KAUAI	Waimea	Waiawa	0.50	7,050	11.75	AMFAC Sugar (West)[1]
	Waiawa	Kehaha Ditch	1.00			AMFAC Sugar (West)
	Lihue	Wailua Ditch	0.50	2,890	4.82	AMFAC Sugar (East)[2]
	Lihue	Wailua Ditch	0.80			AMFAC Sugar (East)
	North	Wainiha	3.80	0	0	McBryde Sugar
	Kalaheo	Alexander Res.	1.00	0	0	McBryde Sugar
	Kaumakani	Makawili	1.25	7,430	12.38	Gay & Robinson Sugar
		Subtotal	**8.85**	**17,370**	**28.95**	
MAUI	Kaheka	Wailoa Ditch	4.50	18,360	30.60	HC&S
	Paia	Wailoa Ditch	0.90	5,920	9.87	HC&S
	Hamakua	Wailoa Ditch	0.50	0	0	HC&S
	Lahaina	Kauaula	0.50	110	0.18	Pioneer Mill Co., Ltd.
		Subtotal	**6.40**	**24,390**	**40.65**	
		Total	**29.93**	**92,692**	**153.92**	

* Oil equivalent based on 600 kWh per barrel of oil. Totals are rounded.

[1] Combined generation for AMFAC Sugar Kauai (West)

[2] Combined generation for AMFAC Sugar Kauai (East)

Table A.10 Hydroelectric Generation Sold to or Produced by Hawaii Utilities (GWh), 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Hawaii	25.19	19.10	9.99	31.94	64.37	34.75	40.55	50.93
Kauai	53.37	52.88	33.48	19.87	52.40	52.24	51.45	17.37
Maui	26.30	16.43	20.32	22.71	28.08	14.56	17.70	24.39
Statewide	104.86	88.41	63.79	74.52	144.85	101.55	109.70	92.69

Table A.11 Wind Power in Hawaii, 1997

Location	No. of Units	Model	Capacity Each kW	Total Capacity MW	Gross Generation MWh	Annual Oil Equiv. (1000 Bbl)	Owner
Kahua Ranch	3	Bergey-Excel R-240	10	0.03	84	140	Kahua
Lalamilo	26/55	Jacobs	17.5/20	2.28	4,030	6,717	HEI
South Point	37	Mitsubishi	250	7.00	12,047	20,078	Apollo Energy
Various					49	82	Various
Total	121			9.31	16,210	27,017	

Table A.12 Registered Motor Vehicles in Hawaii by County, 1990-1997

Year	City and County of Honolulu	County of Hawaii	County of Kauai	County of Maui	State Total
1990	612,742	110,834	55,927	109,593	889,096
1991	613,119	113,265	57,751	113,058	897,193
1992	611,513	113,080	51,165	110,003	885,761
1993	604,602	111,138	54,068	110,344	880,152
1994	600,087	111,532	52,817	110,708	875,144
1995	601,239	111,624	52,364	112,529	877,756
1996	598,772	115,647	52,984	117,214	884,617
1997	595,121	118,364	53,904	116,878	884,267
Percent 1997	67%	13%	6%	13%	100%

DBEDT 1998, Table 18.07

Table A.13 Hawaii Highway Vehicles, Vehicle Miles Traveled (VMT), Fuel Use and Fuel Efficiency, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Registered Vehicles								
Number	889,096	897,193	885,761	880,152	875,144	877,756	884,617	884,267
Vehicle Miles Traveled (VMT)								
Miles (000)	8,065,400	8,142,200	8,065,500	7,945,300	7,925,200	7,944,100	8,005,900	8,003,000
Highway Fuel Use (Gasoline-Equivalent)								
Gallons (000)	403,478	404,490	410,676	412,527	425,761	427,234	428,420	434,073
Estimated Average Vehicle Fuel Efficiency								
Miles per Gallon	20.0	20.1	19.6	19.3	18.6	18.6	18.7	18.4

DBEDT 1998, Table 18.07, 18.18

Table A.14 Hawaii Interisland Airline Activity, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Passengers	9,907,154	9,368,576	9,568,464	9,345,320	9,920,709	10,388,281	10,581,825	10,448,099
Aloha Airlines and Hawaiian Airlines								
ASM (000)	1,978,493	1,849,059	2,029,999	1,817,291	1,915,300	2,032,080	2,002,095	not available
RPM (000)	1,134,404	1,063,201	1,102,609	1,077,184	1,158,940	1,186,409	1,204,002	not available
Load Factor	57.3%	57.5%	54.3%	59.3%	60.5%	58.4%	60.1%	not available
Estimated Fuel Used (Bbl)	1,800,249	1,636,393	1,781,460	1,489,651	1,578,553	1,696,847	1,747,129	not available
ASM/Gallon	**26.2**	**26.9**	**27.1**	**29.0**	**28.9**	**28.5**	**27.3**	not available

Sources: Ackerman 1997; Chun 1997; Fujitani 1997; HAL 1994, 1995; The State of Hawaii Data Book 1998

ASM = Available Seat Miles; RPM = Revenue Passenger Miles

Table A.15 Estimated Overseas Airline Seats, Passengers, and Load Factors, 1990-1997

Year	Westbound Seats	Westbound Passengers	Westbound Load Factor	Eastbound Seats	Eastbound Passengers	Eastbound Load Factor	Average Load Factor
1990	5,966,265	4,378,238	73%	4,427,382	3,215,019	73%	73%
1991	5,519,555	4,199,748	76%	5,038,046	3,136,100	62%	69%
1992	5,330,206	4,055,012	76%	5,291,926	3,418,027	65%	70%
1993	5,023,345	3,956,548	79%	4,645,839	3,232,605	70%	74%
1994	5,012,724	3,926,724	78%	4,061,019	2,851,259	70%	75%
1995	4,945,549	4,023,164	81%	4,583,040	3,271,618	71%	77%
1996	5,168,937	4,091,091	79%	4,421,396	3,313,140	75%	77%
1997	5,275,132	4,335,653	82%	4,293,502	3,128,106	73%	78%

