Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-0001

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William A. Bonnet
Vice President
Government and Community Affairs

February 27, 2004

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PUBLIC UTILITIES COMMISSION

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

Dear Commissioners:

Subject: HECO, HELCO and MECO
Renewable Portfolio Standards Status Report

HECO, HELCO, and MECO respectfully submit its Renewable Portfolio Standards (RPS) Status Report for 2003. The report reviews the status of the RPS percentage for HECO, HELCO and MECO. It also explains our policy position and strategy regarding the Hawaii RPS law, including activities by HECO, HELCO and MECO to identify, support, and develop projects directed toward achieving the goals established under the law.

As shown in the report, HECO, HELCO, and MECO reached a consolidated renewable energy penetration of 8.40% in 2003, which exceeds the 7% target. However, as discussed in the report, given the many variables which impact potential renewable energy projects, it is premature to provide assurance that the future goals of 8% in 2005 and 9% in 2010 will be achieved.

If you have any questions on this matter, Please call me at 543-5660 or Patsy Nanbu at 543-4702.

Sincerely,

Attachment

cc: Division of Consumer Advocacy

Renewable Portfolio Standards
Status Report to the Hawaii Public Utilities Commission
2003

Prepared by:

Hawaiian Electric Company, Incorporated
Hawaii Electric Light Company, Incorporated
Maui Electric Company, Limited

February 27, 2004

Renewable Portfolio Standard Status Report
For the year ended December 31, 2003

Executive Summary

RPS Results for 2003

Hawaiian Electric Company and its subsidiaries, Hawaii Electric Light Company and Maui Electric Company ("the HECO utilities") are very pleased to have achieved in 2003 a consolidated Renewable Portfolio Standard (RPS) percentage of 8.40% (Figure 2). This is a significant increase over the 6.76% RPS percentage reported for 2002 and exceeds the RPS goal of 7% for 2003.

The increase from 2002 was primarily caused by the return to near-normal output levels of Puna Geothermal Venture after well problems in 2002 (i.e. from about 5 MW in 2002 to about 27 MW in 2003) a 12% increase in electricity produced by the HPOWER facility and an increased use of bagasse at HC&S. This highlights the great variation from year to year in electricity production from renewable energy sources. The increase in the RPS percentage from 2002 was also caused by a first-time adjustment to include a portion of the output from AES which represents the amount of old tires, used oil, and used carbon filters utilized as fuel.

The increases in 2003 were offset by reduced hydroelectric generation due to a catastrophic equipment failure at Puueo Hydro on the Big Island as well as drought conditions on the Big Island during a significant portion of the year.

However, a note of caution is also essential. Although the 2003 percentage of 8.40% exceeds the RPS goal of 7% for 2003, this level may be difficult to maintain. Even if the amount of renewable energy remains at 2003 levels in future years (not at all a certainty as the problems experienced in 2002 drove home), the RPS percentage may decline because electric sales (the denominator in the calculation) continue to increase as the economy grows (see Figure 3). In fact, recent news of increased economic activities including increased military activities, such as the addition of a Stryker brigade and C-17 squadron, could result in even higher sales than currently forecast for Oahu. The point is simply that Hawaii's use of electricity is growing and therefore renewable production must grow or the RPS numbers will slip.

RPS Projections for 2005 and 2010

With the attainment of the 7% goal for 2003 – the first year targeted in the RPS law – it is now appropriate to look ahead toward the targets for 2005 and 2010. To help assess the reasonableness of RPS goals for the future, a projection of future RPS percentages is provided. This projection requires a forecast of electricity sales and an estimate of future renewable energy usage. The sales forecast used to make the projection is the latest available for each utility. The estimate of future renewable energy usage is divided into two parts:

(1) Estimates of the renewable energy from *existing* projects.
(2) Estimates of the renewable energy from *new projects* that have been proposed.

Given the variable nature of the electricity generation from renewable energy projects, future renewable energy from existing projects generally was estimated to be the average of the electricity generation from the last five years. Regarding estimates of future renewable energy from new projects, HECO, HELCO and MECO are involved in many activities to bring more renewable energy onto their utility systems (see section 5 of this report).

The calculations in Figure 4 indicate that given preliminary assumptions about the timeframe for completion of proposed projects, the amount of renewable energy on the system is expected to increase through 2010. Given the current forecast, we can hopefully meet or slightly exceed the 8% RPS level in 2005. With some fairly optimistic assumptions about specific future renewable energy projects, it also appears possible to meet the 9% RPS in 2010.

Though we are committed to doing everything we can to achieve these preliminary projections, they are provided with the strong caveat that there are many variables impacting the actual development of renewable projects. For example, a renewable energy developer may be unable to obtain State or County permits, land lease, project financing, or community support. In addition, the developer may not be able to locate the renewable resource, or once operational, may be unable to keep its facility operating. Also, it is not simply a matter of whether a given technology is feasible; it also frequently requires additional infrastructure such as power lines to connect the renewable project to the electric grid. This infrastructure also must be permitted, a challenge which may be more formidable than permitting the renewable energy generation itself. Expiration of tax credits such as the Federal Production Tax credit (wind) or the state Energy Conservation Income Tax Credit (wind, solar water heating) can also have negative impacts on renewable energy.

The following is a list of some of the reasons for failed renewable energy projects in the State:

- Inability to secure permits (hydroelectric on Kauai);
- Inability to secure land lease (10 MW wind on Maui);
- Poor economics or inability to secure project financing (40 MW OTEC on Oahu, sugar mills on Hawaii, Maui, Oahu and Kauai, 9 MW wind on Oahu, 2 MW wind on Big Island);
- Community opposition (6 MW hydroelectric on Kauai, 2-4 MW hydroelectric on Maui, 14 MW hydroelectric on Hawaii, and hydroelectric on Molokai, 1 MW wind on Oahu);
- Unavailability of renewable resources (early geothermal projects on Hawaii, 4 MW biomass on Molokai); and
- Operational problems (1 MW wind on Molokai).

In addition, planning for a major wind project on the Big Island was significantly delayed because the potential developer was an Enron subsidiary at a time when Enron was distracted by its own corporate difficulties.

Any one of these factors, which are outside of the utilities' direct control, could prevent, delay or shut down a renewable energy project.

HECO Utilities' RPS Strategy

Despite these challenges, the HECO utilities take the RPS law very seriously and have demonstrated through our actions a strong commitment to achieving these levels. We strongly support the Hawaii State Energy Goal for "increased energy self-sufficiency where the ratio of indigenous to imported energy use is increased."

To this end HECO, MECO and HELCO are executing a strategy that incorporates myriad activities, but which can be grouped into two main thrusts to increase its renewable energy portfolio:

(1) Pursue commercial renewable energy projects; and

(2) Accelerate the development of emerging renewable energy technologies that have potential for commercial application.

This strategy aims to pursue commercially available renewable energy generation in the near term, and in parallel, to invest in research, development, and demonstration projects (RD&D) for emerging technologies and resources that are not currently commercially available or economically viable in the near term. This strategy

will ensure that the HECO utilities are not only taking action to use as much renewable energy as is commercially and economically viable today, but also are helping to develop future sources of renewable energy.

Section 5 provides a very detailed list of the current activities the HECO utilities are engaged in to help reduce Hawaii's use of imported oil and meet the RPS targets.

Conclusion

HECO, HELCO and MECO are very pleased to have met the initial 7% target for 2003. Looking ahead, although preliminary projections are hopeful, given the variables which can impact potential renewable projects, we believe it is premature to draw definite conclusions about the achievability of the future goals of 8% in 2005 and 9% in 2010 or to set targets beyond 2010. But as the detailed report illustrates, despite the variables and challenges, we are actively working on many fronts to support and develop projects that will give us every opportunity to achieve these important goals for our State. What we most need is an equally strong commitment by the public sector to doing its part to help make the goals achievable.

Renewable Portfolio Standard Status Report
For the year ended December 31, 2003

1.0 Introduction – Purpose of report

The 2001 Hawaii State Legislature passed a law introducing a Renewable Portfolio Standard (RPS) for Hawaii. Act 272, codified as Hawaii Revised Statutes (HRS) section 269.91 through 269.94, established RPS levels for electric utilities to guide them in incorporating renewable resources into their resource portfolios and to reduce Hawaii's use of imported oil.

The purpose of this report is to review the status of the RPS percentage for the Hawaiian Electric Company (HECO) utilities for the calendar year 2003 in accordance with Hawaii Revised Statutes (HRS) 269-92. This document also explains the policy position and strategy of Hawaiian Electric Company, Inc., Hawaii Electric Light Company, Inc. and Maui Electric Company, Ltd. (together referred to as HECO utilities) regarding the Hawaii RPS law.

