ATTACHMENT A

Hawai'i Energy

ACRONYM LIST (PY2015)

Revised: September 29, 2016

ACRONYM	ACRONYM EXTENSION
AC	Air Conditioner
AEE	Association of Energy Engineers
AHU	Air Handler Unit
AOAO	Associations of Apartment Owners AOAO
API	Application Program Interface
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
AVE	Asvertising Value Equivalency
AVG	Average
AWWA	American Water Works Association
BBLS	Barrels
BEEM	Business Energy Efficiency Measures
BESM	Business Energy Services & Maintenance
BHTR	Business Hard to Reach
BOC	Building Operator Certification
BTRAN	Business Transformational
BTU	Brittish Thermal Unit
C&I	Commercial and Industrial
C&S	Codes & Standards
CBEEM	Custom Business Energy Efficiency Measures
CBSM	Community-Based Social Marketing
CEA	Clean Energy Ally
CEE	Consortium for Energy Efficiency
CEM	Certified Energy Manager
CESH	Custom Energy Solutions for the Home
CEUS	Commercial End-Use Survey
CFL	Compact Fluorescent Lamps
CH4	Methane
CO2	Carbon Dioxide
COCH	Chamber of Commerce Hawai'i
CSE	Cost of Saved Energy
DBEDT	Department of Business, Economic Development & Tourism
DEER	Database for Energy Efficient Resources
DOE	Department of Education
DR	Demand Response
DSM	Demand Side Management
DWS	Department of Water Supply
ES4H	Energy Smart 4 Homes
ECM	Electrically Commutated Motor

ACRONYM	ACRONYM EXTENSION
EE	Energy Efficiency
EEFG	Energy Efficiency Funding Group
EEPS	Energy Efficiency Portfolio Standard
EISA	Energy Independence and Security Act of 2007
EM&V	Evaluation Measurement & Verification
EMIT	Energy Manager in Training
EMS	Energy Management System
ES	Energy Study
EV	Electric Vehicle
GDP	Gross Domestic Product
GEMS	Green Energy Market
GWh	Gigawatt Hour
HAN	Home Area Network
HCEI	Hawai'i Clean Energy Initiative
HDWS	Hawai'i Department of Water Supply
HEAC	High-Efficiency Air Conditioning
HECO	Hawaiian Electric Company
HEI	Hawaiian Electric Industries
HELCO	Hawai'i Electric Light Company
HEMS	Home Energy Management System
HER	Home Energy Report
HEWH	High Efficiency Water Heating
HGIA	Hawai'i Greeen Infrastructure Authority
HOV	High-Occupancy Vehicle
HPU	Hawai'i Pacific University
HPWH	Heat Pump Water Heater
HSEA	Hawai'i Solar Energy Association
HTR	Hard To Reach
HVAC	Heating Ventilation and Air Conditioning
HWEA	Hawai'i Water Environment Association
IECC	International Energy Conservation Code
IES	Illuminating Engineering Society
IFMA	International Facility Management Association
IHD	In-Home-Display
IRP	Integrated Research Plan
IRR	Individual Rate of Return
IT	Information Technology
K - 12	Kindergarten to 12th Grade
KEMA	KEMA Laboratory
KIUC	Kauai Island Utilities Cooperative
kW	Kilowatt
kWh	Kilowatt Hour

ACRONYM	ACRONYM EXTENSION
LDIR	Lighting Distributor Instant Rebate
LED	Light Emitting Diode
M	Million
M & V	Measurement and Verification
MFDI	Multifamily Direct Install
MECO	Maui Electric Company
MEDB	Maui Economic Development Board
MMBTU	One Million British Thermal Unit
MW	Megawatt
MWh	Megawatt Hour
N2O	Nitrous Oxide
NEED	National Energy Education Development Project
NPV	Net Present Value
NREL	National Renewable Energy Laboratory
NTG	Net-to-gross
OBF	On-Bill Financing
OBR	On-Bill Repayment
PBF	Public Benefits Fee
PBFA	Public Benefits Fee Administrator
PI	Performance Incentive
PRV	Pressure-Reducing Valve
PUC	Public Utilities Commission
PV	Photovoltaic (PV)
PY	Program Year
PY15	Program Year 2015
R1/R2/R3/R4	Reallocation 1/2/3/4 (refers to budget reallocations made throughout PY)
REEM	Residential Energy Efficiency Measures
RESM	Residential Energy Services & Maintenance
RFP	Request For Proposal
RHTR	Residential Hard to Reach
RISE	Rewarding Internships for Sustainable Employment
RPS	Renewable Portfolio Standard
RTRAN	Residential Transformational
SAIC	Science Applications International Corporation
SBDIL	Small Business Direct Install Lighting
SEM	Strategic Energy Management
SERWH	Standard Electric Resistance Water Heater
SG	Smart Grid
SHGC	Solar Heat Gain Coefficient
SIBD	Solar Interest Buy-Down
SLIM	Sustainable Living Institute of Maui
SMS	Short Message Service

ACRONYM	ACRONYM EXTENSION
STEM	Science Technology Engineering Mathematics
SWH	Solar Water Heating
T&M	Time and Materials
TAB	Teacher Advisory Board
TAG	Technical Advisory Group
TRB	Total Resource Benefit
TRC	Total Resource Cost Ratio
TRM	Technical Reference Manual
UH	University of Hawaii at Manoa
UHMOC	University of Hawaii - Maui College
URL	Uniform Resource Locator
USPS	United States Postal Service
VFD	Variable Frequency Drive
VRF	Variable Refrigerant Flow
W	Watt
YR	Year

ATTACHMENT B

Y15 Program Participation List												
Program / Measure	**Units**	**Customer Level Demand (kW)**	**Customer Level Energy (kWh)**	**Program Level Demand (kW)**	**Program Level Energy (kWh)**	**Average Useful Life (Years)**	**Lifetime Resource Acquisition Cost ($/kWh-Life)**	**Program TRB**	**TRC**	**Average Customer Level kW/Unit**	**Average Customer Level kWh/Unit**
BEEM	**168,504**	**3,947**	**26,401,923**	**3,352**	**22,156,918**	**14.5**	**$ 0.011**	**$ 58,650,985**	**$ 9,670,922**	**0.023**	**156.7**
LED Specialty	26,302	651	4,858,347	540	4,030,324	15.0	$ 0.004	$ 10,883,620	$ 529,225	0.025	184.7
Chillers	67	545	3,372,081	453	2,803,718	20.0	$ 0.008	$ 9,794,709	$ 2,212,020	8.129	50,329.6
LED Omni Directional	55,738	480	3,948,006	397	3,271,281	15.0	$ 0.008	$ 8,616,360	$ 729,736	0.009	70.8
Split Systems (VRF)	539	176	1,607,831	146	1,335,298	15.0	$ 0.027	$ 3,432,893	$ 862,644	0.327	2,983.0
Fluorescent T12 to T8 Low Wattage	32,176	196	1,585,159	163	1,318,018	14.0	$ 0.013	$ 3,276,697	$ 38,611	0.006	49.3
LED Lighting	7,166	131	1,128,645	109	941,036	15.0	$ 0.007	$ 2,452,383	$ 503,880	0.018	157.5
VFD - AHU	118	357	840,787	297	701,028	15.0	$ 0.008	$ 2,970,009	$ 141,263	3.021	7,125.3
Domestic Water Booster Packages	19	78	820,859	65	684,411	15.0	$ 0.007	$ 1,707,253	$ 1,152,750	4.110	43,203.1
ECM Refrigeration	1,077	70	650,291	58	536,300	15.0	$ 0.011	$ 1,373,010	$ 217,554	0.065	603.8
VFD Pump for Chilled Water / Condenser Water	22	172	632,793	142	524,936	15.0	$ 0.007	$ 1,799,631	$ 59,585	7.807	28,763.3
Fluorescent Delamping with Reflectors	4,895	79	626,945	65	522,300	14.0	$ 0.007	$ 1,302,170	$ 98,840	0.016	128.1
Water Cooler Timers	4,443	80	899,708	66	745,848	8.0	$ 0.011	$ 1,040,092	$ 66,600	0.018	202.5
Packaged Units	109	76	439,060	63	364,176	15.0	$ 0.028	$ 1,057,513	$ 104,527	0.695	4,028.1
Split Systems	166	49	434,733	41	361,895	15.0	$ 0.025	$ 937,663	$ 78,309	0.297	2,618.9
ECM Fan Coil	1,869	50	433,608	41	357,119	15.0	$ 0.019	$ 926,948	$ 392,490	0.027	232.0
Fluorescent Delamping	3,230	47	449,099	39	374,102	14.0	$ 0.003	$ 893,687	$ 25,840	0.014	139.0
T8 to T8 Low Wattage	3,320	89	385,616	74	321,517	14.0	$ 0.012	$ 967,697	$ 3,984	0.027	116.1
Custom - EMS HVAC Controls	1	48	356,250	39	291,234	15.0	$ 0.011	$ 785,418	$ 507,462	47.500	356,250.0
LED Exit Signs	1,007	37	321,370	31	267,585	15.3	$ 0.005	$ 709,539	$ 30,210	0.037	319.1
Submetering (Condo)	958	59	454,930	49	379,310	8.0	$ 0.047	$ 568,284	$ 479,000	0.061	474.9
Kitchen Ventilation	15	31	182,994	26	150,915	15.0	$ 0.021	$ 437,034	$ 76,500	2.085	12,199.6
CFL Omni-Directional	8,565	48	332,897	53	370,082	5.0	$ 0.015	$ 319,398	$ 28,460	0.006	38.9
Advance Power Strips	2,722	31	268,629	34	298,635	5.0	$ 0.043	$ 251,513	$ 64,021	0.011	98.7
Heat Pump	18	5	171,145	5	142,269	10.0	$ 0.008	$ 217,005	$ 407,680	0.302	9,508.1

VFD Fan for AHU	19	31	100,514	26	83,735	15.0	$ 0.006	$ 304,980	$ 12,422	1.650	5,290.2
Showerhead	2,973	144	175,182	160	194,750	5.0	$ 0.027	$ 263,058	$ 25,975	0.049	58.9
VFD Pool Pumps	11	6	75,277	5	62,764	15.0	$ 0.016	$ 151,982	$ 30,525	0.563	6,843.3
Window Film	22	27	99,708	22	82,975	10.0	$ 0.017	$ 192,151	$ 21,700	1.223	4,532.2
Refrigerator w/ Trade In	85	3	69,870	2	58,153	14.0	$ 0.010	$ 121,209	$ 30,600	0.034	822.0
Transformer (Three-Phase)	13	3	30,055	3	25,031	32.0	$ 0.009	$ 90,765	$ 43,886	0.264	2,311.9
Cool Roof	9	32	79,664	26	65,977	10.0	$ 0.097	$ 181,291	$ 318,656	3.541	8,851.6
Fluorescent T12 to T8 Standard	1,283	4	52,896	3	44,037	14.0	$ 0.010	$ 97,135	$ 1,925	0.003	41.2
Room Occupancy Sensors	1,166	8	79,055	7	65,801	8.0	$ 0.044	$ 93,678	$ 23,320	0.007	67.8
CFL	1,183	31	206,547	26	172,058	3.0	$ 0.007	$ 80,774	$ 13,841	0.026	174.6
LED Refrigerated Case Lighting	442	16	88,267	13	72,802	5.0	$ 0.089	$ 64,778	$ 130,260	0.036	199.7
VRF Air Conditioners	29	9	26,247	7	21,869	15.0	$ 0.014	$ 81,943	$ 56,980	0.300	905.1
Faucet Aerator	5,403	39	40,438	44	44,955	5.0	$ 0.088	$ 65,444	$ 19,873	0.007	7.5
Solar Water Heating	1	3	12,050	3	10,047	15.0	$ 0.016	$ 34,133	$ 6,600	3.200	12,050.0
Rid-A-Fridge (Refrigerator)	28	0	12,026	0	9,941	14.0	$ 0.009	$ 20,635	$ 2,465	0.017	429.5
Metal Halide	28	1	10,973	1	9,149	14.0	$ 0.009	$ 21,702	$ 818	0.039	391.9
CFL Specialty	1,074	3	18,258	3	20,297	6.0	$ 0.056	$ 22,434	$ 6,852	0.002	17.0
Clothes Washer	49	1	10,094	1	8,411	12.0	$ 0.024	$ 18,362	$ 5,390	0.028	206.0
Window AC w/ Trade In	51	1	5,148	1	4,285	12.0	$ 0.039	$ 11,621	$ 3,700	0.028	100.9
Transformer (Single-Phase)	4	0	1,656	0	1,381	32.0	$ 0.010	$ 5,064	$ 1,380	0.050	414.0
Ceiling Fans	63	1	4,095	1	3,402	5.0	$ 0.130	$ 3,038	$ 567	0.012	65.0
Refrigerator	12	0	1,260	0	1,047	14.0	$ 0.089	$ 2,797	$ 1,920	0.017	105.0
Rid-A-Fridge (Freezer)	2	0	859	0	716	14.0	$ 0.007	$ 1,487	$ 75	0.017	429.5
Custom - High Efficiency HVAC	2	0	0	0	0	0.0	$ 0.000	$ 0	$ 100,000	0.000	0.0
Accounting	10	0	0	0	0	0.0	$ 0.000	$ 0	$ 0	0.000	0.0

CBEEM	**1,404**	**5,033**	**37,629,795**	**4,186**	**31,309,741**	**10.9**	**$ 0.021**	**$ 59,630,700**	**$ 25,139,882**	**3.585**	**26,801.8**
Custom - High Efficiency Lighting	380	3,559	26,868,232	2,959	22,343,642	9.5	$ 0.020	$ 37,114,673	$ 14,814,309	9.365	70,705.9
Custom - Energy Auction	42	436	5,175,848	362	4,311,076	12.1	$ 0.027	$ 7,880,094	$ 1,413,433	10.371	123,234.5
Custom - High Efficiency HVAC	106	424	2,294,002	353	1,912,681	19.0	$ 0.015	$ 6,647,589	$ 5,908,390	3.996	21,641.5
Custom - Chiller or Central Plant Controls	3	150	1,069,362	125	891,607	17.3	$ 0.011	$ 2,689,689	$ 1,145,114	50.035	356,454.0
Custom - High Efficiency Water Heating	854	186	926,653	155	772,620	12.9	$ 0.034	$ 2,073,147	$ 1,223,314	0.217	1,085.1
Custom - Guest Room Controls	6	170	399,098	142	332,758	15.0	$ 0.015	$ 1,412,781	$ 123,028	28.317	66,516.3
Custom - Lighting Controls	2	35	269,275	29	224,515	18.2	$ 0.011	$ 690,611	$ 320,612	17.255	134,637.5
Custom - Industrial Equipment	2	24	211,835	20	176,623	14.6	$ 0.018	$ 446,069	$ 45,380	12.050	105,917.5
Custom - Appliances	6	36	259,782	29	215,350	10.4	$ 0.023	$ 436,332	$ 131,303	5.958	43,297.0
Custom - Water Pumping	2	15	128,368	13	106,073	10.9	$ 0.024	$ 207,352	$ 0	7.580	64,184.0
Custom - Refrigeration Controls	1	0	27,340	0	22,795	10.0	$ 0.024	$ 32,362	$ 15,000	0.000	27,340.0
BESM	**35**	**24**	**585,796**	**25**	**614,147**	**4.4**	**$ 0.143**	**$ 474,099**	**$ 458,314**	**0.697**	**16,737.0**
Custom - High Efficiency Water Pumping	1	24	214,038	25	221,636	10.0	$ 0.059	$ 398,545	$ 271,138	24.400	214,038.0
Custom - High Efficiency HVAC	2	0	362,358	0	382,692	1.0	$ 0.224	$ 61,613	$ 85,812	0.000	181,179.0
Energy Study	10	0	9,400	0	9,819	10.0	$ 0.750	$ 13,941	$ 50,000	0.000	940.0
Custom - Submetering	3	0	0	0	0	0.0	$ 0.000	$ 0	$ 1,500	0.000	0.0
Energy Audits	6	0	0	0	0	0.0	$ 0.000	$ 0	$ 30,000	0.000	0.0
Custom - Water Pumping	1	0	0	0	0	0.0	$ 0.000	$ 0	$ 0	0.000	0.0
Custom - Benchmarking	12	0	0	0	0	0.0	$ 0.000	$ 0	$ 19,864	0.000	0.0
BHTR	**1,449,810**	**1,972**	**9,662,219**	**2,157**	**10,572,117**	**14.4**	**$ 0.026**	**$ 31,176,778**	**$ 3,898,107**	**0.001**	**6.7**
LED Specialty	17,499	563	2,674,463	614	2,921,274	15.0	$ 0.019	$ 9,064,196	$ 825,589	0.032	152.8
LED Linear	8,201	496	2,150,237	543	2,353,107	14.0	$ 0.035	$ 7,076,927	$ 1,138,030	0.061	262.2
Fluorescent T12 to T8 Low Wattage	11,341	458	1,991,150	502	2,184,341	14.0	$ 0.033	$ 6,559,929	$ 997,176	0.040	175.6
Custom - High Efficiency Lighting	1,403,919	191	1,417,736	209	1,551,700	14.0	$ 0.018	$ 3,939,713	$ 381,824	0.000	1.0
LED Omni Directional	4,078	180	945,681	196	1,032,139	15.0	$ 0.009	$ 3,090,173	$ 146,808	0.044	231.9
Fluorescent T12 to T8 Standard	964	42	190,208	46	208,303	14.0	$ 0.036	$ 615,697	$ 106,160	0.043	197.3
LED Refrigerated Case Lighting	796	22	155,509	24	171,139	15.0	$ 0.098	$ 466,464	$ 252,180	0.027	195.4
Reach-In Freezer	15	3	33,117	4	36,375	12.0	$ 0.010	$ 74,568	$ 6,964	0.224	2,207.8
CFL	215	6	27,889	6	30,567	14.0	$ 0.007	$ 88,636	$ 2,795	0.027	129.7

Custom	2	0	23,790	0	25,834	15.0	$ 0.017	$ 52,739	$ 0	0.115	11,895.0
Steam Cooker	3	7	29,322	7	32,061	12.0	$ 0.006	$ 81,447	$ 3,654	2.232	9,774.0
Combination Oven	1	3	11,604	3	12,632	12.0	$ 0.003	$ 31,880	$ 200	2.600	11,604.0
LED Exit Signs	64	2	7,774	2	8,554	15.0	$ 0.023	$ 25,998	$ 2,935	0.024	121.5
Reach-In Refrigerator	4	0	2,168	0	2,360	12.0	$ 0.042	$ 4,960	$ 6,117	0.062	542.0
Custom Lighting	16	0	767	0	844	14.0	$ 0.016	$ 1,589	$ 192	0.000	47.9
Ice Machine	1	0	805	0	886	12.0	$ 0.009	$ 1,860	$ 3,700	0.092	805.0
Ladder Charge	2,681	0	0	0	0	0.0	$ 0.000	$ 0	$ 17,275	0.000	0.0
Contractor Reward	9	0	0	0	0	0.0	$ 0.000	$ 0	$ 6,509	0.000	0.0
Accounting	1	0	0	0	0	0.0	$ 0.000	$ 0	$ 0	0.000	0.0

REEM	**5,053,917**	**11,310**	**58,452,216**	**9,885**	**51,076,574**	**9.6**	**$ 0.018**	**$ 93,788,203**	**$ 30,427,471**	**0.002**	**11.6**
LED Lighting	874,680	2,799	19,680,300	2,443	17,175,643	15.0	$ 0.012	$ 47,129,012	$ 8,528,130	0.003	22.5
CFL	932,203	2,237	15,847,451	1,956	13,852,429	6.0	$ 0.012	$ 15,310,869	$ 1,398,305	0.002	17.0
Solar Water Heating	1,600	707	3,161,609	618	2,763,115	20.0	$ 0.023	$ 10,724,899	$ 10,144,200	0.442	1,976.0
VRF Air Conditioners	3,100	930	3,066,388	816	2,690,685	15.0	$ 0.013	$ 9,679,076	$ 6,107,561	0.300	989.2
Refrigerator w/ Trade In	2,086	71	1,714,692	62	1,502,469	14.0	$ 0.010	$ 3,131,619	$ 750,960	0.034	822.0
Peer Group Comparison	3,211,849	4,126	12,520,167	3,605	10,938,766	1.0	$ 0.200	$ 2,608,174	$ 2,185,929	0.001	3.9
Rid-A-Fridge (Refrigerator)	950	16	408,025	14	355,989	14.0	$ 0.008	$ 738,902	$ 80,645	0.017	429.5
Whole House Fan	506	253	184,690	222	162,105	20.0	$ 0.012	$ 1,789,451	$ 60,720	0.500	365.0
Residential Custom	5	13	348,682	11	305,114	9.0	$ 0.025	$ 428,316	$ 68,350	2.546	69,736.5
LED Omni Directional	7,754	25	174,465	22	152,627	15.0	$ 0.000	$ 418,800	$ 217,112	0.003	22.5
Heat Pump Water Heater	143	30	235,092	26	205,471	10.0	$ 0.020	$ 378,850	$ 257,400	0.210	1,644.0
Window AC w/ Trade In	1,175	31	114,840	27	100,745	12.0	$ 0.037	$ 273,201	$ 83,065	0.027	97.7
LED Specialty	3,609	12	81,203	10	70,995	15.0	$ 0.000	$ 194,806	$ 144,360	0.003	22.5
Water Cooler Timers	2,875	0	146,625	0	128,446	8.0	$ 0.042	$ 149,718	$ 43,125	0.000	51.0
VFD Pool Pumps	193	1	115,221	1	100,887	10.0	$ 0.029	$ 146,594	$ 115,800	0.006	597.0
Clothes Washer	453	13	93,318	11	81,648	12.0	$ 0.023	$ 178,250	$ 49,830	0.028	206.0
Solar Attic Fan	304	6	164,160	5	143,655	5.0	$ 0.021	$ 113,088	$ 45,600	0.020	540.0
Advance Power Strips	1,492	17	153,378	15	134,105	5.0	$ 0.000	$ 112,944	$ 0	0.012	102.8
Rid-A-Fridge (Freezer)	108	2	46,386	2	40,579	14.0	$ 0.008	$ 84,228	$ 8,445	0.017	429.5
Refrigerator	326	6	34,230	5	30,025	14.0	$ 0.098	$ 80,210	$ 52,160	0.017	105.0
Ceiling Fans	1,265	15	82,225	13	71,921	5.0	$ 0.123	$ 64,217	$ 11,385	0.012	65.0
Faucet Aerator	578	0	54,093	0	47,309	5.0	$ 0.000	$ 35,988	$ 0	0.000	93.6
Showerhead	289	0	24,540	0	21,463	5.0	$ 0.000	$ 16,327	$ 0	0.000	84.9
Room Occupancy Sensors	21	0	437	0	383	8.0	$ 0.034	$ 663	$ 420	0.005	20.8
Accounting-Custom Energy Kits	289	0	0	0	0	0.0	$ 0.000	$ 0	$ 0	0.000	0.0
Incentives for Kits and/or Pop-up Retail	3,595	0	0	0	0	0.0	$ 0.000	$ 0	$ 73,970	0.000	0.0
Accounting-Freight	2,469	0	0	0	0	0.0	$ 0.000	$ 0	$ 0	0.000	0.0

CESH	**423**	**2**	**9,254**	**1**	**6,610**	**15.0**	**$ 0.014**	**$ 18,993**	**$ 1,388**	**0.004**	**21.9**
LED Specialty	422	1	5,460	1	3,868	15.0	$ 0.014	$ 10,665	$ 819	0.002	12.9
Residential Custom	1	1	3,794	1	2,742	15.0	$ 0.014	$ 8,328	$ 569	0.750	3,794.0
RESM	**1,150**	**33**	**286,350**	**34**	**291,973**	**5.0**	**$ 0.118**	**$ 246,460**	**$ 345,000**	**0.029**	**249.0**
Solar Water Heating Tune-up	1,150	33	286,350	34	291,973	5.0	$ 0.118	$ 246,460	$ 345,000	0.029	249.0
RHTR	**43,209**	**551**	**1,925,956**	**612**	**2,139,060**	**7.3**	**$ 0.029**	**$ 3,025,731**	**$ 615,017**	**0.013**	**44.6**
Residential Custom	574	105	500,410	116	554,298	11.0	$ 0.033	$ 1,171,216	$ 199,004	0.182	871.8
CFL Omni-Directional	17,084	96	669,113	106	743,853	5.0	$ 0.015	$ 641,982	$ 56,942	0.006	39.2
LED Omni Directional	5,896	19	132,660	21	147,460	15.0	$ 0.000	$ 404,623	$ 165,088	0.003	22.5
Advance Power Strips	3,249	36	320,637	41	356,453	5.0	$ 0.043	$ 300,208	$ 76,416	0.011	98.7
Showerhead	4,028	192	233,729	213	259,836	5.0	$ 0.028	$ 350,336	$ 36,168	0.048	58.0
Faucet Aerator	7,709	101	55,383	113	61,569	5.0	$ 0.093	$ 127,469	$ 28,505	0.013	7.2
LED Specialty	309	1	6,953	1	7,729	15.0	$ 0.009	$ 21,208	$ 1,848	0.003	22.5
CFL Specialty	416	1	7,072	1	7,862	6.0	$ 0.056	$ 8,690	$ 2,654	0.002	17.0
Incentives for Kits and/or Pop-up Retail	3,932	0	0	0	0	0.0	$ 0.000	$ 0	$ 48,393	0.000	0.0
Accounting	12	0	0	0	0	0.0	$ 0.000	$ 0	$ 0	0.000	0.0
Accounting-Freight	0	0	0	0	0	0.0	$ 0.000	$ 0	$ 0	0.000	0.0

Program / Measure	Units	Customer Level Demand (kW)	Customer Level Energy (kWh)	Program Level Demand (kW)	Program Level Energy (kWh)	Average Useful Life (Years)	Lifetime Resource Acquisition Cost ($/kWh-Life)	Program TRB	TRC	Average Customer Level kW/Unit	Average Customer Level kWh/Unit
BEEM	168,504	3,947	26,401,923	3,352	22,156,918	14.5	$ 0.011	$ 58,650,985	$ 9,670,922	0.023	156.7
CBEEM	1,404	5,033	37,629,795	4,186	31,309,741	10.9	$ 0.021	$ 59,630,700	$ 25,139,882	3.585	26,801.8
BESM	35	24	585,796	25	614,147	4.4	$ 0.143	$ 474,099	$ 458,314	0.697	16,737.0
BHTR	1,449,810	1,972	9,662,219	2,157	10,572,117	14.4	$ 0.026	$ 31,176,778	$ 3,898,107	0.001	6.7
REEM	5,053,917	11,310	58,452,216	9,885	51,076,574	9.6	$ 0.018	$ 93,788,203	$ 30,427,471	0.002	11.6
CESH	423	2	9,254	1	6,610	15.0	$ 0.014	$ 18,993	$ 1,388	0.004	21.9
RESM	1,150	33	286,350	34	291,973	5.0	$ 0.118	$ 246,460	$ 345,000	0.029	249.0
RHTR	43,209	551	1,925,956	612	2,139,060	7.3	$ 0.029	$ 3,025,731	$ 615,017	0.013	44.6
Grand Total	**6,718,452**	**22,872**	**134,953,508**	**20,253**	**118,167,139**	**11.2**	**$ 0.018**	**$ 247,011,948**	**$ 70,556,102**	**0.003**	**20.1**

James Flanagan Associates (JFA)
c/o Hawaii Public Utilities Commission
465 South King Street, #103
Honolulu, HI 96813

May 21, 2015

HAWAII ENERGY EFFICIENCY PY15 PROGRAM RENEWAL PROPOSAL

Leidos Engineering, LLC ("Leidos" or "Contractor") is pleased to present our Renewal Proposal for the period of July 1, 2015 to June 30, 2016 ("Contract Renewal" or "Supplemental Contract"), reflecting requirements and direction received from the Public Utilities Commission's (PUC) Renewal Guidelines and PUC staff.

Program Year 2015 (PY15) Proposal Highlights

Key features of this Contract Renewal Proposal include:

- Utilizing a $38M budget to provide program-level impacts of 122,243,721 kWh first year savings with $0.034 (LBNL Cost of Saved Energy (CSE)) per kWh average lifetime Program acquisition cost, a fraction of the current utility avoided cost of $0.161/kWh;
- Achieving a TRB of $159M and a measure life energy cost savings of $509M to utility customers;
- The development of a new custom lighting program to address energy saving potential in existing specialty interior and linear fluorescent lamps in the residential sector;
- A specially designed custom residential hard-to-reach program targeting previous Transformational program participants;
- Removing the Residential and Commercial Energy Auctions from the Program making $196,000 available to be used on more cost-effective and realistic measures;
- Proactively addressing a market transition of CFLs to LEDs by reducing CFLs to 13% of the planned energy savings, as compared to 38% in PY13; overall portfolio savings (see **Table 6**);
- Increasing the Peer Group Comparison program to reach 240,000 households while improving customer experience through the use of web-based services and enhanced tools; and
- Establishing a Strategic Energy Management (SEM) teaming process to assist large businesses and institutions to plan and execute effective energy management as a critical part of business operations.

1. Summary Budget and Category Breakouts

Table 1 shows a summary of the proposed Program budget and budget category numbers for PY15 which derive from the assumptions made in this Renewal Proposal. The detailed Program budget and impacts for July 1, 2015 to June 30, 2016 will be included in the PY15 Annual Plan.

The proposed total PY15 Program budget of $38M is $1.6M less than PY14. In our view, the underlying Program initiatives remain responsive to industry advances and PUC guidance. The initiatives support forward-looking efficiency measures and clean energy technology, while maintaining a respectable level of first-year energy savings and reducing implementation costs. Key budget changes from PY14 include:

a. Waiver of the contractually-allowed $133,000 performance award “bonus”;

b. Decrease in the Transformational program budget from 14% in PY14 to 12% of direct incentives, or $3.3M in PY15;

c. Flexible ratios in budgeting across residential and commercial customer classes for both direct incentives and implementation costs, while staying within a 10% range of the historical 45%/55% split; and

d. Slight percentage increases in the budget for General Administrative & IT costs from 6% in PY14 to 6.9% in PY15 to allow for more aggressive website and technical tool development, as well as program operations flexibility.

Table 1: SUMMARY BUDGET

Hawaii Energy

Hawaii Energy - PY15 - Proposed Program Budget

Hawaii Energy - PY15 - Detailed Proposed Incentives and Operations Budgets

Program Year	**2015**
Period of Performance	7/1/15 to 6/30/16
Guideline Budget Allocation	$ 39,666,917
Proposed Budget	**$ 38,033,885.00**

Budget Item / Category	**Amount**	**% of Total Budget**	**% of Subtotal**
General Administrative and IT Costs	$ 2,641,208	**6.9%**	100.0%
Performance Award in Excess of Target*	**$** -	0.0%	0.0%
Total PBFA Administrative Costs	$ 2,641,208	6.9%	100.0%

Budget Item / Category		**Total**	**Allocation Targets: Direct Incentives**	**Allocation Targets: Direct Implementation Cost**
General Administrative and IT Costs	6.9%	$ 2,641,208	$ -	$ 2,641,208
Total Direct Program Costs	93.1%	$ 35,392,677	$ 26,725,374	$ 8,667,303
Total Incentives and Operations	100.0%	$ 38,033,885	$ 26,725,374	$ 11,308,511
			70.3%	29.7%

	EE/Trans Split	**Res/Bus Split %**	**Direct Incentives**	**Res/Bus Split $**
Res + Bus Direct Efficiency Incentives	87.8%		$ 23,473,414.00	
Residential Direct Efficiency Incentives		**45.0%**		$ 10,557,940
Business Direct Efficiency Incentives		55.0%		$ 12,915,474
Res + Bus Transformational Incentives	**12.2%**		$ 3,251,960.00	
Residential Transformational Incentives		**49.1%**		$ 1,595,166
Business Transformational Incentives		50.9%		$ 1,656,794
Direct Incentives	100%		$ 26,725,374	$ 26,725,374

		Total	**Direct Incentives**	**Direct Implementation Cost**
Residential Program Cost Split	45.7%	$ 16,173,516	$ 12,153,106	**$ 4,020,410**
Business Program Cost Split	54.3%	$ 19,219,161	$ 14,572,268	$ 4,646,893
	100.0%	$ 35,392,677	$ 26,725,374	$ 8,667,303

Hawaii Energy - PY15 - Summary Incentives and Operations Budget

Budget Item / Category	Amount	% of Total Budget	% of Subtotal
Residential Direct Efficiency Incentives	$ 10,557,940	27.8%	39.5%
Business Direct Efficiency Incentives	$ 12,915,474	34.0%	48.3%
Residential Transformational Incentives	$ 1,595,166	4.2%	6.0%
Business Transformational Incentives	$ 1,656,794	4.4%	6.2%
Total Incentives	$ 26,725,374	70.3%	100.0%
Administration / IT	$ 2,641,208	6.9%	23.4%
Direct Program Implementation Costs	$ 8,667,303	22.8%	76.6%
Total Operations	$ 11,308,511	29.7%	100%
Total Incentives	$ 26,725,374	70.3%	70.3%
Total Operations	$ 11,308,511	29.7%	29.7%
Total Incentives and Operations	$ 38,033,885	100.0%	100%
Total Incentives and Operations	$ 38,033,885	100.0%	100.0%
Total Award in Excess of Target*	$ -	0.0%	0.0%
Total Budget	$ 38,033,885	100.0%	100%

*** The $133,000 Incentive Award is being waived for PY15**

These highlighted figures are key program metric percentages

2. Summary of Impact Results Expected From the Renewal Guidelines

Table 2 below shows a summary of savings impacts anticipated for PY15 based on the proposed budget presented in **Table 1**. The detailed program budget and impacts for July 1, 2015 to June 30, 2016 will be included in the PY15 Annual Plan.

Table 2: COST EFFECTIVENESS AND BENEFIT TARGETS

Hawaii Energy - PY15 - Annual Plan - Program Cost Effectiveness Targets

PBFA Contract Renewal Guidelines				
Total Program Direct Incentives		$	26,725,374	
First Year Energy Reduction			122,243,721	kWh - Program Level
Peak Demand Reduction			17,150	kW on Peak 5 to 9 p.m. Weekdays
Total Resource Benefit		$	159,372,834	NPV of Utility Cost Avoidance
Derived Top Down Cost Effectiveness Metrics				
Total Program Direct Incentives		$	26,725,374	
First Year Energy Reduction	÷		122,243,721	
Measure Cost Effectiveness - First Year		$	0.219	per kWh - Program Level
First Year Energy Reduction			122,243,721	
Average Measure Life	x		11.1	years
Lifetime Energy Savings			1,350,839,175	kWh - Program Level
Total Program Direct Incentives		$	26,725,374	
Lifetime Energy Savings	÷		1,350,839,175	
Measure Cost - Lifetime		$	0.020	per kWh - Program Level
Total Program Direct Incentives		$	26,725,374	
Avg. Incentive % of Incremental Cost	÷		37%	
TRC - Total Resource Cost		$	73,084,379	
TRB - Total Resource Benefit		$	159,372,834	
TRC - Total Resource Cost	÷	$	73,084,379	
Cost Effectiveness - TRB/TRC			2.2	
First Year Energy Reduction			122,243,721	kWh - Program Level
Estimated Average Net-to-Gross	÷		79.4%	
First Year Energy Reduction			153,962,893	kWh First Year - System Level
First Year Energy Reduction			153,962,893	kWh First Year - System Level
County Generation and T&D Losses	÷		110.7%	
First Year Energy Reduction			139,081,204	kWh First Year - Customer Level
Annual 2030 Energy Reduction Goal	÷		195,000,000	kWh/year
% Achievement towards HCEI 2030 Goal			71.3%	
First Year Energy Reduction			139,081,204	kWh First Year - Customer Level
Average Energy Cost	x	$	0.33	per kWh
Participant Customer Energy Cost Savings		$	46,103,169	per year
Average Measure Life	x		11.1	
Participant Customer Energy Cost Savings		$	509,457,390	over lifetime of Equipment

County Distribution Targets

PBFA Contribution by County for PY2013

Hawaii	Maui	Honolulu	Total
13.0%	13.0%	74.0%	100.0%

Program Level Targets by County

Hawaii	Maui	Honolulu	Total	
$ 3,474,299	$ 3,474,299	$ 19,776,777	$ 26,725,374	Incentives
12,273,270	12,273,270	97,697,182	122,243,721	kWh First Year - Program Level
10.0%	10.0%	79.9%	100.0%	Contribution %
$ 0.28	$ 0.28	$ 0.20	$ 0.22	Cost per kWh - Target

County Generation and T&D Losses

Hawaii	Maui	Honolulu	Average
9.0%	10.0%	11.2%	10.7%

Defining Levelized Cost of Saved Energy — PY15 Plan

LBNL March 2014 – CSE Report - http://emp.lbl.gov/sites/all/files/lbnl-6595e.pdf

			w/o HTR	Total Program
Discount Rate	A		6%	6%
Estimated Program Savings Life	B		11.1	11.1
Total Program Budget Less Direct Install Programs	C*	$	34,609,420	$ 38,033,885
Annual kWh Saved at Customer Level	D		128,972,249	139,081,204
$Levelized\ CSE = \frac{C \times (Capital\ Recovery\ Factor)}{D}$	A*(1+A)^B		0.114	0.114
	(1+A)^B-1	÷	0.904	0.904
	Capital Recovery Factor		0.126	0.126
$Capital\ Recovery\ Factor = [A * (1 + A)^{\wedge B}]/[(1 + A)^{\wedge B} - 1]$	C	$	34,609,420	$ 38,033,885
	Capital Recovery Factor	x	0.126	0.126
	D	÷	128,972,249	139,081,204
		$	**0.0339**	**$ 0.0346**

		Cost*	kWh
Total Program Budget	$	38,033,885	139,081,204
RHTR	$	(682,250)	(897,225)
BHTR	$	(2,442,215)	(8,177,247)
Custom Residential Hard to Reach Efficiency Measures	$	(300,000)	(1,034,483)
	$	34,609,420	128,972,249

* - Does not remove T&M related to these HTR Programs

3. Proposed PY15 Performance Goals and Incentives

Table 3 below shows the Program's proposed performance goals and incentives for PY15 using the adjusted goals as referenced in this Renewal Proposal in conjunction with a continuation of the $700,000 per year payment holdback for performance incentives. Leidos waives the $133,000 award in excess of target for PY15. The adjusted target goals proposed in **Table 4** have been modified to allow the Program to have aspirational goals with fair opportunity to meet the minimum targets.

Table 3: PY15 PERFORMANCE GOALS AND INCENTIVES

Hawaii Energy - PY15 - Performance Goals and Performance Incentives									
Performance Target Item	*Performance Goals*					*Award*	*Program Incentive Award*		
Resource Acquisition	*Minimum*	*Target*	*Maximum*			*Fraction*	*Minimum*	*Target*	*Maximum*
	75%	100%	110%				75%	100%	100.0%
First Year Energy Reduction	91,682,791	122,243,721	134,468,093	kWh		35%	$ 183,750	$ 245,000	$ 245,000
Peak Demand Reduction	12,863	17,150	18,865	kW		5%	$ 26,250	$ 35,000	$ 35,000
Total Resource Benefit	$ 119,529,625	$ 159,372,834	$ 175,310,117	$		40%	$ 210,000	$ 280,000	$ 280,000
Island Incentive Equity	*Minimum*	*Target*	*Maximum*	*Contribution*	All Items must be met for award		*Minimum*	*Target*	*Maximum*
	80%	100%				10%	n/a	$ 70,000	$ 70,000
County of Hawaii	$ 2,779,439	$ 3,474,299	n/a	13.0%					
C&C Honolulu	$ 15,821,421	$ 19,776,777	n/a	74.0%					
County of Maui	$ 2,779,439	$ 3,474,299	n/a	13.0%					
Total		$ 26,725,374		100.0%					
Market Transformation	*Minimum*	*Target*	*Potential Actions*				*Minimum*	*Target*	*Maximum*
	70%	100%							
Behavior Modification	12,600	18,000	Participants			2%	$ 11,250	$ 15,000	$ 15,000
Professional Development	560	800	Participants			2%	$ 11,250	$ 15,000	$ 15,000
Technical Training	140	200	Participants			2%	$ 11,250	$ 15,000	$ 15,000
Hawaii Energy Ally Program	175	250	New Allies			1%	n/a	$ 5,000	$ 5,000
Benchmarking	105	150	Sites EUI/Peer Group Evaluated		All Target Items must be met for award	3%	n/a	$ 20,000	$ 20,000
Codes & Standards	1 Action	2 Actions	1. Incentive Program for Early Code Adoption 2. Code Compliance Assistance						
Smart Grid	1 Action	1 Action	Continue with PY 14 Smart grid In-Home Display Pilot project						
Demand Response	1 Action	2 Actions	1. In-field live-test and evaluated Project 2. Project TBD by Mutual Agreement w/PUC						
Electric Vehicle	1 Action	2 Actions	1. Marketing Materials to raise EE/EV awareness 2. Project TBD by Mutual Agreement w/PUC						
Total						100%	$ 453,750	$ 700,000	$ 700,000

A discussion of the derivation of the proposed adjusted values follows:

Leidos proposes that the Program be allowed to deviate from the "reach" Renewal Guidelines with adjustments as shown in **Table 4** in the following ways:

- Reduce energy (kWh) target requirements to 122,243,721 kWh, with resulting minimum reductions. This is justified by the significant CFL energy reduction being proposed and by exceeding the EnerNOC potential study value for the program. See factor review after **Table 4.**

- Reduce the demand (kW) target requirements to 17,150kW to reflect the mix of programs developed and factor in the CFL demand reduction.

- Reduce TRB Target to $159,372,834 as a result of a lower energy target.

Justification for these reductions can be found in **Table 4** and is further explained in the next section.

The adjusted EEPS TRB value that uses updated Utility Avoided Cost values demonstrates that the program action in PY15 has the potential to provide a net present value (NPV) of $226M cost avoidance provided in **Table 4** for reference and future use**.** The avoided costs used are provided in **Table 9a**.

Table 4: PROPOSED CHANGES FROM GUIDANCE TARGET VALUES

Hawaii Energy - PY15 - Proposed Changes from Guidance Target Values					
	Guidance Target	*Target Adjustment*	*Minimum*	*Adjusted Target*	*Maximum*
Energy (1st Year kWh)	148,719,184	-18%	100,851,070	**122,243,721**	134,468,093
Demand (kW)	20,923	-18%	12,863	**17,150**	18,865
TRB (NPV $ Avoided Costs)	$ 194,653,616	-18%	$ 119,529,625	**$ 159,372,834**	$ 175,310,117
Justification of Reduction	148,719,184	kWh - Guidance Target Energy			
	(32,277,294)	kWh - CFL Contribution Reduction PY15 vs. PY13			
	(9,146,650)	kWh - Codes and Standards Reductions PY15 vs. PY13			
	107,295,240	kWh - Net of CFL and Codes & Standards Impacts			
Avoided Cost Values Used	***Total NPV TRB***	***Capacity TRB***	***Energy TRB***	***TRC***	***TRB/TRC***
Legacy Utility Avoided Costs	$ 159,372,834	$ 47,083,540	$ 112,289,293	$ 73,084,379	2.2
Current EEPS Avoided Costs	$ 226,178,274	$ 43,201,637	$ 182,976,636	$ 73,084,379	3.1

Energy (kWh) Target Reduction Justification

In preparing this Renewal Proposal, the Program has determined that the PY15 performance goals provided in the Renewal Guidelines require adjustment to address other directives in the Guidelines and market factors beyond the Program's control.

Leidos proposes a reduction of the energy target by 26,475,463 kWh.

There are three major factors that have led to this proposed reduced energy savings:

1. Changes in baseline conditions due to enhanced codes and standards since 2013

2. A 30% reduction in CFL counts in our proposal based on Renewal Guidelines

3. A 127% increase in LED counts to offset the LED reduction

- **Code Changes in 2013**
  As the EnerNOC 2014 Potential Study determined, there have been, and will continue to be codes and standards changes within the industry that will drive energy savings through more efficient manufacturer standards. The Program has experienced these changes and has reduced our claimed savings accordingly. In essence, Hawaii is still receiving these energy reductions each year, but is no longer paying incentives for them. **Table 5** shows the estimated impact of selected codes and standards on considerable portions of the Program. As you can see, code and baseline changes alone have impacted the Program significantly. This table does not reflect the impact to residential CFL and LED savings.

Table 5: CODES AND STANDARDS IMPACTS

Hawaii Energy - PY15 - Codes & Standards (C&S) Energy Savings Impacts			
Selected Code & Standards (C&S) Changes to Measure Impacts	PY15 Plan Savings (kWh/yr.)	C&S Reduction (%)	C&S Reduction Energy (kWh/yr.)
Lighting - Business Only	27,703,610	-28%	(7,757,011)
Residential Appliances	3,685,970	-25%	(921,493)
Air Conditioning Units	2,463,930	-19%	(468,147)
Selected C&S PY15 Impact	33,853,510	-27%	**(9,146,650)**
Impacts from CFL & LEDs Baseline changes			(8,899,488)
Waterheating & Motors			(5,595,185)
Total C&S PY15 Impact			**(23,641,323)**

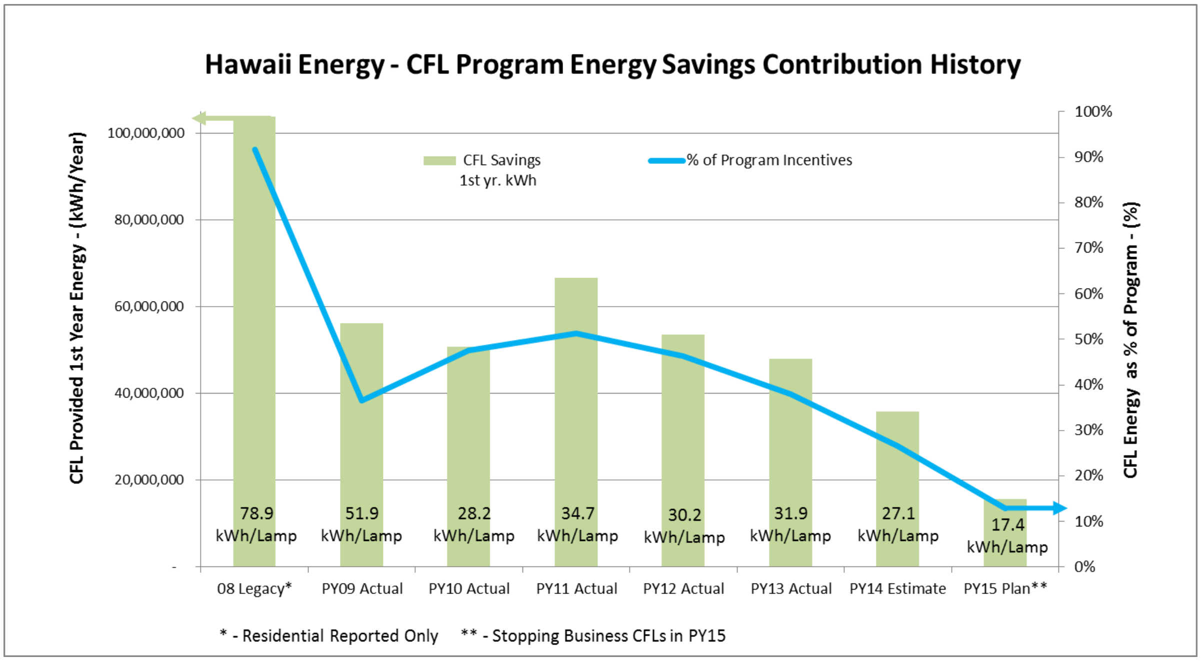
- **Reduction in CFLs in the Program Plan**
  Consistent with the Renewal Guidelines requirements, Leidos proposes a major reduction in the CFL count for the PY15 plan, (from 1,501,579 in PY13 down to 900,000 lamps for PY15). This count reduction and a 35% decrease in deemed savings due to the evolution of base case conditions (more CFLs replacing CFLs) results in a 32,277,294 kWh reduction in program energy savings potential for PY15. **Table 6** and **Chart 1** show the historical contributions of CFLs to the overall program energy savings, clearly demonstrating the cost-effectiveness and overall effect of major reductions in CFL counts. **Chart 1** also shows the continued steady reductions in CFL count that the Program has achieved over the past years, consistent with PUC directives.

Table 6: PY15 CFL MEASURE CONTRIBUTION HISTORY

Hawaii Energy - PY15 - CFL Measure Energy Savings Contribution History						
Program Year	*Units of CFLs*	*Average Program Level kWh/CFL*	*CFL Savings 1st yr. kWh*	*PY15 vs. PY13 CFL Energy Savings*	*% of Program Energy Savings*	*Total Program Savings*
08 Legacy*	1,316,391	78.9	103,836,336		92%	113,159,373
PY09 Actual	1,081,930	51.9	56,153,413		37%	153,700,165
PY10 Actual	1,798,633	28.2	50,765,075		48%	106,570,657
PY11 Actual	1,923,077	34.7	66,683,669		51%	130,108,676
PY12 Actual	1,775,226	30.2	53,537,449		46%	115,779,968
PY13 Actual	1,501,579	31.9	47,940,126	47,940,126	38%	126,485,578
PY14 Estimate	1,325,000	27.1	35,907,500		27%	134,816,230
PY15 Plan**	900,000	17.4	15,662,832	15,662,832	13%	122,243,721
Total CFL Reduction Energy Impact PY 15 vs. PY13				**(32,277,294)**		

* Reported Residential CFLs Only ** PY15: Program no longer Incentivizes Business CFLs

Chart 1: PY15 CFL PROGRAM ENERGY-SAVINGS CONTRIBUTION HISTORY



- **Increased LEDs in the Program**
  With the significant reduction in CFLs under the Renewal Guidelines, Leidos proposes to increase LED counts and decrease incentive levels in PY15 to reflect market conditions and maximize program impact. Fortunately there is an increase in deemed savings for LEDs based on a corrected base case.

4. Historic Energy Savings and Program Cost Comparisons

The Program continues to shift its focus toward direct install, hard-to-reach, benchmarking and consulting programs to meet market demands and provide deeper energy savings. As the Program has taken a focused approach to lowering the reliance on CFLs, the inevitable impact has been that new measures, which still have great value, cannot reach the cost-effectiveness level of previous program years.

These changes need to be looked at in the overall context of the accomplishment of the 4,300 GWh energy reduction target and compared to the avoided cost of electrical energy production. Current cost of energy production is well over $0.16/kWh while the Program's lifetime energy reduction costs have increased from just $0.024/kWh in PY11 to a proposed $0.028/kWh (non-discounted) for PY15. This is reflected in the Program first-year energy cost savings decreasing at a higher rate than the lifetime savings figures. See **Table 7** below for historic comparisons.

Table 7: HISTORIC PROGRAM METRICS COMPARISON

Hawaii Energy - PY15 - Historic Program Results							
	Claimed kWh	***Verified kWh***	***Avg. Life***	***Estimate Life kWh***	***Total Program Cost***	***1st year $/kWh***	***Life $/kWh***
PY11 Actual	128,785,968	130,108,676	8.4	1,092,912,878	$ 25,741,826	$ 0.198	$ 0.024
PY12 Actual	113,198,801	115,779,968	9.4	1,088,331,699	$ 30,903,826	$ 0.267	$ 0.028
PY13 Actual	127,007,811	126,485,578	10.8	1,366,044,242	$ 32,049,856	$ 0.253	$ 0.023
PY14 Estimate	120,811,495	120,811,495	10.4	1,256,439,548	$ 39,666,917	$ 0.328	$ 0.032
PY15 Target	122,243,721	122,243,721	11.1	1,350,839,175	$ 38,033,885	$ 0.311	$ 0.028

5. Proposal Technical Details

A. TRB

Leidos proposes the following two TRB tables for use in PY15. The first, **Table 8**, is a continuation of using the avoided cost figures that the Program has been using since inception. It has been modified to show 2015 as year one. The second table, **Table 9**, is being introduced per the Renewal Guidelines to use an initial $0.161/kWh avoided cost figure and escalate it at 3% per year. This figure is a conservative value derived from EEPS filings in the Waiver Docket 2013-0056 shown in **Table 10.** The capacity avoided cost for the Program takes into account a prorated demand value based on Oahu demand achievements of 76%. No capacity savings was used for Maui County as the out years do not materially impact the NPV TRB.

Table 8: UPDATED UTILITY AVOIDED COST AND NON-UTILITY IMPACTS USING LEGACY METHOD

Hawaii Energy - PY15 - TRB Values Using Legacy Utility Avoided Cost								
		Discount Rate						
		6%	HECO IRP4 Avoided Cost		NPV for each Year		NPV Cumulative from Final Year	
Year	Period	NPV Multiplier	$/kW/yr.	$/kWh/yr.	$/kW/yr.	$/kWh/yr.	$/kW/yr.	$/kWh/yr.
2015	1	1.00	$ 382.5	$ 0.112	$ 383	$ 0.1124	$ 383	$ 0.1124
2016	2	0.94	$ 386.2	$ 0.113	$ 364	$ 0.1070	$ 747	$ 0.2194
2017	3	0.89	$ 387.7	$ 0.114	$ 345	$ 0.1014	$ 1,092	$ 0.3208
2018	4	0.84	$ 389.1	$ 0.114	$ 327	$ 0.0960	$ 1,419	$ 0.4167
2019	5	0.79	$ 391.9	$ 0.115	$ 310	$ 0.0912	$ 1,729	$ 0.5079
2020	6	0.75	$ 390.7	$ 0.115	$ 292	$ 0.0858	$ 2,021	$ 0.5937
2021	7	0.70	$ 394.6	$ 0.116	$ 278	$ 0.0817	$ 2,299	$ 0.6754
2022	8	0.67	$ 398.3	$ 0.117	$ 265	$ 0.0778	$ 2,564	$ 0.7532
2023	9	0.63	$ 397.4	$ 0.117	$ 249	$ 0.0732	$ 2,814	$ 0.8265
2024	10	0.59	$ 401.4	$ 0.118	$ 238	$ 0.0698	$ 3,051	$ 0.8963
2025	11	0.56	$ 405.7	$ 0.119	$ 227	$ 0.0665	$ 3,278	$ 0.9628
2026	12	0.53	$ 409.3	$ 0.120	$ 216	$ 0.0633	$ 3,493	$ 1.0261
2027	13	0.50	$ 415.9	$ 0.122	$ 207	$ 0.0607	$ 3,700	$ 1.0869
2028	14	0.47	$ 423.3	$ 0.124	$ 198	$ 0.0583	$ 3,898	$ 1.1452
2029	15	0.44	$ 428.9	$ 0.126	$ 190	$ 0.0557	$ 4,088	$ 1.2009
2030	16	0.42	$ 433.9	$ 0.128	$ 181	$ 0.0534	$ 4,269	$ 1.2543
2031	17	0.39	$ 438.9	$ 0.130	$ 173	$ 0.0512	$ 4,442	$ 1.3055
2032	18	0.37	$ 443.9	$ 0.132	$ 165	$ 0.0490	$ 4,607	$ 1.3545
2033	19	0.35	$ 448.9	$ 0.134	$ 157	$ 0.0469	$ 4,764	$ 1.4014
2034	20	0.33	$ 453.9	$ 0.136	$ 150	$ 0.0449	$ 4,914	$ 1.4464
2035	21	0.31	$ 458.9	$ 0.138	$ 143	$ 0.0430	$ 5,057	$ 1.4894
2036	22	0.29	$ 463.9	$ 0.140	$ 136	$ 0.0412	$ 5,194	$ 1.5306
2037	23	0.28	$ 468.9	$ 0.142	$ 130	$ 0.0394	$ 5,324	$ 1.5700
2038	24	0.26	$ 473.9	$ 0.144	$ 124	$ 0.0377	$ 5,448	$ 1.6077
2039	25	0.25	$ 479.0	$ 0.146	$ 118	$ 0.0361	$ 5,566	$ 1.6437

Table 9: NEW PROPOSED UTILITY AVOIDED COST AND NON-UTILITY IMPACTS

Hawaii Energy - PY15 - Demonstration TRB Values Using Modified Current EEPS Utility Avoided Cost								
		Discount Rate	Factored EEPS	Escalation Rate				
		6%	76%	3%				
			Utility Avoided Costs*		NPV for each Year		NPV Cumulative from Final Year	
Year	Period	NPV Multiplier	$/kW/yr.	$/kWh/yr.	$/kW/yr.	$/kWh/yr.	$/kW/yr.	$/kWh/yr.
2015	1	1.00		$ 0.161	$ -	$ 0.1610	$ -	$ 0.1610
2016	2	0.94		$ 0.166	$ -	$ 0.1564	$ -	$ 0.3174
2017	3	0.89		$ 0.171	$ -	$ 0.1520	$ -	$ 0.4695
2018	4	0.84		$ 0.176	$ -	$ 0.1477	$ -	$ 0.6172
2019	5	0.79		$ 0.181	$ -	$ 0.1435	$ -	$ 0.7607
2020	6	0.75	$ 904	$ 0.187	$ 676	$ 0.1395	$ 676	$ 0.9002
2021	7	0.70	$ 986	$ 0.192	$ 695	$ 0.1355	$ 1,371	$ 1.0357
2022	8	0.67	$ 856	$ 0.198	$ 569	$ 0.1317	$ 1,940	$ 1.1674
2023	9	0.63	$ 750	$ 0.204	$ 471	$ 0.1280	$ 2,410	$ 1.2953
2024	10	0.59	$ 663	$ 0.210	$ 392	$ 0.1243	$ 2,803	$ 1.4197
2025	11	0.56	$ 590	$ 0.216	$ 329	$ 0.1208	$ 3,132	$ 1.5405
2026	12	0.53	$ 527	$ 0.223	$ 278	$ 0.1174	$ 3,410	$ 1.6579
2027	13	0.50	$ 474	$ 0.230	$ 236	$ 0.1141	$ 3,646	$ 1.7720
2028	14	0.47	$ 1,020	$ 0.236	$ 478	$ 0.1108	$ 4,124	$ 1.8828
2029	15	0.44	$ 1,066	$ 0.244	$ 471	$ 0.1077	$ 4,595	$ 1.9905
2030	16	0.42	$ 964	$ 0.251	$ 402	$ 0.1047	$ 4,997	$ 2.0952
2031	17	0.39	$ 875	$ 0.258	$ 344	$ 0.1017	$ 5,342	$ 2.1969
2032	18	0.37	$ 795	$ 0.266	$ 295	$ 0.0988	$ 5,637	$ 2.2957
2033	19	0.35	$ 724	$ 0.274	$ 254	$ 0.0960	$ 5,891	$ 2.3918
2034	20	0.33		$ 0.282	$ -	$ 0.0933	$ 5,891	$ 2.4851
2035	21	0.31		$ 0.291	$ -	$ 0.0907	$ 5,891	$ 2.5757
2036	22	0.29		$ 0.300	$ -	$ 0.0881	$ 5,891	$ 2.6638
2037	23	0.28		$ 0.308	$ -	$ 0.0856	$ 5,891	$ 2.7494
2038	24	0.26		$ 0.318	$ -	$ 0.0832	$ 5,891	$ 2.8326
2039	25	0.25		$ 0.327	$ -	$ 0.0808	$ 5,891	$ 2.9135

* EEPS (2013-0056) Avoided Capacity Cost factored by 76% to reflect contribution of kW reductions achieved on Oahu in PY13. $161/MWh Avoided Costs per Guidance Recommendations. This is a conservative estimate based on EEPS 2014 Projections of $192, $225 and $192/MWh for HECO, HELCO and MECO respectively.

Table 9a: CALCULATION OF OAHU PRO-RATED CAPACITY AVOIDED COST

PY13 System Level Demand Impacts - kW		
Oahu	16,481	76.4%
Hawaii	2,469	11.5%
Maui	2,597	12.0%
Molokai	8	0.0%
Lanai	8	0.0%
Total	21,563	100.0%

Table 10: AVOIDED COSTS ATTACHMENT A FROM WAIVER DOCKET – 2013-0056

Attachment A: Revised Avoided Costs

EEPS avoided cost with 15% non energy cost benefit added included in Energy price forecast

HECO

P2_100vs110

Year	Energy $/MWH	Capacity $/KY-Yr
2014	192	0
2015	196	0
2016	230	0
2017	233	0
2018	243	0
2019	253	0
2020	260	1,189
2021	273	1,298
2022	295	1,126
2023	297	987
2024	314	872
2025	326	776
2026	328	694
2027	346	624
2028	357	1,342
2029	358	1,403
2030	373	1,269
2031	391	1,151
2032	397	1,046
2033	420	953
	Levelized 273 $/MWH	Levelized 812 $/kW-yr

HELCO

H2_100vs110

Year	Energy $/MWH	Capacity $/KY-Yr
2014	225	0
2015	226	0
2016	232	0
2017	241	0
2018	248	0
2019	258	0
2020	271	0
2021	280	0
2022	306	0
2023	319	0
2024	332	0
2025	346	0
2026	359	0
2027	376	0
2028	390	0
2029	407	0
2030	425	0
2031	448	0
2032	465	0
2033	493	0
	Levelized 296 $/MWH	Levelized 0 $/kW-yr

MECO

M2_100vs110

Year	Energy $/MWH	Capacity $/KY-Yr
2014	192	0
2015	219	0
2016	220	0
2017	223	0
2018	226	0
2019	232	0
2020	238	0
2021	243	0
2022	267	0
2023	276	0
2024	288	0
2025	295	0
2026	306	0
2027	317	0
2028	329	0
2029	341	4,902
2030	356	5,647
2031	370	5,126
2032	394	4,671
2033	416	4,269
	Levelized 257 $/MWH	Levelized 1361 $/kW-yr

B. Net-to-Gross

The net-to-gross figures in **Table 11** will be used for PY15 and are unchanged from the third-party evaluator's recommendations put into place in PY14. The system loss factors will also be carried over from PY14 with no changes as shown in **Table 12**.

Table 11: PY15 - NET-TO-GROSS FACTORS

Hawaii Energy - PY15 - Net-to-Gross Factors		
Program		***Attribution Rate***
BEEM	Business Energy Efficiency Measures	75.0%
BESM	Business Services and Maintenance	95.0%
BHTR	Business Hard to Reach	99.0%
CBEEM	Custom Business Energy Efficiency Measures	75.0%
CESH	Custom Energy Solutions for the Home	65.0%
REEM	Residential Energy Efficiency Measures	79.0%
RESM	Residential Services and Maintenance	92.0%
RHTR	Residential Hard to Reach	100.0%

Table 12: PY15 SYSTEM LOSS FACTORS

Hawaii Energy - PY15 - System Loss Factors			
County	***Factor***	***%***	***Weighted***
Hawaii	9.00%	13.5%	1.2%
Maui	9.96%	13.5%	1.3%
Honolulu	11.17%	73.0%	8.2%
System Average			10.7%

6. Program and Measure Overview

Leidos proposes to modify each offering to address the needs of the markets served and to respond to the directives of the PUC. The following is a brief summary of the highlights of our proposed changes or additions to each program area. We look forward to working with the PUC and its staff to develop these and other potential new offerings more fully. We will provide a full description of each program in the PY15 Annual Plan.

A. Residential Programs

I. Transitioning Lighting Program: Moving from CFLs to LEDs

a) Upstream Lighting Program

PY15 will see a reduction (31%) in the number of CFL bulbs rebated through the residential program. This transition allows the Program to expand incentives available for the growing LED market. The PY15 plan includes 781,000 LED rebates, an increase of 260% from the PY14 plan. The Program is also reducing the average dollar value per LED rebate in order to properly align with lower market prices.

Program execution will appropriately balance the increased unit counts with the need to effectively control the types of incentives available. Qualified LED technologies will continue to expand in the coming year and the Program's educational marketing efforts will be matched accordingly to ensure customers are well informed to make the appropriate purchase choice to meet their needs. Marketing plans include online case studies promoted via social media and in-store buying guides to assist customers in choosing the correct product for their existing fixtures.

The CFL program will continue PY14 efforts to move away from the larger big box stores and design effective promotions with local retailers who serve a customer base otherwise inclined to stay with incandescent alternatives.

b) Custom Lighting Program

PY15 includes $200,000 for custom lighting incentives. LED technologies have improved significantly in the past few years and the Program is now well positioned to encourage the replacement of lamps not previously addressed by the more traditional upstream lighting market. This new program will allow Hawaii Energy to specifically target the existing energy saving potential in specialty interior and linear fluorescent lamps found in the residential sector. By leveraging our existing Clean Energy Ally Program relationships we can better identify and penetrate the appropriate market segment. We will also apply lessons learned from the commercial custom lighting and SBDIL programs to further remove any barriers associated with custom lamp and fixture functionality.

III. Expansion of Peer Group Comparison Program

We will nearly double the Peer Group Comparison program in PY15 to reach an additional 110,000 households. Over the last four years, this program has grown tremendously due to its effectiveness in motivating behavioral responses surrounding energy use in the home. Home Energy Reports are easily recognized and often commented on by utility customers. Customers receive additional insight into how their usage compares to similar households and the reports provide energy-saving tips while promoting available Hawaii Energy rebates. This program maintains a lower opt-out rate than most other similar initiatives nationwide. In PY14, we utilized more data-driven market segmentation to develop customized messages to customers. We will continue these enhancements in PY15 to include more dynamic messaging based on customer usage profiles. Messages will encourage sign-ups for email-based Home Energy Reports and the use of online web portal tools to track energy-saving progress. This expansion aligns well with the Leidos-created “Dare-to-Compare” tools available at HawaiiEnergy.com.

IV. High Efficiency Water Heating Program Updates

During PY15, the solar water heating (SWH) program budget will see a reduction in total unit count to 1,450 as well as a reduced rebate amount of $750. We will also modify the requirement for system post-inspections in order to limit SWH program administration costs. This will shift approximately $120,000 from T&M to direct incentives. These modifications are required given a SWH market penetration of over 45% of eligible residences, increased sales of PV-direct water heaters, PV-only contractors capturing complete rooftops and a shifting baseline due to codes and standards. Most importantly, it is significant effort to better align the SWH program’s cost effectiveness with the overall Program goals.

The Program is looking to PY15 as an opportunity to expand residential water heating incentives beyond the traditional SWH rebates. We see a need for a more targeted focus on heat pump applications in multifamily settings. We will address this market with an increase in the standard incentive for heat pumps from $200 to $300. We will also continue to work with government housing agencies, condominium association boards and property management companies to identify multifamily properties well-suited for Hawaii Energy’s Heat Pump Direct Installation Program.

V. Expanded Program Reach through Online Marketplace Solutions

In PY15, we will expand the provision of energy-saving devices through our online store and incorporate additional web-based marketplace services for customers. We plan to include a customized user experience with product education and purchase options for lower cost energy-saving devices not as readily available in local retail locations. The online marketplace will have savings calculators addressing specific customer characteristics. This will result in customized suggestions for applicable energy-efficient technologies. Customers will then be able to take advantage of instant rebates for the purchase of products like advanced power strips, small appliance timers and occupancy sensors, which will be shipped to their door.

VI. Direct Install Initiatives – A No Cost Solution for Customers

We are well-positioned to build upon the PY14 Multifamily Direct Install Program and expand the installation of energy-saving technologies like high efficiency showerheads, faucet aerators, advanced power strips and high efficiency light bulbs (CFLs and LEDs) in multifamily residences. In PY15 we will target over 4,000 households to participate in the offering; this includes multifamily properties with individually-metered residential accounts and commercial master-metered accounts. The Program has a strong pipeline of leads and continues to engage property managers and government housing agencies to identify potential participants. We are also engaging additional properties through existing submetering and benchmarking efforts. This multifaceted approach will continue in PY15 as it has proven effective in gaining access to the multifamily market which has historically been slower to participate in existing rebate programs.

We will continue to support the implementation of the Green Neighborhood Program direct install efforts in Moanalua and Pearl City neighborhoods. This project was originally awarded funding as part of the PY14 Energy Efficiency Auction but faced constraints in execution within the original one-year timeline. PY15 will target 1,800 homes for the direct installation of high efficiency showerheads, faucet aerators, advanced power strips and CFLs, with an added effort to address water heating insulation, air conditioning filters and refrigerator coil cleaning. These efforts also include a comprehensive marketing strategy to enroll residents during an outreach and education campaign in their neighborhood.

VII. Custom Residential Hard-To-Reach Program

In PY15 we will allocate $300,000 in funding to a Custom Residential Hard-To-Reach program. Participants will be identified and recruited based on their participation in past and existing Transformational programs like Sharing the Aloha and NEED.org. Rooted in a whole-home performance approach, this program is designed to convert Hawaii Energy's workshop attendees to active energy-saving program participants. We will utilize the Program's existing online tools to rank neighborhood energy usage and then analyze efficiency measures suitable to specific residences on a case-by-case basis. Customers will receive custom offers to participate in unique program offerings. Hawaii Energy will then measure energy usage to track and report on energy saving progress.

B. Business Programs

I. Energy Efficiency Advisors

Leidos will be selectively retooling its business operations staff with enhanced tools and techniques to advise prospective participants in the value of energy efficiency. This effort will better align with sales trainings provided to Clean Energy Allies through our Transformational programs.

II. Midstream Programs

Leidos will continue to seed and grow its Midstream Programs with the intent to shift 10% to 25% of its prescriptive lighting program to this channel. Midstream programs are relatively new in the industry, but offer the Program an administratively-efficient platform to expand its reach while mitigating recognized barriers to participation (e.g. submitting a complete application). Efforts are underway to recruit local distributors under the Clean Energy Ally program to offer their customers, primarily electrical and lighting contractors, to receive instant rebates when purchasing qualified lighting. Hawaii Energy will also explore midstream opportunities with other measures such as motors, pumps, ENERGY STAR® kitchen equipment and possibly HVAC.

III. Small Business Direct Install Lighting (SBDIL)

Supported by a dedicated staff and Transformational program interns, Hawaii Energy will continue to improve the SBDIL program. After introducing a new online application system and piloting a participating contractor bonus, additional strategies will be considered including adding new participating contractors, particularly in areas not currently served by the SBDIL program; and adding and/or modifying qualifying measures to stay current with advances in technology, pricing and other specific needs of small businesses, notably, restaurants.

Cash flow is a significant pain point among the cadre of participating contractors, who themselves are small businesses. With over $2M in incentives earmarked for this important program, Hawaii Energy will explore the integration of the Midstream Program, once fully operational, with the SBDIL program with the aim of relieving participating contractors' material carrying costs.

IV. Restaurant Programs

Hawaii Energy introduced a portfolio of incentives for ENERGY STAR® kitchen equipment in the last quarter of PY14 and aims to place over $300K with these incentives in PY15. In addition to other specialty equipment, Hawaii Energy will promote this bundle of offers to the restaurant and foodservice communities and in particular, their suppliers. Hawaii Energy will monitor participation of this offer and evaluate barriers to participation, which may lead to alternative distribution strategies (e.g., a midstream program).

V. Water-Wastewater Programs

Hawaii Energy will continue our special focus on the close connection between water and energy. The Water-Wastewater Catalyst Program aims to incentivize high-quality energy efficiency projects that are stalled due to lack of funding sources by providing up to 100% of project cost. Through our outreach efforts to both private and municipal water and wastewater professionals and the Catalyst program, we plan to motivate more people to implement new energy-saving projects that otherwise would not be possible. Projects that may not qualify for the Catalyst program funding will remain eligible for our traditional energy incentives through the custom and prescriptive commercial programs.

VI. Major Projects – In Development

Sand Island UV – In recent months, the City and County of Honolulu's Environmental Services Department (ENV) has approved a project to upgrade the ultraviolet (UV) lamps in one of the disinfection channels at their largest wastewater treatment plant after several years of discussion and collaboration with Leidos. This single-channel project has a first-year energy savings estimate of 7.6M kWh and 644 kW. The project is in the procurement process and will likely be award in PY15 and expected to be completed PY16 due to the long lead time of awarding a contract and associated procurement, installation and commissioning of the equipment. Hawaii Energy has committed $2.3M in incentive ($0.30/kWh), anticipated to impact Program Year 2016.

Seawater Air Conditioning (SWAC) –The Program will continue to support this evolving project in PY15 through metering and providing ad hoc resources as needed. The Program will pay incentives as directed in earlier proceedings upon installation and startup of the SWAC system.

Kakaako/New Construction – The Program will continue to support new construction projects as they incorporate energy-efficient technologies above code. Program staff will continue to engage developers and builders throughout the design-build cycle to the degree possible; however, our one-year budget cycle limits the program's ability to invest resources in potential projects that will yield savings beyond this short-time horizon.

C. Transformational Programs

The budget for the Transformational program includes costs associated with activities that do not immediately produce energy savings, but have long-reaching impact on behaviors and future program design. Transformational initiatives can be characterized in the following categories: 1) Innovation Activities, and 2) Behavior Modification, Professional Development, Technical Training and Institutional Change. PY15 planned activities include the following:

Innovation Activities

I. Benchmarking

The Program will continue in-house efforts to benchmark facilities and business sectors in PY15. We will identify per sector, facilities with above-average energy use intensities (EUI) and present them with a team approach to evaluate their consumption, identify energy-saving opportunities and provide technical assistance and incentives that will remove barriers to the successful implementation of these energy conservation measures.

II. Support for Codes and Standards

The Program proposes to build upon knowledge gained from the PY14 updated code compliance study to focus our support to the State Codes Council and to identify and develop concrete incentives or Program support for barrier removal in order to drive deep savings in new and major renovation projects.

III. Renewables Integration Program

The Program will use knowledge gained from our PY14 pilot outcomes and intelligence gathered from internal research on technology and best practices to enable more grid integrated renewables. Our plan is to complete and maintain the research and pilots that were started last year in order to support the PUC and the utility in the critical area of grid integrated renewable energy. Efforts will include demand response/load shifting, support to electric vehicle penetration to include day time charging, smart home/grid/communities research and island grid analysis to determine focused Program designs that meet each grids needs for stability and the ability to accept more renewables.

IV. Shift for Savings Plan

One lesson learned is the negative connotation associated with the terms “demand response (DR)” and “load control”. Hawaii Energy will refer to these programs in a more customer-friendly term such as “Shift for Savings Plan.” We will build on our PY14 pilots and research to enhance certain current CBEEM and BESM program offers to include a requirement for load control. Our team will use knowledge gained by our two PY14 water heating load shifting projects to inform the CBEEM and BESM program design.

V. Smart Grid Support

Leidos proposes to build upon the lessons learned from PY14 in order to enhance implementation of the smart grid benefits to customers and the utility. The actions will include:

- Working with CEIVA Energy, HECO, and others to develop meaningful follow-up actions to our current pilots;
- Engaging current pilot participants with EE messaging and support;
- Evaluating the initial Smart Grid Phase 0 participants on energy use and Hawaii Energy program participation; and
- Evaluating the effects of the In-Home Display (IHD) in producing behavioral changes that could result in energy-savings.

VI. Electric Vehicle Support

The Program will move its electric car purchase energy-saving kit offer to online fulfillment in PY15. Additionally, the Program will continue broad support for EVs to include:

- *Raise Awareness* – Leidos will continue to incorporate Electric Vehicle (EV) messaging into the energy efficiency program work and provide marketing and communications support.

- *Strategic EV Plan* – Leidos has the ability and experience to assist the PUC/HECO/DBEDT/Blue Planet Foundation, to evaluate the issues and opportunities with expanding EV opportunities in Hawaii. Leidos can offer a technical and cost proposal to follow a three-pronged approach to develop best practices, models, and strategies; gather lessons-learned; and create a relevant set of installation guidelines and ordinances through our experience, research and surveys.

VII. Clean Energy Ally Program

Led by a dedicated Program Ally Specialist, the Program will continue to develop its Clean Energy Ally network with a focus on value-added tools, techniques and training to augment the Program's team of Energy Efficiency Advisors. This effort will ensure customers have a robust selection of Allies to implement projects. Specific aims will include networking opportunities, collaborative marketing and a recognition program to acknowledge the contributions Hawaii Energy's Clean Energy Allies make in helping the State achieve its clean energy goals. The Program will evaluate its SBDIL bonus pilot to assess the bonus-to-participation elasticity to evaluate the impact on outcomes and cost effectiveness of directly incenting Clean Energy.