Source: BACK 1999

Table A.16 Estimated Aviation Fuel Use and Sales from Hawaii Sources (Bbl), 1990-1997								
Fuel	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Domestic Jet	8,592,397	7,948,266	7,950,386	7,359,913	8,220,593	8,203,185	8,635,095	8,442,008
Bonded Jet	9,744,361	9,855,053	9,966,179	9,411,294	8,691,605	9,025,344	8,846,322	8,901,608
Military Jet	255,579	33,912	1,223,252	1,219,115	1,434,394	1,233,902	252,056	735,290
Military JP-4	1,329,953	1,760,963	118,299					
Jet Fuel Total	19,922,290	19,598,194	19,258,116	17,990,322	18,346,592	18,462,431	17,733,473	18,078,906
Domestic Avgas	43,278	44,000	40,154	35,730	37,176	37,291	31,692	32,056
Military Avgas	1,546	1,533	1,136	1,247	913			
Avgas Total	44,824	45,533	41,290	36,977	38,089	37,291	31,692	32,056

Table A.17 Estimated Greenhouse Gas Emissions from Hawaii Aviation Fuels (Tons) 1990-1997								
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Domestic Jet Fuel								
CO_2	3,846,478	3,558,126	3,559,075	3,294,744	3,680,036	3,672,243	3,865,592	3,779,155
CH_4	107	99	99	92	103	102	108	105
Domestic Aviation Gasoline								
CO_2	16,495	16,770	15,304	13,618	14,169	14,213	12,079	12,218
CH_4	15	15	13	12	12	13	11	11
N_2O	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Domestic Subtotal								
CO_2	3,862,973	3,574,897	3,574,379	3,308,362	3,694,206	3,686,457	3,877,671	3,791,373
CH_4	122	114	113	104	115	115	118	116
N_2O	0.22	0.22	0.20	0.18	0.19	0.19	0.16	0.16
Bonded (International) Jet Fuel								
CO_2	4,362,167	4,411,719	4,461,467	4,213,066	3,890,890	4,040,292	3,960,151	3,984,900
CH_4	122	123	124	117	108	113	110	111
Military Jet Fuel								
CO_2	676,704	759,700	597,618	545,750	642,122	552,369	112,836	329,160
CH_4	19	21	17	15	18	15	3	9
Military Aviation Gasoline								
CO_2	589	584	433	475	348	-	-	-
CH_4	1	1	0.4	0.4	0.3	-	-	-
N_2O	0.01	0.01	0.01	0.01	0.005	-	-	-
Total								
CO_2	8,902,434	8,746,900	8,633,897	8,067,653	8,227,565	8,279,118	7,950,658	8,105,433
CH_4	263	259	254	237	242	243	232	236
N_2O	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Global Warming Potential								
Domestic	3,848,836	3,560,308	3,561,257	3,296,763	3,682,292	3,674,494	3,867,962	3,781,472
Bonded	4,364,841	4,414,424	4,464,202	4,215,649	3,893,275	4,042,768	3,962,578	3,987,343
Military	677,722	760,763	598,427	546,571	642,871	552,708	112,905	329,362
Total	8,891,399	8,735,495	8,623,885	8,058,983	8,218,439	8,269,971	7,943,445	8,098,177

Table A.18 Marine Fuels Sold or Distrubuted in Hawaii (Bbl) and Greenhouse Gas Emissions (Tons), 1990-1997

Fuel/Use	1990	1991	1992	1993	1994	1995	1996	1997
Distillate								
In-State	322,175	424,904	421,700	367,174	266,691	207,498	258,859	235,598
Overseas	1,735,339	1,568,259	1,672,255	1,655,316	1,444,687	1,506,093	1,063,268	1,177,667
Subtotal	2,057,514	1,993,163	2,093,955	2,022,490	1,711,378	1,713,591	1,322,127	1,413,265
Motor Gasoline								
In-State	3,879	1,238	1,143	833	1,429	1,190	1,380	997
Subtotal	3,879	1,238	1,143	833	1,429	1,190	1,380	997
Residual Fuel Oil								
In-State	6,789	17,216	-	-	5,114	191,841	143,337	130,742
Overseas	2,056,854	3,598,180	2,573,210	2,019,376	2,303,229	1,992,753	1,838,106	1,813,039
Subtotal	2,063,643	3,615,396	2,573,210	2,019,376	2,308,343	2,184,594	1,981,443	1,943,781
Total In-State Greenhouse Gas Emissions								
CO_2	149,871	197,659	196,168	170,804	124,061	96,525	120,417	109,597
CH_4	0.11	0.04	0.03	0.02	0.04	0.03	0.04	0.03
N_2O	2	3	2	2	2	2	2	2
GWP	150,404	198,361	196,836	171,384	124,494	97,181	121,073	110,193

DBEDT 1999

Table A.19 Fuel and Energy Sources Used to Generate Electricity for Utility Sales in Hawaii, 1990-1997

Fuel/Source	1990	1991	1992	1993	1994	1995	1996	1997
Oil	92.5%	92.1%	87.2%	78.6%	77.6%	76.6%	77.0%	76.5%
Biomass	3.0%	3.0%	2.7%	2.4%	2.4%	1.2%	1.2%	1.0%
Coal	0.04%	0.1%	5.8%	14.7%	13.3%	15.5%	15.7%	16.0%
Geothermal	none	none	none	none	1.8%	2.3%	2.3%	2.3%
Hydroelectric	0.7%	0.7%	0.4%	0.6%	1.1%	0.7%	0.7%	0.7%
LF Methane*	0.1%	0.2%	0.2%	0.1%	0.2%	0.1%	0.1%	0.2%
MSW	3.5%	3.6%	3.5%	3.3%	3.4%	3.4%	2.8%	3.2%
Wind	0.1%	0.4%	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%