2.0 Policy Statement

HECO and its subsidiaries Maui Electric Company (MECO) and Hawaii Electric Light Company (HELCO) strongly support the Hawaii State Energy Goal for "increased energy self-sufficiency where the ratio of indigenous to imported energy use is increased."

To this end HECO, MECO and HELCO follow two basic tracks for the development and application of renewable energy.

The first is the application of commercially viable, cost-effective renewable energy technologies to the electric grid. This can be achieved through the development and implementation of renewable energy projects directly by HECO, by the contracting of renewable energy from independent power producers and by the investment of HECO's subsidiary, Renewable Hawaii, Inc., into commercially viable projects.

The second track is the research and development of renewable energy technologies that are not yet economic but have potential in the future to increase Hawaii's energy self-sufficiency. HECO recognizes and supports the goal of cultivating the promise of emerging renewable technologies through partnerships between the public and private sectors. Such partnerships not only provide for the leveraging of resources, they also capitalize on Hawaii's unique opportunities to be a center for the testing and demonstration of renewable energy technologies.

3.0 RPS Background

3.1 Description of State RPS Law (HRS-269.91 – 94)

HRS 269.91 through 94 state that the RPS is the percentage of electricity sales that is represented by renewable energy. Renewable energy is the electrical energy produced by wind, solar energy, hydropower, landfill gas, waste-to-energy, geothermal resources, ocean thermal energy conversion, wave energy, biomass including municipal solid waste, biofuels or fuels derived from organic sources, hydrogen fuels derived entirely from renewable energy, fuel cells where the fuel is derived entirely from renewable resources, or the savings brought about by the use of solar and heat pump water heating. The HRS further specifies that the RPS levels shall be 7% of electricity sales by December 31, 2003, 8% by December 31, 2005, and 9% by December 31, 2010. An electric utility company and its electric utility affiliates may aggregate their renewable portfolios in order to achieve the RPS.

3.2 Description of RPS in other jurisdictions

RPS has been investigated in other jurisdictions and a number of them have enacted legislation or regulation establishing RPS. Several jurisdictions investigated RPS as part of their electricity deregulation efforts using RPS as a vehicle to ensure that electricity from renewable energy will continue to have a market even under full retail electricity competition. Although interest in electricity deregulation has somewhat diminished, RPS continues to be debated in the legislative and regulatory arena. Figure 1 shows a comparison of RPS enacted in other jurisdictions.

The RPS requirements in other jurisdictions range from 1.1% in 2012 for Arizona and 2.2% by 2011 for Wisconsin, up to 20% in 2017 for California and 30% in 2000 for Maine. It is important to note that California and Maine have existing hydroelectric dam facilities that contribute towards meeting their RPS requirements. In all, there are 15 states (Arizona, California, Connecticut, Hawaii, Illinois, Iowa, Maine, Massachusetts, Minnesota, Nevada, New Jersey, New Mexico, Pennsylvania, Texas, and Wisconsin) that have some form of RPS.

Part of the controversy with RPS requirements is the establishments of specific penalties for non-attainment of the RPS percentage targets. Several jurisdictions have very substantial penalties (e.g. 5.5 cents/kWh in Connecticut). There has been at least one instance (i.e. Arizona) where penalties had a negative effect on the utility to the detriment of ratepayers resulting in repeal of the penalties. At least six states (Arizona, California, Hawaii, Illinois, Minnesota, and Pennsylvania) do not specify penalties.

Figure 1

RPS – Adopted by Legislation/Regulatory Action

	State	Eligible Resources/Technologies[2]	Requirements	Current RE Level[2,3]
1	**ARIZONA** *Regulatory action (1999)* *Docket No. E00000A-99-205* *Rules* *R14-2-1618* *"Environmental Portfolio Standard"*	Solar: PV, STE, SWH Other: LG, W, B	0.2% in 2001; annual +0.2% to 2005; 1.05% in 2006; 1.1% in 2007-2012 Sub-requirement: 60% of EPS level from PV/STE by 2007 Annual increase after 12/31/04 contingent upon conditions set by ACC (findings of Cost Evaluation Working Group due to ACC by 6/3/03)	9.4% (with hydro) 0.01% (without hydro) H, Other
2	**CALIFORNIA** *Legislation (2002)* *SB 1078* *"Renewables Portfolio Standard"*	STE, PV, LG, W, B, H, G, MSW Restrictions on G, H, and MSW	Increase of 1% per year beginning 2003; 20% by end of 2017	29.4% (with hydro) 10.9% (without hydro) H, G, PV, W, MSW/LG, S B, Other
3	**CONNECTICUT** *REVISED: Legislation (2003)* *SB 733* *Public Act No. 03-135* *Rules* *CT PUC licensing, 16-245-5* *"Renewable Portfolio Standard"*	Class I: S, W, H (< 5 MW), SB, LG, FC, OT, OW, T Class II: H, MSW, B RE facility emissions cap (NOx per million Btu)	All years: 3% from Class I or II 4% total in 2004 (1% from Class I); +0.5% per year from Class I until 2006 6.5% total in 2007 (3.5% from Class I) 8% total in 2008 (5% from Class I); +0.5% per year from Class I until 2010 10% total in 2010 (7% from Class I)	8.0% (with hydro) 6.4% (without hydro) H, MSW/LG, Other
4	**HAWAII** *Legislation (2001)* *HB173 CD1; Act 272* *"Renewables Portfolio Standard"*	W, S, H, LG, MSW, G, OT, OW, B, BF, FC, H2 (FC must utilize renewable fuels)	7% by end of 2003; 8% by end of 2005; 9% by end of 2010	8.6% (with hydro) 7.7% (without hydro) H, G, W, MSW/LG, B, Other
5	**ILLINOIS** *Legislation (2001)* *HB 1599* *"Renewables Portfolio Standard"*	W, S, PV, SB, H	5% by end of 2010; 15% by end of 2020	0.6% (with hydro) 0.5% (without hydro) H, MSW/LG, Other
6	**MAINE** *Legislation (1997, 1999)* *P.L. 1999; 35-A, MRSA 3210* *Rules* *MPUC Chap. 311* *"Renewables Portfolio Standard"*	FC, T, S, W, G, H, B, MSW Nameplate capacities <100 MW Qualifying cogeneration facilities under FERC 18 code, Part 292, Sub. B; 60% efficiency (power+heat)	>30% of total kWh sales to ME customers	56.8% (with hydro) 29.3% (without hydro) H, MSW/LG, B, Other
7	**MASSACHUSETTS** *Legislation (1997)* *Acts of 1997, Chap. 164, HB 5117* *MGL c25A, Sec. 11F* *Rules* *225 CMR 14.00* *"Renewables Portfolio Standard"*	STE, PV, W, OT, OW, T, FC, LG, MSW, H, B (FC must utilize renewable fuels)	1% new renewables in 2003; +0.5% to 2009 (to 4%); annual +1% until ended by MA DOER Service provider can purchase RE to make-up RPS shortfall	8.3% (with hydro) 5.6% (without hydro) H, MSW/LG, Other
8	**MINNESOTA** *REVISED: Legislation (2003)* *MN Session Laws, Chapter 11* *Sec. 216B.1691* *"Renewable Energy Objective"*	STE, PV, W, B, H <60 MW, H2 Biomass provision (see requirements) After 1/1/2010, H2 must be from eligible resources	1% in 2005; increase by 1% each year until 2015 (10%) Of this total, 0.5% from B & MSW; 1% by 2010	5.8% (with hydro) 4.0% (without hydro) H, W, MSW/LG, B, Other
9	**NEVADA** *Legislation (2001)* *NRS 703.147 and SB372* *Rules* *Docket No. 01-7029* *"Portfolio Standard for RE"*	S, SWH, W, B, G	5% in 2003-2004; 7% in 2005-2006; 9% in 2007-2008; 11% in 2009-2010; 13% in 2011-2012; 15% in 2013 and in each year thereafter Sub-requirement: 5% of level from solar NPUC can exempt provider if sufficient RE supply is not available	10.7% (with hydro) 3.8% (without hydro) H, G
10	**NEW JERSEY** *Legislation (1999)* *N.J.S.A. 48:3-87* *Rules (Interim RPS)* *Subchapter 8, NJAC 14:4-8* *"RE Portfolio Standards"*	Class I: S, W, FC, G, OW, T, LG, SB Class II: MSW, H (<30 MW)	All years: 2.5% from Class I or II 3% total in 2001-2002 (0.5% from Class I); 3.25% total in 2003-2005 (0.75% from Class I); 3.5% total in 2006 (1.0% from Class I); annual +0.5% per year from Class I until 2012 and beyond 6.5% total (4% from Class I)	2.4% (with hydro) 2.3% (without hydro) H, MSW/LG, Other
11	**NEW MEXICO** *Regulation (2002)* *Rule 17.9 573 NMAC* *Approved by Final Order, Utility Case No. 3619, 12/17/02 and voted on by NMPRC 2/4/03 (4-1)* *"Renewables Portfolio Standard"*	W, H (<5 MW, new), S, B, G, LG, FC FC must utilize renewable fuels	5% by Jan. 1, 2006; increase by 1% each year; 10% by Jan. 1, 2011 and each year thereafter Each public utility must have RE certificates representing above requirements Certificates issued for each kWh in following values towards RPS compliance: 1 kWh for W and H; 2 kWh for B, G, LG, FC; 3 kWh for S	0.7% (with hydro) 0.02% (without hydro) H, Other
12	**PENNSYLVANIA** *Regulatory action (1998)* *Addressed in individual utility restructuring settlement plans* *"Renewable Portfolio Standard"*	For PECO, PPL, APS: S, W, SB, LG, G, OW, OT, T For GPU: S, W, SB, LG, G, OW, OT, T, and waste coal	For PECO, PPL, APS: 2% in 2002; annual +0.5%; for 20% of residential customers For GPU: 0.2% in 2000 for 20% of customers; increasing to 80% of cust. in 2003	2.4% (with hydro) 1.3% (without hydro) H, MSW/LG, B, Other
13	**TEXAS** *Legislation (1999)* *SB 7, Sec. 39.904* *Rules* *Subst. Rules Sec. 25.173* *"Goal for Renewable Energy"*	S, W, G, H, OW, T, B, LG, SWH	400 MW in 2003; 850 MW in 2005; 1400 MW (~1.1% retail sales) in 2007; 2000 MW (~1.4% retail sales) in 2009 (Retail sales estimated using EIA data)	0.7% (with hydro) 0.5% (without hydro) H, S, W, MSW/LG, B, Other
14	**WISCONSIN** *Legislation (1999)* *Wisconsin Act 9, Sec. 2334t, 196.378* *"Renewable Portfolio Standard"*	W, STE, PV, OW, T, B, G, FC, H (<60 MW) (FC must utilize renewable fuels)	0.5% in 2001; bi-annual +0.35% to 2009; 2.2% in 2011	5.3% (with hydro) 1.9% (without hydro) H, MSW/LG, B, W, Other