Behavior Modification, Professional Development, Technical Training and Institutional Change

Throughout PY15, Leidos will build upon the successes of many current initiatives within the Behavior Modification, Professional Development and Technical Training program categories. Notably, Sharing the Aloha and Kanu Hawaii's programs will continue. We will also continue to provide traditional energy efficiency technical trainings for engineers and facilities personnel. Highlights of other Transformational activities are described below:

I. Behavior Modification

a) ***Community Based Social Marketing (CBSM)*** – Building on research that was launched in PY14, the CBSM program will target specific energy efficiency behavior changes in the Association of Apartment Owners (AOAO) condo market. The work will pilot behavior change projects and also build local capacity to implement data driven, outcomes-oriented behavior modification programs.

b) ***Hawaii Pacific University (HPU)*** – We will continue to develop the Energy Ambassadors pilot program to build on PY14 work to engage office occupants at HPU in specific behavior modification programs and develop a resource kit for implementation at Hawaii colleges and universities.

c) ***Hawaii Green Growth (HGG)*** – The Program will continue to support the ongoing work of HGG in their development of the online dashboard with statewide energy metrics. We will provide technical expertise on the Sustainability Measures Project, and collaborate with HGG Working Group members keeping energy efficiency at the forefront of the discussion.

d) **UH Variable Pricing Economic Research** – The Program will work with the University of Hawaii to develop a plan to evaluate various time-of-use rate structures and their applicability to drive behavior changes.

II. Professional Development

a) ***NEED*** – The coming year will focus on a refinement of the K-12 teacher professional development to offer a phased approach that provides opportunities for teachers to continually engage with energy efficiency, develop their energy literacy and curriculum, and support students to practice energy-saving behaviors in the school and at home. The Program will focus on deepening ongoing relationships with teachers who commit to being leaders in energy efficiency. Particular attention will be given to engaging with parents through Energy Expos and connecting them to Hawaii Energy resources such as the Dare-to-Compare tool.

b) ***Energy Efficiency Funding Group (EEFG)*** – PY15 will see the development of targeted offerings for specific market segments such as the AOAO market, universities, and executive level business leaders. These efforts will produce tools, templates, and case studies to support market penetration of effective sales techniques. We will also work with EEFG to further develop trainings (both online and in person) that support contractor engagement with the Clean Energy Ally program. These trainings will incorporate techniques to integrate efficiency messaging with the Hawaii Energy rebate process.

c) ***Hawaii Energy Intern Program*** – Program modification will focus on the reduction of management costs and expanded intern assignment scope to offer higher level work products that assist with the growth of more innovative Transformational offerings in PY15. We plan to move to a multi-level internship program with peer-to-peer mentorship to provide fellows with increasing leadership responsibilities. This will lay the foundation for future expanded reach and impact at a reduced Program cost.

III. Technical Training

a) ***Facilities Management Training*** – The Program will continue to offer training for existing facilities staff, managers and technicians to support their role in implementing energy efficiency upgrades. We will also facilitate and support strategic planning to ensure that Hawaii's various offerings related to facilities management and energy efficiency are coordinated including: the Bachelor of Applied Science (B.A.S.) degree program in Facilities Management at the University of Hawaii – West Oahu (UHWO), UH Maui College Sustainable Living Institute of Maui (SLIM) and other partners.

b) ***Building Operator Certifications (BOC®)*** – The Program plans to expand this offering to include Hawaii County for the first time.

c) ***Foodservice Energy Conservation and Efficiency Workshops*** – The Program will host a series of trainings and events to encourage energy-efficient practices and technology in the hard-to-reach food service industry and support vendors to market energy-efficient restaurant equipment.

d) ***Water/Wastewater –*** The Program will continue to sponsor efficiency and conservation education for entry-level water and wastewater operators through the UH Maui College and Sustainable Living Institute of Maui (SLIM).

IV. Institutional Change

a) ***Strategic Energy Management (SEM)*** –The Program will introduce the processes of SEM and develop a set of tools and resources to assist large institutions, to comprehensively plan for effective energy management as a critical part of their business decision making and exponentially increase the number and effectiveness of energy efficiency projects that are considered as part of the strategic vision and plan of the organization rather than a specific isolated project. This approach will lead to deeper and more meaningful energy efficiency throughout the organization.

D. Marketing and Communications

Breaking Through Awareness and Participation Barriers
The Program understands the PUC's desire to ensure that all eligible utility customers are aware of the offerings and the benefits of participating. The nature of the messaging is critical and the Program will work to utilize language that has broad appeal, reaching electric customers across rate schedules and demographics. In PY15, the Program will continue to increase awareness of and participation in program offerings by leveraging marketing successes and lessons learned from prior program years through a cost-effective and metrics-based marketing communications plan, which will utilize a strategic mix of traditional and non-traditional strategies and tactics.

I. Integrating All Components of Marketing Communications
As part of an integrated marketing communications plan, the Program will continue to increase the reach of and participation in the Program's offerings through strategies and tactics including but not limited to public relations, outreach, promotions, web and social media. Specifically, public relations includes media relations with the goal of securing "earned media" in mainstream, community and trade publications such as bylined articles and feature stories to keep the Program top-of-mind for and increase participation from various segments of the electric customer population.

Additionally, while the Program's outreach calendar has evolved significantly over time to include well-attended and engaged electric utility customers from a wide range of demographics and geographical areas, a significant uptick in web traffic and social media-based engagement will be the focus in PY15.

II. Leveraging Strategic and Cost-Effective Advertising, Budget Pending, to Further Expand Reach
To maximize reach while maintaining cost-effectiveness, the Program will also continue to develop and utilize a mix of strategic advertising, budget pending, which will be integrated with the messaging of all other marketing communications strategies outlined above. The timeframe, total reach and mix of advertising among these media will be determined to maximize effectiveness and the budget available.

The advertising may include but is not limited to TV, radio, print and online medium. Where feasible, built-in metrics for the Program to gauge not only interest from the target markets – but action or participation will be worked on, tracked and analyzed. This will expand on PY14's successes, including a recent one-month online advertising buy to promote Residential energy-saving kits, which provided metrics ranging from interest (e.g., click-throughs) to "conversion" (i.e., opt-in/purchase of the kits).

III. Evaluation to Increase and Measure Success

Progress and results of marketing strategies will be tracked and analyzed with continuous pre- and post-evaluation to determine the effectiveness and success of the messaging and tactics in relation to industry-established metrics. The Program will continually monitor and remain flexible throughout the Program year to adjust strategies and tactics, where needed, based on the evaluations to maximize success. Evaluation methods include, but are not limited to, phone and online surveys, as well as website and social media metrics.

7. Additional Contract Renewal Terms

A. KEY PERSON LIST

Table 13 below contains a proposed new updated **KEY PERSON LIST** for Key Persons through Dec 31, 2016.

Table 13: KEY PERSON LIST

KEY PERSON	POSITION	PBFA WORK	HOURLY RATE
Ray Starling	Program Director	80%	$ 190
Michael Chang	Chief Innovation Architect	100%	$ 190
Vacant*	Program Operations Director	100%	$ 190

*as of 1 Jun 2015 (planning to fill)

B. Additional PBFA Incentive Support for Bill $aver (OBF) Program and Bill $aver Budget

The PBFA PY15 Budget and responsibilities for the Bill $aver (OBF) Program will be negotiated separately from this PBFA Proposal.

In the event the Bill $aver (OBF) Program starts trending to exceed the 350 OBF solar water heater (SWH) unit goal already accommodated in the PY15 Annual Plan, the Program will utilize SWH incentives from the Residential Energy Efficiency Measures budget available at that time until they are exhausted. Leidos will then utilize the residential and business measures as appropriate to cover the additional OBF SWH units using allowed adjustments to the Annual Plan budget expenditures, if needed. In any event, Leidos will ensure that a minimum of 150 additional OBF SWH units (500 OBF units total) are accommodated without requesting modification of Program Performance Incentive goals. Finally, Leidos will work with the Contract Manager and the PUC to revise the Performance Incentive goals to accommodate further desired increases in OBF participation, if needed.

C. Existing Contract Terms and Conditions Not Modified Herein Remain In Place

Leidos proposes that all other Contract Terms and Conditions not specifically referenced in this Proposal be left as they currently are under the original 2009 Contract as subsequently amended, unless clearly inappropriate for the current circumstances.

8. Contract Value Enhancement for Hawaii

Leidos will continue to voluntarily limit all Leidos employee bill rates under this Contract to no more than $190/hour through Dec. 31, 2016. This includes all Leidos reachback personnel. T&M savings to the PUC and Public Benefits Fund from these capped rates over PY15 is estimated to be in excess of $200,000.

As a final added value enhancement, Leidos proposes to voluntarily waive its right under the contract to claim any of the $133K performance “bonus” available for PY15.

The entire Leidos team appreciates the extraordinary opportunity and responsibility we have been given to serve Hawaii as it transitions to a new sustainable, clean energy economy. We look forward to being a part of Hawaii’s long term success in this effort.

Respectfully submitted,

James M. Gariepy

James M. Gariepy
Vice President
Leidos Engineering, LLC

2015 ANNUAL PLAN

leidos

Hawaii Energy
YOUR CONSERVATION & EFFICIENCY PROGRAM

Annual Plan

Program Year 2015

June 10, 2015

Hawaii Energy *is the ratepayer-funded energy conservation and efficiency program administered by Leidos Engineering, LLC under contract with the Hawaii Public Utilities Commission serving the islands of Hawaii, Lanai, Maui, Molokai and Oahu.*

TABLE OF CONTENTS

TABLES & FIGURES

TABLES

FIGURES

1.0 INTRODUCTION

On behalf of Leidos Engineering, LLC ("Leidos") and the Hawaii Energy Efficiency Program, operating as the Hawaii Public Benefits Fee Administrator (PBFA) under contract with the Hawaii Public Utilities Commission (PUC), we are pleased to present the PBFA Annual Plan for Program Year 2015 [July 1, 2015 through June 30, 2016] (PY15).

1.1 Annual Plan

This PY15 Annual Plan is based on our PY15 Program Renewal Proposal submitted May 21, 2015 and provides the detailed strategies, budget, goals and a roadmap for administration and delivery of the Hawaii Energy Program based on enhanced PBFA statutory authority, our experience to date, PUC directives and the State's clean energy goals.

Key features of this PY15 Annual Plan include:

a. Utilizing a $38M budget to provide program-level impacts of 122,243,721 kWh first year savings with $0.034 (LBNL Cost of Saved Energy (CSE)) per kWh average lifetime Program acquisition cost, a fraction of the current utility avoided cost of $0.161/kWh;

b. Achieving a TRB of $159M and a measure life energy cost savings of $509M to utility customers;

c. The development of a new custom lighting program to address energy saving potential in existing specialty interior and linear fluorescent lamps in the residential sector;

d. A specially designed custom residential hard-to-reach program targeting previous Transformational program participants;

e. Removing the Residential and Commercial Energy Auctions from the Program making $196,000 available to be used on more cost-effective and realistic measures;

f. Proactively addressing a market transition of CFLs to LEDs by reducing CFLs to 13% of the planned energy savings, as compared to 38% in PY13;

g. Increasing the Peer Group Comparison program to reach 240,000 households while improving customer experience through the use of web-based services and enhanced tools; and

h. Establishing a Strategic Energy Management (SEM) teaming process to assist large businesses and institutions to plan and execute effective energy management as a critical part of business operations.

1.2 Key Factors Impacting and Actions Basis for Annual Plan

The following are some of the key factors and actions that have impacted the Annual Plan developed for PY15:

1.2.1 *Increased Program Aggressiveness* – The PUC guidance has been to push the Program to:

- Deeper energy savings achievement with expanded offerings and services for the Public
- Longer life measures
- Integrated Demand Response capability into energy efficiency projects
- Further opportunity and awareness for all to participate,

1.2.2 *Building a Cost-Effective Program* – The benchmark measurements of the Energy Efficiency program is the "Program Cost Test" that takes into account all program-related costs as compared to the energy reductions achieved. For PY15 the "all-in" cost per kWh is $0.03.

The PY15 program energy figures are provided in the table below:

- Customer Level First Year Energy Impact of 139M kWh
- 1,536,899,706 kWh savings over the life of the measures
- $38,033,885 Overall Program Budget "Program Cost"
- Lifetime Cost of Saved Energy (CSE) of $0.034 /kWh
- Annual Cost Savings to Participants of $46 Million
- Lifetime project cost savings of $509 Million
- Economic generation of $184 Million in facility improvements

Table 1

PY15 Program Performance Targets and Impacts

Proposed PY15	First Year ($/kWh)	Lifetime ($/kWh)	Average Life (Yrs.)	Incentives	First Year Energy (kWh)	Lifetime Energy (kWh)
Business	$ 0.209	$ 0.019	9.1	$ 12,915,474	61,753,307	549,238,079
Residential	$ 0.175	$ 0.016	13.0	$ 10,557,940	60,490,414	801,601,096
Direct Incentives Only	$ 0.192	$ 0.017	11.1	$ 23,473,414	122,243,721	1,334,111,790
Transformational Programs				$ 3,251,960		
Program Cost/Savings	**$ 0.219**	**$ 0.020**		**$ 26,725,374**	**122,243,721**	**1,334,111,790**
Customer Level Bill Savings					**139,081,204**	**1,536,899,706**
Economic Benefits				**Cost per kWh**	**Annual**	**Lifetime**
Potential Participant Cost Savings				**$ 0.33**	**$ 46,103,169**	**$ 509,457,390**
Average Project Simple Payback					4.0 years	
Potential Participant Capital Investment					**$ 184,412,677**	
Direct Incentives					$ 23,473,414	
Average Project Incentive as a % of Project Cost					13%	

1.2.3 *"How & What to Buy" Participant Advocacy* – Hawaii Energy has sustained a focused review of the inclusion of new measures and equipment into the program over the past five years and this has proven to have protected participants from "bleeding edge" and "here today, gone tomorrow" offerings. The program has always offered customized incentives that would encompass any energy savings action and perform reviews of post energy usage to confirm claimed energy savings. The Program has also stayed contractor/vendor neutral to the extent that no promotions of available companies were done in order to avoid the appearance of endorsement.

In PY15 Hawaii Energy will utilize the Clean Energy Ally program to create awareness of all the companies that are providing energy efficiency goods and services and provide "how-to-buy" discussions to address common hurdles of indecision to starting energy projects.

1.2.4 *Increased Benchmarking and Web Tools to Drive Engagement and Awareness* – Hawaii Energy will build on the experience gained in PY14 with benchmarking and utility data analysis to drive behavior in both the business and residential sectors.

Data visualization and customized views of information on the website shown on the following pages (Figures 1, 2, & 3) will drive engagement by showing participants where their energy consumption compares with others in the community in new ways.

The Program will also provide our Clean Energy Allies with segmented and Hawaii specific data so they can make informed decisions on what products and services they can offer to assist customers in improving their operations as they lower energy usage and costs.

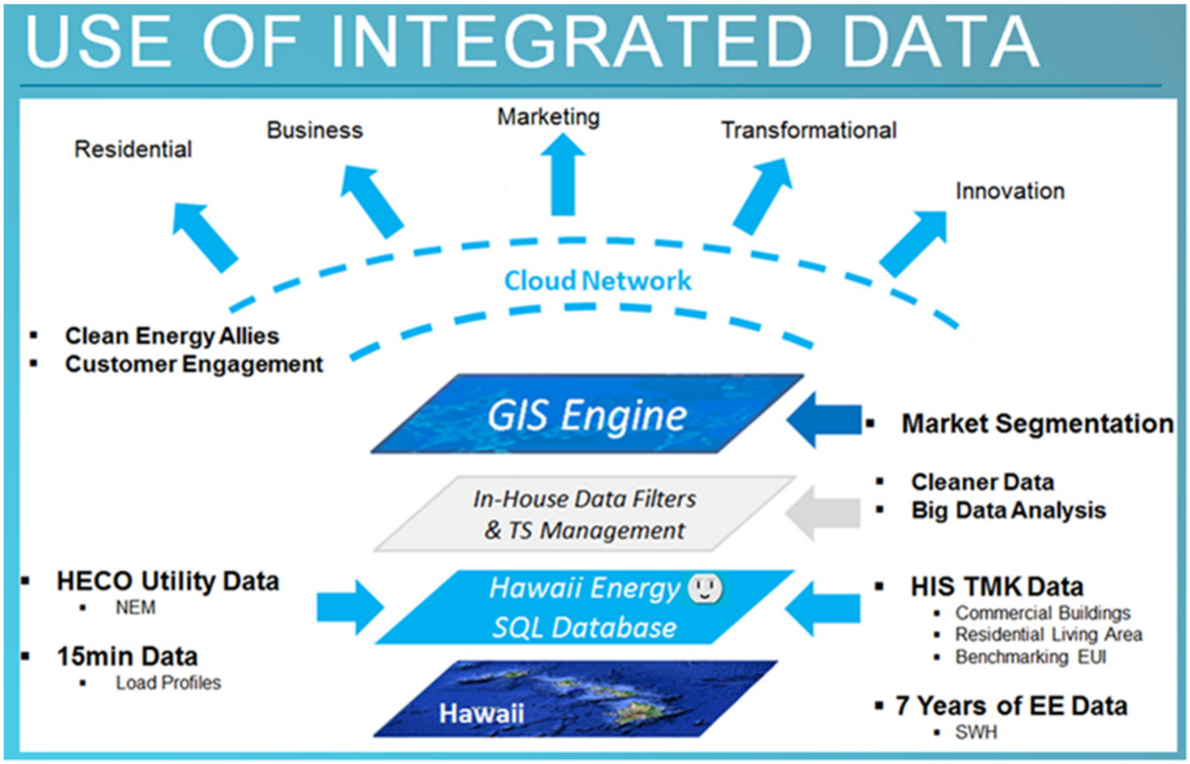


Figure 1: Data Integration Process

Hawaii Energy's new data engine will integrate the utility data with geographic information system (GIS) to capture, analyze, and present the valuable information to both the business and residential sectors.

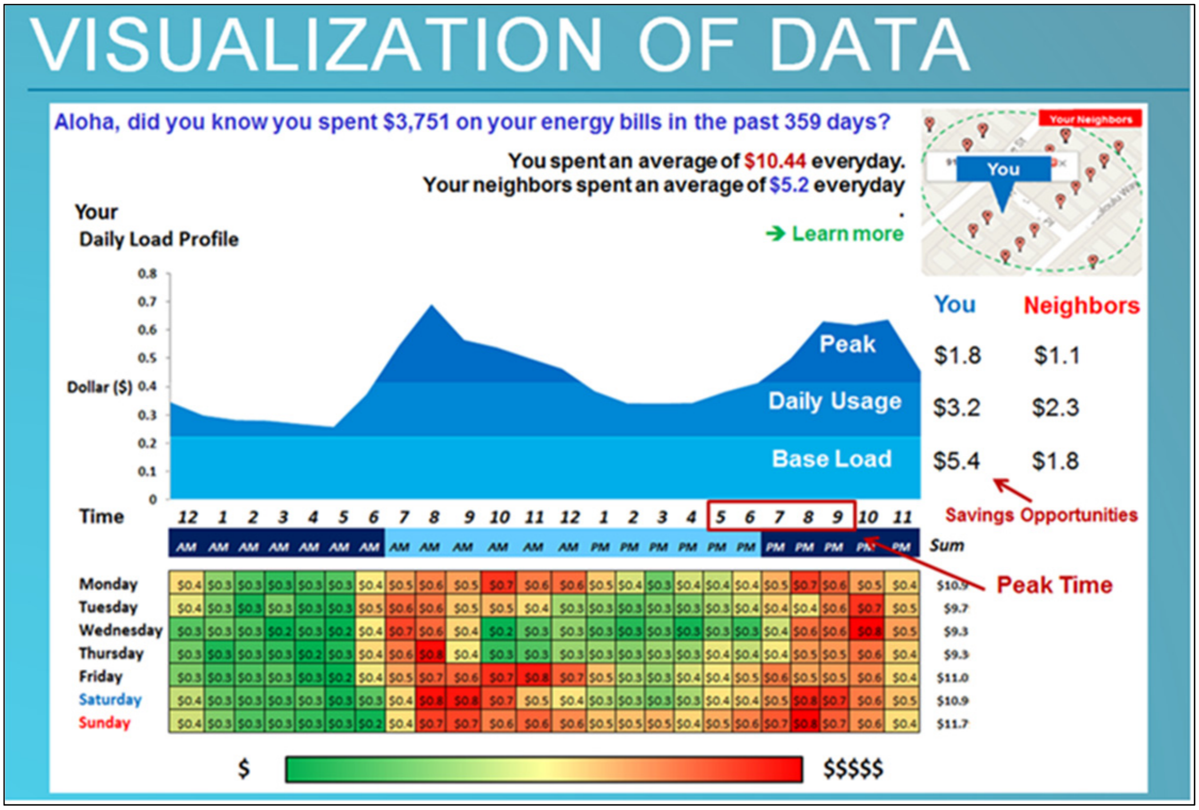


Figure 2: Smart Meter Data Visualization

This chart illustrates the concept of using energy in Time-of-Use (TOU) with the smart meter and how the Program can analyze and visualize the 15-min interval AMI data effectively in an innovative way to help the customers make informed decisions.

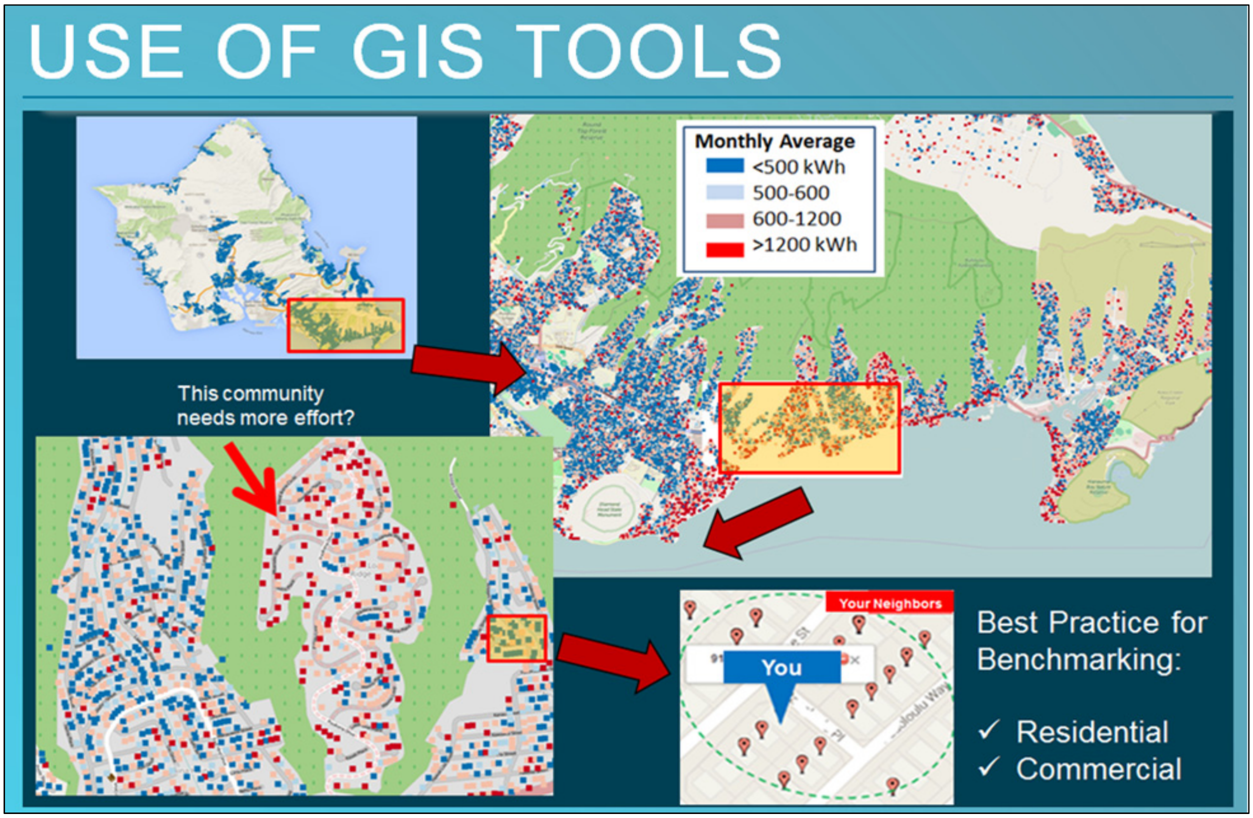


Figure 3: Use of GIS Tools

Utilizing the "Big Data" with the GIS mapping software will help the Program to drive engagement and awareness.

2.0 OUTREACH & MARKETING COMMUNICATIONS

2.1 Overview

For PY15, the primary objective of the Program's Marketing Communications ("Marcom") is to more aggressively increase customer awareness of and participation in Hawaii Energy offerings (i.e., residential rebates, business incentives and transformational educational/training opportunities) through development and execution of a strategic and integrated marketing plan utilizing effective strategies and tactics.

Most notably, the Program will continue to leverage lessons learned and replicate successes to break through awareness and participation barriers across electric utility customer segments by speaking in each segment's "language" (including metrics that matter to them) and tone to motivate each to participate in Hawaii Energy's offerings and save energy.

Breaking Through Awareness and Participation Barriers
The Program understands the PUC's desire to ensure that all eligible utility customers are aware of the offerings and the benefits of participating. The nature of the messaging is critical and the Program will work to utilize language that has broad appeal, reaching electric customers across rate schedules and demographics. In PY15, the Program will continue to increase awareness of and participation in program offerings by leveraging marketing successes and lessons learned from prior program years through a cost-effective and metrics-based marketing plan, which will utilize a strategic mix of traditional and non-traditional strategies and tactics.

The Program will more aggressively develop and execute results-based marketing plan to increase electric customers' awareness and participation to levels needed to sustain Hawaii Energy as a brand and a successful energy conservation and efficiency program.

Opportunities for PY15
For PY15, Hawaii Energy has identified significant opportunities to leverage the successes and lessons learned to enhance strategies and tactics already proven effective, as well as explore additional innovative, cost-effective and wide-reaching opportunities. Comprised of a mix of results-based strategies and tactics, Hawaii Energy will reach customers across Hawaii, Honolulu and Maui counties and maximize reach and effectiveness with continuous analysis and refinement.

2.2 Key Objectives

For Marcom, the key objective continues to be to increase awareness and participation in Hawaii Energy's offerings. The primary call-to-action for customers is to go to our Hawaii Energy's website or contact our call center. Where the offerings and/or applications are available only at retailers or other distribution points by design, the call-to-action is adjusted accordingly.

Specific new segments to be targeted are:

- *Residential* – Multi-family direct install candidates and homes with T12 and MR16 lamps for participation in Customized Energy Solutions for the Home (CESH)
- *Business* – Warehouse high bay lighting, High Intensity Discharge (HID) lighting replaced with new Light Emitting Diode (LED) lighting fixtures coupled with lighting controls.

Additionally, PY15 is the opportune time to revisit and use a more aggressive, yet local and relatable, approach to market the Program. This approach will leverage market research results from PY14, as well as selling and communication approaches such as those utilized and promoted by one of the Program's Transformational subcontractors, Mark Jewell of EEFG Inc. Such an approach is critical to the continued and increased success of the Program.

A brief summary of the market research, as well as high-level key considerations of an aggressive integrated marketing plan in PY15, are outlined below.

2.3 PY14 Market Research

Market research conducted in PY14 indicates that although there is low awareness of Hawaii Energy, many had heard of and had participated in some of our offerings.

Specifically from the telephone phone and online surveys (the quantitative component of the market research):

- Out of a base of 624 surveyed, 10% reported having contact with Hawaii Energy.
- Of those who had heard of Hawaii Energy, 43% could describe – unaided – an offering from Hawaii Energy.
- As for aided awareness of 5 specific offerings (i.e., solar water heating, Home Energy Reports, ENERGY STAR® appliances, efficient light bulb low prices & old refrigerator rebates), it ranged from 35% to 78%.
- As for participation in those same offerings, it ranged from 15 to 34%.

The market research also included two qualitative components (i.e., focus groups and one-on-one interviews). A summary of the key findings of the market research was presented to key Hawaii Energy and PUC staff by the independent market research subcontractor, and a written detailed summary provided for further analysis. Highlights of the research will be outlined in the PY14 Annual Report.

In short, the research indicates a strong need to increase Hawaii Energy's brand (i.e., name) awareness to increase participation. In addition, of note, those surveyed online were asked how they get most of their information. They were allowed to check off a list and indicate all that applied. A majority indicated the Star-Advertiser, Hawaii News Now, KHON-2, word-of-mouth, websites, direct mail and radio, among other responses. Key feedback such as the above will be analyzed and considered for the PY15 marketing plan.

Considering the above, where appropriate, the Program will continue to integrate cost-effective and relatable branding into offer-specific marketing communications strategies and tactics.

2.4 Overview of Integrated Marketing Plan

The cornerstone of Hawaii Energy's PY15 integrated marketing plan is continuing to refine and use clear messaging that Hawaii Energy is the energy conservation and efficiency program funded by electric customers to serve electric customers in a way that excites and engages the different segments of the electric customers – with the goal of their participation in Hawaii Energy offers.

As always, critical to the marketing plan – and all Marcom strategies and tactics – is the development of the exact messaging that will resonate with electric customers, yet still be simple and memorable for customers to carry out the call-to-action.

2.4.1 *Integrating All Components of Marketing*

As an integrated marketing plan and to add credibility and relatability to the Program, the Program will continue to increase the reach of and participation in the Program's offerings through robust strategies and tactics, including but not limited to public relations, outreach, promotions, web and social media to maximize success. An overview of the strategies and tactics are outlined in the sections below.

Specifically, public relations includes media relations with the goal of securing "earned media" in mainstream, community and trade publications such as bylined articles and feature stories to keep the Program top-of-mind for and to increase participation from various segments of the electric customer population.

Additionally, while the Program's outreach activities have evolved significantly over time to include well-attended and engaged electric utility customers from a wide range of demographics and geographical areas, a significant uptick in web traffic and social media-based engagement will be the focus in PY15. See Outreach section below.

2.4.2 *Leveraging Strategic and Cost-Effective Advertising to Expand Reach and Increase Participation*

To maximize reach while maintaining cost-effectiveness, the Program will also continue to develop and utilize a mix of strategic advertising which will be integrated with the messaging of all other marketing communications strategies outlined herein. The timeframe, total reach and mix of advertising among these media will be determined to maximize effectiveness and the budget available. PY14 advertising highlights and metrics will be included in the PY14 Annual Report.

PY15's advertising may include but is not limited to print, radio, TV and online medium. Where feasible, built-in metrics for the Program to gauge not only interest from the target markets – but action or participation will be worked on, tracked and analyzed. This will expand on PY14's successes, including PY14's one-month online advertising buy to promote Residential energy-saving kits, which provided metrics ranging from interest (e.g., click-throughs) to "conversion" (i.e., opt-in/purchase of the kits). Results and metrics from PY14's advertising buys will be highlighted in the PY14 Annual Report.

Details and components of the media buy, including but not limited to frequency, estimated impressions or reach and audience demographics, are to be determined based on budget availability, as well as the offers being promoted and target markets. Where appropriate, the Program will work with the media directly or a media buyer to negotiate the best pricing and placement available for the buys and inclusion of added-values where available (e.g., "complimentary" or "built-into the buy" additional promotional opportunities such as bonus mentions and invitations to participate in strategic outreach events) to maximize the impact of the advertising budget.

2.4.3 *Evaluation to Increase and Measure Success of Marketing Plan*

Progress and results of marketing strategies will be tracked and analyzed with continuous pre- and post-evaluation to determine the effectiveness and success of the messaging and tactics in relation to industry-established metrics. The Program will continually monitor and remain flexible throughout the Program year to adjust strategies and tactics, where needed, based on the evaluations to maximize success.

Evaluation methods include, but are not limited to, cost-effective phone and online surveys, as well as website and social media metrics. Specific evaluation methods will be determined and tailored for each strategy and tactic to provide the Program with the most relevant and useful metrics on an ongoing basis to allow for readjustments as needed during the Program year.

2.5 Overview of Marketing Strategies and Tactics

To continue to increase awareness of and participation in the Program's Residential, Business and Transformational offerings, the Program will leverage industry-recognized strategies and tactics including those outlined below: (1) outreach; (2) website; (3) social media; (4) promotions; (5) videos; (6) email marketing; (7) co-op marketing with Clean Energy Allies; (8) marketing collateral; (9) direct mail; and (10) public relations.

2.5.1 *Outreach*

The Program's community outreach efforts continue to play an important role in increasing and maintaining the awareness of Program rebates and offers for the general customer population and business communities.

As of PY14 third quarter, Hawaii Energy has participated in 31 events and is on track to reach a total of 45 events for the entire program year, reaching approximately 107,705 people (estimated event attendance). This includes a mix of traditionally well-attended residential community events and business trade expos, as well as smaller, industry-tailored events where we were able to promote specific sets of offerings (i.e., small business lighting, restaurant kitchen, etc.). For PY15, the Program will again aim for upward of 40 events during the year, continuously evaluating for cost-effectiveness, reach and lead generation potential.

A few highlights of PY15 outreach efforts include:

- *Traditional Outreach* **-** For PY15, the Program will continue to participate in the community and trade expo events that proved to be successful based on post-event surveys, historical participation, audience, attendance and location. While striving to maintain reach levels consistent with past program years, the Program will research new opportunities and partnerships, strategically incorporating new events if they are deemed feasible and beneficial in reaching overall Program goals. Marcom will also re-evaluate tracking and evaluation metrics in PY15 to ensure outreach remains a high-value portion of overall marketing efforts.

- *Outreach Through Community Allies & Organizations* - The Program will continue to align itself with organizations that: 1) share a common or similar objective of helping the community through environmental and/or sustainable efforts, or 2) reach market sectors that would benefit from specific business, residential or transformational offerings (i.e. promoting restaurant-related incentives at a foodservice industry association meeting). These strategic partnerships help the Program increase its ability to reach more electric customers, as well as "hard-to-reach" populations.

- *Collaborate with Hawaii Businesses and Organizations* - Hawaii Energy will increase collaboration with private businesses and industry/nonprofit organizations to facilitate other creative or more targeted ways of disseminating Program messages. These methods may include tailored presentations by Hawaii Energy team members and collaborating on special events as appropriate. In addition, Program personnel will join and participate in professional organizations that are important for the Program to support as an active member, provided there is no actual or appearance of conflict of interest.

2.5.2 *Website*

The Program's website serves as a resource for electric customers and Clean Energy Allies to learn about how homes and businesses can save energy and money on their electric bills. The Program designs and maintains the website in-house and the site's design was refreshed to incorporate new offers and interactive customer tools.

The Hawaii Energy website receives, on average, 19,000 page views from roughly 5,000 unique visitors per month. (More metrics will be available in the PY14 Annual Report.) For PY15, Hawaii Energy will continue to review and refine the website to ensure that it is providing a relevant and positive user experience. The Program's goal is to increase page views and unique visitors by 10% and to re-evaluate its website metrics and web design to improve customer engagement and experience.

At the beginning of 2014, Hawaii Energy developed a "Dare-to-Compare" website tool to engage customers with live, personalized information regarding their energy usage as compared to their neighbors. We will continue to refine this tool in PY15, providing greater segmentation (e.g. markets, sizes of homes) capabilities and layering with GIS and other data sources.

2.5.3 *Social Media*

Hawaii Energy continues to use social media (i.e., Facebook, Twitter and Instagram) as a low/no-cost tool to market Program offerings, stay at the forefront of customers' minds on a daily basis, and most importantly, keep a pulse on our community.

As of PY14 third quarter, Hawaii Energy has over 3,500 Facebook "likes" and over 2,700 Twitter followers, counts that remained consistent (i.e., without significant drops) over the year. Additionally, the Instagram account, which was started in PY13, is up to 136 followers.

For PY15, the Program will continue to provide interesting and relevant content, while developing a solid social media strategy – with the ultimate goal to increase not only follower count, but other important metrics such as reach, virality (number of people talking about our brand) and conversion (translating post viewing into program participation). Options to execute this strategy can include, but are not limited to: (1) developing a refined editorial calendar and set of goals; (2) advertising on social media platforms, which is traditionally inexpensive compared to other mediums; and (3) executing 1-2 timed campaigns around specific program offers throughout the year.

2.5.4 *Promotions*

The Program will continue to develop promotions to bring excitement and increase word-of-mouth for Hawaii Energy. Promotions will be developed based on specific offer or Program goals, but may include contests (e.g., social media, photos, videos), special promotions via our Clean Energy Allies, community promotions through local nonprofits, seasonal promotions and discount offers. The Program will identify and track participation metrics to determine the success of the promotions. Results (including metrics, successes and lessons learned) of PY14 promotions will be highlighted in the PY14 Annual Report.

For PY15, the promotions plan includes:

- *Residential* – Special discount offers to promote products available at Hawaii Energy's online store. Online sweepstakes for customers to register to win a free energy-saving device.

  Special discount offers to promote products available at Hawaii Energy's online store. Online sweepstakes to encourage customers to check their Dare-To-Compare results and win a free energy-saving device.

- *Business* – Promotions on incentives will be limited should it be determined that they will move the market to a meaningful degree. Rather, the Program will look towards promotions akin to SPFFs and other sales-oriented incentives to motivate Clean Energy Allies who are more instrumental in selling energy efficiency.

2.5.5 *Videos*

Marcom recognizes and understands that videos can be powerful for drawing in and retaining the attention of its customers. As such, the Program will continue to explore the strategy of conveying our messages through videos.

For PY15, the Program's goal is to build a library of resource videos for residential and commercial customers. Video content can range from featuring success stories/testimonials from residential and commercial customers, energy-saving tips and educational "how-to" videos. The videos will be featured on our website and YouTube pages, as well as promoted through our e-newsletters and social media channels.

2.5.6 *Email Marketing*

As of PY14 third quarter, Hawaii Energy has over: (1) 10,500 subscribers to the monthly "residential" e-newsletter, (2) 800 to the "business" e-newsletter distributed every other month and (3) 750 to the "energy professional" e-newsletter distributed periodically when the Program extends offers to that target market.

In PY15, the Program will continue to develop and implement a robust email marketing system to support Program communications. The Program will work to maintain and increase the number of email subscribers; better integrate/share email marketing communications via web and social media; and maintain high open rates of over 30%.

Additionally, the Program will work to increase its email subscribers by 10 - 15% for the "residential" and "business" e-newsletters. Additionally, the Program will collaborate with the Clean Energy Ally Specialist and the Business Program team to increase subscribers to the "energy professionals" e-newsletter by 5 - 10%, which by its nature is a niche audience.

For PY15, the Program will maintain the frequency of its email distribution. The "residential" e-newsletter will continue to be a monthly distribution and the "business" e-newsletter will remain a bi-monthly distribution. The "energy professionals" e-newsletter will continue to be on a periodic basis depending on Program offerings and promotions developed.

2.5.7 *Co-Op Advertising with Clean Energy Allies*

Cooperative ("co-op") advertising is a mechanism by which Hawaii Energy contributes some funds to the advertising costs of Allies, provided Allies comply with certain specific approved messaging and logo inclusion rules, as well as request pre-approval from and allow preview rights to Marcom.

Co-op advertising is a cost-effective way for the Program to collaborate with our Allies, increase our brand awareness and maximize our marketing budget. The Program launched co-op advertising to residential solar water heating participating contractors in the second quarter of PY13 and had a slow start. However, contractor participation to date in PY14 significantly increased by 50% with approximately 66% of the $25,000 budget earmarked and 8 contractors participating. In PY14, the Hawaii Energy co-op cap per contractor is $3,000 for up to 50% of the cost of the ad(s).

For PY15, the Program will continue to offer co-op advertising to residential solar water heating residential contractors and adjust the co-op cap in consultation with the Residential team, as needed. Additionally, the Program anticipates expanding the offer to all Clean Energy Allies with an increased overall budget but a lower monetary cap to allow Clean Energy Allies to participate.

2.5.8 *Marketing Collateral*

To support all Marcom and Program objectives, as appropriate for the audience, the Program will continue to:

- Maintain, update and expand a collateral system to support the residential, business and transformational programs. This can include, but is not limited to, brochure development, rack cards, flyers, one-sheets and posters.

- Ensure that important information and messaging are written and organized in an easy-to-understand manner for the audience whether they are general population customers, strategic partners or Clean Energy Allies.
- Highlight the businesses and organizations that have participated and been helped by the Program through the development of case studies/testimonials.

2.5.9 *Direct Mail*

Direct mail to geographically-targeted areas is a new channel that the Program will further explore in PY15. In PY14, the Program utilized current data and customer information to strategically promote our solar water heating offer. The direct mail piece was sent to approximately 50,000 residents across all three counties. Market segmentation included households that: 1) are larger than 700 sq. ft., 2) consume more than 700 kWh/month over the last 12 months, and 3) have never participated in the solar water heating rebate.

In PY15, the Program will consider implementing additional targeted direct mail and other integrated marketing efforts to promote various rebates and energy efficiency measures to businesses and residential customers, when applicable. In addition, the Program will continue to work with Hawaiian Electric to distribute targeted messaging and inserts through the electric company's business and residential monthly bills across the counties. For any offering promoted via direct mail, the Program will track and analyze the effectiveness of customers' interest and/or participation by assigning specific website addresses or codes in the direct mail as the call-to-action.

2.5.10 *Public Relations*

Public relations ("PR") is the strategic communication process that fosters mutually beneficial relationships between organizations and the general public. The news media is the primary medium to shape, articulate and amplify a particular message or issue. Unlike paid-for advertising, news coverage is "earned" rather than purchased and validated by a third-party (i.e., the media), which enhances its credibility.

2.5.10.1 Media Relations

Hawaii Energy will continue to secure local news coverage throughout the State, as well as “third-party endorsements” (e.g., testimonials or positive, endorsing statements) from community leaders and key stakeholders. The volume of earned media coverage may vary month-to-month based on the nature of the program’s announcements and pitches, as well as competing breaking news stories.

Local media outreach will include the following:

- Mass print media (e.g., Honolulu Star-Advertiser, Pacific Business News, Midweek, Hawaii Business Magazine and numerous neighbor island newspapers)
- Mass broadcast (e.g., KHON, Hawaii News Now, KITV, Hawaii Public Radio, FM & AM radio)
- Trade publications (e.g., Building Industry Hawaii, Hawaii Hospitality)
- Community and professional organizations (e.g., via newsletters, emails, presentations and/or collateral distribution)
- Online media (e.g., local blogs, local community-minded websites)

Media training will continue for staff and subcontractors as needed to ensure Hawaii Energy’s messaging is clear and consistent when reported on by the news media. In addition, the Program will work with select Hawaii Energy staff members to develop “personal interest” stories aimed at featuring their background and community involvement as an additional tactic to secure media coverage for the Program where appropriate.

As of PY14 third quarter, media coverage for the Program had a reach of more than 9.4 million with an estimated publicity value of over $168,000. The estimated reach of the media coverage was calculated by multiplying the circulation/audience figures of each media by three, which is a generally-accepted calculation method within the public relations industry. Publicity value is calculated by multiplying the advertising value equivalency by three, which is a factor generally accepted by the marketing industry. Advertising value equivalency is what the editorial coverage would cost if it were advertising space (print publications) or on-air time (television and radio).

For PY15, Hawaii Energy’s goal is to secure two to five media stories per month and increase advertising value of the media coverage for the overall program year by 15%. Since earned media coverage is a third-party opinion, the impact is considered three times that of a paid advertisement. Therefore, the program's reported advertising value is multiplied by three, which is a widely-accepted metric in the PR industry. Advertising values of media coverage are summarized in annual reports.

2.5.10.2 Program Positioning

For PY15, Hawaii Energy will identify 6 to 8 opportunities to coordinate informational presentations to introduce/reintroduce the Program to and influence energy efficiency decision-makers and buyers including the "hard-to-reach" segments to increase participation in Program offerings.

This will include leveraging existing relationships with government agencies, community service organizations as well as maximizing the Program's potential sponsorships with entities such as the Chamber of Commerce of Hawaii. Additional organizations will include, but are not limited to the following: energy industry professionals, business groups, AOAOs and large employers.

As discussed earlier, PR is one of the key complementary components to maximize success of the marketing plan. PR will reinforce Hawaii Energy's unique attributes and benefits for electric utility customers. There will be a sustained effort throughout PY15 to support Hawaii Energy staff and/or key subcontractors with presentation training, community outreach preparation and event coordination as needed.

3.0 TRANSFORMATIONAL ACTIONS

3.1 Overview

Market Transformation seeks to identify, assess and help overcome market barriers that inhibit residents and businesses from adopting energy-efficient technologies and practices. Projects areas include:

- **Behavioral modification** initiatives targeted to specific audiences
- **Professional development** for energy salespeople, teachers, and others who can influence decision making
- **Technical training** for people who buy or operate equipment
- **Energy in decision-making** support for large energy users to develop comprehensive energy management strategies incorporated in business practices

Projects are delivered through established programs that have proven successful over time and new initiatives. Established offerings are continually evaluated for opportunities to improve and expand. New initiatives include research to identify market leverage points and pilot projects to find scalable solutions. The goal of the Transformational program is to effect large scale change that saves energy over a three to five year time horizon.

3.2 Key Objectives

The key objectives of the Transformational programs are to:

- Leverage the work of others in the community to reach across all islands and ratepayers
- Implement projects that will reduce energy consumption in the state within a five year period
- Leverage resources to support the development of self-sustaining efforts
- Build on successes and lessons learned in past program years
- Support the development of a robust Clean Energy Ally Program to leverage energy industry professionals to multiply energy efficiency projects
- Develop programs that support institutional change for energy efficiency that include strategic energy management, codes and standards, benchmarking, and renewables integration
- Pilot new projects that can lead to scalable programs with measurable savings
- Develop outcomes-based logic models and evaluation metrics to better measure progress, inform program design, and ensure savings potential is maximized

3.3 Behavior Modification

Behavior modification programs aim to help people make daily decisions that reduce energy use. These efforts require a range of efforts and dynamic programs in order to reach this diverse target market. For PY15 we will continue to focus on the foundation of energy literacy and strive to reach the mass market as well as "hard-to-reach" residents in underserved communities in Hawaii, Honolulu and Maui counties.

We will also build on efforts to better quantify savings such as through Community-Based Social Marketing pilot projects that target specific, high impact behavior changes. The Program will use knowledge gained from our PY14 pilots and intelligence gathered from research on technology and best practices to demonstrate the effectiveness of behavioral change.

The following outlines the PY15 portfolio of Behavior Modification offerings planned:

- *"Sharing the Aloha" Community Workshops* – This workshop blends financial and energy literacy to connect energy-related behavior and choices to one's electric bill. Workshops will target community organizations, housing and condo associations and government housing agencies that can provide access to a large number of residential customers (e.g. municipalities, hotels, etc.).

- *Creation and Distribution of Transformative Messaging*
  Hawaii Energy will continue with its communications campaign to increase the availability of energy-saving information using culturally-relevant images, videos, phrases, etc., that is spread via the Internet and in creative and often humorous ways. Content will start discussions and promote existing residential offers. We will also track the effectiveness of the messaging in increasing participation in rebate programs.

  Hawaii Energy will promote energy saving competitions (e.g. gamification) for local businesses and community groups. These have proven successful in teaching and promoting energy-saving behaviors, multiplying Hawaii Energy's reach and local workforce understanding of the importance of energy efficiency.

- *Community Based Social Marketing (CBSM)*
  Building on research that was launched in PY14, the CBSM program will target specific energy efficiency behavior changes in the Association of Apartment Owners (AOAO) condo market. The work will pilot behavior change projects and also build local capacity to implement data driven, outcomes-oriented behavior modification programs.

  We will continue to develop Hawaii Pacific University's (HPU) Energy Ambassadors pilot program and build on PY14 work to engage office occupants in specific behavior modification programs and develop a resource kit for CBSM implementation at Hawaii colleges and universities.

- *Community Education Support* – Support collaborative efforts to raise awareness and educate the community about energy efficiency
  - Continue to sponsor the University of Hawaii's Annual Sustainability in Higher Education Summit, which has been a catalyst for improving energy efficiency policy, education and awareness throughout the UH System as well as other institutions of higher education.
  - Continue to sponsor the ongoing work of Hawaii Green Growth (HGG) in the development of the online dashboard with statewide energy metrics. We will provide technical expertise on the Sustainability Measures Project, and collaborate with HGG Working Group members keeping energy efficiency at the forefront of the discussion.

- *Market Research* – The Program will work with a cross disciplinary team of faculty at the University of Hawaii to develop a methodology to test various time-of-use rate structures to drive behavior change. This is to assist the utilities in filling the daytime PV load depression and control the nighttime peak loads.

- *Smart Grid* – Build upon the lessons learned from PY14 in order to enhance Home-Area-Network (HAN) implementation of the smart grid benefits to customers and the utility. The actions will include:
  - Developing meaningful follow-up actions to our current pilots, and potentially enhanced with Home Energy Management System (HEMS) applications such as smart thermostat, smart plug, water heater controller, and photovoltaic sub-meter for EE and load shifting opportunities.
  - Engaging current pilot participants with EE messaging and 15-min interval energy feedback to demonstrate the concept of Time-of-Use (TOU).
  - Evaluating the initial Smart Grid Phase 0 participants on near real-time energy use and Hawaii Energy program participation; and
  - Evaluating the effects of the HEMS applications, In-Home Display (IHD), Mobile Apps monitor in producing behavioral changes that could result in energy-savings.

- *Shift for Savings Plan*

  In response to the lesson learned that "demand response" (DR) and "load control" have negative connotations associated with the terms, Hawaii Energy will refer to these programs in a more customer-friendly ways such as "Shift for Savings Plan." We will build on our PY14 pilots and research to enhance certain current CBEEM and BESM program offers to include a requirement for load control. Our team will use knowledge gained by our two PY14 water heating load shifting projects to inform the CBEEM and BESM program design.

  We have committed to a demand response initiative for a new construction project consisting of 499 rental apartments, each with electric water heating. This is in support of efforts by Shifted Energy, HECO and the developer to coordinate the install of grid interactive water heaters.

- *Electric Vehicle Support* – The Program will upgrade its new electric vehicle owner energy-saving kit offer to online fulfillment in PY15. Additionally, the Program will continue broad support for EVs. For example, in an effort to raise awareness, Hawaii Energy will incorporate Electric Vehicle (EV) messaging throughout the program and provide marketing and communications support. The Program will also continue supporting various DBEDT and Blue Planet-sponsored EV awareness activities to include participation in EV Partnership meetings, outreach events and providing information as well as other promotional items.

3.4 Professional Development

Professional development is aimed at people in positions to influence energy decisions in the home and in businesses.

3.4.1 *K-12 Educator Training and Development*

The coming year will focus on a refinement of the K-12 teacher professional development to offer a phased approach that provides opportunities for teachers to continually engage with energy efficiency, develop their energy literacy and curriculum, and support students and their families to practice energy-saving behaviors in the school and at home. The Program will focus on deepening ongoing relationships with teachers who commit to being leaders in energy efficiency. Particular attention will be given to engaging with parents through Energy Expos and connecting them to Hawaii Energy resources such as the "Dare-to-Compare" tool. Hawaii Energy's Teacher Advisory Board (TAB) will continue to provide feedback on the program (e.g. curriculum and materials) and pilot the new phased approach.

3.4.2 *Facility Management Degree Program*

In fall 2015 the University of Hawaii West Oahu, in collaboration with the International Facility Management Association of Hawaii, will officially launch their four year degree in Facility Management to meet the rising demand for skilled professionals in the field. Hawaii Energy plans to continue to support this initiative with funding as well as technical and industry expertise.

3.4.3 *Energy Efficiency Sales and Financial Analysis of Energy Projects Training*

PY15 will see the continuation of training for energy professionals to be effective at getting projects approved. This program year we will produce tools, templates, and case studies to support market penetration of effective sales techniques. We will also develop targeted offerings for specific market segments such as the AOAO market, universities, and executive level business leaders. This program emphasizes contractor engagement with Hawaii Energy's Clean Energy Ally program.

3.4.4 *Hawaii Energy Fellowship Program*

Program modification will focus on the reduction of management costs and expanded intern assignment scope to offer higher level work products that assist with the growth of innovative Transformational offerings in PY15. We plan to move to a more customized internship program with peer-to-peer mentorship that provides fellows with increasing leadership responsibilities. This will lay the foundation for future expanded reach and impact at a reduced Program cost.

3.5 Technical Training

Technical Training is focused on people who buy or operate equipment such as engineers, facility managers, architects, building operators, and energy managers. These professionals have typically had experience in infrastructure and energy for a substantial portion of their career, but may need to enhance their technical skills.

3.5.1 *Facilities Management Training*

The Program will continue to offer training for existing facilities staff, managers and technicians to support their role in implementing energy efficiency upgrades. This will include technical training workshops on HVAC, lighting, pumps, motors, etc. to be promoted throughout the year. We will also facilitate and support strategic planning to ensure that Hawaii's various offerings related to facilities management and energy efficiency are coordinated including: the Bachelor of Applied Science (B.A.S.) degree program in Facilities Management at the University of Hawaii – West Oahu (UHWO), UH Maui College Sustainable Living Institute of Maui (SLIM) and other partners.

3.5.2 *Building Operator Certifications (BOC®)*

Building Operator Certification Level I and Level II training sessions with University of Hawaii's Manoa Outreach College and Maui College's Sustainable Living Institute of Maui (SLIM) program will be supported. The Program also plans to expand this offering to include Hawaii County for the first time.

3.5.3 *Water/Wastewater*

The Program will continue to sponsor efficiency and conservation education for entry-level water and wastewater operators through the SLIM program. Hawaii Energy will continue to work with groups such as the Rural Community Assistance Corporation and the Hawaii Rural Water Association to offer trainings, outreach, networking, and project identification.

3.5.4 *Support Business and Residential Program Offerings*

Develop additional trainings as time and budget allows that support the development of technical expertise to increase adoption of business and residential programs.

3.6 Energy in Decision Making

3.6.1 *Strategic Energy Management (SEM)*

The Program will introduce the processes of SEM and develop a set of tools and resources to assist large institutions to comprehensively plan for effective energy management as a critical part of their business decision making and exponentially increase the number and effectiveness of energy efficiency projects that are considered as part of the strategic vision and plan of the organization rather than a specific isolated project. This approach will lead to deeper and more meaningful energy efficiency throughout the organization.

- Hawaii Energy plans to assist in the development of a long-term Strategic Energy Plan with the University of Hawaii to improve energy management and educate faculty, staff and students in energy efficiency and conservation practices.

3.6.2 *Codes and Standards*

Hawaii Energy will continue to work with the State Building Codes Council (SBCC) to adopt IECC 2015 with Hawaii amendments. Utilizing the codes compliance report we completed in PY2014, we will inform the industry of current strengths and challenges in energy code compliance. Hawaii Energy will be a resource to help permit reviewers and building designers understand and comply with Hawaii's energy codes and standards. Next steps include providing a summary report and action items to county building officials, DBEDT, and other professionals as well as offering practical and specific training on the latest adopted energy code.

3.6.3 *Benchmarking*

The Program will continue in-house efforts to benchmark facilities and business sectors in PY15, with a goal of 150 new locations. We will identify, by sector, facilities with above-average energy use intensities (EUI) and present them with a team approach to evaluate their consumption, identify energy-saving opportunities and provide technical assistance and incentives that will remove barriers to the successful implementation of these energy conservation measures. The new locations, along with the 500+ previously benchmarked locations from PY14, will also be a valuable resource for direct targeting of residential apartment buildings through our Multifamily Direct Install program.

4.0 RESIDENTIAL PROGRAM STRATEGY & DETAILS

4.1 Overview

For PY15, Hawaii Energy will maintain the following incentive categories:

- *Residential Energy Efficiency Measures (REEM)* – This incentive category is the core of Hawaii Energy's residential portfolio and undergoes incremental developments responding to market conditions (i.e. retail pricing) and consumer need.
- *Custom Energy Solutions for the Home (CESH)* – This incentive category provides a measure of flexibility within the prescriptive portfolio to accommodate unforeseen market opportunities. The budget and unit cost targets provide financial efficacy guidance to the Program and allies who champion these opportunities.
- *Residential Energy Services & Maintenance (RESM)* - This incentive category targets ally-driven service offerings to enhance energy savings persistence and bootstrap fledgling energy services businesses trying to secure a toehold in Hawaii.
- *Residential Hard-to-Reach (RHTR)* – This incentive category will seek to secure various projects among geographies and demographics that have been traditionally underserved. Efforts in PY15 will continue to address the landlord/tenant barrier through direct installation of home energy saving kits and heat pump water heaters.

A summary listing of the updated Residential Program offerings can be found in the table below followed by a brief summary of additions and changes. A detailed description of the Residential Program offerings follows in section 4.1 through 4.5. Appendix B contains a projection of potential energy savings for the planned programs.

Figure 4: List of Residential Programs

Residential Programs
REEM
High Efficiency Water Heating
High Efficiency Lighting
High Efficiency Air Conditioning
High Efficiency Appliances
Energy Efficiency Equipment Grants
Energy Awareness, Measurement and Control Systems
CESH
Customized Project Measures
RESM
Residential System Tune-Ups
RHTR
Energy Efficiency Equipment Grants
Direct Installation - Residential Energy Kits

4.1.1 *New Program Offerings of Residential Energy Efficiency Measures (REEM)*

4.1.1.1 High Efficiency Water Heating

- *Solar Water Heating* - During PY15, the solar water heating (SWH) program budget will see a reduction in total unit count to 1,450 as well as a reduced rebate amount of $750. These modifications are required given a SWH market penetration of over 45% of eligible residences, increased sales of PV-direct water heaters, PV-only contractors capturing complete rooftops and a shifting baseline due to codes and standards. Most importantly, this is a significant effort to better align the SWH program's cost effectiveness with the overall Program goals.
- *Heat Pump Water Heaters* - In PY15, the Program will focus on heat pump applications in multifamily settings. We will address this market with an increase in the standard incentive for heat pumps from $200 to $300. We will also continue to work with government housing agencies, condominium association boards and property management companies to identify multifamily properties well-suited for Hawaii Energy's Heat Pump Direct Installation Program.

4.1.1.2 High Efficiency Lighting

- *CFL Lighting* - PY15 will see a reduction in the number of CFL bulbs rebated through the residential program. This transition allows the Program to expand incentives available for the growing LED market. Hawaii Energy will also continue PY14 efforts to move away from the larger big box stores and design effective promotions with local retailers who serve a customer base otherwise inclined to stay with incandescent alternatives.
- *LED Lighting* - While not new to the residential portfolio, LEDS are becoming a more predominant energy saving lighting option for residential consumers. The Program closely follows availability (rising) and pricing (decreasing) in order to maintain adequate incentive levels. The PY15 plan includes 781,000 LED rebates, an increase of 260% from the PY14 plan. The Program is also reducing the average dollar value per LED rebate to $3.75 in order to properly align with lower market prices. Qualified LED technologies will continue to expand in the coming year and the Program's educational marketing efforts will be matched accordingly to ensure customers are well informed to make the appropriate purchase choice to meet their needs.

4.1.1.3 Energy Efficiency Equipment Grants

- *Online Marketplace* – Hawaii Energy will expand the provision of energy-saving devices through our online store launched in PY14. During PY15 we will incorporate additional web-based marketplace services for customers. We plan to include a customized user experience with product education and purchase options for lower cost energy-saving devices not as readily available in local retail locations. The online marketplace will have savings calculators addressing specific customer characteristics. This will result in customized suggestions for applicable energy-efficient technologies. Customers will then be able to take advantage of instant rebates for the purchase of products like advanced power strips, small appliance timers and occupancy sensors, which will be shipped to their door.

4.1.1.4 Energy Awareness, Measurement and Control Systems

- *Peer Group Comparison* – Hawaii Energy will nearly double the Peer Group Comparison program in PY15 to reach an additional 110,000 households. Over the last four years, this program has grown tremendously due to its effectiveness in motivating behavioral responses surrounding energy use in the home. Home Energy Reports are easily recognized and often commented on by utility customers. Customers receive additional insight into how their usage compares to similar households and the reports provide energy-saving tips while promoting available Hawaii Energy rebates. This program maintains a lower opt-out rate than most other similar initiatives nationwide. In PY14, we utilized more data-driven market segmentation to develop customized messages to customers. We will continue these enhancements in PY15 to include more dynamic messaging based on customer usage profiles. Messages will encourage sign-ups for email-based Home Energy Reports and the use of online web portal tools to track energy-saving progress. This expansion aligns well with the Leidos-created “Dare-to-Compare” tools available at HawaiiEnergy.com.

- *Whole House Energy Management Systems and In Home Displays* – While not new to the residential portfolio, the market approach to promoting whole house offers will evolve. Specifically, Hawaii Energy will use lessons learned from PY14 pilot projects and data from industry working groups to qualify technologies. We will also explore targeting specific high-use households to consider this measure.

- *Small Appliance Timers* – Building on the PY14 water cooler timer program, Hawaii Energy will expand the offering to encourage the use of timers on small household appliances and items such as bathroom exhaust fans and bedroom lighting. This will be accompanied by educational outreach and marketing surrounding plug load management within the home.

4.1.2 *New Program Offerings of Custom Energy Solutions for the Home (CESH)*

Customized Project Measures

- *Green Neighborhood Program* – We will continue to support the implementation of the Green Neighborhood Program direct install efforts in Moanalua and Pearl City neighborhoods. This project was originally awarded funding as part of the PY14 Energy Efficiency Auction but faced constraints in execution within the original one-year timeline. PY15 will target 1,800 homes for the direct installation of high efficiency showerheads, faucet aerators, advanced power strips and CFLs, with an added effort to address water heating insulation, air conditioning filters and refrigerator coil cleaning. These efforts also include a comprehensive marketing strategy to enroll residents during an outreach and education campaign in their neighborhood.
- *Custom Lighting Program* - PY15 includes $200,000 for custom lighting incentives. LED technologies have improved significantly in the past few years and the Program is now well positioned to encourage the replacement of lamps not previously addressed by the more traditional upstream lighting market. This new program will allow Hawaii Energy to specifically target the existing energy saving potential in specialty interior and linear fluorescent lamps found in the residential sector. By leveraging our existing Clean Energy Ally Program relationships we can better identify and penetrate the appropriate market segment. We will also apply lessons learned from the commercial custom lighting and SBDIL programs to further remove any barriers associated with custom lamp and fixture functionality.
- *Custom Residential Hard to Reach Efficiency Measures*- In PY15 we have allocated $300,000 in funding to a Custom Residential Hard-To-Reach program. Participants will be identified and recruited based on their participation in past and existing Transformational programs like Sharing the Aloha and NEED.org. Rooted in a whole-home performance approach, this program is designed to convert Hawaii Energy's workshop attendees to active energy-saving program participants. We will utilize the Program's existing online tools to rank neighborhood energy usage and then analyze efficiency measures suitable to specific residences on a case-by-case basis. Customers will receive custom offers to participate in unique program offerings. Hawaii Energy will then measure energy usage to track and report on energy saving progress.

4.1.3 *New Program Offerings of Residential Energy Services and Maintenance (RESM)*

Residential System Tune-Ups

Central Air Conditioning Retrofit Pilot – This initiative will look at the effectiveness of replacing mid-life central air conditioning systems. The pilot will target single-family homes (generally 15-20 years of age) with central air conditioning that are ready to purchase a replacement system. The typical target home type will be equipped with central air conditioning units with EER of 10.0. The retrofit will consist of upgrading the primary unit to one with a higher EER of 13.0. These efforts may also require refrigerant upgrades and duct sealing which would result in higher costs for the customer.

4.1.4 *New Program Offerings of Residential Hard-to-Reach (RHTR)*

Energy Efficiency Equipment Grants

- *Direct Install Heat Pump Water Heater (HPWH)* - Hawaii Energy will work with government housing agencies and property management companies to identify ideal multi-family facilities to receive fully-funded heat pump water heaters. We will engage the Clean Energy Allies for the installation work and will build on efforts initiated in PY14 to appropriately address concerns for noise mitigation.

Direct Installation

- *Multi-family Direct Install* – Hawaii Energy is well-positioned to build upon the PY14 Multifamily Direct Install Program and expand the installation of energy-saving technologies like high efficiency showerheads, faucet aerators, advanced power strips and high efficiency light bulbs (CFLs and LEDs) in multifamily residences. In PY15 we will target over 4,000 households to participate in the offering; this includes multifamily properties with individually-metered residential accounts and commercial master-metered accounts. The Program has a strong pipeline of leads and continues to engage property managers and government housing agencies to identify potential participants. We are also engaging additional properties through existing submetering and benchmarking efforts. This multifaceted approach will continue in PY15 as it has proven effective in gaining access to the multifamily market which has historically been slower to participate in existing rebate programs.

4.1.5 *Residential Program Details Table of Contents*

To follow, in Sections 4.2 through 4.5, is an overview summary of Residential Program Offerings followed by detailed descriptions and energy savings. The overall program details are provided on the following page, preceding the individual Program summaries.

Program Category	4.1 Residential Programs Overview Overview of All Categories
Target Market	• Homeowners, Landlords, Tenants and Property Managers • Manufacturers, Distributors, Dealers and Retailers • Solar Contractors, Plumbing Contractors and General Contractors • Architect and Engineers
Projected Impacts	Demand 11,016 kW Energy 60,490,414 kWh Incentive Budget $10,557,940 Cost per kWh $0.17 /kWh TRB $71,287,622
Technologies	**Incentivized Measures** — <u>**Incentive Forecast**</u> **Residential Energy Efficiency Measures** — $8,614,690 (37%) **Custom Energy Solutions for the Home** — $1,011,000 (4%) **Residential Energy Services & Maintenance** — $250,000 (1%) **Residential Hard-to-Reach** — <u>$682,250 (3%)</u> $10,557,940 (45%) • Solar Water Heating – Contractor Incentive $750 • Solar Water Heater Interest Buy Down $750 • Solar Water Heater – OBF contribution* $750 • Heat Pumps* $300 • CFLs $1.10 • LED* $3.75 • VRF Split System AC $200 • Window AC with Recycling $80 • Ceiling Fans – Under $80 Fans for HTR Households w/lights $35 • Solar Attic Fans $50 • Whole House Fans $75 • Refrigerator (Purchase only <$750) $50 • Refrigerator (with Recycling of Old) $100 • Garage Refrigerator/Freezer Bounty $85 • Pool VFD Controller Pumps $150 • Smart Strips $18 • Online Marketplace: Home Energy-Saving Kits - Advanced (Copay)* $30 • Online Marketplace: Home Energy Saving Kits - Standard (Free)* $20 • Room Occupancy Sensors & Timers $8 • Peer Group Comparison – Phase 1/2/3 $9.02/HH • Peer Group Comparison – Phase 4* $9.02/HH • Home Energy Metering Systems (HEMS) $100 • Water Cooler Timers – HOD Distribution $15

Program Category	4.1 Residential Programs Overview Overview of All Categories
	• Small Appliance/Lighting/Bathroom Fan – Timers* $5 • In Home Display – Co-incentive with Appliances/Direct Install* $100 • Direct Install – Green Neighborhood Program Carry Over* $0.32 • Custom Residential Lighting Efficiency Measures* $0.19 • Custom Residential Hard to Reach Efficiency Measures* $0.29 • Solar Water Heater Tune-Up $150 • Central Air Conditioning Retrofit Pilot* $1,000 • Refrigerator (with Recycling of Old) – Lanai and Molokai Equity $250 • Direct Install – Solar Water Heater (SWH) $9,000 • Direct Install – Heat Pump Water Heater (HPWH)* $2,500 • Multi-Family Direct Install – Energy-Saving Kits* $129/unit *New or expanded measures

4.2 Residential Energy Efficiency Measures (REEM)

<table>
<tr><td>Program Category</td><td>4.2 Residential Energy Efficiency Measures
4.2.1 High Efficiency Water Heating</td></tr>
<tr><td>Target Market</td><td>• Homeowners, Landlords, Tenant, and Property Managers
• Manufacturers, Distributors, Dealer, and Retailers
• Solar Contractors, Plumbing Contractors, and General Contractors
• Architect and Engineers</td></tr>
<tr><td>Impacts</td><td>Demand 749 kW
Energy 3,916,128 kWh
Incentive Budget $1,359,000
Cost per kWh $0.35 /kWh
TRB $8,327,034</td></tr>
<tr><td>Technologies</td><td><table>
<tr><td></td><td><u>Incentive</u></td><td><u>Units</u></td></tr>
<tr><td>Solar Water Heater (SWH) Incentive</td><td>$750</td><td>1,052</td></tr>
<tr><td>Solar Water Heater Interest Buy-Down</td><td>$750</td><td>50</td></tr>
<tr><td>Solar Water Heater OBF Contribution</td><td>$750</td><td>350</td></tr>
<tr><td>Heat Pumps</td><td>$300</td><td>900</td></tr>
</table>
(The following Water Heating Systems budgets are included in the plan under the RHTR-Energy Efficiency Equipment Grants. See section 4.5.1)
<table>
<tr><td>• Direct Install – Solar Water Heater (SWH)</td><td>$9,000</td><td>24</td></tr>
<tr><td>• Direct Install- Heat Pump Water Heater (HPWH)</td><td>$2,500</td><td>100</td></tr>
<tr><td>Total Water Heating Systems</td><td>$1,825,000</td><td></td></tr>
</table></td></tr>
<tr><td>Market Barriers</td><td>General
• Large up-front cost
• Strong demand for PV / low awareness of cost-effective SWH
• Trust and credibility of technology providers
• Quality of system design, equipment and installation
• Operational knowledge and maintenances of technologies

Owner-Occupant
• Access to and/or understanding of financial options
• Time between purchase and tax refunds (carrying cost)

Landlords and Property Managers
• May not pay for electricity cost
• Reluctance to invest without a financial return
• Short term investment

Renters and Lessees
• Do not have the authority or responsibility for the hot water system
• Renter lease term shorter than simple payback</td></tr>
</table>

Program Category	4.2 Residential Energy Efficiency Measures 4.2.1 High Efficiency Water Heating
Description & Implementation Strategies	**Solar Water Heating** *Solar Water Heater (SWH) Incentive* In PY15, the Program will provide a $750 rebate for solar hot water systems installed by qualified participating contractors. The process will be further streamlined from previous years but will generally include the following: • Customers contact a contractor from a list of participating contractors on Hawaii Energy's website. • Contractor comes to the home, reviews site conditions, interviews the customer to analyze hot water usage then provides a written proposal for a complete installation; Contractor's proposed sale price reflects the inclusion of the $750 rebate. • Contractor fills out the Program's worksheets and sizing forms. • Contractor provides rebate form and helps customer to fill it out. • Contractor provides Hawaii Energy with building permit number. • Contractor installs solar water heating system. • Contractor reviews system operation and maintenance with customer. • Hawaii Energy will conduct a small sample of post-installation inspections. *Solar Water Heater Interest Buy-Down* The Program works with participating lending institution to provide an incentive to buy down the interest charges for loans made on solar hot water systems that are installed by qualified participating contractors. This incentive will cover the loan interest up to a total maximum of $750. The process includes: • The customer contacts a participating lender from a list of participating lenders on Hawaii Energy's website. • The customer enters into a financing agreement with the lender that indicates the sale price, loan amount, interest component and the Hawaii Energy Incentive. • The customer works with a participating contractor to complete the standard installation process.

Program Category	4.2 Residential Energy Efficiency Measures 4.2.1 High Efficiency Water Heating
Description & Implementation Strategies (continued)	*SWH Incentive – OBF Contribution* For PY15, Hawaii Energy has allocated funding specifically for solar hot water systems installed through the upcoming Bill $aver (On-Bill Financing) program. The customer will work with the contractor to determine eligibility for the program. Once approved, these systems will be installed in accordance with the specifications for the standard incentives. **Heat Pump Water Heaters** For PY15, Residential heat pump rebates will be available at an increased value of $300. Rebate applications for water heaters are provided by the retailers at the time of purchase or a customer can visit our website and download the form. Rebate applications must include an original purchase receipt showing brand and model number. Promotional efforts will focus on heat pump applications in multifamily settings. **Implementation With Clean Energy Allies** The Program will conduct outreach with key allies including the Solar Technical Advisory Group, solar contractors, suppliers, government and housing agencies; financial institutions; and housing, apartment, and contractor associations. This team will promote the program, solicit feedback for more efficient program operation, and identify opportunities for implementation and coordination of efforts.

Key Changes	• Improved Program cost-effectiveness:
	  - Reduction in SWH incentive from $1,000 to $750
	  - Reduction in SWH inspection requirements
	• Cooperative marketing funds for solar contractors and lenders
	• Increased heat pump water heater rebates from $200 to $300
	• Focus on heat pump applications in multifamily settings

Marketing Strategies	• Comprehensive marketing initiative including online, print, TV and radio advertising • Customer billing data analysis for market segmentation and targeting • Direct contact with participating solar contractors • Community event promotion of High Efficiency Water Heating • Listing of participating contractors and solar water heating resources on our website

Program Category	**4.2 Residential Energy Efficiency Measures** **4.2.2 High Efficiency Lighting**
Target Market	• Homeowners, Landlords, Tenants, and Property Managers • Manufacturers, Distributors, Dealers, and Retailers
Impacts	Demand 4,663 kW Energy 33,011,880 kWh Incentive Budget $3,918,859 Cost per kWh $0.12 /kWh TRB $44,639,246
Technologies	**Incentive** / **Units** CFLs $1.10 900,000 LED $3.75 781,029
Market Barriers	**General** • Lack of understanding about how energy is used in the home • Disposal concerns • Lack of understanding as to which technology is the most appropriate for existing fixtures • Product availability of specialty and dimmable LEDs within the customer shopping area **Owner Occupant** • Ability to self-install • Ability to find appropriate bulb for fixture or ceiling fan • Disposal concerns • May not pay for electricity cost (condominiums) **Landlords and Property Managers** • No control over the hours used for lighting • May not pay for electricity cost • Reluctance to invest without a financial return • Short term investment **Renters and Lessees** • Do not have the authority or responsibility for the lighting fixtures • May not pay for electricity

Program Category	**4.2 Residential Energy Efficiency Measures** **4.2.2 High Efficiency Lighting**
Description & Implementation Strategies	The CFL and LED rebates are offered through manufacturer direct incentives which are provided as point of sale cost reductions. The process includes: • Distributors, retailers and manufacturers complete a program application in which they commit to advertising and promotion for instant rebates for the CFL and LEDs sold to customers. • Participating retailers agree to display signage showing the rebate has been provided by the Program, provide assistance in ordering and stocking qualifying products, and provide sales staff training. • Retailers agree to promote consumer education, undergo staff training and follow proper procedures. • Manufacturers provide accurate, timely data on point of purchase information by store by SKU for rebate reimbursement. **Implementation with Clean Energy Allies** The program is implemented through strong working relationships between the program, the major CFL/LED manufacturers and the national retailers. The participating CFL manufacturers are: GE, FEIT, Sylvania, Westinghouse, TCP and Philips. The participating LED manufacturers are: Cree, Feit, Philips, GE, and Lighting Science Group. Participating retailers include: City Mill, Costco, Don Quijote, Foodland, Home Depot, Longs Drugs/CVS, Safeway, Sam's Club, Times and Wal-Mart who have all utilized their buying power to offer a better blend of quality, affordable CFLs and LEDs across the State.
Key Changes	• Increased unit numbers and reduced incentive levels for LEDs to reflect market changes • CFL program focus shifting from big box stores to smaller local retailers
Marketing Strategies	• Significant focus on merchandising, including more requirements for in-store signage featuring Hawaii Energy brand and incentive amounts • Educational information online and in the media to inform customers on best practices for purchasing CFLs and LEDs • Advertisements to explain how to select a CFL or LED • Leverage allies to share CFL information and increase participation • Encourage an increase in selection of CFLs available • Promotion via social media

Program Category	**4.2 Residential Energy Efficiency Measures** **4.2.3 High Efficiency Air Conditioning**
Target Market	• Homeowners, Landlords, Tenants and Property Managers • Manufacturers, Distributors, Dealers and Retailers • HVAC and General Contractors • Architect and Engineers
Impacts	Demand 537 kW Energy 1,267,325 kWh Incentive Budget $331,250 Cost per kWh $0.26 /kWh TRB $3,939,842
Technologies	(see table below)
Market Barriers	**General** • Lack of understanding of how energy is used in the home • Lack of information about product energy efficiency • Lack of understanding as to which are the most effective ways to reduce energy consumption **Owner Occupant** • Inability to self-install • Existing air conditioning opening prevents the proper selection for energy savings • Homeowner association rules **Landlords and Property Managers** • No control over the hours that tenant/units use air conditioning • May not pay for electricity cost • Reluctance to invest without a financial return **Renters and Lessees** • Do not have the authority or responsibility for the HVAC system • May not pay for electricity

Technologies

	Incentive	Units
VRF Split System AC	$200	1,000
Window AC with Recycling	$80	500
Ceiling Fans - Under $80 Fans	$35	1,000
Solar Attic Fans	$50	300
Whole House Fans	$75	550

Program Category	**4.2 Residential Energy Efficiency Measures** **4.2.3 High Efficiency Air Conditioning**
Description & Implementation Strategies	The Program will continue to provide prescriptive incentives to residential customers who purchase and install energy efficiency measures that meet or exceed ENERGY STAR® standards. The process includes: • The customer purchases a qualified high-efficiency air conditioner, ceiling fan, solar attic fan or whole house fan. • The customer obtains an application through the Program's website, in hard copy from Hawaii Energy, or through point of sale retailer displays. • Customers participating in the Window AC Trade-Up program must call Hawaii Energy for pick-up and recycling of their old working units. **Implementation with Clean Energy Allies** We will continue to build relationships with manufacturers, distributors and dealers by offering workshop and events to train Allies on Hawaii Energy's offerings and processes while seeking input on how to create additional offerings and refinements to existing programs. We will also use industry working groups as a resource to identify appropriate efficiency standards when qualifying technologies to be incentivized.
Key Changes	• Ceiling fan rebates will be targeted specifically for models with high efficiency lighting kits • The Program will continue to encourage variable refrigerant flow (VRF) inverter split system units with additional input from manufacturers and local distributors
Marketing Strategies	• Provide cost of ownership information on rebate application forms • Provide more information on the website explaining how to properly use HVAC systems • Advertise to explain how to select an HVAC system • Find organizations to assist with HVAC outreach • Promotion via social media

Program Category

4.2 Residential Energy Efficiency Measures
4.2.4 High Efficiency Appliances

Target Market

- Homeowners, Landlords, Tenants, and Property Managers
- Manufacturers, Distributors, Dealers and Retailers
- Wholesalers and General Contractors
- Architect and Engineers

Impacts

Demand	158	kW
Energy	3,792,803	kWh
Incentive Budget	$539,000	
Cost per kWh	$0.14	/kWh
TRB	$4,902,517	

Technologies

	Incentive	Units
Refrigerator (Purchase only, <$750)	$50	300
Refrigerator with Recycling	$100	4,000
Garage Refrigerator/Freezer Bounty	$85	1,000
Pool VFD Controller Pumps	$150	200
Smart Strips	$18	500

Market Barriers

General
- Lack of understanding of how energy is used in the home
- Lack of information about energy efficient products
- Lack of understanding as to which are the most effective ways to reduce energy consumption
- Lack of understanding of the importance of size and operation for energy savings
- Large up-front cost

Owner Occupant
- Ability to self-install
- Homeowner association rules
- Availability of product when needed

Landlords and Property Managers
- No control over the hours of use
- May not pay for electricity cost
- Reluctance to invest without a financial return
- Short term investment

Renters and Lessees
- Do not have the authority or responsibility for the appliances
- May not pay for electricity

Program Category	**4.2 Residential Energy Efficiency Measures** **4.2.4 High Efficiency Appliances**
Description & Implementation Strategies	The program will continue to provide prescriptive incentives to residential customers who purchase and install energy efficiency measures that meet or exceed ENERGY STAR® standards. The process includes: • The customer purchases a qualified high efficiency appliance. • The customer obtains an application through the program's website, in hard copy from Hawaii Energy, or through point of sale retailer displays. **Implementation** We will continue to build relationships with manufacturers, distributors and dealers through store visits where we train allies on Hawaii Energy's offerings and processes while seeking input on how to create additional offerings and refinements to existing programs. We will leverage the relationships that were created with retailers across the State through the Trade Up for Cool Cash offering.
Key Changes	• Removal of legacy clothes washer rebate offering • Continue to improve quality control and reporting of recyclers • Increase price cap for ENERGY STAR® refrigerator (purchase new only) rebates to $750 to appropriately reflect market trends • Identify additional distribution methods for Advanced Power Strips
Marketing Strategies	• Provide point of purchase (POP) signage and information supported by quality control (merchandising) • Provide cost of ownership information on rebate application forms • More information on the website explaining good practices on how to use ENERGY STAR® appliances • Advertising explaining how to select and use appliances for the best energy savings • Identify organizations to assist with appliance outreach • Continue to advertise the Refrigerator/Freezer Bounty offer as the "Rid-A-Fridge" allowing customers the opportunity to donate their rebate directly to the local food bank.