* Landfill Methane

Table A.20 HECO-Owned Generators, 1998

Unit	Unit Type & Fuel	Mode of Operation	Initial Operation	Service Review Date	Capacity (MW)	1997 MWh
Existing HECO-Owned Generation						
Honolulu 8	OFS-LSFO	Cycling	1954	2024	56	
Honolulu 9	OFS-LSFO	Cycling	1957	2024	57	
						110,785
Waiau 3	OFS-LSFO	Cycling	1947	2035	49	
Waiau 4	OFS-LSFO	Cycling	1950	2035	49	
Waiau 5	OFS-LSFO	Cycling	1959	2035	57	
Waiau 6	OFS-LSFO	Cycling	1961	2035	58	
Waiau 7	OFS-LSFO	Baseload	1966	2035	92	
Waiau 8	OFS-LSFO	Baseload	1968	2035	92	
						1,079,250
Waiau 9	CT-Diesel	Peaking	1973	2030	52	
Waiau 10	CT-Diesel	Peaking	1973	2030	50	
						2,351
Kahe 1	OFS-LSFO	Baseload	1963	2035	92	
Kahe 2	OFS-LSFO	Baseload	1964	2035	90	
Kahe 3	OFS-LSFO	Baseload	1970	2035	92	
Kahe 4	OFS-LSFO	Baseload	1972	2035	93	
Kahe 5	OFS-LSFO	Baseload	1974	not set	142	
Kahe 6	OFS-LSFO	Baseload	1981	not set	142	
						3,073,458
				Total Capacity	**1,263**	**4,265,844**

Table A.21 Oahu Non-Utility Generators, 1998

Unit	Unit Type & Fuel	Mode of Operation	Initial Operation	End of Contract	Capacity MW	1997 Sales MWh[1]
Firm Power Purchase Agreements						
AES-Hawaii	AFBC - Coal	Baseload	1993	2022	180	1,454,602
H-Power	Steam - MSW	Baseload	1990	2015	46	322,887
Kalaeloa Partners	DTCC-LSFO	Baseload	1992	2016	180	1,345,632
				Subtotal	406	3,123,121
As Available Power Purchase Agreements						
BHP Refinery [2]	CT - Oil Gas	As Available	<1990	Not Available	18	4,728
Kapaa Partners	CT - Landfill Methane	As Available	1990	Not Available	3	15,175
Chevron Refinery	CT - Oil Gas	As Available	1993	Not Available	9	81
				Subtotal	30	19,984
				Total	**436**	**3,143,105**

1 Amount sold to HECO. Does not include plant use. [2] Now Tesoro Hawaii

Abbreviations: AFBC - atmospheric fluidized bed coal; MSW - municipal solid waste; DTCC -LSFO - dual-train combined cycle - low sulfur fuel oil (residual); CT - combustion turbine

Source: HECO 1998b; HECO FERC Fm. 1, 1998a

Table A.22 HELCO-Owned Generation, 1998

Unit	Unit Type & Fuel	Mode of Operation	Initial Operation	Service Review Date	Capacity MW	1997 MWh
MSFO-Fired Generation						
Hill 5	OFS-MSFO	Baseload	1965	2015	14.10	
Hill 6	OFS-MSFO	Baseload	1974	2024	20.80	
Puna	OFS-MSFO	Baseload	1970	2020	15.50	
Shipman 1	OFS-MSFO	Cycling	1943	1999	3.40	
Shipman 3	OFS-MSFO	Cycling	1955	2005	7.50	
Shipman 4	OFS-MSFO	Cycling	1958	2008	7.70	
				Steam/MSFO Subtotal	**69.00**	**412,864**
Diesel-Fired Generation						
Kanoelehua 11	IC-Diesel	Peaking	1962	2001	2.00	
Kanoelehua 15	IC-Diesel	Peaking	1972	2000	2.75	
Kanoelehua 16	IC-Diesel	Peaking	1972	2000	2.75	
Kanoelehua 17	IC-Diesel	Peaking	1973	2000	2.75	
Kanoelehua CT1	CT-Diesel	Peaking	1962	2000	11.50	
Keahole 18	IC-Diesel	Peaking	1974	2000	2.75	
Keahole 19	IC-Diesel	Peaking	1974	2000	2.75	
Keahole 20	IC-Diesel	Peaking	1966	2001	2.75	
Keahole 21	IC-Diesel	Peaking	1967	2001	2.75	
Keahole 22	IC-Diesel	Peaking	1967	2001	2.75	
Keahole 23	IC-Diesel	Peaking	1970	2001	2.75	
Keahole CT2	CT-Diesel	Cycling	1989	2019	11.00	
Puna CT3	CT-Diesel	Cycling	1992	2022	20.80	
Waimea 8	IC-Diesel	Peaking	1954	2000	1.00	
Waimea 9	IC-Diesel	Peaking	1954	2000	1.00	
Waimea 10	IC-Diesel	Peaking	1954	2000	1.00	
Waimea 12	IC-Diesel	Peaking	1970	2000	2.75	
Waimea 13	IC-Diesel	Peaking	1972	2000	2.75	
Waimea 14	IC-Diesel	Peaking	1972	2000	2.75	
				IC/CT-Diesel Subtotal	**81.30**	**195,359**
				Total HELCO Firm Generation	**150.30**	**608,223**
HELCO Renewable Generation						
Puueo 1&2	Hydro	Supplemental			2.25	
Waiau 1&2	Hydro	Supplemental			1.10	
Lalamilo	Wind	Supplemental			2.28	
				Hydro/Wind Subtotal	**5.63**	**23,119**
				Total HELCO Generation	**155.93**	**631,342**

Abbreviations: MSFO - medium sulfur fuel oil (residual); OFS - oil-fired steam; IC - internal combustion; CT - combustion turbine