[2] B = biomass; BF = biofuels from RE; FC = fuel cell; G = geothermal; H = hydro; H2 = hydrogen fuels from RE; LG = landfill gas; MSW = municipal solid waste; OT = ocean thermal; OW = ocean wave; PV = photovoltaic; S = solar (not specified as STE or PV or both); T = tidal; W = wind; Other = agricultural byproducts/crops, sludge waste, tires and other biomass solids, liquids and wastes

[3] Percentage of net electric generation from renewable energy sources; 2000 data; Energy Information Administration (EIA) -- Electric Power Annual 2000 and Renewable Energy Annual 2001

Misc. notes: RE = renewable energy; EDC = electric distribution company; PECO = PECO Energy Company; PPL = Pennsylvania Power and Light; APS = Allegheny Power Systems; GPU = GPU Energy; "Cure" policy refers to the provision of a one-year extension to me

4.0 Current Renewable Energy Situation and Projections for 2005 and 2010

4.1 HECO Utilities' RPS levels for 2003

The HECO utilities are very pleased to have achieved in 2003 a consolidated RPS percentage of 8.40% (Figure 2). This is a significant increase over the 6.76% RPS percentage reported for 2002 and exceeds the RPS goal of 7% for 2003.

The increase from 2002 was primarily caused by the return to near-normal output levels of Puna Geothermal Venture after well problems in 2002 (i.e. from about 5 MW in 2002 to about 27 MW in 2003), a 12% increase in electricity produced by the HPOWER facility, and an increased use of bagasse at HC&S. This highlights the great variation from year to year in electricity production from renewable energy sources. The increase in the RPS percentage from 2002 was also caused by a first-time adjustment to include a portion of the output from AES which represents the amount of old tires, used oil, and used carbon filters utilized as fuel.

The increases in 2003 were offset by reduced hydroelectric generation due to a catastrophic equipment failure at Puueo Hydro on the Big Island as well as drought conditions on the Big Island during a significant portion of the year.

Information on specific renewable energy projects is provided in Section 5.1.

Figure 2

Renewable Portfolio Standard 2003 Status Report

Hawaiian Electric Company, Inc.
Hawaii Electric Light Company, Inc.
Maui Electric Company, Ltd.

Year-to-Date as of December 31, 2003

	GWh
HECO	
H-POWER	338
AES	30
Photovoltaic Systems	0.2
Solar Water Heating[1]	38
Solar Water Heating (Pre-DSM Systems)[2]	73
Heat Pump[3]	5
Subtotal	484
HELCO	
PGV	176
Hydro-Wailuku	24
Hydro-HELCO owned	2
Wind-Lalamilo Wells	2
Small Hydro	1
Other Wind including Kamaoa	10
Photovoltaic Systems	1.4
Solar Water Heating[1]	8
Solar Water Heating (Pre-DSM Systems)[2]	14
Heat Pump[3]	0.3
Subtotal	239
MECO	
Biomass & Hydro-HC&S[4]	66
Photovoltaic Systems	0.2
Solar Water Heating[1]	13
Solar Water Heating (Pre-DSM Systems)[2]	17
Heat Pump[3]	2
Subtotal	98
TOTAL Renewable Energy (GWh)	**821**
TOTAL Sales[5] (GWh)	**9,775**
RPS Percentage[6]	**8.40%**
Energy Savings From DSM Programs (GWh)[7]	397

Footnotes:

1. Act 272 specifies that renewable energy include the electrical energy savings brought about by the use of solar water heating. The gigawatt hour (GWh) for solar water heating is based upon the energy savings from solar water heating systems installed under the utility's demand-side management programs. The energy savings from utility demand-side management programs are reported to the Public Utilities Commission and the Consumer Advocate and are verified by an independent consultant whose evaluation reports are also filed with the Public Utilities Commission and the Consumer Advocate.

2. Pre-DSM solar water heating systems represent an estimate of energy saved by solar water heating system in operation today that were installed prior to the inception of the utility DSM programs in 1996. This estimate is based on a survey of appliance usage by customers of HECO, HELCO, and MECO.

3. Act 272 specifies that renewable energy include the electrical energy savings brought about by the use of heat pump water heating. The GWh for heat pumps is based upon the energy savings from heat pump systems installed under the utility's demand-side management programs.

4. HC&S utilizes bagasse (i.e. sugar cane residue) and hydropower, which are sources of renewable energy, in addition to coal and oil to generate the electricity it sells to MECO. Renewable energy is estimated to be 80.9% of the electricity sold to MECO based on recorded 2003 information provided by the Department of Business, Economic Development and Tourism.

5. Electricity sales for the period January 1, 2003 through December 31, 2003 were 7,522 GWh for HECO, 1,046 GWh for HELCO, and 1,207 GWh for MECO.

6. Renewable energy is defined in Act 272 to include the electrical energy savings brought about by the use of solar and heat pump water heating. Since solar and heat pump water heating are included with renewable energy and also reduce the amount of electricity sales, the renewable portfolio standards percentage might be viewed as double counting the benefits of solar and heat pump water heating. If the energy savings of 163 GWh were added back into the electricity sales, then the renewable portfolio standards percentage would be 8.26%.

7. Provided for reference only. One of the goals of the RPS is to reduce the State's use of oil. That end is accomplished by the use of both renewable energy AND energy efficiency. Although the RPS law does not include energy efficiency savings, for reference purposes, this is the estimated amount of energy saved during the 2003 in GWh by all participants in the HECO, HELCO and MECO-sponsored demand-side management (energy efficiency) programs to date (i.e. since the start of the programs in 1996 including solar water heating and heat pumps).

4.2 HECO Utilities RPS Projections for 2005 and 2010

With the attainment of the 7% goal for 2003 – the first year targeted in the RPS law – it is now appropriate to look ahead toward the targets for 2005 and 2010. To help assess the reasonableness of RPS goals for the future, a projection of future RPS percentages is provided. This projection requires a forecast of electricity sales and an estimate of future renewable energy usage. The sales forecast used to make the projection is the latest available for the specific utility. The estimate of future renewable energy usage is divided into two parts:

(1) Estimates of the renewable energy from *existing* projects.
(2) Estimates of the renewable energy from *new projects* that have been proposed.

Given the variable nature of the electricity generation from renewable energy projects, future renewable energy from *existing* projects except for geothermal generally was estimated to be the average of the electricity generation from the last five years. For geothermal, the average output for the last nine months of 2003 was used because of the changes PGV made to its production and re-injection wells to correct problems experienced in 2002 and early 2003. Future energy savings from solar water heating and heat pumps are based on estimates from the utility demand-side management programs and an estimated burn-out rate of 6.7% for pre-DSM solar water heating systems. Renewable energy from photovoltaic systems was estimated to increase at 10% per year. The estimate of renewable energy from existing sources is shown in Figure 3.