Program Category	**4.2 Residential Energy Efficiency Measures** **4.2.5 Energy Efficiency Equipment Grants**
Target Market	**General** • Homeowners, Landlords, Tenants and Property Managers • Manufacturers, Distributors, Dealers and Retailers
Impacts	Demand 1,007 kW Energy 1,774,946 kWh Incentive Budget $226,000 Cost per kWh $0.13/kWh TRB $2,643,389
Technologies	<u>Incentive</u> <u>Units</u> Online Marketplace - Home Energy Saving Kits (Copay) $30 2,000 Online Marketplace - Home Energy Saving Kits (Free) $20 8,300
Market Barriers	**General** • Lack of understanding of how energy is used in the home • Awareness of available technologies • Lack of understanding of best application
Description & Implementation Strategies	In PY15 Hawaii Energy will expand its online presence to provide more services for customers. Efforts will include a customized user experience with product information and purchase options for lower cost energy-saving devices both online and in local retail locations. The online marketplace will have savings calculators addressing specific customer characteristics. This will result in customized suggestions for applicable energy-efficient technologies. Customers will then be able to take advantage of instant rebates for the purchase of products like advanced power strips, small appliance timers and occupancy sensors, which will be shipped to their door. **Implementation with Clean Energy Allies** Hawaii Energy will work with Clean Energy Allies and online retailers to provide a more enhanced user experience. Data gathered through the online marketplace will allow greater insight into customer characteristics and support future program targeting.

Program Category	**4.2 Residential Energy Efficiency Measures** **4.2.6 Energy Awareness, Measurement and Control Systems**
Target Market	**General** • Homeowners, Landlords, Tenants and Property Managers • Manufacturers, Distributors, Dealers and Retailers
Impacts	Demand 3,609 kW Energy 11,129,977 kWh Incentive Budget $2,240,581 Cost per kWh $0.20 /kWh TRB $2,704,012
Technologies	(see table below)
Market Barriers	**General** • Lack of understanding of how energy is used in the home • Limited awareness of phantom loads • Unfamiliarity with best application, installation and proper use
Description & Implementation Strategies	**Room Occupancy Sensors & Timers** These sensors control the use of lighting in areas around the home with infrequent use such as laundry, storage, garage or spare areas. They are not intended for high use areas or CFLs. The Program will continue to test distribution methods for room occupancy sensors and timers. We will reflect on lessons learned throughout the PY12-14 upstream implementation and utilize incoming data from the online fulfillment initiative to inform targeting of the offer. **Peer Group Comparison** Hawaii Energy plans to expand the Home Energy Report offer to an additional 110,000 households on Oahu. The program began in the Ewa region on Oahu (which was formerly funded with ARRA) and expanded across the neighbor islands (Hawaii, Maui, Lanai and Molokai) in PY11. It expanded again in PY13 to include multiple zip codes on leeward and windward Oahu. Our strategy will look for ways to affect measurable energy savings through behavior change. The market for peer comparison initiatives is evolving in PY15 to include additional analytical capabilities and geographic targeting. Recipient households will receive specific tips and promotions based on data driven market segmentation efforts. In addition, web portal access will be available to all residential utility account holders (approximately 380,000 households).

Technologies:

	Incentives	Units	
Room Occupancy Sensor & Timers	$8	200	Units
Peer Group Comparison- Phase 1/2/3	$9.02	132,500	Homes
Peer Group Comparison – Phase 4	$9.02	110,000	Homes
Home Energy Management System (HEMS)	$100	200	Units
HEMS In-Home Display – Co-incentive w/Appliances/Direct Install	$100	200	Units
Water Cooler Timers – HOD Distribution	$15	500	Units
Small Appliance/Lighting Timers	$5	1,000	Units

	Home Energy Management Systems- In Home Display Hawaii Energy will build on PY14 pilot projects and develop offerings for In-Home Display, smart thermostats and plugs. These devices collect energy data and transmit the information to a display unit which can be carried anywhere throughout the house or viewed via the internet. The Home Energy Management Systems offer will benefit from marketing to high use households, where visibility of how electricity is being used will lead to subsequent investments in energy efficiency. **Water Cooler Timers** Hawaii Energy will provide a limited number of water cooler timers to residential customers identified by existing home and office water delivery (HOD) companies. The Program will target hot/cold water dispensers in order to save the stand-by losses in the cold and hot tanks during times that the systems are not being utilized. Educational videos and instructional guides to setting the timer will be made available to customers receiving timers. **Small Appliance/Lighting Timers** Building on the PY14 water cooler timer program, Hawaii Energy will expand the offering to encourage the use of timers on small household appliances and items such as bathroom exhaust fans and household lighting. Much of this effort will be in conjunction with new residential direct install efforts in the hard-to-reach sector.
Key Changes	• Expansion of Peer Group Comparison to an additional 110,000 households • Opower web portal access will be promoted alongside the Hawaii Energy's "Dare-to-Compare" tools • Research and development of standards for Home Energy Management Systems (HEMS) • Addition of small appliance timer program • Targeting for room occupancy sensor and timer distribution
Marketing Strategies	• Public relations and media opportunities stemming from Home Energy Reports • Three program specific marketing modules to be developed for printed Home Energy Reports • Integration of historical program participation data to Home Energy Report messaging • Collaboration with home delivery water service providers to deliver educational energy efficiency messages for water cooler timer recipients • Promotion of small appliance timer program through direct install efforts

4.3 Custom Energy Solutions for the Home (CESH)

Program Category	**4.3 Custom Energy Solutions for the Home** **4.3.1 Custom Project Measures**
Target Market	• Homeowners, Landlords, Tenants and Property Managers • Manufacturers, Distributors, Dealers and Retailers • Mechanical and Solar Service Contractors
Impacts	Demand - kW Energy 4,081,636 kWh Incentive Budget $1,011,000 Cost per kWh $0.25 /kWh TRB $2,073,161
Technologies	(see table below)
Market Barriers	Lack of Program's mechanisms to encourage deeper energy savings within residential households.
Description & Implementation Strategies	(see below)

Technologies

	Incentive	Units	
Direct Install – Green Neighborhood Program Carry Over	$0.32/kWh	1,600,000	kWh
Custom Residential Lighting Efficiency Measures	$0.19/kWh	1,052,632	kWh
Custom Residential Hard-to-Reach Efficiency Measures	$0.29/kWh	1,034,483	kWh

Description & Implementation Strategies

Energy Efficiency Auctions Carry Over – Green Neighborhood Program
Hawaii Energy will continue to support the implementation of the Green Neighborhood Program direct install efforts in the Moanalua and Pearl City neighborhoods. PY15 will target 1,800 homes for the direct installation of high efficiency showerheads, faucet aerators, advanced power strips and CFLs, with an added effort to address water heating insulation, air conditioning filters and refrigerator coil cleaning. These efforts also include a comprehensive marketing strategy to enroll residents during an outreach and education campaign in their neighborhood.

Custom Residential Lighting Efficiency Measures
LED technologies have improved significantly in the past few years and the Program is now well positioned to encourage the replacement of lamps not previously addressed by the more traditional upstream lighting market. This new program will allow Hawaii Energy to specifically target the existing energy saving potential in specialty interior and linear fluorescent lamps found in the residential sector. By leveraging our existing Clean Energy Ally Program relationships we can better identify and penetrate the appropriate market segment. We will also apply lessons learned from the commercial custom lighting and SBDIL programs to further remove any barriers associated with custom lamp and fixture functionality.

	Custom Residential Hard-To-Reach Efficiency Measures In PY15, Hawaii Energy will implement a custom program for the residential hard-to-reach sector. Participants will be identified and recruited based on their participation in past and existing Transformational programs like Sharing the Aloha and NEED.org. Rooted in a whole-home performance approach, this program is designed to convert Hawaii Energy's workshop attendees to active energy-saving program participants.
Key Changes	• New initiatives
Marketing Strategies	• Promotion through existing Transformational program offerings • Direct contact with participating energy professionals • Direct contact with Property Managers and AOAOs

4.4 Residential Energy Services & Maintenance (RESM)

Program Category	**4.4 Residential Energy Services & Maintenance** **4.4.1 Residential System Tune-Ups**
Target Market	• Homeowners, Landlords, Tenants and Property Managers • Manufacturers, Distributors, Dealers and Retailers • Mechanical and Solar Service Contractors
Impacts	Demand 99 kW Energy 522,490 kWh Incentive Budget $250,000 Cost per kWh $0.48 /kWh TRB $644,993
Technologies	**Incentive** / **Units** Solar Water Heater Tune-Up $150 1,000 Systems Central Air Conditioning Retrofit Pilot $1,000 100 Homes
Market Barriers	**General** • Lack of awareness of need for maintenance • Resistance to engage unknown contractors • High up front cost
Description & Implementation Strategies	**Solar Water Heater Tune-up** • Demonstrate the benefits of tune-ups • Educate customer of potential savings and system longevity • Utilize the participating contractors to contact the customers and have them arrange for the service work • Participating contractors will use the Hawaii Energy Checklist to inspect and record the pre and post conditions • Participating contractor's invoice must show that checklist requirements have been met and signed by the servicing technician and customer **Central Air Conditioning Retrofit- Pilot** • This pilot will explore the effectiveness of replacing central air conditioning units popularly installed in residential single family developments in the early 2000's. The retrofit will consist of upgrading the primary unit, typically with an EER of 10.0, to one with a higher EER of 13.0. • The higher incentive of $1,000 is designed to offset the cost of this work which is expected to require a significant investment from the customer. **Implementation** The Program will conduct outreach sessions with existing contractors, both solar and HVAC, to promote the programs, solicit feedback for more efficient program operation, and identify opportunities for implementation and coordination of efforts.

Program Category	**4.4 Residential Energy Services & Maintenance** **4.4.1 Residential System Tune-Ups**
Key Changes	• Central Air Conditioning Retrofit Pilot
Marketing Strategies	• Direct contact with Solar and AC Contractors • Provide collateral to Clean Energy Allies offering this service • Distribute educational materials at community events, neighborhood board meetings and homeowners association meetings • Provide cost of ownership information on rebate application forms and benefits of ownership on our website

4.5 Residential Hard-to-Reach (RHTR)

Program Category	**4.5 Residential Hard-to-Reach** **4.5.1 Energy Efficiency Equipment Grants**
Target Market	Low-income, geographically-isolated and traditionally underserved residential markets
Impacts	Demand 44 kW Energy 437,044 kWh Incentive Budget $521,000 Cost per kWh $1.19 /kWh TRB $778,399
Technologies	**Incentive** / **Units** Refrigerator (w/recycling) - Lanai/Molokai equity $250 220 units Direct Install – Solar Water Heater (SWH) $9,000 24 Systems Direct Install - Heat Pump Water Heater (HPWH) $2,500 100 Systems
Market Barriers	• Customer lack of access to capital for energy improvements • Lack of understanding of energy efficiency benefits • Renter and Lessee reluctance to invest in property
Description & Implementation Strategies	**Refrigerator (with recycling) Lanai and Molokai equity** Building on existing relationships with local haulers/recyclers, the Program will expand its ENERGY STAR® refrigerator trade-up with recycling program to retail locations on Lanai and Molokai. **Direct Install – Solar Water Heater** The Program will continue to work with community assistance programs to identify hard-to-reach residential households to receive fully-funded solar water heating systems. **Direct Install – Heat Pump Water Heater** Hawaii Energy will work with government housing agencies and property management companies to identify ideal multifamily facilities to receive fully-funded heat pump water heaters. We will engage the Clean Energy Allies for the installation work and will build on efforts initiated in PY14 to appropriately address concerns for noise mitigation.
Key Changes	• Increased focus and penetration of direct install and educational outreach • New Heat Pump Water Heater direct install program
Marketing Strategies	• Continue to target low-income and hard-to-reach customers through existing state and local agencies who service the needs of low income families • Develop working relationships with more community action and similar local groups to increase market penetration

Program Category	**4.5 Residential Hard-to-Reach** **4.5.2 Direct Installation – Residential Energy Kits**
Target Market	• Associations of Apartment Owners • Property Managers • Landlord/Tenants
Impacts	Demand 151 kW Energy 556,184 kWh Incentive Budget $161,250 Cost per kWh $0.29 /kWh TRB $635,027
Technologies	**Incentive** **Units** Multi-family Direct Install – Energy Savings Kits $129/unit 1,250
Market Barriers	• Lack of understanding of energy efficiency benefits • Renter and Lessee reluctance to invest in property
Description & Implementation Strategies	In PY15 Hawaii Energy will expand the turn-key installation of energy-saving technologies like high efficiency showerheads, faucet aerators, advanced power strips and high efficiency light bulbs (CFLs and LEDs) in multifamily residences. Will target over 4,000 households to participate in the offering; this includes multifamily properties with individually-metered residential accounts and commercial master-metered accounts **Implementation** The Program has a strong pipeline of leads and continues to engage property managers and government housing agencies to identify potential participants. We will also continue to engage additional properties through existing submetering and benchmarking efforts. This multifaceted approach will continue in PY15 as it has proven effective in gaining access to the multifamily market which has historically been slower to participate in existing rebate programs. All measures will be direct install with no customer co-pay required. Hawaii Energy will manage customer education, scheduling and installation.
Key Changes	• Expansion of PY14 efforts
Marketing Strategies	• Direct contact with State housing agencies, property managers, AOAOs, and landlords • Community event promotion • Print advertising and social media

5.0 BUSINESS PROGRAM STRATEGY & DETAILS

5.1 Overview

Hawaii Energy will be selectively retooling its Business Operations staff with enhanced tools and techniques to advise prospective participants in the value of energy efficiency. This effort will better align Transformational offerings in Selling Energy Efficiency and embed these best practices throughout its internal operations.

Hawaii Energy will continue to develop its Clean Energy Ally network with a focus on value-added tools, techniques and training to augment Hawaii Energy's small team of Energy Efficiency Advisors. This effort will ensure customers have a robust selection of Allies to implement projects. Backed with a budget around $40,000, specific aims will include networking opportunities, collaborative marketing and a recognition program to acknowledge the contributions Hawaii Energy's Clean Energy Allies make in helping the State achieve its clean energy goals.

For PY15, Hawaii Energy will continue with its programmatic philosophies that have been successful over the past few years, specifically these incentive categories:

- *Business Energy Efficiency Measures (BEEM)* – This category offers incentives for standard, known energy efficiency technologies in the form of prescriptive incentives in a streamlined application and grant award process. A new focus for this program year will be the expansion of the midstream program which will rely on energy efficiency distributors to reduce the upfront material costs for contractors installing energy efficient measures

- *Custom Business Energy Efficiency Measures (CBEEM*) – This category offers incentives for non-standard energy efficiency technologies often needed for commercial and industrial customers who need to invest in energy efficiency opportunities specific to unique projects and designs. Incentive award amounts are determined via calculations performed to quantify specific energy savings related to unique applications.

- *Business Energy Service and Maintenance (BESM)* – This incentive category focuses on developing viable projects through collaboration, competition and direct support in the form of expertise and/or equipment (i.e. metering).

- *Business Hard-to-Reach (BHTR)* - This incentive category aims to secure various projects among geographies and demographics that have been traditionally underserved such as retail, restaurants and other small businesses.

A summary listing of the Business Program offerings can be found in the table below followed by a brief summary of any additions and changes. A detailed description of the Business Program follows in sections 5.2 through 5.5. Appendix B contains a projection of potential energy savings for the planned programs.

Figure 5: List of Business Programs

Business
BEEM
High Efficiency Water Heating
High Efficiency Lighting
High Efficiency HVAC
High Efficiency Water Pumping
High Efficiency Motors
Commercial Industrial Processes
Building Envelope Improvements
High Efficiency Appliances
Energy Star Business Equipment
Direct Install - Residential Energy Kits
Energy Efficiency Equipment Grants
Energy Awareness, Measurement and Control Systems
CBEEM
Customized Project Measures
BESM
Business Design, Audits and Commissioning
BHTR
Business Direct Installation
Restaurant Targeted Participation Programs

5.1.1 *New Program Offerings of Business Energy Efficiency Measures (BEEM)*

High Efficiency Lighting

Hawaii Energy will continue to seed and grow its Midstream Programs with the intent to shift 10% to 25% its prescriptive lighting program (e.g. ~$150,000 BEEM incentives) to this channel. Midstream programs are relatively new in the industry, but offer the Program an administratively efficient platform to expand its reach while mitigating recognized barriers to participation (e.g. submitting a complete application). Efforts are underway to recruit local distributors under the Clean Energy Ally banner to offer their customers, primarily electrical and lighting contractors, to receive instant rebates when purchasing qualified lighting. Hawaii Energy will also explore midstream opportunities with other measures such as motors, pumps, ENERGY STAR® kitchen equipment and possibly HVAC.

Wastewater

Wastewater facilities are 24/7 facilities that have specific technical requirements, high capital costs and long procurement process. This targeted program will continue practices started in PY13 to target the two highest energy consumers in the plants, Air Systems & UV Lighting through process improvements. Lessons learned from PY13 and PY14, specifically the potentially long procurement cycle of these facilities, will be incorporated into the program in PY15 and Hawaii Energy will continue to pursue projects that we identified over the last two years.

Sea Water Cooling

Hawaii Energy will continue to support this evolving project in PY15 through metering and providing ad hoc resources as needed. The Program will pay incentives as directed in earlier proceedings upon installation and startup of the Sea Water Air Conditioning (SWAC) system.

5.1.2 *New Program Offerings of Customized Business Energy Efficiency Measures (CBEEM)*

Customized Project Measures

- *Target Cost per KWh Request for Proposals* – There is a potential to utilize a program that will provide an open opportunity for achieving energy efficiency by developing cost-effective projects that focus on high energy consumption businesses. The program would be part of the customized measures and be a formal call for projects that meet a total dollar per kWh savings target and allow the market to be creative in how it is achieved. The projects will use utility metered data and if needed, will be sub-metered to ensure savings performance.

- In PY14 Hawaii Energy conducted a small pilot program to install refrigerated display case gaskets, and strip curtains and automatic door closures for walk-in refrigerators and freezers in grocery and convenience stores. Preliminary indications were very positive and delivered savings cost effectively. Hawaii Energy will continue to evaluate the savings from this pilot program and may institute a full scale program in PY15 if savings results are confirmed.

5.1.3 *New Program Offerings of Building Energy Services and Maintenance (BESM)*

Business Design, Audits and Commissioning

<u>Decision Maker: Real-Time Submeters</u> – There are individuals within business organizations who have influence over a large number of employees whose behavior within the work environment drive unnecessary energy consumption (e.g., leaving on lights, additional electronic equipment, etc.). This offer is the direct installation of a web-based electrical metering device. This metering will be monitored by the decision maker(s) within the organization to identify usage patterns and be the basis of peer group competitions within the organization.

5.1.4 *New Program Offerings of Business Hard-to-Reach (BHTR)*

Small Business Direct Install Lighting Program

Hawaii Energy will evaluate its SBDIL bonus pilot to assess the bonus-to-participation elasticity to evaluate the impact on outcomes and cost-effectiveness of directly incenting Clean Energy Allies (a strategy which has been implemented in other utility programs to a limited extent).

ENERGY STAR® Kitchen Equipment

This program will focus on raising awareness of energy efficiency options when replacing equipment at end-of-life. Promoting ENERGY STAR® equipment in restaurants will help to save energy and lower annual operating costs for the participant. Hawaii Energy will offer prescriptive incentives for a variety of ENERGY STAR® kitchen appliances.

5.1.5 *Business Program Details*

To follow, in Sections 5.2 through 5. 5, is an overview summary of Business Program offerings followed by detailed descriptions and energy savings. The Overall Program Details are provided on the following page, preceding the individual Program summaries.

Program Category	5.1 All Business Programs Overview of All Business Programs
Target Markets	**Competitive Commercial** o Office Buildings o Retail **Multi-Site** o Convenience Stores o Restaurants **Governmental** o City o State o Federal **High Load Factor Customers** o Hospitals o Hotels o Super Markets o Data Centers **Industrial Sector** o Warehousing o Cold Storage o Water Pumping o Manufacturing **Multi-Family Commercial Rate** o AOAO o AOAO - Mixed Use
Projected Impacts	Demand 6,134 kW Energy 61,753,307 kWh Incentive Budget $12,915,474 Cost per kWh $0.2091 /kWh TRB $88,085,212
Incentives	**Measure Categories** — **Incentives** 5.2 Business Energy Efficiency Measures — $ 3,561,800 5.3 Custom Business Energy Efficiency Measures — $ 6,131,459 5.4 Business Service and Maintenance — $ 780,000 5.5 Business Hard-to-Reach — $2,442,215 $ 12,915,474
Market Barriers	**General** • Lack of familiarity with availability of energy efficient technology and the vendors offering these services and products • Trust and creditability of technology providers • Unaware of business benefits of reducing exposure to cost of energy changes • High initial up-front cost • Life Cycle Cost vs. Simple Payback decision analysis • Need for a cash positive investment • Access to and/or understanding of financial options • Lack of knowledge of operation and maintenance of technologies **Landlords and Property Managers** • May not pay for electricity cost • Reluctance to invest without a financial return • Property is a short term investment

Program Category	**5.1 All Business Programs** **Overview of All Business Programs**
	Renters and Lessees • Do not have the authority or responsibility for the systems • Renter lease term shorter than simple payback for a measure
Description & Implementation Strategies	**Technology Based Categories:** High Efficiency Lighting, HVAC, Water Heating, Water Pumping, Motors, Commercial Industrial Processes, Building Envelope Improvements, ENERGY STAR® Business Equipment The technology-based incentives are provided for energy efficiency products that provide reliable energy savings for a wide array of customers. These incentives are developed to be based on fixed amounts per technology with performance adjustments to reflect the savings potential to ensure program cost-effectiveness set based on expected savings. Measures are selected and reviewed to determine that the energy savings can be reliably deemed, or calculated using simple threshold criteria. The implementation process includes: • Program performs outreach and promotions to inform customers of incentive opportunities. • Customer selects and approves purchase and installation of energy efficiency measures • Customer sends in completed application forms with scheduling and supporting documentation • Customer provides evidence of installation and/or program will verify the installation Hawaii Energy processes the incentive on approved applications on an as-funds available basis **Energy Awareness, Measurement, and Control Systems** • Provide peer groups with customized Hawaii-specific Energy Use Intensity reports. These comparisons show their usage in comparison to their peers currently on an entire facility basis and as the program progresses we will disaggregate the comparisons down to the technologies “categories.” • Provide self-assessment forms that the customer can complete on their own to identify potential savings. Increase the use of incentives such as the Condominium Submetering that combine cash incentives with the requirement for educational components and the execution of audits to promote further energy savings activity in the facilities.

Program Category	5.1 All Business Programs Overview of All Business Programs
Key Changes	• Hawaii Energy will continue to seed and grow its Midstream Programs with the intent to shift 10% to 25% its prescriptive lighting program (e.g. ~$150,000 BEEM incentives) to this channel. Midstream programs are relatively new in the industry, but offer the Program an administratively efficient platform to expand its reach while mitigating recognized barriers to participation (e.g. submitting a complete application). • Hawaii Energy will discontinue offering incentives for CFL in the business programs reflecting the maturity of the measure in the marketplace.
Marketing Strategies	• Web-based application forms will be advertised and made available to customers and their channel allies (lighting, cooling, motors, and controls). • Train and recruit program allies from various channels as program partners to enhance sales of their energy efficiency equipment • Maintain direct contact with key market players to understand the markets and decision points and to leverage their marketing resources to inform members • Email informational campaigns • Award and publish success of customer and ally partners to demonstrate highest level leadership in an effort to pull the market.

5.2 Business Energy Efficiency Measures (BEEM)

Program Category	5.2 Business Energy Efficiency Measures BEEM Programs Overview
Projected Impacts	Demand 4,050 kW Energy 22,395,900 kWh Incentive Budget $3,561,800 (15%) Cost per kWh $0.1590 /kWh TRB $ 40,472,594
Incentives	**Incentives** High Efficiency Lighting $1,063,250 High Efficiency HVAC $1,265,500 High Efficiency Water Heating $227,400 High Efficiency Water Pumping $50,900 High Efficiency Motors $86,000 Commercial Industrial Processes $52,500 Building Envelope Improvements $52,000 High Efficiency Appliances $33,750 ENERGY STAR® Business Equipment $12,500 Direct Install – Residential Energy Kits* $378,000 Energy Awareness, Measurement and Control Systems $190,000 Energy Efficiency Equipment Grants $150,000 *These are residential end-use measures installed in multi-family dwelling billed by Hawaii Electric as commercial accounts.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.1 High Efficiency Lighting**
Projected Impacts	Demand 1,382 kW Energy 11,798,724 kWh Incentive Budget $ 1,063,250 (4.5%) Cost per kWh $0.0901 /kWh TRB $ 19,463,917
Incentives	see below

	Incentive	Units
T12 to T8 (2&3 foot lamps)	$5.20	1,450 Lamps
T12 to T8 Low Wattage	$10.00	5,000 Lamps
T8 to T8 Low Wattage	$5.50	3,750 Lamps
Delamp	$8.80	17,550 Lamps Removed
Delamp/Reflector	$4.50	6,800 Lamps Removed
LED Refrigerated Case Light	$75.00	1,500 Lamps
ENERGY STAR LED		
-non-dimmable existing	$9.00	20,000 Lamps
-dimmable w/controls	$10.00	20,000 Lamps
-non-dimmable A19 existing	$5.00	24,000 Lamps
-dimmable A19 new	$7.50	13,250 Lamps
LED Exit Signs	$40.00	600 Signs
LED Fixtures	$30.00	100 Fixtures
Sensors	$20.00	3000 Sensors

Key Changes

Hawaii Energy will continue to seed and grow its Midstream Programs with the intent to shift 10% to 25% its prescriptive lighting program (e.g. ~$150,000 BEEM incentives) to this channel. Midstream programs are relatively new in the industry, but offer the Program an administratively-efficient platform to expand its reach while mitigating recognized barriers to participation (e.g. submitting a complete application). Efforts are underway to recruit local distributors under the Clean Energy Ally banner to offer their customers, primarily electrical and lighting contractors, to receive instant rebates when purchasing qualified lighting. Hawaii Energy will also explore midstream opportunities with other measures such as motors, pumps, ENERGY STAR® kitchen equipment and possibly HVAC.

Hawaii Energy will also discontinue offering incentives for CFL in the BEEM program reflecting the maturity of the measure in the marketplace.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.2 High Efficiency HVAC**
Projected Impacts	Demand 1,402 kW Energy 5,273,391 kWh Incentive Budget $ 1,265,500 (5.4%) Cost per kWh $0.2400 /kWh TRB $ 12,591,839
Incentives	

	Incentive	Units	
Central Chiller Plant > 15% Better than Code	$50	6,400	Tons
Chillers – kW/ton meter and Chiller Curve Optimization	$5,000	25	Systems
Optimized Chiller Selection Engineering	$2,500	25	Participants
VFD – HVAC Chilled Water/Condenser Water	$80	1,600	hp
VFD – HVAC AHU	$50	3,600	hp
Garage Active Ventilation Control	$0.12	500,000	kWh
Package Units	$200	700	Tons
VRF Split Systems - Existing	$300	500	Tons
VRF Split Systems – New Construction	$250	400	Tons

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.2 High Efficiency HVAC** **5.2.2.1 Central Plant ->15% Better than Code Chillers**
Projected Impacts	Demand 292 kW Energy 1,422,982 kWh Incentive Budget $ 320,000 Cost per kWh $0.2249 /kWh TRB $3,494,277
Incentives	**Incentive** **Units** Chillers $50 6,400 Tons
Description & Implementation Strategies	This incentive will be targeted at chillers, both air-cooled and water-cooled, that have efficiencies at least 15% better than code efficiency requirements in place at the time of permitting the project. Significant savings can be achieved with this measure particularly when you consider the life expectancy of a chiller is 20 years.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.2 High Efficiency HVAC** **5.2.2.2 Chiller Plant Efficiency – kW/ton meter**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $ 125,000 Cost per kWh 0 /kWh TRB 0
Incentives	<u>**Incentive**</u> <u>**Units**</u> Chillers $5,000 25 Systems
Description & Implementation Strategies	**Energy Reduction Opportunity** The use of variable speed drives, oil-free magnetic bearings, large heat exchangers, lower condenser water and other modern design features, new chillers are 20-40% more efficient than older machines. Much of the savings is at part-load conditions where chillers operate the majority of the time. The BTU metering will allow building operators to know exactly how efficient the chiller is running at all times including part load and full load conditions. This should allow the building operator to continuously optimize and maintain the chiller producing of energy savings over time. At this time it is not known what savings will be generated by this measure; consequently, this incentive will be run as a pilot program subject to review and approval of how savings will be determined. Once determined the savings methodology will be included in the TRM for 2015 Programs. **Target Audience** Who: Property Managers, Facilities Directors, Chief Engineers and Governmental Facilities Departments What: Large Commercial facilities <u>CUSTOMER QUALIFICATIONS</u> Customers with existing centrifugal, screw, scroll or reciprocating chillers approaching the end of their useful life. **Application Process** The following will be completed and submitted for review • Rebate Application, AC Chiller Rebate Worksheet • Chiller Equipment type (centrifugal, screw, reciprocating) • BTU metering configuration **Complementary Programs** • Customized Project Measures

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.2 High Efficiency HVAC** **5.2.2.3 Optimized Chiller Selection Engineering**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $ 62,500 Cost per kWh $0 /kWh TRB $0
Incentives	<u>**Incentive**</u> <u>**Units**</u> Optimized Chiller Selection Engineering $2,500 25 Participants
Description & Implementation Strategies	**Energy Reduction Opportunity** The chiller selection process is an important element prior to chiller purchase that is often overlooked. In many applications, replacing chillers with the size chiller that currently exists misses an opportunity to downsize the chiller. Significant energy savings can occur if chillers are "right-sized" to the load. After seeing lackluster participation in the chiller optimization program in PY13 that was based on the eventual installation of an optimized chiller, it was determined the ultimate goal of this incentive was to get vital information to the decision makers on the optimized size of the chiller before a buying decision is made. Hawaii Energy believes this can best be done by funding an energy optimization studies in the beginning of the selection process. **Target Audience** Who: Property Managers, Facilities Directors, Chief Engineers and Governmental Facilities Departments What: Large Commercial facilities **Incentive & Targeted Economics** Hawaii Energy would fund a study to determine the actual load that the existing chiller is serving. The result of the study can be used by the decision makers to right size the new chiller when it is purchased. <u>CUSTOMER QUALIFICATIONS</u> Customers with existing chillers include centrifugal, screw, scroll and reciprocating, approaching the end of their useful life.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.2 High Efficiency HVAC** **5.2.2.4 Package Units – 15% Better Than Code**
Projected Impacts	Demand 54 kW Energy 320,925 kWh Incentive Budget $ 140,000 Cost per kWh $0.4362 /kWh TRB $ 606,353
Incentives	**Incentive** **Units** Package Units $200 700 Tons
Description & Implementation Strategies	**Energy Reduction Opportunity** The air-cooled package units are most often found in small commercial facilities as they are least first-cost and maintenance intensive of HVAC options to this market. The units are often roof-top mounted and feed constant volume distribution systems. The most cost effective opportunity to reduce energy consumption in these units are to replace them with the highest efficiency unit available and potentially convert at the same time to a VAV distribution system to increase both comfort and reduce cooling loads. A higher cost option is to convert to VRF split systems. **Target Audience** Who: Property Managers & Private and Public Facilities Directors. Air Conditioning/Mechanical Contractors, Mechanical Engineers What: Small Commercial facilities. **Incentive & Targeted Economics** The offering of prescriptive incentives based on the EER of the units at or above 15% better than IECC 2006 energy codes. **Application Process** 1. A prescriptive worksheet will be competed and submitted for review • Unit size, model, efficiency rating, operational hours • Map of Locations 2. A sample of sites have pre/post inspections **Complementary Programs** • Window Tinting • Package and Split AC Tune-Up • VRF Split Systems

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.2 High Efficiency HVAC** **5.2.2.5 Variable Refrigerant Flow Air Conditioners – Existing Facility**
Projected Impacts	Demand 85 kW Energy 505,647 kWh Incentive Budget $ 250,000 Cost per kWh $0.4944 /kWh TRB $ 1,149,948
Incentives	**Incentive** / **Units** VRF Split Systems – Existing Systems $300 500 Tons VRF Split Systems – New Construction $250 400 Tons
Description & Implementation **Strategies**	**Energy Reduction Opportunity** Inverter driven variable refrigerant flow (VRF) air conditioning systems are direct expansion AC systems that utilize variable speed evaporator/condenser fans, and a combination of fixed and variable speed compressors along with most often multiple individual zone evaporators to provide the ability to more closely match the AC system's output with the building's cooling requirements. A potential of 20 to 35% energy savings come from: • *Part Load Efficiencies*: Increased part-load efficiency operation • *High Efficiency Motors*: Many systems use Electrically Commutated Motors (ECM) motors • *Higher Room Temperatures*: The capacity matching allows for better humidity control through longer cooling operation. • *Reduction of Distribution Losses*: Duct losses are reduced with DX systems. This may be offset by dedicated outside air distribution systems when needed. **Target Audience** Who: Property Managers & Private and Public Facilities Directors. Air Conditioning/Mechanical Contractors, Mechanical Engineers What: Commercial facilities. **Incentive & Targeted Economics** The offering of prescriptive incentives based on the tonnage of the VRF system. This level of incentive should reduce 25% of the incremental difference between a VRF and an alternative single or two-speed standard efficiency unit. **Application Process** 1. A prescriptive worksheet will be completed and submitted for review • Unit size, model, efficiency rating, operational hours • Map of Locations 2. A sample of sites have pre/post inspections **Complementary Programs** • Window Tinting, Package and Split AC Tune-Up

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.2 High Efficiency HVAC** **5.2.2.6 VFD – AHU** **5.2.2.7 VFD – Chilled Water / Condenser Water**
Projected Impacts	Demand 923 kW Energy 2,608,712 kWh Incentive Budget $ 308,000 Cost per kWh $0.1181 /kWh TRB $ 6,907,063
Incentives	<u>**Incentive**</u> <u>**Units**</u> VFD – AHU $50 3,600 hp VFD – Chilled Water / Condenser Water $80 1,600 hp
Description & Implementation Strategies	**Energy Reduction Opportunity** The use of variable frequency drives to vary motor speeds to control flow in response to changes to loads provides significant savings in HVAC applications of supply, return and exhaust fans as well as chilled water and condenser water pumps. **Target Audience** Who: Property Managers, Facilities Directors, Chief Engineers and Governmental Facilities Departments, Mechanical Engineers and Contractors. What: All Commercial Facilities **Incentive & Targeted Economics** HVAC Fans (VFD): The offering of a prescribed $50 per fan HP controlled (3-100 HP for existing facilities and 3-25 HP for new facilities) incentive. HVAC Pumps (VFD): The offering of a prescribed $80 per pump HP controlled (3-100 HP and 3-50 HP for new facilities) incentive for both existing and new construction facilities. <u>CUSTOMER QUALIFICATIONS</u> The application must have a load and system design and controls (two way valves, VAV boxes etc.) that respond to varying loads. **Application Process** A HVAC Fan or Pump VFD rebate worksheet will be completed and submitted for review. • Require pre-notification before projects begin. • Existing equipment must not have a VFD. • The VFDs must actively control and vary the fan or pump speed. • Motor HP • Motor quantity

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.2 High Efficiency HVAC** **5.2.2.8 Garage Active Ventilation Control**
Projected Impacts	Demand 47 kW Energy 415,125 kWh Incentive Budget $ 60,000 (0.3%) Cost per kWh $0.1445 /kWh TRB $434,198
Incentives	<u>**Incentive**</u> <u>**Units**</u> Garage Active Ventilation Control $0.12 500,000 kWh
Description & Implementation Strategies	**ENERGY REDUCTION OPPORTUNITY** Enclosed parking garages that are mechanically ventilated 24/7 in order to remove the carbon monoxide (CO) created by gasoline powered vehicles. The ventilation systems are designed for maximum capacity conditions and there are opportunities to reduce both operating speed and fan runtimes during times of lower traffic periods to achieve fan energy savings of 60% to 90% with active CO monitoring systems control. The addition of Variable Speed Drives (VFDs) can also be incorporated if not already present. **TARGET AUDIENCE** Who: Property Managers & Private and Public Facilities Directors Air Conditioning/Mechanical Contractors Facilities Maintenance Companies What: Office/Retail Buildings with mechanically ventilated parking garages **INCENTIVE & TARGETED ECONOMICS** The $0.12/kWh incentive is directly provided to the metered savings resulting from the retrofit. **APPLICATION PROCESS** 1. A garage fan savings worksheet will be competed and submitted for review • Exhaust Fan/Motor Inventory • Map of Locations • Motor Horsepower & Runtimes • Sample set of fans must be spot metered to determine operating power consumption. 2. A pre/post inspection will be performed for systems totaling over 75 hp. This inspection may include metering of current fan horsepower. **COMPLEMENTARY PROGRAMS:** • High Efficiency Lighting – Induction/T8/T5/Occupancy Sensors/Timers

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.3 High Efficiency Water Heating**			
Projected Impacts	Demand	521	kW	
	Energy	587,460	kWh	
	Incentive Budget	$227,400	(1.0%)	
	Cost per kWh	$0.3871	/kWh	
	TRB	$3,318,543		
Incentives		**Incentive**	**Units**	
	Commercial Solar Water Heaters			
	- Electric Resistance	$250	200	Tons
	- Heat Pump	$100	300	Tons
	Single Family Solar Water Incentive	$750	150	systems
	Heat Pumps			
	- Conversion (Electric Resistance)	$120	20	Tons
	- Heat Pump Upgrade	$65	500	Tons

Program Category	5.2 Business Energy Efficiency Measures 5.2.3 High Efficiency Water Heating 5.2.3.1 Commercial Solar Water Heaters Electric Resistance 5.2.3.2 Commercial Solar Water Heaters Heat Pump
Projected Impacts	Demand 457 kW Energy 190,094 kWh Incentive Budget $ 80,000 Cost per kWh $0.4208 /kWh TRB $ 2,518,897
Incentives	Incentive / Units Commercial Solar Water Heaters - Electric Resistance $250 200 Tons - Heat Pump $100 300 Tons
Description & Implementation Strategies	**Energy Reduction Opportunity** Commercial solar water heaters can provide a renewable energy source of water heating. The systems can reduce electrical consumption for water heating by providing supplemental pre-heating all the way to 100% of the water heating needs limited by the hot water demand characteristic and the site's physical constraints on storage tank and panel locations. **Target Audience** Who: AOAOs, Property Managers, Private and Public Facilities Directors. Mechanical Contractors, Mechanical Engineers. What: Hotel, Condominium and Apartments & Government housing. **Incentive & Targeted Economics** The offering of a $250/12,000 BTU prescriptive incentive-based on the derated installed capacity of the solar water heating system. The base system must have been electric resistance, heat pump or heat recovery off an electric chiller, the latter two receiving a smaller incentive commensurate with their lesser energy savings. Conversion to a gas backup system is permitted to eliminate any potential electrical demand from the system and allow quick peak recovery. The economic impact of this incentive will depend on the ability for the customer to take advantage of tax credits and the site specific system costs.
Description & Implementation Strategies (continued)	**Application Process** 1. A prescriptive worksheet/saving calculator will be competed and submitted for review • Unit sizes, model, derating rating, operational hours • System diagram 2. A sample of sites will have pre/post inspections **Complementary Programs** • Water saving showerheads, spray-rinse valves, and fixtures.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.3 High Efficiency Water Heating** **5.2.3.3 Heat Pump – Conversion – Electric Resistance** **5.2.3.4 Heat Pump Upgrade** **5.2.3.5 Single Family SWH Incentive**
Projected Impacts	Demand 64 kW Energy 397,366 kWh Incentive Budget $ 147,400 Cost per kWh $0.3709 /kWh TRB $799,646
Incentives	(see table below)
Description & Implementation Strategies	(see text below)

Incentives

	Incentive	Units	
Heat Pumps			
- Electric Resistance	$120	20	Tons
- Upgrade	$65	500	Tons
Single Family SWH	$750	150	units

Description & Implementation Strategies

Energy Reduction Opportunity

Heat pump water heaters can provide a highly-efficient source of water heating. Water-source heat pumps are the most efficient when used to supplement the heat rejection from chilled water return loops and condenser water systems to heat a facility's domestic water needs or swimming pools. Heat pumps can also be air-source and provide heat mitigation in areas such as commercial kitchens and can function as a stand-alone water heater for pools

The systems can reduce electrical consumption for water heating by providing supplemental pre-heating all the way to 100% of the water heating needs limited by the hot water demand characteristic and the site's physical constraints on heat pump storage tanks.

Target Audience

Who: AOAOs, Property Managers, Private and Public Facilities Directors, Mechanical Contractors, Mechanical Engineers.

What: Commercial Pools, Hotel, Condominium and Apartments & Government housing.

Incentive & Targeted Economics

The offering of a $120 or $65/ton prescriptive incentive based on the installed capacity of the heat pump. The base system must be an electric resistance, failing heat pump (10 years or older) or heat recovery off an electric chiller. Conversion/remaining on a gas backup system are permitted to eliminate any potential electrical demand from the system and allow quick peak recovery.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.4 High Efficiency Water Pumping - Overview**
Projected Impacts	Demand 14 kW Energy 143,609 kWh Incentive Budget $ 50,900 (0.2%) Cost per kWh $0.3544 /kWh TRB $227,851
Incentives	<u>**Incentive**</u> <u>**Units**</u> VFD Dom. Water Booster Packages – VFD $600 75 hp VFD Dom. Water Booster Packages - added HP Reduction $80 30 hp reduced VFD Pool Pump Packages $350 10 hp

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.4 High Efficiency Water Pumping** **5.2.4.1 VFD Dom. Water Booster Packages – added HP Reduction** **5.2.4.2 VFD Dom. Water Booster Packages – VFD ($3K per Sys.)**
Projected Impacts	Demand 13 kW Energy 134,286 kWh Incentive Budget $ 47,400 Cost per kWh $0.3530 /kWh TRB $ 213,497
Incentives	see table below
Description & Implementation Strategies	see text below

Incentives

	Incentive	Units
VFD Dom. Water Booster Packages – VFD	$600	75 hp
VFD Dom. Water Booster Packages - Added HP Reduction	$80	30 hp reduced

Description & Implementation Strategies

Energy Reduction Opportunity

The replacement of single speed staged domestic water booster pumps can provide up to 70% energy savings by:

- providing constant pressure regardless of flow
- reducing pump speed during low use periods increases system efficiency

Target Audience

Who: Property Managers, Facilities Directors, Chief Engineers and Governmental Facilities Departments, Mechanical Contractors and VFD Pump Package suppliers.

What: Apartments, Office Buildings, Hotels, Hospitals

Incentive & Targeted Economics

The offering of a prescribed $3,000 for the VFD booster pump system plus another $80 per HP reduction is targeted to achieve a 10 - 15% reduction in the system cost. All pump motors must meet CEE Premium Efficiency standards.

<u>CUSTOMER QUALIFICATIONS</u>

Booster Pump applications require pre-notification before equipment is purchased and installed.

- The new booster pump system's total horsepower must be equal to or less than that of the existing system.
- The system horsepower reduction must be between 0 to 129 hp. For projects with greater than 129 hp, please contact the program
- Booster Pump applications do not apply to New Constructions.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.4 High Efficiency Water Pumping** **5.2.4.1 VFD Dom. Water Booster Packages – added HP Reduction** **5.2.4.2 VFD Dom. Water Booster Packages – VFD ($3K per Sys.)**
Description & Implementation Strategies (continued)	**Application Process** The following will be completed and submitted for review • Rebate Application • Booster Pump Rebate Worksheet • Manufacturer's specification sheets or Name Plate Information including: • Manufacturer • Model Number • Serial Number • Motor Size (nominal hp) – All pump motors must meet CEE Premium Efficiency standards • Pump Type • Identify Pump with VFD or without VFD • Existing System hp minus New System hp **Complementary Programs** • Customized Project Measures • Central Plant Optimization Competition • CEE Listed Premium Efficiency Motors

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.4 High Efficiency Water Pumping** **5.2.4.3 VFD Pool Pump Packages**
Projected Impacts	Demand 1 kW Energy 9,324 kWh Incentive Budget $ 3,500 Cost per kWh $0.3754 /kWh TRB $14,353
Incentives	**Incentive** / **Units** VFD Pool Pump Packages $350 10 hp
Description & Implementation Strategies	see below

Energy Reduction Opportunity

Pool pumps often run much longer than necessary. A variable speed commercial pool pump motor in place of a standard single speed motor can save energy and maintain a comfortable swimming pool temperature and chemical circulation by using a smaller, higher efficiency pump and by operating it less.

Target Audience

Who: Property Managers, Facilities Directors, Chief Engineers and Governmental Facilities Departments

What: Commercial facilities with swimming pool.

Incentive & Targeted Economics

The offering of a prescribed $225 per HP installed.

CUSTOMER QUALIFICATIONS

Existing single speed pool pump

Application Process

The following will be completed and submitted for review:

- Rebate Application
- VFD Pool Pump Rebate Worksheet
- Manufacturer's specification sheets
- Name Plate - Manufacturer, Model Number, Serial Number
- Motor Size–pump motors must meet NEMA Premium Efficiency
- Pump Type
- Proof of installation and purchase

Complementary Programs

- Customized Project Measures
- Central Plant Optimization Competition

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.5 High Efficiency Motors** **5.2.5.1 CEE Tier 1+ Premium Efficiency Motors** **5.2.5.2 ECM- Fan Coil Fans** **5.2.5.3 ECM w/ Controller- Evaporator Fan Motors**
Projected Impacts	Demand 24 kW Energy 214,196 kWh Incentive Budget $ 86,000 (0.4%) Cost per kWh $0.4015 /kWh TRB $ 357,183
Incentives	Incentive / Unit CEE Tier 1+ Premium Efficiency Motors: $10/hp, 0 hp ECM w/ Controller - Evaporator Fan Motors: $85/motor, 300 Motor ECM- Fan Coil Fans: $55/motor, 1,100 Motor

	Incentive	Unit
CEE Tier 1+ Premium Efficiency Motors	$10/hp	0 hp
ECM w/ Controller		
- Evaporator Fan Motors	$85/motor	300 Motor
ECM- Fan Coil Fans	$55/motor	1,100 Motor

Description & Implementation Strategies

Energy Reduction Opportunity

CEE LISTED MOTORS

There is an opportunity to save energy with motors designed to utilize less power for the same horsepower of work. Motors in many applications (Water pumping and air handing) have long operational hours and are often out of sight and mind until they fail.

The CEE Premium Efficiency Specification will be the qualification level for motors. This is driven by the December 2010 implementation of the Energy Independence and Security Act of 2007 (EISA) requiring the vast majority of new electric motors to meet NEMA Premium Efficiency standards.

ECM

There is an opportunity to save energy with ECM motors that have higher electrical efficiency (Electronically Commutated Motor, 70 percent efficient) than PSC (Permanent split capacitor, 49 percent efficient) or shaded-pole (32 percent efficient). In addition, "cooler" motor operation creates less heat load on the conditioned space.

When motors fail there is often an operational urgency to replace them at the lowest first-cost as the replacement was not budgeted.

Target Audience

Who: Property Managers, Mechanical & Electrical Contractors, Motor Repair/Rewind Shops, Motor Distributor and Supply houses

What: All Refrigeration and PTAC units

Incentive & Targeted Economics

The current $10/hp incentive was designed to eliminate the cost premium for the listed CEE Premium efficiency motors up to 200 hp. The $85 and $55/motor incentives are aimed at 20% of installed cost.

Application Process

1. A contractor or customer submitted application and savings worksheet.
   - Unit size, model,
   - Unit location description
   - Operational hours
2. A sample of sites will have post inspections

Complementary Programs

- High Efficiency HVAC
- Central Plant Optimization
- Target Cost per kWh Request for Proposals

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.6 Commercial Industrial Processes – Overview**
Projected Impacts	Demand 28 kW Energy 163,954 kWh Incentive Budget $ 52,500 (0.2%) Cost per kWh $0.3202 /kWh TRB $ 311,442
Incentives	<u>**Incentive**</u> <u>**Unit**</u> Kitchen Exhaust Hood Demand Ventilation $700 75 hp Refrigerated Case Night Cover $10/Linear ft. 0 Linear ft.* **but is available to participants*

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.6 Commercial Industrial Processes** **5.2.6.1 – Kitchen Exhaust Hood Demand Ventilation**
Projected Impacts	Demand 28 kW Energy 163,954 kWh Incentive Budget $ 52,500 Cost per kWh $0.3202 /kWh TRB $ 311,442
Incentives	<u>**Incentive**</u> <u>**Unit**</u> Kitchen Exhaust Hood Demand Ventilation $700/hp 75 hp
Description & Implementation Strategies	**Energy Reduction Opportunity** Kitchen ventilation with demand control hood exhaust uses temperature and/or smoke sensors to adjust ventilation rates. This saves significant energy compared to traditional 100% on/off controls. Traditional ventilation systems operate at one speed regardless of how hard the appliances are working. Demand-controlled ventilation systems respond to variations in stove use, allowing two-speed or variable speed fans to regulate exhaust and make up airflow as necessary. Therefore, when stoves are off or only a few burners are in use, exhaust fans work at lower speeds and use less energy. **Target Audience** Restaurants, hotels, universities and hospitals. **Incentive & Targeted Economics** Incentive amounts will differ based on existing or new construction applications. **Application Process** To qualify for a Hawaii Energy Commercial Kitchen Demand Ventilation Controls Rebate, the following conditions must be met: • The control system must be used in conjunction with variable speed fan motor controls. • All motors must meet NEMA Premium Efficiency standards and be UL® Approved • Temperature or optical fume sensors must have the ability to sense and ramp up or down the ventilation rate based on the presence of temperature, smoke or steam from cooking activity • Temperature and Infrared cooking sensors must have the ability to measure temperature at the cooking surface to ramp ventilation up or down based on when cooking starts • Hawaii Energy incentive worksheet must be submitted with application **Complementary Programs** • ENERGY STAR Kitchen Equipment • SBDI – Restaurant Lighting • Low Flow Spray Rinse Nozzles

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.6 Commercial Industrial Processes** **5.2.6.2 – Refrigerated Case Night Covers**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $ 0 Cost per kWh $0.00 /kWh TRB $ 0
Incentives	**Incentive** **Unit** Refrigerated Case Night Covers $10/Linear ft. 0 Linear ft.* **but is available to participants*
Description & Implementation Strategies	**Energy Reduction Opportunity** The installation of retractable aluminum woven fabric covers for open-type refrigerated display cases, where the covers are deployed during the facility's unoccupied hours in order to reduce refrigeration energy consumption. **Target Audience** Supermarkets, grocery stores, convenience stores and big box stores. **Incentive & Targeted Economics** The incentive target is $10/linear feet. **Application Process** Eligibility • Must install a cover on an existing open refrigerated display case to decrease its cooling load during off hours. • The equipment manufacturer must not object to the use of night covers for the existing display case model. • This incentive is based on linear footage of the installed night cover. • The cover must be applied for a period of at least six hours. **Complementary Programs** • EC Evaporator Fan Motors • Refrigerated case lighting

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.7 Building Envelope Improvements - Overview**
Projected Impacts	Demand 67 kW Energy 254,472 kWh Incentive Budget $ 52,000 (0.2%) Cost per kWh $0.2043 /kWh TRB $ 431,995
Incentives	

	Incentive	Unit
Window Tinting	$0.70/sq.ft	60,000 sq.ft.
Cool Roof Technologies	$0.20/sq.ft	50,000 sq.ft.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.7 Building Envelope Improvements** **5.2.7.1 Cool Roof Technologies**
Projected Impacts	Demand 2 kW Energy 10,378 kWh Incentive Budget $ 10,000 Cost per kWh $0.9636 /kWh TRB $ 15,634
Incentives	<u>**Incentive**</u> <u>**Unit**</u> Cool Roof Technologies $0.20/sq.ft 50,000 sq.ft.
Description & Implementation Strategies	**Energy Reduction Opportunity** Cool Roofs increase the reflectivity of the roof and reduce cooling loads by either the reflective white or silver color and/or by "stealth" technologies such as ceramic and titanium oxide particles embedded in the material. The cool roof technologies allow a wide range of roof colors. **Target Audience** Who: AOAOs, Property Managers, Private and Public Facilities Directors. Roofing Companies, Architects What: All Commercial Facilities **Incentive & Targeted Economics** The offering of a $0.20/sq. ft. prescriptive incentive based on ENERGY STAR® Qualified roofing products. • *Warranty* – Roof must have a minimum fifteen-year manufacturer's warranty and one-year installer's warranty • *Conditioned Space* – Rebates shall be paid on actual square footage of roof covering a conditioned space. • *Unshaded* – Roofs significantly shaded by buildings, trees or awnings are not eligible for rebates. This is targeted to incentive will provide a 25% of the incremental cost of moving from standard to ENERGY STAR® roofing materials.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.7 Building Envelope Improvements** **5.2.7.2 Window Tinting**
Projected Impacts	Demand 65 kW Energy 244,094 kWh Incentive Budget $ 42,000 Cost per kWh $0.1721 /kWh TRB $ 416,361
Incentives	**Incentive** **Unit** Window Tinting $0.70/sq.ft. 60,000 sq.ft.
Description & Implementation Strategies	**Energy Reduction Opportunity** Window tinting can save energy by reducing the heat gain through windows as well as preventing lowering of temperature set points by occupants near the windows. Modern tints can provide the rejection of infrared energy while not blocking visible light. This expands the tinting opportunities in view sensitive locations such as hotel and office buildings. **Target Audience** Who: AOAOs, Property Managers, Private and Public Facilities Directors. Window Tinting Companies What: Hotel, Office, Condominium and Apartments & Government housing. **Incentive & Targeted Economics** The offering of a $0.85/sq. ft. prescriptive incentive based on the film's Solar Heat Gain Coefficient (SHGC) < 0.435. • *Warranty* – Film must have a minimum five-year manufacturer's warranty and one-year installer's warranty • *Conditioned Space* – Rebates shall be paid on actual square footage of glass in a conditioned space on the east, west, and south facing windows. • *Eligible Types* – Windows may be clear or factory tinted, single or double pane, but must not have reflected glass. All orientations are eligible. • *Unshaded* – Windows significantly shaded by buildings, trees or awnings are not eligible for rebates. • *Replacement Film* – Replacement of deteriorated window film is eligible for 50% of the rebate. This incentive is targeted to provide a 25% cost reduction for the installation. **Application Process** 1. A prescriptive worksheet will be completed and submitted for review • Square footage of tinting • HVAC system Information • Site Layout • Exterior photo of the south, east and west of the facility

Description & Implementation Strategies (continued)	2. Manufacturer specification sheets. 3. A request for a manufacturer's energy savings model run based on the location specific site conditions. 4. All sites will have pre/post inspections **Complementary Programs** • High Efficiency HVAC Measures • Central Plant Optimization

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.8 ENERGY STAR® Business Equipment** **5.2.8.1 ENERGY STAR® Refrigerators w/Recycling**
Projected Impacts	Demand 7 kW Energy 170,616 kWh Incentive Budget $ 12,500 (0.1%) Cost per kWh $0.0733 /kWh TRB $ 222,894
Incentives	<u>**Incentive**</u> <u>**Unit**</u> ENERGY STAR® Refrigerators w/recycling $50/unit 250 units
Description & Implementation Strategies	**Energy Reduction Opportunity** There is a 32 to 62% energy reduction opportunity in the replacement of the "old" office refrigerator with a modern ENERGY STAR® model. **Target Audience** Who: Property Managers, Executive Level Company Officers What: All Commercial **Incentive & Targeted Economics** The offering of a $125 incentive for ENERGY STAR® units bought and delivered by participating retailers. This incentive is a 10 to 25% reduction in the cost of a new ENERGY STAR® model. **Application Process** 1. A retailer submitted application and recycling verification worksheet. • Unit size, model, • Confirmation of Pickup and Recycling. • Unit location description 2. A sample of sites will have post inspections **Complementary Programs** • High Efficiency HVAC and Lighting Measures

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.9 High Efficiency Appliances**
Projected Impacts	Demand 8 kW Energy 174,975 kWh Incentive Budget $ 33,750 (0.1%) Cost per kWh $0.1929 /kWh TRB $ 230,637
Incentives	<u>**Incentive**</u> <u>**Unit**</u> Clothes Washer (Tier II/III) $50 0 Refrigerator (new purchase only) < $750 $50 50 Refrigerator (with recycling of old) $125 250

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.10 Energy Awareness, Measurement and Control Systems**
Projected Impacts	Demand 94 kW Energy 629,446 kWh Incentive Budget $ 190,000 (0.8%) Cost per kWh $0.3019 /kWh TRB $ 715,315
Incentives	<u>**Incentive**</u> <u>**Unit**</u> Hotel Room Occupancy Controls $100 500 Condominium Submetering $200 500 units metered Small Business Submetering $200 100 units metered Vending Machine Energy Control Systems $100 200

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.10 Energy Awareness, Measurement and Control Systems** **5.2.10.1 Hotel Room Occupancy Controls**
Projected Impacts	Demand 42 kW Energy 311,344 kWh Incentive Budget $ 50,000 Cost per kWh $0.1606 /kWh TRB $ 340,955
Incentives	**Incentive** **Unit** Hotel Room Occupancy Controls $100 500
Description & Implementation Strategies	PROGRAM OBJECTIVE • This offer is for the installation of energy management systems that gives thermostat control to existing guest room air conditioning systems using occupancy sensors. REQUIREMENTS • All entry and lanai doors must have door switches or other technologies that will de-energize the fan coil unit (FCU) when the door remains open. • All main rooms must have occupancy sensors that will de-energize the FCU when no movement is detected for a given period of time (not to exceed 15 minutes) Thermostat controls must be preset • Applicant must be on a commercial rate schedule (reference utility bill). APPLICATION • Completed Commercial and Industrial Prescriptive Incentive Application • W-9 Tax Form • Completed Hotel Guest Room EMS Worksheet • Hotel Guest Room List • Equipment Invoice: Must clearly show the manufacturer, model number and quantity. • Equipment Specification Sheets INCENTIVE • $100 per guest room controlled

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.10 Energy Awareness, Measurement and Control Systems** **5.2.10.2 Condominium Submetering**
Projected Impacts	Demand 24 kW Energy 113,329 kWh Incentive Budget $ 100,000 Cost per kWh $0.8824 /kWh TRB $ 146,035
Incentives	<u>Incentive</u> <u>Unit</u> Condominium Submetering $200 500 units metered

Description & Implementation Strategies

PROGRAM OBJECTIVE

- This program is designed to assist master-metered condominiums and their Association of Apartment Owners (AOAO) to install billing submeters for their units and common areas to drive energy conservation and ensure equity and fairness in allocating energy costs to tenants and/or owners of their condominium units. The knowledge of personal energy usage and the responsibility to pay for it can result in energy usage behavior modification and reward those making investments in energy efficient equipment.
- The combination of billing submeters, along with education, peer group comparisons and special equipment offerings, will assist the owner or tenant to achieve significant energy conservation and efficiency.
- Provides the AOAO an opportunity to receive an energy audit of the property and participate in other Hawaii Energy incentives for conservation in all common areas. Possible incentives could include A/C, lighting, pool pumps, domestic water pumps and parking garage exhaust fans.

INCENTIVE

- The payment of this $200/unit metered incentive is payable to the AOAO towards the purchase and installation of a third party submetering system. The metering system is to be used for billing purposes so that each owner or tenant of the unit metered will be responsible for the payment of their own electric consumption.
- Incentive payment will be made upon completion of: installation of each meter and billing system, tenant education submetering workshop, energy audit of the AOAO property and commencement of real time billing to individual tenants.
- Incentive payment cannot exceed 50% of total project cost.

ENERGY SAVINGS

- It is expected there will be at least a 10% reduction in energy usage; however, there is no minimum reduction in electrical use required to retain the incentive.
- Currently the M&V Review found a 22.7% reduction on the projects they reviewed, but recommended no change to the 10% reduction assumption.

Program Category	5.2 Business Energy Efficiency Measures 5.2.10 Energy Awareness, Measurement and Control Systems 5.2.10.2 Condominium Submetering
Description & Implementation Strategies (continued)	REQUIREMENTS • The metering system must remain in place and billing to occur for a period of at least five (5) years or a pro-rated portion of the incentive will be recovered by Hawaii Energy. • Energy meter data (submetered billing statements) must be provided to Hawaii Energy for analysis purposes. • A joint educational and monitoring program will be undertaken with AOAO to assist in the verification of savings and development of an ongoing energy incentive offering for other condominiums in Hawaii. Components of the Pilot Program: • Physical verification review of meters serving the building. Review monthly billing history • AOAO to provide monthly individual data collection for a two month period after meter installation to Hawaii Energy. This would be the mock billing information that is supplied to the tenant. • Submetering system installation inspection review • Identification of Top (T) and Bottom (B) 5 energy users for the purpose of peer comparison. All information will be anonymous. • AOAO to host submetering and energy conservation and efficiency workshops presented by Hawaii Energy. A free energy efficient power strip will be given to encourage attendance. (If power strips are not available, Hawaii Energy reserves the right to offer a comparable promotional item.) • CFLs and LEDs can be purchased utilizing the point of purchase rebates made available by Hawaii Energy in retail outlets throughout the state. • AOAO owners/tenants are eligible for ENERGY STAR® Appliance rebates and can purchase ENERGY STAR® appliances through major retailers throughout the state. • AOAO to perform energy audit/Vendor Project Proposals with Hawaii Energy assistance on the following: 1. Common Area Lighting 2. HVAC 3. Domestic Water Pumping 4. Domestic Water Heating

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.10 Energy Awareness, Measurement and Control Systems** **5.2.10.3 Small Business Submetering**
Projected Impacts	Demand 9 kW Energy 34,073 kWh Incentive Budget $ 20,000 Cost per kWh $0.5870 /kWh TRB $ 49,934
Incentives	**Incentive** **Unit** Small Business Submetering $200 100 units metered
Description & Implementation Strategies	• Small businesses ongoing efforts to reduce energy consumption and support the current submetering proposal as one that will ensure both fairness in allocating energy costs as well as encouraging energy conservation through direct feedback of business energy use to the tenants. • Combining the submetering program with education and audits as proposed will complete developing the tenant's newfound desire for energy conservation with the how to achieve it. • $200 per unit metered, payable to the owner or small business • The payment of the incentive will be based on owner installing and utilizing the submeters for billing purposes as well as participating in the actions proposed below. • It is expected there will be at least 10% reduction in energy use; however, there is no minimum reduction in electrical use to be required by owner to retain the incentive. • We do require that the system remain in place and billing to occur for a period of at least five (5) years or a pro-rated portion of the incentive will be recovered by Hawaii Energy. • A joint educational and monitoring program will be undertaken with owner to assist in the verification of savings and development of an ongoing energy incentive offering for other condominiums in Hawaii. • This will be a pilot program subject to review and approval of how savings will be determined. Savings methodology to be included in the TRM for 2015 programs.

Program Category	**5.2 Business Energy Efficiency Measures** **5.2.11 Energy Efficiency Equipment Grants** **5.2.11.1 – Water Cooler Timers**
Projected Impacts	Demand 149 kW Energy 1,681,256 kWh Incentive Budget $ 150,000 Cost per kWh $0.0892 /kWh TRB $1,112,357
Incentives	**Incentive** **Unit** Water Cooler Timers $15 10,000 units
Description & Implementation Strategies	**Energy Reduction Opportunity** Water coolers use a significant amount of energy. To address the vast energy waste, water cooler timers can save over 70% on water cooler electricity cost in a standard office work week. Water coolers programmed to shut down during non-usage hours will save significant amount of energy. **Target Audience** Offices **Incentive & Targeted Economics** $15 per water cooler timer **Application Process** This program will be implemented through home-office delivery (HOD) companies that provide water services. Water cooler timers will be programmed to shut down during non-usage office hours.

Program Category	5.2 Business Energy Efficiency Measures 5.2.12 Multi-Family Direct Install – Energy-Saving Kits
Projected Impacts	Demand 354 kW Energy 1,303,800 kWh Incentive Budget $ 378,000 (1.6%) Cost per kWh $0.2899 /kWh TRB $ 1,488,621
Incentives	Incentive / Unit Multi-Family Direct Install Energy-Saving Kits $129 2,930 Kits
Description & Implementation Strategies	Multi-family property buildings will be targeted as recipients of turn-key installations of basic energy saving items for individual units. Proposed installations include CFLs, low flow showerheads, faucet aerators, and advanced power strips. Program development will include market analysis and segmentation using input from State housing agencies, direct property manager outreach and tenant education. All measures will be installed without a customer co-pay.

5.3 Custom Business Efficiency Measures (CBEEM)

Program Category	**5.3 Custom Business Energy Efficiency Measures** **CBEEM Programs Overview**
Projected Impacts	Demand 850 kW Energy 29,785,760 kWh Incentive Budget $ 6,131,459 (26.1%) Cost per kWh $0.2059 /kWh TRB $ 35,674,387
Incentives	This program provides for incentives for all energy-savings actions that are not already covered by the prescribed incentives. Custom incentives will not be limited to a certain list of measures. **Incentive** **Units** Customized Project Measures <= 5 yrs. $0.11 3,181,818 kWh Customized Project Measures > 5 yrs. $0.19 32,693,834 kWh

Program Category

5.3 Custom Business Energy Efficiency Measures

5.3.1 Customized Project Measures

5.3.1.1 Customized Project Measures <5 yrs.

5.3.1.2 Customized Project Measures >5 yrs.

Projected Impacts

Demand	850	kW
Energy	29,785,760	kWh
Incentive Budget	$ 6,131,459	(26.1%)
Cost per kWh	$0.2059	/kWh
TRB	$ 35,674,387	

Incentives

	Incentive	Units	
Customized Project Measures <=5 yrs.	$0.11	3,181,818	kWh
Customized Project Measures >5 yrs.	$0.19	32,693,834	kWh

Market Barriers

- Risk Avoidance
- Market acceptance of new technologies
- Lack of familiarity with availability of energy efficient technology
- High initial up-front cost
- Life Cycle Cost vs. Simple Payback decision analysis
- Need for a cash positive investment
- Access to and/or understanding of financial options
- Lack of knowledge of operation and maintenance of technologies

Description & Implementation Strategies

Customized Application Process

This program will provide a custom application and granting process for participants to receive incentives for installing non-standard energy efficiency technologies. The intent of this structure is to enable customers to invest in energy efficiency processes and technology measures that may require calculations of energy savings for specific, unique applications. Incentive awards will be based on calculated savings that ensure program cost-effectiveness.

The process includes:

- Program performs outreach and promotions to inform customers of incentive opportunities
- Customer learns about the program offerings through various channels
- Customer may call the program to request assistance.

Customer or his agent must submit a brief proposal that describes the project and includes estimates of energy savings and payback

- Engineering calculations are required and may be reviewed either internally or with a third-party engineering firm
- Program provide feedback on the project to clarify if needed
- Program provides pre-inspection and/or arranges for pre-metering of existing equipment if required
- Customers select and approve purchase and installation of energy efficiency measures

Program Category	**5.3 Custom Business Energy Efficiency Measures** **5.3.1 Customized Project Measures** **5.4.1.1 Customized Project Measures <=5 yrs.** **5.4.1.2 Customized Project Measures >5 yrs.**
Description & Implementation Strategies (continued)	**Customized Project Criteria** • Payback of greater than one year or 6 months for LED projects. • Pass the utility benefit-cost test, Total Resource Cost Ratio (TRC) based on the value of the Utility avoided demand (kW) and avoided energy (kWh) that the project produces • Incentive rate will not exceed the 50% of incremental cost of the energy efficiency improvement **Customized Worksheet of Decision Criteria** We listened to feedback that the prior customized application process was mysterious and subjective. A customized worksheet was developed and implemented in PY2009 that incorporates all the information required to screen the project: • Base case and enhanced case scenarios • Project savings • Project costs The worksheet calculates and we are able to screen based on the following: • Simple Payback (>1 year or 6 months or greater for LED projects) • Incentive Amount (<=50% of incremental cost) • Total Resource Cost Ratio (>=1) Encouraged technology categories • Fresh Water Pumping / Waste Water Pumping • Data Centers - Airflow Optimization • Data Centers - Server Virtualization and Related Technologies • Parking Garages - Perimeter Dimming • Parking Ventilation Control • Demand Control Ventilation (CO2 Sensors in return airstream) • LED Refrigeration Case Lighting • LED Interior Lights • LED Traffic Lights and Exterior Lighting • Commercial Refrigeration Measures • Advanced Energy Management Controls • Variable Refrigerant Flow Air Conditioning • High Performance Commercial Lighting • Bi-Level Stairwell and Parking Garage Lighting

<table>
<tr><td>Program Category</td><td>5.3 Custom Business Energy Efficiency Measures
5.3.1 Customized Project Measures
5.4.1.1 Customized Project Measures <=5 yrs.
5.4.1.2 Customized Project Measures >5 yrs.</td></tr>
<tr><td>Key Changes</td><td>Tiered Incentives by Payback
• Projects that have longer life measures often have longer paybacks, which makes it difficult for businesses to gain approvals for them.
• These projects can be pushed into reality by offering increases in the incentive levels in order to enhance feasibility and get them to a point where the customers will implement them.

<table><tr><th>Measure Life</th><th>Reduction in Energy use Incentive</th></tr><tr><td><= 5 years</td><td>$0.10 /kWh</td></tr><tr><td>> 5 years</td><td>$0.18 /kWh</td></tr></table></td></tr>
<tr><td>Marketing Strategies</td><td>• Offer program ally custom incentive training and workshops to ensure program allies are comfortable with utilizing all aspects of the custom incentive program to sell more energy-efficient options to their respective customers
• Maintain direct contact with key market players to understand the markets and decision points and to leverage their marketing resources to inform members
• Email informational campaigns
• Award and publish success of customer and ally partners to demonstrate highest level leadership in an effort to pull the market</td></tr>
</table>

5.4 Business Service and Maintenance (BESM)

Program Category	**5.4 Business Energy Services & Maintenance** **BESM Program Overview**
Projected Impacts	Demand 10 kW Energy 609,957 kWh Incentive Budget $780,000 (3.3%) Cost per kWh $1.28 /kWh TRB $199,379
Incentives	**5.4.1 Business Design, Audits & Commissioning**

	Incentive	Units	
Benchmark Metering	$75,000	2	Groups
Decision Maker – Real-Time Submeters	$80,000	1	Project
Energy Audit	$5,000	10	Studies
Energy Study Project Implementation (100%)	$25,000	2	Studies
Energy Study Assistance (50%)	$15,000	5	Studies
Design Study Assistance (50%)	$15,000	2	Designs
Education Facilities – Submetering for Energy Programs	$75,000	1	Participants
Water/Wastewater Catalyst	$1.25/kwh	80,000	kWh
ENERGY STAR® Portfolio Scoring Rewards	$7,000	10	Participants
System Retro-commissioning	$20,000	5	Projects

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.1 Benchmark Metering**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $ 150,000 Cost per kWh $000 /kWh TRB $0
Incentives	<u>**Incentive**</u> <u>**Unit**</u> Benchmark Metering $75,000 2 Groups
Description & Implementation Strategies	The Benchmark Metering incentive is designed to encourage business customers to install a central chiller plant metering and data logging system that will provide real-time data and trend data. This data reflects actual tons of cooling and measured efficiency in KW per ton. The new equipment will make it possible for the customer to set meaningful energy efficiency goals and track progress towards those goals. With the Hawaii Energy incentive, there is no cost to the customer for the metering equipment or installation (up to $75,000). **Procedure** Customer: 1. Have a central chiller plant (or a central chiller plant project in the planning phase) with a total building electrical energy consumption of at least 3 million kWh per year. 2. Complete and submit Central Chiller Plant Benchmarking Application 3. The Hawaii Energy monitoring and data acquisition server shall be located at the customer's site and connected to the internet via customer's connection. 4. Submit to Hawaii Energy all payee information and the IRS Form W-9 at the beginning of every calendar year for processing of the IRS Form 1099. It is understood that Hawaii Energy will forward a copy of the IRS Form 1099 to the payee at the end of the calendar year. 5. Agree to inspection of project for up to 5 years after completion Industry Partners: 1. Assist customer in submission of application, savings estimate worksheet, and project proposal. 2. Provide quotations for metering installation at customer's location. Only firm/fixed cost quotes will be accepted by Hawaii Energy. 3. Provide supporting documentation to support information submitted on Worksheet. Information may include drawings, vendor cut sheets, energy savings estimates (methodology and calculations). 4. Install approved measures and required metering/monitoring equipment

	Hawaii Energy: 1. Review application, worksheet, and proposal to determine if proposed project meets the intent of the program. 2. Perform post installation inspection to ensure all measures/equipment are properly install and operational. 3. Process approved incentive payments (to customer or authorized third party) based on validated savings calculations 4. Prepare and file close out report documenting actual savings achieved and incentives paid.
Marketing Strategies	Direct contact with Mechanical Services companies, chief engineers, property managers and manufacturers' representatives,

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.2 Decision Maker – Real-Time Submeters**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $80,000 Cost per kWh $000 /kWh TRB $0
Incentives	<u>**Incentive**</u> <u>**Units**</u> Decision Maker - Real-Time Submeters $80,000/Project 1 Projects
Description & Implementation Strategies	**Energy Reduction Opportunity** There are individuals within business organization who have influence over large numbers of employees whose behavior within the work environment drive unnecessary energy consumption. Examples can be leaving on lights, additional electronic equipment, and items such as foot heaters and additional fans that mask larger energy efficiency issues etc. This will be a pilot program subject to review and approval of how savings will be determined. Savings methodology to be included in the TRM for 2015 Programs. **Target Audience** Who: Property Managers, Executive Level Company Officers What: All Commercial **Incentive & Targeted Economics** The offering of the direct installation or materials with in-house installation of web-based electrical metering. This metering will be monitored by decision makers within the organization to identify usage patterns and be the basis of peer group competitions within the organization. **Application Process** An MOU will be developed with the customer that will outline the purpose and process of setting up education and peer group competitions within their businesses. **Complementary Programs** • High Efficiency HVAC • High Efficiency Lighting Measures

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.3 Energy Audit**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $ 50,000 (0.1%) Cost per kWh $0.00 /kWh TRB $0
Incentives	**Incentive** **Unit** Energy Audit $5,000 10 Studies
Description & Implementation Strategies	This offer is designed to promote energy-saving evaluations of building equipment and operations that consume electricity. Hawaii Energy provides an incentive for a portion of the existing facility's energy consumption analysis through a two phase process: (1) the completion of a preliminary energy audit (see Energy Audit Worksheet from website) and (2) a detailed energy study upon approval of the audit. Pre-approval is required prior to the start of any audit in order to ensure budget availability, review any prior studies at the location, and have a discussion about the goals and context of the energy analysis.