Sources: HELCO 1998a, Schedule C; HELCO 1998b, 4-12 to 4-13

Table A.23 Hawaii County Non-Utility Generators, 1998

Unit	Unit Type & Fuel	Mode of Operation	Contract Start	End of Contract	Capacity MW	1997 MWh Sold
Firm Capacity Power Purchase Agreements						
HCPC	Coal	Baseload	1995	1999	22.0	123,307
Puna Geothermal	Geothermal	Baseload	1993	2027	24.5	228,689
				Hawaii NUG Firm Subtotal	46.5	351,996
Non-Firm Capacity Power Purchase Generators (Renewable)						
Apollo Energy	Wind	Non-Firm			7.0	12,047
Wailuku	Hydro	Non-Firm			11.0	30,445
Other	Hydro/Wind	Non-Firm			0.4	1,446
				Hawaii NUG Non-Firm Subtotal	18.4	43,938
				Hawaii NUG Total	64.9	395,935

Abbreviation: HCPC - Hilo Coast Power Company

Sources: HELCO 1998a, Schedule C; HELCO 1998b, 4-12 to 4-13

Table A.24 Electricity Generation on Kauai, 1998

Unit	Unit Type & Fuel	Initial Operation	Capacity MW	1997 Net MWh
KE-Owned Generation				
Steam Plant	OFS-Diesel	1968	10	33,402
Gas Turbine 1	CT-Diesel	1973	19.2	17,036
Gas Turbine 2	CT-Diesel	1977	23.7	72,918
Diesel 1	IC- Diesel	1964	2	
Diesel 2	IC- Diesel	1964	2	
Diesel 3	IC- Diesel	1968	2.75	
Diesel 4	IC- Diesel	1968	2.75	
Diesel 5	IC- Diesel	1968	2.75	
Diesel 6	IC- Diesel	1990	7.85	
Diesel 7	IC- Diesel	1990	7.85	
Diesel 8	IC- Diesel	1991	7.85	
Diesel 9	IC- Diesel	1991	7.85	
		IC Diesel Subtotal	**43.65**	**207,525**
		KE-Owned Subtotal	**96.55**	**330,881**
Non-Utility Generation				
AMFAC-East (Lihue)	Steam-Bagasse/ Diesel	1981	14	43,963
AMFAC-West	various	various	various	2,584
Gay&Robinson	various	various	various	3,275
McBryde Sugar	various	various	various	23,484
		NUG Subtotal	**14**	**73,305**
		Kauai Total	**110.55**	**404,186**

Abbreviations: OFS - oil -fired steam; CT - combustion turbine; IC - internal combustion

Source: KE 1997b; KE 1998a; HARC 1998

Table A.25 MECO-Owned Generators on Maui, 1998

Unit(s)	Unit Type & Fuel	Mode of Operation	Initial Operation	Planned Retirement	Gross Capacity MW	1997 MWh
Maui Generation Units						
Kahului 1	OFS-MSFO	Baseload	1948	2005	5.9	
Kahului 2	OFS-MSFO	Baseload	1949	2006	6.0	
Kahului 3	OFS-MSFO	Baseload	1954	2004	12.7	
Kahului 4	OFS-MSFO	Baseload	1966	2016	13.0	
				Kahului Subtotal	**38**	**214,828**
Maalaea 1	IC-Diesel	Peaking	1971	2006	2.5	
Maalaea 2	IC-Diesel	Peaking	1972	2007	2.5	
Maalaea 3	IC-Diesel	Peaking	1972	2007	2.5	
Maalaea 4	IC-Diesel	Cycling	1973	2003	5.6	
Maalaea 5	IC-Diesel	Cycling	1973	2003	5.6	
Maalaea 6	IC-Diesel	Cycling	1975	2005	5.6	
Maalaea 7	IC-Diesel	Cycling	1975	2005	5.6	
Maalaea 8	IC-Diesel	Cycling	1977	2007	5.6	
Maalaea 9	IC-Diesel	Cycling	1977	2008	5.6	
Maalaea 10	IC-Diesel	Cyc/Base	1978	2009	12.5	
Maalaea 11	IC-Diesel	Cyc/Base	1979	2010	12.5	
Maalaea 12	IC-Diesel	Cyc/Base	1988	2018	12.5	
Maalaea 13	IC-Diesel	Cyc/Base	1989	2019	12.5	
Maalaea 14	CT-Diesel	Baseload	1992	2023	20.0	
Maalaea 15	SRG	Baseload	1993	2023	18.0	
Maalaea 16	CT-Diesel	Baseload	1993	2023	20.0	
Maalaea 17	CT-Diesel	Baseload	1998	2028	21.2	
Maalaea X1	IC-Diesel	Peaking	1987	2012	2.5	
Maalaea X2	IC-Diesel	Peaking	1987	2012	2.5	
				Maalaea Subtotal	**175**	**740,350**
				Maui Subtotal	**213**	**955,178**

Abbreviations: OFS-MSFO - oil-fired steam - medium sulfur fuel oil (residual); IC - internal combustion; CT - combustion turbine; SRG - steam recovery generator: Cyc - cycling