Regarding estimates of future renewable energy from *new projects*, HECO, HELCO and MECO are involved in many activities to bring more renewable energy onto their utility systems (see section 5 of this report).

Figure 3

Existing Renewable Energy Sources (GWh)

	Historical					Projections [1]						
	1999	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
HECO Renewable Energy (GWh)												
HPOWER	314	316	282	300	338	310	310	310	310	310	310	310
Kapaa Landfill Gas [2]	13	9	7	2	-	-	-	-	-	-	-	-
Municipal Solid Waste - AES [3]	-	-	14	25	30	30	30	30	30	30	30	30
Photovoltaic Systems [4]	-	-	-	-	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
Solar Water Heating	19	24	25	30	38	43	48	53	58	63	68	73
Solar Water Heating (pre-DSM systems) [5]	78	78	78	78	73	68	62	57	52	47	41	36
Heat Pump	3	4	4	5	5	5	5	5	5	5	5	5
Subtotal:	427	431	410	440	484	456	455	455	455	455	454	454
Estimated Oil Saved *(Thousand Barrels)*	710	720	680	730	810	760	760	760	760	760	760	760
HELCO Renewable Energy (GWh)												
PGV [1,6]	196	250	207	74	176	210	210	210	210	210	210	210
Hydro-Wailuku	27	29	33	27	24	28	28	28	28	28	28	28
Hydro-HELCO owned	19	15	18	9	2	13	13	13	13	13	13	13
Wind-Lalamilo Wells	4	3	2	2	2	3	3	3	3	3	3	3
Other Hydro	2	1	1	1	1	1	1	1	1	1	1	1
Wind-Kamaoa	12	13	15	10	10	12	12	12	12	12	12	12
Photovoltaic Systems	-	-	-	-	1.4	1.5	1.7	1.8	2.0	2.2	2.4	2.7
Solar Water Heating	4	5	5	6	8	9	10	11	12	13	14	15
Solar Water Heating (pre-DSM systems) [5]	15	15	15	15	14	13	12	11	10	9	8	7
Heat Pump	-	-	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4
Subtotal:	279	331	296	144	239	291	291	291	291	292	292	292
Estimated Oil Saved *(Thousand Barrels)*	620	740	660	320	530	650	650	650	650	650	650	650
MECO Renewable Energy (GWh)												
Biomass and Hydro-HC&S [7]	53	45	38	69	66	54	54	54	54	54	54	54
Biomass-Pioneer Mill [8]	2	0	0	0	0	0	0	0	0	0	0	0
Photovoltaic Systems	-	-	-	-	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4
Solar Water Heating	5	7	7	10	13	15	17	19	20	22	24	26
Solar Water Heating (pre-DSM systems) [4]	18	18	18	18	17	15	14	13	12	11	9	8
Heat Pump	-	-	1.6	1.9	2.0	2.1	2.1	2.0	2.1	2.1	2.1	2.1
Subtotal:	78	70	65	99	98	86	87	88	88	89	90	91
Estimated Oil Saved *(Thousand Barrels)*	140	120	110	170	170	150	150	150	150	150	160	160
TOTAL Renewable Energy (GWh)	**784**	**832**	**771**	**683**	**821**	**833**	**834**	**835**	**835**	**836**	**836**	**837**
Total Estimated Oil Saved *(Thousand Barrels)*	1,470	1,580	1,450	1,220	1,510	1,560	1,560	1,560	1,560	1,560	1,570	1,570
Electricity Sales (GWh) [9]												
HECO	6,998	7,212	7,277	7,390	7,522	7,701	7,817	7,948	8,040	8,103	8,166	8,229
HELCO	922	955	980	995	1,046	1,049	1,074	1,105	1,134	1,163	1,189	1,213
MECO	1,065	1,105	1,134	1,159	1,207	1,148	1,147	1,147	1,152	1,169	1,193	1,224
TOTAL Sales:	**8,985**	**9,272**	**9,371**	**9,544**	**9,775**	**9,898**	**10,038**	**10,200**	**10,326**	**10,435**	**10,548**	**10,666**
TOTAL Sales Growth (from prior year)		*3.2%*	*1.1%*	*1.8%*	*2.4%*	*1.3%*	*1.4%*	*1.6%*	*1.2%*	*1.1%*	*1.1%*	*1.1%*
RPS Percent for Existing Projects	**8.73%**	**8.97%**	**8.23%**[10]	**7.16%**[11]	**8.40%**	**8.4%**	**8.3%**	**8.2%**	**8.1%**	**8.0%**	**7.9%**	**7.8%**
RPS Targets:					7.0%		8.0%					9.0%

Footnotes:

1. Future renewable energy GWhs projections are based upon the historical Gwh average (1999-2003), except for AES, PGV, Photovoltaic Systems, Solar Water Heating, and Heat Pumps.
2. Kapaa Landfill gas project ceased generating electricity in 2002 due to equipment failure.
3. AES Municipal Solid Waste energy is based on the amount of energy derived from shredded used tires, waste oil, and used activated carbon. Future GWhs are assumed to be the same as the amount in 2003.
4. Photovoltaic assumed to grow at a rate of 10% per year with a capacity factor of 20%.
5. Pre-DSM solar water heating systems represent an estimate of energy saved by solar water heating systems in operation today that were installed prior to the inception of the utility DSM programs in 1996. The 2002 GWh estimate is based on a survey of appliance usage by customers of HECO, HELCO, and MECO. Projections (2003-2010) are based upon an estimated burn out rate of 6.7% per year.
6. PGV total output for 2002 was significantly lower due to well problems. Future PGV output based upon the average output of 17.5 GWhs per month during Apr.-Dec. 2003.
7. HC&S biomass and hydro energy in 2003 is estimated to be 80.9% of their total energy sold to MECO base on recorded 2003 information from DBEDT. Renewable energy contribution for 2008 and beyond depends on the continutation or establishment of a new power purchase agreement.
8. 1999 was the last year Pioneer Mill sold power to MECO. Pioneer Mill has since ceased operations.
9. Sales Forecast data reduced for impacts from DSM and 3rd party Combined Heat and Power:
   - HECO: August 2002 Sales and Peak Forecast adjusted for 2003 actuals
   - HELCO: May 13, 2003 Sales & Peak Forecast extended to 2010
   - MECO: June 26, 2003 Sales & Peak Forecast extended to 2010
10. The RPS percentage for 2001 is an update of the number previously reported to reflect MSW from AES, pre-DSM solar water heaters, and actual renewable energy utilization from HC&S. The RPS percentage for 2001 that was previously reported was 6.92%.
11. The RPS percentage for 2002 is an updated of the number previously reported to reflect MSW from AES and actual renewable energy utilization from HC&S. The RPS percentage for 2002 that was previously reported was 6.76%.

Projections for new renewable energy projects that have been proposed are shown in Figure 4. The projection uses a probabilistic approach that factors the uncertainty in timing of the project into the total estimate of renewable energy. The probability that a project will be completed in the specified year (based on the nature of the project, the existence of a signed power purchase contract in the case of one wind project, and past experience) is multiplied by the estimated electricity output. The result is summed for all projects yielding an expected value of total renewable energy for the specified year. The probability of project completion is estimated to increase over time to reflect the assumption that if a project developer is not able to complete a project, another developer would take over the project. The case in point is Kaheawa Wind farm on Maui, which was originally proposed by Zond Pacific, was taken over by GE Wind Energy, and subsequently by Hawi Renewable Development. At the same time, the probabilities of project completion do not reach 100 percent, as there is no guarantee that a proposed project will be completed. The most recent example of this is the Kahua Power Partners wind farm project, which had all of the required approvals by permitting agency including Public Utilities Commission approval of the Power Purchase Agreement, and yet the project ended up being canceled by the project developer (in order to allow for expansion of another wind farm project.).

The exception to the probabilistic approach is geothermal expansion because the proposed geothermal expansion projects are at very early stages making it difficult to estimate the probability of completion. The projected RPS percentages for both cases (expansion takes place and does not take place) are provided so that readers can make their own decision on the probability of project completion. In addition, given the relatively small size of the Big Island electric grid, there is an issue of how much electricity can be utilized from new generation sources, especially during the early morning periods of low electricity demands. The projected RPS percentages are provided for two different capacity factors (i.e. ratio of average load on the generating unit to the capacity rating) for geothermal expansion.