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.4 Energy Study Project Implementation - 100%**
Projected Impacts	Demand 0kW Energy 0kWh Incentive Budget $ 50,000 Cost per kWh $0.00/kWh TRB $0
Incentives	**Incentive** **Units** Energy Study Assistance $25,000/study 2 studies
Description & Implementation Strategies	• 100% Funded up to $25,000 • Customer agrees to implement reccomendations with less than 2 year paybacks within 1 year up to the value of the energy study or pays back 50% of the energy study cost. • Load / Existing Performance Measurements • Modeling new systems • Actionable recommendations

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.5 Energy Study Assistance**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $ 75,000 Cost per kWh $0.00 /kWh TRB $0
Incentives	<u>**Incentive**</u> <u>**Units**</u> Energy Study Assistance $15,000/study 5 studies
Description & Implementation Strategies	• 50% matching up to $15,000 • Load / Existing Performance Measurements • Modeling new systems • Actionable recommendations

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.6 Design Assistance**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $ 30,000 Cost per kWh $0.00 /kWh TRB $0
Incentives	**Incentive** **Units** Energy Study Assistance $15,000/Design 2 Designs
Description & Implementation Strategies	• 50% matching up to $15,000 for projects exceeding code requirements • Meet targeted energy efficiency levels • Actionable recommendations
Marketing Strategies	• Direct interaction with potential customers and mechanical engineers • Promote measure information on the website • Promote successful projects in the media and events

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.7 Education Facilities – Submetering for Energy Programs**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $ 75,000 Cost per kWh $0.00 /kWh TRB $0
Incentives	**Incentive** **Units** Submetering for Energy Programs $75,000 1 Participants

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.8 Water/Wastewater Energy Project Catalyst**
Projected Impacts	Demand 10 kW Energy 84,132 kWh Incentive Budget $ 100,000 Cost per kWh $1.19 /kWh TRB $140,295
Incentives	**Incentive** **Units** W/WW Energy Project Catalyst $1.25/kWh 80,000 kWh
Description & Implementation Strategies	The objective of the catalyst program is to accelerate stalled high impact UV disinfection project. • *5 year Cost Neutral Incentive* – This measure will provide the funding required to drive this project into a 5 year lease that is cash neutral for the customer.

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.9 ENERGY STAR® Portfolio Scoring Rewards**
Projected Impacts	Demand 0 kW Energy 0 kWh Incentive Budget $ 70,000 Cost per kWh $0.00 /kWh TRB $0
Incentives	**Incentive** **Units** ENERGY STAR® Portfolio Scoring Rewards 7,000 10 Participants
Description & Implementation Strategies	ENERGY STAR® is a program of the US Environmental Protection Agency and the US Department of Energy. ENERGY STAR® Portfolio Manager provides a valuable platform for capturing baseline data and tracking energy efficiency improvements over time. There are commercially available programs and web based platforms that facilitate data acquisition, entry and updating into both the ENERGY STAR® Portfolio Manager and other privately secured data bases. The Program will provide a web-based platform that shall be used to provide this energy efficiency benchmarking and other energy use indexes in a common format allowing both The Program, Industry partners and end users to see and use this information to facilitate intelligent energy efficiency decisions in future Operations & Maintenance (O&M) and capital improvement plans. Targeted incentives will be offered to participants of this program based on their ENERGY STAR® Rating number. If a building does not qualify for an ENERGY STAR® Rating number they will be encouraged to participate in our custom incentive program. Below are the targeted Incentives to be provided: **<75** – These facilities are considered a very low performing facility and in need of major facility improvements. For these facilities we will offer our Whole Building Assistance Program; Energy Audits , Energy Studies, and Design assistance, **75-90** - These facilities are considered high performing buildings and may need specific energy efficiency upgrades. For these facilities we will offer Certification assistance. **>90** – These facilities are considered optimal performing buildings and need very specific projects in order to tweak existing system. For these Facilities we will offer Decision Maker Metering, a program that by installation of sub metering allows decision makers to focus efforts on energy wasters that may not otherwise be obvious.

Program Category	**5.4 Business Energy Services & Maintenance** **5.4.1 Business Design, Audits and Commissioning** **5.4.1.10 System Retro-commissioning**
Projected Impacts	Demand 0 kW Energy 525,825 kWh Incentive Budget $ 100,000 Cost per kWh $0.19 /kWh TRB $140,295
Incentives	**Incentive** / **Units** System Retro-commissioning $20,000 / 5 Projects
Description & Implementation Strategies	**Energy Reduction Opportunity** Often, re- and retro-commissioning activities have fairly modest project costs, but return significant energy and demand savings. Savings are achieved by optimizing building systems and assemblies to operate as efficiently as possible based on design criteria, data evaluation, and operational parameters. These savings opportunities will likely be a combination of no/low cost operational adjustments and sequencing, low-cost equipment optimization, and capital improvement projects. **Incentive** • *Minimum of: $0.20/SF, 50% study cost, or $15,000* • *Additional $0.10 per kwh saved and $125 per kW (5-9 PM)* • *Max incentive = 80% of total project cost*

5.5 Business Hard-to-Reach (BHTR)

Program Category	**5.5 Business Hard-to-Reach** **BHTR Program Overview**
Target Market	Small Business Customers receiving electric power under a Schedule "G" rate are eligible under this program. Small customers similar to Schedule "G" customers that are under master-metered accounts would also be eligible. The program will target the 50,000 customers within the small business market that have limited time and expertise within their organizations to research lighting technology options, obtain financing and contract with lighting contractors to replace their older less efficient lighting technologies. **Restaurants** This sector has a low participation rate, low saturation of high efficiency equipment and high potential for energy savings. The Small Business Direct Installation (SBDI) method has proven effective in generating attention and participation. It also allows the Program to gather information on equipment and operations, and present opportunities for greater energy savings through other programs, such as the ENERGY STAR® Kitchen Equipment program. **Landlords** The landlord-tenant relationship provides challenges to making energy efficiency capital investments in properties and operations such as air conditioning and lighting upgrades. This funding is to create a program that works with landlords that are taking This program will be targeted to provide landlords of small business schedule "G" customers with comprehensive audit, RFP and other support for energy saving projects that will drive down the energy cost of their tenants.
Projected Impacts	Demand 1,225 kW Energy 8,961,690 kWh Incentive Budget $2,442,215 (10.4%) Cost per kWh $0.2725 /kWh TRB $11,738,851

Schedule "G" Customers	
Oahu	29,117
Big Island	12,614
Maui	8,503
Lanai	194
Molokai	498
Totals	50,926

Incentives	5.5.1 Small Business Direct Installation			
		Incentive	**Units**	
	Retrofitted Lamps	$69.67	15,582	Lamps
	Custom Lighting	$0.25	80,000	kWh
	Refrigerated Cases	$1.10	45,455	kWh
	5.5.2 Restaurant Targeted Participation Programs			
		Incentive	**Units**	
	ENERGY STAR® Commercial Kitchen Equipment	$0.23/kWh	978,261	kWh
	Low Flow Spray Rinse Nozzles	$22	500	units
	SBDI - Kitchen Exhaust Hood Demand Ventilation	$1,700	50	hp
	SBDI - Restaurant Lighting Retrofitted Lamps	$64.33	13,965	Lamps
	Custom Lighting	$0.25	269,180	kWh

Program Category	**5.5 Business Hard to Reach** **5.5.1 Small Business Direct Installation** **5.5.1.1 – SBDI Lighting Retrofits** **5.5.1.2 – SBDI Refrigeration Retrofits**
Projected Impacts	Demand 242 kW Energy 2,826,938 kWh Incentive Budget $ 1,155,595 (4.9%) Cost per kWh $0.4088 /kWh TRB $4,168,194
Incentives	**Incentive** **Units** Small Business Direct Lighting Retrofits Retrofitted Lamps $69.67 15,582 Lamps Custom Lighting $0.25 80,000 kWh Refrigerated Cases $1.10 45,455 kWh
Technologies	Small Business Lighting Retrofit providing a “Turnkey” program consisting of audits, 100% incentivized lighting measures, installation by participating Hawaii Energy Participating contractors and 6 month financing of lighting retrofit costs of custom measures beyond the cost per kWh incentive. The 100% incentive levels will be reviewed to insure that changes in equipment pricing (LEDs in particular) are taken into account.
Market Barriers	• Trust in equipment vendors/contractors • Lack of familiarity with energy efficient lighting technologies • Inability to obtain project financing • Lack of time and expertise to seek and select lighting contractors • Life Cycle Cost vs. Simple Payback decision analysis
Description & Implementation Strategies	• Provide complete process to provide direct installation of lighting retrofits for small business customers. • Participating Hawaii Energy Participating contractors will offer six month payment plans for the lighting retrofits • Use of workforce development groups and grass roots volunteer organizations to generate leads and perform initial audits to lower cost of sales for Lighting contractors • Quick Inventory worksheet to ID potential targeting for future mechanical measures (AC/Water heating/Appliances/Refrigeration)
Marketing Strategies	• Direct contact with participating lighting contractors • Direct contact with Small Business Administration • Direct contact and printed materials to Property Management groups • Door-to-Door contact through Grassroots Action Groups • Website listing of participating lighting contractors

Program Category	**5.5 Business Hard to Reach** **5.5.2 Restaurant-Targeted Participation Programs** **5.5.2.1 - ENERGY STAR® Commercial Kitchen Equipment**
Projected Impacts	Demand 214 kW Energy 1,072,105 kWh Incentive Budget $ 225,000 (1.0%) Cost per kWh $0.2099 /kWh TRB $1,069,842
Incentives	<u>**Incentive**</u> <u>**Unit**</u> Commercial Kitchen Equipment $0.23/kWh 978,261 kWh
Description & Implementation Strategies	**Energy Reduction Opportunity** This program will start with direct installation of variable exhaust ventilation systems that adjust to the cooking exhaust loads. **Target Audience** Who: Restaurants and commercial kitchens What: Commercial Kitchen Equipment **Incentive & Targeted Economics** This program will have a variety of incentives for dozens of equipment types. It is expected that the average cost per kWh will be $0.23/kWh. **Application Process** This program will be implemented through specialty contractors with prescriptive incentives although the program is expressed on a dollar per kWh basis in the plan. The program will also develop a vendor-driven program that will provide them direct incentives and the support of Hawaii Energy technology papers and sales call assistance. **Complementary Programs** • Target Cost per kWh Request for Proposals

Program Category	**5.5 Business Hard-to-Reach** **5.5.2 Restaurant-Targeted Participation Program** **5.5.2.2 Low Flow Spray Rinse Nozzles**
Projected Impacts	Demand 493 kW Energy 1,995,689 kWh Incentive Budget $11,000 Cost per kWh $0.0055 /kWh TRB $1,866,399
Incentives	**<u>Incentive</u>** **<u>Units</u>** Low Flow Spray Rinse Nozzles $22 500 units
Description & Implementation Strategies	A low-flow pre-rinse spray valve is one of the easiest and most cost-effective energy-saving devices available to the foodservice operator. In addition to minimizing water consumption, water heating energy and sewer charges are also reduced.

Program Category	5.5 Business Hard-to-Reach 5.5.2 Restaurant-Targeted Participation Programs 5.5.2.3 SBDI - Kitchen Exhaust Hood Demand Ventilation
Projected Impacts	Demand 25 kW Energy 144,279 kWh Incentive Budget $85,000 Cost per kWh $0.5891 /kWh TRB $274,069
Incentives	Incentive / Unit SBDI - Kitchen Exhaust Hood Demand Ventilation $1,700 50 hp
Market Barriers	• Familiarity with technology • Vendor/Contractor sales and support in Hawaii for technology • Customer lack of access to capital for energy improvements • Renter and Lessee reluctance to invest in non-owned property
Description & Implementation Strategies	**Energy Reduction Opportunity** Kitchen Exhaust hoods run typically at full speed during the operating hours of the restaurant. These controller systems monitor the cooking surfaces for heat and/or particulates in the air to run the fans only when needed. Saving the energy that is wasted during idle periods. **Target Audience** Who: Restaurant Owners, Hawaii Restaurant Association What: Restaurants **Incentive & Targeted Economics** The offering of the direct installation 100% cost incentive. Work to be performed by participating contractors/manufacturers. **Application Process** • Targeted Anticipation and Vendor Driven leads drive interest. • Application and site audit information • Agreement to allow marketing/promotions in Restaurant regarding work performed and savings achieved.

Program Category	**5.5 Business Hard-to-Reach** **5.5.2 Restaurant-Targeted Participation Programs** **5.5.2.4 SBDI - Restaurant Lighting**
Projected Impacts	Demand 250 kW Energy 2,922,679 kWh Incentive Budget $965,620 (4.1%) Cost per kWh $0.34 /kWh TRB $4,360,347
Incentives	**Incentive** / **Units** Retrofitted Lamps $64.33 13,965 Lamps Custom Lighting $0.25 269,180 kWh
Market Barriers	• Customer lack of access to capital for energy improvements • Renter and Lessee reluctance to invest in non-owned property
Description & Implementation Strategies	• Provide complete process to provide direct installation of lighting retrofits for small business customers. • Participating Hawaii Energy Participating contractors will offer six month payment plans for the lighting retrofits • Use of workforce development groups and grass roots volunteer organizations to generate leads and perform initial audits to lower cost of sales for Lighting contractors • Quick Inventory worksheet to ID potential targeting for future mechanical measures (AC/Water heating/Appliances/Refrigeration)
Marketing	• Direct contact with participating lighting contractors • Direct contact with Small Business Administration • Direct contact and printed materials to Property Management groups • Door-to-Door contact through Grassroots Action Groups • Website listing of participating lighting contractors

Program Category	**5.5 Business Hard-to-Reach** **5.5.2 Restaurant Targeted Participation Program** **5.5.2.4 SBDI - Restaurant Lighting**
Technologies	A “Turnkey” program consisting of audits, 100% incentivized lighting measures, installation by participating Hawaii Energy Participating contractors and 6 month financing of lighting retrofit costs of custom measures beyond the cost per kWh incentive. The 100% incentive levels will be reviewed to insure that changes in equipment pricing (LEDs in particular) are taken into account.
Market Barriers	• Trust in equipment vendors/contractors • Lack of familiarity with energy efficient lighting technologies • Inability to obtain project financing • Lack of time and expertise to seek and select lighting contractors • Life Cycle Cost vs. Simple Payback decision analysis

6.0 PROGRAM BUDGET

Below is a summary of the PY15 Budget.

Table 2

Annual Plan Budget

July 1, 2015 through June 30, 2016

Activity	Non-Incentive	Incentive	Total
Residential Programs			
REEM	2,220,000	8,614,690	10,834,690
CESH	135,000	1,011,000	1,146,000
RESM	100,000	250,000	350,000
RHTR	620,000	682,250	1,302,250
Total Residential Programs	**3,075,000**	**10,557,940**	**13,632,940**
Residential Market Evaluation	**200,212**	**0**	**200,212**
Residential Outreach	**564,281**	**0**	**564,281**
Total Residential Services and Initiatives	**3,839,493**	**10,557,940**	**14,397,433**
Business Programs			
BEEM	1,150,000	3,561,800	4,711,800
CBEEM	1,170,000	6,131,459	7,301,459
BESM	620,000	780,000	1,400,000
BHTR	620,000	2,442,215	3,062,215
Total Business Programs	**3,560,000**	**12,915,474**	**16,475,474**
Business Market Evaluation	**234,551**	**0**	**234,551**
Business Outreach	**643,234**	**0**	**643,234**
Total Business Services and Initiatives	**4,437,785**	**12,915,474**	**17,353,259**
Total Residential and Business Services and Initiatives	**8,277,278**	**23,473,414**	**31,750,692**
Transformational Programs			
Residential Transformational Programs	0	1,595,166	1,595,166
Business Transformational Programs	0	1,656,794	1,656,794
Total Transformation Services and Initiatives	**0**	**3,251,960**	**3,251,960**
Total Supporting Services	**2,522,354**	**0**	**2,522,354**
Total Tax on Non-Incentive	**508,879**	**0**	**508,879**
Sub-Total Estimated Contractor Costs	**11,308,511**	**26,725,374**	**38,033,885**
Performance Awards in Excess of Target Levels			**0**
Total Estimated Contractor Costs			**38,033,885**

This table provides a program-level itemization of the overall contract budget. While the contractual budget categories and limitations are as set forth in the contract, the Hawaii Energy team will continue reporting status of budget and expenditures at the program-level, consistent with prior years. Formal changes to the contract budget will be in accordance with the contract.

7.0 PERFORMANCE INCENTIVE GOALS AND INCENTIVE WEIGHTING

The following table shows the PY15 Program Performance Goals and Incentives will be contained in the supplemental contract covering the PY15 budget. The transition between Minimum, Target and Maximum shall be calculated on a linear basis for both goals and awards where appropriate.

Table 3
Performance Goals and Performance Incentives

Hawaii Energy - PY15 - Performance Goals and Performance Incentives									
Performance Target Item	***Performance Goals***					***Award***	***Program Incentive Award***		
Resource Acquisition	***Minimum***	***Target***	***Maximum***			***Fraction***	***Minimum***	***Target***	***Maximum***
	75%	*100%*	110%				75%	*100%*	100.0%
First Year Energy Reduction	91,682,791	122,243,721	134,468,093	kWh		35%	$ 183,750	$ 245,000	$ 245,000
Peak Demand Reduction	12,863	17,150	18,865	kW		5%	$ 26,250	$ 35,000	$ 35,000
Total Resource Benefit	$ 119,529,625	$159,372,834	$ 175,310,117	$		40%	$ 210,000	$ 280,000	$ 280,000
Island Incentive Equity	***Minimum***	***Target***	***Maximum***	***Contribution***	All Items must be met for award		***Minimum***	***Target***	***Maximum***
	80%	100%				10%	n/a	$ 70,000	$ 70,000
County of Hawaii	$ 2,779,439	$ 3,474,299	n/a	13.0%					
C&C Honolulu	$ 15,821,421	$ 19,776,777	n/a	74.0%					
County of Maui	$ 2,779,439	$ 3,474,299	n/a	13.0%					
Total		$ 26,725,374		100.0%					
Market Transformation	***Minimum***	***Target***	***Potential Actions***				***Minimum***	***Target***	***Maximum***
	70%	100%							
Behavior Modification	12,600	18,000	Participants			2%	$ 11,250	$ 15,000	$ 15,000
Professional Development	560	800	Participants			2%	$ 11,250	$ 15,000	$ 15,000
Technical Training	140	200	Participants			2%	$ 11,250	$ 15,000	$ 15,000
Hawaii Energy Ally Program	175	250	New Allies			1%	n/a	$ 5,000	$ 5,000
Benchmarking	105	150	Sites EUI/Peer Group Evaluated		All Target Items must be met for award	3%	n/a	$ 20,000	$ 20,000
Codes & Standards	1 Action	2 Actions	1. Incentive Program for Early Code Adoption 2. Code Compliance Assistance						
Smart Grid	1 Action	1 Action	Continue with PY 14 Smart grid In-Home Display Pilot project						
Demand Response	1 Action	2 Actions	1. Continued evaluation of current heat pump water heater pilot 2. Deployment of DR-enabled water heaters at newly constructed large apartment building						
Electric Vehicle	1 Action	2 Actions	1. Marketing Materials to raise EE/EV awareness 2. Upgrade the EV kit offering to online fulfillment						
Total						100%	$ 453,750	$ 700,000	$ 700,000

8.0 CONCLUSION

On July 1, 2015, Leidos begins its seventh and final Program Year as Hawaii's first Public Benefits Fee Administrator. During this final year we will continue adding to our experience curve as we further explore what works best for Hawaii's energy efficiency and related clean energy efforts in this rapidly changing energy environment. With this cumulative experience and the engaged support of our PUC, allies and customers, this PY15 Annual Plan will close out Hawaii's first PBFA Contract on June 30, 2016 with a strong forward momentum towards achieving Hawaii's long term clean energy goals.

Beginning with the new PBFA Contract starting July 1, 2016, the Hawaii Efficiency Program and its chosen Administrator will be able to stand on the Program's cumulative achievements to reach even more challenging levels of energy savings and clean energy grid integration going forward. The Leidos Hawaii Energy Team is committed to working hard and smart to ensure that it will be our Team that has the privilege of continuing this important work for the people of Hawaii.

MAHALO,
The Leidos Hawaii Energy Team

9.0 APPENDIX

APPENDIX A Program-Level Budget PY2015 (Expanded Version)

As noted above, while the contract sets forth the overall budget categories and limitations, status of Hawaii Energy PY15 budget and expenditures will be reported at this itemized program-level.

Hawaii Energy Efficiency Program Annual Plan Budget	PY15 Budget
Residential Programs	
Residential Program Ops and Management	
REEM	2,220,000
CESH	135,000
RESM	100,000
RHTR	620,000
Subtotal Residential Programs	3,075,000
Residential Market Evaluation	200,212
Residential Outreach	564,281
Total Residential Non-Incentive	*3,839,493*
Residential Incentives	
REEM	8,614,690
CESH	1,011,000
RESM	250,000
RHTR	682,250
Subtotal Residential Incentives	10,557,940
Residential Transformational	1,595,166
Total Residential Incentives	*12,153,106*
Total Residential Programs	**15,992,599**
Business (C&I) Programs	
Business Programs Ops and Management	
BEEM	1,150,000
CBEEM	1,170,000
BESM	620,000
BHTR	620,000
Subtotal Business Programs	3,560,000
Business Evaluation	234,551
Business Outreach	643,234
Total Business Non-Incentive	*4,437,785*
Business Incentives	
BEEM	3,561,800
CBEEM	6,131,459
BESM	780,000
BHTR	2,442,215
Subtotal Business Incentive	12,915,474
Business Transformational	1,656,794
Total Business Incentives	*14,572,268*
Total Business Programs	**19,010,053**
Supporting Services	
Supporting Services	2,522,354
Total Supporting Services	**2,522,354**

-

Subtotal Non-Incentive (Prior to Tax)	10,799,632
Less Performance Incentives (Prior to Tax)	(668,500)
Subtotal Non-Incentive Less Performance Incentives (PI)	10,131,132
Total Tax on Non-Incentive Without PI	477,379
Performance Incentive Award (Inclusive of Tax)	700,000
Subtotal Non-Incentive Billed	*11,308,511*
Subtotal Residential and Business Customer Incentives	*23,473,414*
Subtotal Transformational Incentives	*3,251,960*
Subtotal Customer and Transformational Incentives	*26,725,374*
Sub-Total Estimated Contractor Costs	***38,033,885***
Performance Awards in Excess of Target Levels	-
Total Estimated Contractor Costs	**38,033,885**

Hawaii Energy

Hawaii Energy - PY2015 ANNUAL PLAN - SUMMARY PRESENTATION OF PROGRAMS BY MEASURE

Item	Incentives	Transformati	Total	Program kW	Program kWh - 1st yr.	TRB $		Cost	Customer kWh - 1st yr.
Residential Direct Incentives Only	$ 10,557,940		$ 10,557,940	11,016	60,490,414	$ 71,287,622			67,866,011
Business Direct Incentives Only	$ 12,915,474		$ 12,915,474	6,134	61,753,307	$ 88,085,212			71,215,193
Total Direct Incentives Only	$ 23,473,414		$ 23,473,414	17,150	122,243,721	$ 159,372,834		$ 38,033,885	139,081,204
Program Targets				17,150	122,243,721	$ 159,372,834	RHTR	$ (682,250)	(897,225)
Residential Transformational Incentives		$ 1,595,166					BHTR	$ (2,442,215)	(8,177,247)
Business Transformational Incentives		$ 1,656,795					Custom Residential Hard to Reach Efficiency Measures	$ (300,000)	(1,034,483)
Total Transformational Incentives		$ 3,251,960					Customer Level Totals for CSE Calculation	$ 34,609,420	128,972,249

Item	G&A	T&M	Incentives		Total	CSE - $	CSE - kWh	CSE - $/kWh
Total Program Budget	$ 2,641,208	$ 8,667,303	$ 23,473,414	$ 3,251,960	$ 38,033,885	$ 34,609,420	128,972,249	$ 0.0339

Program, Category, Measure	Count		Average Participant Incentive per Unit	Estimated Budget ($)	% Total Program Budget (%)	Peak Demand Reduction per Unit (kW/Unit)	Energy Reduction per Unit (kWh/Unit)	Program Demand (kW Peak)	Program Energy (kWh/Year)	TRB ($)	Life (yrs.)	Program 1st Year ($/kWh)	Customer Energy (kWh/Year)	Program Lifetime Energy (kWh/Life)
Residential				$ 10,557,940	27.8%			11,016	60,490,414	$ 71,287,622	9.1	$ 0.1745	67,866,011	549,238,079
REEM				$ 8,614,690	22.7%			10,723	54,893,060	$ 67,156,042	9	$ 0.1569	62,768,641	513,665,989
High Efficiency Water Heating				*$ 1,359,000*	*3.6%*			*749*	*3,916,128*	*$ 8,327,034*	*17*	*$ 0.3470*	*4,477,980*	*65,383,011*
Solar Water Heater - Contractor Incentive	1,052	systems	$ 750	$ 789,000	2.1%	0.4600	2,065	423	1,899,811	$ 4,827,466	20	$ 0.4153	2,172,380	37,996,230
Solar Water Heater - Interest Buydown	50	systems	$ 750	$ 37,500	0.1%	0.4600	2,065	20	90,295	$ 229,442	20	$ 0.4153	103,250	1,805,904
Solar Water Heater - OBF Contribution	350	systems	$ 750	$ 262,500	0.7%	0.4600	2,065	141	632,067	$ 1,606,096	20	$ 0.4153	722,750	12,641,331
Water Heating - New Technology Pilots and Testing	-	systems	$ -	$ -	0.0%	0.0000	-	-	-	$ -	20	$ -	-	-
Heat Pumps	900	units	$ 300	$ 270,000	0.7%	0.2100	1,644	165	1,293,955	$ 1,664,031	10	$ 0.2087	1,479,600	12,939,546
Renewable Integration - Digital Timer Devices	-	units	$ 100	$ -	0.0%	0.0855	410	-	-	$ -	10	$ -	-	-
Renewable Integration - Two-Way Enabling Device	-	units	$ 150	$ -	0.0%	0.0000	-	-	-	$ -	10	$ -	-	-
High Efficiency Lighting				*$ 3,918,859*	*10.3%*			*4,663*	*33,011,880*	*$ 44,639,246*	*11*	*$ 0.1187*	*37,748,139*	*354,212,715*
CFLs	900,000	lamps	$ 1.10	$ 990,000	2.6%	0.0028	19.9	2,204	15,662,832	$ 13,752,718	6	$ 0.0632	17,910,000	93,976,994
LED	781,029	lamps	$ 3.75	$ 2,928,859	7.7%	0.0036	25.4	2,459	17,349,048	$ 30,886,528	15	$ 0.1688	19,838,139	260,235,722
High Efficiency Air Conditioning				*$ 331,250*	*0.9%*			*537*	*1,267,325*	*$ 3,939,842*	*14*	*$ 0.2614*	*1,449,150*	*20,993,180*
VRF Split System AC	1,000	units	$ 200	$ 200,000	0.5%	0.3000	583	262	509,851	$ 1,684,826	15	$ 0.3923	583,000	7,647,765
Window AC with Recycling	500	units	$ 80	$ 40,000	0.1%	0.0540	198	24	86,491	$ 137,916	9	$ 0.4625	98,900	778,419
Ceiling Fans - Under $80 Fans for HTR Households w/lights	1,000	units	$ 35	$ 35,000	0.1%	0.0120	65	10	56,844	$ 47,019	5	$ 0.6157	65,000	284,222
Solar Attic Fans	300	units	$ 50	$ 15,000	0.0%	0.0000	502	-	131,704	$ 190,492	20	$ 0.1139	150,600	2,634,084
Whole House Fans	550	units	$ 75	$ 41,250	0.1%	0.5000	1,003	240	482,434	$ 1,879,590	20	$ 0.0855	551,650	9,648,689
High Efficiency Appliances				*$ 539,000*	*1.4%*			*158*	*3,792,803*	*$ 4,902,517*	*11*	*$ 0.1421*	*4,336,962*	*52,374,395*
Refrigerator (with Recycling of Old)	4,000	units	$ 100	$ 400,000	1.1%	0.0340	822	119	2,875,455	$ 3,756,511	14	$ 0.1391	3,288,000	40,256,365
Garage Refrigerator / Freezer Bounty	1,000	units	$ 85	$ 85,000	0.2%	0.0340	859	30	751,221	$ 976,182	14	$ 0.1131	859,000	10,517,098
Pool VFD Controller Pumps	200	units	$ 150	$ 30,000	0.1%	0.0060	597	1	104,473	$ 96,837	10	$ 0.2872	119,462	1,044,731
Refrigerator (Purchase New Only) <$750	300	units	$ 50	$ 15,000	0.0%	0.0170	105	4	27,548	$ 48,934	14	$ 0.5445	31,500	385,668
Advanced Power Strips	500	units	$ 18	$ 9,000	0.0%	0.0089	78	4	34,107	$ 24,053	5	$ 0.2639	39,000	170,533
Energy Efficiency Equipment Grants				*$ 226,000*	*0.6%*			*1,007*	*1,774,946*	*$ 2,643,389*	*5*	*$ 0.1273*	*2,029,600*	*8,874,730*
Online Marketplace - Home Energy Saving Kits - Advanced (Copay)	2,000	Packs	$ 30	$ 60,000	0.2%	0.0157	135	27	236,123	$ 167,414	5	$ 0.2541	270,000	1,180,616
Online Marketplace - Home Energy Saving Kits - Standard (Free)	8,300	Packs	$ 20	$ 166,000	0.4%	0.1350	212	980	1,538,823	$ 2,475,975	5	$ 0.1079	1,759,600	7,694,115
Energy Awareness, Measurement and Control Systems				*$ 2,240,581*	*5.9%*			*3,609*	*11,129,977*	*$ 2,704,012*	*4*	*$ 0.2013*	*12,726,810*	*11,827,957*
Room Occupancy Sensors & Timers	200	units	$ 8.00	$ 1,600	0.0%	0.0046	21	1	3,638	$ 4,803	8	$ 0.4398	4,160	29,104
Peer Group Comparison - Phase 1/2/3	132,500	homes	$ 9.02	$ 1,194,675	3.1%	0.0170	52	1,970	5,976,844	$ 1,425,083	1	$ 0.1999	6,834,350	5,976,844
Peer Group Comparison - Phase 4	110,000	homes	$ 9.02	$ 991,806	2.6%	0.0170	52	1,635	4,961,908	$ 1,183,088	1	$ 0.1999	5,673,800	4,961,908
Water Cooler Timers - HOD Distribution	500	units	$ 15	$ 7,500	0.0%	0.0000	51	-	22,301	$ 11,327	5	$ 0.3363	25,500	111,503
Small Appliance / Lighting / Bathroom Fan - Timers	1,000	units	$ 5	$ 5,000	0.0%	0.0000	25	-	21,863	$ 16,468	8	$ 0.2287	25,000	174,906
In Home Display - Coincentive with Appliances/Direct Install	200	units	$ 100.00	$ 20,000	0.1%	0.0070	410	1	71,711	$ 31,622	4	$ 0.2789	82,000	286,846
Home Energy Management Systems/In Home Display	200	units	$ 100	$ 20,000	0.1%	0.0070	410	1	71,711	$ 31,622	4	$ 0.2789	82,000	286,846

Hawaii Energy - PY2015 ANNUAL PLAN - SUMMARY PRESENTATION OF PROGRAMS BY MEASURE

Residential Programs Continued

Program, Category, Measure	Count		Average Participant Incentive per Unit	Estimated Budget ($)	% Total Program Budget (%)	Peak Demand Reduction per Unit (kW/Unit)	Energy Reduction per Unit (kWh/Unit)	Program Demand (kW Peak)	Program Energy (kWh/Year)	TRB ($)	Life (yrs.)	Program 1st Year ($/kWh)	Customer Energy (kWh/Year)	Lifetime Energy (kWh/Life)
CESH				$ 1,011,000	2.7%			-	4,081,636	$ 2,073,161	5	$ 0.2477	3,687,114	20,408,178
Customized Project Measures				*$ 1,011,000*	*2.7%*			*-*	*4,081,636*	*$ 2,073,161*	*5*	*$ 0.2477*	*3,687,114*	*20,408,178*
Direct Install - Green Neighborhood Program Carry Over	1,600,000	kWh	$ 0.32	$ 511,000	1.3%	0.0000	1	-	1,771,200	$ 899,635	5	$ 0.2885	1,600,000	8,856,000
Hawaii Energy - Efficiency Project Auction	-	kWh	$ 0.35	$ -	0.0%	0.0000	1	-	-	$ -	5	$ -	-	-
Custom Residential Lighting Efficiency Measures	1,052,632	kWh	$ 0.19	$ 200,000	0.5%	0.0000	1	-	1,165,263	$ 591,865	5	$ 0.1716	1,052,632	5,826,316
Custom Residential Hard to Reach Efficiency Measures	1,034,483	kWh	$ 0.29	$ 300,000	0.8%	0.0000	1	-	1,145,172	$ 581,661	5	$ 0.2620	1,034,483	5,725,862
RESM				$ 250,000	0.7%			99	522,490	$ 644,993	8	$ 0.4785	513,030	4,287,072
Residential System Tune-Ups				*$ 250,000*	*0.7%*			*99*	*522,490*	*$ 644,993*	*8*	*$ 0.4785*	*513,030*	*4,287,072*
Solar Water Heater Tune Up	1,000	Tune Ups	$ 150	$ 150,000	0.4%	0.0290	249	30	253,592	$ 39,792	1	$ 0.5915	249,000	253,592
Central Air Conditioning Retrofit Pilot	100	Homes	$ 1,000	$ 100,000	0.3%	0.6780	2,640	69	268,899	$ 605,201	15	$ 0.3719	264,030	4,033,481
RHTR				$ 682,250	1.8%			195	993,228	$ 1,413,426	15	$ 0.6869	897,225	10,876,840
Energy Efficiency Equipment Grants				*$ 521,000*	*1.4%*			*44*	*437,044*	*$ 778,399*	*18*	*$ 1.1921*	*394,800*	*7,539,733*
Refrigerator (with Recycling of Old) - Lanai & Molokai Equity	220	units	$ 250	$ 55,000	0.1%	0.0340	822	8	200,190	$ 261,529	14	$ 0.2747	180,840	2,802,658
Direct Install - Solar Water Heater (SWH)	24	systems	$ 9,000	$ 216,000	0.6%	0.4600	2,065	12	54,863	$ 139,408	20	$ 3.9371	49,560	1,097,258
Direct Install - Heat Pump Water Heater (HPWH)	100	systems	$ 2,500	$ 250,000	0.7%	0.2100	1,644	23	181,991	$ 377,462	20	$ 1.3737	164,400	3,639,816
Direct Installation - Residential Energy Kits				*$ 161,250*	*0.4%*			*151*	*556,184*	*$ 635,027*	*6*	*$ 0.2899*	*502,425*	*3,337,107*
Multifamily Direct install - Energy Savings Kits	1,250	dwelling units	$ 129	$ 161,250	0.4%	0.1090	402	151	556,184	$ 635,027	6	$ 0.2899	502,425	3,337,107

Hawaii Energy - PY2015 ANNUAL PLAN - SUMMARY PRESENTATION OF PROGRAMS BY MEASURE

Program, Category, Measure	Count		Average Participant Incentive per Unit	Estimated Budget ($)	% Total Program Budget (%)	Peak Demand Reduction per Unit (kW/Unit)	Energy Reduction per Unit (kWh/Unit)	Program Demand (kW Peak)	Program Energy (kWh/Year)	TRB ($)	Life (yrs.)	Program 1st Year ($/kWh)	Customer Energy (kWh/Year)	Lifetime Energy (kWh/Life)
Business				$ 12,915,474	34.0%			6,134	61,753,307	$ 88,085,212	13.0	$ 0.2091	71,215,193	801,601,096
BEEM				$ 3,561,800	9.4%			4,050	22,395,900	$ 40,472,594	14	$ 0.1590	26,582,294	305,209,548
High Efficiency Water Heating				*$ 227,400*	*0.6%*			*521*	*587,460*	*$ 3,318,543*	*16*	*$ 0.3871*	*707,570*	*10,347,240*
Commercial Solar Water Heating - Elec. Res.	200	tons	$ 250	$ 50,000	0.1%	1.1000	1,030	183	170,965	$ 1,144,858	20	$ 0.2925	205,920	3,419,302
Commercial Solar Water Heating - Heat Pump	300	tons	$ 100	$ 30,000	0.1%	1.1000	77	274	19,129	$ 1,374,039	20	$ 1.5683	23,040	382,579
Heat Pump - Conversion from Electric Resistance	20	tons	$ 120	$ 2,400	0.0%	0.0300	943	0	15,659	$ 15,554	10	$ 0.1533	18,860	156,585
Heat Pump - End-of-Life Upgrade	500	tons	$ 65	$ 32,500	0.1%	0.0150	300	6	124,538	$ 130,617	10	$ 0.2610	150,000	1,245,375
Single Family Solar Water Heater (SWH) Incentive	150	systems	$ 750	$ 112,500	0.3%	0.4600	2,065	57	257,170	$ 653,475	20	$ 0.4375	309,750	5,143,399
High Efficiency Lighting				*$ 1,063,250*	*2.8%*			*1,382*	*11,798,724*	*$ 19,463,917*	*14*	*$ 0.0901*	*14,211,050*	*172,550,139*
Delamp Only (2 foot Lamp)	5,750	lamps removed	$ 5	$ 28,750	0.1%	0.0090	80	43	381,915	$ 604,850	14	$ 0.0753	460,000	5,346,810
Delamp Only (4 foot Lamp)	10,000	lamps removed	$ 10	$ 100,000	0.3%	0.0170	149	141	1,238,733	$ 1,968,777	14	$ 0.0807	1,492,000	17,342,262
Delamp Only (8 Foot Lamp)	1,800	lamps removed	$ 15	$ 27,000	0.1%	0.0390	333	58	497,652	$ 797,103	14	$ 0.0543	599,400	6,967,126
Delamp with Reflector Kit (2 foot Lamp)	1,700	lamps removed	$ 3	$ 4,250	0.0%	0.0090	80	13	112,914	$ 178,825	14	$ 0.0376	136,000	1,580,796
Delamp with Reflector Kit (4 foot Lamp)	4,800	lamps removed	$ 5	$ 24,000	0.1%	0.0170	149	68	594,592	$ 945,013	14	$ 0.0404	716,160	8,324,286
Delamp with Reflector Kit (8 Foot Lamp)	300	lamps removed	$ 8	$ 2,250	0.0%	0.0390	333	10	82,942	$ 132,851	14	$ 0.0271	99,900	1,161,188
ENERGY STAR LED Dimmable A19	13,250	lamps	$ 8	$ 99,375	0.3%	0.0081	70	89	771,157	$ 1,290,347	15	$ 0.1289	928,825	11,567,354
ENERGY STAR LED Dimmable w/Controls	20,000	lamps	$ 9	$ 180,000	0.5%	0.0239	206	397	3,425,612	$ 5,736,166	15	$ 0.0525	4,126,000	51,384,173
ENERGY STAR LED Non-Dimmable	20,000	lamps	$ 10	$ 200,000	0.5%	0.0179	155	297	2,568,794	$ 4,299,929	15	$ 0.0779	3,094,000	38,531,903
ENERGY STAR LED Non-Dimmable A19	24,000	lamps	$ 5	$ 120,000	0.3%	0.0061	53	122	1,046,115	$ 1,753,166	15	$ 0.1147	1,260,000	15,691,725
LED Exit Signs	600	signs	$ 40	$ 24,000	0.1%	0.0350	307	17	152,932	$ 266,255	16	$ 0.1569	184,200	2,446,913
LED Flat Panel Drop-In Replacements	100	Fixtures	$ 30	$ 3,000	0.0%	-	181	-	14,994	$ 18,006	15	$ 0.2001	18,060	224,915
LED Refrigerated Case Lighting	1,500	lamps	$ 75	$ 112,500	0.3%	0.0320	200	40	248,701	$ 461,581	15	$ 0.4523	299,550	3,730,521
Occupancy Light Sensors	3,000	sensors	$ 20	$ 60,000	0.2%	0.0068	68	17	168,873	$ 170,628	8	$ 0.3553	203,400	1,350,983
T12 to T8 Low Wattage	5,000	lamps	$ 10	$ 50,000	0.1%	0.0090	78	37	324,213	$ 516,924	14	$ 0.1542	390,500	4,538,977
T12 to T8 Standard (2 foot lamps)	1,200	lamps	$ 5	$ 6,000	0.0%	0.0040	36	4	35,767	$ 56,495	14	$ 0.1678	43,080	500,740
T12 to T8 Standard (3 foot lamps)	250	lamps	$ 6	$ 1,500	0.0%	0.0070	56	1	11,707	$ 19,070	14	$ 0.1281	14,100	163,891
T8 to T8 Low Wattage	3,750	lamps	$ 6	$ 20,625	0.1%	0.0090	39	28	121,113	$ 247,930	14	$ 0.1703	145,875	1,695,578
High Efficiency HVAC				*$ 1,265,500*	*3.3%*			*1,402*	*5,273,391*	*$ 12,591,839*	*17*	*$ 0.2400*	*6,351,570*	*85,838,136*
Central Plant - >15% Better than Code Chillers	6,400	Tons	$ 50	$ 320,000	0.8%	0.0550	268	292	1,422,982	$ 3,494,277	20	$ 0.2249	1,713,920	28,459,642
Chiller Plant Efficiency kW/Ton Meter	25	Units	$ 5,000	$ 125,000	0.3%	-	-	-	-	$ -	20	$ -	-	-
Optimized Chiller Selection Engineering	25	Units	$ 2,500	$ 62,500	0.2%	-	-	-	-	$ -	20	$ -	-	-
Garage Active Ventilation Control	500,000	kWh	$ 0	$ 60,000	0.2%	0.0001	1	47	415,125	$ 434,198	8	$ 0.1445	500,000	3,321,000
Package Units - 15% Better Than Code	700	tons	$ 200	$ 140,000	0.4%	0.0930	552	54	320,925	$ 606,353	15	$ 0.4362	386,540	4,813,873
Variable Refrigerant Flow Air Conditioners - Existing Facility	400	Tons	$ 250	$ 100,000	0.3%	0.1140	677	38	224,732	$ 511,088	20	$ 0.4450	270,680	4,494,641
Variable Refrigerant Flow Air Conditioners - New Construction	500	Tons	$ 300	$ 150,000	0.4%	0.1140	677	47	280,915	$ 638,860	20	$ 0.5340	338,350	5,618,302
VFD - AHU	3,600	hp	$ 50	$ 180,000	0.5%	0.2000	472	598	1,409,565	$ 4,136,518	15	$ 0.1277	1,697,760	21,143,479
VFD - Chilled Water / Condenser Water	1,600	hp	$ 80	$ 128,000	0.3%	0.2450	903	325	1,199,147	$ 2,770,545	15	$ 0.1067	1,444,320	17,987,200
High Efficiency Water Pumping				*$ 50,900*	*0.1%*			*14*	*143,609*	*$ 227,851*	*15*	*$ 0.3544*	*172,971*	*2,154,141*
VFD Dom. Water Boosters - added HP Reduction	30	hp reduced	$ 80	$ 2,400	0.0%	0.3730	3,921	9	97,662	$ 155,262	15	$ 0.0246	117,630	1,464,935
VFD Dom. Water Boosters - VFD ($3K per Sys.)	75	hp	$ 600	$ 45,000	0.1%	0.0560	588	3	36,623	$ 58,236	15	$ 1.2287	44,111	549,350
VFD Pool Pump Packages	10	hp	$ 350	$ 3,500	0.0%	0.0930	1,123	1	9,324	$ 14,353	15	$ 0.3754	11,230	139,856
High Efficiency Motors				*$ 86,000*	*0.2%*			*24*	*214,196*	*$ 357,183*	*15*	*$ 0.4015*	*257,990*	*3,212,943*
ECM - Fan Coil Fans	1,100	motors	$ 55	$ 60,500	0.2%	0.0265	232	24	211,880	$ 353,383	15	$ 0.2855	255,200	3,178,197
ECM w/Controller- Evaporator Fan Motors	300	motors	$ 85	$ 25,500	0.1%	0.0010	9	0	2,316	$ 3,800	15	$ 11.0085	2,790	34,746
Commercial Industrial Processes				*$ 52,500*	*0.1%*			*28*	*163,954*	*$ 311,442*	*13*	*$ 0.3202*	*197,475*	*2,459,304*
Kitchen Exhaust Hood Demand Ventilation	75	hp	$ 700	$ 52,500	0.1%	0.4500	2,633	28	163,954	$ 311,442	15	$ 0.3202	197,475	2,459,304

Hawaii Energy - PY2015 ANNUAL PLAN - SUMMARY PRESENTATION OF PROGRAMS BY MEASURE

Business Programs Continued

Program, Category, Measure	Count		Average Participant Incentive per Unit	Estimated Budget ($)	% Total Program Budget (%)	Peak Demand Reduction per Unit (kW/Unit)	Energy Reduction per Unit (kWh/Unit)	Program Demand (kW Peak)	Program Energy (kWh/Year)	TRB ($)	Life (yrs.)	Program 1st Year ($/kWh)	Customer Energy (kWh/Year)	Lifetime Energy (kWh/Life)
Building Envelope Improvements				*$ 52,000*	*0.1%*			*67*	*254,472*	*$ 431,995*	*10*	*$ 0.2043*	*306,500*	*2,544,716*
Cool Roof Technologies	50,000	square feet	$ 0.20	$ 10,000	0.0%	0.0001	0	2	10,378	$ 15,634	10	$ 0.9636	12,500	103,781
Window Tinting	60,000	square feet	$ 0.70	$ 42,000	0.1%	0.0013	5	65	244,094	$ 416,361	10	$ 0.1721	294,000	2,440,935
High Efficiency Appliances				*$ 33,750*	*0.1%*			*8*	*174,975*	*$ 230,637*	*13*	*$ 0.1929*	*210,750*	*2,449,653*
Refrigerator (Purchase New Only) <$700	50	units	$ 50	$ 2,500	0.0%	0.0170	105	1	4,359	$ 7,743	14	$ 0.5736	5,250	61,023
Refrigerator (with Recycling of Old)	250	units	$ 125	$ 31,250	0.1%	0.0340	822	7	170,616	$ 222,894	14	$ 0.1832	205,500	2,388,629
Energy Star Business Equipment				*$ 12,500*	*0.0%*			*7*	*170,616*	*$ 222,894*	*14*	*$ 0.0733*	*205,500*	*2,388,629*
Refrigerators w/Recycling			$ 50	$ 12,500	0.0%	0.0340	822	7	170,616	$ 222,894	14	$ 0.0733	205,500	2,388,629
Direct Install - Residential Energy Kits				*$ 378,000*	*1.0%*			*354*	*1,303,800*	*$ 1,488,621*	*6*	*$ 0.2899*	*1,177,778*	*7,822,799*
Multifamily Direct install - Energy Savings Kits	2,930	dwelling units	$ 129	$ 378,000	1.0%	0.1090	402	354	1,303,800	$ 1,488,621	6	$ 0.2899	1,177,778	7,822,799
Energy Efficiency Equipment Grants				*$ 150,000*	*0.4%*			*149*	*1,681,256*	*$ 1,112,357*	*5*	*$ 0.0892*	*2,025,000*	*8,406,281*
DI - Water Cooler Timers - HOD	10,000	units	$ 15	$ 150,000	0.4%	0.0180	203	149	1,681,256	$ 1,112,357	5	$ 0.0892	2,025,000	8,406,281
Energy Awareness, Measurement and Control Systems				*$ 190,000*	*0.5%*			*94*	*629,446*	*$ 715,315*	*8*	*$ 0.3019*	*758,140*	*5,035,566*
Condominum Submetering	500	units metered	$ 200	$ 100,000	0.3%	0.0570	273	24	113,329	$ 146,035	8	$ 0.8824	136,500	906,633
Hotel Room Occupancy Controls	500	units	$ 100	$ 50,000	0.1%	0.1000	750	42	311,344	$ 340,955	8	$ 0.1606	375,000	2,490,750
Small Business Submetering Pilot	100	units metered	$ 200	$ 20,000	0.1%	0.1140	410	9	34,073	$ 49,934	8	$ 0.5870	41,040	272,588
Vending Machine Energy Control Systems	200	units	$ 100	$ 20,000	0.1%	0.1170	1,028	19	170,699	$ 178,390	8	$ 0.1172	205,600	1,365,595
CBEEM				$ 6,131,459	16.1%			850	29,785,760	$ 35,674,387	11	$ 0.2059	35,875,652	394,885,806
Customized Project Measures				*$ 350,000*	*0.9%*			*850*	*29,785,760*	*$ 35,674,387*	*11*	*$ 0.0118*	*35,875,652*	*394,885,806*
Customized Proj. Measures - Under 5 year Life	3,181,818	kWh	$ 0.11	$ 5,781,459	15.2%	0.0000	1	75	2,641,705	$ 1,472,145	5	$ 2.1885	3,181,818	13,208,523
Customized Proj.Measures - Over 5 year Life	32,693,834	kWh	$ 0.19	$ -	0.0%	0.0000	1	775	27,144,056	$ 34,202,243	14	$ -	32,693,834	381,677,283
Hawaii Energy - Efficiency Project Auction	-	kWh	$ 0.29	$ 780,000	2.1%	0.0000	1	-	-	$ -	10	$ -	-	-
BESM				$ 780,000	2.1%			10	609,957	$ 199,379	2		580,000	1,787,805
Business Design, Audits and Commissioning				*$ 150,000*	*0.4%*			*10*	*609,957*	*$ 199,379*	*2*		*580,000*	*1,787,805*
Benchmark Metering	2	Groups	$ 75,000	$ 80,000	0.2%	0.0001	-	0	-	$ 0	1	$ -	-	-
Decision Maker - Real-Time Submeters	1	Projects	$ 80,000	$ 50,000	0.1%	0.0000	-	-	-	$ -	1	$ -	-	-
Energy Audit	10	studies	$ 5,000	$ 50,000	0.1%	0.0000	-	-	-	$ -	1	$ -	-	-
Energy Study Project Implementation - 100%	2	studies	$ 25,000	$ 75,000	0.2%	0.0000	-	-	-	$ -	1	$ -	-	-
Energy Study Assistance - 50%	5	studies	$ 15,000	$ 30,000	0.1%	0.0000	-	-	-	$ -	1	$ -	-	-
Design Assistance - 50%	2	designs	$ 15,000	$ 75,000	0.2%	0.0000	-	-	-	$ -	1	$ -	-	-
Education Facilities - Submetering for Energy Programs	1	Projects	$ 75,000	$ 100,000	0.3%	0.0000	-	-	-	$ -	1	$ -	-	-
Water & Waste Water Catalyst - Rural Site Grants	80,000	kWh	$ 1.25	$ 70,000	0.2%	0.0001	1	10	84,132	$ 140,295	15	$ 0.8320	80,000	1,261,980
ENERGY STAR Portfolio Scoring Rewards	10	Participants	$ 7,000	$ 100,000	0.3%	0.0000	-	-	-	$ -	1	$ -	-	-
System Retrocommissioning	5	Projects	$ 20,000	$ 2,442,215	6.4%	0.0000	100,000	-	525,825	$ 59,083	1	$ 4.6445	500,000	525,825

Hawaii Energy - PY2015 ANNUAL PLAN - SUMMARY PRESENTATION OF PROGRAMS BY MEASURE

Program, Category, Measure	Count		Average Participant Incentive per Unit	Estimated Budget ($)	% Total Program Budget (%)	Peak Demand Reduction per Unit (kW/Unit)	Energy Reduction per Unit (kWh/Unit)	Program Demand (kW Peak)	Program Energy (kWh/Year)	TRB ($)	Life (yrs.)	Program 1st Year ($/kWh)	Customer Energy (kWh/Year)	Lifetime Energy (kWh/Life)
BHTR				$ 2,442,215	6.4%			1,225	8,961,690	$ 11,738,851	11	$ 0.2725	8,177,247	99,717,938
Business Direct Installation				*$ 1,155,595*	*3.0%*			*242*	*2,826,938*	*$ 4,168,194*	*14*	*$ 0.4088*	*2,579,488*	*39,590,214*
SBDI - Lighting Retrofits	16,082	Retrofitted Unit	$ 68	$ 1,085,595	2.9%	0.0119	139	230	2,689,449	$ 3,964,858	14	$ 0.4036	2,454,033	37,665,362
SBDI - Lighting Retrofits - Custom	80,000	kWh	$ 0.25	$ 20,000	0.1%	0.0001	1	8	87,674	$ 129,664	14	$ 0.2281	80,000	1,227,442
SBDI - Refrigeration Retrofits	45,455	kWh	$ 1.10	$ 50,000	0.1%	0.0001	1	4	49,815	$ 73,673	14	$ 1.0037	45,455	697,410
Restaurant Targeted Participation Programs				*$ 1,286,620*	*3.4%*			*982*	*6,134,752*	*$ 7,570,657*	*12*	*$ 0.2097*	*5,597,759*	*60,127,724*
ENERGY STAR Com. Kitchen Equip. - Total	978,261	kWh	$ 0.23	$ 225,000	0.6%	0.0002	1	214	1,072,105	$ 1,069,842	6	$ 0.2099	978,261	6,432,633
ENERGY STAR Com. Kitchen Equip. - Combination Oven	-	kWh	$ -	$ -	0.0%	3.9000	17,121	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Commercial Fryer	-	kWh	$ -	$ -	0.0%	0.4300	1,876	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Commercial Ice Machine	-	kWh	$ -	$ -	0.0%	0.2278	1,994	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Convection Ovens	-	kWh	$ -	$ -	0.0%	0.3700	1,934	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Electric Griddle	-	kWh	$ -	$ -	0.0%	0.1700	758	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Glass-Door Reach-In Freezer	-	kWh	$ -	$ -	0.0%	0.4076	3,570	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Glass-Door Reach-In Refrigerato	-	kWh	$ -	$ -	0.0%	0.1989	1,742	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Hot Food Holding Cabinet	-	kWh	$ -	$ -	0.0%	0.5250	2,875	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Solid-Door Reach-In Freezer	-	kWh	$ -	$ -	0.0%	0.3213	2,815	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Solid-Door Reach-In Refrigerato	-	kWh	$ -	$ -	0.0%	0.1381	1,210	-	-	$ -	6	$ -	-	-
ENERGY STAR Com. Kitchen Equip. - Steam Cooker	-	kWh	$ -	$ -	0.0%	2.2300	3,258	-	-	$ -	6	$ -	-	-
Low Flow Spray Rinse Nozzles - HP - Restaurant	-	each	$ 22	$ -	0.0%	1.0300	1,553	-	-	$ -	5	#DIV/0!	-	-
Low Flow Spray Rinse Nozzles Online Marketplace	500	each	$ 22	$ 11,000	0.0%	0.9000	3,642	493	1,995,689	$ 1,866,399	5	$ 0.0055	1,821,000	9,978,443
Low Flow Spray Rinse Nozzles - Electr - Restaurant	-	each	$ 22	$ -	0.0%	1.0300	4,753	-	-	$ -	5	$ -	-	-
Low Flow Spray Rinse Nozzles - Electr - Schools	-	each	$ 22	$ -	0.0%	0.7900	2,604	-	-	$ -	5	$ -	-	-
Low Flow Spray Rinse Nozzles - HP - Schools	-	each	$ 22	$ -	0.0%	0.7900	851	-	-	$ -	5	#DIV/0!	-	-
SBDI - Kitchen Exhaust Hoods	50	hp	$ 1,700	$ 85,000	0.2%	0.4500	2,633	25	144,279	$ 274,069	15	$ 0.5891	131,650	
SBDI - Restaurant Lighting	15,165	Retrofitted Unit	$ 59	$ 898,325	2.4%	0.0141	165	225	2,627,676	$ 3,924,060	14	$ 0.3419	2,397,668	
SBDI - Restaurant Lighting - Custom	269,180	kWh	$ 0.25	$ 67,295	0.2%	0.0001	1	25	295,002	$ 436,287	14	$ 0.2281	269,180	

Hawaii Energy - PY2015 ANNUAL PLAN - SUMMARY PRESENTATION OF PROGRAMS BY MEASURE

Program, Category, Measure	Count		Budget ($)	% Total Program Budget (%)	Lifetime Energy (kWh/Life)
Transformational Programs			$ -	0.0%	
Residential			$ 1,595,166	4.2%	
RTRAN	17,437	#N/A	$ 1,595,166	4.2%	
Benchmarking, Codes and Standards			*$ -*	*0.0%*	
30% Above Code Design and Construction Program - Residential	1	Pilot	$ -	0.0%	
Renewables Integration Program			*$ 60,000*	*0.2%*	
Shift for Savings Plan	4	Pilot	$ 110,000	0.3%	
AC Integrated DR Control Pilot	1	Pilot	$ -	0.0%	
EV - Day time charging	1	Pilot	$ 25,000	0.1%	
Smart Grid Support			*$ -*	*0.0%*	
Transformation IT Web Tools - Dare-To-Compare	-	-	$ -	0.0%	
Electric Vehicle Support			*$ 10,000*	*0.0%*	
Net Zero Electric Car Purchase Package	1	Pilot	$ 10,000	0.0%	
Energy Trade Ally Support			*$ 15,000*	*0.0%*	
Trade Ally Program Development	1	Program	$ 15,000	0.0%	
Behavior Modification	17,251	Participants	$ 550,000	1.4%	
Community Based Social Marketing	-	-	$ 65,000	0.2%	
Hawaii Energy / Kanu Hawaii Projects	5,455	Participants	$ 75,000	0.2%	
Hawaii Energy / Sharing the Aloha - Classes			*$ 300,000*	*0.8%*	
Hawaii Green Growth Res	-	-	$ 10,000	0.0%	
Hawaii Energy / Community Engagement Projects	7,832	Participants	$ 100,000	0.3%	
Professional Development	177	#N/A	$ 210,000	0.6%	
Rebuild Hawaii			*$ 15,000*	*0.0%*	
Hawaii Energy Intern Project Support	6	Events	$ 25,000	0.1%	
Hawaii Energy - Educator Training			*$ 170,000*	*0.4%*	
Labor	1	#N/A	$ 640,166	1.7%	
Labor Transformational Labor			$ 640,166	1.7%	
Business			$ 1,656,795	4.4%	
BTRAN	*1,077*		*$ 1,656,795*	*4.4%*	
Benchmarking, Codes and Standards	13	#N/A	$ 150,000	0.4%	
30% Above Code Design and Construction Program - Business	1	Pilot	$ 30,000	0.1%	
Code Compliance Assistance			$ 50,000	0.1%	
ENERGY STAR Portfolio Scoring Rewards	10	Participants	$ 30,000	0.1%	
Hawaii Energy Benchmarking Program	*1*	*Pilot*	*$ 40,000*	*0.1%*	
Shift for Savings Plan	3	#N/A	$ 135,000	0.4%	
Limited Incentivizes to Add DR Capability in EE Projects			$ 25,000	0.1%	
Transformational Time-of-Use Rates	1	Pilot	$ 10,000	0.0%	
UH Variable Pricing Econ Research	*1*	*Pilot*	*$ 100,000*	*0.3%*	
Smart Grid Support			$ -	0.0%	
Smart Grid EE Integration Support & Evaluation	1	Pilot	$ -	0.0%	
Transformation IT Web Tools - Dare-To-Compare			*$ -*	*0.0%*	
Energy Trade Ally Support	1	#N/A	$ 25,000	0.1%	
Trade Ally Program Development	*1*	*Program*	*$ 25,000*	*0.1%*	
Behavior Modification	201	#N/A	$ 126,000	0.3%	
Community Based Social Marketing	-	-	$ 65,000	0.2%	
Hawaii Energy / Kanu Hawaii Projects	-	Participants	$ -	0.0%	
Hawaii Energy / UH - Sustainability Conference	200	Participants	$ 11,000	0.0%	
Hawaii Green Growth Bus			$ 10,000	0.0%	
HPU Green Office Program	-	-	$ 20,000	0.1%	
IFMA - Higher Education Energy Program Support	*1*	*Pilot*	*$ 20,000*	*0.1%*	
Professional Development	607	#N/A	$ 245,000	0.6%	
Rebuild Hawaii			$ -	0.0%	
Student Energy Summit	-	-	$ 10,000	0.0%	
Hawaii Energy Intern Project Support	6	Events	$ 75,000	0.2%	
Hawaii Energy / Efficiency Sales Training	600	Participants	$ 160,000	0.4%	
Technical Training	250		$ 273,000	0.7%	
Hawaii Energy - Water and Waste Water Industry Support			$ 25,000	0.1%	
Energy Innovation Support	-	-	$ 63,000	0.2%	
Technical Development	150	-	$ 185,000	0.5%	
Institutional Change			*$ 185,000*	*0.5%*	
UH Strategic Energy Management	-	-	$ 85,000	0.2%	

Hawaii Energy - PY2015 ANNUAL PLAN - MAJOR PROJECTS IDENTIFIED OUTSIDE OF PROGRAM PLANNING PERIOD

Program, Category, Measure	Count	Unit	Average Participant Incentive per Unit	Estimated Budget ($)	% Total Program Budget (%)	Peak Demand Reduction per Unit (kW/Unit)	Energy Reduction per Unit (kWh/Unit)	Program Demand (kW Peak)	Program Energy (kWh/Year)	TRB ($)	Life (yrs.)	1st Year ($/kWh)	Lifetime Energy (kWh/Life)
Potential Projects Pending on Project Progress and Program Participation (figures provided for demonstration of impact and not summarized in Program totals above)													
SWAC Infrastructure Support Incentive	25,000	tons	$ 300	$ 7,500,000		0.57300	3,080	11,818	63,522,113	$ 118,812,700	14	$ 0.118	889,309,575
Solar Water Heater - OBF Contribution - Expansion	1,000	systems	$ 1,000	$ 1,000,000		0.46000	2,065	400	1,794,403	$ 4,559,621	20	$ 0.557	35,888,069
Water & Waste Water Catalyst - UV System - 1 Channel Incentive	7,602,763	kWh	$ 0	$ 2,361,368		0.00008	1	644	7,944,526	$ 11,608,314	14	$ 0.297	111,223,367

APPENDIX C TRB Utility Benefit Values

Hawaii Energy - PY15 - TRB Values Using Legacy Utility Avoided Cost								
		Discount Rate						
		6%	HECO IRP4 Avoided Cost		NPV for each Year		NPV Cumulative from Final Year	
Year	Period	NPV Multiplier	$/kW/yr.	$/kWh/yr.	$/kW/yr.	$/kWh/yr.	$/kW/yr.	$/kWh/yr.
2015	1	1.00	$ 382.5	$ 0.112	$ 383	$ 0.1124	$ 383	$ 0.1124
2016	2	0.94	$ 386.2	$ 0.113	$ 364	$ 0.1070	$ 747	$ 0.2194
2017	3	0.89	$ 387.7	$ 0.114	$ 345	$ 0.1014	$ 1,092	$ 0.3208
2018	4	0.84	$ 389.1	$ 0.114	$ 327	$ 0.0960	$ 1,419	$ 0.4167
2019	5	0.79	$ 391.9	$ 0.115	$ 310	$ 0.0912	$ 1,729	$ 0.5079
2020	6	0.75	$ 390.7	$ 0.115	$ 292	$ 0.0858	$ 2,021	$ 0.5937
2021	7	0.70	$ 394.6	$ 0.116	$ 278	$ 0.0817	$ 2,299	$ 0.6754
2022	8	0.67	$ 398.3	$ 0.117	$ 265	$ 0.0778	$ 2,564	$ 0.7532
2023	9	0.63	$ 397.4	$ 0.117	$ 249	$ 0.0732	$ 2,814	$ 0.8265
2024	10	0.59	$ 401.4	$ 0.118	$ 238	$ 0.0698	$ 3,051	$ 0.8963
2025	11	0.56	$ 405.7	$ 0.119	$ 227	$ 0.0665	$ 3,278	$ 0.9628
2026	12	0.53	$ 409.3	$ 0.120	$ 216	$ 0.0633	$ 3,493	$ 1.0261
2027	13	0.50	$ 415.9	$ 0.122	$ 207	$ 0.0607	$ 3,700	$ 1.0869
2028	14	0.47	$ 423.3	$ 0.124	$ 198	$ 0.0583	$ 3,898	$ 1.1452
2029	15	0.44	$ 428.9	$ 0.126	$ 190	$ 0.0557	$ 4,088	$ 1.2009
2030	16	0.42	$ 433.9	$ 0.128	$ 181	$ 0.0534	$ 4,269	$ 1.2543
2031	17	0.39	$ 438.9	$ 0.130	$ 173	$ 0.0512	$ 4,442	$ 1.3055
2032	18	0.37	$ 443.9	$ 0.132	$ 165	$ 0.0490	$ 4,607	$ 1.3545
2033	19	0.35	$ 448.9	$ 0.134	$ 157	$ 0.0469	$ 4,764	$ 1.4014
2034	20	0.33	$ 453.9	$ 0.136	$ 150	$ 0.0449	$ 4,914	$ 1.4464
2035	21	0.31	$ 458.9	$ 0.138	$ 143	$ 0.0430	$ 5,057	$ 1.4894
2036	22	0.29	$ 463.9	$ 0.140	$ 136	$ 0.0412	$ 5,194	$ 1.5306
2037	23	0.28	$ 468.9	$ 0.142	$ 130	$ 0.0394	$ 5,324	$ 1.5700
2038	24	0.26	$ 473.9	$ 0.144	$ 124	$ 0.0377	$ 5,448	$ 1.6077
2039	25	0.25	$ 479.0	$ 0.146	$ 118	$ 0.0361	$ 5,566	$ 1.6437

Hawaii Energy Efficiency Program

July 1, 2015 through June 30, 2016

Technical Reference Manual (TRM)

PY 2015

Measure Savings Calculations

Table of Contents

1 Introduction

METHODS AND ASSUMPTIONS
This reference manual provides methods, formulas and default assumptions for estimating energy and demand peak impacts from measures and projects that receive cash incentives from the Hawaii Energy Efficiency Program.

This reference manual is organized by program, end-use and measure. Each section provides mathematical equations for determining savings (algorithms), other program Technical Reference Manual (TRM) methodologies as well as default assumptions for all equation parameters that are not based on site-specific information. In addition, any descriptions of calculation methods or baselines are provided, as appropriate.

The parameters for calculating savings are listed in the same order for each measure. Algorithms are provided for estimating annual energy and demand impacts.

Data assumptions are based on Hawaii specific data, where available. Where Hawaii data was not available, data from neighboring regions is used where available and in some cases, engineering judgment is used.

Data sources used, in the general order of preference, included, but were not necessarily limited to the following:

- Energy and Peak Demand Impact Evaluation Report of the 2005-2007 Demand Management Programs – KEMA
- HECO IRP-4: Energy Efficiency Potential Study (HECO DSM Docket)
- 2004-2005 Database for Energy Efficiency Resources (CA DEER database)
- 2007-2008 Database for Energy Efficiency Resources (CA DEER database) Update
- Other EE Program Design Information (e.g. Efficiency Maine, Focus on Energy, etc.)
- SAIC Staff expertise and engineering judgment
- Evergreen TRM Review – 2/23/12
- Evergreen PY12 TRM Review – 1/15/14

2 Gross Customer-to-Net Program Savings Calculation

The algorithms shown with each measure calculate gross customer electric savings without counting the effects of line losses from the generator to the customer or free ridership. The formulae for converting gross customer-level savings to net generation-level savings are as follows:

Net Program kWh = Gross Customer Level ΔkWh $\times$ (1 + SLF) x RR
Net Program kW = Gross Customer Level ΔkW $\times$ (1 + SLF) x RR

Where: Net kWh = kWh energy savings at generation-level, net of free riders and system losses
Net kW = kWh energy savings at generation-level, net of free riders and system losses
Gross Cust. ΔkWh = Gross customer level annual kWh savings for the measure
Gross Cust. ΔkW = Gross customer level connected load kW savings for the measure
SLF = System Loss Factor
RR = Realization Rate that includes Free Riders and Engineering Verification

SLF – System Loss Factor
The system loss factors were provided by HECO, MECO and HELCO. The do not vary by measure, but by island, and are in the following Table 2.1:

Table 2.1

County Customer to System Loss Factor		
Oahu	Maui	Hawaii
11.17%	9.96%	9.00%

RR - Realization Rate
The Realization Rate used was estimated using the following information from the Evergreen (EM&V) report:

Table 2.2

New Net-to-Gross Factors		
Program		Net-to-Gross
BEEM	Business Energy Efficiency Measures	0.75
CBEEM	Custom Business Energy Efficiency Measures	0.75
BESM	Business Services and Maintenance	0.95
BHTR	Business Hard to Reach	0.99
REEM	Residential Energy Efficiency Measures	0.79
CESH	Custom Energy Solutions for the Home	0.65
RESM	Residential Services and Maintenance	0.92
RHTR	Residential Hard to Reach	1.00
Effective Program Total Based on PY11 Portfolio Performance		0.78

3 Interactive Effects

The TRM provides specific savings algorithms for many prescriptive measures. When a customer installs a prescriptive measure, the savings are determined according to these algorithms. In some cases these algorithms include the effects of interactions with other measures or end.

For “custom” measures, Hawaii Energy performs site-specific customized calculations. In this case, Hawaii Energy takes into account interactions between measures (e.g., individual savings from installation of window film and replacement of a chiller are not additive because the first measure reduces the cooling load met by the second measure).

Hawaii Energy will calculate total savings for the package of custom measures being installed, considering interactive effects, either as a single package or in rank order of measures as described below.

If a project includes both prescriptive and custom measures, the prescriptive measures will be calculated in the normal manner. However, the prescriptive measures will be assumed to be installed prior to determining the impacts for the custom measures.

For commercial lighting measures, the following factors are applied for facilities with air conditioning.

Table 3.1

Building Type	Expected Level of Similarity	Energy Factor	Demand Factor
All Commercial	Low	1.056	1.075
Misc Commercial	Low	1.056	1.075
Cold Storage	Very High	1.423	1.22
Education	Low	1.061	1.039
Grocery	Low	1.043	1.114
Health	High	1.122	1.233
Hotel/Motel	High	1.115	1.236
Industrial	Low	1.043	1.074
Office	Low	1.068	1.102
Restaurant	Low	1.051	1.073
Retail	Low	1.054	1.085
Warehouse	Low	1.019	1.053

4 Persistence

Persistence factors may be used to reduce lifetime measure savings in recognition that initial engineering estimates of annual savings may not persist long term.

This might be because a measure is removed or stops functioning prior to the end of its normal engineering lifetime, because it is not properly maintained, it is overridden, it goes out of calibration (controls only), or for some other reason.

Some of the measure algorithm may contain an entry for persistence factor. The default value if none is indicated is 1.00 (100%). A value lower than 1.00 will result in a downward adjustment of lifetime savings and total resource benefits.

For any measure with a persistence value less than 1.00, the claimed first year savings are reduced, and claimed for each year of the equipment's expected useful life.

5 Glossary

The following glossary provides definitions for necessary assumptions needed to calculate measure savings.

Attribution Factor (AF): The Attribution Factor is the amount of savings attributable to the program impact. It is calculated by subtracting from one the % free ridership.

Baseline Efficiency (η_{base}): The assumed standard efficiency of equipment, absent an Hawaii Energy program.

Coincidence Factor (CF): Coincidence factors represent the fraction of connected load expected to be "on" and using electricity coincident with the system peak period.

Connected Load: The maximum wattage of the equipment,under normal operating conditions, when the equipment is "on".

Freeridership (FR): A program's free ridership rate is the percentage of program participants deemed to be free riders. A free rider refers to a customer who received an incentive through an energy efficiency program who would have installed the same or a smaller quantity of the same high efficiency measure on their own within one year if the program had not been offered.

Full Load Hours (FLH): The equivalent hours that equipment would need to operate at its peak capacity in order to consume its estimated annual kWh consumption (annual kWh/connected kW).

High Efficiency (η_{effic}): The efficiency of the energy-saving equipment installed as a result of an efficiency program.

Incremental Cost: The cost difference between the installed cost of the high efficiency measure and the standard efficiency measure.

Lifetimes: The number of years (or hours) that the new high efficiency equipment is expected to function. These are generally based on engineering lives, but sometimes adjusted based on expectations about frequency of remodeling or demolition.

System Loss Factor (SLF): The marginal electricity losses from the generator to the customer meter – expressed as a percent of meter-level savings. The Energy Line Loss Factors vary by period. The Peak Line Loss Factors reflect losses at the time of system peak, and are shown for two seasons of the year (winter and summer). Line loss factors are the same for all measures.

Load Factor (LF): The fraction of full load (wattage) for which the equipment is typically run.

Operating Hours (HOURS): The annual hours that equipment is expected to operate.

Persistence (PF): The fraction of gross measure savings obtained over the measure life.

Realization Rate (RR): The fraction of gross measure savings realized by the program impact. It includes the gross verification adjustment and free ridership or attribution adjustment.

Spillover (SPL): Spillover refers to energy-efficient equipment installed in any facility in the program service area due to program influences, but without any financial or technical assistance from the Program. It is expressed as a percent or fraction of the gross savings attributable to program participation.

Total Resource Benefits (TRB): The present value of benefits from the program savings resulting from avoided energy and capacity costs for the utility and their ratepayers.

6 Load shapes and Demand Coincidence Factors

Load shapes for different types of equipment or systems were not needed because the savings values estimated in the KEMA 2008 impact evaluation already accounted for these load shapes. The coincidence factors were developed based on the calculated full load demand reduction and the KEMA values for each building type. The resulting coincidence factors were evaluated for reasonableness depending on the system type and the building type.