Source: MECO IRP Prelimnary Results

Table A.26 MECO-Owned Generators on Lanai and Molokai, 1998

Unit	Unit Type & Fuel	Mode of Operation	Initial Operation	Planned Retirement	Capacity MW	1997 MWh
Lanai Generating Units						
Lanai City L7	IC-Diesel	Standby	1988	Standby 1997	1.0	
Lanai City L8	IC-Diesel	Standby	1985	Standby 1998	1.0	
Miki Basin LL1	IC-Diesel	-	1990	2006	1.0	
Miki Basin LL2	IC-Diesel	-	1990	2006	1.0	
Miki Basin LL3	IC-Diesel	-	1990	2006	1.0	
Miki Basin LL4	IC-Diesel	-	1990	2006	1.0	
Miki Basin LL5	IC-Diesel	-	1990	2006	1.0	
Miki Basin LL6	IC-Diesel	-	1990	2006	1.0	
Miki Basin LL7	IC-Diesel	-	1996	TBD	2.2	
Miki Basin LL8	IC-Diesel	-	1996	TBD	2.2	
				Lanai Subtotal	**12**	**27,944**
Molokai Generating Units						
Palaau P-1	IC-Diesel	Peaking	1985	2006	1.29	
Palaau P-2	IC-Diesel	Peaking	1985	2006	1.29	
Palaau P-3	IC-Diesel	Peaking	1985	2006	0.97	
Palaau P-4	IC-Diesel	Peaking	1985	2006	0.97	
Palaau P-5	IC-Diesel	Peaking	1985	2006	0.97	
Palaau P-6	IC-Diesel	-	1991	2006	0.97	
Palaau CT	CT-Diesel	-	1982	2012	2.22	
Palaau P-7	IC-Diesel	-	1996	2021	2.20	
Palaau P-8	IC-Diesel	-	1996	2021	2.20	
Palaau P-9	IC-Diesel	-	1996	2021	2.20	
				Molokai Subtotal	**15**	**37,096**
				Lanai and Molokai Total	**27**	**65,040**

Abbreviations: IC - internal combustion; CT - combustion turbine

Sources: MECO 1998a; MECO 1998c

Table A.27 Future Generation in Hawaii Utility IRP Plans Requiring New Sites, 2000-2020

	HECO		HELCO		KE		MECO	
Year	Type	MW	Type	MW	Type	MW	Type	MW
2000								
2001								
2002					CT w/HRS	26.4		
2003								
2004							DTCC Ph 1	20.8
2005								
2006			ST-7	18.0			DTCC Ph 2	20.8
2007							DTCC Ph 3	17.1
2008							DTCC Ph 1	20.8
2009	DTCC Ph 1	107.0	DTCC Ph 1	21.3			DTCC Ph 2	20.8
2010							DTCC Ph 3	17.1
2011							DTCC Ph 1	20.8
2012					IC Diesel	10.0		
2013	DTCC Ph 2	107.0	DTCC Ph 2	21.3			DTCC Ph 2	20.8
2014					Coal Steam	24.0		
2015							DTCC Ph 3	17.1
2016	DTCC Ph 3	104.0	DTCC Ph 3	19.0				
	AFBC	180.0						
2017	SCCT	107.0	DTCC Ph 1	21.3			DTCC Ph 1	20.8
2018							DTCC Ph 2	20.8
2019							DTCC Ph 3	17.1
2020								
Total		**605.0**		**100.9**		**60.4**		**234.8**

Abbreviations: CT w/HRS - combustion turbine with heat recovery system; DTCC - dual-train combined cycle; ST- steam turbine (added to two combustion turbines (CT-4 and 5) to make a DTCC; IC - internal combustion; AFBC - atmospheric fluidized bed coal; SCCT - simple cycle combustin turbine

Table A.28 Percentage of Utility Electricity from Renewable Sources, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
HECO	5%	5%	5%	5%	5%	5%	4%	5%
HELCO	21%	19%	19%	31%	37%	32%	33%	35%
KE	25%	22%	18%	16%	16%	15%	18%	11%
MECO	8%	7%	8%	7%	7%	8%	7%	7%
Statewide	7.7%	7.7%	7.0%	8.0%	8.6%	8.0%	7.4%	7.9%

Table A.29 Percentage Contribution to Utility Sales by Renewable Resource, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Sugar Bagasse	3.0%	3.0%	2.7%	2.4%	2.3%	1.5%	1.4%	1.1%
Geothermal	0%	0%	0%	1.5%	1.8%	2.3%	2.3%	2.3%
Hydroelectric	0.7%	0.6%	0.4%	0.4%	0.6%	0.5%	0.5%	0.4%
Wind	0.4%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
LF Methane	0.1%	0.2%	0.2%	0.1%	0.2%	0.1%	0.1%	0.2%
MSW	3.5%	3.6%	3.5%	3.3%	3.5%	3.5%	2.8%	3.8%
Total Renewable	**7.7%**	**7.7%**	**7.0%**	**8.0%**	**8.6%**	**8.0%**	**7.4%**	**7.9%**

Table A.30 Estimated Model Energy Code Savings

Year	New Non-Res. (GWh)	Non-Res. Renov. (GWh)	Total (GWh)	Estimated Tons CO_2 Saved	Energy Cost Savings
1994	8	3	11	11,330	$ 1,100,000
1995	16	6	22	22,660	$ 2,200,000
1996	24	8	32	32,960	$ 3,200,000
1997	32	11	43	44,290	$ 4,300,000
1998	40	14	54	55,620	$ 5,400,000
1999	49	17	66	67,980	$ 6,600,000
2000	57	20	77	79,310	$ 7,700,000
2005	97	33	130	133,900	$ 13,000,000
2010	138	40	178	183,340	$ 17,800,000
2013	162	41	203	191,580	$ 20,300,000
20-yr Total	1,699	529	2,228	2,294,840	$ 222,800,000

Based on State of Hawaii 1998b, Table 4, 17

Table A.31 Estimated Energy Savings (GWh) and Emissions Reductions from HECO DSM Programs