Figure 4

Proposed Renewable Energy Projects [1]

	Projections							PGV 8MW Increment Capacity Factor [11]		PGV 22MW Increment Capacity Factor [11]	
	2004	2005	2006	2007	2008	2009	2010	@50 % 2010	@ 70% 2010	@ 50% 2010	@ 70% 2010
Proposed Oahu RE Projects											
Waste Gas (1 MW) [2]											
- *Probability of project completion*	-	-	50%	70%	80%	90%	90%				
- *Estimated Energy Output (GWh)* [3]	-	-	4	6	6	7	7	7	7	7	7
Municipal Solid Waste (16 MW Increment) [4]											
- *Probability of project completion*	-	-	-	-	50%	60%	70%				
- *Estimated Energy Output (GWh)* [3]	-	-	-	-	46	55	64	64	64	64	64
Estimated Oil Saved *(Thousand Barrels)*	-	-	7	10	90	100	120	120	120	120	120
Proposed Big Island RE Projects											
Wind-Kamaoa Repower (20 MW) [5,6]											
- *Probability of project completion*	-	-	50%	60%	70%	80%	90%				
- *Estimated Energy Output (GWh)* [3]	-	-	19	25	31	37	43	43	43	43	43
Wind-Hawi (10.6 MW) [5,7]											
- *Probability of project completion*	-	-	70%	80%	80%	90%	90%				
- *Estimated Energy Output (GWh)* [3]	-	-	23	26	26	29	29	29	29	29	29
Wood Waste Generation [8]											
- *Probability of project completion*	-	-	-	-	-	-	-	-	-	-	-
- *Estimated Energy Output (GWh)* [4]	-	-	-	-	-	-	-	-	-	-	-
PGV (8 MW Increment) [9] See Col. Descript											
- *Estimated Energy Output (GWh)* [3]	-	-	-	-	-	-	-	35	49	-	-
PGV (22 MW Increment) [9, 10] See Col. Descript											
- *Estimated Energy Output (GWh)* [3]	-	-	-	-	-	-	-	-	-	96	135
Estimated Oil Saved *(Thousand Barrels)*	-	-	90	110	130	150	160	240	270	380	460
Proposed Maui RE Projects											
Wind-Kaheawa (17.8 MW) [5,12]											
- *Probability of project completion*	-	-	50%	60%	70%	80%	90%				
- *Estimated Energy Output (GWh)* [3]	-	-	27	33	38	44	49	49	49	49	49
Estimated Oil Saved *(Thousand Barrels)*	-	-	50	60	70	80	90	90	90	90	90
TOTAL Renewable Energy of Proposed Projects (GWh)	0	0	73	89	147	172	192	227	241	289	327
RPS Percent for Proposed Projects	**0.0%**	**0.0%**	**0.7%**	**0.8%**	**1.4%**	**1.6%**	**1.8%**	**2.1%**	**2.2%**	**2.7%**	**3.0%**

Projection of Future RPS Percentage

	Projections							PGV 8MW Increment Capacity Factor [11]		PGV 22MW Increment Capacity Factor [11]	
	2004	2005	2006	2007	2008	2009	2010	@ 50% 2010	@ 70% 2010	@ 50% 2010	@ 70% 2010
Total Estimated Oil Saved by Existing and Proposed Projects *(Thousand Barrels)*	1,560	1,560	1,710	1,740	1,850	1,900	1,940	2,020	2,050	2,160	2,240
RPS Percent for Existing Projects	8.4%	8.3%	8.2%	8.1%	8.0%	7.9%	7.8%	7.8%	7.8%	7.8%	7.8%
RPS Percent for Proposed Projects	0.0%	0.0%	0.7%	0.8%	1.4%	1.6%	1.8%	2.1%	2.2%	2.7%	3.0%
RPS Percent Total:	**8.4%**	**8.3%**	**8.9%**	**8.9%**	**9.4%**	**9.5%**	**9.6%**	**9.9%**	**10.1%**	**10.5%**	**10.9%**
RPS Target:		8.0%					9.0%				

Footnotes:

1. Renewable energy projects listed have been proposed and meets the following:
   - Proposed Technology is currently in commercial operation in Hawaii or elsewhere
   - Renewable resource is available for the technology
   - Technology has established capital and operating costs.
2. Waste Gas electricity generation based upon a 90% capacity factor.
3. Estimated energy output is calculated by multiplying the probability of project completion in the year shown by the proposed output of the project.
4. Municipal Solid Waste electricity generation based upon a capacity factor of 65%.
5. A 35% Capacity factor was used for all future proposed windfarm projects due to:
   - Wind regime of proposed windfarm project location (class 6 or higher)
   - Size and type of wind turbines proposed
   - Review and averaging of the various capacity factors for windfarms
6. Kamaoa Repower GWh output shown in the table is calculated by subtracting the estimated output of the repowered windfarm (20MW @ 35% capacity factor = 61.3 GWh) by the estimated output (12 GWh) of the existing windfarm.
7. HRD-2 Power Purchase Agreement signed on December 30, 2003 for an expanded windfarm development at UpoluPoint. Expanded windfarm the windfarm size from 8 wind turbines (5.3 MW) to 16 wind turbines (10.56 MW).
8. Details of this project are still being developed and are not available at this time.
9. PGV has proposed to increase the output of their existing generation facility by 8MW. Well problems experienced in 2002 has put this proposal on hold.
10. PGV has proposed to expand the capacity of their facility to 60MW. This is a 22MW increment in addition to the 8MW increment for a total of 60MW.
11. Energy shown at 50% and 70% capacity factor to enable consideration that additional energy from PGV is constrained by system minimum load and transmission line capacity.
12. Kaheawa windfarm is assumed to have 27-660 kw wind turbines with a capacity factor of 35% (capacity factor per Zond Pacific's EIS).

4.3 Discussion of current situation and projections

Although the 2003 percentage of 8.40% exceeds the RPS goal of 7% for 2003, it should be noted this level might be difficult to maintain. Even if the amount of renewable energy remains at 2003 levels in future years (not at all a certainty as the problems experienced in 2002 drove home), the RPS percentage may decline because electric sales (the denominator in the calculation) continue to increase as the economy grows (see Figure 3). In fact, recent news of increased economic activities including increased military activities, such as the addition of a Stryker brigade and C-17 squadron, could result in even higher sales than currently forecast for Oahu. The point is simply that Hawaii's use of electricity is growing and therefore renewable production must grow or the RPS numbers will slip.

The calculations in Figure 4 indicate that given preliminary assumptions about the timeframe for completion of proposed projects, the amount of renewable energy on the system is expected to increase through 2010. Given the current forecast, we can hopefully meet or slightly exceed the 8% RPS level in 2005. With some fairly optimistic assumptions about specific future renewable energy projects, it also appears possible to meet or slightly exceed the 9% RPS in 2010.

Though we are committed to doing everything we can to achieve these preliminary projections, they are provided with the strong caveat that there are many variables impacting the actual development of renewable projects. For example, a renewable energy developer may be unable to obtain State or County permits, land lease, project financing, or community support. In addition, the developer may not be able to locate the renewable resource, or once operational, may be unable to keep its facility operating. Also, it is not simply a matter of whether a given technology is feasible; it also frequently requires additional infrastructure such as power lines to connect the renewable project to the electric grid. This infrastructure also must be permitted, a challenge which may be more formidable than permitting the renewable energy generation itself. Expiration of tax credits such as the Federal Production Tax credit (wind) or the state Energy Conservation Income Tax Credit (wind, solar water heating) can also have negative impacts on renewable energy.

The following is a list of some of the reasons for failed renewable energy projects in the State:

- Inability to secure permits (hydroelectric on Kauai);
- Inability to secure land lease (10 MW wind on Maui);

- Poor economics or inability to secure project financing (40 MW OTEC on Oahu, sugar mills on Hawaii, Maui, Oahu and Kauai, 9 MW wind on Oahu, 2 MW wind on Big Island);
- Community opposition (6 MW hydroelectric on Kauai, 2-4 MW hydroelectric on Maui, 14 MW hydroelectric on Hawaii, and hydroelectric on Molokai, 1 MW wind on Oahu);
- Unavailability of renewable resources (early geothermal projects on Hawaii, 4 MW biomass on Molokai); and
- Operational problems (1 MW wind on Molokai).

In addition, planning for a major wind project on the Big Island was significantly delayed because the potential developer was an Enron subsidiary at a time when Enron was distracted by its own corporate difficulties.

Any one of these factors, which are outside of the utilities' direct control, could prevent, delay or shut down a renewable energy project.

5.0 HECO Utilities' RPS Strategy

Despite these challenges, the HECO utilities take the RPS law very seriously and have demonstrated through our actions a strong commitment to achieving these levels.

As discussed in the previous Policy Statement, HECO utilities are executing a strategy that incorporates myriad activities, but which can be grouped into two main thrusts to increase its renewable energy portfolio:

(1) Pursue commercial renewable energy projects; and

(2) Accelerate the development of emerging renewable energy technologies that have potential for commercial application.