7 Total Resource Benefits – Avoided Costs and Measure Life

Table 7.1

Hawaii Energy - PY15 - TRB Values Using Modified Current EEPS Utility Avoided Cost

			Discount Rate	Factored EEPS	Escalation Rate				
			6%	76%	3%				
				Utility Avoided Costs*		NPV for each Year		NPV Cumulative from Final Year	
Program Year	Year	Period	NPV Multiplier	$/kW/yr.	$/kWh/yr.	$/kW/yr.	$/kWh/yr.	$/kW/yr.	$/kWh/yr.
PY15	2016	1	1.00		$ 0.161	$ -	$ 0.1610	$ -	$ 0.1610
PY16	2017	2	0.94		$ 0.166	$ -	$ 0.1564	$ -	$ 0.3174
PY17	2018	3	0.89		$ 0.171	$ -	$ 0.1520	$ -	$ 0.4694
PY18	2019	4	0.84		$ 0.176	$ -	$ 0.1477	$ -	$ 0.6171
PY19	2020	5	0.79	$ 904	$ 0.181	$ 716	$ 0.1435	$ 716	$ 0.7606
PY20	2021	6	0.75	$ 986	$ 0.187	$ 737	$ 0.1395	$ 1,453	$ 0.9001
PY21	2022	7	0.70	$ 856	$ 0.192	$ 603	$ 0.1355	$ 2,056	$ 1.0356
PY22	2023	8	0.67	$ 750	$ 0.198	$ 499	$ 0.1317	$ 2,555	$ 1.1673
PY23	2024	9	0.63	$ 663	$ 0.204	$ 416	$ 0.1280	$ 2,971	$ 1.2953
PY24	2025	10	0.59	$ 590	$ 0.210	$ 349	$ 0.1243	$ 3,320	$ 1.4196
PY25	2026	11	0.56	$ 527	$ 0.216	$ 294	$ 0.1208	$ 3,615	$ 1.5404
PY26	2027	12	0.53	$ 474	$ 0.223	$ 250	$ 0.1174	$ 3,864	$ 1.6578
PY27	2028	13	0.50	$ 1,020	$ 0.230	$ 507	$ 0.1141	$ 4,371	$ 1.7719
PY28	2029	14	0.47	$ 1,066	$ 0.236	$ 500	$ 0.1108	$ 4,871	$ 1.8827
PY29	2030	15	0.44	$ 964	$ 0.244	$ 426	$ 0.1077	$ 5,297	$ 1.9904
PY30	2031	16	0.42	$ 875	$ 0.251	$ 365	$ 0.1047	$ 5,662	$ 2.0951
PY31	2032	17	0.39	$ 795	$ 0.258	$ 313	$ 0.1017	$ 5,975	$ 2.1968
PY32	2033	18	0.37	$ 724	$ 0.266	$ 269	$ 0.0988	$ 6,244	$ 2.2956
PY33	2034	19	0.35		$ 0.274	$ -	$ 0.0960	$ 6,244	$ 2.3916
PY34	2035	20	0.33		$ 0.282	$ -	$ 0.0933	$ 6,244	$ 2.4849
PY35	2036	21	0.31		$ 0.291	$ -	$ 0.0907	$ 6,244	$ 2.5756
PY36	2037	22	0.29		$ 0.300	$ -	$ 0.0881	$ 6,244	$ 2.6637
PY37	2038	23	0.28		$ 0.308	$ -	$ 0.0856	$ 6,244	$ 2.7493
PY38	2039	24	0.26		$ 0.318	$ -	$ 0.0832	$ 6,244	$ 2.8325
PY39	2040	25	0.25		$ 0.327	$ -	$ 0.0808	$ 6,244	$ 2.9133

* EEPS (2013-0056) Avoided Capacity Cost factored by 76% to reflect contribution of kW reductions achieved on Oahu in PY13. $161/MWh Avoided Costs per Guidance Recommendations. This is a conservative estimate based on EEPS 2014 Projections of $192, $225 and $192/MWh for HECO, HELCO and MECO respectively.

8 Effective Useful Life (EUL)

Version Date & Revision History:
Draft date: July 1, 2013
Revision date: July 7, 2015

Referenced Documents:
- Econorthwest TRM Review – 6/23/10
- DEER (The Database for Energy Efficient Resources) – 10/1/08

TRM Review Actions:
- 6/23/10 Rec. – Adopt DEER values in those cases where there is a greater than 20 percent difference between DEER and current TRM. – Adopted

Major Changes:
- Hawaii Energy will adopt DEER EUI values across the board and will follow DEER changes as they are updated unless obvious differences for Hawaii applications are identified.
- 7/7/2015 – Changed Commercial Solar Water Heating effective useful life from 15 to 20 years to be consistent with residential SWH and historical data available through literature review

The measure Effective Useful Life estimated for each measure is shown in the following table:

Table 8.1

Residential (R) Business (B)	Measure Type	Description	DEER Effectve Useful Life (EUL)
REEM	Water Heating	Solar Water Heating	20
R		Heat Pumps	10
R	Lighting	CFL	6
R		LED	15
R	Air Conditioning	VRF Split	15
R		Window AC w/recycling	9
R		Ceiling Fans	5
R		Solar Attic Fans	20
R		Whole House Fans	20
R	Appliances	Refrigerator (<$600)	14
R		Refrigerator w/Recycling	14
R		Garage Refrigerator/Freezer Bounty	14
R		Clothes Washer (Tier II/III)	11
R		Set top box	5
R		Pool VFD Controller Pumps	10
R		Advanced Power Strip	5
R	Control Systems	Room Occupancy Sensors & Timers	8
R		Peer Group Comparison	1
R		Whole House Energy Metering	4
R		Water cooler timer	8
CESH	Custom	Efficiency Project Auction	5
RESM	Design and Audits	Efficiency Inside	15
R	Tune Ups	Solar Water Heater Tune Up	5
R	Tune Ups	Central Air Conditional Retrofit	15
RHTR	Hard to Reach Grants	CFL Exchange	6
R		Refrigerator w/Recycling	14
R		Solar Water Heating	20
R	Direct Install	Energy Saving Kits	6

Residential (R) Business (B)	Measure Type	Description	DEER Effectve Useful Life (EUL)
BEEM	Water Heating	Solar Water Heating - Electric Resistance	20
B		Solar Water Heating - Heat Pump	
B		Heat Pump - conversion - Electric Resistance	10
B		Heat Pump Upgrade	10
B		Single Family Solar Water Heating	20
B	Lighting	Ceramic Metal Halide	14
B		CFL	3
B		Delamp w/Reflector (2', 4', 8')	14
B		Delamp	14
B		ENERGY STAR LED Dimmable A19	15
B		ENERGY STAR LED Dimmable w/Controls	15
B		ENERGY STAR LED Non-Dimmable	15
B		ENERGY STAR LED Non-Dimmable A19	15
B		LED Exit Signs	16
B		LED FIXTURE	15
B		LED Refrigerator Case Lighting	15
B		LED STREET AND PARKING LOT FIXTURE	15
B		Sensors	8
B		Stairwell Bi-Level Dimming Fluorescent	14
B		T12 to T8 Low Wattage	14
B		T12 to T8 Standard (2/3)	14
B		T8 to T8 Low Wattage	14
B	HVAC	Chillers	20
B		Chiller Plant Efficiency kW/Ton Meter	20
B		Garage Active Ventilation Control	8
B		Package Units	15
B		VFR Split System - New Construction	15
B		VFR Split System - Existing	15
B		VFD - AHU	15
B		VFD - Chilled Water/Condenser Water	15

Residential (R) Business (B)	Measure Type	Description	DEER Effectve Useful Life (EUL)
B	Water Pumping	VFD Dom Water Booster Packages	15
B		VFD Pool Pump	15
B	Motors	CEE Tier 1 + Premium Efficiency Motors	15
B		ECM w/Controller - evap fan motors	15
B		ECM - Fan Coil Fans	15
B	Industrial Process	Kitchen Exhaust Hood Demand Ventilation	15
B		Refrigerated Case Night Covers	10
B	Building Envelope	Cool Roof	10 15
B		Window Tinting	10
B	Business Equipment	ENERGY STAR Refrigerator	14
B		Clothes Washer	11
B		Energy Savings Kit	6
B	Control Systems	Hotel Room Occupancy Controls	8
B		Condominium submetering	8
B		Small Business submetering	8
CBEEM	Customized	Custom <= 5 years	5
B		Custom > 5 years	13
B		Efficiency Project Auction	10
BESM	Design and Audits	Benchmarking Metering	1
B		Decision Maker - Real time submeters	1
B		Energy Audit	N/A
B		Energy Study Implementation - 100%	N/A
B		Energy Study Assistance - 50%	N/A
B		Design Assistance - 50%	N/A
B		Water/Wastewater Catalyst	15
BHTR	Direct Install	SBDI	14
B	Grants	Water cooler timer	5
B	Restaurant	SBDI - Kitchen Exhaust Hood Demand Ventilation	15
B		Low flow spray rinse nozzles	12
B		ENERGY STAR Kitchen Equipment	12
B		SBDI - Lighting	14
B	Customized	Customized Retrofit	Custom calculated value

9 Commercial Lighting Factors

Commercial Lighting Factors

Building Type	Annual Hours of Operation[1]	Peak Coincidence Factor[2]
Misc. Commercial	4,325	0.3
Cold Storage	4,160	0.5
Education	2,653	0.2
Grocery	5,824	0.85
Health	6,474	0.65
Hotel/Motel	4,941	0.6
Industrial	4,290	0.5
Office	2,808	0.5
Restaurant	5,278	0.75
Retail	4,210	0.6
Warehouse	4,160	0.45

[1]The Database for Energy Efficient Resources (DEER)

[2]California Commercial End Use Summary (CEUS)

10 Residential Energy Efficiency Measures (REEM)

10.1 High Efficiency Water Heating

10.1.1 Solar Water Heater

Version Date & Revision History:
Draft date: February 24, 2010
Revision date: April 8, 2015

Referenced Documents:
- Energy and Peak Demand Impact Evaluation Report of the 2005-2007 Demand Management Programs – (KEMA 2005-07)
- Econorthwest TRM Review – 6/23/10
- Evergreen TRM Review – 2/23/12
- Evergreen TRM Review – 1/15/14
- DCA Office of Affordable Housing, 2011 Architectural Manual, Expected Useful Life Table

TRM Review Actions:
- 6/23/10 Rec. # 6 – For PY 2010, adjust claimed demand savings based on participant data from all service territories covered. Adjust Demand Savings based on participant data weighted average of KEMA results across all counties. Change from 0.50 to 0.46 kW. non-military – Adopted and incorporated into PY2010-1 TRM.
- 6/23/10 Rec. # 7 - For PY 2010, include a discussion of shell losses in the savings analysis and supporting documentation. Discussion included in PY2010-1 TRM.
- 10/5/11 – Currently Under Review.

Major Changes:
- Demand change to weighted average from KEMA 2008. 0.46 kW
- Changed individual water usage from 13.3035 to 13.3
- 4/8/2015 – Changed performance factor from 0.943816230585148 to 0.94. Resultant reduction in yearly energy savings from 2065 kWh to 2057 kWh.

Measure Description:
Replacement of Electric Resistance Water Heater with a Solar Water Heater designed for a 90% Solar Fraction. The new Solar Water Heating systems most often include an upgrade of the hot water storage tank sized at 80 or 120 gallons.

Systems must comply with Hawaii Energy Solar Standards and Specifications which call out:
- Panel Ratings
- System Sizing
- Installation orientation de-rating factors
- Hardware and mounting systems

Shell Losses:
The increase in size from a 40 or 60 gallon to an 80 or 120 gallon standard electric resistance water heater would in and of itself increase the “shell” losses of the system. These shell losses are the result of a larger surface area exposing the warm water to the cooler environment and thus more heat lost to the environment through conduction through the tank. Engineering calculations by Econorthwest puts this at a 1% increase in losses. This is further reduced by 90% as the solar water system provides that fraction of the annual water heating requirements.

Baseline Efficiencies:
Baseline usage is a 0.9 COP Electric Resistance Water Heater. The baseline water heater energy consumption is by a single 4.0kW electric resistance element that is controlled thermostatically on/off controller based of tank finish temperature set point. The tank standby loss differences between baseline and high efficiency case are assumed to be negligible.

Demand Baseline has been determined by field measurements by KEMA 2005-07 report. The energy baseline also comes from the KEMA 2005-07 report and is supported by engineering calculations shown in this TRM.

Building Types	Demand Baseline (kW)	Energy Baseline (kWh)
Residential	0.57	2,732

High Efficiency:
Solar Water Heater designed for a 90% Solar Fraction. The Solar Systems use solar thermal energy to heat the water 90% of the time and continue to utilize electricity to operate the circulation pump and provide heating through a 4.0 kW electric resistance element when needed.

Solar Contractors do not favor Photo-Voltaic powered DC circulation pumps as they have proven less reliable in the field than an AC powered circulation pump.

The electric resistance elements in the high efficiency case do not have load control timers on them.

The energy is the design energy of a 90% solar fraction system with circulation pump usage as metered by KEMA 2008.

The on peak demand is the metered demand found by KEMA 2008.

Building Types	Demand High Efficiency (kW)	Energy High Efficiency (kWh)	Circ. Pump %
Residential	0.07	379	28%

Energy Savings:

Solar Water Heater Gross Savings before operational adjustments:

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Residential	0.46	2,354

Operational Factor	Adjustment Factor
Solar Fraction Performance (sfp)	0.94
Persistence Factor (pf)	1.0
Demand Coincidence Factor (cf)	0.93

Solar Water Heater Net Savings after operational adjustments:

Building Types	Energy Savings (kWh/year)	Demand Savings (kW)
Residential	2057	0.46

Savings Algorithms

Solar Water Heater - Non-Military Single Family Home

Energy per Day (BTU) = (Gallons per Day) x (lbs. per Gal.) x (Temp Rise) x (Energy to Raise Water Temp)

Hot Water needed per Person		13.3	Gallons per Day per Person	HE
Average Occupants	x	3.77	Persons	KEMA 2008
Household Hot Water Usage		50.141	Gallons per Day	
Mass of Water Conversion		8.34	lbs/gal	
Finish Temperature of Water		130	deg. F Finish Temp	
Initial Temperature of Water	-	75	deg. F Initial Temp	
Temperature Rise		55	deg. F Temperature Rise	
Energy to Raise Water Temp		1.0	BTU / deg. F / lbs.	
Energy per Day (BTU) Needed in Tank		23,000	BTU/Day	
Energy per Day (BTU) Needed in Tank		23,000	BTU/Day	
BTU to kWh Energy Conversion	÷	3,412	kWh / BTU	
Energy per Day (kWh)		6.7	kWh / Day	
Days per Month	x	30.4	Days per Month	
Energy (kWh) per Month		205	kWh / Month	
Days per Year	x	365	Days per Year	
Energy (kWh) Needed in Tank to Heat Water per Year		2,459	kWh / Year	
Elec. Res. Water Heater Efficiency	÷	0.90	COP	
Base SERWH Energy Usage per Year at the Meter		2,732	kWh / Year	KEMA 2008 - HECO
Design Annual Solar Fraction		90%	Water Heated by Solar System	Program Design
		10%	Water Heated by Remaining Backup Element	
Energy Usage per Year at the Meter		2,732	kWh / Year	
	x	10%	Water Heated by Remaining Backup Element	
Back Up Element Energy Used at Meter		273	kWh / Year	
Circulation Pump Energy		0.082	kW	KEMA 2008
Pump Hours of Operation	x	1,292	Hours per Year	KEMA 2008
Pump Energy used per Year		106	kWh / Year	
Back Up Element Energy Used at Meter		273	kWh / Year	72%
Pump Energy used per Year	+	106	kWh / Year	28%
Design Solar System Energy Usage		379	kWh / Year	
Base SERWH Energy Usage per Year at the Meter		2,732	kWh / Year	
Design Solar System Energy Usage	-	379	kWh / Year	
Design Solar System Energy Savings		2,353	kWh / Year	
Design Solar System Energy Savings		2,353	kWh / Year	
Performance Factor		0.94	pf	HE
Persistance Factor	x	0.93	pf	KEMA 2008
		2,057	kWh / Year	KEMA 2008
Residential Solar Water Heater Energy Savings		**2,057**	**kWh / Year Savings**	
Base SERWH Element Power Consumption		4.0	kW	
Coincidence Factor	x	0.143	cf	8.6 minutes per hour
Base SERWH On Peak Demand		0.57	kW On Peak	KEMA 2008
Base SERWH On Peak Demand	-	0.57	kW On Peak	
Solar System Metered on Peak Demand	-	0.11	kW On Peak	KEMA 2008
		0.46	kW On Peak	
Residential Solar Water Heater Demand Savings		**0.46**	**kW Savings**	

Operating Hours
See Table above.

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Persistence
The persistence factor has been found to be 0.93 based in the KEMA 2005-07 report that found 7% of the systems not operational.

Measure Life
20 years (DCA Office of Affordable Housing, 2011 Architectural Manual, Expected Useful Life Table)

Component Costs and Lifetimes Used in Computing O&M Savings
TBD

Reference Tables
None

10.1.2 Solar Water Heating Loan Interest Buydown (Hot Water Cool Rates)

Version Date & Revision History:
Draft date: May 22, 2011

Referenced Documents:

- Energy and Peak Demand Impact Evaluation Report of the 2005-2007 Demand Management Programs – (KEMA 2005-07)
- Econorthwest TRM Review – 6/23/10
- Evergreen TRM Review – 2/23/12
- Evergreen TRM Review – 1/15/14

TRM Review Actions:

- 6/23/10 Rec. # 6 – For PY 2010, adjust claimed demand savings based on participant data from all service territories covered. Adjust Demand Savings based on participant data weighted average of KEMA results across all counties. Change from 0.50 to 0.46 kW. non-military – Adopted and incorporated into PY2010-1 TRM.
- 6/23/10 Rec. # 7 - For PY 2010, include a discussion of shell losses in the savings analysis and supporting documentation. Discussion included in PY2010-1 TRM.
- 10/5/11 – Currently Under Review.

Major Changes:

- Eliminated Military figure as no foreseeable military retrofit applications will be received.
- Demand change to weighted average from KEMA 2008. 0.46 kW
- Changed individual water usage from 13.3035 to 13.3
- 11/14/13 – Included peak demand savings calculations.

Measure Description:
The Solar Water Heating Loan Interest Buydown Program offers eligible borrowers an interest buy down of $1,000 (with a minimum loan of $5,000) toward the financing of a solar water heating system from a participating lender – see www.hawaiienergy.com for a list of participating lenders.

Replacement of Electric Resistance Water Heater with a Solar Water Heater designed for a 90% Solar Fraction. The new Solar Water Heating systems most often include an upgrade of the hot water storage tank sized at 80 or 120 gallons.

Systems must comply with Hawaii Energy Solar Standards and Specifications which call out:

- Panel Ratings
- System Sizing
- Installation orientation de-rating factors
- Hardware and mounting systems

Shell Losses:
The increase in size from a 40 or 60 gallon to an 80 or 120 gallon standard electric resistance water heater would in and of itself increase the “shell” losses of the system. These shell losses are the result of a larger surface area exposing the warm water to the cooler environment and thus more heat lost to the environment through conduction through the tank. Engineering calculations by Econorthwest puts this at a 1% increase in losses. This is further reduced by 90% as the solar water system provides that fraction of the annual water heating requirements.

Baseline Efficiencies:
Baseline usage is a 0.9 COP Electric Resistance Water Heater. The baseline water heater energy consumption is by a single 4.0 kW electric resistance element that is controlled thermostatically on/off controller based of tank finish temperature set point. The tank standby loss differences between baseline and high efficiency case are assumed to be negligible.

Demand Baseline has been determined by field measurements by KEMA 2005-07 report. The energy baseline also comes from the KEMA 2005-07 report and is supported by engineering calculations shown in this TRM.

Building Types	Demand Baseline(kW)	Energy Baseline (kWh)
Residential	0.57	2,733

High Efficiency:
Solar Water Heater designed for a 90% Solar Fraction. The Solar Systems use solar thermal energy to heat the water 90% of the time and continue to utilize electricity to operate the circulation pump and provide heating through a 4.0 kW electric resistance element when needed.

Solar Contractors do not favor Photo-Voltaic powered DC circulation pumps as they have proven less reliable in the field than an AC powered circulation pump.

The electric resistance elements in the high efficiency case do not have load control timers on them.

The energy is the design energy of a 90% solar fraction system with circulation pump usage as metered by KEMA 2008.

The on peak demand is the metered demand found by KEMA 2008.

Building Types	Demand High Efficiency (kW)	Energy High Efficiency (kWh)	Circ. Pump %
Residential	0.07	379	28%

Energy Savings:
Solar Water Heater Gross Savings before operational adjustments:

Building Types	Demand Savings (kW)	Energy Savings (kWh)
Residential	0.46	2,354

Operational Factor	Adjustment Factor
Solar Fraction Performance (sfp)	0.94
Persistence Factor (pf)	0.93
Demand Coincidence Factor (cf)	1.0

Solar Water Heater Net Savings after operational adjustments:

Building Types	Energy Savings (kWh/year)	Demand Savings (kW)
Residential	2057	0.46

Savings Algorithms
See savings algorithm for for section 9.1.1 Solar Water Heater.

Operating Hours
See savings algorithm for for section 9.1.1 Solar Water Heater.

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Persistence
The persistence factor has been found to be 0.93. Based in the KEMA 2005-07 report that found 7% of the systems not operational.

Lifetime
20 years

10.1.3 Heat Pump Water Heaters

Measure ID:

Version Date & Revision History:
Draft date: March 2, 2011
Revision date: June 23, 2015

Referenced Documents:
- From SalesForce Measures (Impact)
- October 2004 (KEMA Report)
- Evergreen TRM Review – 2/23/12
- Evergreen TRM Review – 1/15/14

TRM Review Actions:
- 10/5/11 – Currently Under Review.
- 11/14/13 – Adjusted savings to be consistent with the most recent product specifications.
- 06/23/15 – Reviewed for PY15. Removed reference to incentive amount ($).

Major Changes:
- Recognizing the growing product availability and sales efforts regarding residential heat pumps, increase educational efforts.
- Changed base SERWH element power consumption from 4.5 kW to 4.0 kW

Measure Description:
Rebate applications for water heaters are provided by the retailers at the time of purchase or a customer can visit our website and download the form. Rebate applications must include an original purchase receipt showing brand and model number.

Baseline Efficiencies:
The base case is a standard electric resistance water heater (SERWH).

Energy Savings:

Measure	Energy Savings (kWh/year)	Demand Savings (kW)
Base Case (SERWH)	2732	0.57
Enhanced Case (HPWH)	1088	0.36
Savings	1644	0.21

Savings Algorithms

Heat Pump Water Heater

Energy per Day (BTU) = (Gallons per Day) x (lbs. per Gal.) x (Temp Rise) x (Energy to Raise Water Temp)

Hot Water needed per Person		13.3	Gallons per Day per Person	HE
Average Occupants	x	3.77	Persons	KEMA 2008
Household Hot Water Usage		50.1	Gallons per Day	
Mass of Water Conversion		8.34	lbs/gal	
Finish Temperature of Water		130	deg. F Finish Temp	
Initial Temperature of Water	-	75	deg. F Initial Temp	
Temperature Rise		55	deg. F Temperature Rise	
Energy to Raise Water Temp		1.0	BTU / deg. F / lbs.	
Energy per Day (BTU) Needed in Tank		23,000	BTU/Day	

Energy per Day (BTU) Needed in Tank		23,000	BTU/Day	
BTU to kWh Energy Conversion	÷	3,412	kWh / BTU	
Energy per Day (kWh)		6.7	kWh / Day	
Days per Month	x	30.4	Days per Month	
Energy (kWh) per Month		205	kWh / Month	
Days per Year	x	365	Days per Year	
Energy (kWh) Needed in Tank to Heat Water per Year		2,459	kWh / Year	
Elec. Res. Water Heater Efficiency	÷	0.90	COP	
Base SERWH Energy Usage per Year at the Meter		2,732	kWh / Year	KEMA 2008 - HECO

Energy (kWh) Needed to Heat Water per Year		2,459	kWh / Year
Heat Pump Water Heating Efficiency	÷	2.26	COP
Heat Pump Water Heating Energy Usage		1,088	kWh / Year
Base SERWH Energy Usage per Year at the Meter		2,732	kWh / Year
Heat Pump Water Heating Energy Usage	-	1,088	kWh / Year
Residential Heat Pump Water Heating Energy Savings		**1644**	**kWh / Year**

Heat Pump Power Consumption		4.5	kW		
Coincidence Factor	x	0.08	cf	4.80	Minutes per hour
		0.36	kW On Peak		
Base SERWH Element Power Consumption		4.0	kW		
Coincidence Factor	x	0.143	cf	8.6	Minutes per hour
Base SERWH On Peak Demand		0.57	kW On Peak	KEMA 2008	
Base SERWH On Peak Demand	-	0.57	kW On Peak		
Heat Pump Water Heater Demand	-	0.36	kW On Peak	KEMA 2008	
		0.21	kW On Peak		

Residential Heat Pump Water Heating Demand Savings	**0.21**	**kW**	**Savings**

Operating Hours
See Table above.

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Persistence Factor

Coincidence Factor
0.143 (based on 8.6 minutes per hour for 4 hours)

Lifetime
10 years (DEER)

10.2 High Efficiency Lighting

10.2.1 Compact Fluorescent Lamp (CFL)

Version Date & Revision History:
Draft date: February 24, 2010
Revision date: April 17, 2015

Referenced Documents:
- Energy and Peak Demand Impact Evaluation Report of the 2005-2007
- Demand Management Programs – KEMA (KEMA 2005-07)
- Econorthwest TRM Review – 6/23/10
- Evergreen TRM Review – 2/23/12
- Evergreen TRM Review – 1/15/14

TRM Review Actions:
- 6/23/10 Rec. # 8 – Starting with PY2010, adjust the hours used per day for CFLs from 4.98 to 2.3 in order to be consistent with other literature. Conduct additional research to verify the most appropriate hours of operation for the Hawaii customer base, which can be incorporated into future years. – Adopted.
- 6/23/10 Rec. # 9 - Starting with PY 2010, adjust the peak coincidence factor from 0.334 to 0.12 to be consistent with the literature. Conduct additional research to verify the most appropriate coincidence factor for the Hawaii customer base, which can be incorporated into future years.- Adopted.
- 10/5/11 – Currently Under Review.
- 4/17/12 – Updated persistence factor to 0.96 and removed adjustment for mix of CFL sizes found in CA study as per EMV report February 23, 2012. Updated energy and demand savings accordingly.
- 11/14/13 – Adjust delta watts from 45W to 38.25W.

Major Changes:
- Hours used per day for CFLs from 4.98 to 2.3 hrs.
- Peak coincidence factor from 0.334 to 0.12
- Persistence factor changed from 0.80 to 0.96 as per EMV
- Adjustment for mix of CFL sized found in CA study removed as per EMV
- 4/17/15 – Baseline efficiency for CFL and for LED shall be the same.
- 4/17/15 – Adjust baseline to be a mixture of incandescents and CFLs.
- 4/17/15 – Adjust baseline percentages based on Program statistics of CFLs and incandescents and a burn-out ratio of 4.5:1 (incandescents:CFL).
- 4/17/15 – Adjust enhanced case to be a mixture of CFLs based on actual Program statistics.

Measure Description:
The replacement of incandescent screw-in lamps to standard spiral compact fluorescent lamps in Residential Single Family and Multi-family homes. Lamps must comply with Energy Star and UL.

Baseline Efficiencies:
Breakdown of CFL vs incandescent is based on a burn-out ratio of 9000 hours to 2000 hours. In 9000 hours, 4.5 incandescents will burn out and 1 CFL will burn out, for a total of 5.5 burnt-out bulbs. This equates to a replacement rate of 81.8% incandescents and 18.2% CFLs. Within each category of incandescents or CFLs, the breakdown of wattages is based on actual Hawaii Energy Program statistics.

Baseline Efficiency					
Lamp Types	Demand Baseline (kW)	Hours per Day	Energy Baseline (kWh/year)	%	Totals
Incandescent	0.072	2.3	60.4	2.4%	1.45
Incandescent	0.053	2.3	44.5	26.5%	11.79
Incandescent	0.043	2.3	36.1	24.7%	8.92
Incandescent	0.029	2.3	24.3	28.2%	6.87
CFL	0.026	2.3	21.8	0.5%	0.12
CFL	0.023	2.3	19.0	5.9%	1.12
CFL	0.014	2.3	11.9	5.5%	0.65
CFL	0.013	2.3	10.6	6.3%	0.67
				Total Baseline Energy (kWh)	31.58
				Total Average Demand (kW)	0.0376

High Efficiency:
The high efficiency case is a mixture of 26 W, 23 W, 14, W, and 13W CFL bulbs. These wattages, as well as the percentage breakdown of wattages, is based on actual Hawaii Energy Program statistics.

Enhanced Efficiency					
Lamp Types	Demand Baseline (kW)	Hours per Day	Energy Baseline (kWh/year)	%	Totals
CFL	0.026	2.3	21.8	2%	0.35
CFL	0.023	2.3	19.0	33%	6.28
CFL	0.014	2.3	11.9	24%	2.81
CFL	0.013	2.3	10.6	42%	4.42
				Total Baseline Energy (kWh)	13.86
				Total Average Demand (kW)	0.0165

Operational Factors:

Operational Factor	Adjustment Factor
Persistence Factor (pf)	0.96
Demand Coincidence Factor (cf)	0.12

Energy Savings:
CFL Net Savings after operational adjustments:

Wattage Delta (kW)	0.0211
Annual Operating hours	839.5
Total Baseline Energy (kWh/year)	31.58
Total High Efficiency Energy (kWh/year)	13.86
Energy Delta (kWh/year)	17.72
Persistence Factor (pf)	0.96
Annual Energy Savings (kWh/year)	**17.0**
Persistence Factor (pf)	0.96
Peak Coincidence Factor	0.12
Peak Demand Savings (kW)	**0.0024**

Operating Hours
2.3 hours per day, 839.5 hours per year

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Demand Coincidence Factor
Estimated coincidence factor of 0.12 cf assumes that 12% of the lamps purchased would be operating during the winter 5 p.m. to 9 p.m. weekday peak period.

Persistence
Estimated persistence factor of 0.96 pf which assumes 4% of the lamps purchased not installed or returned back to incandescent.

Lifetime
6 years

Component Costs and Lifetimes Used in Computing O&M Savings
TBD

Reference Tables
None

Military savings
Based on EM&V review 1/15/14, military homes have 50 percent more operating hours than non-military homes, or 1,259.3 hours per year instead of 839.5 hours per year.

Type	Demand Savings (kW)	Energy Savings (kWh/yr)
Non-Military	0.0028	17.0
Military	0.0028	25.5

Savings Algorithm:

CFL - Single and Multi Family Residential Home					
Lamp Average Demand		0.0376	kW		
		2.30	Hours per Day		
	x	365	Days	839.50	Hours per Year
Baseline Energy Usage		31.57	kWh per Year		
Enhanced LED Lamp Average Demand		0.0165	kW		
		2.30	Hours per Day		
	x	365	Days	839.50	Hours per Year
Enhanced LED Lamp Energy Usage		13.85	kWh per Year		
Baseline Energy Usage		31.57	kWh per Year		
Enhanced LED Lamp Energy Usage	-	13.85	kWh per Year		
LED Savings Before Adjustments		17.71	kWh per Year		
		17.71	kWh per Year		
Persistance Factor	x	0.960	pf	4.0%	Lamps not installed or replaced back
		17.00	kWh per Year		
CFL Energy Savings		**17.0**	**kWh / Year Savings**		
Baseline Lamp Demand		0.0376	kW		
Enhanced LED Lamp Demand	-	0.0165	kW		
LED Demand Reduction Before Adjustments		0.0211	kW		
LED Demand Reduction Before Adjustments		0.021	kW		
Coincidence Factor		0.120	cf	12.0%	Lamps on between 5 and 9 p.m.
Persistance Factor	x	0.960	pf	4.0%	Lamps not installed or replaced back
		0.0024	kW		
CFL Demand Savings		**0.0024**	**kW Savings**		

10.2.2 Light Emitting Diode (LED)

Version Date & Revision History:
Draft date: February 24, 2010
Revision date: May 19, 2016

Referenced Documents:
- Evergreen TRM Review – 2/23/12
- Evergreen TRM Review – 1/15/14

TRM Review Actions:
- 10/5/11 – Currently Under Review.
- 4/8/15 – Revised LED savings values per PY12 TRM Review

Major Changes:
- 11/21/11 – Updated tables and text in the following headings:
    - Measure description
    - Baseline efficiencies
    - High efficiency
    - Energy savings
    - Savings algorithm
- Updates made to capture a broader range of lamp types (two wattages per lamp type) and obtain more accurate savings calculations.
- 11/21/11 – Changed the following text under *Energy Savings* heading: 1) "LED Gross Savings before operational adjustments" was changed to "LED Savings before…" and 2) "CFL Net Savings after operational adjustments" was changed to "LED Savings after…"
- 11/21/11 – Under *Energy Savings* heading changed table to only one building type because savings are calculated the same between single and multi-family housing.
- Removed the 1.08 size adjustment factor.
- 4/8/15 – Changed persistence factor from 0.8 to 0.96 to be consistent with CFL bulbs.
- 4/17/15 – Baseline efficiency for CFL and for LED shall be the same.
- 4/17/15 – Adjust baseline to be a mixture of incandescents and CFLs.
- 4/17/15 – Adjust baseline percentages based on Program statistics of CFLs and incandescents and a burn-out ratio of 4.5:1 (incandescents:CFL). Burn-out ratio from 2014 DEER data.
- 4/17/15 – Adjust enhanced case to be a mixture of LEDs based on actual Program statistics.
- 5/19/2016 – Added measure life.

Measure Description:
The replacement of a standard incandescent lamp or spiral compact fluorescent lamp with a light emitting diode in both Residential Single Family and Multi-family homes. Lamps must comply with Energy Star and UL.

Baseline Efficiencies:

Breakdown of CFL vs incandescent is based on a burn-out ratio of 9000 hours to 2000 hours. In 9000 hours, 4.5 incandescents will burn out and 1 CFL will burn out, for a total of 5.5 burnt-out bulbs. This equates to a replacement rate of 81.8% incandescents and 18.2% CFLs. Within each category of incandescents or CFLs, the breakdown of wattages is based on actual Hawaii Energy Program statistics.

Baseline Efficiency					
Lamp Types	Demand Baseline (kW)	Hours per Day	Energy Baseline (kWh/year)	%	Totals
Incandescent	0.072	2.3	60.4	2.4%	1.45
Incandescent	0.053	2.3	44.5	26.5%	11.79
Incandescent	0.043	2.3	36.1	24.7%	8.92
Incandescent	0.029	2.3	24.3	28.2%	6.87
CFL	0.026	2.3	21.8	0.5%	0.12
CFL	0.023	2.3	19.0	5.9%	1.12
CFL	0.014	2.3	11.9	5.5%	0.65
CFL	0.013	2.3	10.6	6.3%	0.67
				Total Baseline Energy (kWh)	31.58
				Total Average Demand (kW)	0.0376

High Efficiency:

The high efficiency case is a mixture of 5.5 W, 7.6 W, 12.6 W, and 17.1 W LED bulbs. These wattages, as well as the percentage breakdown of wattages, is based on actual Hawaii Energy Program statistics.

Enhanced Efficiency					
Lamp Types	Demand Baseline (kW)	Hours per Day	Energy Baseline (kWh/year)	%	Totals
LED	0.0171	2.3	14.4	8%	1.20
LED	0.0126	2.3	10.6	29%	3.09
LED	0.0076	2.3	6.4	57%	3.62
LED	0.0055	2.3	4.6	6%	0.26
				Total Baseline Energy (kWh)	8.17
				Total Average Demand (kW)	0.0097

Operational Adjustments

Operational Factor	Adjustment Factor
Persistence Factor (pf)	0.96
Demand Coincidence Factor (cf)	0.12

Energy Savings:
LED Savings:

Wattage Delta (kW)	0.0279
Annual Operating hours	839.5
Total Baseline Energy (kWh/year)	31.58
Total High Efficiency Energy (kWh/year)	8.17
Energy Delta (kWh/year)	23.41
Persistence Factor (pf)	0.96
Annual Energy Savings (kWh/year)	**22.5**
Persistence Factor (pf)	0.96
Peak Coincidence Factor	0.12
Peak Demand Savings (kW)	**0.0032**

Military savings
Based on EM&V review 1/15/14, military homes have 50 percent more operating hours than non-military homes, or 1,259.3 hours per year instead of 839.5 hours per year.

Type	Demand Savings (kW)	Energy Savings (kWh/yr)
Non-Military	0.0032	22.5
Military	0.0032	33.8

Measure Life
15 years

Savings Algorithms

LED - Single and Multi Family Residential Home				
Lamp Average Demand		0.0376	kW	
		2.30	Hours per Day	
	x	365	Days	839.50 Hours per Year
Baseline Energy Usage		31.58	kWh per Year	
Enhanced LED Lamp Average Demand		0.0097	kW	
		2.30	Hours per Day	
	x	365	Days	839.50 Hours per Year
Enhanced LED Lamp Energy Usage		8.14	kWh per Year	
Baseline Energy Usage		31.58	kWh per Year	
Enhanced LED Lamp Energy Usage	-	8.14	kWh per Year	
LED Savings Before Adjustments		23.43	kWh per Year	
		23.4	kWh per Year	
Persistance Factor	x	0.960	pf	4.0% Lamps not installed or replaced back
		22.5	kWh per Year	
LED Energy Savings		**22.5**	**kWh / Year Savings**	
Baseline Lamp Demand		0.038	kW	
Enhanced LED Lamp Demand	-	0.010	kW	
LED Demand Reduction Before Adjustments		0.028	kW	
LED Demand Reduction Before Adjustments		0.028	kW	
Coincidence Factor		0.120	cf	12.0% Lamps on between 5 and 9 p.m.
Persistance Factor	x	0.960	pf	4.0% Lamps not installed or replaced back
		0.0032	kW	
LED Demand Savings		**0.0032**	**kW Savings**	

10.3 High Efficiency Air Conditioning

10.3.1 VRF Split System AC

Version Date & Revision History:
Draft date: February 24, 2011
Revision date: April 17, 2015

Referenced Documents:

- Evergreen TRM Review – 2/23/12
- Evergreen TRM Review – 1/15/14

TRM Review Actions:

- 10/5/11 – Currently Under Review.

Major Changes:

- 4/17/2015 – Updated values for single-family vs multi-family to 68% and 32% based on Evergreen Baseline Report to PUC. Resultant change was energy savings of 583 kWh/year to 689 kWh/year and 0.30 kW to 0.32 kW.
- 12/18/2015 – Changed coincidence factor from 1.0 to 0.5 to match other residential AC measures.
- 12/18/2015 – Removed SF/MF use factor and weighted average method and changed equivalent full-load operating hours from 5016 to 1825 to capture average usage for all types of homes.
- 3/9/2016 – Added standard sizes for “small” and “large” units and corresponding energy and demand savings values for respective sizes.

Description: Inverter driven variable refrigerant flow (VRF) air conditioning systems are direct expansion AC systems that utilize variable speed evaporator/condenser fans, and a combination of fixed and variable speed compressors along with most often multiple individual zone evaporators to provide the ability to more closely match the AC system’s output with the building’s cooling requirements.
Savings comes from:

- *Part Load Efficiencies*: Increased part-load efficiency operation
- *High Efficiency Motors*: Many systems use ECM motors
- *Higher Room Temperatures*: The capacity matching allows for better humidity control through longer cooling operation.
- *Reduction of Distribution Losses*: Duct losses are reduced with DX systems. This may be offset by dedicated outside air distribution systems when needed.

Energy and Demand Savings: VRF systems have demonstrated a 20-30% reduction in energy consumption as compared to standard DX equipment.

Base Efficiency
Base case efficiency is 10.9 SEER.

High Efficiency
The high efficiency case is 16 SEER.

Energy Savings
Savings of 640 kWh/year (see algorithm below) is based on per 1 ton (12,000 Btu/hr) cooling capacity. Energy savings may be multiplied for VRF systems larger than 1 ton. From a review of PY2015 rebates processed, the average size of a small unit (2 tons and less) was 1.28 tons. The average size of a large unit (greater than 2 tons) was 2.58 tons. Therefore, a small VRF unit savings is equal to 819 kWh/year and a large VRF unit is 1651 kWh/year.

Demand Savings

Peak demand savings of 0.18 kW (see algorithm below) is based on per 1 ton (12,000 Btu/hr) cooling capacity. Demand savings may be multiplied for VRF systems larger than 1 ton. From a review of PY2015 rebates processed, the average size of a small unit (2 tons and less) was 1.28 tons. The average size of a large unit (greater than 2 tons) was 2.58 tons. Therefore, a small VRF unit demand savings is equal to 0.23 kW and a large VRF unit demand savings is 0.46 kW.

<u>Savings Algorithms</u>

VRF Split System AC - Single and Multi Family Residential Home				
Base Case				
Conventional Room AC Built After 1994				
Average Unit Cooling Capacity		12,000	BTU / Hr	(Equals 1 Ton Cooling Capacity)
Energy Efficiency Ratio	÷	10.9	EER	Federal minimum standard (June 1, 2014)
Full Load Demand		1,101	Watts	
Conversion	÷	1,000	Watts / kW	
Full Load Demand		1.1	kW	
Conventional Room AC Full Load Demand		1.1	kW	
Honolulu Full Load Equivalent Cooling Hours	x	1,825	Hours per Year	Hawaii Energy estimate full-load equivalent hours
Conventional Room AC Annual Energy Consumption		2,009	kWh per Year	
VRF Split System AC				
Average Unit Cooling Capacity		12,000	BTU / Hr	(Equals 1 Ton Cooling Capacity)
Energy Efficiency Ratio	÷	16.0	EER	HE minimum requirement for incentive
Full Load Demand		750.0	Watts	
Conversion	÷	1,000.0	Watts / kW	
Full Load Demand		0.75	kW	
VRFSplit AC Full Load Demand		0.75	kW	
Honolulu Full Load Equivalent Cooling Hours	x	1,825	Hours per Year	
VRF Split Annual Energy Consumption		1,369	kWh per Year	
Conventional Room AC Annual Energy Consumption		2,009	kWh per Year	
VRF Split Annual Energy Consumption	-	1,369	kWh per Year	
VRF Split Annual Energy Savings		640	kWh per Year	
		640	kWh per Year	
Persistance Factor	x	1	pf	100.0%
		640	kWh per Year	
VRF Split AC Energy Savings		**640**	**kWh / Year Savings per ton of capacity**	
Conventional Room AC Full Load Demand		1.1	kW	
VRF Split AC Full Load Demand	-	0.75	kW	
VRF AC Demand Reduction Before Adjustments		0.35	kW	
VRF AC Demand Reduction Before Adjustments		0.35	kW	
Coincidence Factor	x	0.5	pf	50.0% VRFs operational between 5-9 PM
Persistance Factor	x	1.0	pf	100.0% VRFs installed and operational at EER Efficiency
VRF AC Demand Reduction After Adjustments		0.18	kW	
Single & Multi Family VRF Split AC Demand Savings		**0.18**	**kW Savings per ton of capacity**	

Measure Life

The measure life is assumed to be 15 years.

10.3.2 Window AC with Recycling

Version Date & Revision History:
Draft date: December 23, 2014
Revision date: June 23, 2015

Referenced Documents:
- http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/41)

TRM Review Actions:

Major Changes:
- Base-case efficiency = 9.8 EER (Energy conservation standard for 8500 Btuh capacity with louvered sides and without reverse cycle, per US DOE, until 5/31/2014. Enhanced-case efficiency = 11.2 EER (Minimum Energy Star qualifying for < 19,999 Btuh capacity with louvered sides and without reverse cycle)
- Measure life = 9 years (DEER)
- Coincidence Factor = 0.50
- 6/23/15 – Changed run time from 1824 to 1825 hours for simplicity (Hawaii Energy estimation based on Hawaii climate, 5 hrs per day)

Measure Description
This measure involves the early removal of an existing inefficient room window air conditioning unit from service and replacement with a new ENERGY STAR qualifying unit.

Baseline Condition
The baseline condition is the existing inefficient room air conditioning unit 8,500 Btuh at 9.8 EER.

Definition of Efficient Condition
The efficient condition is a new replacement room air conditioning unit 8,500 Btuh meeting the ENERGY STAR efficiency standard at 11.2 EER.

Annual Energy Savings Algorithm
Savings for remaining life of existing unit:

$$\Delta kWh = (Hours * BtuH * (1/EERexist - 1/EERee))/1{,}000$$

Where:
- Hours = Run hours of Window AC unit = 1,825 hr/yr
- Btuh = Capacity of replaced unit = Actual or 8,500 if unknown
- EERexist = Efficiency of existing unit in Btus per Watt-hour = 9.8
- EERee = Efficiency of ENERGY STAR unit in Btus per Watt-hour = 11.2

Annual Energy Savings = 197.8 kWh/year

Peak Demand Savings Algorithm

Peak Demand Savings = Annual Energy Savings divided by Hours of Operation multiplied by Coincidence Factor

Peak Demand Savings = 0.054 kW

Algorithm Savings

Window AC w/Recycling				
Average Unit Cooling Capacity		8500	BTU/Hr	Average size of Window AC's incentivized by Hawaii Energy in PY14
Energy Efficiency Ratio	÷	9.8	EER	DOE Federal Test Procedure 10CFR 430, Appendix F
Full Load Demand		867.3	Watts	
Conversion	÷	1000	Watts/kW	
Full Load Demand		0.87	kW	
Conventional Full Load Demand		0.87	kW	
Honolulu Full Load Equivalent Cooling Hour	x	1825	Hours per Year	Hawaii Energy estimate, based on 5 hr/day, 365 day/year
Conventional AC Annual Energy Consumption		1582.9	kWh per Year	
Energy Star Window AC		8500	BTU/hr	Average size of Window AC's incentivized by Hawaii Energy in PY14
Energy Efficiency Ratio	÷	11.2	EER	Minimum Energy Star Rated Window AC
Full Load Demand		758.9	Watts	
Conversion	÷	1000	Watts/kW	
Full Load Demand		0.76	kW	
ENERGY STAR Full Load Demand		0.76	kW	
Cooling Hours	x	1825	Hours per Year	Hawaii Energy estimate, based on 5 hr/day, 365 day/year
ENERGY STAR AC Annual Energy Consumption		1385.0	kWh per Year	
Annual Energy Savings		198	kWh per Year	
Coincidence Factor		0.5		Hawaii Energy estimate for AC use during peak demand period
Demand Peak Savings		0.054	kW	

Incremental Cost

The incremental cost for this measure should be the actual implementation cost for recycling the existing units, plus $129.

Measure Life

The measure life is assumed to be 9 years.

10.3.3 Ceiling Fans

Version Date & Revision History:
Draft date: March 2, 2011
Review date: June 23, 2015

Referenced Documents:
- ENERGY STAR Ceiling Fan Savings Calculator

TRM Review Actions:

Major Changes:
- Reduced fan lighting hours of operation from 3.5 hours to 2.3 hours per day to be consistent with the other lighting measures – EM&V Review November 14, 2013

Measure Description:
This measure describes the instillation of an ENERGY STAR ceiling fan that uses a high efficiency motor and contains compact fluorescent bulbs in place of a standard fan with integral incandescent bulbs.

Baseline Efficiencies:
The baseline equipment is assumed to be a standard fan with integral incandescent bulbs.

High Efficiency:
The efficient equipment must be an ENERGY STAR certified ceiling fan with integral CFL bulbs.

Energy Savings:

	Average Annual kWh savings per unit	Average Coincident Peak kW savings per unit
2010 - 2013	110	0.019
2014 on	65	0.012

ΔkWh = ((%$_{low}$ * (LowKW$_{base}$ - LowKW$_{ee}$) + %$_{med}$ * (MedKW$_{base}$ - MedKW$_{ee}$) + %$_{high}$ * (HighKW$_{base}$ - HighKW$_{ee}$)) * HOURS$_{fan}$) + ((IncKW – CFLKW) * HOURS$_{light}$ * WHFe)

Where:

$\%_{low}$	= Percent of time on Low Speed	= 40%
$\%_{med}$	= Percent of time on Medium Speed	= 40%
$\%_{high}$	= Percent of time on High Speed	= 20%
$LowWatt_{base}$	= Low speed baseline ceiling fan wattage	= 0.0152 kW
$LowWatt_{ee}$	= Low speed ENERGY STAR ceiling fan wattage	= 0.0117 kW
$MedWatt_{base}$	= Medium speed baseline ceiling fan wattage	= 0.0348 kW
$MedWatt_{ee}$	= Medium speed ENERGY STAR ceiling fan wattage	= 0.0314 kW
$HighWatt_{base}$	= High speed baseline ceiling fan wattage	= 0.0725 kW
$HighWatt_{ee}$	= High speed ENERGY STAR ceiling fan wattage	= 0.0715 kW
$HOURS_{fan}$	= Typical fan operating hours (2.8/day, 365 days per year)	= 1022 hours
IncWatt	= Incandescent bulb kW (assumes 3 * 60W bulb)	= 0.180kW
CFLWatt	= CFL bulb kW (assumes 3 * 20W bulb)	= 0.060kW
$HOURS_{light}$	= Typical lighting operating hours (2.3/day, 365 days per year)	= 839.5 hours
WHFe	= Waste Heat Factor for Energy to account for cooling savings from Efficient lighting.	= 1.07

ΔkWh = ((0.4 * (0.0152 – 0.0117) + 0.4 * (0.0348 – 0.0314) + 0.2 * (0.0725 – 0.0715)) * 1022) + ((0.18 – 0.06) * 839.5 * 1.07)

= **110 kWh**

<u>Baseline Adjustment</u>

Federal legislation stemming from the Energy Independence and Security Act of 2007 will require all general-purpose light bulbs between 40 and 100W to be approximately 30% more energy efficient than current incandescent bulbs, in essence beginning the phase out of standard incandescent bulbs. In 2012 100W incandescents will no longer be manufactured, followed by restrictions on 75W in 2013 and 60W in 2014. The baseline for this measure will therefore become bulbs (improved incandescent or halogen) that meet the new standard. To account for these new standards, first year annual savings for this measure must be reduced beginning in 2014. This measure assumes 60W baseline bulbs, which in 2014 will become 43W and so the annual savings beginning in 2014 should therefore be:

ΔkWh = ((0.4 * (0.0152 – 0.0117) + 0.4 * (0.0348 – 0.0314) + 0.2 * (0.0725 – 0.0715)) * 1022) + ((0.129 – 0.06) * 839.5 * 1.07)

= **65 kWh**

In addition, since during the lifetime of a CFL, the baseline incandescent bulb will be replaced multiple times, the annual savings claim must be reduced within the life of the measure. Therefore, for bulbs installed in 2010, the full savings (110 kWh) should be claimed for the first four years, but the reduced annual savings (65 kWh) claimed for the remainder of the measure life. The savings adjustment is therefore equal to 65/110 = 59%.

<u>Coincident Peak Demand Savings</u>

ΔkW = (%low * (LowKWbase - LowKWee) + %med * (MedKWbase - MedKWee) + %high * (HighKWbase - HighKWee)) + ((IncKW – CFLKW) * WHFd) * CF

Where:

WHFd = Waste Heat Factor for Demand to account for cooling savings from efficient lighting = 1.21

CF = Peak Coincidence Factor for measure = 0.11

$\Delta kW = ((0.4 * (0.0152 – 0.0117) + 0.4 * (0.0348 – 0.0314) + 0.2 * (0.0725 – 0.0715)) + ((0.18 – 0.06) * 1.21) * 0.11$

$\Delta kW = \mathbf{0.019kW}$

After 2014, this will be reduced to:

$\Delta kW = ((0.4 * (0.0152 – 0.0117) + 0.4 * (0.0348 – 0.0314) + 0.2 * (0.0725 – 0.0715)) + ((0.129 – 0.06) * 1.21) * 0.11$

$\Delta kW = \mathbf{0.012kW}$

Operating Hours
See Table above.

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Lifetime
5 years (DEER)

Component Costs and Lifetimes Used in Computing O&M Savings
TBD

10.3.4 Solar Attic Fans

Version Date & Revision History:
Draft date: March 2, 2011
Revision date: April 29, 2016

Referenced Documents:

- n/a

TRM Review Actions:

- November 14, 2013 – Conduct additional research to ensure the 10% air conditioning savings estimate is reasonable. This could include some metering or bill history analysis of customers who participated in this measure. This is a low priority research task as participation for this measure was small during the last program year.

Major Changes:

- 4/17/2015 – PY14 TRM was assuming 5016 full load operating hours of a room air conditioner. This value was revised to 1825 hours to be consistent with the Window AC with Recycling measure.
- 4/17/2015 – PY14 TRM was assuming an average size of 1.0 kW room air conditioner. To be consistent with the Window AC with Recyling measure, size was revised to 0.87 kW, which is based on actual Hawaii Energy program statistics from PY14.
- 4/17/2015 – Resultant change in net energy savings was 158 kWh/year instead of 502 kWh/yr.
- 4/29/2016 – Measure life corrected to 20 years

Measure Description: Solar attic fan is assumed to reduce 10% of existing air conditioning load energy usage and no demand reduction from 5PM – 9PM.

Baseline Efficiencies: The baseline case is no solar attic fan.

Base Case	Demand Baseline (kW)	Energy Baseline (kWh/year)
No Solar Attic Fan	0.87	1583

High Efficiency: The enhanced case is a solar attic fan in conjunction with a AC unit.

High Efficiency Case	Efficient Case (kW)	Efficient Case (kWh/year)
Solar Attic Fan	0.87	1425

Operational Factors:

Operational Factor	Adjustment Factor
Persistence Factor (pf)	1.00
Demand Coincidence Factor (cf)	0.00

Energy Savings:

Savings Type	Net Customer Savings (kW)	Net Customer Savings (kWh/year)
Net Savings	0.000	158

Savings Algorithms

Solar Attic Fan - Single Family Residential Home				
Average Unit Cooling Capacity		8500	BTU/Hr	Average size of Window AC's incentivized by Hawaii Energy in PY14
Energy Efficiency Ratio	÷	9.8	EER	DOE Federal Test Procedure 10CFR 430, Appendix F
Full Load Demand		0.87	kW	
Energy Star Room AC Full Load Demand		0.87	kW	
Honolulu Full Load Equivalent Cooling Hours	x	1,825	Hours per Year	Hawaii Energy estimate for window AC based on local climate
Energy Star Room AC Annual Energy Consumption		1,583	kWh per Year	
Energy Reduction Percentage with Solar Attic Fan		10.0%		
Energy Usage with Solar Attic Fan		1,425	kWh / Year Savings	
Energy Star Room AC Annual Energy Consumption		1,583	kWh / Year Savings	
Energy Usage with Solar Attic Fan	-	1,425	kWh / Year Savings	
Solar Attic Fan Annual Energy Savings		158	kWh / Year Savings	
Solar Attic Fan Annual Energy Savings		158	kWh / Year Savings	
Persistance Factor	x	1.0		
Net Customer Level Savings		158	kWh / Year Savings	
Solar Attic Fan Energy Savings		158	kWh / Year Savings	
Energy Star Room AC Full Load Demand		0.87	kW	
Peak Demand Reduction		0%		
AC Demand with Solar Attic Fan		0.87	kW	
Energy Star Room AC Full Load Demand		0.87	kW	
AC Demand with Solar Attic Fan	-	0.87	kW	
Gross Customer Demand Savings		-	kW	
Solar Attic Fan Demand Savings		0.000	kW Savings	

Operating Hours
See Table above.

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Persistence
1.0

Lifetime
20 years

10.3.5 Whole House Fans

Version Date & Revision History
Draft date: March 2, 2011
Revision date: April 17, 2015

Referenced Documents:
- KEMA for the Sate of California Low-Income Energy Efficiency Program; calmac.org/publications/2001_LIEE_Impact_Evaluation.pdf
- Evergreen TRM Review – 2/23/12

TRM Review Actions:
- 10/5/11 – Currently Under Review.
- 4/9/12 – Energy reduction percentage changed from .25 to .2 as per the EM&V report dated 23 Feb 2012. Added reference document from EM&V report.

Major Changes:
- 4/17/2015 – PY14 TRM was assuming 5016 full load operating hours of a room air conditioner. This value was revised to 1825 hours to be consistent with the Window AC with Recycling measure.
- 4/17/2015 – PY14 TRM was assuming an average size of 1.0 kW room air conditioner. To be consistent with the Window AC with Recyling measure, size was revised to 0.87 kW, which is based on actual Hawaii Energy program statistics from PY14.
- 4/17/2015 – Resultant change in net energy savings was 365 kWh/year instead of 1,254 kWh/yr.

Measure Description: A whole house fan is a ventilation system, usually placed centrally within a home, that pulls air from the living space into an attic for purposes of increased circulation. In warm climates such as Hawaii, this serves to cool the home, by pulling in cooler outside air and evacuating warmer air that has been built up or trapped within the house. Whole house fan is assumed to reduce 20% of existing air conditioning load energy usage.

Baseline Efficiencies:

Base Case	Demand Baseline (kW)	Energy Baseline (kWh/year)
No Whole House Fan	1.00	1,825

High Efficiency:

High Efficiency Case	Efficient Case (kW)	Efficient Case (kWh/year)
Whole House Fan	0.15	1,460

Energy Savings:

Savings Type	Gross Customer Savings (kW)	Gross Customer Savings (kWh/year)
Gross Savings	0.85	365
Operational Factor	**Adjustment Factor**	
Persistence Factor (pf)	1.00	
Demand Coincidence Factor (cf)	0.59	
Savings Type	**Net Customer Savings (kW)**	**Net Customer Savings (kWh/year)**
Net Savings	0.50	365

Savings Algorithms

Whole House Fan - Single Family Residential Home				
Energy Star Room AC Full Load Demand		1.0	kW	
Honolulu Full Load Equivalent Cooling Hours	x	1,825	Hours per Year	Hawaii Energy estimate (5 hrs/day)
Energy Star Room AC Annual Energy Consumption		1,825	kWh per Year	
Energy Reduction Percentage with Whole House Fan		20.0%		Per Evergreen review dated 1/23/2012
Energy Usage with Whole House Fan		1,460	kWh / Year Savings	
Energy Star Room AC Annual Energy Consumption		1,825	kWh / Year Savings	EPA, 2002 Report
Energy Usage with Whole House Fan	-	1,460	kWh / Year Savings	
Whole House Fan Annual Energy Savings		365	kWh / Year Savings	
Whole House Fan Annual Energy Savings		365	kWh / Year Savings	
Persistance Factor	x	1.0		
Net Customer Level Savings		365	kWh / Year Savings	
Whole House Fan Energy Savings		365	kWh / Year Savings	
Energy Star Room AC Full Load Demand		1.00	kW	
Whole House Fan Demand	-	0.15	kW	
Gross Customer Demand Reduction		0.85	kW	
Gross Customer Demand Reduction		0.850	kW	
Gross Customer Demand Reduction		0.850	kW	
Persistence Factor		1.000		
Coincidence Factor	x	0.590		
Net Whole House Fan Demand Savings		0.50	kW Savings	

Operating Hours
See Table above.

Lifetime
20 years

10.4 High Efficiency Appliances

10.4.1 ENERGY STAR Refrigerator and Clothes Washer

Version Date & Revision History:
Draft date: February 24, 2010
Revision date: November 14, 2013
Review date: June 23, 2015

Referenced Documents:
- HECO DSM Docket – Backup Worksheets - Global Energy (07-14-06)
- Econorthwest TRM Review – 6/23/10
- Department of Energy Refrigerator Profile – Updated December 2009
- Evergreen TRM Review – 1/15/14

TRM Review Actions:
- 6/23/10 Rec. # 11 – Revise savings to be consistent with ENERGY STAR estimates. – Adopted with modifications on refrigerator figures based on DOE Refrigerator profile and the addition of bounty, recycle with new figures.
- 6/23/10 Rec. # 12 – Split the claimed savings by appliance. – Adopted.
- 6/23/10 Rec. # 13 – Incorporate solar hot water heating into appliance savings values – Adopted.
- 6/23/10 Rec. # 14 – Revise demand savings values for ENERGY STAR appliances – Adopted.
- 10/4/11 – Removed dishwashers from appliance list.
- 4/9/12 – Baseline efficiency for non-ES Refrigerator changed from 537 to 540. Number changed to match ES data.
- 11/14/13 – Updated Energy Star clothes washer to be consistent with the most recent Energy Star standards and calculations.
- 11/14/13 – New standards will take effect beginning September 15, 2014.

Major Changes:
- Split between ESH appliances
- Incorporation of three refrigerator categories (new, new with turn in, and bounty (turn in only))
- All ESH 313 kWh and 0.12 kW changed to:
  - New ES Refrigerator Only – 105 kWh, .017 kW
  - New ES Refrigerator with Turn-In – 822 kWh, .034 kW
  - Bounty (Turn in only) – 859 kWh, .034 kW
  - Washing Machine – 328 kWh, .042 kW

Measure Description:
The replacement of standard Clothes Washers and Refrigerators in Residential Single Family and Multi-family homes.

Appliances must comply with:
- Energy Star

Refrigerators – ENERGY STAR refrigerators utilize improvements in insulation and compressors.

Clothes Washers – Clothes washers that meet ENERGY STAR criteria use next generation technology to cut energy and water consumption by over 40% compared to conventional washers. Clothes washers come in either front-load or redesigned top-load designs. Both configurations include technical innovations that help save substantial amounts of energy and water.
- **No Central Agitator** Front-loaders tumble clothes through a small amount of water instead of rubbing clothes against an agitator in a full tub. Advanced top loaders use sophisticated wash

systems to flip or spin clothes through a reduced stream of water. Both designs dramatically reduce the amount of hot water used in the wash cycle, and the energy used to heat it.

- **High Spin Speeds** Efficient motors spin clothes two to three times faster during the spin cycle to extract more water. Less moisture in the clothes means less time and energy in the dryer.

Baseline Efficiencies:
Baseline energy usage based on 2009 Energy Star Information for the appliances are as follows:

	Demand Baseline (kW)	Energy Baseline (kWh)	Notes
Non ES Qualifying Refrigerator		540	19.0-21.4 Top Freezer
Non ES Qualifying Clothes Washer		966	392 Loads per Year

High Efficiency:
The high efficiency case Energy Star energy usage based on 2009 Energy Star Calculator Information and DOE Refrigerator Market Profile for the appliances is as follows:

	Demand High Efficiency (kW)	Energy High Efficiency (kWh)	Notes
ES Qualifying Refrigerator		435	19.0-21.4 Top Freezer
ES Qualifying Clothes Washer		609	392 Loads per Year

Energy Savings:

Energy Star Appliance Gross Savings before operational adjustments:

	Demand Savings (kW)	Energy Savings (kWh)
ES Refrigerator	0.017	105
ES Refrigerator with Turn-In	0.034	822
Bounty (Turn in only)	0.034	859
ES Washing Machine	0.042	328

Energy Star Appliance Net Savings operational adjustments:

Operational Factor	Adjustment Factor
Persistence Factor (pf)	1.0
Demand Coincidence Factor (cf)	1.0

Savings Algorithms

Energy Star Clothes Washer

Standard (kWh)	Energy Star (kWh)	Savings (kWh/yr)	SHW PF	Claimed Energy Savings (kWh)
966	609	357	92%	328

Energy Star Refrigerator and Turn In Refrigerator - Single and Multi Family Residential Home

Opportunity		Energy Usage		
New Non-ENERGY STAR		540		Table 2
New ENERGY STAR Refrigerator	-	435		Table 2
		105	kWh/Year	Table 1
#1 - Purchase of ENERGY STAR Refrigerator		105		Table 1
#2 - Removal of Old Unit from Service (off the grid)	+	717		Table 1
#1 + #2 = Purchase ES and Recycle old unit		822	kWh/Year	

	Energy Usage	Ratio	Contribution		
Post-1993 Refrigerator	640	55%	354.54		Table 3
Pre-1993 Refrigerator	1,131	45%	504.46		Table 3
			859	kWh/Year	

Table 1

Energy Savings Opportunities for Program Sponsors

Opportunity	Annual Savings			
	Per Unit		Aggregate U.S. Potential	
	kWh	$	MWh	$ million
1. Increase the number of buyers that purchase ENERGY STAR qualified refrigerators. • 9.3 million units were sold in 2008. • 70 percent were not ENERGY STAR. • 6.5 million potential units per year could be upgraded.	105	11.64	675,928	75
2. Decrease the number of units kept on the grid when new units are purchased. • 8.7 million primary units were replaced in 2008. • 44 percent remained in use, whether they were converted to second units, sold, or given away. • 3.8 million units are candidates for retirement every year.	717	79.53	2,746,062	305
3. Decrease the number of second units. • 26 percent of households had a second refrigerator in 2008. • 29.6 million units are candidates for retirement.	859	95.28	25,442,156	2,822
4. Replace pre-1993 units with new ENERGY STAR qualified models. • 19 percent of all units in use in 2008 were manufactured before 1993. • 27.3 million total potential units are candidates for targeted replacement.	730	81	19,946,440	2,212

Sources: See endnote 10.

Table 2

Energy and Cost Comparison for Upgrading to ENERGY STAR

Purchase Decision	New Non-ENERGY STAR Qualified Refrigerator	New ENERGY STAR Qualified Refrigerator
Annual Consumption	540 kWh	435 kWh
	$60	$48
Annual Savings	–	105 kWh
	–	$12
Average Lifetime	12 years	12 years
Lifetime Savings	–	1,260 kWh
	–	$140
Price Premium	–	$30 - $100
Simple Payback Period	–	3-9 years

Note: Calculations based on shipment-weighted average annual energy consumption of 2008 models. An ENERGY STAR qualified model uses 20 percent less energy than a new non-qualified refrigerator of the same size and configuration.

Source: See endnote 10.

Table 3

Energy and Cost Comparison for Removing a Second Refrigerator from the Grid

Fate of Unit	Post-1993 Unit		Pre-1993 Unit	
	Remains on the Grid	Removed from the Grid	Remains on the Grid	Removed from the Grid
Annual Consumption	640 kWh	–	1,131 kWh	–
	$71	–	$125	–
Annual Savings	–	640 kWh	–	1,131 kWh
	–	$71	–	$125
Average Lifetime*	6	–	6	–
Lifetime Savings*	–	3,840 kWh	–	6,788 kWh
	–	$426	–	$753
Removal Cost	–	$50 - $100	–	$50 - $100
Simple Payback Period	–	1-2 years	–	<1 year

*Assumes unit has six years of functionality remaining.

Sources: See endnote 10.

Operating Hours
Refrigerators = 8,760 hours per year
Clothes Washers = 392 Loads per Year

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Demand Coincidence Factor
NA

Persistence
NA

Lifetime
(DEER) 11 years for clothes washer
(DEER) 14 years for refrigerator

Measure Costs and Incentive Levels

Residential Measure Costs and Incentive Levels

Description	Unit Incentive	Incremental Cost HECO DSM Docket 2006	Incremental Cost Energy Star 2009
ES Refrigerator	$50	$ 60.36	$ 65
ES Clothes Washer	$50	$ 398.36	$ 258

Component Costs and Lifetimes Used in Computing O&M Savings
TBD

Water Descriptions

	Base Water Usage (Gallons)	High Efficiency Water Usage (Gallons)	Water Savings (Gallons)	Notes
Refrigerator	n/a	n/a		19.0-21.4 Top Freezer
Clothes Washer	12,179	5,637	6,542	392 Loads per Year

10.4.2 Pool Pump VFD

Version Date & Revision History:
Draft date: February 24, 2010

Referenced Documents:

- Davis Energy Group (2008). Proposal Information Template for Residential Pool Pump Measure Revisions. Prepared for Pacific Gas and Electric Company; Page 2.
- Residential Retrofit High Impact Measure Evaluation Report. The Cadmus Group. February 8, 2010.

TRM Review Actions:

- 4/9/12 – Measure updated per EMV report February 23, 2012. Coincidence Factor of .0862 added. Added algorithm for Evergreen with 4.25 hours in place of 6 hours per day. Added Cadmus Group reference.
- 10/5/11 – Currently Under Review.
- 11/14/13 – No changes are recommended.

Major Changes:

- n/a

Measure Description
A variable speed residential pool pump motor in place of a standard single speed motor of equivalent horsepower.

Definition of Efficient Equipment
The high efficiency equipment is a variable speed residential pool pump.

Definition of Baseline Equipment
The baseline efficiency equipment is assumed to be a single speed residential pool pump.

$$\Delta kWh = (kWBASE \times Hours) \times 55\%\ BASE$$

Where:

Unit	= variable speed pool pump
ΔkWh	= Average annual kWh reduction
Hours	= Average annual operating hours of pump
kWBASE	= connected kW of baseline pump
55%	= average percent energy reduction *(Davis Energy Group, 2008)*

Baseline Efficiency
The baseline efficiency case is a single speed pump.

Based Demand	0.70 kW
Base Energy Usage per day	2.97 kWh/day
Base Energy Usage per year	1085 kWh/year

High Efficiency
The high efficiency case is variable speed pump.

Demand Reduction	10%	
High Efficiency Demand	0.63	kW
Energy Savings	55%	
High Efficiency Energy Usage	488	kWh/year

Energy and Demand Savings

Demand Savings	1.278	kW
Coincidence Factor	0.0862	kW

Energy Savings per year	597	kWh/year
Peak Demand Reduction	0.006	kW

Savings Algorithm

Average Pool Pump Horesepower	0.75	HP
Efficiency	0.8	
Hours of operation per day	4.25	hours
Number of days pool in use	365	days per year
1 HP Equals	0.746	kW

Based Demand	0.70	kW
Base Energy Usage per day	2.97	kWh/day
Base Energy Usage per year	1085	kWh/year

Demand Reduction	10%	
High Efficiency Demand	0.63	kW
Energy Savings	55%	
High Efficiency Energy Usage	488	kWh/year

Demand Savings	1.278	kW
Coincidence Factor	0.0862	kW

Energy Savings per year	597	kWh/year
Peak Demand Reduction	0.006	kW

Lifetime of Efficient Equipment
The estimated useful life for a variable speed pool pump is 10 years.

Measure Cost
The incremental cost is estimated to be $750 for a variable speed motor

10.4.3 Smart Strips

Version Date & Revision History:
Draft date: February 24, 2010
Revision date: December 11, 2015

Referenced Documents:

- 11/22/11 – Akamai Power Strip kWh savings updated based on NYSERDA Measure Characterization for Advanced Power Strips.

TRM Review Actions:

- Evergreen TRM Review – 1/15/14

Major Changes:

- 6/23/2015 – Removed power strip cost data.
- 12/11/2015 – Added persistence factor of 0.80 (estimate) to account for some smart strips that are never installed or uninstalled.

Measure Description
Load sensing advanced power strips. This measure involves the purchase and installation of a new load sensing advanced power strips in place of a code-compliant or standard efficiency power strip. Savings is based on the average savings per plug of a 5-plug strip and a 7-plug strip.

Definition of Efficient Equipment
The high efficiency equipment is an advanced power strip. If the exact number of plugs in the strip is unknown, savings is based on a 6-plug strip, as shown below. If the exact number of plugs in the strip is known, such as part of the Hawaii Energy online kit promotions, then the respective savings value may be used based on the actual size of the advanced power strip.

Definition of Baseline Equipment
The baseline efficiency equipment is a code-compliant or standard efficiency power strip.

Measure Life
5 years

Savings Algorithm

Akamai Power Strips					
Savings per Unit		56.5 kWh		102.8 kWh	*NYSERDA Measure Characterization for*
Plugs per Unit		x 5 plugs		x 7 plugs	Advanced Power Strips
Savings per Plug		11.3 kWh/plug		14.7 kWh/plug	
Average Savings per Plug			13.0	kWh	
	x		6	plugs/unit	
	x		0.8	pf	
Akamai Power Strip Energy Savings			**62.4**	**kWh per Unit first year**	
Hours of Operation			8760	hours/year	
Demand Savings			**0.0071**	**kW**	
First Year Savings			62.4	kWh first year	
Measure Life	x		5	year measure life	
Lifetime Savings			312	kWh lifetime	

10.5 Energy Awareness, Measurement and Control Systems

10.5.1 Room Occupancy Sensors

Version Date & Revision History:
Draft date: March 2, 2011

Referenced Documents:
Flex your Power – "Occupancy sensors can reduce lighting costs by up to 50% in rooms where lights are frequently left on when on one is around."

According to the Federal Energy Management Program (FEMP) of the US Department of Energy, in a small, private office, an occupancy sensor can reduce energy use by almost 30% shaving 100kWh off the annual energy use. In a large open office area, energy use can be reduced by approximately 10%.

TRM Review Actions:
- 10/5/11 – Currently Under Review.
- 11/14/13 – It is recommended that further research be conducted in order to determine if the savings assumptions used in this measure is appropriate.

Major Changes:
- n/a

Measure Description:
This measure is for wall switch sensors that controls the use of lighting in areas around the home with variable use such as laundry, storage, garage, bedrooms or spare areas.

Occupancy sensors must comply with:
- Energy Star
- UL Listing

Baseline Efficiencies:
The base case is an even split between two (2) 60W A-Shaped incandescent lamp and 15W Compact Fluorescent Lamp with the energy consumption as follows:

Lamp Types	Demand Baseline (kW)	Hours per Day	Energy Baseline (kWh/year)	%	Totals
Incandescent	0.060	2.30	50.4	50%	25.2 kWh
CFL	0.015	2.30	12.6	50%	6.3 kWh
				Watts per Lamp	31.5 W
				Lamps	2
				Total Baseline Energy (kWh)	63.0 kWh

High Efficiency:
The high efficiency case is 33% run time reduced.

Lamp Types	Demand Baseline (kW)	Hours per Day	Energy Baseline (kWh/year)	%	Totals
Incandescent	0.060	1.54	33.7	50%	16.9 kWh
CFL	0.015	1.54	8.4	50%	4.2 kWh
				Watts per Lamp	21.1 W
				Lamps	2
				Total High Efficiency Energy (kWh)	42.2 kWh

Energy Savings:

Total Baseline Energy (kWh)	63.0 kWh
Total High Efficiency Energy (kWh)	42.2 kWh
	20.8 kWh

Savings Algorithms

Room Occupancy Sensors - Single and Multi Family Residential Home			
Two (2) - Lamp Demand		0.075 kW	Even split between 60W Incand. and 15W CFL
		2.30 Hours per Day	
	x	365 Days	839.5 Hours per Year
Baseline Energy Usage		63.0 kWh per Year	
Run Time Reduced (RTR)		0.76 Hours per Day	33%
		63.0 kWh per Year	
	x	0.330	33% Run Time Reduced
		20.8 kWh per Year	
Energy Savings		**20.8 kWh / Year Savings**	
Two Lamp Demand Reduction Before Adjustments		0.075 kW	
Demand Reduction Before Adjustments		0.038 kW	
Coincidence Factor		0.120 cf	12.0% Lamps on between 5 and 9 p.m.
Persistance Factor	x	1.000 pf	100.0%
		0.0046 kW	
Demand Savings		**0.0046 kW Savings**	

Operating Hours
2.3 hours per day

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Coincidence
CF = 0.12 (12% lamps on between 5PM – 9PM)

Persistence
PF =1.0

Lifetime
8 years (DEER)

Component Costs and Lifetimes Used in Computing O&M Savings
TBD

Reference Tables
None

10.5.2 Peer Group Comparison

Version Date & Revision History:
Draft date: September 18, 2011

Referenced Documents:

TRM Review Actions:

- Continue to monitor participant vs control group energy usage comparison.
- 10/5/11 – Currently Under Review.

Major Changes:

- New PBFA 100% funded program.
- 11/22/11 – Removed detailed table from *Energy Savings* heading – not pertinent information.
- 11/14/13 – Change savings from 1.73% to 0.89% per EM&V review.

Measure Description:
The Behavior/Feedback programs send monthly energy use reports to participating electric customers in order to change customers' energy-use behavior. These reports rank the customers within a group of 100 similar sized homes in their neighborhood. Customers are also directed to a website with energy efficient tips and recommendations on energy conservation.

Energy Savings
The unit energy savings of 0.89% is based on EM&V recommendation.

Example Algorithm Calculating Customer Level Impact

ΔkWh = (Total Monthly Base Energy Usage)(# of Participating Months)(%Savings)
ΔkW = Annual ΔkWh per Unit/ 3000 hours

(Note: 3000 hours assumes 8.22 hours per day of active behavioral usage)

Where:
Unit = One participant household
%Savings = Energy savings percent per program participant

Baseline Efficiency
The baseline efficiency case is the control group that does not receive behavior and feedback program reports.

High Efficiency
The high efficiency case is test group receiving home energy reports.

Persistence
1 year

Measure Life
1 year

10.5.3 Whole House Energy Metering

Version Date & Revision History:
Draft date: March 2, 2011

Referenced Documents:
- Hawaii Energy Historic Utility Billing Research – Residential Review 2010
- Evergreen TRM Review – 2/23/12

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- Changed energy savings from 2% to 3.8% based on EM&V Review.

Measure Description:
Whole house metering systems allow the occupant to see in real time the energy usage in their home. This "dashboard" allows them to see what actions and equipment drive their energy usage and the associated costs of running them. These devices collect energy data for the whole house at the panel and transmit the information to a display unit "dashboard" which can be located anywhere in the house.