Year	Residential Water Heating (Existing)	Residential Water Heating (New)	Commercial/ Industrial Prescriptive Measures	Commercial/ Industrial New Construction	Commercial/ Industrial Custom Rebate	Annual Total GWh Savings	Annual Total Savings [1] (Tons CO_2)
1996	1.35	0.08	9.38	1.66	0.27	12.74	12,480
1997	5.79	1.28	12.29	5.32	2.09	26.77	26,235
1998	6.58	1.84	15.87	6.81	5.39	36.49	35,760
1999	13.52	3.74	32.74	14.17	13.79	77.96	76,401
2000	20.81	5.62	50.48	21.92	29.32	128.15	125,587
2001	28.37	7.50	69.06	30.09	36.21	171.23	167,805
2002	36.21	9.32	88.40	38.84	42.86	215.63	211,317
2003	44.27	11.14	108.42	48.24	49.40	261.47	256,241
2004	52.59	14.82	129.24	58.55	55.40	308.75	302,575
2005	60.90	14.82	150.05	68.86	61.40	356.03	348,909
2006	69.41	16.80	171.51	80.19	71.72	409.63	401,433
2007	77.92	18.78	192.96	91.52	82.04	463.22	453,956
2008	86.44	20.78	214.53	103.83	86.64	512.22	501,971
2009	94.96	22.78	236.09	116.14	91.24	561.21	549,986
2010	111.80	24.78	257.35	128.87	98.36	621.16	608,732
2011	115.10	26.78	278.60	141.60	105.48	667.56	654,206
2012	118.39	27.85	292.14	151.36	105.66	695.39	681,481
2013	121.69	28.91	305.68	161.11	105.83	723.22	708,756
2014	122.70	28.96	310.41	168.04	107.58	737.68	722,922
2015	123.70	29.01	315.13	174.96	109.33	752.13	737,087
2016	124.05	29.06	318.12	181.66	111.62	764.50	749,205
2017	124.40	29.10	321.11	188.35	113.90	776.86	761,323
Total	1,560.94	373.74	3,879.54	1,982.08	1,485.52	9,279.97	9,094,366

[1] CO_2 savings calculated based upon HECO's 1997 system average emissions of 2.064 lbs CO_2 per kWh sales or 1,032 tons/GWh sales

HECO 1998b - Even years 2006-2016 are interpolated.

Table A.32 Estimated Peak Demand Reduction from HECO DSM Programs (MW)

Year	Residential Water Heating (Existing)	Residential Water Heating (New)	Commercial/ Industrial Prescriptive Measures	Commercial/ Industrial New Construction	Commercial/ Industrial Custom Rebate	Residential Direct Load Control	Commercial/ Industrial Capacity Buy Back	Total
1998	2.15	0.76	3.15	1.32	1.15	-	0.81	9.34
1999	3.66	1.27	5.30	2.25	2.52	1.59	10.00	26.59
2000	5.35	1.82	7.78	3.31	5.20	4.76	19.10	47.32
2005	14.42	4.34	21.38	9.62	10.22	11.00	27.29	98.27
2010	24.49	7.25	36.69	18.03	16.37	11.00	27.29	141.12
2015	29.35	8.49	44.96	24.54	18.19	11.00	27.29	163.82
2017	29.54	8.51	45.83	26.46	18.95	11.00	27.29	167.58

Source: HECO 1998b

Table A.33 Estimated Energy Savings (GWh) and CO_2 Emissions Reductions from HELCO DSM Programs

Year	Residential Efficient Water Heating	Commercial/ Industrial Energy Efficiency	Commercial/ Industrial New Construction	Commercial/ Industrial Customized Rebate	Annual Total GWh Savings	Annual Total Savings (Tons CO_2)
1999	0.64	1.66	0.30	0.40	3.00	2,955
2000	1.78	4.10	1.00	1.48	8.36	8,235
2005	7.66	15.38	7.90	5.61	36.55	35,997
2010	12.96	24.57	18.20	10.65	66.38	65,384
2015	16.10	30.93	29.15	16.54	92.73	91,339
2018	16.12	32.37	35.00	20.47	103.96	102,401
20-Year Total						
	193	375	284	172	1,024	1,111,154

[1] CO_2 savings calculated based upon HELCO's 1997 average emissions of 1.97 lbs CO_2 per kWh sales or 985 tons/GWh sales

HELCO 1998b

Table A.34 Estimated Peak Demand Reductions from HELCO DSM Programs (MW)

Year	Residential Efficient Water Heating	Commercial/ Industrial Energy Efficiency	Commercial/ Industrial New Construction	Commercial/ Industrial Customized Rebate	Total MW Savings
1999	0.25	0.03	0.10	0.10	0.48
2000	0.49	0.58	0.20	0.21	1.48
2005	2.11	1.61	1.20	0.82	5.74
2010	2.73	2.59	2.80	1.56	9.68
2015	3.39	3.28	4.45	2.42	13.54
2018	3.41	3.45	5.30	2.99	15.15

HELCO 1998b

Table A.35 Estimated Energy Savings (MWh) and CO_2 Emissions Reductions from KE DSM Programs							
Year	Residential Retrofit	Residential Direct Install	Residential New Construction	Commercial Retrofit	Commercial New Construction	Annual Total MWh Savings [1]	Annual Total Savings [2] (Tons CO_2)
1998	1.01	0.68	-	2.90	-	5	3,214
1999	3.32	2.22	-	9.47	-	15	10,499
2000	6.35	4.24	-	18.06	-	29	20,052
2005	8.36	5.47	1.74	23.22	1.89	41	28,477
2010	5.26	2.66	1.74	18.79	0.57	29	20,313
2015	1.14	0.62	1.33	12.55	0.50	16	11,293
2017	0.13	0.07	0.90	11.79	0.47	13	9,349
20-Year Total	**103**	**64**	**23**	**354**	**15**	**558**	**390,513**

[1] Annual energy savings from measures implemented over program's first seven years.