This strategy aims to pursue commercially available renewable energy generation in the near term, and in parallel, invest in research, development, and demonstration projects (RD&D) for emerging technologies and resources that are not currently commercially available or economically viable in the near term. This strategy will ensure that the HECO utilities are not only taking action to use as much renewable energy as is commercially and economically viable today, but also are helping to develop future sources of renewable energy. .

HECO's activities and initiates are described in detail below.

5.1 Pursue Commercial Renewable Energy Projects

The HECO utilities are pursuing commercial renewable energy projects by (1) keeping existing commercial renewable energy projects operating, and (2) pursuing new commercial renewable energy projects.

Keep Existing Commercial Renewable Energy Projects and Resources on the System

A key component of the HECO utilities' renewable portfolio strategy is to maintain the existing sources that are currently contributing renewable energy to the State's energy mix.

- Puueo Hydro Rehabilitation
  The existing 1.5 MW HELCO-owned run-of-river Puueo hydroelectric plant will be rehabilitated. The PUC approved HELCO's plans to rehabilitate the damaged generator by installing a modern, more efficient turbine generator with a capacity of roughly 2.28 to 2.4 MW.

- Lalamilo Windfarm
  The Lalamilo wind farm is an existing 2.28 MW HELCO-owned facility located in the Waimea area (Big Island). HELCO is presently considering options for increasing the output of this facility.

- PGV
  Due to well problems, the normal capacity of 30 MW at PGV had been reduced to an average of 5.6 MW from April to December 2002. PGV has drilled a new source well and converted KS-11 into a re-injection well, which has enabled PGV's output to slowly increase. PGV indicates that as of January 2004, it has been able to export roughly to 27 MW on a consistent basis.

- Hawaiian Commercial and Sugar Company (HC&S)
  MECO and Hawaiian Commercial and Sugar Company (HC&S) have agreed to have their power purchase agreement remain in effect at least through December 31, 2007, thus continuing the export of bagasse-generated and hydroelectric energy to the grid.

- Continue Existing DSM Programs
  Since its beginnings in 1996, our residential solar water heating program, the largest in the nation, has paid over $24 million in rebates to help 23,000 Hawaii households install solar. Over 4,700 Hawaii businesses have received an additional $18 million to help pay for energy efficient technologies such as lighting, cooling, heating and motors.

  In their second Integrated Resource Plan reports, HECO, HELCO and MECO all determined that their demand-side management (DSM) programs, including solar water heating and heat pumps, should continue to be included in future resource plans. Future rebates for solar water heating systems will provide an important incentive to encourage the adoption of solar water heating in the future. The HECO utilities continue to work towards obtaining PUC approval to continue, and expand, its DSM programs in the future.

  In addition to utility planning efforts, the 2003 Legislature demonstrated vision and commitment to renewable energy by passing the Renewable Energy Tax Credit. This legislation in conjunction with the utility demand-side management programs provides a positive incentive for both solar water heating and other renewable technologies.

Pursue and Facilitate New Commercial Renewable Energy Projects

HECO utilities are also pursuing programs to facilitate the commercial development of wind and biomass resources, as well as a program to enhance the positive integration of renewable energy systems with the electric grid.

Stimulate Renewable Energy Market

HECO formed a non-regulated subsidiary in December 2002 called Renewable Hawaii, Inc. to seek passive investment (providing a reasonable return) opportunities in cost-effective, commercial renewable energy projects in the State. With initial approval to invest up to $10 million, Renewable Hawaii's formation builds on HECO's ongoing commitment to increase Hawaii's use of renewable energy. The primary objectives of Renewable Hawaii are to stimulate the addition of cost-effective, commercial renewable energy in Hawaii, promote viable projects that will integrate positively with the utility grid and encourage renewable energy generation activity where such is lacking in targeted categories. (Technologies requiring research and design, prototype development, or demonstration will not be considered.)

Renewable Hawaii is attempting to stimulate the renewable energy market by releasing a series of island-specific Renewable Energy Request for Project Proposals (RE RFPP). The following summarizes the efforts thus far:

- *Island of Oahu*
  A RE RFPP for the island of Oahu was released on May 22, 2003 and closed on August 22, 2003. Eight proposals were received with three proposals passing the screening process and currently undergoing detailed evaluation.

- *Maui County (islands of Maui, Molokai, and Lanai)*
  A RE RFPP for the islands of Maui, Molokai, and Lanai was released on September 4, 2003 and closed on December 4, 2003. Five proposals were received; three proposals passed the screening process and are currently undergoing detailed evaluation.

- *Big Island of Hawaii*
  A RE RFPP for the Big Island of Hawaii was released on January 22, 2004. Proposals are due April 22, 2004.

Wind Program

Wind has a high potential for near-term commercial development because of the potential resource availability in Hawaii and the maturity of the technology. HECO has launched various wind initiatives:

- *High Resolution Wind Resource Maps*
  A new project funded by HECO, the Department of Business, Economic Development and Tourism (DBEDT), and the Department of Energy's National Renewable Energy Laboratory (NREL) has been initiated to update the State's wind resource maps. Preliminary high resolution wind resource maps, which graphically show wind power densities and wind speed, for the islands of Oahu, Big Island of Hawaii, Maui, Molokai, and Lanai have been developed to help identify new wind sites that could lead to commercial wind development.

- *Commercial Wind Assessment*
  In response to the findings of the high resolution wind resource maps, HECO will pursue site-specific assessments for wind farm development to investigate commercial development opportunities.

- *Offshore Wind Assessment*
  In anticipation of the findings of the high resolution wind resource maps, HECO hoped to conduct an assessment of potential offshore wind development on Oahu. However, the wind maps revealed that the offshore wind speeds were too low in areas having shallow depths (50 to 100 feet depth necessary for offshore wind development) and that the depths were too deep in areas having high wind speeds. Therefore, a study was not pursued.

- *Hawaii Wind Working Group*
  HECO and DBEDT co-chair the federal-sponsored Hawaii Wind Working Group (HWWG) as part of the Department of Energy's Wind Powering America program. The function of the HWWG is to provide a forum for information exchange among member organizations, the public, and decision makers and to encourage the development of technically and economically feasible wind projects. Formed in 2002, the HWWG has already had several meetings to exchange information.

Bioenergy Program

Biomass has a high potential for near-term commercial development because of the potential resource availability in Hawaii and the maturity of the technology. Initiatives to explore agricultural wastes and biofuels are underway.

- *Hawaii Biomass Program*
  HECO is working with HC&S and the University of Hawaii at Manoa (UHM) to develop the Hawaii Biomass Program. This proposed multi-year program would take a collaborative approach in developing a policy and technology framework that would lead to commercialization of an economically viable way to make full use of the total sugarcane material (including the use of cane trash) as a biomass energy resource (i.e., implement a dual-use crop strategy to economically produce both sugar and energy).

- *Biofuels Program*
  The potential utilization of biofuels (e.g., biodiesel, ethanol, and biofuel blends) in existing and new power generation units is being explored under HECO's Biofuels Program. The use of biofuels in electric power generating units represents a potential near-term renewable energy option. Before biofuels can be used on a commercial basis, however, the technical feasibility of firing stationary power generating units will need to be evaluated and demonstrated. Program activities include the following:

  - HECO is funding a project to obtain information on biofuel properties, supply, availability, and pricing (Phase 1 of a planned multi-phase, multi-year biofuels assessment study).

  - HECO is examining the feasibility of using boiler-grade fuel derived from used grease trap oil (such as the waste oil produced by restaurants) in its generating units.

  - MECO is evaluating the use of biodiesel during start-up operations in two of its generating units at Maalaea.

  - After a one-year pilot program, HECO has converted its entire fleet of diesel-fueled trucks and associated refueling stations to use B20 fuel (20% biodiesel and 80% diesel).

Facilitate Non-Utility Projects

HECO, HELCO and MECO receive and evaluate proposals from independent power producers seeking to sell power to the utilities. The following projects are either under review, in negotiations, or in the case of the Hawi project, completed with negotiations.

- *Union Mill Hydroelectric Project (HELCO)*
  Power Tech Industries, Inc. is proposing an 800 kW hydroelectric facility (Union Mill) located at Hawi, Hawaii.

- *Tradewinds (HELCO)*
  Tradewinds, LLC has proposed to build and operate a wood processing plant to process eucalyptus trees into various wood products. The plant would include a cogeneration facility to generate electricity fueled by wood waste with the excess electricity to be utilized on the HELCO grid. Tradewinds continues to pursue this project and HELCO has been in discussions with Tradewinds on the possible forms that this project could take.