Baseline Efficiencies:

Building Types	Demand Baseline (kW)	Energy Baseline (kWh/year)
No Metering	1.50	12,000

High Efficiency:

Building Types	Efficient Case (kW)	Efficient Case (kWh/year)
Whole House Meter	1.47	11,544

Energy Savings:

Building Types	Efficient Case (kW)	Efficient Case (kWh/year)
Whole House Meter	1.47	11,544

Building Types	Gross Customer Savings (kW)	Gross Customer Savings (kWh/year)
Gross Customer Savings	0.026	456

Operational Factor	Adjustment Factor
Persistence Factor (pf)	0.90
Demand Coincidence Factor (cf)	0.30

Building Types	Net Customer Savings (kW)	Net Customer Savings (kWh/year)
Net Customer Savings	0.007	410

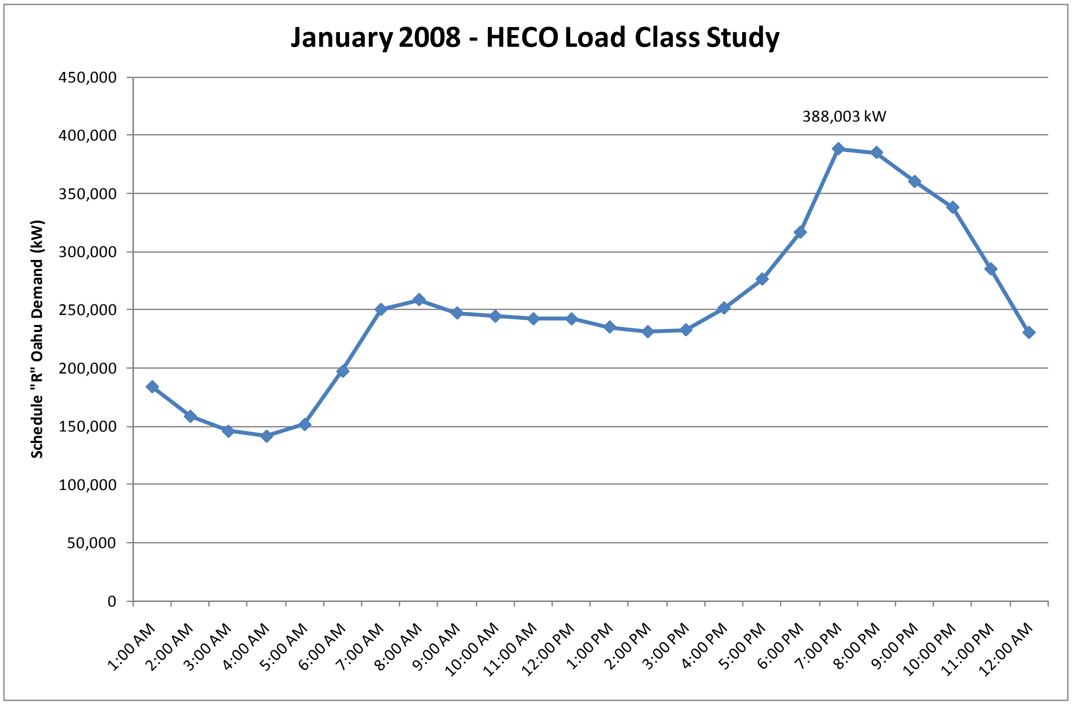
Savings Algorithms

Whole House Metering - Single Multi Family Residential Home

High Energy Usage Home (85th percentile)		1,000	kWh per home per month	Hawaii Energy review - HECO 2010 Data
	x	12		
Baseline Household Energy Usage		12,000	kWh per Year	
Energy Reduction		3.8%		
Actively Informed Household Energy Usage		11,544	kWh per Year	
Baseline Household Energy Usage		12,000	kWh per Year	
Actively Informed Household Energy Usage	-	11,544	kWh per Year	
Gross Customer Level Energy Savings		456	kwh per Year	
	x	1,000	Watts per kW	
	÷	8,760	Hours per Year	
Average 24/7 Demand Reduction		52	Watts	
Gross Customer Level Energy Savings		456	kwh per Year	
Persistance Factor	x	0.9		
Net Customer Level Savings		410	kwh per Year	
Whole House Metering Energy Savings		410	kWh / Year Savings	
Baseline Household Demand		1.50	kW	HECO 2008 Load Study
Peak Demand Reduction		1.75%		
Actively Informed Household Demand		1.47	kW	
Baseline Household Demand		1.50	kW	
Actively Informed Household Demand	-	1.47	kW	
Gross Customer Demand Savings		0.026	kW	
Gross Customer Demand Savings		0.026	kW	
Persistance Factor	x	0.90		
Coincidence Factor	x	0.30		
		0.007	kW	
Whole House Metering Demand Savings		0.007	kW Savings	

Operating Hours
8,760 hours per year

Loadshape
TBD



Freeridership/Spillover Factors
0.73

Persistence Factor
PF = 0.9

Coincedence Factor
CF= 0.3

Lifetime
4 years

Measure Costs and Incentive Levels

		Low	High
Measure Cost		$100	$450
Incremental Cost		$100	$450

Incentive Level 50% up to $100

10.6 Energy Efficiency Equipment Grants

10.6.1 Home Energy Savings Kits

Measure ID:

Version Date & Revision History:
Draft date: 12-15-2015

Referenced Documents:
-

TRM Review Actions:
- 12/15/2015 – Pending review by EM&V

Major Changes:
- New measure

Measure Description:
Customized kits can be built using different energy saving devices of varying quantities. Savings for each kit will be calculated based on energy savings list below This online kit promotion may contain various combinations of the following components:
- A19 LED (60 watt equivalent)
- BR30 LED (65 watt equivalent)
- 1 CFL
- Advanced power strip
- Low-flow showerhead*
- Faucet aerator*

*The savings claim for each household for water measures depends on the type of water heating for each home, as well as the occupancy for each home (this data was collected by the team).

Baseline Efficiencies:
Baseline lighting = blend of incandescent/CFL = 37.6 watts (see 9.2.1)
Showerhead = 2.5 gpm
Faucet = 2.2 gpm

Enhanced Efficiencies:
CFL = 13 watts
LED = 10 watts
Advanced power strip (7 plugs) for home entertainment system or home office
Low-flow showerheads = 1.5 gpm (40% reduction)
Low-flow faucet aerators = 1.5 gpm (32% reduction)

Persistence Factor:
For LED lightbulbs: 0.96
For CFL lightbulbs: 0.96
For advanced power strip: 0.80
For showerheads: 0.59
For faucet aearators: 0.51

Peak Demand Coincidence Factor:
For LED lightbulbs: 0.12
For CFL lightbulbs: 0.12
For advanced power strip: 1.00

For showerheads: N/A (no demand savings claimed, too small)
For faucet aerators: N/A (no demand savings claimed, too small)

Measure Lives:
For LED lightbulbs: 15 years
For CFL lightbulbs: 6 years
For advanced power strip: 5 years
For showerheads and faucet aearators: 5 years

Energy Savings Algorithm:
For A19 LED and BR30 LED:
Use TRM value of 22.5 kWh per year (see Section 9.2.2 Light Emitting Diode (LED))

For CFL:
Use TRM value of 17.0 kWh per year (see Section 9.2.1 Compact Fluorescent Lamp (CFL))

For advanced power strip
Using TRM value of 102.8 kWh/year savings for 7-plug power strip (see Section 9.4.3 Smart Strips) and applying persistance factor of 0.80 = 102.8 kWh * 0.80 = 82.2 kWh per year

For water saving measures (low-flow showerheads and faucet aerators), the energy and demand savings calculation depend on a number of factors:

- type of water heating (standard electric-resistance, heat pump, electric tankless, solar)
- number of occupants (1, 2, 3, 4, 5, 6, 7, 8+)
- number of faucets in the home (it was calculated that the average SF/MF home has 2.8 faucets)
- number of showers in the home (It was calculated that the average SF/MF home has 1.8 showerheads)

See separate docuement for detailed energy savings calculations.

For low-flow showerhead:

Water Heater Type	1	2	3	4	5	6	7	8
electric resistance	51.1	68.0	102.0	136.0	170.0	204.0	238.0	272.0
heat pump	17.5	23.3	35.0	46.6	58.3	70.0	81.6	93.3
electric tankless/on-demand	39.4	52.4	78.7	104.9	131.1	157.3	183.5	209.7
solar water heating	6.6	13.1	19.7	26.3	32.9	39.4	46.0	52.6

For faucet aerator:

Water Heater Type	1	2	3	4	5	6	7	8
electric resistance - MF+SF average	11.5	23.0	34.4	45.9	57.4	68.9	80.4	91.8
heat pump - MF+SF average	4.9	9.8	14.6	19.5	24.4	29.3	34.1	39.0
on demand	8.5	16.9	25.4	33.8	42.3	50.7	59.2	67.7
SWH	6.5	13.0	19.5	26.0	32.5	39.0	45.5	52.0

Demand Savings Algorithm
For A19 LED and BR30 LED:
Use TRM value of 0.0032 kW (see Section 9.2.2 Light Emitting Diode (LED))

For CFL:
Use TRM value of 0.0024 kW (see Section 9.2.1 Compact Fluorescent Lamp (CFL))

For advanced power strip
Using TRM value of 102.8 kWh/year savings for 7-plug power strip (see Section 9.4.3 Smart Strips) and operating hours of 8760 hours per year and applying persistence factor = 102.8 kWh * 0.80 ÷ 8760 = 0.0094 kW

For low-flow showerhead:
Peak demand savings is difficult to quantify and almost neglible. Therefore, demand savings= 0.
For faucet aerator:
Peak demand savings is difficult to quantify and almost neglible. Therefore, demand savings= 0.

	Energy Savings (kWh/year)	Demand Savings (kW)
A19 LED	22.5	0.0032
BR30 LED	22.5	0.0032
CFL	17.0	0.0024
Advanced power strip	82.2	0.0094
Low-flow showerhead	See table above	0
Faucet Aerator	See table above	0

11 Custom Energy Solutions for the Home (CESH)

11.1 Target Cost Request for Proposals

11.1.1 Efficiency Project Auction

Version Date & Revision History:
Draft date: October 4, 2011

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- n/a

Measure Description:
Hawaii Energy will issue a call for projects to solicit innovative, cost-effective projects that focus on energy efficiency in high-consumption and hard-to-reach homes. Projects must meet a total dollar per kWh savings target.

Implementation
Eligible projects in this auction will be any new technology, marketing approach or offering not currently served by existing Hawaii Energy programs. This initiative should increase customer satisfaction and participation in the energy efficiency program by allowing the market to be creative in the actions and measures that achieve the targeted cost per kWh energy savings. The projects will use utility metered data and submeters if required, to insure savings performance.

11.2 Residential Design

11.2.1 Solar Water Heating Tune-up

Version Date & Revision History:
Draft date: February 21, 2011

Referenced Documents:

- KEMA "Impact Evaluation Report of the 2001-2003 Demand Side Management Programs" October 2004. Page 2-36 "Inoperable systems are those that use more than an average of 5 kWh per day, and problem systems use between 2-5 kWh per day.

TRM Review Actions:

- none

Major Changes:

- New

Eligibility:

- Systems never received tune-up must be > 3 years old
- Systems that received a tune-up incentive cannot be eligible more than once every 5 years

Measure Description:

- Demonstrate the benefits of tune-ups
- Educate customer of potential savings and system longevity
- Utilize the participating contractors to contact the customers and have them arrange for the service work
- Participating contractors will use the Hawaii Energy Checklist to inspect and record the pre and post conditions
- Participating contractor's invoice must show that checklist requirements have been met and signed by the servicing technician

Baseline Efficiencies:

	Energy (kWh)	Demand (kW)
Baseline	577	0.079

High Efficiency:

	Energy (kWh)	Demand (kW)
High Efficiency	328	0.05

Energy/Demand Savings:

	Energy (kWh)	Demand (kW)
Energy Savings	249	0.029

KEMA 2005-2007 Energy and Peak Demand Impact Evaluation Report

Samples	Group	kWh per Unit	On Peak Demand	Total kWh	On Peak Demand
260	All	577	0.079	150,020	20.5
18	Failed	3,925	0.469	70,644	8.4
242	Operating	328	0.050	79,376	12.1

Measure Life
5 years

Operating Hours
10 hours

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Demand Coincidence Factor

Persistence

Measure Costs and Incentive Levels
Incentive is available once per system per year.

Component Costs and Lifetimes Used in Computing O&M Savings
TBD

Reference Tables
None

11.2.2 Central Air Conditioning Retrofit

Version Date & Revision History:
Draft date: June 20, 2014

Measure Description
This measure involves the early removal of an existing inefficient central air conditioning unit from service, prior to its measure and natural end of life, and replacement with a higher efficient unit.

Baseline Condition
The baseline condition is the existing inefficient central air conditioning unit with an EER of 9.8.

Definition of Efficient Condition
The efficient condition is a new replacement central air conditioning with a higher EER of 13.0.

Annual Energy Savings Algorithm
Savings for remaining life of existing unit:

$$\Delta kWh = (Hours * BtuH * (1/EERexist - 1/EERee))/1{,}000$$

Where:

- Hours = Run hours of AC unit
- Btuh = Capacity of replaced unit
- EERexist = Efficiency of existing unit in Btus per Watt-hour = 9.8
- EERee = Efficiency of new higher efficient = 13.0

Savings Algorithm

Central AC Replacement				
Average Unit Cooling Capacity		12000	BTU/Hr	Equals 1 Ton Cooling Capacity
Energy Efficiency Ratio	÷	9.8	EER	DOE Federal Test Procedure 10CFR 430, Appendix F
Full Load Demand		1224.5	Watts	
Conversion	÷	1000	Watts/kW	
Full Load Demand		1.22	kW	
Conventional Full Load Demand		1.22	kW	
Honolulu Full Load Equivalent Cooling Hours	x	2920	Hours per Year	Based on 8 hr/day, 365 day/year
Conventional AC Annual Energy Consumption		3575.5	kWh per Year	
High Efficiency Central AC		12000	BTU/hr	Equals 1 Ton Cooling Capacity
Energy Efficiency Ratio	÷	13	EER	Minimum Energy Star Rated Window AC
Full Load Demand		923.1	Watts	
Conversion	÷	1000	Watts/kW	
Full Load Demand		0.92	kW	
High Efficiency Demand		0.92	kW	
Cooling Hours	x	2920	Hours per Year	
High Efficiency Energy Usage		2695.4	kWh per Year	
Annual Energy Savings		880.1	kWh per Year (PER TON)	
Coincidence Factor		0.75		
Demand Peak Savings		0.226	kW/TON	

12 Residential Hard to Reach (RHTR)

12.1 Energy Efficiency Equipment Grants

12.1.1 Residential Water Cooler Timer

Measure ID:

Version Date & Revision History:
Draft date:

Referenced Documents:

- LBNL 2007 - http://enduse.lbl.gov/info/LBNL-56380%282007%29.pdf
- EPA2012 - http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=WA#specs

TRM Review Actions:

- Currently Under Review.

Major Changes:

- New measure

Measure Description:
Many homes have water coolers, often equipped with both cold and hot water spigots. Unbeknownst to many, however, is how much energy is used to continuously keep that water hot and cold.

Similar to the timers you might use to control lights in your home, water cooler timers are programmed to turn off during periods when family members are away or sleeping.

Baseline Efficiencies:
No timer

	Energy Usage	
Type of Water Cooler	Cold Only (kWh/day)	Hot/Cold (kWh/day)
ENERGY STAR	0.16	1.20
Conventional	0.29	2.19

Hours per Day	24
Days per year	365

Base Case Usage	Cold Only	Hot/Cold
ENERGY STAR USAGE (kWh/year)	58	438
Conventional (kWh/year)	106	799

High Efficiency:
Timer installed.

Enhanced Case Usage	Cold Only	Hot + Cold
ENERGY STAR (kWh/year)	41	311
Conventional (kWh/year)	75	567

Energy Savings:

Energy Savings	Cold Only	Hot + Cold
ENERGY STAR (kWh/year)	17	127
Conventional (kWh/year)	31	233
Average Savings (kWh/yr)	24	180
Ave Savings Combined (kWh/yr)	102	
Persistence Factor	50%	
Energy Savings (kWh/yr)	**51.0**	

Energy Savings Assumptions:

It is assumed that half of all water coolers are Energy Star and half are not:

- 50% Energy Star
- 50% Conventional

It is assumed that half of all water coolers are cold only and half are hot + cold dispenser:

- 50% Cold Only
- 50% Hot + Cold

The energy savings figure will be based on the average of the above-mentioned percentages.

Operating Hours: Timer Off from 10PM-5AM everyday.

Persistence Factor = 50% (half will not use for intended purpose)

Demand Savings:
No Demand savings since cooler is off from 10PM – 5AM.

Savings Algorithms

Type of Water Cooler	Cold Only (kWh/day)	Hot + Cold (kWh/day)
ENERGY STAR	0.16	1.2
Conventional	0.29	2.19

Hours per day	24	
Days per year	365	

Base Case Usage	Cold Only	Hot + Cold
ENERGY STAR (kWh/year)	58	438
Conventional (kWh/year)	106	799

Weekday OFF (hr/day)	7	(10PM-5AM)
Weekend OFF (hr/day)	7	(10PM-5AM)
Weekday (days/week)	5	
Weekend (days/week)	2	
Weekday (weeks/yr)	52	
Weekend (weeks/yr)	52	

Hours OFF	2548
Hours per year	8760
Hours Off (%)	29%
Hours On (%)	71%

Enhanced Case Usage	Cold Only	Hot + Cold
ENERGY STAR (kWh/year)	41	311
Conventional (kWh/year)	75	567

Energy Savings	Cold Only	Hot + Cold
ENERGY STAR (kWh/year)	17	127
Conventional (kWh/year)	31	233
Average Savings (kWh/yr)	24	180
Ave Savings Combined (kWh/yr)	102	
Persistence Factor	75%	
Energy Savings (kWh/yr)	**76.4**	

Lifetime

8 years

12.1.2 Multifamily Direct-Install Kits

Measure ID:

Version Date & Revision History:
Draft date: July 1, 2015

Referenced Documents:
-

TRM Review Actions:
- 7/1/2015 – Pending review by EM&V

Major Changes:
- New measure

Measure Description:
The Hawaii Energy/Honeywell team went in to multifamily residential buildings and offered free installation of energy efficiency devices, including light bulbs, low flow showerheads and faucet aeartors, and an advanced power strip. The savings claim for each household depends on the type of water heating for each home, as well as the occupancy for each home (this data was collected by the team).

Baseline Efficiencies:
100 W incandescent (replaced with 23 W CFL)
75 W incandescent (replaced with 20 W CFL)
60 W incandescent (replaced with 13 W CFL)
Showerhead = 2.5 gpm
Faucet = 2.2 gpm

Enhanced Efficiencies:
23 W CFL to replace the 100 W incandescent
20 W CFL to replace the 75 W incandescent
13 W CFL to replace the 60 W incandescent
Advanced power strip (7 plugs) for home entertainment system or home office
Low-flow showerheads = 1.5 gpm (40% reduction)
Low-flow faucet aerators = 1.5 gpm (32% reduction)

Persistence Factor:
Given that this measure was directly installed by the Hawaii Energy/Honeywell team, persistence factors are:
For CFL lightbulbs: 0.96
For advanced power strip: 0.96
For showerheads and faucet aearators: 1.00

Peak Demand Coincidence Factor:
For CFL lightbulbs: 0.12
For advanced power strip: 1.00
For showerheads and faucet aearators: 0.2

Measure Lives:
For CFL lightbulbs: 6 years
For advanced power strip: 5 years
For showerheads and faucet aearators: 5 years

Energy Savings Algorithm:

For advanced power strip: See 9.4.3, Smart Strips

- Savings = 102.8 kWh per year * 0.96 pf = 98.7 kWh per year, first-year
- Given that this device was a 7-plug strip, the 7-plug strip value was used, rather than the TRM assumption of an average 6-plug unit.

For light bulbs:

- For each bulb replaced, the reduced wattage was calculated. Run time was assumed to be 2.3 hours per day per bulb, 365 days per year. Persistence factor is 0.96 and measure life = 6 years.
- 100 W replacement = 23 W CFL = 62.1 kWh per year savings
- 75 W replacement = 20 W CFL = 44.3 kWh per year savings
- 60 W replacement = 13 W CFL = 37.9 kWh per year savings

For low-flow showerheads:

- Given standard electric resistance water heating: PY14 TRM value of 306 kWh for an average family size of 3.77 people. This value was normalized on a per person basis of 81.2 kWh. Then the value was multiplied by the actualy occupancy of the household. These values were assumed to be the same regardless of individual electric resistance water heating in the residential unit or system level electric resistance water heating in the building. Also, these values were assumed to be the same regardless of individually metered electrical billing at the apartment or master-metered electrical billing at the building.

Water Heater Type	1	2	3	4	5	6	7	8
Indiv Meter - Indiv WH - Elect	81.2	162.3	243.5	324.7	405.8	487.0	568.2	649.3
Indiv Meter - Sys WH - Elect	81.2	162.3	243.5	324.7	405.8	487.0	568.2	649.3
Master Meter - Indiv WH - Elect	81.2	162.3	243.5	324.7	405.8	487.0	568.2	649.3
Master Meter - Sys WH - Elect	81.2	162.3	243.5	324.7	405.8	487.0	568.2	649.3

- Given heat pump water heating: Starting with the PY14 TRM value of 2460 kWh per year required for heating all water for an average family size of 3.77 people, this value was divided by an average COP of 2.26 for heat pump water heaters, for 1088 kWh per year. Then the value was plussed up given 6% tank and pipe losses, for 1157 kWh per year. Given the assumption that showers account for 28% of all hot water use, heat pump water heating consumption for an average family is 324 kWh per year. By reducing shower water consumption by 40% with the low-flow showerhead, heat pump water heading consumption is reduced to 195 kWh per year per family, for a savings of 130 kWh per year per family. Per person energy savings is 34.5 kWh per person per year. Finally, the value was multiplied by the actualy occupancy of the household. Savings is assumed to be the same regardless of individual heat pump, central heat pump, individually metered billing, or master-metered billing.

Water Heater Type	1	2	3	4	5	6	7	8
Indiv Meter - Indiv WH - HP	34.5	69.0	103.5	137.9	172.4	206.9	241.4	275.9
Indiv Meter - Sys WH - Cent HP	34.5	69.0	103.5	137.9	172.4	206.9	241.4	275.9
Master Meter - Indiv WH - HP	34.5	69.0	103.5	137.9	172.4	206.9	241.4	275.9
Master Meter - Sys WH - HP	34.5	69.0	103.5	137.9	172.4	206.9	241.4	275.9

- Given on-demand electric water heating: Starting with the PY14 TRM value of 2460 kWh per year required for heating all water for an average family size of 3.77 people, this value was divided by an average efficiency of 0.98 for on-demand/instantaneous water heaters, for 2510 kWh per year. Then the value was plussed up given 2% tank and pipe losses, for 2561 kWh per year. Given the assumption that showers account for 28% of all hot water use, heat pump water heating consumption for an average family is 717 kWh per year. By reducing shower water consumption by 40% with the low-flow showerhead, on-demand water heading consumption is reduced to 430 kWh per year per family, for a savings of 287 kWh per year per family. Per person energy savings is 76.1 kWh per person per year. Finally, the value was multiplied by the actualy occupancy of the household. Savings is assumed to be the same regardless of individually metered billing or master-metered billing. There are no central on-demand water heating systems, only individual systems.

Water Heater Type	1	2	3	4	5	6	7	8
Indiv Meter - Indiv WH - OD	76.1	152.2	228.3	304.4	380.5	456.6	532.7	608.8
Master Meter - Indiv WH - OD	76.1	152.2	228.3	304.4	380.5	456.6	532.7	608.8

- Given boiler water heating: Savings were assumed to be the same for boiler water heating as for standard electric resistance water heating because gas-fired boilers were not in the scope of this measure. An electric-fired boiler is essentially the same as a standard electric resistance water heater. Savings are assumed to be the same regardless of individually metered billing or master-metered billing. There are no individual boiler water heaters in apartments, only central boilers.

Water Heater Type	1	2	3	4	5	6	7	8
Indiv Meter - Sys WH - Boiler	81.2	162.3	243.5	324.7	405.8	487.0	568.2	649.3
Master Meter - Sys WH - Boiler	81.2	162.3	243.5	324.7	405.8	487.0	568.2	649.3

For faucet aerators:

- Given standard electric-resistance water heating: PY14 TRM value for savings per year for an average family size of 3.77 people for faucet aerators is 65 kWh (assuming 90% efficiency). This value was normalized on a per person basis of 17.2 kWh. Then the value was multiplied by the actualy occupancy of the household. These values were assumed to be the same regardless of individual electric resistance water heating in the residential unit or system level electric resistance water heating in the building. Also, these values were assumed to be the same regardless of individually metered electrical billing at the apartment or master-metered electrical billing at the building.

Water Heater Type	1	2	3	4	5	6	7	8
Indiv Meter - Indiv WH - Elect	17.2	34.5	51.7	69.0	86.2	103.4	120.7	137.9
Indiv Meter - Sys WH - Elect	17.2	34.5	51.7	69.0	86.2	103.4	120.7	137.9
Master Meter - Indiv WH - Elect	17.2	34.5	51.7	69.0	86.2	103.4	120.7	137.9
Master Meter - Sys WH - Elect	17.2	34.5	51.7	69.0	86.2	103.4	120.7	137.9

- Given heat pump water heating: Starting with the PY14 TRM value of 58.44 kWh savings per year for a family of 3.77 for faucet aerators (assuming 100% efficiency), this value was divided by an average COP of 2.26 for heat pump water heaters, for 25.9 kWh per year. Then the value was plussed up given 6% tank and pipe losses, for 27.6 kWh per year per family, or 7.3 kWh per year per person. Finally, the value was multiplied by the actualy occupancy of the household. Savings is assumed to be the same regardless of individual heat pump, central heat pump, individually metered billing, or master-metered billing.

Water Heater Type	1	2	3	4	5	6	7	8
Indiv Meter - Indiv WH - HP	7.3	14.6	21.9	29.3	36.6	43.9	51.2	58.5
Indiv Meter - Sys WH - Cent HP	7.3	14.6	21.9	29.3	36.6	43.9	51.2	58.5
Master Meter - Indiv WH - HP	7.3	14.6	21.9	29.3	36.6	43.9	51.2	58.5
Master Meter - Sys WH - HP	7.3	14.6	21.9	29.3	36.6	43.9	51.2	58.5

- Given on-demand electric water heating: Starting with the PY14 TRM value of 58.44 kWh savings per year for a family of 3.77 for faucet aerators (assuming 100% efficiency), this value was divided by an average efficiency of 98% for on-demand/instantaneous water heaters, for 59.6 kWh per year. Then the value was plussed up given 2% tank and pipe losses, for 60.8 kWh per year per family, or 16.1 kWh per year per person. Finally, the value was multiplied by the actualy occupancy of the household. Savings is assumed to be the same regardless of individually metered billing, or master-metered billing. There is only individual on-demand water heating, no central systems.

Water Heater Type	1	2	3	4	5	6	7	8
Indiv Meter - Indiv WH - OD	16.1	32.3	48.4	64.6	80.7	96.8	113.0	129.1
Master Meter - Indiv WH - OD	16.1	32.3	48.4	64.6	80.7	96.8	113.0	129.1

- Given boiler water heating: Savings were assumed to be the same for boiler water heating as for standard electric resistance water heating because gas-fired boilers were not in the scope of this measure. An electric-fired boiler is essentially the same as a standard electric resistance water heater. Savings are assumed to be the same regardless of individually metered billing or master-metered billing. There are no individual boiler water heaters in apartments, only central boilers.

Water Heater Type	1	2	3	4	5	6	7	8
Indiv Meter - Sys WH - Boiler	17.2	34.5	51.7	69.0	86.2	103.4	120.7	137.9
Master Meter - Sys WH - Boiler	17.2	34.5	51.7	69.0	86.2	103.4	120.7	137.9

Demand Savings Algorithm
For lightbulbs:

- Peak coincidence demand factor is 0.12.
- 100 W replacement = 77 watt reduction * 0.96 pf * 0.12 cf = 0.0089 kW
- 75 W replacement = 55 watt reduction * 0.96 pf * 0.12 cf = 0.0063 kW
- 60 W replacement = 47 watt reduction * 0.96 pf * 0.12 cf = 0.0054 kW

For advanced power strip:

- 98.7 kWh savings per year/8760 hours per year = 0.0113 kW peak demand reduction

For low-flow showerheads:

- Electric-resistance = PY14 TRM value = 0.1144 kW (see PY14 TRM Section **Error! Reference source not found.**)
- Heat pump = 0.1008 kW
- On-demand = assumed the same as electric-resistance (conservative value)

For faucet aerators:

- Electric-resistance = TRM value = 0.017 kW (see PY14 TRM Section **Error! Reference source not found.**)
- Heat pump = TRM value = 0.0936 kW
- On-demand = assumed the same as electric-resistance (conservative value)

13 Business Energy Efficiency Measures (BEEM)

13.1 High Efficiency Lighting

13.1.1 T12 to T8 with Electronic Ballast

Version Date & Revision History:
Draft date: February 24, 2011
Revision date: May 16, 2016

Referenced Documents:
- Energy and Peak Demand Impact Evaluation Report of the 2005-2007
- Demand Management Programs – KEMA (KEMA 2005-07).
- Econorthwest TRM Review – 6/23/10
- DEER - The Database for Energy Efficient Resources
- The California Energy Commission California Commercial End Use Summary http://www.energy.ca.gov/ceus/
- Evergreen TRM Review – 2/23/12

TRM Review Actions:
- 6/23/10 Rec. #18 – Break down T8 savings by lamp length – Adopted
- 10/5/11 – Currently Under Review.

Major Changes:
- Wholesale replacement of prior TRM using DEER operational data and CEUS Commercial Data
- Added interactive effect factors for energy and demand Table 3.
- 5-19-2016 – Added measure life

Description: This measure involves the replacement of an existing T12 lamp with a new high efficiency T8 lamp, and savings are calculated assuming standard T12 lamps and magnetic ballasts. The average watt savings per lamp for replacing 2', 3', 4', and 8' lamps is calculated by weighting the average toward those replacements that most likely to occur; largely 4' 2 lamp and 4' 4 lamp fixtures. Based on the assumed fixture distribution, the average savings per lamp is 18.6W.

Base Efficiency
The base case efficiency is either an existing T12 lamp with magnetic ballast.

High Efficiency
The high efficiency case is a T8 lamp with electronic ballast.

Measure Life:
14 years

Demand Savings: Using the CEUS coincidence factors the demand savings are (see Section 3 Interactive Effects):

	Demand Savings (kW)			
Building Type	**2' Lamp**	**3' Lamp**	**4' Lamp**	**8' Lamp**
Misc. Commercial	0.0020	0.0040	0.0060	0.0120
Cold Storage	0.0040	0.0070	0.0100	0.0200
Education	0.0020	0.0030	0.0040	0.0080
Grocery	0.0070	0.0110	0.0160	0.0340
Health	0.0050	0.0080	0.0130	0.0260
Hotel/Motel	0.0050	0.0080	0.0120	0.0240
Industrial	0.0040	0.0070	0.0100	0.0200
Office	0.0040	0.0070	0.0100	0.0200
Restaurant	0.0060	0.0100	0.0140	0.0300
Retail	0.0050	0.0080	0.0120	0.0240
Warehouse	0.0040	0.0060	0.0090	0.0180

Energy Savings: Using the DEER operational hours the energy savings are (see Section 3 Interactive Effects):

	Energy Savings (kWh/year)			
Building Type	**2' Lamp**	**3' Lamp**	**4' Lamp**	**8' Lamp**
Misc. Commercial	35.9	56.4	83.2	170.8
Cold Storage	34.5	54.3	80.0	164.3
Education	22.0	34.6	51.0	104.8
Grocery	48.3	76.0	112.0	230
Health	53.7	84.5	124.5	255.7
Hotel/Motel	41.0	64.5	95.0	195.2
Industrial	35.6	56.0	82.5	169.5
Office	23.3	36.6	54.0	110.9
Restaurant	43.8	68.9	101.5	208.5
Retail	34.9	54.9	81.0	166.3
Warehouse	34.5	54.3	80.0	164.3

13.1.2 T12 to T8 Low Wattage

Version Date & Revision History:
Draft date: February 24, 2011
Revision date: May 19, 2016

Referenced Documents:
- Energy and Peak Demand Impact Evaluation Report of the 2005-2007
- Demand Management Programs – (KEMA 2005-07).
- Econorthwest TRM Review – 6/23/10
- DEER-The Database for Energy Efficient Resources
- The California Energy Commission California Commercial End Use Summary http://www.energy.ca.gov/ceus/
- Evergreen TRM Review – 2/23/12

TRM Review Actions:
- 6/23/10 Rec. #no number– Adjust with DEER/CEUS usage characteristics – Adopted
- 10/5/11 – Currently Under Review.

Major Changes:
- Adjustment of hours and coincidence factors of prior TRM using DEER operational data and CEUS Commercial Data
- Added interactive effect factors for energy and demand Table 3.
- 5/19/2016 – Added measure life

Description:
This measure involves the replacement of 4' standard T12 with low wattage T8 fixtures and electronic ballasts.

Base Efficiency
The baseline fixtures are assumed to be standard magnetic ballasts with T12 lamps.

High Efficiency
The high efficiency case is super T8 low wattage lamps with high performance electronic ballasts.

Energy and Demand Savings:
The savings for this measure were calculated assuming an even distribution of 1, 2, 3, and 4 lamp fixtures.

Measure Life:
14 years

Energy and Demand Savings and Incentive Levels: Using the DEER operational hours (Energy) and the CEUS coincidence factors (Demand) the savings are the following (see Section 3 Interactive Effects):

Building Type	Demand Savings (kW)	Energy Savings (kWh/year)
Misc. Commercial	0.005	78.1
Cold Storage	0.009	75.1
Education	0.004	47.9
Grocery	0.015	105.1
Health	0.012	116.9
Hotel/Motel	0.011	89.2
Industrial	0.009	77.4
Office	0.009	50.7
Restaurant	0.014	95.3
Retail	0.011	76.0
Warehouse	0.008	75.1

13.1.3 T8 to T8 Low Wattage

Version Date & Revision History:
Draft date: February 24, 2011
Revision date: May 19, 2016

Referenced Documents:
- Energy and Peak Demand Impact Evaluation Report of the 2005-2007
- Demand Management Programs – (KEMA 2005-07).
- Econorthwest TRM Review – 6/23/10
- DEER-The Database for Energy Efficient Resources
- The California Energy Commission California Commercial End Use Summary http://www.energy.ca.gov/ceus/
- Evergreen TRM Review – 2/23/12

TRM Review Actions:
- 6/23/10 Rec. #no number– Adjust with DEER/CEUS usage characteristics – Adopted
- 10/5/11 – Currently Under Review.
- 11/14/13 – Remove all forms of T12 lamps from the energy savings calculations in time for PY16.

Major Changes:
- Adjustment of hours and coincidence factors of prior TRM using DEER operational data and CEUS Commercial Data
- Added interactive effect factors for energy and demand Table 3.
- 5/19/2016 – Added measure life.

Description:
This measure involves the replacement of 4' standard T8 with low wattage T8 fixtures and electronic ballasts.

Base Efficiency
The baseline T8 fixtures are assumed to be standard T8 (32W) lamps with standard magnetic ballasts.

High Efficiency
The high efficiency case is super T8 low wattage (25W/28W) lamps with high performance electronic ballasts.

Energy and Demand Savings:
The Base Watts and New Watts values are taken from Appendix B of the KEMA Report Table B-2. Appendix G of the KEMA report gives the same value for all Building Types. The following table shows the savings for low wattage T8 lamps and ballast compared to standard T8 lamps.

Measure Life:
14 years

Energy and Demand Savings and Incentive Levels: Using the DEER operational hours (Energy) and the CEUS coincidence factors (Demand) the savings are the following (see Section 3 Interactive Effects):

Building Type	Demand Savings (kW)	Energy Savings (kWh/yr)
Misc. Commercial	0.005	21.6
Cold Storage	0.009	37.4
Education	0.004	10.6
Grocery	0.015	87.4
Health	0.012	77.7
Hotel/Motel	0.011	54.4
Industrial	0.009	38.6
Office	0.009	25.3
Restaurant	0.014	73.9
Retail	0.011	46.3
Warehouse	0.008	33.3

13.1.4 Delamping

Version Date & Revision History:
Draft date: February 24, 2011
Revision date: May 19, 2016

Referenced Documents:

- Energy and Peak Demand Impact Evaluation Report of the 2005-2007
- Demand Management Programs – KEMA (KEMA 2005-07).
- Econorthwest TRM Review – 6/23/10
- DEER-The Database for Energy Efficient Resources
- The California Energy Commission California Commercial End Use Summary http://www.energy.ca.gov/ceus/
- Evergreen TRM Review – 2/23/12

TRM Review Actions:

- 6/23/10 Rec. #20 – Break down the savings by lamp size**.** – Adopted
- 10/5/11 – Currently Under Review.

Major Changes:

- Adjustment of hours and coincidence factors of prior TRM using DEER operational data and CEUS Commercial Data
- Added interactive effect factors for energy and demand Table 3.
- 5/19/2016 – Added measure life

Description: The ballasts are re-wired for de-lamping.

Base Efficiency
The base case is no delamping

High Efficiency
The savings for this measure are determined by calculating the average watt reduction by removing either a 32 W T8, or a standard 40 W or reduced wattage 34 W T12 lamp from a standard ballast fixture, magnetic energy saving ballast fixture, or electric ballast fixture. This measure covers 2', 4' and 8' fixtures.

Incremental Cost
$7.50 per lamp

Measure Life:
14 years

Energy and Demand Savings – see Section 3 Interactive Effects**.**

	Delamping Avg. Wattage Reduction			
	2' Lamp	3' Lamp	4' Lamp	8' Lamp
Average	18.5	27.5	34.5	77.0

	Demand Savings (kW)			
Building Type	2' Lamp	3' Lamp	4' Lamp	8' Lamp
Misc. Commercial	0.0060	0.0080	0.0100	0.0230
Cold Storage	0.0090	0.0140	0.0170	0.0390
Education	0.0040	0.0060	0.0070	0.0150
Grocery	0.0160	0.0230	0.0290	0.0650
Health	0.0120	0.0180	0.0220	0.0500
Hotel/Motel	0.0110	0.0170	0.0210	0.0460
Industrial	0.0090	0.0140	0.0170	0.0390
Office	0.0090	0.0140	0.0170	0.0390
Restaurant	0.0140	0.0210	0.0260	0.0580
Retail	0.0110	0.0170	0.0210	0.0460
Warehouse	0.0080	0.0120	0.0160	0.0350

	Energy Savings (kWh/year)			
Building Type	2' Lamp	3' Lamp	4' Lamp	8' Lamp
Misc. Commercial	80.0	118.9	149.2	333
Cold Storage	77.0	114.4	143.5	320.3
Education	49.1	73.0	91.5	204.3
Grocery	107.7	160.2	200.9	448.4
Health	119.8	178.0	223.4	498.5
Hotel/Motel	91.4	135.9	170.5	380.5
Industrial	79.4	118.0	148.0	330.3
Office	51.9	77.2	96.9	216.2
Restaurant	97.6	145.1	182.1	406.4
Retail	77.9	115.8	145.2	324.2
Warehouse	77.0	114.4	143.5	320.3

13.1.5 Delamping with Reflectors

Version Date & Revision History:
Draft date: February 24, 2011
Revision date: May 19, 2016

Referenced Documents:
- New Buildings Institute, Advanced Lighting Guidelines, 2003
- Energy and Peak Demand Impact Evaluation Report of the 2005-2007
- Demand Management Programs – KEMA (KEMA 2005-07).
- Econorthwest TRM Review – 6/23/10
- DEER-The Database for Energy Efficient Resources
- The California Energy Commission California Commercial End Use Summary http://www.energy.ca.gov/ceus/
- Evergreen TRM Review – 2/23/12

TRM Review Actions:
- 6/23/10 Rec. #20 – Break down the savings by lamp size***.*** – Adopted
- 10/5/11 – Currently Under Review.

Major Changes:
- Adjustment of hours and coincidence factors of prior TRM using DEER operational data and CEUS Commercial Data
- Added interactive effect factors for energy and demand Table 3.
- 5/19/2016 – Added measure life

Description: Putting reflectors on the ballasts allows for more light, with less lamps. The ballasts are re-wired for de-lamping.

Base Case

The base efficiency case is no delamping with reflectors.

High Efficiency

The savings for this measure are determined by calculating the average watt reduction by removing either a 32 W T8, or a standard 40 W or reduced wattage 34 W T12 lamp from a standard ballast fixture, magnetic energy saving ballast fixture, or electric ballast fixture.

Measure Life:
14 years

Energy and Demand Savings:
The wattage per lamp varies greatly depending on the size of the lamp. See Section 3 Interactive Effects.

	Demand Savings (kW)			
Building Type	**2' Lamp**	**3' Lamp**	**4' Lamp**	**8' Lamp**
All Commercial	0.0090	0.0140	0.0170	0.0390
Misc. Commercial	0.0060	0.0080	0.0100	0.0230
Cold Storage	0.0090	0.0140	0.0170	0.0390
Education	0.0040	0.0060	0.0070	0.0150
Grocery	0.0160	0.0230	0.0290	0.0650
Health	0.0120	0.0180	0.0220	0.0500
Hotel/Motel	0.0110	0.0170	0.0210	0.0460
Misc. Industrial	0.0090	0.0140	0.0170	0.0390
Office	0.0090	0.0140	0.0170	0.0390
Restaurant	0.0140	0.0210	0.0260	0.0580
Retail	0.0110	0.0170	0.0210	0.0460
Warehouse	0.0080	0.0120	0.0160	0.0350

	Energy Savings (kWh/year)			
Building Type	**2' Lamp**	**3' Lamp**	**4' Lamp**	**8' Lamp**
All Commercial	80.0	118.9	149.2	333
Misc. Commercial	80.0	118.9	149.2	333
Cold Storage	77.0	114.4	143.5	320.3
Education	49.1	73.0	91.5	204.3
Grocery	107.7	160.2	200.9	448.4
Health	119.8	178.0	223.4	498.5
Hotel/Motel	91.4	135.9	170.5	380.5
Misc. Industrial	79.4	118.0	148.0	330.3
Office	51.9	77.2	96.9	216.2
Restaurant	97.6	145.1	182.1	406.4
Retail	77.9	115.8	145.2	324.2
Warehouse	77.0	114.4	143.5	320.3

13.1.6 LED Refrigerated Case Lighting

Version Date & Revision History:
Draft date: October 3, 2011
Revision date: May 19, 2016

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- 8/13/12 – Measure updated as per EM&V report. The kWh calculations were updated to use new COP and hours per year numbers, and kW numbers were updated respectively.
- 11/14/13 – Correct the calculation of the refrigeration interactive effect to divide by the COP instead of multiply.
- 5/19/2016 – Added measure life.

Measure Description:
This measure involves the replacement of a 40W T8 fluorescent lamp with a 23W LED linear lamp fixtures.

Baseline Efficiencies:
40W F40 T8 Linear Fluorescent Lamp

High Efficiency:
23W LED Linear Lamp

Energy Savings:
199.7 kWh

Demand Savings:
0.032 kW

Measure Life:
15 years

Savings Algorithms

LED Refrigerated Case Lighting Retrofit					
40W F40 T12 Linear Fluorescent Fixture Demand		40 W	40%		
Base Demand		0.040	kW		
		17	Hours per Day		
	x	365	Days	6,205	Hours per Year
4 foot Linear Fluorescent Lamp Blended Energy Usage		248.2	kWh per Year		
23 W LED Linear Fixture Demand		0.0230	kW		
		17	Hours per Day		
	x	365	Days	6,205	Hours per Year
Energy Usage		142.7	kWh per Year		
4 foot Linear Fluorescent Lamp Blended Energy Usage		248.2	kWh per Year		
Energy Usage	-	142.7	kWh per Year		
LED Savings Before Adjustments		105.5	kWh per Year		
Lighting Wattage Reduction		105.5	kWh per Year		
% of Lighting Savings reduced from Compressor Load	x	100%			
Cooling Energy Reduced from System		105	kWh per Year		
Lighting Contribution to Cooling Energy Reduced from System		105.5	kWh per Year		
Refrigerator Compressor Efficency	÷	1.12	COP		
Compressor Energy Reduced		94.2	kWh per Year		
LED Savings Before Adjustments		105.5	kWh per Year		
Compressor Energy Reduced	+	94.2	kWh per Year		
		199.7	kWh per Year		
		199.7	kWh per Year		
Persistance Factor	x	1.000	pf	0.0%	Lamps not installed or replaced back
Fixture Savings per Year		199.7	kWh per Year		
LED Case Lighting Energy Savings		**199.7**	**kWh / Year Savings**		
Annual Energy Savings		199.7			
Hours of Operation	÷	6205			
Total kW savings		**0.032**	**Demand Savings (kW)**		

13.1.7 LED Street and Exterior Lighting

Version Date & Revision History:
- Draft date: July 1, 2015

Referenced Documents:
- PG&E Work Paper PGECOLTG151 (8/29/12)

TRM Review Actions:
- 8/1/14 – Currently Under Review.

Major Changes:
- New Measure

Measure Description:
Replacement of exterior HID fixtures with LED luminaires in outdoor street and exterior area applications.

Light emitting diode (LED) technology has proven to be an effective lighting source that can offer substantial savings over typical high intensity discharge (HID) lighting technologies.

The light is easily controllable and can be turned on and off instantly or dimmed for added energy savings at dawn and dusk.

LED streetlights are available from a variety of vendors and offer many advantages over traditional streetlight technologies.

- No mercury or other hazardous chemical and gasses in the LEDs
- Long lifetimes and highly reliable service, greatly reducing maintenance costs
- White light available in color temperatures from "warm" to "cool" with high CRI providing high-quality white light.

Baseline & High Efficiency:

Measure Name	Building Type	Base Case Wattage (W)	Measure Case Wattage (W)	Delta Watts (kW)	Annual Operating Hours	Energy Savings (kWh/yr)	Demand Reduction (kW)	Unit Definition	EUL	Base Case Cost ($/unit)	Measure Cost ($/unit)	Incremental Measure Cost (IMC)
LED Street/Exterior Lighting - Replace up to a 70 W Lamp with LED	ANY	85	50	0.035	4100	144	0.0350	Fixture	12	$217	$700	$483
LED Street/Exterior Lighting - Replace 71 to 100 W Lamp with LED	ANY	120	70	0.050	4100	205	0.0500	Fixture	12	$251	$800	$549
LED Street/Exterior Lighting - Replace 101 to 150 W Lamp with LED	ANY	176	110	0.066	4100	271	0.0660	Fixture	12	$296	$995	$699
LED Street/Exterior Lighting - Replace 151 to 200 W Lamp with LED	ANY	234	150	0.084	4100	344	0.0840	Fixture	12	$495	$1,200	$705
LED Street/Exterior Lighting - Replace 201 to 250 W Lamp with LED	ANY	293	192	0.101	4100	414	0.1010	Fixture	12	$535	$1,400	$865
LED Street/Exterior Lighting - Replace 251 to 310 W Lamp with LED	ANY	363	225	0.138	4100	566	0.1380	Fixture	12	$535	$1,600	$1,065
LED Street/Exterior Lighting - Replace 311 to 400 W Lamp with LED	ANY	468	265	0.203	4100	832	0.2030	Fixture	12	$555	$1,750	$1,195
Average Energy and Demand Savings						**397**	**0.097**					
Coincidence Factor (CF)	0.75											
Average Delta kW	0.097											
Peak Demand Savings	**0.073**											

Energy Savings:
Energy savings is based on the average kW reduction multiplied by hours of operation. Hours of operation is based on 4100 hours/year. **Average energy savings = 397 kWh/year**

Demand Savings:
Demand savings is based on the average kW reduction = 0.097 kW

- Coincidence Factor = 0.75

- Coincidence factor is based on lights being on during 6PM-9PM which is 3 out of the 4 peak demand hour period.

Peak Demand Savings = CF x 0.097 = 0.073 kW

Program Restrictions and Guidelines

To qualify for an incentive, the following requirements must be met:

- The LEDs must replace high intensity discharge, low pressure sodium, or incandescent lighting.
- Proposed fixture must be ENERGY STAR, Design Lights Consortium (DLC) listed or Lighting Facts.
- The pole/arm-mounted area and roadway luminaires must meet a minimum efficacy of 60 lumens per watt.
- Luminaire/enclosure type must be certified by NEMA/IEC as wet location for exterior parking, roadway, area, or wall-mounted luminaires and damp (or wet) location for parking garage luminaires.
- Not to exceed the power supply manufacturer's maximum recommended case temperature or TMP when measured during in-situ operation. Note: This performance characteristic is separate and distinct from thermal requirements established by UL, which governs safety rather than longevity of the power supply.
- Luminaires must possess a power factor greater than 0.9.
- The LEDs must possess less than 20% of total harmonic distortion.
- A written warranty must be issued to the customer guaranteeing repair or replacement of defective electrical parts (including light source and power supplies) for a minimum of three (3) years from the date of purchase.
- A product cut sheet and installation instructions must be provided.

Measure Life = 12 years (source: PG&E white paper).

Hours of Operation = 4100 hours/year (based on HECO Schedule F).

Incentives:

LED Street/Exterior Area Lighting

Existing Fixture Wattage	Incentive
Replace 311–400 watt lamp with LED	$115/fixture
Replace 251–310 watt lamp with LED	$90/fixture
Replace 201–250 watt lamp with LED	$70/fixture
Replace 151–200 watt lamp with LED	$60/fixture
Replace 101–150 watt lamp with LED	$50/fixture
Replace 71–100 watt lamp with LED	$40/fixture
Replace up to 70 watt lamp with LED	$30/fixture

13.1.8 LED

Version Date & Revision History:
Draft date: November 30, 2011

Referenced Documents:
- The Database for Energy Efficient Resources (DEER)
- California Commercial End Use Summary (CEUS)
- Evergreen TRM Review – 2/23/12
- Evergreen TRM Review – 1/15/14

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- 11/30/11 – Moved *LED Product Customized Process* measure to addendum (section 16.2.1) and created new prescriptive *LED* measure.
- Added interactive effect factors for energy and demand Table 3.

Measure Description: Light Emitting Diodes (LED) are a lighting technology that utilizes solid-state technology to produce light, opposed to fluorescent or incandescent lighting sources. In general, LED technology will provide energy levels 15% of a comparable incandescent lamp (15W to a 100W equivalent).

Baseline & High Efficiency:

25% *Dimmable Demand Reduction*

Lamp	Base Case Incandescent Demand (kW)	Percent Incandescent Base	Base Case CFL Demand (kW)	Percent CFL Base	Base Mix Demand (kW)	Enhanced Case LED Demand (kW)	*LED* Demand Savings (kW)	*Dimmable LED* Demand Savings (kW)
MR16	0.0500	100%	n/a	0%	0.0500	0.0065	0.0435	0.0326
PAR20 8 deg.	0.0600	80%	0.0150	20%	0.0510	0.0086	0.0424	0.0318
PAR20 25 deg.	0.0550	80%	0.0130	20%	0.0466	0.0090	0.0376	0.0282
PAR30 Short Neck	0.0750	80%	0.0200	20%	0.0640	0.0163	0.0477	0.0358
PAR30 Long Neck	0.0750	80%	0.0200	20%	0.0640	0.0163	0.0477	0.0358
PAR38 25 deg.	0.0750	80%	0.0200	20%	0.0640	0.0203	0.0437	0.0328
A-19	0.0600	20%	0.0150	80%	0.0240	0.0078	0.0162	0.0122

Energy Savings by Building/Usage Type (see Section 3 Interactive Effects):

			Dimmable Commercial Lighting											
			MR16		PAR20 8 deg.		PAR20 25 deg.		PAR30 Short Neck/Long Neck		PAR38 25 deg.		A-19	
Building Type	Hours of Operation[1]	Peak Coincidence Factor[2]	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)
Misc. Commercial	4,325	0.30	188.1	0.0131	183.4	0.0127	162.6	0.0113	206.3	0.0143	189.0	0.0131	70.1	0.0049
Cold Storage	4,160	0.50	181.0	0.0218	176.4	0.0212	156.4	0.0188	198.4	0.0239	181.8	0.0219	67.4	0.0081
Education	2,653	0.20	115.4	0.0087	112.5	0.0085	99.8	0.0075	126.5	0.0095	115.9	0.0087	43.0	0.0032
Grocery	5,824	0.85	253.3	0.0370	246.9	0.0360	219.0	0.0320	277.8	0.0405	254.5	0.0371	94.3	0.0138
Health	6,474	0.65	281.6	0.0283	274.5	0.0276	243.4	0.0244	308.8	0.0310	282.9	0.0284	104.9	0.0105
Hotel/Motel	4,941	0.60	214.9	0.0261	209.5	0.0254	185.8	0.0226	235.7	0.0286	215.9	0.0262	80.0	0.0097
Industrial	4,290	0.50	186.6	0.0218	181.9	0.0212	161.3	0.0188	204.6	0.0239	187.5	0.0219	69.5	0.0081
Office	2,808	0.50	122.1	0.0218	119.1	0.0212	105.6	0.0188	133.9	0.0239	122.7	0.0219	45.5	0.0081
Restaurant	5,278	0.75	229.6	0.0326	223.8	0.0318	198.5	0.0282	251.8	0.0358	230.6	0.0328	85.5	0.0122
Retail	4,210	0.60	183.1	0.0261	178.5	0.0254	158.3	0.0226	200.8	0.0286	184.0	0.0262	68.2	0.0097
Warehouse	4,160	0.45	181.0	0.0196	176.4	0.0191	156.4	0.0169	198.4	0.0215	181.8	0.0197	67.4	0.0073

[1] The Database for Energy Efficient Resources (DEER)
[2] California Commercial End Use Summary (CEUS)

			Non-Dimmable Commercial Lighting											
			MR16		PAR20 8 deg.		PAR20 25 deg.		PAR30 Short Neck/Long Neck		PAR38 25 deg.		A-19	
Building Type	Hours of Operation[1]	Peak Coincidence Factor[2]	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)	Energy Savings (kWh/year)	Demand Savings (kW)
All Commercial	4,325	0.50	141.1	0.0163	137.5	0.0159	122.0	0.0141	154.7	0.0179	141.8	0.0164	52.5	0.0061
Misc. Commercial	4,325	0.30	141.1	0.0098	137.5	0.0095	122.0	0.0085	154.7	0.0107	141.8	0.0098	52.5	0.0036
Cold Storage	4,160	0.50	135.7	0.0163	132.3	0.0159	117.3	0.0141	148.8	0.0179	136.3	0.0164	50.5	0.0061
Education	2,653	0.20	86.6	0.0065	84.4	0.0064	74.8	0.0056	94.9	0.0072	87.0	0.0066	32.2	0.0024
Grocery	5,824	0.85	190.0	0.0277	185.2	0.0270	164.2	0.0240	208.4	0.0304	190.9	0.0279	70.8	0.0103
Health	6,474	0.65	211.2	0.0212	205.9	0.0207	182.6	0.0183	231.6	0.0233	212.2	0.0213	78.7	0.0079
Hotel/Motel	4,941	0.60	161.2	0.0196	157.1	0.0191	139.3	0.0169	176.8	0.0215	161.9	0.0197	60.0	0.0073
Misc. Industrial	4,290	0.50	140.0	0.0163	136.4	0.0159	121.0	0.0141	153.5	0.0179	140.6	0.0164	52.1	0.0061
Office	2,808	0.50	91.6	0.0163	89.3	0.0159	79.2	0.0141	100.5	0.0179	92.0	0.0164	34.1	0.0061
Restaurant	5,278	0.75	172.2	0.0245	167.8	0.0239	148.8	0.0212	188.8	0.0268	173.0	0.0246	64.1	0.0091
Retail	4,210	0.60	137.4	0.0196	133.9	0.0191	118.7	0.0169	150.6	0.0215	138.0	0.0197	51.2	0.0073
Warehouse	4,160	0.45	135.7	0.0147	132.3	0.0143	117.3	0.0127	148.8	0.0161	136.3	0.0147	50.5	0.0055

[1] The Database for Energy Efficient Resources (DEER)

[2] California Commercial End Use Summary (CEUS)

Equipment Qualifications: Incentivized LED lamps must be Energy Star labeled or Design Lights Consortium (DLC).

13.1.9 LED Exit Signs

Version Date & Revision History:
Draft date: January, 2010
Revision date: May 19, 2016

Referenced Documents:

- Energy and Peak Demand Impact Evaluation Report of the 2005-2007 Demand Management Programs – KEMA (KEMA 2005-07). http://www.energystar.gov/ia/business/small_business/led_exitsigns_techsheet.pdf
- Econorthwest TRM Review – 6/23/10

TRM Review Actions:

- 6/23/10 No Changes
- 10/5/11 – Currently Under Review.

Major Changes:

- 5/19/2016 – Added measure life

Measure Description:
Replacement of Incandescent Exit Signs with LED Exit Signs. Savings are equal across all building use types.

Baseline Efficiencies:
Demand Baseline has been determined by technical specifications of an incandescent exit sign, which typically holds two 20 W bulbs (40 W). The Energy Baseline is based on 24/7 operation of the sign (8,760 hours).

Building Types	Demand Baseline(kW)	Energy Baseline (kWh)
All Types	0.040	351

High Efficiency:
The typical technical specification on an LED Exit Sign (through energystar.gov) claims “less than 5W” of Demand. The Energy High Efficiency figure is based on 24/7 operation (8,760 hours).

Building Types	Demand High Efficiency (kW)	Energy High Efficiency (kWh)
All Types	0.005	44

Final Savings:
The Impact Evaluation Report by KEMA states that LED exit signs are expected to have high realization ratios and that measured savings were typically 100% of claimed savings. These figures match the suggested savings by the KEMA report.

Building Types	Demand Savings (kW)	Energy Savings (kWh)
All Types	0.035	307

Measure Life:
16 years

Saving Algorithm:

Exit Signs - Businesses				
Incandescent Exit Sign		0.040	kW	
		24.00	Hours per Day	
	x	365	Days	8,760 Hours per Year
Incandescent Exit Sign		350.4	kWh per Year	
LED Exit Sign		0.005	kW	
		24.00	Hours per Day	
	x	365	Days	8,760 Hours per Year
LED Exit Sign		43.8	kWh per Year	
Incandescent Exit Sign		350.4	kWh per Year	
LED Exit Sign	-	43.8	kWh per Year	
Savings Before Adjustments		306.6	kWh per Year	
		306.6	kWh per Year	
Persistance Factor	x	1.000	pf	0.0% Lamps not installed or replaced back
		307	kWh per Year	
CFL Energy Savings		**307**	**kWh / Year Savings**	
Incandescent Exit Sign		0.040	kW	
LED Exit Sign	-	0.005	kW	
Demand Reduction Before Adjustments		0.035	kW	
Demand Reduction Before Adjustments		0.035	kW	
Coincidence Factor		1.000	cf	100.0% Lamps on between 5 and 9 p.m.
Persistance Factor	x	1.000	pf	0.0% Lamps not installed or replaced back
		0.035	kW	
CFL Demand Savings		**0.035**	**kW Savings**	

13.1.10 HID Pulse Start Metal Halide

Version Date & Revision History:
Draft date: February 24, 2011

Referenced Documents:

- Energy and Peak Demand Impact Evaluation Report of the 2005-2007
- Demand Management Programs – KEMA (KEMA 2005-07).
- Econorthwest TRM Review – 6/23/10
- DEER-The Database for Energy Efficient Resources
- The California Energy Commission California Commercial End Use Summary http://www.energy.ca.gov/ceus/
- Evergreen TRM Review – 2/23/12

TRM Review Actions:

- 6/23/10 Rec. #17 – Break down savings by wattage ranges pulse start metal halides- Adopted
- 10/5/11 – Currently Under Review.

Major Changes:

- Wholesale replacement of prior TRM using DEER operational data and CEUS Commercial Data
- Added interactive effect factors for energy and demand Table 3.
- Updated document regarding persistence and coincident factors based on EM&V review.

Referenced Documents:

Description: Traditional probe-start metal halide lamps do not use an igniter and require three electrical contacts to ignite the gas and remain lit. Recently developed pulse-start metal halide lamps use only two contacts and use an igniter located inside the ballast pod. Pulse-start lamps offer higher light output per unit of electric power. Multiple Wattages of Pulse-Start Metal Halides are installed. The most common have rated wattages between 100 and 250, with the majority of installations being 250 W.

Incremental Cost
$150 (320W PS Replacing 400W HID)

Measure Life
14 years?

Base Case
Probe start metal halide

High Efficiency
Lower wattage pulse start metal halide

Energy Savings

The savings for pulse start metal halide fixtures are calculated based on a wattage savings for the replacement of a metal halide fixture with a smaller wattage pulse start metal halide fixture. Based on the wattages provided, it appears that it was assumed that a 175W metal halide fixture would be replaced with a 100W pulse start metal halide fixture, 250W metal halide fixture would be replaced with either a 150W or 175W pulse start metal halide fixture, and a 400W metal halide would be replaced with a 250W pulse start metal halide fixture. Based on the expected fixture wattages and breakdown of fixture installations, an average savings of 123W per fixture was assumed.

Measure	Metal Halide (W)	Pulse Start Metal Halide (W)
Equivalent Replacement	175	100
	250	150 or 175
	400	250

Savings

	Pulse Start Wattage Reduction		
	<=100W	101-200W	201-350W
Average	48	70	109

Energy Savings: Using the DEER operational hours the energy savings are (see Section 3 Interactive Effects):

	Pulse Start Energy Reduction		
Building Type	**<=100W**	**101-200W**	**201-350W**
Misc. Commercial	209.0	302.0	471.4
Cold Storage	201.1	290.4	453.4
Education	128.2	185.2	289.2
Grocery	281.5	406.6	634.8
Health	312.9	452.0	705.7
Hotel/Motel	238.8	345.0	538.6
Industrial	207.4	299.5	467.6
Office	135.7	196.0	306.1
Restaurant	255.1	368.5	575.3
Retail	203.5	293.9	458.9
Warehouse	201.1	290.4	453.4

Demand Savings: Using the CEUS coincidence factors the demand savings are (see Section 3 Interactive Effects):

	Pulse Start Demand Reduction		
Building Type	**<=100W**	**101-200W**	**201-350W**
Misc. Commercial	0.015	0.021	0.033
Cold Storage	0.024	0.035	0.055
Education	0.010	0.014	0.022
Grocery	0.041	0.059	0.093
Health	0.031	0.045	0.071
Hotel/Motel	0.029	0.042	0.065
Industrial	0.024	0.035	0.055
Office	0.024	0.035	0.055
Restaurant	0.036	0.052	0.082
Retail	0.029	0.042	0.065
Warehouse	0.022	0.031	0.049

Pulse Start Operational Hours and Peak Coincidence Factors:

Commercial Lighting Factors

Building Type	Hours of Operation[1]	Peak Coincidence Factor[2]
Misc. Commercial	4,325	0.30
Cold Storage	4,160	0.50
Education	2,653	0.20
Grocery	5,824	0.85
Health	6,474	0.65
Hotel/Motel	4,941	0.60
Industrial	4,290	0.50
Office	2,808	0.50
Restaurant	5,278	0.75
Retail	4,210	0.60
Warehouse	4,160	0.45

[1] The Database for Energy Efficient Resources (DEER)

[2]California Commercial End Use Summary (CEUS)

13.1.11 Sensors

Version Date & Revision History:
Draft date: March 2, 2011

Referenced Documents:
Occupancy sensors can reduce lighting costs by up to 50% in rooms where lights are frequently left on when on one is around."

According to the Federal Energy Management Program (FEMP) of the US Department of Energy, in a small, private office, an occupancy sensor can reduce energy use by almost 30% shaving 100kWh off the annual energy use. In a large open office area, energy use can be reduced by approximately 10%.

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- TRM measure previously discussed using smart-strips with occupancy sensors. Changed to occupancy sensors for lighting as intended in the annual plan. Updated energy conservations numbers accordingly.

Measure Description:
This measure is for wall switch sensors that controls the use of lighting in areas around the home with variable use such as laundry, storage, garage, bedrooms or spare areas.

Occupancy sensors must comply with:
- Energy Star
- UL Listing

Baseline Efficiencies:
The base case is two (2) 32W T8 fluorescent lamp.

High Efficiency:
The high efficiency case is 33% reduced run time from the base case.

Energy Savings:
Energy savings is calculated at 67.8 kWh per year per sensor.

Savings Algorithms

Room Occupancy Sensors - Commercial					
4' T8 Lamp		0.032	kW		
Two (2) - Lamp		2.0			
		0.064			
Ballast Factor		0.880			
		0.056	kW		
		10.00	Hours per Day		
	x	365	Days	839.5	Hours per Year
Baseline Energy Usage		205.6	kWh per Year		
Run Time Reduced (RTR)		3.30	Hours per Day	33%	
		205.6	kWh per Year		
	x	0.33		33%	Run Time Reduced
		67.8	kWh per Year		
Energy Savings		**67.8**	**kWh / Year Savings**		
Two Lamp Demand Reduction Before Adjustments		0.056	kW		
Coincidence Factor		0.120	cf	12.0%	Lamps on between 5 and 9 p.m.
Persistance Factor	x	1.000	pf	100.0%	
		0.0068	kW		
Demand Savings		**0.0068**	**kW Savings**		

Operating Hours
10 hours per day

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Coincidence
CF = 0.12 (12% lamps on between 5PM – 9PM)

Persistence
PF =1.0

Lifetime
8 years (DEER)

Component Costs and Lifetimes Used in Computing O&M Savings
TBD

13.1.12 Stairwell Bi-Level Dimming Lights

Version Date & Revision History:
Draft date: March 30, 2014

Referenced Documents:
Seattle City Light Energy Smart Services – ***"Funding Calculation Worksheets for Lighting"***

TRM Review Actions:
- Currently Under Review.

Major Changes:
- TRM measure previously discussed using smart-strips with occupancy sensors. Changed to occupancy sensors for lighting as intended in the annual plan. Updated energy conservations numbers accordingly.

Measure Description:
Stairwell lighting typically operates continuously at full output despite very low, intermittent use. Bi-level stairwell dimming lights utilizes either an ultra-sonic or infrared motion sensor to detect motion in stairwells. Solid state controls are used to dim fixtures to lower light levels when a space is unoccupied. This technology is ideal for areas where codes user preferences, safety, or security requirements call for minimal light levels during unoccupied periods and full light output during occupied periods. Fixtures must be UL compliant. If the enhanced case is LED, it must meet program requirements which is 3 year warranty, one of the following: Energy Star/DLC/LED Lighting Facts, UL compliant.

Baseline Efficiencies:
The base case is no bi-level dimming lights with occupancy sensors.

High Efficiency:
The high efficiency case is bi-level dimming lights with occupancy sensors.

Energy Savings:
Energy savings is calculated based on the modified customized lighting worksheet which accounts for the following:

- Watts (Base)
- Watts (Enhanced)
- Hours of operation (including peak period of 5PM-9PM)
- % on High/Low Level (based on the following table from Seattle City Light Energy Smart Services):

Seattle City Light Energy Smart Services

Funding Calculation Worksheets for Lighting

- Occupancy Reference Table 1. Occupancy Type Codes -

Use this table to find the Occupancy Type Code inputs for the Bi-Level Stairway Lighting worksheet.

Occupancy Types		Occupancy Code	Occupied Fraction
High Rise >10 floors	Free Access	**FH**	10%
	Limited Access (Exit only)	**LH**	5%
Low Rise <10 floors	Free Access	**FL**	20%
	Limited Access (Exit only)	**LL**	10%

1) Occupancy Percentage. This column is included for information only. The Occupancy Percentage is automatically transferred to the Funding Calculation Worksheets when you

Sample Worksheet

CUSTOMIZED LIGHTING INCENTIVE WORKSHEET

Project:	
Application No.:	
Date:	
Done By:	

The yellow columns should correspond with the customized incentive worksheet.

Existing and Base Case

Location	Fixture Type	Fixture Qty	System Wattage	Total Wattage	M - F Hours of Operation	Sat Hours of Operation	Sun Hours of Operation	(E3) Annual Operating Hours	On-Peak Demand Hours (Weekday 5 to 9 pm.)	(E7) Off Peak Demand	(E8) On Peak Demand	(E9) Annual Energy Use (kWh / Yr.)
Stairwell	32WT-8's	205	34	6970	24	24	24	8760.00	4	6.97	6.97	61057.20
				0				0.00		0.00	0.00	0.00
				0				0.00		0.00	0.00	0.00
				0				0.00		0.00	0.00	0.00
				0				0.00		0.00	0.00	0.00
								8760.00	**4.00**	**6.97**	**6.97**	**61057.20**

Notes:

*Please delete all unused rows.

Operational Cost

(E24) Annual Maintenance Cost	

Project Cost

(F27) Equipment Cost	$ 1,000.00
(F26) Total Project Cost	$ 2,000.00

Installation Info

(E30) Installation year	
(E31) Measure of Life	

Enhanced Case: Retrofit

Location	Fixture Type	Fixture Qty	System Wattage	Total Wattage	M - F Hours of Operation	Sat Hours of Operation	Sun Hours of Operation	(G3) Annual Operating Hours	On-Peak Demand Hours (Weekday 5 to 9 pm.)	(G7) Off Peak Demand	(G8) On Peak Demand	(G9) Annual Energy Use (kWh / Yr.)
Stairwell	Fluorescent Bi-level Lighting	205	6	1230	23	23	23	8395.00	4	1.23	1.23	10325.85
Stairwell	Fluorescent Bi-level Lighting	205	60	12300	1	1	1	365.00	1	12.30	3.08	4489.50
				0				0.00		0.00	0.00	0.00
				0				0.00		0.00	0.00	0.00
				0				0.00		0.00	0.00	0.00
								4380.00	**2.50**	**13.53**	**4.31**	**14815.35**

Notes:

*Please delete all unused rows.

Operational Cost

(G24) Annual Maintenance Cost	

Project Cost

(G27) Equipment Cost	$ 34,628.72
(G26) Total Project Cost	$ 49,330.13

Installation Info

(G30) Installation year	2012
(G31) Measure of Life	13.00 years
(G32) New / Retrofit Project	Retrofit

Project Summary			Estimated Incentive Amount
Average Energy Savings Per Year	46241.85 kWh/Year	$ 0.10 kWh/Year	$ 4,624.19
On-Peak Demand Savings	2.67 kW	$ 125 /kW	$ 333.13
Total Demand Savings	-6.56 kW	Total	$ 4,957.00

Measure Life:

14 years (DEER)

13.2 High Efficiency HVAC

13.2.1 Chiller

Version Date & Revision History:
Draft date: February 24, 2011
Revision date: April 12, 2016

Referenced Documents:
- Econorthwest TRM Review – 6/23/10
- IECC 2006

TRM Review Actions:
- 6/23/10 Rec. #23 – Utilize IECC 2006 Efficiencies as the Baseline Efficiency and Efficient Packaged
  Unit 15% better than IECC 2006 – Adopted
- 6/23/10 Rec. #24 - break down the savings by chiller type and size. Conduct additional research for future program years to calibrate claimed savings for Hawaii
  customer base.- Adopted

Major Changes:
- Chiller efficiency selected at 15% improvement over IECC 2006.
- 4/12/2016 – Added second requirement of 15% improvement over IECC for full load efficiency (COP) in addition to 15% improvement over IECC for part load efficiency (IPLV) per requirements of IECC 2006. Qualifying chillers must meet both COP and IPLV efficiency requirements.

Description: The replacement of chillers with Energy Efficiency above the code efficiency values in place at the time of permitting the project. In multiple unit chiller plants, a review of operational chillers will be conducted to determine what fraction of installed chillers will be incentivized. This is to avoid paying for standby units.

Water Cooled Chiller Efficiency

High Efficiency Chiller - 15% higher than IECC 2006

		IECC 2006 IPLV (kW/Ton)	IECC 2006 COP (kW/ton)	Hawaii Energy Premium Efficiency IPLV (kW/Ton)	Hawaii Energy Premium Efficiency COP (kW/Ton)
Reciprocating	All	0.70	0.84	0.60	0.71
Rotary Screw and Scroll	< 150 tons	0.68	0.79	0.58	0.67
	150-300 tons	0.63	0.72	0.54	0.61
	> 300 tons	0.57	0.64	0.48	0.54
Centrifugal	< 150 tons	0.67	0.70	0.57	0.60
	150-300 tons	0.60	0.63	0.51	0.54
	> 300 tons	0.55	0.58	0.47	0.49

Note: Qualifying chillers must meet both IPLV and COP efficiency requirements, per IECC 2006.

Air Cooled Chiller Efficiency

2006 IECC

Equipment Type	Size	Min Eff	Type	kW/ton	15% Better kW/ton	Test Procedure
Air cooled, with condenser, electrically operated	< 150 tons	2.8	COP	1.256	1.068	ARI 550/590
		2.8	IPLV	1.256	1.068	
	> = 150 tons	2.5	COP	1.407	1.196	
		2.5	IPLV	1.407	1.196	

Water Cooled Energy Savings:

High Efficiency Chiller - 15% higher than IECC 2006 - Energy Reduction (kWh/Ton)

Building Type	Reciprocating	Rotary Screw or Scroll			Centrifugal		
	All	<150	150-300	>300	<150	150-300	>300
Misc. Commercial	312.5	303.6	281.2	254.4	299.1	267.8	245.5
Cold Storage	536.7	521.3	483.0	437.0	513.7	460.0	421.7
Education	307.9	299.1	277.1	250.7	294.7	263.9	241.9
Grocery	536.7	521.3	483.0	437.0	513.7	460.0	421.7
Health	435.7	423.3	392.1	354.8	417.0	373.5	342.3
Hotel/Motel	312.4	303.5	281.2	254.4	299.0	267.8	245.5
Industrial	435.7	423.3	392.1	354.8	417.0	373.5	342.3
Office	520.1	505.3	468.1	423.5	497.8	445.8	408.7
Restaurant	349.0	339.0	314.1	284.2	334.1	299.2	274.2
Retail	273.9	266.1	246.5	223.1	262.2	234.8	215.2
Warehouse	536.7	521.3	483.0	437.0	513.7	460.0	421.7

Air Cooled Energy Savings:

Air Cooled Chiller Energy Savings (kWh/ton)		
Building Type	Chiller <150 tons	Chiller >= 150 tons
Misc. Commercial	559.5	627.9
Cold Storage	960.9	1078.5
Education	551.2	618.7
Grocery	960.9	1078.5
Health	780.1	875.6
Hotel/Motel	559.3	627.8
Industrial	780.1	875.6
Office	931.3	1045.2
Restaurant	624.9	701.4
Retail	490.5	550.5
Warehouse	960.9	1078.5

Water Cooled Demand Savings:

High Efficiency Chiller - 15% higher than IECC 2006 - Demand Reduction (kW/Ton)

Building Type	Reciprocating	Rotary Screw or Scroll			Centrifugal		
	All	<150	150-300	>300	<150	150-300	>300
Misc. Commercial	0.064	0.062	0.058	0.052	0.061	0.055	0.050
Cold Storage	0.072	0.070	0.065	0.059	0.069	0.062	0.057
Education	0.084	0.082	0.076	0.068	0.080	0.072	0.066
Grocery	0.056	0.054	0.050	0.045	0.053	0.048	0.044
Health	0.071	0.069	0.064	0.058	0.068	0.061	0.056
Hotel/Motel	0.055	0.053	0.049	0.044	0.052	0.047	0.043
Industrial	0.064	0.062	0.058	0.052	0.061	0.055	0.050
Office	0.048	0.047	0.043	0.039	0.046	0.041	0.038
Restaurant	0.056	0.054	0.050	0.045	0.053	0.048	0.044
Retail	0.069	0.067	0.062	0.056	0.066	0.059	0.054
Warehouse	0.063	0.061	0.057	0.051	0.060	0.054	0.050

Air Cooled Demand Savings:

Air Cooled Chiller Demand Savings (kW/ton)		
Building Type	Chiller <150 tons	Chiller >= 150 tons
Misc. Commercial	0.094	0.106
Cold Storage	0.094	0.106
Education	0.038	0.042
Grocery	0.160	0.179
Health	0.122	0.137
Hotel/Motel	0.113	0.127
Industrial	0.094	0.106
Office	0.094	0.106
Restaurant	0.141	0.158
Retail	0.113	0.127
Warehouse	0.085	0.095

Measure Life
20 years (DEER)

13.2.2 VFD – Chilled Water/Condenser Water

Version Date & Revision History:
Draft date: March 4, 2016
Revision date: May 19, 2016

Referenced Documents:
- Energy and Peak Demand Impact Evaluation Report of the 2005-2007
- Demand Management Programs – KEMA (KEMA 2005-07).
- Econorthwest TRM Review – 6/23/10
- IECC 2006

TRM Review Actions:
- 6/23/10 Rec. #25 - Breakdown the savings by building types. Conduct additional research for future program years to calibrate claimed savings for Hawaii customer base – Adopted
- 10/5/11 – Currently Under Review.
- 3/4/16 – Added section for baseline efficiency description.

Major Changes:
- Energy savings separated into building type breakdown.
- 5/19/2016 – Added measure life

Measure Description: The installation of variable frequency drives on chilled and/or condenser water pumps used in HVAC systems.

Baseline Efficiency: The baseline efficiency for this measure is no a chilled water/condenser water motor/pump with no VFD. The pump/motor is assumed to be a 10 hp motor running at full power for 6000 hours per year.

Qualification
- Require pre-notification before projects begin.
- The program reserves the right to perform on-site verifications, both pre- and post-installation.
- Existing equipment must not have a VFD. (i.e. – incentives are not available for replacement)
- For existing facilities, motor hp must be between 3 and 100.
- For new facilities, motor hp must be between 3 and 50.
- The VFDs must actively control and vary the pump speed.