[2] CO_2 savings calculated based upon KE's 1997 average emissions of 1.4 lbs CO_2 per kWh sales or 700 tons per GWh

KE 1997b, Appendix D, Table B. Program Summary Spreadsheets

Table A.36 Estimated Peak Demand Reduction from KE DSM Programs (MW)						
Year	Residential Retrofit	Residential Direct Install	Residential New Construction	Commercial Retrofit	Commercial New Construction	Total MW Savings
1998	0.17	0.12	-	0.39	-	0.67
1999	0.54	0.40	-	1.17	-	2.12
2000	1.04	0.77	-	2.24	-	4.04
2005	1.37	1.01	0.29	2.89	0.22	5.78
2010	0.87	0.48	0.29	2.33	0.04	3.99
2015	0.19	0.10	0.22	1.53	0.03	2.07
2017	0.022	0.01	0.15	1.42	0.02	1.63

KE 1997b, Appendix D, Table B. Program Summary Spreadsheets

Table A.37 Estimated Energy Savings (GWh) and Emissions Reductions from MECO DSM Programs

Year	Residential Efficient Water Heating	Commercial/ Industrial Energy Efficiency	Commercial/ Industrial New Construction	Commercial/ Industrial Customized Rebate	Annual Total GWh Savings	Annual Total Savings [1] (Tons CO_2)
1997	1.60	7.70	0.45	0.29	8.44	7,934
1998	2.97	12.78	1.30	0.74	17.79	16,722
1999	7.93	18.49	2.47	1.41	30.31	28,488
2000	11.94	23.95	3.98	2.23	42.08	39,559
2001	16.48	28.40	5.89	3.16	53.94	50,699
2002	21.10	31.51	7.66	4.19	64.46	60,590
2003	21.10	31.51	7.66	4.19	64.46	60,590
2004	21.10	31.51	7.66	4.19	64.46	60,590
2005	21.10	31.51	7.66	4.19	64.46	60,590
2006	21.10	31.51	7.66	4.19	64.46	60,590
2007	21.10	31.51	7.66	4.19	64.46	60,590
2008	21.10	31.51	7.66	4.19	64.46	60,590
2009	21.10	31.51	7.66	4.19	64.46	60,590
2010	21.10	31.51	7.66	4.19	64.46	60,590
2011	21.10	31.51	7.66	4.19	64.46	60,590
2012	19.50	23.81	7.21	3.90	54.42	51,152
2013	18.13	18.73	6.36	3.45	46.67	43,868
2014	13.17	13.01	5.19	2.78	34.15	32,102
2015	9.17	7.56	3.69	1.96	22.37	21,031
2016	4.62	3.11	1.77	1.02	10.52	9,891
20-Year Total	**317**	**473**	**115**	**63**	**965**	**907,340**

[1] CO_2 savings calculated based upon MECO's 1997 average emissions of 1.88 lbs CO_2 per kWh sales or 940 tons/GWh sales

Table A.38 Estimated Peak Demand Reduction (MW) from MECO DSM Programs

Year	Residential Efficient Water Heating	Commercial/ Industrial Energy Efficiency	Commercial/ Industrial New Construction	Commercial/ Industrial Customized Rebate	Total MW Savings
1997	0.63	0.39	0.22	0.02	1.26
1998	1.04	0.70	0.34	0.02	2.10
1999	1.53	0.86	0.50	0.02	2.91
2000	2.01	1.12	0.58	0.07	3.78
2005	4.35	2.12	1.23	0.34	8.04
2010	6.46	3.53	2.20	0.61	12.80
2015	6.84	4.41	2.83	0.86	14.94
2016	3.79	4.67	3.02	0.91	15.39

Table A.39 Estimated Future Monetary, Electricity, and CO_2 Emissions Savings from State of Hawaii Government Performance Contracting Projects

Project		Estimated Annual Savings ($)	Estimated Annual Electricity Savings (kWh)	Estimated Annual CO_2 Emissions Avoided (Tons)
State of Hawaii				
Community College System	$	924,543	8,374,484	8,207
Hawaii Army Nat'l Guard	$	68,576	321,651	315
Judiciary Facilities	$	448,360	3,043,443	2,983
State Library System	$	200,000	1,550,388	1,519
UH Hilo	$	577,000	3,218,070	3,170
Total	$	2,218,479	16,508,035	16,194

Table A.40 Estimated Benefits of Existing Hawaii Rebuild America Partnership Programs

Partner	Annual kWh Savings	Annual Savings	Investment in Retrofits	Jobs Created	Income to Economy	Reduction in CO_2 (Tons)
State Buildings	8,929,906	$ 967,000	$ 5,485,000	83	$ 3,236,150	9,123
Public Library System	1,165,000	$ 200,000	$ 1,000,000	15	$ 590,000	1,200
Community College System	8,460,896	$ 924,000	$ 4,260,000	70	$ 27,258,000	8,715
Department of Education	10,159,638	$ 1,440,000	$ 7,200,000	109	$ 4,248,000	10,464
UH at Manoa School of Architecture	14,424,750	$ 1,225,500	$ 6,127,500	93	$ 3,615,225	14,857
County of Hawaii	3,800,000	$ 735,000	$ 3,675,000	56	$ 2,168,250	3,838
County of Kauai	16,680,000	$ 3,005,611	$ 15,028,055	228	$ 8,866,552	10,675
County of Maui	9,580,000	$ 1,150,000	$ 5,750,000	87	$ 3,392,500	8,957
City and County of Honolulu	200,000	$ 40,000	$ 200,000	3	$ 118,000	206
Subtotal	**73,400,190**	**$ 9,687,111**	**$ 48,725,555**	**744**	**$ 53,492,677**	**68,035**
HECO Programs	**21,826,667**	**$ 2,510,067**	**$ 12,550,334**	**191**	**$ 7,404,697**	**22,481**
Total	**95,226,857**	**$ 12,197,178**	**$ 61,275,889**	**935**	**$ 60,897,374**	**90,516**