- *Apollo (HELCO)*
  Apollo Energy Corporation (Apollo) is proposing to repower its existing 7,000 kW wind farm (Kamao'a Wind Farm) located at South Point, Hawaii. Under the plans, the repowered wind farm would increase in size to 20,500 kW. There is an agreement in principle between Apollo and HELCO on almost all of the key issues in a power purchase agreement (PPA).

- *Hawi (HELCO)*
  Hawi Renewable Development LLC (HRD) and HELCO signed a power purchase agreement (PPA) on December 30, 2003 for as-available energy from a 10,560 kW wind farm at Hawi,

Hawaii. The PUC approved a signed PPA between HELCO and Hawi Renewable Development, Inc. (HRD Inc.) for as-available energy from a 5,280 kW wind farm at Hawi, Hawaii. However, HRD Inc. decided to proceed negotiate for and upon, PUC approval, construct and operate a 10,560 kW wind farm, which would incorporate the original 5,280 kW wind farm at the same site.

- *GE Wind Energy/HRD Kaheawa Wind farm (MECO)*
  GE Wind Energy/HRD has proposed to develop a 20 MW wind farm on conservation land at Kaheawa Pastures, Maui. The Board of Land and Natural Resources decided to award a land lease for the site to GE Wind Energy/HRD, thus rendering a competing proposal moot. The current proposal is for a 17.8 MW wind farm at the site.

- *Sea Solar Power (HECO)*
  Sea Solar Power, International, LLC (SSPI) is proposing a 100 MW ocean thermal energy conversion (OTEC) facility to be anchored off Kahe Point, Oahu. The proposal received in late December 2003 proposes a July 2008 in-service date. If the project proves to be technically and economically feasible, the facility would be the first commercial OTEC facility in the world. HECO and SSPI are at the preliminary stages of discussions.

- *H-Power Expansion (HECO)*
  There have been informal, verbal comments by H-Power personnel that the City & County of Honolulu may want to expand the facility by adding a third boiler.

- *Makila Hydro (MECO)*
  Hawaii Energy Group, the consultant to the owner of Makila Hydro, is requesting an "as available" power purchase contract, for the proposed repowering of an existing 500 kW hydro generator located above Lahaina (previously interconnected to Pioneer Mill).

Streamlined Power Purchase and Net Energy Metering Agreements

In response to the passage of Act 272, HECO utilities worked hard to be ready for implementation of the new law before the Governor signed Act 272 into law on June 25, 2001. This allowed the utilities to implement the customer billing modification, a streamlined NEM Agreement, and a NEM Tariff on the same day the legislation was signed into law. This streamlined net energy metering process, coupled to the existing power purchase contract governing systems less than 10 kW (referred to as the PV-10 contract), creates an environment that encourages the operationally-positive integration of customer-sited NEM systems.

Standardized Interconnection Agreement

H.C.R. No. 172, H.D. 1 of the Twenty-Second State Legislature, dated April 1, 2003, directed the Consumer Advocate (CA) "to form an ad hoc advisory group to investigate and make recommendations regarding the implementation of standard offer contracts and standardized interconnection agreements to facilitate the purchase of electricity from renewable energy producers in Hawaii." HECO is part of the ad hoc advisory group. The Consumer Advocate submitted an interim report of the ah hoc advisory group to the Legislature in December 2003.

Renewable Energy Integration Program

The intermittent and variable nature of wind can put a major strain on the existing utility systems in terms of being able to control system frequency and power fluctuations, which can impact the reliability of power provided to customers. The smaller the system, the greater the impact these fluctuations may have on utility and consumer electrical equipment. HECO, HELCO, and MECO are conducting various projects to address this issue with the ultimate goal of allowing more wind on the utility systems.

- *Electronic Shock Absorber*
  To help stabilize operation of grid-connected wind turbines and minimize power fluctuations on an electric grid which is connected to a number of wind farms, HECO, HELCO, and MECO have teamed with a private company to conduct a study and confirm that a device can be developed from commercial products for installation between a wind farm and the utility grid. The purpose of the device, called the Electronic Shock Absorber (ESA), is to help the electric utility ride through short duration power fluctuations (frequency, voltage, etc.) from the wind farm caused by the variable nature of wind.

- *Intermittent Generation Assessment Protocol (IGAP)*
  To improve existing planning and evaluation tools, HECO is working with a consultant on the IGAP study to address the technical and cost impacts of relatively high levels of intermittent renewable energy generation on small, isolated electric utility systems.

  The study will develop improved modeling to quantify the impacts of high levels of intermittent generation, establish appropriate power quality standards, and identify specific measures that can be taken by intermittent generation operators and utility operators to mitigate power quality fluctuations.

- *Grid Quality Assessment*
  Through its membership with the Utility Wind Interest Group (UWIG), HECO plans to participate in a project to develop assessment tools related to grid quality. The purpose of this project is to determine and characterize the voltage fluctuations caused by wind farms on distribution feeder lines.

- *In-line Hydro and Pumped Storage Hydro Assessment*
  Under a partnership with HECO, HELCO, DBEDT, County of Hawaii, and the State Department of Agriculture, a study is being funded by DBEDT and HECO to identify the potential for in-line hydroelectric and pumped storage hydroelectric (i.e., use of wind during off-peak hours to pump water to a higher elevation and generating power through in-line hydro units during on-peak hours) in existing County, State, and private water systems.

- *Bulk Energy Storage to Relieve Transmission Congestion on the Island of Hawaii*
  Under a partnership with HELCO, DBEDT, and Sentech, a study is being funded by the U.S. Department of Energy to investigate new forms of energy storage that could alleviate the issue of overloading transmission lines when transporting renewable electricity to end uses, fostering the increased use of distributed energy and renewable energy systems.

- *Distributed Energy Resources Management as a Microgrid*
  HECO and DBEDT have received funding under a U.S. Department of Energy competitive grant program to evaluate the combination of hybrid, controllable distributed energy resources (DER) systems that will encourage development of renewable and distributed resources.

Assess Renewable Energy Technologies in IRP

HECO utilities conduct long-range planning to meet the energy needs of its customers. As part of its Integrated Resource Planning (IRP) process, HECO utilities evaluate both supply-side and demand-side resource options. Included in the IRP process is a comprehensive assessment of renewable energy resources and technologies that are feasible in the near term (within the 5-year action plan period) and long term (over the 20-year IRP horizon). The evaluation of near-term technologies yields the most up-to-date information on potential renewable projects in Hawaii.

5.2 Accelerate the development of emerging renewable energy technologies

As part of HECO utilities' strategy to increase the renewable portfolio in the long-term, the companies are pursuing a broad range of initiatives to facilitate and accelerate the development of emerging renewable energy technologies in Hawaii.

HECO's parent company, Hawaiian Electric Industries (HEI), also provides venture capital funding to local companies engaged in emerging technology development to help accelerate technology deployment in Hawaii. HEI is involved with two companies developing renewable energy technology.

Hoku Scientific
In June 2002, HEI provided venture capital funding to Hoku Scientific, Inc., a Hawaii-based fuel cell R&D company that is developing proprietary fuel cell membrane technology. HEI's investment, which was part of a $1+ million round of funding, is viewed as critical to the further development of Hoku Scientific and its technology.

Worldwide Energy Group
HEI provided venture capital funding to Worldwide Energy Group, Inc., a Hawaii-based company developing a technology that converts sugarcane bagasse or other biomass resources into ethanol. Ethanol is a potential alternative fuel produced from locally available renewable sources that can be used to generate electricity.

Research, development and demonstration (RD&D) projects and projects that enhance public education about renewable energy are underway. HECO utilities' membership with the Electric Power Research Institute (EPRI), the research arm of the electric utility industry, keeps HECO utilities abreast of technology advances and is a core component of their RD&D thrust. In addition, HECO utilities will continue to seek partnerships with Federal, State, and County governments, the University of Hawaii, and other entities to increase their renewable energy portfolio.

RD&D projects, listed by technology, are described below.

Hydrogen and Fuel Cells

Hawaii Fuel Cell Test Facility
HECO has partnered with HNEI, U.S. Department of Defense (DOD), and UTC Fuel Cells to build and operate a hydrogen fuel cell test facility in Hawaii. The Hawaii Fuel Cell Test Facility, operational since April 2003, is housed in approximately 4,000 square feet of warehouse space at HECO's Ward Avenue facility and is used to evaluate the performance and reliability of production-sized, single-celled, fuel cell stack designs, materials, and fuels.

Hydrogen Power Park Study
HECO and HELCO are partnering with the DBEDT, HNEI, Sentech, Sunline, Stuart Energy, and UTC Fuel Cells in a project to introduce and demonstrate hydrogen-based infrastructure in Hawaii.