Energy and Demand Savings

Energy Savings = 902.7 kWh per HP
Demand Savings = 0.245 kW per HP

Measure Life:
15 years

HVAC Pump Motor VFD

DSMIS Values for All Commercial
kW = 0.245 per HP
kWh = 902.7 per HP

KEMA 2008 Values for All Commercial (HECO):
kW = none available
kWh = none available

Base Pump Motor Use:

Base HP =	10 HP	Example
Motor Efficiency =	92%	Estimated Typical
Average Load =	75%	Estimated Typical
HP to kW conversion =	0.746	
kW load = HP*0.746*% Load/eff =	6.1 kW	
Hours of operation =	6000 hours	Estimated
kWh Used Annually = kW load * Hours =	36,489	

Pump Motor Savings with VFD:

Energy Savings percentage =	24.74%	Needed to meet the kWh savings from DSMIS
kWh savings = % savings * kWh annual use =	9,027 kWh	
kW average savings = kWh savings/Hours =	1.50 kW	
kW savings = average kW savings * CF =	2.45 kW	Based on DSMIS value of 245 watts per HP
CF needed = kW savings (program) / kW average =	1.63	

13.2.3 VFD – AHU

Version Date & Revision History:
Draft date: March 4, 2016
Revision date: May 19, 2016

Referenced Documents:
- Energy and Peak Demand Impact Evaluation Report of the 2005-2007
- Demand Management Programs – KEMA (KEMA 2005-07).
- Econorthwest TRM Review – 6/23/10
- IECC 2006
- Evergreen TRM Review – 2/23/12

TRM Review Actions:
- 6/23/10 Rec. #25 - Breakdown the savings by building types. Conduct additional research for future program years to calibrate claimed savings for Hawaii customer base – Adopted
- 10/5/11 – Currently Under Review.
- 3/4/2016 – Added section for Baseline Efficiency description

Major Changes:
- Energy savings separated into building type breakdown.
- Updated energy and demand savings based on EM&V review.

Measure Description: The installation of variable frequency drives on fans used in HVAC systems.

Measure Life:
15 years

Baseline Efficiency: The baseline efficiency for this measure is an air-handling unit with no VFD. The AHU is assumed to be a 10 hp motor operating at full power for 3,720 hours per year.

Values for this measure are not called out in the KEMA report. The DSMIS values for this measure are 200 watts and 760.9 kWh per horsepower. The primary assumption used for the savings calculation is that the percentage savings of the energy used before the VFD is applied. This percent savings is shown in the calculations below as about 21%. Based on information from the EPRI Adjustable Speed Drive directory and comparing energy use for outlet damper, inlet damper and VFD controls the average savings for this profile would be 50% for replacement of an outlet damper and 33% for replacement of an inlet damper. See table below.

Percentage of Full Load Power				Power Savings %	
% Flow	Outlet Dampers	Inlet Dampers	VFD	Outlet Savings	Inlet Savings
100	111	109	105	6	4
90	107	93	73	34	20
80	104	82	57	47	25
70	99	75	44	55	31
60	94	69	32	62	37
50	87	65	21	66	44
40	80	63	14	66	49
30	72	60	8	64	52
			Average	**50**	**33**

Therefore, the 21% of base case savings used in to match the DSMIS values in the calculations below appears to be reasonable and possibly conservative. The actually savings for the customer will depend on many factors related to their type of building, system and hours of operation.

VFD AHU – Energy and Demand Savings:

Building Type	Hours	Demand Savings (kW/HP)	Energy Savings (kWh/HP)
Misc. Commercial	3,720	0.20	471.69
Cold Storage	6,389	0.20	810.12
Education	3,665	0.20	464.72
Grocery	6,389	0.20	810.12
Health	5,187	0.20	657.71
Hotel/Motel	3,719	0.20	471.57
Industrial	5,187	0.20	657.71
Office	6,192	0.20	785.14
Restaurant	4,155	0.20	526.85
Retail	3,261	0.20	413.49
Warehouse	6,389	0.20	810.12

Example Calculation:

HVAC Fan Motor VFD

DSMIS Values for All Commercial
kW = 0.200 per HP
kWh = 760.9 per HP

KEMA 2008 Values for All Commercial (HECO):
kW = none available
kWh = none available

Base Pump Motor Use:

Base HP =	10	HP	Example
Motor Efficiency =	92%		Estimated Typical
Average Load =	75%		Estimated Typical
HP to kW conversion =	0.746		
kW load = HP*0.746*% Load/eff =	6.1	kW	
Hours of operation =	3,720	hours	Estimated
kWh Used Annually = kW load * Hours =	22,623		22623.26

Pump Motor Savings with VFD:

Energy Savings percentage =	20.85%		Needed to meet the kWh savings from DSMIS
kWh savings = % savings * kWh annual use =	4,717	kWh	
kW average savings = kWh savings/Hours =	1.268	kW	
kW savings = average kW savings * CF =	2.0	kW	Based on DSMIS value of 200 watts per HP
CF needed = kW savings (program) / kW average =	1.58		

13.2.4 Garage Demand Ventilation Control

Version Date & Revision History:
Draft date: October 3, 2011

Referenced Documents:
- ASHRAE Standard 62
- International Mechanical Code
- Department of Health (DOH) Title 11 Chapter 39 (Air Conditioning and Ventilation)

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- New program offering.
- 11/22/11 – Under *Description,* the phrase "City Codes" was changed to "Codes" for accuracy.

Description:

Demand-controlled ventilation (DCV) using carbon monoxide (CO) sensing is a combination of two technologies: Sensors that monitor CO levels in the parking garage, and an air-handling system that uses data from the sensors to regulate the amount of ventilation air admitted. CO sensors continually monitor the air in a parking garage. Given a predictable activity level, automobiles will exhaust CO at a predictable level. Thus CO production in the parking garage will closely track activity. Given these two characteristics, a CO measurement can be used to measure and control the amount of outside air that is being introduced to dilute the CO generated by automobiles. The result is that ventilation rates can be measured and controlled to a specific cfm/ft2. This is in contrast to the traditional method of ventilating at a fixed rate regardless of occupancy.

City codes for enclosed parking areas require ventilation during all hours of operation to protect against an unhealthful build-up of carbon monoxide (CO). As a result, exhaust fans generally run 100% of operating hours. Although some buildings use timers to cut fan run time, it is important to note that the use of timers may not meet code compliance and health considerations. To achieve major energy savings and meet all health requirements, carbon monoxide sensors have now been authorized by code and mandated in some jurisdictions for new construction. Sensors measure CO levels, activating fans only when necessary to maintain CO at an acceptable level, saving upwards to 90% of energy cost.

Program Requirements:

1. Pre-notification before equipment is purchased and installed.
2. New construction is not eligible.
3. Incentive amount not to exceed 85% of installed Cost.
4. Failure of devices causes the exhaust fans to operate in the ON position

Energy and Demand Savings:
All assumptions, data and formulas used in the calculations must be clearly documented. Standard engineering principles must be applied, and all references cited. Pre and post monitoring will be conducted to determine measured energy and demand savings.

Savings Algorithms
Gross energy and demand savings estimates for custom projects are calculated using engineering analysis and project-specific details including pre and post monitoring. A physical fan motor audit will be performed as well as spot amperage checks and logging of pre and post operational times.

Baseline Efficiency
The baseline efficiency case assumes compliance with the efficiency requirements as mandated by the Hawaii State Energy Code or industry accepted standard practice.

High Efficiency
The high efficiency case is the installation of a parking garage ventilation demand control device utilizing carbon monoxide sensors.

Persistance Factor
PF = 1 since all custom projects require verification of equipment installation.

Notes

- Incentives is limited to 85% of incremental cost.
- Installations are subject to inspection for up to 5 years. Removal will be cause for incentive forfeiture.

Measure Life
8 years

Example

Zone	New Fan Tag	Fan Location	Old Fan Tag	HP	Measured kW		100% 8,760 hr/yr.	1.0% 88 hr/yr.	6/7 to 6/15	Notes			
1	GEF-1	1-B	PEF-2	10.0	7.2		63,072	631	100.0%	Data logger installed	7.5	0.3	96.5%
	GSF-1	1-B	PSF-4	5.0	3.4		29,784	298			3.7	0.3	91.2%
	GSF-2	1-B	PSF-4	5.0	3.4		29,784	298			3.7	0.3	91.2%
2	GEF-3	2-B	PEF-2	10.0	7.7		67,452	675			7.5	(0.2)	103.2%
	GSF-3	2-B	PSF-4	10.0	7.5		65,700	657	100.0%	Data logger installed	7.5	(0.0)	100.5%
3	GEF-6	3-B	PEF-2	10.0	7.4		64,824	648	99.9%	Data logger installed	7.5	0.1	99.2%
	GSF-4	3-B	PSF-2	10.0	7.4		64,824	648	100.0%	Data logger installed	7.5	0.1	99.2%
4	GEF-9	4-B	PEF-1	7.5	4.5		39,420	394	100.0%	Data logger installed	5.6	1.1	80.4%
	GEF-10	4-B	PEF-4	3.0	2.6		22,776	228			2.2	(0.4)	116.2%
5	GEF-7	4-A	PEF-1	7.5	4.5		39,420	394			5.6	1.1	80.4%
	GSF-5	4-A	PSF-3	7.5	5.8		50,808	508	100.0%	Data logger installed	5.6	(0.2)	103.7%
6	GEF-11	5-A	PEF-1	7.5	4.9		42,924	429			5.6	0.7	87.6%
	GSF-6	5-A	PSF-3	7.5	5.8		50,808	508	100.0%	Data logger installed	5.6	(0.2)	103.7%
7	GEF-13	6-A	PEF-2	10.0	7.5		65,700	657			7.5	(0.0)	100.5%
	GSF-7	6-A	PSF-3	7.5	5.0		43,800	438	100.0%	Data logger installed	5.6	0.6	89.4%
8	GEF-2	1-B	PEF-1	7.5	3.6		31,536	315			5.6	2.0	64.3%
	GEF-4	2-A	PEF-2	10.0	7.4		64,824	648			7.5	0.1	99.2%
	GEF-5	3-A	PEF-3	5.0	3.1		27,156	272			3.7	0.6	83.1%
	GEF-8	4-A	PEF-3	5.0	3.1		27,156	272			3.7	0.6	83.1%
	GEF-12	5-A	PEF-1	7.5	4.9		42,924	429	99.9%	Data logger installed	5.6	0.7	87.6%
	GEF-14	6-A	PEF-4	3.0	2.4		21,024	210			2.2	(0.2)	107.2%
TOTALS				**156.0**	**109.1** kW	Pre-Project	955,716	9,557			116.4	7.3	
			Coincidence Factor		1.0	Post-Project	(9,557)						
			On Peak Demand Savings		109.1 kW	Energy Savings per Year	946,159 kWh						

		109.1 kW			946,159 kWh/yr.
Demand Cost per Unit	$	12.60 /kW month	Energy Cost per Unit	$	0.21 /kWh
Demand Cost Savings	$	1,375 /month	Energy Cost Savings	$	200,586 /yr.
		12 months			
	$	16,496 /Year			

Incentive $ 0.18

Demand Cost Savings	$	16,496
Energy Cost Savings	$	200,586
	$	217,082 /yr.

Project Cost	**$**	**152,323**
Incentive not to exceed 100% of project cost		**170,308.6**
Incentive		**152,323.0**

13.2.5 Package Unit AC

Version Date & Revision History:
Draft date: February 24, 2011

Referenced Documents:
- Econorthwest TRM Review – 6/23/10
- Econorthwest Email Correspondence – 1/23/12
- IECC 2006, pg. 34

TRM Review Actions:
- 6/23/10 Rec. #21 – Utilize IECC 2006 Efficiencies as the Baseline Efficiency and Efficient Packaged Unit 15% better than IECC 2006 – Adopted
- 6/23/10 Rec. #22 - Break down packaged AC savings based on equipment size. – Adopted
- 10/5/11 – Currently Under Review.

Major Changes:
- Package chiller unit AC efficiency selected at 15% improvement over IECC 2006.
- 12/12/11 – kW/ton and EER values updated to match IECC 2006 package unit values as per Econorthwest's direction, high efficiency numbers adjusted accordingly. Energy & demand savings updated accordingly.

Description: The replacement of package and split unit air conditioners with Energy Efficiency above the Hawaii Model Energy Code.

Measure Life:
15 years

Package Units

Unit Size (Btu/Hr.)	IECC 2006 Efficiency (kW/ton)	SEER/EER	Hawaii Energy Premium Efficiency (kW/ton)	SEER/EER
< 65,000	1.364	9.7 SEER	1.159	11.2 SEER
65,000 to 134,999	1.165	10.3 EER	0.990	11.8 EER
135,000 to 239,999	1.237	9.7 EER	1.052	11.2 EER
240,000 to 759,999	1.263	9.5 EER	1.074	10.9 EER
> 760,000	1.304	9.2 EER	1.109	10.6 EER

Energy Savings

Package Unit AC - 15% higher than IECC 2006 - Energy Reduction – kWh per ton

Building Type	< 65,000	65,001 to 135,000	135,001 to 240,000	240,001 to 760,000	> 760,000
Misc. Commercial	608.7	520.1	552.2	563.9	582.3
Cold Storage	1,045.4	893.2	948.5	968.4	1,000.0
Education	599.7	512.4	544.1	555.5	573.7
Grocery	1,045.4	893.2	948.5	968.4	1,000.0
Health	848.8	725.2	770.0	786.2	811.9
Hotel/Motel	608.5	519.9	552.1	563.7	582.1
Industrial	848.8	725.2	770.0	786.2	811.9
Office	1,013.2	865.7	919.2	938.6	969.2
Restaurant	679.9	580.9	616.8	629.8	650.3
Retail	533.6	455.9	484.1	494.3	510.4
Warehouse	1,045.4	893.2	948.5	968.4	1,000.0

Military Energy Savings = 559.5 kWh per ton (which is 1.5 times the residential AC values)

Demand Savings

Package Unit AC - 15% higher than IECC 2006 - Demand Reduction – kW per ton

Building Type	< 65,000	65,001 to 135,000	135,001 to 240,000	240,001 to 760,000	> 760,000
Misc. Commercial	0.061	0.052	0.056	0.057	0.059
Cold Storage	0.102	0.087	0.093	0.095	0.098
Education	0.041	0.035	0.037	0.038	0.039
Grocery	0.174	0.149	0.158	0.161	0.166
Health	0.133	0.114	0.121	0.123	0.127
Hotel/Motel	0.123	0.105	0.111	0.114	0.117
Industrial	0.102	0.087	0.093	0.095	0.098
Office	0.102	0.087	0.093	0.095	0.098
Restaurant	0.153	0.131	0.139	0.142	0.147
Retail	0.123	0.105	0.111	0.114	0.117
Warehouse	0.092	0.079	0.084	0.085	0.088

Military Demand Savings = 0.19 kW per ton

13.2.6 Inverter Variable Refrigerant Flow (VRF) Split Air Conditioning Systems

Version Date & Revision History:
Draft date: March 4, 2016

Referenced Documents:
- Evergreen TRM Review – 2/23/12
- Evergreen TRM Review – 1/15/14

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- Original TRM values was divided by .8 but have been corrected to be multiplied by 1.2 in order to obtain a 20% increase in efficiency.
- 3/4/2016 – added section for baseline efficiency description

Description: Inverter driven variable refrigerant flow (VRF) air conditioning systems are direct expansion AC systems that utilize variable speed evaporator/condenser fans, and a combination of fixed and variable speed compressors along with most often multiple individual zone evaporators to provide the ability to more closely match the AC system's output with the building's cooling requirements. Savings comes from:
- *Part Load Efficiencies*: Increased part-load efficiency operation
- *High Efficiency Motors*: Many systems use ECM motors
- *Higher Room Temperatures*: The capacity matching allows for better humidity control through longer cooling operation.
- *Reduction of Distribution Losses*: Duct losses are reduced with DX systems. This may be offset by dedicated outside air distribution systems when needed.

Payback Qualifications: VRF products need a payback requirement of 1 year or greater. The TRB/TRC must be greater than 1.

Baseline Efficiency: The baseline efficiency for this measure is defined as ***

Energy and Demand Savings: VRF systems have demonstrated a 20-30% reduction in energy consumption as compared to standard DX equipment. The energy savings and demand tables that follow provide the savings by building type and system size for VRF systems. These figures are conservatively determined to be 20% greater than provided by the "Standard" Package Unit AC measures that require EERs 15% greater than IECC 2006 requirements.

The VRF applications have been new construction projects with no ability to perform pre and post measurements. Hawaii Energy will perform field pre and post field measurements to determine the measure effectiveness in the local environment

Measure Life:
15 years

VRF Energy Savings per Ton

Building Type	< 65,000	65,001 to 135,000	135,001 to 240,000	240,001 to 760,000	> 760,000
Misc. Commercial	730.4	624.1	662.6	676.7	698.8
Cold Storage	1,254.5	1,071.8	1,138.2	1,162.1	1,200.0
Education	719.6	614.9	652.9	666.6	688.4
Grocery	1,254.5	1,071.8	1,138.2	1,162.1	1,200.0
Health	1,018.6	870.2	924.0	943.4	974.3
Hotel/Motel	730.2	623.9	662.5	676.4	698.5
Industrial	1,018.6	870.2	924.0	943.4	974.3
Office	1,215.8	1,038.8	1,103.0	1,126.3	1,163.0
Restaurant	815.9	697.1	740.2	755.8	780.4
Retail	640.3	547.1	580.9	593.2	612.5
Warehouse	1,254.5	1,071.8	1,138.2	1,162.1	1,200.0

VRF Demand Savings per Ton

Building Type	< 65,000	65,001 to 135,000	135,001 to 240,000	240,001 to 760,000	> 760,000
Misc. Commercial	0.074	0.063	0.067	0.068	0.070
Cold Storage	0.123	0.105	0.111	0.114	0.117
Education	0.049	0.042	0.045	0.045	0.047
Grocery	0.209	0.178	0.189	0.193	0.200
Health	0.160	0.136	0.145	0.148	0.153
Hotel/Motel	0.147	0.126	0.134	0.136	0.141
Industrial	0.123	0.105	0.111	0.114	0.117
Office	0.123	0.105	0.111	0.114	0.117
Restaurant	0.184	0.157	0.167	0.171	0.176
Retail	0.147	0.126	0.134	0.136	0.141
Warehouse	0.110	0.094	0.100	0.102	0.106

13.3 High Efficiency Water Heating

13.3.1 Commercial Solar Water Heating

Version Date & Revision History:
Draft date: May 30, 2011
Revision date: July 7, 2015

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.
- 11/14/13 – more research should be done to determine typical baseline efficiencies for both standard electric resistance and heat pump water heaters.

Major Changes:
- July 7, 2015 – Changes EUL from 15 to 20 years to be consistent with residential SWH and historical data available through literature review

Measure Description:
Replacement of a Standard Electric Resistance Water Heater (SERWH) or heat pump with a Solar Water Heater. Solar equipment must comply with Solar Rating and Certification Corporation (SRCC) standards.

Baseline Efficiencies:
Baseline usage is a 0.9 COP Electric Resistance Water Heater or heat pump with a COP of 3.5.

The baseline water heater energy consumption is by a single 4.0 kW electric resistance element that is controlled thermostatically on/off controller based of tank finish temperature set point. The tank standby loss differences between baseline and high efficiency case are assumed to be negligible.

Energy Savings
Energy savings is based on the following commercial solar water heating worksheet.

COMMERCIAL SOLAR HOT WATER INCENTIVE WORKSHEET

Hawaii Energy, Efficiency Program • Program Year 2014

(Effective July 1, 2014)

Hawaii Energy

CUSTOMER INFORMATION

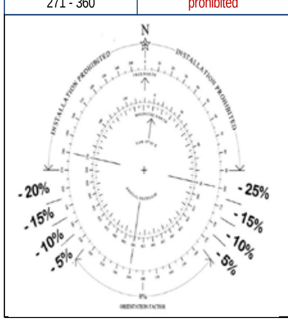
Customer Name:		Island:	Oahu	Application Number:	
Project Name:		T&D Loss Factor:	11.17%	Existing or New:	Existing
Storage Capacity:	# Tanks:	Design Finish Temp:		OG-100 Collector Rating (BTU):	
Panel Size (W x L):	# of Panels:	Total Cost of Project:		Existing System (electric / heat pump):	Electric
Building sq. ft.:	Year Built:	Installation Date:		Back-up Technology (gas / electric / heat pump):	Electric
Number of Units:	Num of Floors:	Building Type			

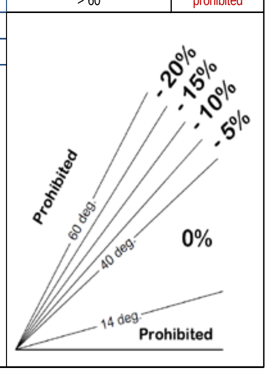
SOLAR INCENTIVE CALCULATION

	A	B	C	D		E	F	G		H	I		
Solar Panel Brand/Model	No. of Panels	Sun Zone	Panel rated Output BTU/Day	Total BTU D=A*C	N = New B=Burned out R=Retrofit	Orientation Factor	Tilt Factor	Total BTU Derating =(E*D+F*D)	Adjusted Solar Output =D-G BTU/Day	Adjusted Tons of Heating =H/K	Incentive factor		Incentive Amount =H*I
Example: SunEarth EC40	10	500	39,668	396,680	R	15%	5%	79,336	317,344	26.4	$250/ton	=	$6,611
		400		0	N - New	0%	0%	0	0	0.0	$250/ton	=	$ -
	0	300	0	0	N - New	0%	0%	0	0	0.0	$250/ton	=	$ -
								Total Adjusted Solar Output:	0			Total	$ -

SOLAR PANEL DERATING FACTORS

Collector Orientation	Derating	Collector Tilt	Derating
(Degrees True North)	(percent)	(degrees)	(percent)
0 - 89	prohibited	0 - 13	prohibited
90 - 115	25%	14 - 40	0%
105 - 115	10%	40 - 45	5%
115 - 125	5%	45 - 50	10%
125 - 225	0%	50 - 55	15%
225 - 235	5%	55 - 60	20%
235 - 245	10%	60	25%
245 - 255	15%	> 60	prohibited
255 - 270	20%		
271 - 360	prohibited		





Analysis

Impacts	kW	kWh/yr
Utility	0.67	#VALUE!
Customer	0.60	#VALUE!
Simple Payback (yrs)		#DIV/0!
TRB Ratio (TRB/Incremental Cost)		#VALUE!
* TRB Ratio must be ≥ 1		#VALUE!

Solar System Energy Production

Installed Capacity	-	Btu/day
Realized Annual Output	90%	
Annual Output	-	Btu/year

Existing System Energy Displaced

Energy Conversion	3,412	kWh/Btu
Electric Res. (COP 0.9)	-	kWh/Year
Heat Pump (COP 3.5)	-	kWh/Year
Additional Pump Energy	p	kWh/Year

Existing System On-Peak Demand Removed

	-	kWh/day
Electric Resistance Power	4.0	kW
Heat Pump Average Power		kW
Run Time	-	Hours / Day
On-Peak Fraction	15%	
On-Peak Energy	0.60	kW On-Peak

TRB Calculation Table 6% Discount Rate

System Life	Year	$/kW/yr.	$/kWh/yr.	Utility Benefits NPV
1	2012	$ 280	$ 0.099	#VALUE!
2	2013	$ 306	$ 0.100	#VALUE!
3	2014	$ 339	$ 0.104	#VALUE!
4	2015	$ 353	$ 0.104	#VALUE!
5	2016	$ 371	$ 0.109	#VALUE!
6	2017	$ 383	$ 0.112	#VALUE!
7	2018	$ 386	$ 0.113	#VALUE!
8	2019	$ 388	$ 0.114	#VALUE!
9	2020	$ 389	$ 0.114	#VALUE!
10	2021	$ 392	$ 0.115	#VALUE!
11	2022	$ 391	$ 0.115	#VALUE!
12	2023	$ 395	$ 0.116	#VALUE!
13	2024	$ 398	$ 0.117	#VALUE!
14	2025	$ 397	$ 0.117	#VALUE!
15	2026	$ 401	$ 0.118	#VALUE!
			Total Resource Benefit (TRB):	#VALUE!

Cost of Base Alternative:	$ 1,000
Cost of Solar System:	$ -
Incremental Cost:	$ (1,000)
Energy Savings:	-
Marginal Energy Cost:	$ 0.38 /kWh
First Year Project Savings:	$ -

Requirement: Must comply with Solar Rating and Certification Corporation (SRCC) Standards

Questions: Call the Business Program 839-8880 (Oahu) or toll free at 877-231-8222 • www.hawaiienergy.com

Measure Life

20 years

13.3.2 Heat Pump

Version Date & Revision History:
Draft date: February 24, 2011

Referenced Documents:
- Evergreen TRM Review – 2/23/12

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- Adjust the assumptions so the description and calculations are consistent.

Measure Description
This measure relates to the installation of a heat pump water heater (HPWH) in place of a standard electric water heater. HPWHs can be added to existing domestic hot water (DHW) systems to improve the overall efficiency. HPWHs utilize refrigerants (like an air source heat pump) and have much higher coefficients of performance (COP) than standard electric water heaters. HPWHs remove waste heat from surrounding air sources and preheat the DHW supply system. HPWHs come in a variety of sizes and the size of HPWH will depend on the desired temperature output and amount of hot water needed by application. The savings from water heater heat pumps will depend on the design, size (capacity), water heating requirements, building application and climate. This measure could relate to either a retrofit or a new installation.

Definition of Efficient Equipment
In order for this characterization to apply, the efficient equipment is assumed to be a heat pump water heater with or without an auxiliary water heating system.

Definition of Baseline Equipment
In order for this characterization to apply, the baseline equipment is assumed to be a standard electric storage tank type water heater with a thermal efficiency of 98%. This measure does not apply to natural gas-fired water heaters.

Deemed Lifetime of Efficient Equipment
The expected measure life is assumed to be 10 years

Deemed Measure Cost
Due to the complexity of heat pump water heater systems, incremental capital costs should be determined on a case by- case basis. High capacity heat pump water heaters will typically have a supplemental heating source such as an electric resistance heater. For new construction applications, the incremental capital cost for this measure should be calculated as the difference in installed cost of the entire heat pump water heater system including any auxiliary heating systems and a standard electric storage tank water heater of comparable capacity. For retrofit applications, the total installed cost of heat pump water heater should be used.

Savings Algorithm

Heat Pump Water Heater

Energy per Day (BTU) = (Gallons per Day) x (lbs. per Gal.) x (Temp Rise) x (Energy to Raise Water

Hot Water needed per Person		13.3	Gallons per Day per Person	HE
Average Occupants	x	3.77	Persons	KEMA 2008
Household Hot Water Usage		50.1	Gallons per Day	
Mass of Water Conversion		8.34	lbs/gal	
Finish Temperature of Water		130	deg. F Finish Temp	
Initial Temperature of Water	-	75	deg. F Initial Temp	
Temperature Rise		55	deg. F Temperature Rise	
Energy to Raise Water Temp		1.0	BTU / deg. F / lbs.	
Energy per Day (BTU) Needed in Tank		12,000	BTU/Ton	
Energy per Day (BTU) Needed in Tank		12,000	BTU/Ton	
BTU to kWh Energy Conversion	÷	3,412	kWh / BTU	
Energy per Day (kWh)		3.5	kWh /Ton	
Days per Month	x	30.4	Days per Month	
Energy (kWh) per Month		107	kWh / Month	
Days per Year	x	365	Days per Year	
Energy (kWh) Needed in Tank to Heat Water per Year		1,283	kWh /Ton	
Elec. Res. Water Heater Efficiency	÷	0.98	COP	
Base SERWH Energy Usage per Year at the Meter		1,309	kWh /Ton	KEMA 2008 - HECO
Energy (kWh) Needed to Heat Water per Year		1,283	kWh /Ton	
Heat Pump Water Heating Efficiency	÷	3.50	COP	
Heat Pump Water Heating Energy Usage		367	kWh /Ton	
Base SERWH Energy Usage per Year at the Meter		1,309	kWh /Ton	
Heat Pump Water Heating Energy Usage	-	367	kWh /Ton	
Commercial Heat Pump Water Heating Savings		943	kWh /Ton	
Hours per Day		10		
Hours per Year		3,650		
Heat Pump Power Consumption		0.3	kW	
Coincedence Factor	x	0.08	cf	4.80 Minutes per hour
		0.02	kW On Peak	
Base SERWH Element Power Consumption		0.4	kW	
Coincidence Factor	x	0.143	cf	8.6 Minutes per hour
Base SERWH On Peak Demand		0.05	kW On Peak	KEMA 2008
Base SERWH On Peak Demand	-	0.05	kW On Peak	
Heat Pump Water Heater Demand	-	0.02	kW On Peak	KEMA 2008
		0.03	kW On Peak	

Commercial Solar Water Heater Demand Savings	**0.03**	**kW Savings per Ton**

13.4 High Efficiency Water Pumping

13.4.1 Domestic Water Booster Packages

Version Date & Revision History:
Draft date: May 23, 2011
Revision date May 19, 2016

Referenced Documents:
- The increased incentive was based on previous paid booster pump installations and measured energy/demand savings.
- The energy and demand impacts are based on HECO's evaluation from past projects and monitoring.

TRM Review Actions:
- 10/5/11 – Currently Under Review.
- Evergreen TRM Review – 1/15/14

Major Changes:
- Updated the TRM algorithm. Clarified energy savings to calculate per HP.
- 6/10/2016 – Removed incentive dollar values.

Description:
The purpose of this measure is to reduce energy consumption through more efficient domestic water booster systems by installing a VFD and/or reducing pump HP. Pump improvements can be done to optimize the design and control of water pumping systems. The measurement of energy and demand savings for commercial and industrial applications will vary with the type of pumping technology, operating hours, efficiency and current and proposed controls. Depending on the specific application, slowing the pump, trimming or replacing the impeller, or replacing the pump may be suitable options for improving pumping efficiency.

Base Efficiency
The baseline equipment is assumed to be a non-optimized existing pumping system. Baseline pumps are assumed to run 60% of the time.

High Efficiency
In order for this characterization to apply, the efficient equipment is assumed to be an optimized pumping system meeting applicable program efficiency requirements. The proposed Booster Pump System must be a more efficient design than the existing system. (i.e. Installed with VFD.). All pump motors must meet NEMA Premium Efficiency standards. As in the base case, enhanced pumps are assumed to run 60% of the time. Savings result from two aspects: (1) reduced horsepower and (2) reduced speed on the motor due to VFD. VFD load reduction is assumed to be 15% conservatively.

Qualification
Booster Pump applications require pre-notification before equipment is purchased and installed.
The new Booster Pump System's total horsepower must be equal to or less than that of the existing system. The system horsepower reduction must be between 0 to 129 hp. For projects with greater than 129hp, please contact the program. Booster Pump applications do not apply to New Construction.

Measure Life:
15 years

Energy and Demand Savings:

Source of Savings *(per HP)*	Yearly kWh Reduction	kW Reduction
Reduced HP	3921	0.373
Installation of VFD	588	0.056

Savings Algorithm:

Domestic Water Booster Packages

REDUCED HP

Motor Energy Consumption		0.746	kW / hp
Run Time	x	8760	hrs / year
Percent Run Time	x	60%	percent run / day
Yearly Savings per HP Reduction		3921	Total kWh savings / hp / year
		3921	**kWh Reduction / HP / Year**
Demand Savings per HP		0.746	kW savings per hp
Coincidence Factor	x	50%	peak coincidence factor
Peak Demand Savings		0.373	kW savings per hp during peak hour *(5 p.m. to 9 p.m.)*
		0.373	**Peak kW Reduction / HP**

INSTALLATION OF VFD

Motor Energy Consumption		0.746	kW / hp	
Percent Load Reduction with VFD	x	15%	percent load reduction	
Demand Savings per HP		0.112	kW savings per hp	
Run Time	x	8760	hrs / year	
Energy Savings per hp with VFD		980.24	kWh savings / hp / year	
Percent Run Time	x	60%	pump percent run time	
Total Energy Savings per hp with VFD		588	Total kWh savings / hp / year	EM&V review comments recommend 500 - 700 kWh savings (Feb. 23, 2012)
		588.15	**kWh Reduction / HP / Year**	
Demand Savings per HP		0.112	kW savings per hp	
Coincidence Factor	x	50%	peak coincidence factor	
Peak Demand Savings		0.056	kW savings per hp during peak hour *(5 p.m. to 9 p.m.)*	
		0.056	**Peak kW Reduction / HP**	

13.4.2 VFD Pool Pump Packages

Version Date & Revision History:
Draft date: February 24, 2010

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- 12/15/11 – Updated algorithm average pump size from 1.5 HP pump to 1 HP pump. Updated baseline and high efficiency calculations accordingly.

Measure Description
A variable speed commercial pool pump motor in place of a standard single speed motor of equivalent horsepower.

Definition of Efficient Equipment
The high efficiency equipment is a variable speed commercial pool pump.

Definition of Baseline Equipment
The baseline efficiency equipment is assumed to be a single speed commercial pool pump.

$$\Delta kWh = (kWBASE \times Hours) \times 55\%$$

Where:

Unit	= 2-speed or variable speed pool pump
ΔkWh	= Average annual kWh reduction
Hours	= Average annual operating hours of pump
kWBASE	= connected kW of baseline pump
55%	= average percent energy reduction from switch to 2-speed or variable speed pump (1)

Baseline Efficiency
The baseline efficiency case is a single speed pump.

High Efficiency
The high efficiency case is a 2-speed or variable speed pump.

Energy and Demand Savings
Demand Savings: 0.093 kW / HP
Energy Savings: 1123 kWh per year / HP

(1) Davis Energy Group (2008). Proposal Information Template for Residential Pool Pump Measure Revisions. Prepared for Pacific Gas and Electric Company; Page 2.

Savings Algorithm

Commercial Pool Pump

Pool Pump Horesepower	1	HP
Efficiency	0.8	
Hours of operation per day	6	hours
Number of days pool in use	365	days per year
1 HP Equals	0.746	kW

Baseline

Pump Size		1.00	HP
kW / HP	x	0.75	kW / HP
		0.75	kW
Efficiency	÷	0.80	
Based Demand		0.93	kW
Hours of operation	x	6	hours/day
Base Energy Usage per day		5.60	kWh/day
Base Energy Usage per year		2042	kWh/year

High Efficiency

Base Demand	0.93	kW
Demand Reduction	10%	
High Efficiency Demand	0.839	kW
Base Energy Usage	2042	kWh/year
Energy Reduction	55%	
High Efficiency Energy Usage	919	kWh/year

Demand Savings	**0.093**	**kW per HP**

Energy Savings per year	**1123**	**kWh/year per HP**

Deemed Lifetime of Efficient Equipment

The estimated useful life for a variable speed pool pump is 10 years.

Deemed Measure Cost

The incremental cost is estimated to be $350 for a two speed motor and $1,500 for a variable speed motor

Incremental Cost

$161 per motor. – (from: 2001 DEER Update Study, CCIG-CRE-02, p. 4-84, Xenergy, Oakland, CA.

13.5 High Efficiency Motors

13.5.1 CEE Tier 1 Listed Premium Efficiency Motors

Version Date & Revision History:
Draft date: March 2, 2011

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- 11/22/11 – Removed the following sentence from *Measure Description*: "Therefore, this measure should be suspended at that time."

Measure Description
This measure relates to the installation of premium efficiency three phase Open Drip Proof (ODP) and Totally Enclosed Fan-Cooled (TEFC) motors less than or equal to 200 HP, meeting minimum qualifying efficiency for the following HVAC applications: supply fans, return fans, exhaust fans, chilled water pumps, and boiler feed water pumps. On December 9, 2010, new federal efficiency standards will take effect requiring motors in this size category to meet National Electric Manufacturers Association (NEMA) premium efficiency levels.

- Incentives apply to both ODP and TEFC enclosures with 1200 RPM, 1800 RPM or
- 3600 RPM motors.
- Motors must meet minimum efficiency requirements as shown in the Motor Incentive Reference Table on the CEE Premium Efficient Motors list available at www.cee1.org.
- Motors greater than 200 hp will be given consideration under the Hawaii Energy Customized Program
- If motors are not listed on the CEE website, submit manufacturer specifications, motor curve and performance data to Hawaii Energy for consideration

Baseline
2007 EISA nominal efficiency (as defined in NEMA MG1 Table 12-12) motors.

High Efficient Condition
The CEE Motors List includes motors that are 1-200 hp NEMA Design A/B, 460 volts, TEFC or ODP and 1200rpm, 1800 rpm, or 3600 rpm.

Energy Savings

Based on per HP

Demand Savings	0.0283 kW
Energy Savings	46.4 kWh/year

Savings Algorithm

$\Delta kWh = HP \times 0.746 \times ((1/\eta BASE)-(1/\eta EE)) \times LF \times HOURS$

Where:

HP	= Motor Horse Power
	= Actual installed
ηBASE	= Efficiency of baseline motor. Based on EPACT 92 for installed HP
ηEE	= Efficiency of premium efficiency motor
	= Actual installed
LF	= Load factor of motor = 0.75
HOURS	= Annual motor run hours

1	HP	equals	0.746 kW
Hours of Operation		6 per day	
Hours of Operation		2190 per year	
Load Factor		0.75	

Demand	0.746 kW
Base Efficiency	80%
Base Demand	0.933 kW
Base Energy	1531.6 kWh/year
Demand	0.746 kW
High Efficiency	82.50%
High Efficiency Demand	0.904 kW
High Efficiency Energy	1485.2 kWh/year
Demand Savings	0.0283 kW
Energy Savings	46.4 kWh/year

Measure Life

15 years

Incremental Cost

1 to 5HP ($35.20 per HP)
7.5 to 20HP ($17.30 per HP)
25 to 100HP ($10.28 per HP)
125 to 250HP ($5.95 per HP)

13.5.2 Refrigeration – ECM Evaporator Fan Motors for Walk-in Coolers and Freezers

Version Date & Revision History:
Draft date:

Referenced Documents:

- 2007 Arkansas Deemed Savings Quick Start Programs http://www.aepefficiency.com/oklahoma/ci/downloads/Deemed_Savings_Report.pdf

TRM Review Actions:

- 10/5/11 – Currently Under Review.

Major Changes:

- n/a

Measure Description:
An electronically commutated motor (ECM) is a fractional horsepower direct current (DC) motor used most often in commercial refrigeration applications such as display cases, walk-in coolers/freezers, refrigerated vending machines, and bottle coolers. ECMs generally replace shaded pole (SP) motors and offer at least 50% energy savings. Analysis efforts summarized in this report focused on the most prevalent use of ECMs – refrigeration, where motor sizes are typically listed in watts (10-140 W).

Measure/Technology Review
Five of the primary data sources reviewed for this effort contained data for ECMs in refrigeration and HVAC applications. The NPCC study gave savings estimates for upgrading a CAV box single speed motor to an ECM. The other four studies gave wide ranging savings and cost data for compressor, condenser, and evaporator fan motors. KW Engineering completed a study for PacifiCorp in October of 2005 regarding the market for ECMs in walk-in refrigerators (kW Engineering, 2005). This study included the market share in each state for refrigeration ECMs as well as cost and energy savings data. These values for energy and demand savings are given in Table 1 below.

Measure Information Available	Resource	Application	Annual Energy Savings[1] (kWh/unit)	Demand Savings[1] (kW/unit)
Yes	Ecotope 2003	Small Evaporator Fan ECM	200	-
Yes	PG&E 2003	Evaporator Fan	673	0.077
Yes	Stellar Processes 2006	Small Evaporator Fan ECM	200	-
No	Xcel Energy 2006			
No	Quantec 2005			
No	DEER			
No	KEMA 2006			
Yes	CEE	Evaporator Fan – Freezer Condenser Fan – Freezer Compressor Fan – Freezer Evaporator Fan – Refrigerator Condenser Fan – Refrigerator Compressor Fan - Freezer	115 141 985 294 141 690	0.013 0.016 0.112 0.034 0.016 0.079
No	Energy Star			
No	RTF			
Yes	NPCC 2005	CAV Box	517	0.397
Yes	kW Engineering 2005	Evaporator Fan	734	0.084

[1] Savings values reflect gross savings at the customer meter

Table 1

Baseline Efficiencies:
The standard motor type for this application is a shaded pole (SP) motor. Table 2 contains the baseline annual energy consumption and demand for ECM equivalent SP motors.

Table 2 (Baseline Efficiency)

Measure	Annual Energy Consumption	Demand
Shaded Pole (SP) motor	18 kWh/W	0.002 kW/W

Minimum Requirements/High Efficiency
Any ECM up to 1 hp in size will meet the minimum requirements for both retrofit and new construction installations. Table 3 contains the estimated annual energy consumption, demand, and cost for the ECM application.

Table 3 (High Efficiency)

Measure	Annual Energy Consumption	Demand
ECM	8.7 kWh/W	0.001 kW/W

Energy Savings:

Annual Energy Savings	Demand Savings
9.3 kWh/W	0.001 kW/W

Savings Algorithms

Deemed demand and energy savings should be calculated by the following formulas for Refrigeration applications:

kW savings = Rated Wattage x (kW/Wpre - kW/Wpost)
kWh savings = Rated Wattage x (kWh/Wpre – kWh/Wpost)

Where:

Rated Wattage =	Rated Wattage of the electronically commutated motor
kW /W pre =	Demand of the existing electronically commutated motor. If unavailable, demand listed in Table 2 should be used
kW /W post =	Demand of the new electronically commutated motor. If unavailable, demand listed in Table 3 should be used
kWh /W pre =	Annual energy consumption of the existing electronically commutated motor. If unavailable, annual energy consumption listed in Table 2 should be used
kWh /W post =	Annual energy consumption of the new electronically commutated motor. If unavailable, annual energy consumption listed in Table 3 should be used

Lifetime
DEER – 15 years

13.5.3 EC Motors – Fan Coil Units

Version Date & Revision History:
Draft date:

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- n/a

Measure Description: Electronically commutated motors provide clear advantages over AC or conventional DC motors in terms of service life, controllability, flexibility, and cost-effectiveness.

For the past 30 years, forward-bladed centrifugal fans in fan coil-units have been driven by AC motors, which are typically around 45% efficient. However, the latest electronically commutated (EC) motors are 80% efficient, leading to significant operational benefits. The term EC is applied to a DC motor having electronic commutation achieved with a microprocessor.

Commutation means applying a current to the motor phases to produce the best torque at the motor's shaft. In brush-type motors, commutation is done electromechanically using graphite brushes and a commutator. In brushless motors, however, it is achieved by switching electronics using rotor-position information obtained by sensors. Thus, the EC motor is essentially a DC motor that can be connected direct to an AC mains supply.

Baseline Efficiencies:

BASE CASE		
Base demand 4 pole (1800 rpm)	107	watts

High Efficiency:

ENHANCED CASE		
High efficiency DC/EC demand	54	watts

The major advantage of EC motors over their AC counterparts is far higher efficiency, which enables a fan-coil unit to achieve a specific fan power (SFP) of 0.3 compared with 0.8 for an AC motor (the limit in the latest Building Regulations is 0.8 W/l/s).

This higher efficiency can be maintained at low speeds, so less motor heat is absorbed by the cold air discharged from the FCU, which in turn leads to more cooling applied in the space. Lower temperatures increase motor life, and in-built soft starting gives longer bearing life.

Speed control is simple, and results in impressive energy saving performance. The maximum cooling load on an FCU may only apply for 500 hour out of a total annual running time of 3,000 hour. With a typical fan coil unit, the fans deliver more air than necessary for 2500 hour/year — a shocking waste of energy.

By using the temperature controller on an FCU to reduce the speed of the EC motor during periods of reduced cooling demand, we can cut energy wastage dramatically. For example, an annual fan energy consumption of 620 kWh can be reduced to 140 kWh using speed control.

The reduction of air volume is, however, limited by considerations of the room air distribution. That is why we recommend that tests are undertaken in a suitable test facility to determine the optimum range of air volume.

Energy Savings:

ENERGY SAVINGS		
Energy savings 4 pole	232	kWh/year

PEAK DEMAND SAVINGS (5PM-9PM)		
Coincidence factor	0.5	
Peak demand savings (4 pole)	0.0265	kW

Electronically commutated motors offer six major benefits when used in fan-coil units.

• High efficiency of 85%, leading to lower input power.
• Lower rise in air temperature on the air stream.
• Efficient speed control.
• Longer motor life resulting from lower running temperatures.
• Longer bearing life because of the soft-start feature.
• Suitable for a 230 V supply.

By considering a typical 2 fan, fan coil unit providing 190l/s of air against an external resistance of 30Pa, from the testing undertaken by Caice the following figures were derived:

• 4 pole AC Motor Fan Unit powered by 2 off fans energy consumed = 107 watts, sfp 0.55 = w/l/s
• DC/EC Motor Fan Unit powered by 2 off fans energy consumed = 54 watts, sfp = 0.28 w/l/s.

Savings Algorithms

BASE CASE		
Base demand 4 pole (1800 rpm)	107	watts
ENHANCED CASE		
High efficiency DC/EC demand	54	watts
DEMAND SAVINGS		
Demand savings 4 pole	53	watts
hours of operation	12	hours/day
hours of operation	4380	hours/year
ENERGY SAVINGS		
Energy savings 4 pole	232	kWh/year
PEAK DEMAND SAVINGS (5PM-9PM)		
Coincidence factor	0.5	
Peak demand savings (4 pole)	0.0265	kW

Operating Hours
4,380 hours/year (12 hours/day)

Demand Coincidence Factor
0.5

Lifetime
15 years

13.6 Commercial Industrial Processes

13.6.1 Demand Control Kitchen Ventilation (DCKV)

Version Date & Revision History:
Draft date:

Referenced Documents:

- Detailed Energy Savings Report, Melink Corporation, http://www.melinkcorp.com/Intellihood/Energy_Analysis.pdf

TRM Review Actions:

- 10/5/11 – Currently Under Review.

Major Changes:

- n/a

Measure Description:
Kitchen ventilation with DCKV hood exhaust. Demand ventilation uses temperature and/or smoke sensing to adjust ventilation rates. This saves energy comparing with the traditional 100% on/off kitchen ventilation system.

Baseline Efficiencies:
Kitchen ventilation without DCKV. Usage per HP:

Basecase = (HP x .746 KW/HP x Hours per Year)/efficiency

Basecase fan motor usage per HP (kWh/year)	4827
Basecase fan motor demand (kW)	0.83

High Efficiency:

Usage per HP:

Enhanced case fan motor usage per HP (kWh/year)	2194
Enhanced case fan motor demand (kW)	0.38

Energy Savings:
The demand control kitchen ventilation savings were determined using the method described in the Melink Detailed Energy Savings Report.

Energy Savings from fan motor per HP (kWh/year)	2633
Demand Savings from fan motor per HP (kW)	0.45

Savings Algorithms

% Rated RPM	% Run Time	Time HRS/YR	Output KW/HP	System Efficiency	Input KW/HP	KWH/HP/YR
H	I	J=GXI	K	L	M=K/L	N=JXM
100	5%	291.2	0.746	0.9	0.829	241
90	20%	1164.8	0.544	0.9	0.604	704
80	25%	1456	0.382	0.9	0.424	618
70	25%	1456	0.256	0.9	0.284	414
60	15%	873.6	0.161	0.9	0.179	156
50	10%	582.4	0.093	0.9	0.103	60
40	0%	0	0.048	0.9	0.053	0
30	0%	0	0.02	0.9	0.022	0
20	0%	0	0.015	0.9	0.017	0
10	0%	0	0.01	0.9	0.011	0
Total kWh/HP/YR						**2194**

Basecase = (HP x .746 KW/HP x Hours per Year)/efficiency

Basecase fan motor usage per HP (kWh/year)	4827
Basecase fan motor demand (kW)	0.83

Enhanced case fan motor usage per HP (kWh/year)	2194
Enhanced case fan motor demand (kW)	0.38

Energy Savings from fan motor per HP (kWh/year)	2633
Demand Savings from fan motor per HP (kW)	0.45

Operating Schedule	
16	HR/DAY
7	DAY/WK
52	WK/YR
5824	

Demand Coincidence Factor

TBD

Persistence

TBD

Lifetime

15 Years (Hawaii Energy assumption)

Measure Costs

Measure Cost: $1,200 - $1,700 per HP based on business vertical and site complications (provided my Melink)

13.6.2 Refrigeration – Cooler Night Covers

Version Date & Revision History:
Draft date: March 4, 2016

Referenced Documents:

- CL&P Program Savings Documentation for 2011 Program Year (2010). Factors based on Southern California Edison (1997). Effects of the Low Emissive Shields on Performance and Power Use of a Refrigerated Display Case.
- Energy & Resource Solutions (2005). Measure Life Study. Prepared for the Massachusetts Joint Utilities; Page 4-5 to 4-6.

TRM Review Actions:

- 3/4/2016 – TRM entry is missing section for "TRM Review Actions"

Major Changes:

- 3/4/2016 – Added section for TRM Review Actions

Measure Description:
Installation of retractable aluminum woven fabric covers for open-type refrigerated display cases, where the covers are deployed during the facility unoccupied hours in order to reduce refrigeration energy consumption.

Baseline Efficiencies:
The baseline efficiency case is the annual operation of open-display cooler cases.

High Efficiency:
The high efficiency case is the use of night covers to protect the exposed area of display cooler cases during unoccupied hours.

Energy Savings:
ΔkWh = (Width)(Save)(Hours)
ΔkW = (Width)(Save)

Where:

Width = Width of the opening that the night covers protect (ft)
Save = Savings factor based on the temperature of the case (kW/ft) – see table below
Hours = Annual hours that the night covers are in use.

Cooler Case Temperature	Savings Factor
Low Temperature (-35 to -5 F)	0.03 kW/ft
Medium Temperature (0 F to 30 F)	0.02 kW/ft
High Temperature (35 F to 55 F)	0.01 kW/ft

Operating Hours
Hours represent the number of annual hours that the night covers are in use, and should be determined on a case-by-case basis.

Demand Coincidence Factor
Coincidence factors are set to zero since demand savings typically occur during off-peak hours

Lifetime
10 years

Eligibility

- Must install a cover on an existing open refrigerated display case to decrease its cooling load during off hours.
- The equipment manufacturer must not object to the use of night covers for the existing display case model.
- This incentive is based on linear footage of the installed night cover.
- The cover must be applied for a period of at least six hours.

Measure Costs

The linked image cannot be displayed. The file may have been moved, renamed, or deleted. Verify that the link points to the correct file and location.

13.7 Building Envelope Improvements

13.7.1 Window Tinting

Version Date & Revision History:
Draft date: March 4, 2016

Referenced Documents:

- Basis for a Prescriptive Window Film Rebate Program (Attachment G) prepared for HECO (XENERGY Inc.) November 5, 1999

TRM Review Actions:

- 10/5/11 – Currently Under Review.

Major Changes:

- Rebate increased from $0.35 to $1.00 per square foot
- Changed from 0.4 shading coefficient (SC) to 0.5 SC
- 3/4/2016 – added section for baseline efficiency description

Description:

- *Warranty* – Film must have a minimum five-year manufacturer's warranty and one-year installer's warranty
- *Conditioned Space* – Rebates shall be paid on actual square footage of glass in a conditioned space
- *Eligible Types* – Windows may be clear or factory tinted, single or double pane, but must not have reflected glass. All orientations are eligible.
- *Unshaded* – Windows significantly shaded by buildings, trees or awnings are not eligible for rebates.
- *Replacement Film* – Replacement of deteriorated window film is eligible for 50% of the rebate if the customer did not receive a rebate for the existing film.

Equipment Qualifications:

- Shading Coefficient < 0.5
- Solar Heat Gain Coefficient (SHGC) < 0.435
- SC = 0.87*SHGC
- Replacement of deteriorated window film is eligible for 50% of the incentive if the customer did not receive an incentive from the existing window film. The incentive will be rounded up.

Baseline Efficiency:

The baseline efficiency for this measure is no window tinting.

Energy and Demand Savings:

Savings	Hotel	Office	Other	Average
Energy Savings (kWh/ft2)	5.6	4.5	4.5	**4.9**
Demand Savings (kW/ft2)	0.0014	0.0008	0.0016	**0.0013**

Persistence Factor

1.0

Coincidence Factor

1.0

Lifetime

10 years (DEER)

13.7.2 Cool Roof Technologies

Measure ID:

Version Date & Revision History:
Draft date:
Revision date:

Referenced Documents:

- Evergreen TRM Review – 2/23/12
- (1) Maximum value to meet Cool Roof standards under California's Title 24
- (2) Itron. 2004-2005 Database for Energy Efficiency Resources (DEER) Update Study. December 2005.
- (3) 2008 Database for Energy-Efficiency Resources (DEER), Version 2008.2.05, "Effective/Remaining Useful Life Values",California Public Utilities Commission, December 16, 2008
- (4) 2005 Database for Energy-Efficiency Resources (DEER), Version 2005.2.01, "Technology and Measure Cost Data",California Public Utilities Commission, October 26, 2005
- (5) Coincidence factor supplied by Duke Energy for the commercial HVAC end-use. Pending verification based on information from the utilities**.**

TRM Review Actions:

- 10/5/11 – Currently Under Review.

Major Changes:

- n/a

Description

This section covers installation of "cool roof" roofing materials in commercial buildings with mechanical cooling. The cool roof is assumed to have a solar absorptance of 0.3(1) compared to a standard roof with solar absorptance of 0.8(2). Energy and demand saving are realized through reductions in the building cooling loads. The approach utilizes DOE-2.2 simulations on a series of commercial prototypical building models. Energy and demand impacts are normalized per thousand square feet of roof space.

Definition of Efficient Equipment

The efficient condition is a roof with a solar absorptance of 0.30.

Definition of Baseline Equipment

The baseline condition is a roof with a solar absorptance of 0.80.

Deemed Lifetime of Efficient Equipment

The expected lifetime of the measure is 15 years.

Deemed Measure Cost

The full installed cost for retrofit applications is $8,454.67 per one thousand square feet (4).

Deemed O&M Cost Adjustments

There are no expected O&M cost adjustments for this measure.

Coincidence Factor
The coincidence factor (CF) is 0.50.

Energy Savings
ΔkWh = SF / 1000 * ΔkWhkSF
ΔkWh = 0.25 kWh / square feet

Demand Savings
ΔkW = ΔkW x CF

Demand Savings per square feet

ΔkW = 0.0001/SF * 0.50
ΔkW = 0.00005 kW

Baseline Adjustment
There are no expected future code changes to affect this measure.

Deemed O&M Cost Adjustment Calculation
There are no expected O&M costs or savings associated with this measure.

Unit energy, demand, and gas savings data is based on a series of prototypical small commercial building simulation runs.

13.8 Energy Star Business Equipment

13.8.1 Refrigerators w/Recycling

Version Date & Revision History:
Draft date: February 24, 2010

Referenced Documents:
- HECO DSM Docket – Backup Worksheets - Global Energy (07-14-06)
- Econorthwest TRM Review – 6/23/10
- Department of Energy Refrigerator Profile – Updated December 2009

TRM Review Actions:
- 6/23/10 Rec. # 11 – Revise savings to be consistent with ENERGY STAR estimates. – Adopted with modifications on refrigerator figures based on DOE Refrigerator profile and the addition of bounty, recycle with new figures.
- 6/23/10 Rec. # 12 – Split the claimed savings by appliance. – Adopted.
- 6/23/10 Rec. # 14 – Revise demand savings values for ENERGY STAR appliances – Adopted.
- 10/5/11 – Currently Under Review.

Major Changes:
- Split between ESH appliances
- Incorporation of three refrigerator categories (new, new with turn in, and bounty (turn in only))
- All ESH 313 kWh and 0.12 kW changed to:
  - New ES Refrigerator Only – 105 kWh, .017 kW
  - New ES Refrigerator with Turn-In – 822 kWh, .034 kW

Measure Description:
The replacement of standard Refrigerators for business locations.

Appliances must comply with:
- Energy Star

Refrigerators – ENERGY STAR refrigerators utilize improvements in insulation and compressors.

Baseline Efficiencies:
Baseline energy usage based on 2009 Energy Star Information for the appliances are as follows:

	Demand Baseline (kW)	Energy Baseline (kWh)	Notes
Non ES Qualifying Refrigerator		537	19.0-21.4 Top Freezer

High Efficiency:

The high efficiency case Energy Star energy usage based on 2009 Energy Star Calculator Information and DOE Refrigerator Market Profile for the appliances is as follows:

	Demand High Efficiency (kW)	Energy High Efficiency (kWh)	Notes
ES Qualifying Refrigerator		435	19.0-21.4 Top Freezer

Energy Savings:

Energy Star Appliance Gross Savings before operational adjustments:

	Demand Savings (kW)	Energy Savings (kWh)
ES Refrigerator	0.017	105
ES Refrigerator with Turn-In	0.034	822

Energy Star Appliance Net Savings operational adjustments:

Operational Factor	Adjustment Factor
Persistence Factor (pf)	1.0
Demand Coincidence Factor (cf)	1.0

Savings Algorithms

Energy Star Refrigerator and Turn In Refrigerator - Single and Multi Family Residential Home

Opportunity		Energy Usage		
New Non-ENERGY STAR		540		Table 2
New ENERGY STAR Refrigerator	-	435		Table 2
		105	kWh/Year	Table 1
#1 - Purchase of ENERGY STAR Refrigerator		105		Table 1
#2 - Removal of Old Unit from Service (off the grid)	+	717		Table 1
#1 + #2 = Purchase ES and Recycle old unit		822	kWh/Year	

	Energy Usage	Ratio	Contribution		
Post-1993 Refrigerator	640	55%	354.54		Table 3
Pre-1993 Refrigerator	1,131	45%	504.46		Table 3
			859	kWh/Year	

Table 1

Energy Savings Opportunities for Program Sponsors

Opportunity	Annual Savings			
	Per Unit		Aggregate U.S. Potential	
	kWh	$	MWh	$ million
1. Increase the number of buyers that purchase ENERGY STAR qualified refrigerators. • 9.3 million units were sold in 2008. • 70 percent were not ENERGY STAR. • 6.5 million potential units per year could be upgraded.	105	11.64	675,928	75
2. Decrease the number of units kept on the grid when new units are purchased. • 8.7 million primary units were replaced in 2008. • 44 percent remained in use, whether they were converted to second units, sold, or given away. • 3.8 million units are candidates for retirement every year.	717	79.53	2,746,062	305
3. Decrease the number of second units. • 26 percent of households had a second refrigerator in 2008. • 29.6 million units are candidates for retirement.	859	95.28	25,442,156	2,822
4. Replace pre-1993 units with new ENERGY STAR qualified models. • 19 percent of all units in use in 2008 were manufactured before 1993. • 27.3 million total potential units are candidates for targeted replacement.	730	81	19,946,440	2,212

Sources: See endnote 10.

Table 2

Energy and Cost Comparison for Upgrading to ENERGY STAR

Purchase Decision	New Non-ENERGY STAR Qualified Refrigerator	New ENERGY STAR Qualified Refrigerator
Annual Consumption	540 kWh	435 kWh
	$60	$48
Annual Savings	–	105 kWh
	–	$12
Average Lifetime	12 years	12 years
Lifetime Savings	–	1,260 kWh
	–	$140
Price Premium	–	$30 - $100
Simple Payback Period	–	3-9 years

Note: Calculations based on shipment-weighted average annual energy consumption of 2008 models. An ENERGY STAR qualified model uses 20 percent less energy than a new non-qualified refrigerator of the same size and configuration.

Source: See endnote 10.

Table 3

Energy and Cost Comparison for Removing a Second Refrigerator from the Grid

Fate of Unit	Post-1993 Unit		Pre-1993 Unit	
	Remains on the Grid	Removed from the Grid	Remains on the Grid	Removed from the Grid
Annual Consumption	640 kWh	–	1,131 kWh	–
	$71	–	$125	–
Annual Savings	–	640 kWh	–	1,131 kWh
	–	$71	–	$125
Average Lifetime*	6	–	6	–
Lifetime Savings*	–	3,840 kWh	–	6,788 kWh
	–	$426	–	$753
Removal Cost	–	$50 - $100	–	$50 - $100
Simple Payback Period	–	1-2 years	–	<1 year

*Assumes unit has six years of functionality remaining.

Sources: See endnote 10.

Operating Hours
Refrigerators = 8,760 hours per year

Loadshape
TBD

Freeridership/Spillover Factors
TBD

Demand Coincidence Factor
NA

Persistence
NA

Lifetime
14 years

Measure Costs and Incentive Levels

Residential Measure Costs and Incentive Levels

Description	Unit Incentive	Incremental Cost HECO DSM Docket 2006	Average Incremental Cost Energy Star 2009
ES Refrigerator	$50	$ 60.36	$ 65
ES Refrigerator w/turn in	$125		$130*

***Estimated value**

13.9 Energy Awareness, Measurement and Control Systems

13.9.1 Condominium Submetering

Version Date & Revision History:
Draft date: March 4, 2016

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- 3/4/2016 – added measure description and equipment qualifications

Measure Description:
This program is to assist master-metered condominiums and their Association of Apartment Owners (AOAO) efforts to reduce energy consumption and implement the current submetering proposal as one that will insure both equity and fairness in allocating energy costs as well as encouraging energy conservation through direct feedback of personal energy use to tenants.

The combination of billing submeters, along with education, peer group comparisons and special equipment offerings, will assist the tenant achieve significant energy conservation and efficiency.

Equipment Qualifications:
The manufacturer's submetering system model type to be installed (meter and CTs) must have been tested by an independent third party that is Nationally Rated Testing Laboratory certified for ANSI C12.1. The certification documentation must be provided to the Program prior to installation. Additionally, manufacturers must have a factory-quality compliance procedure in place to ensure meter accuracy. Documentation of this procedure must be available to the Program upon request. The submeter must be UL, CSA or ETL listed (Electrical Safety).

Requirements:
- The metering system must remain in place and billing to occur for a period of at least five (5) years or a pro-rated portion of the incentive will be recovered by Hawaii Energy. Provide Hawaii Energy with energy meter data for analysis purposes.
- A joint educational and monitoring program will be undertaken with AOAO to assist in the verification of savings and development of an ongoing energy incentive offering for other condominiums in Hawaii.

Baseline

The base case is no submetering. Baseline Annual Energy Usage is the actual average usage (kWh/year) based on historical usage for past 24 months (or as appropriate) for entire condominium (master metered) divided by the number of condominium units. Baseline demand (kW) is the Average Historical Demand divided by the number of condominium units.

Building Types	Demand Baseline (kW)	Energy Baseline (kWh/year)
Condominium	1.42	7,200

High Efficiency

The high efficiency case is with submetering. It is expected there will be a 10% reduction in energy usage and 8% reduction in peak demand during (5PM – 9PM).

Building Types	Efficient Case (kW)	Efficient Case (kWh/year)
Condominium	1.30	6,480

Energy and Demand Savings (for illustration purposes only):

Building Types	Gross Customer Savings (kW)	Gross Customer Savings (kWh/year)
Condominium	0.113	720

Operational Factor	Adjustment Factor
Persistence Factor (pf)	1.00
Demand Coincidence Factor (cf)	1.00

Building Types	Net Customer Savings (kW)	Net Customer Savings (kWh/year)
Condominium	0.113	720

Example Savings Algorithm:

Submetering (Condominium)				
Average Master Meter Energy Usage (kWh/month)		180,000	kWh per month	
Number of tenant Units	÷	300	Units	
Average Tenant Energy Usage (Example)		600	kWh per home per month	
	x	12	month per year	
Baseline Annual Household Energy Usage		7,200	kWh per Year	
Average Master Meter Demand (kW)		425		
Number of tenant Units	÷	300		
Baseline Demand (kW)		1.42	kW	
Energy Reduction		10.0%		
Actively Informed Household Energy Usage		6,480	kWh per Year	
Baseline Annual Household Energy Usage		7,200	kWh per Year	
Actively Informed Household Energy Usage	-	6,480	kWh per Year	
Gross Customer Level Energy Savings		720	kwh per Year	
Gross Customer Level Energy Savings		720	kwh per Year	
Persistance Factor	x	1.0		
Net Customer Level Savings		720	kwh per Year	
Submetering Energy Savings		720	kWh / Year Savings	
Baseline Household Demand		1.42	kW	HECO 2008 Load Study
Peak Demand Reduction		8.00%		
Actively Informed Household Demand		1.30	kW	
Baseline Household Demand		1.42	kW	
Actively Informed Household Demand	-	1.30	kW	
Gross Customer Demand Savings		0.113	kW	
Gross Customer Demand Savings		0.113	kW	
Persistance Factor	x	1.0		
Coincidence Factor	x	1.0		
		0.113	kW	
Condominium Sub-Metering Demand Savings		0.113	kW Savings	

Notes

- Incentive payment will be made upon billing individual tenants.
- Incentive payment cannot exceed 50% of total project cost.
- The payment of the incentive will be based on the AOAO securing the approval, installing and utilizing the submeters for billing purposes.

- There is no minimum reduction in electrical use to be required by AOAO to retain the incentive.

Measure Life:
8 years (based on DEER. Similar technology as time-clocks and occupancy sensors)

13.9.2 Small Business Submetering Pilot

Version Date & Revision History:
Draft date: March 4, 2016

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- 3/4/2016 – Added measure description and equipment qualifications

Measure Description:
This program is to assist master-metered small businesses to reduce energy consumption that will insure both equity and fairness in allocating energy costs as well as encouraging energy conservation through direct feedback of personal energy use to business tenants.

The combination of billing submeters, along with education, peer group comparisons and special equipment offerings, will assist the tenant achieve significant energy conservation and efficiency.

Equipment Qualifications:
The manufacturer's submetering system model type to be installed (meter and CTs) must have been tested by an independent third party that is Nationally Rated Testing Laboratory certified for ANSI C12.1. The certification documentation must be provided to the Program prior to installation. Additionally, manufacturers must have a factory-quality compliance procedure in place to ensure meter accuracy. Documentation of this procedure must be available to the Program upon request. The submeter must be UL, CSA or ETL listed (Electrical Safety).

Requirements:
- The metering system must remain in place and billing to occur for a period of at least five (5) years or a pro-rated portion of the incentive will be recovered by Hawaii Energy. Provide Hawaii Energy with energy meter data for analysis purposes.

- A joint educational and monitoring program will be undertaken with the businesses to assist in the verification of savings and development of an ongoing energy incentive offering for other condominiums in Hawaii.

Baseline

The base case is no submetering

Building Types	Demand Baseline (kW)	Energy Baseline (kWh/year)
Small Business	3.00	10,800

High Efficiency

The high efficiency case is with submetering

Building Types	Efficient Case (kW)	Efficient Case (kWh/year)
Small Business	2.76	9,720

Energy and Demand Savings:

Building Types	Gross Customer Savings (kW)	Gross Customer Savings (kWh/year)
Small Business	0.24	1,080

Operational Factor	Adjustment Factor
Persistence Factor (pf)	1.00
Demand Coincidence Factor (cf)	1.00

Building Types	Net Customer Savings (kW)	Net Customer Savings (kWh/year)
Small Business	0.24	1,080

It is expected there will be at least 10% reduction in energy usage and 8% reduction in peak demand during (5PM – 9PM), however, there is no minimum reduction in electrical use to be required to retain the incentive.

Example Savings Algorithm:

Small Business Submetering			
Average Tenant Energy Usage		900	kWh per business per month (Schedule G)
	x	12	
Baseline Business Energy Usage		10,800	kWh per Year
Energy Reduction		10.0%	
Actively Informed Business Energy Usage		9,720	kWh per Year
Baseline Business Energy Usage		10,800	kWh per Year
Actively Informed Business Energy Usage	-	9,720	kWh per Year
Gross Customer Level Energy Savings		1,080	kwh per Year
	x	1,000	Watts per kW
	÷	8,760	Hours per Year
Average 24/7 Demand Reduction		123	Watts
Gross Customer Level Energy Savings		1,080	kwh per Year
Persistance Factor	x	1.0	
Net Customer Level Savings		1,080	kwh per Year
Submetering Energy Savings		1,080	kWh / Year Savings
Baseline Business Demand		3.00	kW
Peak Demand Reduction		8.00%	
Actively Informed Business Demand		2.76	kW
Baseline Business Demand		3.00	kW
Actively Informed Business Demand	-	2.76	kW
Gross Customer Demand Savings		0.240	kW
Gross Customer Demand Savings		0.240	kW
Persistance Factor	x	1.00	
Coincidence Factor	x	1.00	
		0.240	kW
Small Business Demand Savings		0.24	kW Savings

Incentives/Incremental Cost

- Incentive payment will be made upon billing individual tenants.
- Incentive payment cannot exceed 50% of total project cost.

13.9.3 Vending Misers

Measure ID:

Version Date & Revision History:
Draft date: March 2, 2011

Referenced Documents:

(1) USA Technologies Energy Management Product Sheets (2006). http://www.usatech.com/energy_management/energy_productsheets.php. Accessed 9/1/09.

TRM Review Actions:

- n/a

Major Changes:

- none

Measure Description
Controls can significantly reduce the energy consumption of vending machine lighting and refrigeration systems. Qualifying controls must power down these systems during periods of inactivity but, in the case of refrigerated machines, must always maintain a cool product that meets customer expectations. This measure applies to refrigerated beverage vending machines, non-refrigerated snack vending machines, and glass front refrigerated coolers. This measure should not be applied to ENERGY STAR® qualified vending machines, as they already have built-in controls.

Algorithms for Calculating Primary Energy Impact
Unit savings are deemed based on the following algorithms and assumptions:

ΔkWh = (kWrated)(Hours)(SAVE)
ΔkW = ΔkWh/ Hours

Where:

kWrated = Rated kW of connected equipment. See Table below for default rated kW by connected equipment type.
Hours = Operating hours of the connected equipment: default of 8,760 hours
SAVE = Percent savings factor for the connected equipment. See table below for values.

Vending Machine and Cooler Controls Savings Factors

Machine Type	kW Savings	kWh/year Savings
Refrigerated beverage vending maching (cans or bottles)	0.184	1612
Refrigerated	0.124	1086
Non-refrigerated snack vending machine	0.044	387
All (Average)	0.117	1028

Baseline Efficiency
The baseline efficiency case is a standard efficiency refrigerated beverage vending machine, non-refrigerated snack vending machine, or glass front refrigerated cooler without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

High Efficiency
The high efficiency case is a standard efficiency refrigerated beverage vending machine, non-refrigerated

snack vending machine, or glass front refrigerated cooler with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Hours
It is assumed that the connected equipment operates 24 hours per day, 7 days per week for a total annual operating hours of 8,760.

Measure Life
8 Years

13.9.4 Water Cooler Timer (H_2Off)

Measure ID:

Version Date & Revision History:
Draft date:

Referenced Documents:

- LBNL 2007
  - http://enduse.lbl.gov/info/LBNL-56380%282007%29.pdf
  - EPA2012
    http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=WA#

TRM Review Actions:

- Currently Under Review.

Major Changes:

- N/A

Measure Description:
Many businesses have water coolers, often equipped with both cold and hot water spigots. Unbeknownst to many, however, is how much energy is used to continuously keep that water hot and cold. Think about it: Water coolers are generally plugged in 24/7, so they're ready and waiting to make a nice cup of hot tea if someone happens to drop by the office at 3 a.m.

Similar to the timers you might use to control lights in your home, plug-in appliance timers allow you to pre-program the times that various appliances in your business are turned on and drawing electricity. So you could pre-program the water cooler so it turns on one hour before the office opens and turns off again after everyone leaves.

Baseline Efficiencies:
No timer

	Energy Usage	
Type of Water Cooler	Cold Only (kWh/day)	Hot/Cold (kWh/day)
ENERGY STAR	0.16	1.20
Conventional	0.29	2.19

Hours per Day	24
Days per year	365

Base Case Usage	Cold Only	Hot/Cold
ENERGY STAR USAGE (kWh/year)	58	438
Conventional (kWh/year)	106	799

High Efficiency:

Enhanced Case Usage	Cold Only	Hot/Cold
ENERGY STAR USAGE (kWh/year)	21	157
Conventional (kWh/year)	38	287

Energy Savings:

Energy Savings	Cold Only	Hot/Cold
ENERGY STAR USAGE (kWh/year)	37	281
Conventional (kWh/year)	68	512
Average Savings (kWh/year)	**53**	**397**

Energy Savings Assumptions:

It is assumed that half of all water coolers are Energy Star and half are not:

- 50% Energy Star
- 50% Conventional

It is assumed that half of all water coolers are cold only and half are hot + cold dispenser:

- 50% Cold Only
- 50% Hot + Cold

The energy savings figure will be based on the average of the above-mentioned percentages.

Persistence Factor = 90%

Energy Savings = 225 x 90% = 202.5 kWh/year

Demand Savings:

Taking a conservative approach, the demand savings will based on the following calculation and methodology:

Demand Savings = 225 kWh/year divided by 8760 hrs/year = 0.026 kW

Coincidence Factor = 75%

Note: Based on utilization of 3 of the 4 peak hours (6PM-9PM). 5PM-6PM is not counted since most offices close at 5PM and the timer should be set to turn off cooler 1 hour after office closes which is 6PM.

Coincidence Demand Savings = 0.026 kW x .75 = 0.020 kW

Persistence = 90% (10% of people will disconnect)

Peak Demand Savings = 0.020 kW x .90 = 0.018 kW

Savings Algorithms

Hours per Day	24
Days per year	365

Base Case Usage	Cold Only	Hot/Cold
ENERGY STAR USAGE (kWh/year)	58	438
Conventional (kWh/year)	106	799

Weekday OFF (Hour/Day)	12
Weekend OFF (Hour/Day)	24
Weekday (Day/week)	5
Weekend (Day/week)	2
Weekday (Week/year)	52
Weekend (Week/year)	52
Hours OFF	5616
Hours per Year	8760
Hours OFF (%)	64%
Hours ON (%)	36%

Enhanced Case Usage	Cold Only	Hot/Cold
ENERGY STAR USAGE (kWh/year)	21	157
Conventional (kWh/year)	38	287

Energy Savings	Cold Only	Hot/Cold
ENERGY STAR USAGE (kWh/year)	37	281
Conventional (kWh/year)	68	512
Average Savings (kWh/year)	**53**	**397**

Operating Hours

Weekday OFF (Hour/Day)	12
Weekend OFF (Hour/Day)	24
Weekday (Day/week)	5
Weekend (Day/week)	2
Weekday (Week/year)	52
Weekend (Week/year)	52
Hours OFF	5616
Hours per Year	8760
Hours OFF (%)	64%
Hours ON (%)	36%

Lifetime
5 years

13.10 High Efficiency Transformer

13.10.1 Transformer

Measure ID:

Version Date & Revision History:
Draft date: November 25, 2014

Referenced Documents:
- CEE – Commercial and Industrial Distribution Transformer Initiative (November 9, 2011)
- Average Marginal Cost data from survey of manufacturers' current products; price to channel. Energy performance data prepared by members of the CEE Distribution Transformers Committee assuming a constant, linear load at 35% of unit capacity.
- CEE Tier 1 criteria are identical to NEMA Premium voluntary standard levels and the US DOE Energy Efficiency Level 2 (Distribution Transformers Technical Support Document, 2011)
- CEE Tier 2 criteria are identical to US DOE Energy Efficiency Level 5 (Distribution Transformers Technical Support Document, 2011)
- Barnes, P. R., J. W. Van Dyke, B. W. McConnell, and S. Das, Determination Analysis of Energy Conservation Standards for Distribution Transformers, 1996, Oak Ridge National Laboratory. Oak Ridge, TN. Report No. ORNL-6847.
  Distribution Transformer Standards Rulemaking. Dry-type Distribution Transformers, Life Cycle Cost Analysis on Design Line 9. Prepared for: Building Technology Program Office of Energy Efficiency and Renewable Energy (US Department of Energy), October 4, 2002. LBNL.

TRM Review Actions:
- N/A

Major Changes:
- N/A

Measure Description:
Distribution transformers are used in commercial and industrial applications to step down power from distribution voltage to be used in HVAC or process loads (220V or 480V) or to serve plug loads (120V). They are made up of one or more cores (typically carbon steel), two sets of metal windings (copper or aluminum), an insulating material (oil or air), and a container shell. Distribution transformers have no moving parts.

Baseline Efficiencies:
- NEMA TP-1 (current federal minimum standard level)

High Efficiency:
- CEE Tier I (single phase)
- CEE Tier II (single or three phase)

Energy and Peak Demand Savings:
Transformer energy efficiency is the ratio of output power to distribution voltage input power. Between input and output the transformer experiences losses, generally characterized as core losses (or no-load losses) and winding losses (or load losses). Core losses occur in the core materials of the transformer and are constant whenever the transformer is energized, regardless of load. Winding losses occur in the transformer windings, and increase exponentially with load.