Table A.41 Estimated Savings from County Government Projects			
Project	**Estimated Annual Energy Savings**	**CO_2 Reduction (Tons/Year)**	**Project Status**
City and County of Honolulu[1]			
Civic Center Parking Structure Lighting	120,000 kWh	118	Completed 1998
Building Dept. Lighting Projects	700,000 kWh	686	Completed 1999
Honolulu Hale Performance Contract	500,000 kWh	490	Completed 1999
City and County of Honolulu Subtotal		**1,294**	
County of Hawaii[2]			
County Building Retrofit	405,594 kWh	409	Performance Contract
Add'l County Building Retrofits	3,400,000 kWh	3,427	Planned FY 1998-1999
Division of Water Supply	4,700,000 kWh	4,737	Planned FY 1999-2000
Wastewater Division	400,000 kWh	403	Planned FY 1999-2000
County of Hawaii Subtotal		**8,976**	
County of Kauai[3]			
County Facility Retrofits	4,175,000 kWh	2,923	Completed Summer 98
County of Kauai Subtotal		**2,923**	
County of Maui[4]			
County Building Retrofit	400,000 kWh	376	Completed 1994
Swimming Pool Heating and Cooling Retrofit	120 Bbl LPG	33	Initiated 1997
Streetlight Retrofit	473,000 kWh	445	Completed 1998
"Rebuild Maui County" Projects for County Facilities	6,250,000 kWh	5,875	Completed 1999
Biodiesel Demonstration	476 Bbl Diesel	221	5-yr Project to Spring 2002
County of Maui Subtotal		**6,950**	
County Projects Total		**20,142**	

[1] Fujiki 1998; [2] Carr 1997; [3] County of Kauai 1997; [4] Kobayashi 1997

Table A.42 20% Renewable Scenario Generation Additions and Retirements

Year	HECO	HELCO	KE	MECO
2000		60MW DTCC (IPP) -23.9MW Diesel -3MW OFS **4MW PV**		
2001		40 MW CTCC Ph1/2 -10 Diesel, -6 CT **10MW Wind**		-2.7MW Diesel **20 MW Wind**
2002		**10MW Wind**	26MW CT	-5.4MW Diesel
2003				-12.32MW Diesel 17.1MW DTCC Ph 3
2004				20.8MW DTCC Ph1 -12.32MW Diesel
2005	**20MW Wind**	-22MW Coal (IPP) -7 OFS		-12.32MW Diesel 2.2MW Diesel -5.9MW Steam
2006		18MW DTCC Ph3 **13.8MW Hydro**		20.8 MW DTCC Ph2 4.4 MW Diesel -6MW Steam -12.5MW Diesel
2007	**15MW Wind**	-7.7MW Steam	**10MW Wind**	17.1MW DTCC Ph3 20.8MW DTCC Ph1 **25MW Biomass** -5.6MW Diesel
2008		-8 MW OFS		2.2MW Diesel -5.6MW Diesel
2009	107MW DTCC Ph1 **30MW Wind**	**25 MW Geothermal**	**6.6MW Hydro**	20.8MW DTCC Ph2 **20MW Wind** -12.85MW Diesel
2010			**10 MW MSW**	17.1MW DTCC Ph3 -12.85MW Diesel
2011	**25MW Biomass**			20MW DTCC Ph1
2012				-7.6MW Diesel
2013	107MW DTCC Ph2			2.2MW Diesel 20.8MW DTCC Ph 2
2014			**25 MW Biomass**	
2015		-14.1MW Steam		17.1MW DTCC Ph3
2016	104MW DTCC Ph3 180MW AFBC	21MW DTCC Ph2		
2017	107MW SCCT - 180MW DTCC (IPP)	21MW DTCC Ph2		20.8MW DTCC Ph1
2018				20.8MW DTCC Ph 2
2019		-18 CT		
2020		18.7MW DTCC Ph3		

Abbreviations: DTCC - dual-train combined cycle; OFS - oil-fired steam; CT - combustion turbine; IPP - independent powe producer; PV - photovoltaic; MSW - municipal solid waste; AFBC - atmospheric fluidized bed coal; SCCT - simple cycle combustion turbine; CT - combustion turbine

Table A.43 10% Renewable Scenario Generation Additions and Retirements

Year	HECO	HELCO	KE	MECO
2000		60MW DTCC (IPP) -23.9MW Diesel -3MW OFS **4MW PV**		
2001		40 MW CTCC Ph1/2 -10 Diesel, -6 CT **10MW Wind**		-2.7MW Diesel **20 MW Wind**
2002		**10MW Wind**	26MW CT	-5.4MW Diesel
2003				-12.32MW Diesel 17.1MW DTCC Ph 3
2004				20.8MW DTCC Ph1 -12.32MW Diesel
2005	**20MW Wind**	-22MW Coal (IPP) -7 OFS		-12.32MW Diesel 2.2MW Diesel -5.9MW Steam
2006		18MW DTCC Ph3		20.8 MW DTCC Ph2 4.4 MW Diesel -6MW Steam -12.5MW Diesel
2007	**15MW Wind**	-7.7MW Steam	**10MW Wind**	17.1MW DTCC Ph3 20.8MW DTCC Ph1 **25MW Biomass** -5.6MW Diesel
2008		-8 MW OFS		2.2MW Diesel -5.6MW Diesel
2009	107MW DTCC Ph1 **30MW Wind**		**6.6MW Hydro**	20.8MW DTCC Ph2 -12.85MW Diesel
2010			**10 MW MSW**	17.1MW DTCC Ph3 -12.85MW Diesel
2011				20MW DTCC Ph1
2012				-7.6MW Diesel
2013	107MW DTCC Ph2			2.2MW Diesel 20.8MW DTCC Ph 2
2014			24MW Coal	
2015		-14.1MW Steam		17.1MW DTCC Ph3
2016	104MW DTCC Ph3 180MW AFBC	21MW DTCC Ph2		
2017	107MW SCCT - 180MW DTCC (IPP)	21MW DTCC Ph2		20.8MW DTCC Ph1
2018				20.8MW DTCC Ph 2
2019		-18 CT		
2020		18.7MW DTCC Ph3		

Abbreviations: DTCC - dual-train combined cycle; OFS - oil-fired steam; CT - combustion turbine; IPP - independent powe producer; PV - photovoltaic; MSW - municipal solid waste; AFBC - atmospheric fluidized bed coal; SCCT - simple cycle combustion turbine; CT - combustion turbine