NELHA Gateway Project
HELCO is partnering with the Natural Energy Laboratory of Hawaii Authority (NELHA), DBEDT, HNEI, and Sentech in a project to construct distributed energy systems at the Gateway Center located at the entrance to NELHA's Hawaii Ocean Science and Technology (HOST) Park. This project aims to demonstrate renewable distributed energy resources and technology.

Solar

PV/Hydrogen project at Ford Island

A partnership between HECO, HNEI, Office of Naval Research (ONR), and Navy Region Hawaii was formed to develop a photovoltaic energy park (PVEP) on Navy land to generate electricity from the sun and conduct research and development related to renewable energy, hydrogen, and fuel cells. Congressional authorization and appropriation for federal funding for a utility-scale photovoltaic system and associated research and development are in place.

Solar Roof Assessment Study

HECO provided seed funds for a research effort by the University of Hawaii School of Architecture to develop a method for assessing the potential for solar power on roofs of existing buildings on the island of Oahu.

Kona Base Yard Grid-Connect Photovoltaic System

To demonstrate a net energy metered photovoltaic system that would be similar to what a small commercial or residential customer might consider, HELCO has installed a 5.4 kW photovoltaic system along with battery back-up and an educational display at its Kona base yard.

Solar Thermal/Cooling Pilot Project

HELCO is partnering with Pacific Energy Services, Solel, and the Outrigger Waikoloa Beach Marriott on a project to demonstrate a solar thermal pilot system. The pilot system, operational since April 2003, utilizes a solar panel to produce domestic hot water to help meet hotel hot water needs.

Maui Building-Integrated Photovoltaics

MECO provided a solar roof to the County of Maui's Lahaina Civic Center in November 2003. The roof serves the dual purpose of covering a walkway and providing the solar power for an electronic sign as well as parking lot lighting.

U.S. Department of Defense Bus Stop Photovoltaic Lighting Demonstration

To promote and demonstrate off-grid photovoltaic technology, HECO is working with the Army to install photovoltaic area lighting systems at existing bus stops and other facilities on military property (Schofield Barracks).

HELCO Photovoltaic Area Lighting Projects

To promote the use of off-grid photovoltaic applications, HELCO has partnered with various entities to install photovoltaic area lighting systems:

- HELCO, the County of Hawaii, and the U.S. Department of Energy Million Solar Roofs (MSR) program teamed up to design and install a solar lighted educational kiosk and solar lighting for the Hilo bay front public restrooms.
- Two solar-powered lights provide dusk-to-dawn security and improve the safety of the parking lot at the Catholic Charities Community and Immigrant Services transitional shelter Ka Hale ʻO Kawaihae.
- A partnership between HELCO and the County of Hawaii was formed to provide improved lighting for two County parks located in Puna (Ahalanui Beach Park and Pohoiki Beach Park).

Hydroelectric Resources

County of Hawaii In-line Hydroelectric Demonstration Project

HELCO has committed funding to cost-share with the County of Hawaii Department of Water Supply for an in-line hydroelectric generator project.

Lanai In-line Hydroelectric Study

MECO is working with Castle & Cooke Resorts to initiate a feasibility study to examine whether an in-line hydroelectric system can be installed in the existing distribution water pipelines from central Lanai to its Manele Bay Resort.

Ocean Resources

Navy Wave Energy Demonstration

Under a DOD Small Business Innovation Research (SBIR) grant, the Navy is partnering with Ocean Power Technologies (OPT) to assess the technical and economic feasibility of ocean wave energy. An at-sea demonstration of a 20-kW buoy wave energy system will be conducted at Kaneohe Marine Base. HECO provided engineering support regarding interconnecting to the electric grid and also serves as the Navy's technical advisor.

EPRI Offshore Wave Energy Project

HECO and DBEDT are participating in a multi-phase, multi-state collaborative project headed by EPRI to demonstrate the feasibility of wave power. The project will yield a conceptual design, including performance and cost estimates, for an offshore wave power device at a target location in each of six states (Hawaii, Maine, Massachusetts, California, Oregon, and Washington). Environmental and permitting issues will also be assessed.

Honolulu Board of Water Supply (BWS) Deep Ocean Water Application Facility Study

The BWS is evaluating the feasibility of developing a deep ocean water facility to produce potable water, generate power via OTEC, and provide chilled water for air conditioning and other applications. HECO is serving on the study's advisory group.

Public Education

Sun Power for Schools Program

HECO, HELCO, and MECO are entering the 8th year of their Sun Power for Schools program with the State of Hawaii Department of Education. Through the Sun Power for Schools program, HECO utilities will continue to install photovoltaic systems at Hawaii public schools using voluntary customer contributions and by providing in-kind utility contributions, including engineering, project management, administration, advertising, and marketing. To date, nineteen public schools have received photovoltaic systems (nine on Oahu, four on the Big Island, and six in Maui County).

HECO and the State of Hawaii Department of Education developed educational materials through a grant from the U.S Department of Energy's Million Solar Roofs program. The material was provided to public high school teachers. HECO, HELCO and MECO also conducted workshops for public high school and middle school teachers and participated in their Solar Sprint program where students evaluate their solar cars in field tests.

Bishop Museum Energy Pavilion

Increasing public education and awareness of renewable energy technology is an important step towards establishing a sustainable market for renewable energy. HECO provided funding for a grid-

connected photovoltaic system and renewable energy exhibit located at Bishop Museum. The photovoltaic energy system and exhibit, called Hale Ikehu, is operational and open to the public. Visitors are able to observe a working photovoltaic system and learn about solar energy and other renewable energy technologies. During the first seven months, over 600 individuals directly participated in the Hale Ikehu educational programs and over 110,000 visitors to Bishop Museum had the opportunity to view the renewable energy displays and educational materials.

HECO Renewable Energy Website

More information about the HECO Utilities' renewable energy programs and initiatives can be found on HECO's website at www.heco.com under "Renewable Energy".

5.3 Additional Activities

Expand solar water heating and heat pump DSM programs

City and County of Honolulu Solar Roofs, Low-Income Solar Loan Program

To increase participation in HECO's Residential Efficient Water Heating Program, HECO entered into a partnership with the City and County of Honolulu to offer loans for the installation of solar water heating systems to low to moderate-income customers. Working with the Rehabilitation Loan Branch of the Department of Community Services has enabled HECO to offer these low-interest loans with a minimal amount of additional cost to the program.

The interest rate from the loan repayment is either 0% or 2% based on the applicant's income. The term of the loan is 7 years and generally gives customers monthly payments equal to or only slightly greater than the energy savings on their electric bill resulting from the installation of the solar system.

The loan program was introduced in April 2003 and as of December resulted in 35 approved loans.

Maui Solar Roofs Initiative

In September 2002, MECO formed a partnership with the County of Maui to increase the use of renewable energy in Maui County by increasing the number of solar water heating systems installed in residences. The County provided a grant in the amount of $250,000 to MECO to establish a revolving fund, administered by MECO, offering zero-interest loans to qualified homeowners. The loan would help finance the up front costs of installing a solar water heater on their home.

The fund is rebuilt as the approved applicants repay their loans. During the first year, 116 applications were approved of which 40% of the applicants were below the median income. Based on the program's success after its first year, MECO received an additional $100,000 grant from the County's Office of Economic Development. The program was modified to reserve at least 50% of the funds for applicants with household income below the median with priority going to low-income applicants.

MECO is in discussion with Maui County's Department of Housing and Human Concerns, Housing and Urban Development ("HUD") Section 8 administration, to expand the reach into the low-income rental market.

USDA Rural Utilities Service's Grant to Fund Maui Electric's Solar for Molokai Project

To further help make solar water heating more affordable for those who might not otherwise be able to invest in it, MECO has been selected to receive over $1.1 million in USDA funds for the installation of renewable energy solar water heating systems on the island of Molokai. MECO will provide about $400,000 in rebates, as well as project administration and outreach. Approved applicants will be required to attend classes to learn about basic solar system maintenance to ensure maximum performance over the life of the system and other energy saving techniques.

Community partners include the Department of Hawaiian Home Lands, Maui Economic Opportunity, Department of Housing and Human Concerns, Molokai Community Services Council, Office of Hawaiian Affairs, and Ke Aupuni Lokahi, which oversees the island's Enterprise Community efforts. The Energy, Resources and Technology Division of DBEDT will assist in conducting the educational classes.

Conclusion

HECO, HELCO and MECO are very pleased to have met the initial 7% target for 2003. Looking ahead, although preliminary projections are hopeful, given the variables which can impact potential renewable projects, we believe it is premature to draw definite conclusions about the achievability of the future goals of 8% in 2005 and 9% in 2010 or to set targets beyond 2010. But as is detailed in Section 5 of this report, despite the variables and challenges, we are actively working on many fronts to support and develop projects that will give us every opportunity to achieve these important goals for our State. What we most need is an equally strong commitment by the public sector to doing its part to help make the goals achievable.