Total losses, energy and demand savings associated with CEE Tier 1 level for **single-phase** transformers:

KVA	Total Losses (kWh/yr)		Energy Savings vs. Baseline (kWh/yr)	Demand Savings vs. Baseline (kW)
	Baseline	Tier 1	Tier 1	Tier 1
15	1058	740	318	0.04
25	1533	1073	460	0.05
37.5	2070	1449	621	0.07
50	2606	1824	782	0.09
75	3449	2414	1035	0.12
100	4292	3005	1287	0.15
150	*6056*	*4239*	*1817*	*0.21*
167	6656	4659	1997	0.23
250	9198	6439	2759	0.31
333	11231	7862	3369	0.38

Total losses, energy and demand savings associated with CEE Tiers for **three-phase** equipment

KVA	Total Losses (kWh/yr)			Energy Savings vs. Baseline (kWh/yr)		Demand Savings vs. Baseline (kW)		Marginal Equipment Cost: Tier 1 vs. Baseline
	Baseline	**Tier 1**	**Tier 2**	**Tier 1**	**Tier 2**	**Tier 1**	**Tier 2**	
15	1380	966	736	414	644	0.05	0.07	$ 448
25	*1993*	*1395*	*1073*	*598*	*920*	*0.07*	*0.11*	*$ 687*
30	2300	1610	1242	690	1058	0.08	0.12	$ 807
45	3173	2221	1683	952	1490	0.11	0.17	$ 851
75	4599	3219	2460	1380	2139	0.16	0.24	$ 1,115
112.5	6209	4346	3346	1863	2863	0.21	0.33	$ 2,144
150	7818	5473	4139	2345	3679	0.27	0.42	$ 2,740
225	10348	7243	4139	3105	6209	0.35	0.71	$ 3,617
300	12877	9014	5151	3863	7726	0.44	0.88	$ 5,078
450	*18166*	*12716*	*6922*	*5450*	*11244*	*0.62*	*1.28*	*$ 4,881*
500	19929	13950	7512	5979	12417	0.68	1.42	$ 4,815

Operating Hours
24/7

Demand Coincidence Factor
TBD

Persistence
TBD

Lifetime
Measure life = **32 years** (Based on ORNL-6847, Determination Analysis of Energy Conservation Standards for Distribution Transformers)

Measure Costs and Incentive Levels

- Marginal (incremental) cost – see table above for 3-Phase.
- > 500 KVA (3-Phase) will be based on Custom Incentive Program
- > 333 KVA (Single Phase) will be based on Custom Incentive Program
- If a transformer size is not listed in table, we will apply the lower value
- Incentive level is based on the following table:

KVA	Energy Savings vs. Baseline (kWh/yr)		Inventives (total) $	
	Tier 1	Tier 2	Tier 1	Tier 2
Single-phase				
15	318		$ 80	
25	460		$ 115	
37.5	621		$ 155	
50	782		$ 195	
75	1035		$ 260	
100	1287		$ 320	
150	1817		$ 455	
167	1997		$ 500	
250	2759		$ 690	
333	3369		$ 840	
Three-phase				
15	414	644	$ 105	$160
25	598	920	$ 150	$230
30	690	1058	$ 175	$265
45	952	1490	$ 240	$375
75	1380	2139	$ 345	$535
112.5	1863	2863	$ 465	$715
150	2345	3679	$ 585	$920
225	3105	6209	$ 775	$1,550
300	3863	7726	$ 965	$1,930
450	5450	11244	$ 1,365	$2,810
500	5979	12417	$ 1,495	$3,100

14 Custom Business Energy Efficiency Measures (CBEEM)

14.1 Customized Project Measures

14.1.1 Customized Project Measures

Version Date & Revision History:
Draft date: March 4, 2016

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- 3/4/16 – Modified criteria for non-Energy Star, DLC, and Lighting Facts LED Lamps

Description: The Custom project measure is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Non-Lighting Measures:

Measure Life	Reduction in Energy Use Incentive	Evening Peak Demand Reduction (5:00 p.m. to 9:00 p.m. weekdays)	Day Peak Demand Reduction (HVAC only) (12:00 p.m. to 2:00 p.m. weekdays)	First Year Energy Savings (kWh)	Demand Savings (kW)
<= 5 years	$0.10 /kWh	$125 / kW	*$100 / kW		
> 5 years	$0.20 /kWh	$125 /kW	*$100 /kW		

Lighting Measures:

Measure Life	Reduction in Energy Use Incentive	Evening Peak Demand Reduction (5:00 p.m. to 9:00 p.m. weekdays)	First Year Energy Savings (kWh)	Demand Savings (kW)
<= 5 years	$0.10 /kWh	$125 / kW		
> 5 years	$0.15 /kWh	$125 /kW		

Program Requirements:
- Approval is required prior to the start of work on any customized project.
- Total resource benefit ratio is greater than or equal to 1.
- Incremental simple payback greater than one year or six months for lighting projects.

Requirements for Non ENERGY STAR®, DLC or Lighting Facts LED Lamps	
For LED products that do not fall into one of the existing DLC product categories, we will accept products that meet all of the following criteria:	• UL Listed • LM79 and LM80 tests • Five year manufacturer warranty

Category of Measure and Total Resource Cost

Custom Measures under 5 years

1. Lighting
   - TRC = $600,000

Custom Measure over 5 years

1. Lighting (LED & Non-LED)
   - TRC = $5,200,000

2. Mixed
   - TRC = $1,724,000

Energy and Demand Savings:

All assumptions, data and formulas used in the calculations must be clearly documented. Standard engineering principles must be applied, and all references cited. Energy saving calculations shall also reflect the interactive effects of other simultaneous technologies to prevent the overstatement of the actual savings. Proposed base and enhanced cases must be performed by a qualified person or firm. In some cases, a professional engineer may be required to provide verification of the analysis.

Savings Algorithms

Gross energy and demand savings estimates for custom projects are calculated using engineering analysis and project-specific details. Custom analyses typically include a weather dependent load bin analysis, whole building energy model simulation, or other engineering analysis and include estimates of savings, costs, and an evaluation of the project's cost-effectiveness.

Baseline Efficiency

The baseline efficiency case assumes compliance with the efficiency requirements as mandated by the Hawaii State Energy Code or industry accepted standard practice.

High Efficiency

The high efficiency scenario is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective and pass total resource benefit and have a payback greater than or equal to 1.

Persistance Factor
PF = 1 since all custom projects require verification of equipment installation.

Incentives

- Incentives is limited to 50% of incremental costs.
- Installations are subject to inspection for up to 5 years. Removal will be cause for incentive forfeiture.

14.1.2 Efficiency Project Auction

Version Date & Revision History:
Draft date: June 20, 2014

Referenced Documents:
- n/a

TRM Review Actions:
- Currently under review

Major Changes:
- New measure

Description:
Hawaii Energy will issue a call for projects for innovative energy efficiency programs from third parties. Eligible projects in this auction are any new technology, marketing approach or customer segment not already offered or served Hawaii Energy PY14 programs. Projects may include new technologies if it can be demonstrated that the technology is commercially available and any performance issues have been investigated and resolved. A ceiling price and evaluation methods will be defined in the call for projects.

Energy Savings:
The Custom project measure is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Life:
DEER

Energy Savings:
Based on Pre/Post data logging

Demand Savings:
Based on Peak 5PM-9PM

15 Business Energy Services and Maintenance (BESM)

15.1 Business Direct Installation

15.1.1 Small Business Direct Lighting Retrofits

Version Date & Revision History:
Draft date: Marcy 4, 2016

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.
- 3/4/16 – Added language to include restaurants in program requirements to reflect current practices

Major Changes:
- n/a

Measure Description:
The program targets customers within the small business market. Typically this market has limited time and expertise within their organizations to research lighting technology options, obtain financing and contract with lighting contractors to replace their older less efficient lighting technologies. The Small Business Lighting Retrofit provides a “Turnkey” program consisting of audits, fixed pricing, installation by participating Hawaii Energy contractors and 4 month financing of lighting retrofits.

Baseline Efficiency:
The baseline efficiency for this measure is the actual existing lighting at the small business and their actual estimated annual hours of operation.

Program Requirements:
Small Business Customers receiving eclectic power under a Schedule “G” rate, or are similar to Schedule “G” but are under master-metered accounts, are eligible under this program. In addition to schedule G accounts, all restaurants are eligible given the historically hard-to-reach nature of this sector.

Savings Algorithms

Small Business Direct Install Lighting Retrofit Pilot Program

Summary Sheet

Business Name:		Contractor Name:	
Contact Name:		Auditor Name:	
Address:		Address:	
Phone:		Phone:	
Fax:		Fax:	
Email:		Email:	

Total Watts Saved	Energy Savings	Energy Cost Savings	Hawaii Energy Participating Contractor NTE Pricing	Hawaii Energy Cash Incentive	Net Customer Cost	Simple Payback	4 Month Monthly Payment	Monthly Savings % of Payment
1,323 W	3,324 kWh/yr.	$ 776 / yr.	$ 2,300	$ 833	1,467	23	367	18%

Step 1	
f2	
Oahu	Island of Project Location
$ 0.234 /kWh	2010 "G" Marginal Cost of Electricity

Measure Code	Existing Technology	New Technology	Step 2: Total Units	Step 3: M-F Hours per Day	Sat. Hours per Day	Sun. Hours per Day	Annual Hours of Operation	Step 4: Wkdays Hours on between 5 and 9 p.m.	On-Peak Fraction	Total Watts Saved	Energy Savings	Energy Cost Savings	Hawaii Energy Participating Contractor NTE Pricing	Hawaii Energy Cash Incentive	Net Customer Cost	Simple Payback	6 Month Monthly Payment	Monthly Savings % of Payment
			(each)				(hrs/year)	(hrs)	(%)	(Watts)	(kWh/Year)	($/year)	($)	($)	($)	(Months)	($/month)	(%)
			a	b1a	b1b	b2a	b3 = b1*b2*(365/7)	c	c2 =c / 4	d = a x o	e = b x (d/1000)	f = e x f2	g = a x p	h = a x q	i = a x (p-q)	j = (i/f) x 12	k = i /6	l = (f/12)/k
8L1-4L2	8 ft. 1 Lamp F96	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 75	$ 62	$ 13	6	$ 2.24	100%
8L2-4L2	8 ft. 2 Lamp F96	4 ft. 2 lamp F25/28 H	1	8	8	0	2,503	-	0%	57	143	$ 33	$ 84	$ 53	$ 31	11	$ 5.17	54%
8L2HO-4L2R	8 ft. 2 Lamp F96 HO	4 ft. 2 lamp F25/28 N, Reflct.	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 85	$ 27	$ 58	26	$ 9.67	23%
8L2HO-4L4	8 ft. 2 Lamp F96 HO	4 ft. 4 lamp F25/28 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 138	$ 53	$ 85	19	$ 14.17	32%
4L4-4L4	4 ft. 4 Lamp F40	4 ft. 4 lamp F25/28 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 83	$ 51	$ 32	7	$ 5.33	84%
4L4-4L2R	4 ft. 4 lamp F40	4 ft. 2 lamp F25/28 N, Reflct.	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 65	$ 27	$ 38	17	$ 6.33	35%
4L3-4L3	4 ft. 3 lamp F40	4 ft. 3 lamp F25/28 N, Reflct.	1	8	8	0	2,503	-	0%	69	173	$ 40	$ 74	$ 38	$ 36	11	$ 6.00	56%
4L3-4L2R	4 ft. 3 lamp F40	4 ft. 2 lamp F25/28 N, Reflct.	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 65	$ 27	$ 38	17	$ 6.33	35%
4L2-4L2	4 ft. 2 lamp F40	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 35	$ 27	$ 8	4	$ 1.33	168%
4L1-4L1	4 ft. 1 lamp F40	4 ft. 1 lamp F25/28 N	1	8	8	0	2,503	-	0%	23	58	$ 13	$ 30	$ 14	$ 16	14	$ 2.67	42%
4L4-4L4	4 ft. 4 lamp F32	4 ft. 4 lamp F25/28 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 83	$ 34	$ 49	11	$ 8.17	55%
4L4-4L2	4 ft. 4 lamp F32	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 65	$ 53	$ 12	5	$ 2.00	112%
4L3-4L3	4 ft. 3 lamp F32	4 ft. 3 lamp F25/28 N	1	8	8	0	2,503	-	0%	69	173	$ 40	$ 74	$ 26	$ 48	14	$ 8.00	42%
4L3-4L2	4 ft. 3 lamp F32	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 65	$ 25	$ 40	18	$ 6.67	34%
4L2-4L2	4 ft. 2 lamp F32	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 35	$ 27	$ 8	4	$ 1.33	168%
4L1-4L1	4 ft. 1 lamp F32	4 ft. 1 lamp F25/28 N	1	8	8	0	2,503	-	0%	23	58	$ 13	$ 35	$ 9	$ 26	23	$ 4.33	26%
1L400-4L6	HID Pendant 1 lamp 400W	4 foot 6 lamp F25/T8 N	1	8	8	0	2,503	-	0%	138	345	$ 81	$ 360	$ 76	$ 284	42	$ 47.33	14%
1L250-4L4	HID Pendant 1 lamp 250W	4 foot 4 lamp F25/T8 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 330	$ 51	$ 279	62	$ 46.50	10%
1L175-4L4	HID Pendant 1 lamp 175W	4 foot 4 lamp F25/T8 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 330	$ 51	$ 279	62	$ 46.50	10%
UBL2-2L2	4 ft. U-Bend 2 lamp FB40	2 ft. 2 lamp F17 N	1	8	8	0	2,503	-	0%	32	80	$ 19	$ 40	$ 22	$ 18	12	$ 3.00	52%
UBL2-2L2R	4 ft. U-Bend 2 lamp FB40	2 ft. 2 lamp F17 L, Reflector	1	8	8	0	2,503	-	0%	27	68	$ 16	$ 50	$ 30	$ 20	15	$ 3.33	39%
100-23	100 Watt Incandescent	23 Watt CFL	1	8	8	0	2,503	-	0%	23	58	$ 13	$ 10	$ 4	$ 6	5	$ 1.00	112%
75-19	75 Watt Incandescent	19 Watt CFL	1	8	8	0	2,503	-	0%	19	48	$ 11	$ 8	$ 4	$ 4	4	$ 0.67	139%
60-13	60 Watt Incandescent	13 Watt CFL	1	8	8	0	2,503	-	0%	13	33	$ 8	$ 6	$ 4	$ 2	3	$ 0.33	190%
Exit	40W Incandecent	2 Watt LED	1	24	24	24	8,760	-	0%	2	18	$ 4	$ 75	$ 38	$ 37	109	$ 6.17	6%
OverHeight	Cost Adder for Fixtures above or out of the reach of a 10' Ladd		0										$ -		$ -			
										1,323 W	3,324 kWh/yr.	$ 776 / yr.	$ 2,300	$ 833	$ 1,467	23	$ 366.86	18%

WORKBOOK INPUTS

Measure Code	Existing per Unit Watts	Unit New Watts	Unit Watts Saved	Hawaii Energy Participating Contractor Pricing	Hawaii Energy Cash Incentive	Public Benefit Fee Investment
	(Watt/unit)	(Watt/unit)	(Watt/unit)	($/unit)	($)	($/kWh)
	m	n	o = m-n	p	q	r
8L1-4L2	85	46	39	$ 75	$ 62	$ 0.53
8L2-4L2	142	57	85	$ 84	$ 53	$ 0.37
8L2HO-4L2R	170	46	124	$ 85	$ 27	$ 0.23
8L2HO-4L4	170	92	78	$ 138	$ 53	$ 0.23
4L4-4L4	168	92	76	$ 83	$ 51	$ 0.22
4L4-4L2R	168	46	122	$ 65	$ 27	$ 0.23
4L3-4L3	126	69	57	$ 74	$ 38	$ 0.22
4L3-4L2R	126	46	80	$ 65	$ 27	$ 0.23
4L2-4L2	84	46	38	$ 35	$ 27	$ 0.23
4L1-4L1	42	23	19	$ 30	$ 14	$ 0.24
4L4-4L4	112	92	20	$ 83	$ 34	$ 0.15
4L4-4L2	112	46	66	$ 65	$ 53	$ 0.46
4L3-4L3	84	69	15	$ 74	$ 26	$ 0.15
4L3-4L2	84	46	38	$ 65	$ 25	$ 0.22
4L2-4L2	56	46	10	$ 35	$ 27	$ 0.23
4L1-4L1	28	23	5	$ 35	$ 9	$ 0.16
1L400-4L6	475	138	337	$ 360	$ 76	$ 0.22
1L250-4L4	300	92	208	$ 330	$ 51	$ 0.22
1L175-4L4	225	92	133	$ 330	$ 51	$ 0.22
UBL2-2L2	84	32	52	$ 40	$ 22	$ 0.27
UBL2-2L2R	84	27	57	$ 50	$ 30	$ 0.44
100-23	100	23	77	$ 10	$ 4	$ 0.07
75-19	75	19	56	$ 8	$ 4	$ 0.08
60-13	60	13	47	$ 6	$ 4	$ 0.12
Exit	40	2	38	$ 75	$ 38	$ 2.17
OverHeight				$ 8		
						0

15.2 Business Design, Audits and Commissioning

15.2.1 Benchmark Metering

Version Date & Revision History:
Draft date: March 2, 2011

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- n/a

Description:
The Benchmark Metering incentive is designed to encourage business customers to install a central chiller plant metering and data logging system that will provide real-time data and trend data. This data reflects actual tons of cooling and measured efficiency in KW per ton. The new equipment will make it possible for the customer to set meaningful energy efficiency goals and track progress towards those goals. With the Hawaii Energy incentive, there is no cost to the customer for the metering equipment or installation (up to $100,000).

Procedure:

Customer:

1. Have a central chiller plant (or a central chiller plant project in the planning phase) with a total building electrical energy consumption of at least 3 million kWh per year.
2. Complete and submit Central Chiller Plant Benchmarking Application
3. The Hawaii Energy monitoring and data acquisition server shall be located at the customer's site and connected to the internet via customer's connection.
4. Submit to Hawaii Energy all payee information and the IRS Form W-9 at the beginning of every calendar year for processing of the IRS Form 1099. It is understood that Hawaii Energy will forward a copy of the IRS Form 1099 to the payee at the end of the calendar year.
5. Agree to inspection of project for up to 5 years after completion

Industry Partners:

1. Assist customer in submission of application, savings estimate worksheet, and project proposal.
2. Provide quotations for metering installation at customer's location. Only firm/fixed cost quotes will be accepted by Hawaii Energy.
3. Provide supporting documentation to support information submitted on Worksheet. Information may include drawings, vendor cut sheets, energy savings estimates (methodology and calculations).
4. Install approved measures and required metering/monitoring equipment

Hawaii Energy:

1. Review application, worksheet, and proposal to determine if proposed project meets the intent of the program.
2. Perform post installation inspection to ensure all measures/equipment are properly install and operational.
3. Process approved incentive payments (to customer or authorized third party) based on validated savings calculations
4. Prepare and file close out report documenting actual savings achieved and incentives paid.

15.2.2 Energy Study

Version Date & Revision History:
Draft date: September 20, 2011

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- n/a

Description: The Energy Study is an indirect impact product that offers Hawaii businesses with analysis services to identify energy saving opportunities. The goal of the energy study is to provide a method for commercial and industrial customers to learn how their business uses energy today and to identify measures that will help them save energy and reduce operating costs in the future. The focus is on a customer's core energy efficiency opportunities.

Program Requirements:
- Program approval is required prior to the start of work on the energy study
- The program reserves the right to review all materials that result from a program-supported study including, but not limited to, final reports, consultant recommendations, and metered data
- The study must be performed by a qualified person or firm. A brief summary of the consultant's qualifications should be submitted with the application. In some cases, a professional engineer may be required to provide verification of the analysis
- At any time, customers may contact program staff to discuss a project, get assistance in preparing an application, or with any program-related questions

Energy and Demand Savings:

All assumptions, data and formulas used in energy efficiency calculations must be clearly documented. Standard engineering principles must be applied, and all references cited. Energy saving calculations shall also reflect the interactive effects of other simultaneous technologies to prevent the overstatement of the actual savings.

Savings Algorithms

Gross energy and demand savings estimates for energy studies are calculated using engineering analysis and project-specific details. Energy study analyses typically include estimates of savings, costs, and an evaluation of the cost-effectiveness of potential projects/upgrades.

Energy Study

The Energy Study shall include the following information and be presented in the following format:

1) Executive Summary
   a) Energy Conservation Measures (ECMs) Proposed
   b) Summary of Baseline and Enhanced Case Assumptions
   c) Actionable Recommendations in “loading order.”
2) Technical Information and Analysis
   a) Energy Consumption Analysis
      i) Two years of billing data (weatherized and compared to some pertinent operating metric)
   b) Description of the project
   c) Proposed Energy Conservation Measures (ECM)
      i) Descriptive Name
      ii) Schematic System Drawing
      iii) Current Peak Demand (kW), Energy Usage (kWh), Effective Full Load Run Hours
      iv) Proposed Peak Demand (kW), Energy Usage (kWh), Effective Full Load Run Hours
      v) % Change for above
      vi) Estimated Installation Cost
      vii) Project timeline
      viii) Measure Life
      ix) Simple Payback
   d) Base case information
      i) Short term/spot baseline thermal, fluid, and electrical measurements for major equipment to be changed with ECMs
      ii) Permanent metering data (This metering will qualify for additional cost assistance)
      iii) Sizing/Performance Reviews (Pump Curves, Cooling Bin Data etc.)
   e) Enhanced case information
      i) How will performance be measured in the future.
      ii) Description of where energy savings occurs (lower run time, more efficient operations etc.)
   f) Estimated energy and demand savings associated with your proposed project
      i) Applicable figures and tables
      ii) Simple payback period and/or life cycle costs
   g) Estimated costs including design, materials, and installation
3) Appendix
   a) Raw and Analyzed Data (Cooling Models, Field Data, Pictures, Metering Data etc.)
   b) Building Plans (Mechanical, Electrical Schedules, Layouts etc.)

Incentives

- Incentives are limited to 50% of the cost of the study up to $15,000

15.2.3 Design Assistance

Measure ID:

Version Date & Revision History:
Draft date: September 20, 2011

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- 12/22/11 – Program requirement changed to require project be in planning or initial design phase.

Description: Design Assistance is available to building owners and their design teams to encourage the implementation of energy efficient building systems. Considering energy efficiency during the initial phases of planning and design greatly increase the feasibility of implementation. Incentives for energy efficiency are project-specific and offered as upfront assistance for additional costs incurred during the design phase. The long-term benefits include energy use reduction for the state of Hawaii and a reduction in operating costs, equipment lifecycle improvement for building owners, and improved comfort for building users.

Program Requirements:
- Application with written pre-approval from Hawaii Energy
- Project in planning or initial design phase
- Total resource benefit ratio greater than or equal to 1

Energy and Demand Savings:
A base case and enhanced case model must be produced with a clear comparison. All assumptions, data, and formulas used in energy efficiency calculations must be clearly documented. Standard engineering principles must be applied, and all references cited. Energy saving calculations shall also reflect the interactive effects of other simultaneous technologies to prevent the overstatement of actual savings. Proposed base and enhanced cases must be performed by a qualified person or firm. In some cases, a professional engineer may be required to provide verification of the analysis.

Savings Algorithms
Gross energy and demand savings estimates for design assistance are calculated using engineering analysis and project-specific details. Custom analyses typically include a weather dependent load bin analysis, whole building energy model simulation, or other engineering analysis and include estimates of savings, costs, and an evaluation of the project's cost-effectiveness.

Baseline Efficiency
The baseline efficiency case assumes compliance with the efficiency requirements as mandated by the Hawaii State Energy Code or industry accepted standard practice.

High Efficiency
The high efficiency scenario is specific to each project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on comparing a base case analysis and enhanced cased analysis on equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The energy efficiency measures must be proven cost-effective, pass total resource benefit, and have a payback greater than or equal to 1.

Persistence Factor
PF = 1 since all custom projects require verification of equipment installation.

Incentives

- Incentive applications are processed on a first-come, first-serve basis
- Incentives are 50% limited to a maximum of $15,000

16 Business Hard to Reach (BHTR)

16.1 Energy Efficiency Equipment Grants

16.1.1 Small Business Direct Installation - Demand Control Kitchen Ventilation (DCKV)

Version Date & Revision History:

Referenced Documents:
- Detailed Energy Savings Report, Melink Corporation, http://www.melinkcorp.com/Intellihood/Energy_Analysis.pdf

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- n/a

Measure Description:
Kitchen ventilation with DCKV hood exhaust. Demand ventilation uses temperature and/or smoke sensing to adjust ventilation rates. This saves energy comparing with the traditional 100% on/off kitchen ventilation system.

Baseline Efficiencies:
Kitchen ventilation without DCKV. Usage per HP:

Basecase = (HP x .746 KW/HP x Hours per Year)/efficiency

Basecase fan motor usage per HP (kWh/year)	4827
Basecase fan motor demand (kW)	0.83

High Efficiency:

Usage per HP:

Enhanced case fan motor usage per HP (kWh/year)	2194
Enhanced case fan motor demand (kW)	0.38

Energy Savings:
The demand control kitchen ventilation savings were determined using the method described in the Melink Detailed Energy Savings Report.

Energy Savings from fan motor per HP (kWh/year)	2633
Demand Savings from fan motor per HP (kW)	0.45

Savings Algorithms

% Rated RPM	% Run Time	Time HRS/YR	Output KW/HP	System Efficiency	Input KW/HP	KWH/HP/YR
H	I	J=GXI	K	L	M=K/L	N=JXM
100	5%	291.2	0.746	0.9	0.829	241
90	20%	1164.8	0.544	0.9	0.604	704
80	25%	1456	0.382	0.9	0.424	618
70	25%	1456	0.256	0.9	0.284	414
60	15%	873.6	0.161	0.9	0.179	156
50	10%	582.4	0.093	0.9	0.103	60
40	0%	0	0.048	0.9	0.053	0
30	0%	0	0.02	0.9	0.022	0
20	0%	0	0.015	0.9	0.017	0
10	0%	0	0.01	0.9	0.011	0
Total kWh/HP/YR						**2194**

Basecase = (HP x .746 KW/HP x Hours per Year)/efficiency

Basecase fan motor usage per HP (kWh/year)	4827
Basecase fan motor demand (kW)	0.83

Enhanced case fan motor usage per HP (kWh/year)	2194
Enhanced case fan motor demand (kW)	0.38

Energy Savings from fan motor per HP (kWh/year)	2633
Demand Savings from fan motor per HP (kW)	0.45

Operating Schedule

16	HR/DAY
7	DAY/WK
52	WK/YR
5824	

Demand Coincidence Factor
TBD

Persistence
TBD

Lifetime
15 Years (Hawaii Energy assumption)

Measure Costs
Measure Cost: $1,200 - $1,700 per HP based on business vertical and site complications (provided my Melink)

16.1.2 Low Flow Spray Nozzles for Food Service (Retrofit)

Version Date & Revision History:
Draft date:

Referenced Documents:
- Evergreen TRM Review – 1/15/14

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- n/a

Measure Description:
All pre-rinse valves use a spray of water to remove food waste from dishes prior to cleaning in a dishwasher. They reduce water consumption, water heating cost, and waste water (sewer) charges. Pre-rinse spray valves include a nozzle, squeeze lever, and dish guard bumper. Energy savings depend on the facility's method of water heating (electric resistance or heat pump). If the facility does not have electric water heating (i.e. gas or propane), there are no electric savings for this measure. The spray valves usually have a clip to lock the handle in the "on" position. Pre-rinse valves are inexpensive and easily interchangeable with different manufacturers' assemblies.

Baseline Efficiencies:
The baseline equipment is assumed to be a spray valve with a flow rate of 2.25 gallons per minute.

High Efficiency:
The efficient equipment is assumed to be a pre-rinse spray valve with a flow rate of 1.28 gallons per minute.

Energy Savings:

$$\Delta kWh = \Delta Water \times HOT_{\%} \times 8.33 \times (\Delta T) \times (1/EFF^{*}) / 3413$$

ΔWater = Water savings (gallons)
$HOT_{\%}$ = The percentage of water used by the pre-rinse spray valve that is heated = 69%
8.33 = The energy content of heated water (Btu/gallon/°F)
ΔT = Temperature rise through water heater (°F) = 65°F
*EFF1 = Water heater thermal efficiency (electric resistance) = 0.98
*EFF2 = Water heater thermal efficiency (heat pump) = 3.0
3413 = Factor to convert Btu to kWh

Building Type	Operating Schedule (Day/year)	kW Savings	Electric Resistance (kWh/yr) Savings	Heat Pump (kWh/yr) Savings
Restaurants/Institutions	365	1.03	4,753	1,553
Dormitories	274	0.9	3,568	1,165
K-12 Schools	200	0.79	2,604	851

Demand Coincidence Factor
TBD

Persistence
TBD

Lifetime
5 years

Measure Costs and Incentive Levels
The actual measure installation cost should be used (including material and labor).

16.1.3 Commercial Ice Makers

Version Date & Revision History:
Draft date:

Referenced Documents:
- PG&E Work Paper PGECOFST108 Commercial Ice Machines Revision 3 – May 30, 2012

TRM Review Actions:
- Currently Under Review.

Major Changes:
- New measure

Measure Description:
This measure applies to Energy Efficient air-cooled commercial ice makers in retrofit and new construction applications installed in conditioned spaces. Commercial ice makers are classified into three equipment types; ice-making heads (IMHs), remote condensing units (RCUs) and self-contained units (SCUs). The measure described here applies to ice makers that use a batch process to make cubed ice.

The industry standard for energy use and performance of commercial ice machines is AHRI Standard 810. Key parameters reported for ice makers include the Equipment Type, Harvest Rate (lbs of ice/24hrs) and Energy Consumption Rate. The AHRI Directory of Certified Equipment150 lists these values by equipment manufacturer and model number.

Baseline and Efficiency Standard:
The Energy Efficient criteria for ice makers define efficiency requirements for both energy and potable water use.

Market Applicability
Hospitals account for 39.4 percent of all commercial icemaker purchases, followed by hotels (22.3 percent), restaurants (13.8 percent), retail outlets (8.5 percent), schools (8.5 percent), offices (4.3 percent), and grocery stores (3.2 percent).

Measure Savings Calculations:
Annual electric savings can be calculated by determining the energy consumed for baseline ice makers compared against ENERGY STAR performance requirements using the harvest rate of the more efficient unit. Peak demand savings can then be derived from the electric savings.

$$\Delta kWh = (kWh_{\boldsymbol{base,per100lb}} - kWh_{\boldsymbol{ee,per100lb}})/100 \times DC \times H \times 365$$

$$\Delta kW = \Delta kWh / HRS$$

Where:

- 100 = conversion factor to convert $kWh_{base,per100lb}$ and $kWh_{ee,per100lb}$ into maximum kWh consumption per pound of ice.
- DC = Duty Cycle of the ice maker representing the percentage of time the ice machine is making ice
- H = Harvest Rate (lbs of ice made per day)
- 365 = days per year
- kWh = Annual energy savings
- HRS = Annual operating hours
- CF = 1.0

The baseline and energy efficient energy usage per 100lbs of ice produced is dependent on the category of ice maker, as well as the capacity of the energy efficient ice maker. The equations used to determine the energy per 100lbs of ice produced can be seen below.

This incentive applies towards the purchase of new or replacement energy efficient Air-cooled ice machines. Used or rebuilt equipment is not eligible. Customers must provide proof that the appliance meets the energy efficiency specifications listed in Table below.

This specification covers machines generating 60 grams (2 oz.) or lighter ice cubes, as well as flaked, crushed, or fragmented ice machines that meet the Energy Efficiency thresholds by Ice harvest (IHR) rate listed below. Only air cooled machines (icemaker heads, self-contained unites, and remote condensing units) are eligible for incentives. Performance data is based on ARI Standard 810.

Energy Efficiency Requirements

Equipment Type	Ice Harvest Rate Range (lbs of ice/24 hrs)	Energy Efficient Ice Makers		Federal Minimum Standard Energy Consumption Rate (kWh/100 lbs ice) (H = Harvest Rate)
		Energy Consumption Rate (kWh/100 lbs ice) (H = Harvest Rate)	Potable Water Use Limit (gal/100 lbs ice)	
Ice Making Heads	<450	≤ 8.72 - 0.0073H	≤ 20	10.26 - 0.0086H
	≥ 450	≤ 5.86 - 0.0009H	≤ 20	6.89 - 0.0011H
Remote Condensing Units	< 1,000	≤ 7.52 - 0.0032H	≤ 20	8.85 - 0.0038H
	≥ 1,000	≤ 4.34	≤ 20	5.10
Remote Condensing Units	< 934	≤ 7.52 - 0.0032H	≤ 20	8.85 - 0.0038H
	≥ 934	≤ 4.51	≤ 20	5.30
Self-Contained Units	< 175	≤ 15.3 - 0.0399H	≤ 30	18.0 - 0.069H
	≥ 175	≤ 8.33	≤ 30	9.80

Example Savings Calculations

Savings calculation for varying Harvest Rates (H) can be seen below:

Performance	IHR	IHR	IHR	IHR	IHR
Ice Harvest Rate (IHR) (lbs per 24 hrs.)	101-300	301-500	501-1,000	1,001-1,500	> 1,500
Average IHR Used in Energy Calculations (lbs/day)	200	400	750	1,250	1,750
Baseline Model Energy Usage (kWh/100 lbs)	9.8	6.82	6.07	5.1	5.1
Energy Efficient Model Energy Usage (kWh/100 lbs)	8.33	5.8	5.19	4.34	4.34
Baseline Model Daily Energy Consumption (kWh)	14.7	20.5	34.1	47.8	66.9
Energy Efficient Model Daily Energy Consumption (kWh)	12.5	17.4	29.2	40.7	57
Baseline Model Average Demand (kW)	0.613	0.853	1.421	1.992	2.789
Energy Efficient Model Average Demand (kW)	0.521	0.725	1.215	1.695	2.373
Estimated Demand Reduction (kW)	0.092	0.128	0.206	0.297	0.416
Baseline Model Annual Energy Consumption (kWh/yr)	5,366	7,468	12,452	17,452	24,432
Energy Efficient Model Annual Energy Consumption (kWh/yr)	4,561	6,351	10,645	14,851	20,791
Estimated Annual Energy Savings (kWh/yr)	805	1,117	1,807	2,601	3,641
Electric Cost ($/kWh)	$0.25	$0.25	$0.25	$0.25	$0.25
Baseline Model Annual Energy Cost ($/yr)	$1,342	$1,867	$3,113	$4,363	$6,108
Energy Efficient Model Annual Energy Cost ($/yr)	$1,140	$1,588	$2,661	$3,713	$5,198
Estimated Annual Energy Cost Savings ($/yr)	$201	$279	$452	$650	$910
Estimated Incremental Cost	$306	$266	$249	$589	$939
Estimated Useful Life (EUL)	12	12	12	12	12

Demand Coincidence Factor
CF = 1.0

Lifetime
12 years

16.1.4 Food Service – Commercial Electric Steam Cooker

Version Date & Revision History:
Draft date:

Referenced Documents:
- ENERGY STAR Commercial Kitchen Equipment Savings Calculator: Steam Cooker Calcs.
- PG&E Work Paper PGECOFST104 Commercial Steam Cooker Revision #4 (5/22/12)

TRM Review Actions:
- Currently Under Review.

Major Changes:
- New measure

Measure Description:
The installation of a qualified ENERGY STAR commercial steam cooker. ENERGY STAR steam cookers save energy during cooling and idle times due to improved cooking efficiency and idle energy rates.

Baseline Efficiencies:
The Baseline Efficiency case is a conventional electric steam cooker with a cooking energy efficiency of 30%, pan production of 23.3 pounds per hour, and an idle energy rate of 1.2 kW.

High Efficiency:
The High Efficiency case is an ENERGY STAR electric steam cooker with a cooking energy efficiency of 50%, pan production capacity of 16.7 pounds per hour, and an idle energy rate of 0.4 kW.

Energy Savings:
Unit savings are deemed based on study results:

ΔkWh/year = 3,258 kWh/pan
ΔkW = 2.23 kW

Savings Algorithms

Steam Cooker Calculations for the ENERGY STAR Commercial Kitchen Equipment Calculato

Inputs

	USER ENTRY	
	Electric	
Average daily operation	12	hours
Annual days of operation	365	days
Food cooked per day	100	pounds
Number of pans per unit	3	
Incremental cost	$2,000	

Assumptions

	Electric		
	Conventional	ENERGY STAR	
Type	steam generator	boilerless	
Water Use	40	3	gallons/hour
Time in constant steam mode	40%	40%	
Cooking energy efficiency	30%	50%	
Production capacity per pan	23.3	16.7	pounds/hour
Number of preheats per day	1	1	
Preheat length	15	15	minutes
Preheat energy rate	6,000	6,000	W
Idle energy rate	1,200	400	W
ASTM energy to food	30.8		Wh/pound
Equipment lifetime	12		years

Calculations

	Electric		
	Conventional	ENERGY STAR	
Annual operation	4,380		hours
Daily preheat energy	1,500	1,500	Wh
Daily cooking energy	10,267	6,160	Wh
Daily idle time	10.32	9.75	hour
Daily idle energy	37,052	14,382	Wh
Total daily energy	48,819	22,042	Wh

Annual energy consumption per steam cooker

	Conventional	ENERGY STAR	Savings (3 Pan)	Savings per Pan
Electric Usage (kWh/year)	17,819	8,045	9,774	3258

Operating Hours
The average steam cooker is assumed to operate 4,380 hours per year.

Demand Coincidence Factor
CF = 1.0

Persistence
100% persistence factor

Lifetime
12 years

Measure Costs
Incremental cost = $2,000

16.1.5 Food Service – Commercial Electric Griddle

Version Date & Revision History:
Draft date:

Referenced Documents:
- The industry standard for energy use and cooking performance of griddles are ASTM F1275-03: Standard Test
- Method for the Performance of Griddles and ASTM F1605-01: Standard Test Method for the Performance of Double-Sided Griddles
- ENERGY STAR Commercial Griddles Program Requirements Version 1.1, effective May 2009 for gas griddles and effective January 1, 2011 for electric.
- Database for Energy Efficient Resources, 2008, http://www.deeresources.com/deer0911planning/downloads/EUL_Summary_10-1-08.xls
- Assumptions based on PG&E Commercial Griddles Work Paper developed by FSTC, May 22, 2012.

TRM Review Actions:
- Currently Under Review.

Major Changes:
- New measure

Measure Description:
This measure applies to ENERGY STAR or equivalent electric commercial griddles in retrofit and new construction applications. This appliance is designed for cooking food in oil or its own juices by direct contact with either a flat, smooth, hot surface or a hot channeled cooking surface where plate temperature is thermostatically controlled.

Energy-efficient commercial electric griddles reduce energy consumption primarily through the application of advanced controls and improved temperature uniformity.

Baseline and Efficiency Standard
Key parameters for defining griddle efficiency are Heavy Load Cooking Energy Efficiency and Idle Energy Rate. There are currently no federal minimum standards for Commercial Griddles, however, the American Society of Testing and Materials (ASTM) publishes Test Methods155 that allow uniform procedures to be applied to each commercial cooking appliance for a fair comparison of performance results.

ENERGY STAR efficiency requirements apply to single and double sided griddles. The ENERGY STAR criteria should be reviewed on an annual basis to reflect the latest requirements.

ENERGY STAR Criteria for Electric Single and Double Sided Griddles

Performance Parameters	Electric Griddles
Heavy-Load Cooking Energy Efficiency	>= 70%
Idle Energy Rate	<= 320 watts per ft^2

Energy Savings:
Annual savings can be calculated by determining the energy consumed by a standard efficiency griddle as compared with an ENERGY STAR rated griddle.

∆kWh = kWh(base) – kWh(eff)

∆kWh(base or eff) = kWh(cooking) + kWh(idle) + kWh(preheat)

kWh(cooking) = [LB(food) x E(food)/Cook(eff)] x Days

kWh(idle) = IdleEnergy x [DailyHrs – LB(food)/Capacity – PreheatTime/60] x Days

kWh(preheat) = PreheatEnergy x Days

Parameter	Description	Value	Source
Daily Hrs	Daily Operating Hours	12 hours	FSTC
Preheat Time	Time to Preheat (min)	15 min	FSTC
E(food)	ASTM defined Energy to Food	0.139 kWh/lb	FSTC
Days	Number of days of operation	365 days	FSTC
CookEff	Cooking energy efficiency (%)	See Table below	FSTC, ENERGY STAR
IdleEnergy	Idle energy rate (kW)		
Capacity	Production capacity (lbs/hr)		FSTC
Preheat Energy	kWh/day		FSTC
LB(food)	Food cooked per day (lb/day)		FSTC

General assumptions used for deriving deemed electric savings are values taken from the Food Service Technology Center (FSTC) work papers. These deemed values assume that the griddles are 3 x 2 feet in size. Parameters in the table are per linear foot, with an assumed depth of 2 feet.

Baseline and Efficient Assumptions for Electric Griddles

Parameter	Baseline Electric Griddles	Efficient Electric Griddles
Preheat Energy (kWh/ft)	1.33	0.67
Idle Energy Rate (kW/ft)	0.80	0.64
Cooking Energy Efficiency (%)	65%	70%
Production Capacity (lbs/h/ft)	11.7	16.33
Lbs of food cooked/day/ft	33.33	33.33

Base (kWh/year) per linear foot	
Cooking	2602
Idle	2599
Preheat	485
Total Base Energy Usage (kWh)	**5686**
Demand (kW)	**1.30**

Efficient (kWh/year) per linear foot	
Cooking	2416
Idle	2268
Preheat	245
Total Efficient Energy Usage (kWh)	**4928**
Demand (kW)	**1.13**

Energy Savings (kWh/year) per linear foot	**758**
Demand Savings (kW)	**0.17**

Operating Hours
The average steam cooker is assumed to operate 4,380 hours per year.

Demand Coincidence Factor
Coincidence factor is 1.0 because the cooking equipment is assumed to operate throughout the on-peak demand periods (5PM – 9PM).

Persistence
100% persistence factor

Lifetime
12 years – DEER (2008)

Measure Costs and Incentive Levels
Incremental cost = $774
(Assumptions based on PG&E Commercial Griddles Work Paper developed by FSTC, May 22, 2012).

16.1.6 Food Service – Commercial Fryer

Version Date & Revision History:
Draft date:
Effective date: July 1, 2015
End date: June 30, 2015

Referenced Documents:
- The industry standards for energy use and cooking performance of fryers are ASTM Standard Test Method for the Performance of Open Deep Fat Fryers (F1361) and ASTM Standard Test Method for the Performance of Large Vat Fryers (FF2144).
- ENERGY STAR Version 2.0, effective April 22, 2011
- Assumptions based on PG&E Commercial Fryers Work Paper developed by FSTC, June 13, 2012

TRM Review Actions:
- Currently Under Review.

Major Changes:
- New measure

Measure Description:
This measure applies to ENERGY STAR or its equivalent electric commercial open-deep fat fryers in retrofit and new construction applications. Commercial fryers consist of a reservoir of cooking oil that allows food to be fully submerged without touching the bottom of the vessel. Electric fryers use a heating element immersed in the cooking oil. High efficiency standard and large vat fryers offer shorter cook times and higher production rates through the use of heat exchanger design. Standby losses are reduced in more efficient models through the use of fry pot insulation.

Baseline and Efficiency Standard
Key parameters for defining fryer efficiency are Heavy Load Cooking Energy Efficiency and Idle Energy Rate. ENERGY STAR requirements apply to a standard fryer and a large vat fryer. A standard fryer measures 14 to 18 inches wide with a vat capacity from 25 to 60 pounds. A large vat fryer measures 18 inches to 24 inches wide with a vat capacity greater than 50 pounds. The ENERGY STAR criteria should be reviewed on an annual basis to reflect the latest requirements.

There are currently no federal minimum standards for Commercial Fryers, however, the American Society of Testing and Materials (ASTM) publishes Test Methods183 that allow uniform procedures to be applied to each commercial cooking appliance for a fair comparison of performance results.

ENERGY STAR Criteria and FSTC Baseline for Open Deep-Fat Electric Fryers

Performance Parameters	ENERGY STAR Electric Fryer Criteria	
	Standard Fryers	Large Vat Fryers
Heavy-Load Cooking Energy Efficiency	>= 80%	>= 80%
Idle Energy Rate	<+ 1.0 kW	<= 1.1 kW

Energy Savings:

Annual savings can be calculated by determining the energy consumed by a standard efficiency fryer as compared with an ENERGY STAR rated fryer.

∆kWh	= kWh(base) – kWh(eff)
∆kWh(base or eff)	= kWh(cooking) + kWh(idle) + kWh(preheat)
kWh(cooking)	= [LB(food) x E(food)/Cook(eff)] x Days
kWh(idle)	= IdleEnergy x [DailyHrs – LB(food)/Capacity – PreheatTime/60] x Days
kWh(preheat)	= PreheatEnergy x Days

Parameter	Description	Value	Source
Daily Hrs	Daily Operating Hours	12 hours	FSTC
Preheat Time	Time to Preheat (min)	15 min	FSTC
E(food)	ASTM defined Energy to Food	0.167 kWh/lb	FSTC
Days	Number of days of operation	365 days	FSTC
CookEff	Cooking energy efficiency (%)	See Table below	FSTC, ENERGY STAR
IdleEnergy	Idle energy rate (kW)		
Capacity	Production capacity (lbs/hr)		FSTC
Preheat Energy	kWh/day		FSTC
LB(food)	Food cooked per day (lb/day)		FSTC

General assumptions used for deriving deemed electric savings are values taken from the Food Service Technology Center (FSTC) work papers.

Baseline and Efficient Assumptions for Electric Standard and Large Vat Fryers

Parameter	Baseline Electric Fryers		Efficient Electric Fryers	
	Standard	Large Vat	Standard	Large Vat
Preheat Energy (kWh/ft)	2.3	2.5	1.7	2.1
Idle Energy Rate (kW/ft)	1.05	1.35	1.00	1.1
Cooking Energy Efficiency (%)	75%	70%	80%	80%
Production Capacity (lbs/h/ft)	65	100	70	110
Lbs of food cooked/day/ft	150	150	150	150

Baseline Electric Fryers	Standard	Large Vat
Cooking	12191	13062
Idle	3619	5051
Preheat	840	913
Total Energy Usage (kWh/year) per Vat	16649	19025
Demand	3.80	4.34

Efficient Electric Fryers	Standard	Large Vat
Cooking	11429	11429
Idle	3507	4170
Preheat	621	767
Total Energy Usage (kWh/year) per Vat	15556	16366
Demand	3.55	3.74

Savings	Standard	Large Vat
Energy Savings (kWh/year) per Vat	1093	2659
Demand Savings (kW)	0.25	0.61

Operating Hours
The average steam cooker is assumed to operate 4,380 hours per year.

Demand Coincidence Factor
Coincidence factor is 1.0 because the cooking equipment is assumed to operate throughout the on-peak demand periods (5PM – 9PM).

Persistence
100% persistence factor

Lifetime
12 years – DEER (2008)

Measure Costs and Incentive Levels
Incremental cost = $769
(Assumptions based on PG&E Commercial Fryers Work Paper developed by FSTC, May 22, 2012).

16.1.7 Hot Food Holding Cabinet

Version Date & Revision History:
Draft date:
Effective date: July 1, 2015
End date: June 30, 2015

Referenced Documents:
- PG&E Work Paper PGEFST105 (Revision 3) – June 8, 2012

TRM Review Actions:
- Currently Under Review.

Major Changes:
- New measure

Measure Description:
Commercial insulated hot food holding cabinet models that meet program requirements incorporate better insulation, reducing heat loss, and may also offer additional energy saving devices such as magnetic door electric gaskets, auto-door closures, or dutch doors. The insulation of the cabinet also offers better temperature uniformity within the cabinet from top to bottom. This means that qualified hot food holding cabinets are more efficient at maintaining food temperature while using less energy.

- **Full-size holding cabinets** are defined as any holding cabinet with an internal measured volume of greater than or equal to 15 cubic feet (≥15 ft.3). This measure does not include cook-and-hold equipment. All measures must be electric hot food holding cabinets that are fully insulated and have doors. Qualifying cabinets must not exceed the maximum idle energy rate of 20 Watts per cubic foot in accordance with the ASTM Standard test method.

- **Half-size holding cabinets** are defined as any holding cabinet with an internal measured volume of less than 15 cubic feet (<15 ft.3). This measure does not include cook-and-hold or retherm equipment. All measures must be electric hot food holding cabinets that are fully insulated and have doors. Qualifying cabinets must not exceed the maximum idle energy rate of 20 Watts per cubic foot in accordance with the ASTM Standard test method.

Baseline Efficiency:
The baseline equipment is assumed to be a standard hot food holding cabinet with an idle energy rate of 40 watts per cubic foot.

High Efficiency:
The efficient equipment is assumed to be an ENERGY STAR qualified hot food holding cabinet with an idle energy rate of 20 watts per cubic foot.

Energy Savings:

Energy usage calculations are based on 15 hours a day, 365 days per year operation at a typical temperature setting of 150°F. The different sizes for the holding cabinets (half size and full size) have proportional operating energy rates. Operating energy rate for the full size holding cabinets was obtained in accordance with the ASTM Standard.

The energy savings calculations listed in the following tables use Title 20 (California) as the baseline for potential energy savings requiring all hot food holding cabinets sold in California to meet a normalized idle energy rate of 40 Watts/ft³.

Insulated Hot Food Holding Cabinet - Full Size

Performance	Baseline	High Efficiency Qualifying Model
Demand (kW)	1	0.28
Annual Energy Use (kWh/year)	5475	1533
Estimated Demand Reduction (kW)	-	0.72
Annual Energy Savings (kWh/year)	-	3942
Incremental Measure Cost ($)		2336
Estimated Useful Life (years)	12	12

Insulated Hot Food Holding Cabinet - Half Size

Performance	Baseline	High Efficiency Qualifying Model
Demand (kW)	0.38	0.05
Annual Energy Use (kWh/year)	2081	274
Estimated Demand Reduction (kW)	-	0.33
Annual Energy Savings (kWh/year)	-	1807
Incremental Measure Cost ($)		381
Estimated Useful Life (years)	12	12

The demand reduction estimation is based on measured data for standard efficiency insulated holding cabinets and for high-efficiency insulated holding cabinets. The measured data are derived from tests conducted under ASTM Standard Test Method for the Performance of Hot Food Holding Cabinets.

Measure ASTM test results for Hot Food Holding Cabinets

Cabinet Size	Cabinet Volume (ft³)	Normalized Idle Energy Rate (W/ft³)	Total Cabinet Idle Energy Rate (W)
Full-Size	25	11.3	0.28
Half-Size	10	5.7	0.05

Operating Hours

15 hr/day, 365 day/year = 5,475 hours/year

Demand Coincidence Factor
CF = 1.0

Lifetime
12 years

Measure Costs
The incremental cost for ENERGY STAR hot food holding cabinet is $2,336 (full size) & $381 (half size)

16.1.8 Commercial Kitchen Combination Ovens

Version Date & Revision History:
Draft date:
Effective date: July 1, 2015
End date: June 30, 2015

Referenced Documents:
- U.S. Department of Energy, Energy Star website: http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=COO
- Energy Star Commercial Kitchen Equipment Savings Calculator
- PG&E Work Paper PGEFST105 (Revision 3) – June 8, 2012
- Arkansas TRM Version 2.0 Volume 2
- KEMA report titled "Business Programs: Deemed Savings Parameter Development", November 2009 - Coincidence factor for food service building type listed as 0.84

TRM Review Actions:
- Currently Under Review.

Major Changes:
- New measure

Measure Description:
Commercial combination ovens offer the ability to steam food in the oven cavity. These oven are capable of steaming, proofing and reheating various food products in addition to the normal functions of baking and roasting. Foods can be cooked in a variety of ways: in a convection oven dry heat only mode, a steam only mode, and a combination of dry heat and steam modes. Food to be cooked partially in one mode at a certain temperature and then finished in another mode and at a separate temperature by utilizing the programmability of combination ovens. Combination ovens range in size from 6 pan countertop models up to 40 pan stand-alone models.

Baseline Efficiency:

Parameter	< 15 Pans	15-28 Pans	> 28 Pans
Assumptions			
% Time in Steam Mode	50%	50%	50%
Preheat Energy (kWh/day)	3.0	3.75	5.63
Convection Idle Energy Rate (kW)	1.5	3.75	5.25
Steam Idle Energy Rate (kW)	10.0	12.5	18.0
Convection Cooking Energy Efficiency (%)	65%	65%	65%
Steam Cooking Energy Efficiency (%)	40%	40%	40%
Convection Production Capacity (lbs/hour)	80	100	275
Steam Production Capacity (lbs/hour)	100	150	350
Lbs of Food Cooked/day	200	250	400
Total Energy			
Annual Energy Consumption (kWh)	35,263	48,004	74,448
Demand (kW)	6.8	9.2	14.3

High Efficiency:

Parameter	< 15 Pans	15-28 Pans	> 28 Pans
Assumptions			
% Time in Steam Mode	50%	50%	50%
Preheat Energy (kWh/day)	1.5	2.0	3.0
Convection Idle Energy Rate (kW)	1.0	2.5	4.0
Steam Idle Energy Rate (kW)	5.0	6.0	9.0
Convection Cooking Energy Efficiency (%)	70%	70%	70%
Steam Cooking Energy Efficiency (%)	50%	50%	50%
Convection Production Capacity (lbs/hour)	100	152	325
Steam Production Capacity (lbs/hour)	120	200	400
Lbs of Food Cooked/day	200	250	400
Total Energy			
Annual Energy Consumption (kWh)	23,658	32,001	50,692
Demand (kW)	4.5	6.1	9.7

Energy Savings

Energy usage calculations are based on 12 hours a day, 365 days per year (4,380 hours/year). The different sizes for the combination ovens (< 15 pans, 15-28 pans, and > 28 pans) have proportional operating energy rates.

Performance	< 15 Pans	15-28 Pans	> 28 Pans
Annual Energy Savings (kWh)	11,604	16,003	23,756
Estimated Demand Reduction (kW)	2.6	3.7	5.4

Operating Hours
12 hr/day, 365 day/year = 4,380 hours/year

Demand Coincidence Factor
CF = 0.84

Lifetime
12 years

16.1.9 Commercial Kitchen Convection Ovens

Version Date & Revision History:
Draft date:

Referenced Documents:
- U.S. Department of Energy, Energy Star website: http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=COO
- Energy Star Commercial Kitchen Equipment Savings Calculator
- PG&E Work Paper PGEFST105 (Revision 3) – June 8, 2012
- Arkansas TRM Version 2.0 Volume 2
- KEMA report titled "Business Programs: Deemed Savings Parameter Development", November 2009 - Coincidence factor for food service building type listed as 0.84

TRM Review Actions:
- Currently Under Review.

Major Changes:
- New measure

Measure Description:
Commercial convection ovens are widely used in the foodservice industry and have a wide variety of uses from baking and roasting to warming and reheating. Convection ovens are also used for nearly all types of food preparation, including foods typically prepared using other types of appliances (e.g., griddles, fryers, etc.). ENERGY STAR commercial ovens are about 20 percent more energy efficient than standard models.

- **Full-size electric convection ovens** are defined by the ability to accept a minimum of five (5) standard full-size sheet pans (18 in. x 26 in. x 1 in.). Qualifying ovens must meet Energy Star requirements by having a tested heavy-load (potato) cooking efficiency in accordance with ASTM F1496. Cooking energy efficiency must be greater than or equal to 70 percent (≥70%) and must not exceed the maximum idle energy rate of 1.6 kW (≤ 1.6kW).

- **Half-size electric convection ovens** are defined by the ability to accept a minimum of five (5) sheet pans measuring (18 in. x 13 in. x 1 in.). Qualifying ovens must meet Energy Star requirements by having a tested heavy-load (potato) cooking efficiency in accordance with ASTM F1496. Cooking energy efficiency must be greater than or equal to 70 percent (≥70%) and must not exceed the maximum idle energy rate of 1.0 kW (≤ 1.0kW).

Baseline Efficiency:

Parameter	Half Size	Full Size
Assumptions		
Preheat Energy (kWh/day)	1.0	1.5
Idle Energy Rate (kW)	1.5	2.0
Cooking Energy Efficiency (%)	65%	65%
Production Capacity (lbs/hour)	45	70
Lbs of food cooked/day	100	100
Energy per pound of food (kWh/lb)	0.0732	0.0732
Total Energy		
Annual Energy Consumption (kWh)	9,692	12,193
Demand (kW)	1.86	2.34

High Efficiency:

Parameter	Half Size	Full Size
Assumptions		
Preheat Energy (kWh/day)	0.9	1.0
Idle Energy Rate (kW)	1.0	1.6
Cooking Energy Efficiency (%)	70%	70%
Production Capacity (lbs/hour)	50	80
Lbs of food cooked/day	100	100
Energy per pound of food (kWh/lb)	0.0732	0.0732
Total Energy		
Annual Energy Consumption (kWh)	7,704	10,314
Demand (kW)	1.48	1.98

Energy Savings

Energy usage calculations are based on 12 hours a day, 365 days per year. The different sizes for the holding cabinets (half size and full size) have proportional operating energy rates.

Performance	Half Size	Full Size
Annual Energy Savings (kWh)	1,988	1,879
Estimated Demand Reduction (kW)	0.38	0.36

Operating Hours
12 hr/day, 365 day/year = 4,380 hours/year

Demand Coincidence Factor
CF = 0.84

Lifetime
12 years

16.1.10 Commercial Solid Door Refrigerators & Freezers

Version Date & Revision History
Draft date:

Referenced Documents:

- Southern California Edison Work Paper SCE13CC001 Commercial Reach-In Refrigerators and Freezers – April 6, 2012

TRM Review Actions:

- 10/5/11 – Currently Under Review.

Major Changes:

- New measure

Measure Description:
This measure relates to the installation of a new reach-in commercial refrigerator or freezer meeting ENERGY STAR efficiency standards. ENERGY STAR labeled commercial refrigerators and freezers are more energy efficient because they are designed with components such as ECM evaporator and condenser fan motors, hot gas anti-sweat heaters, or high-efficiency compressors, which will significantly reduce energy consumption. This measure could relate to the replacing of an existing unit at the end of its useful life, or the installation of a new system in a new or existing building.

Baseline Efficiencies:
In order for this characterization to apply, the baseline equipment is assumed to be a solid or glass door refrigerator or freezer meeting the minimum federal manufacturing standards. It is assumed that the volume for baseline is the average of the range. For example if range is 0 to 15, the average volume is 7.5.

High Efficiency:
In order for this characterization to apply, the efficient equipment is assumed to be a solid or glass door refrigerator or freezer meeting the minimum ENERGY STAR efficiency level standards.

Energy and Demand Savings:

Annual Energy Savings (kWh/year) = (kWh_{base} – kWh_{ee}) * 365

Demand Savings = Annual Energy Savings / Hours * CF

Operating Hours
8760 hours/year

Demand Coincidence Factor
CF = 1.0

Lifetime
12 years

Volume (cubic feet)	Typical Volume (cubic feet)	Volumetric Factor (kWh/ft3)	Fixed Energy Usage (kWh)	Enhanced Case (kWh/day)
Solid-door Reach-in Refrigerator				
0 < V < 15	7.5	0.089	1.411	2.08
15 ≤ V < 30	22.5	0.037	2.200	3.03
30 ≤ V < 50	40	0.056	1.635	3.88
50 ≤ V	60	0.060	1.416	5.02
Solid-Door Reach-In Freezer				
0 < V < 15	7.5	0.250	1.250	3.13
15 ≤ V < 30	22.5	0.400	-1.000	8.00
30 ≤ V < 50	40	0.163	6.125	12.65
50 ≤ V	60	0.158	6.333	15.81
Glass-door Reach-in Refrigerator				
0 < V < 15	7.5	0.118	1.382	2.27
15 ≤ V < 30	22.5	0.140	1.050	4.20
30 ≤ V < 50	40	0.089	2.625	6.18
50 ≤ V	60	0.110	1.500	8.10
Glass-Door Reach-In Freezer				
0 < V < 15	7.5	0.607	0.893	5.45
15 ≤ V < 30	22.5	0.733	-1.000	15.49
30 ≤ V < 50	40	0.250	13.500	23.50
50 ≤ V	60	0.450	3.500	30.50

Volume (cubic feet)	Typical Volume (cubic feet)	Volumetric Factor (kWh/ft3)	Fixed Energy Usage (kWh)	Base Case (kWh/day)
Solid-door Reach-in Refrigerator				
0 < V < 15	7.5	0.10	2.04	2.79
15 ≤ V < 30	22.5	0.10	2.04	4.29
30 ≤ V < 50	40	0.10	2.04	6.04
50 ≤ V	60	0.10	2.04	8.04
Solid-Door Reach-In Freezer				
0 < V < 15	7.5	0.40	1.38	4.38
15 ≤ V < 30	22.5	0.40	1.38	10.38
30 ≤ V < 50	40	0.40	1.38	17.38
50 ≤ V	60	0.40	1.38	25.38
Glass-door Reach-in Refrigerator				
0 < V < 15	7.5	0.12	3.34	4.24
15 ≤ V < 30	22.5	0.12	3.34	6.04
30 ≤ V < 50	40	0.12	3.34	8.14
50 ≤ V	60	0.12	3.34	10.54
Glass-Door Reach-In Freezer				
0 < V < 15	7.5	0.75	4.10	9.73
15 ≤ V < 30	22.5	0.75	4.10	20.98
30 ≤ V < 50	40	0.75	4.10	34.1
50 ≤ V	60	0.75	4.10	49.1

Volume (cubic feet)	Typical Volume (cubic feet)	Base Case (kWh/day)	Enhanced Case (kWh/day)	Energy Savings (kWh/day)	Energy Savings (kWh/year)	Demand Savings (kW)
Solid-door Reach-in Refrigerator						
0 < V < 15	7.5	2.79	2.08	0.71	259.15	0.030
15 ≤ V < 30	22.5	4.29	3.03	1.26	459.90	0.053
30 ≤ V < 50	40	6.04	3.88	2.16	788.40	0.090
50 ≤ V	60	8.04	5.02	3.02	1102.30	0.126
Solid-Door Reach-In Freezer						
0 < V < 15	7.5	4.38	3.13	1.25	456.25	0.052
15 ≤ V < 30	22.5	10.38	8.00	2.38	868.70	0.099
30 ≤ V < 50	40	17.38	12.65	4.73	1726.45	0.197
50 ≤ V	60	25.38	15.81	9.57	3493.05	0.399
Glass-door Reach-in Refrigerator						
0 < V < 15	7.5	4.24	2.27	1.97	719.05	0.082
15 ≤ V < 30	22.5	6.04	4.20	1.84	671.60	0.077
30 ≤ V < 50	40	8.14	6.18	1.96	715.40	0.082
50 ≤ V	60	10.54	8.10	2.44	890.60	0.102
Glass-Door Reach-In Freezer						
0 < V < 15	7.5	9.73	5.45	4.28	1562.20	0.178
15 ≤ V < 30	22.5	20.98	15.49	5.49	2003.85	0.229
30 ≤ V < 50	40	34.1	23.50	10.60	3869.00	0.442
50 ≤ V	60	49.1	30.50	18.60	6789.00	0.775

Measure Costs and Incentive Levels

Incremental Measure Refrigerator and Freezer Costs

Description	Under-Counter	Single-Door	Double-Door	Triple-Door
Nominal Size	1 door	1 door	2 doors	3 doors
Nominal Volume Range (cubic feet)	0 ≤ V < 15	15 ≤ V < 30	30 ≤ V 50	50 ≤ V
Solid-Door Reach-In Refrigerators Incremental Cost	$1,092.00	$ 1,410.73	$ 1,968.70	$2,723.28
Solid-Door Reach-In Freezers Incremental Cost	$ 257.60	$ 1,363.18	$15,556.71	$1,968.03
Glass-Door Reach-In Refrigerators Incremental Cost	$ 103.60	$ 863.80	$ 1,076.11	$1,548.96
Glass-Door Reach-In Freezers Incremental Cost	$ 25.48	$ 124.04	$ 214.20	$ 899.30

16.1.11 Small Business Direct Restaurant Lighting Retrofits

Version Date & Revision History:
Draft date:

Referenced Documents:
- n/a

TRM Review Actions:
- 10/5/11 – Currently Under Review.

Major Changes:
- n/a

Measure Description:
The program targets customers within the small business market. Typically this market has limited time and expertise within their organizations to research lighting technology options, obtain financing and contract with lighting contractors to replace their older less efficient lighting technologies. The Small Business Lighting Retrofit provides a "Turnkey" program consisting of audits, fixed pricing, installation by participating Hawaii Energy contractors and 4 month financing of lighting retrofits.

Program Requirements:
Small Business Restaurant Customers - TBD

Savings Algorithms

Hawaii Energy

Small Business Direct Install Lighting Retrofit Pilot Program
Summary Sheet

Business Name:	
Contact Name:	
Address:	
Phone:	
Fax:	
Email:	

Contractor Name:	
Auditor Name:	
Address:	
Phone:	
Fax:	
Email:	

Total Watts Saved	Energy Savings	Energy Cost Savings	Hawaii Energy Participating Contractor NTE Pricing	Hawaii Energy Cash Incentive	Net Customer Cost	Simple Payback	4 Month Monthly Payment	Monthly Savings % of Payment
1,323 W	3,324 kWh/yr.	$ 776 / yr.	$ 2,300	$ 833	1,467	23	367	18%

Step 1	
f2	
Oahu	Island of Project Location
$ 0.234 /kWh	2010 "G" Marginal Cost of Electricity

Measure Code	Existing Technology	New Technology	Step 2 Total Units	Step 3 M-F Hours per Day	Sat. Hours per Day	Sun. Hours per Day	Annual Hours of Operation	Step 4 Wkdays Hours on between 5 and 9 p.m.	On-Peak Fraction	Total Watts Saved	Energy Savings	Energy Cost Savings	Hawaii Energy Participating Contractor NTE Pricing	Hawaii Energy Cash Incentive	Net Customer Cost	Simple Payback	6 Month Monthly Payment	Monthly Savings % of Payment
			(each)				(hrs/year)	(hrs)	(%)	(Watts)	(kWh/Year)	($/year)	($)	($)	($)	(Months)	($/month)	(%)
			a	b1a	b1b	b2a	b3 = b1*b2*(365/7)	c	c2 = c / 4	d = a x o	e = b x (d/1000)	f = e x f2	g = a x p	h = a x q	i = a x (p-q)	j = (i/f) x 12	k = i /6	l = (f/12)/k
8L1-4L2	8 ft. 1 Lamp F96	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 75	$ 62	$ 13	6	$ 2.24	100%
8L2-4L2	8 ft. 2 Lamp F96	4 ft. 2 lamp F25/28 H	1	8	8	0	2,503	-	0%	57	143	$ 33	$ 84	$ 53	$ 31	11	$ 5.17	54%
8L2HO-4L2R	8 ft. 2 Lamp F96 HO	4 ft. 2 lamp F25/28 N, Reflct.	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 85	$ 27	$ 58	26	$ 9.67	23%
8L2HO-4L4	8 ft. 2 Lamp F96 HO	4 ft. 4 lamp F25/28 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 138	$ 53	$ 85	19	$ 14.17	32%
4L4-4L4	4 ft. 4 Lamp F40	4 ft. 4 lamp F25/28 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 83	$ 51	$ 32	7	$ 5.33	84%
4L4-4L2R	4 ft. 4 lamp F40	4 ft. 2 lamp F25/28 N, Reflct.	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 65	$ 27	$ 38	17	$ 6.33	35%
4L3-4L3	4 ft. 3 lamp F40	4 ft. 3 lamp F25/28 N, Reflct.	1	8	8	0	2,503	-	0%	69	173	$ 40	$ 74	$ 38	$ 36	11	$ 6.00	56%
4L3-4L2R	4 ft. 3 lamp F40	4 ft. 2 lamp F25/28 N, Reflct.	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 65	$ 27	$ 38	17	$ 6.33	35%
4L2-4L2	4 ft. 2 lamp F40	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 35	$ 27	$ 8	4	$ 1.33	168%
4L1-4L1	4 ft. 1 lamp F40	4 ft. 1 lamp F25/28 N	1	8	8	0	2,503	-	0%	23	58	$ 13	$ 30	$ 14	$ 16	14	$ 2.67	42%
4L4-4L4	4 ft. 4 lamp F32	4 ft. 4 lamp F25/28 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 83	$ 34	$ 49	11	$ 8.17	55%
4L4-4L2	4 ft. 4 lamp F32	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 65	$ 53	$ 12	5	$ 2.00	112%
4L3-4L3	4 ft. 3 lamp F32	4 ft. 3 lamp F25/28 N	1	8	8	0	2,503	-	0%	69	173	$ 40	$ 74	$ 26	$ 48	14	$ 8.00	42%
4L3-4L2	4 ft. 3 lamp F32	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 65	$ 25	$ 40	18	$ 6.67	34%
4L2-4L2	4 ft. 2 lamp F32	4 ft. 2 lamp F25/28 N	1	8	8	0	2,503	-	0%	46	115	$ 27	$ 35	$ 27	$ 8	4	$ 1.33	168%
4L1-4L1	4 ft. 1 lamp F32	4 ft. 1 lamp F25/28 N	1	8	8	0	2,503	-	0%	23	58	$ 13	$ 35	$ 9	$ 26	23	$ 4.33	26%
1L400-4L6	HID Pendant 1 lamp 400W	4 foot 6 lamp F25/T8 N	1	8	8	0	2,503	-	0%	138	345	$ 81	$ 360	$ 76	$ 284	42	$ 47.33	14%
1L250-4L4	HID Pendant 1 lamp 250W	4 foot 4 lamp F25/T8 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 330	$ 51	$ 279	62	$ 46.50	10%
1L175-4L4	HID Pendant 1 lamp 175W	4 foot 4 lamp F25/T8 N	1	8	8	0	2,503	-	0%	92	230	$ 54	$ 330	$ 51	$ 279	62	$ 46.50	10%
UBL2-2L2	4 ft. U-Bend 2 lamp FB40	2 ft. 2 lamp F17 N	1	8	8	0	2,503	-	0%	32	80	$ 19	$ 40	$ 22	$ 18	12	$ 3.00	52%
UBL2-2L2R	4 ft. U-Bend 2 lamp FB40	2 ft. 2 lamp F17 L, Reflector	1	8	8	0	2,503	-	0%	27	68	$ 16	$ 50	$ 30	$ 20	15	$ 3.33	39%
100-23	100 Watt Incandescent	23 Watt CFL	1	8	8	0	2,503	-	0%	23	58	$ 13	$ 10	$ 4	$ 6	5	$ 1.00	112%
75-19	75 Watt Incandescent	19 Watt CFL	1	8	8	0	2,503	-	0%	19	48	$ 11	$ 8	$ 4	$ 4	4	$ 0.67	139%
60-13	60 Watt Incandescent	13 Watt CFL	1	8	8	0	2,503	-	0%	13	33	$ 8	$ 6	$ 4	$ 2	3	$ 0.33	190%
Exit	40W Incandecent	2 Watt LED	1	24	24	24	8,760	-	0%	2	18	$ 4	$ 75	$ 38	$ 37	109	$ 6.17	6%
OverHeight	Cost Adder for Fixtures above or out of the reach of a 10' Ladd		0										$ -		$ -			
										1,323 W	3,324 kWh/yr.	$ 776 / yr.	$ 2,300	$ 833	$ 1,467	23	$ 366.86	18%

WORKBOOK INPUTS

Measure Code	Existing per Unit Watts	Unit New Watts	Unit Watts Saved	Hawaii Energy Participating Contractor Pricing	Hawaii Energy Cash Incentive	Public Benefit Fee Investment
	(Watt/unit)	(Watt/unit)	(Watt/unit)	($/unit)	($)	($/kWh)
	m	n	o = m-n	p	q	r
8L1-4L2	85	46	39	$ 75	$ 62	$ 0.53
8L2-4L2	142	57	85	$ 84	$ 53	$ 0.37
8L2HO-4L2R	170	46	124	$ 85	$ 27	$ 0.23
8L2HO-4L4	170	92	78	$ 138	$ 53	$ 0.23
4L4-4L4	168	92	76	$ 83	$ 51	$ 0.22
4L4-4L2R	168	46	122	$ 65	$ 27	$ 0.23
4L3-4L3	126	69	57	$ 74	$ 38	$ 0.22
4L3-4L2R	126	46	80	$ 65	$ 27	$ 0.23
4L2-4L2	84	46	38	$ 35	$ 27	$ 0.23
4L1-4L1	42	23	19	$ 30	$ 14	$ 0.24
4L4-4L4	112	92	20	$ 83	$ 34	$ 0.15
4L4-4L2	112	46	66	$ 65	$ 53	$ 0.46
4L3-4L3	84	69	15	$ 74	$ 26	$ 0.15
4L3-4L2	84	46	38	$ 65	$ 25	$ 0.22
4L2-4L2	56	46	10	$ 35	$ 27	$ 0.23
4L1-4L1	28	23	5	$ 35	$ 9	$ 0.16
1L400-4L6	475	138	337	$ 360	$ 76	$ 0.22
1L250-4L4	300	92	208	$ 330	$ 51	$ 0.22
1L175-4L4	225	92	133	$ 330	$ 51	$ 0.22
UBL2-2L2	84	32	52	$ 40	$ 22	$ 0.27
UBL2-2L2R	84	27	57	$ 50	$ 30	$ 0.44
100-23	100	23	77	$ 10	$ 4	$ 0.07
75-19	75	19	56	$ 8	$ 4	$ 0.08
60-13	60	13	47	$ 6	$ 4	$ 0.12
Exit	40	2	38	$ 75	$ 38	$ 2.17
OverHeight				$ 8		
						0

ATTACHMENT F – Media Coverage Report

Star Advertiser
“Heat triggers record energy use”
9.12.2015

Heat triggers record energy use

September 12, 2015

CINDY ELLEN RUSSELL / CRUSSELL@STARADVERTISER.COM
Oahu’s peak energy use Thursday was 1,246 megawatts, a 9 percent increase from the same day a year ago and the highest so far this year. City Mill sales associate Eric Lentz assembled a fan for Jovita Somera in Iwilei on Sept. 2 to help her beat the heat.

Oahu’s energy use hit a 2015 high on Thursday as warm weather pushed residents to use more electricity.

The peak energy use Thursday was 1,246 megawatts, a 9 percent increase from electricity use the same day last year — when residents used 1,143 megawatts — and the highest so far this year.

“Whenever it gets hot and humid, we see an increase in the use of electricity,” said Darren Pai, Hawaiian Electric Co. spokesman. “The combination of feeling hot and sticky leads customers to use more air conditioning, which increases the demand for electricity.”

The jump in energy use coincides with El Nino’s hold on the islands; there have been dozens of record-breaking temperatures this summer. The waters in the Central Pacific in August were the warmest in more than 17 years, as the current El Nino is the third strongest on record, behind 1997-98 and one in 1987-88 that peaked early.

“Historically, demand reaches its peak around October, when it is usually both hot and humid,” Pai said. “Weather conditions are not following the usual trends this year, and we’ve seen a corresponding increase in the demand for power.”

HECO’s all-time high for the island’s energy use was 1,327 megawatts, which occurred Oct. 12, 2004.

Relief from the current muggy weather won't happen soon for Hawaii residents as the National Oceanic and Atmospheric Administration reported Thursday that El Nino conditions are likely to continue through the winter before weakening in spring.

Air conditioning businesses reported that demand has followed the record-breaking temperatures.

Cosco Air Conditioning and Refrigeration said demand for 2015 has exceeded projections by 50 percent; in August it was 160 percent over what the company was expecting.

The use of these appliances can have a dramatic effect on resident energy use.

"Residents who don't use an energy-efficient unit may rack up a higher electric bill to survive this heat," said Shan Wirt, spokeswoman for Hawaii Energy, a ratepayer-funded energy conservation and efficiency program.

For cooling, air conditioning units are the most demanding.

The energy usage difference between an energy-efficient ceiling fan and window air conditioning unit can be about 62 kilowatt-hours per month, said Hawaii Energy. At 30 cents per kilowatt-hour, it is an $18.60 difference per month.

For July and August, Hawaii Energy said it saw a 400 percent increase in air conditioning rebate participation compared with the two previous months.

Hawaii Energy's rebate program includes, among other deals, a $50 rebate for purchasing a qualified window air conditioner and trading in an old, working window unit or portable air conditioner unit for recycling.

For more information on rebates from Hawaii Energy, see hawaiienergy.com/for-homes/rebates/hvac.

Market Watch
"Opower and Hawaiʻi Energy Announce Expansion of Energy Efficiency Program"
9.14.2015

Personalized energy insights will be delivered to nearly 250,000 customers in Hawaiʻi

ARLINGTON, Va., Sep 14, 2015 (BUSINESS WIRE) -- Opower OPWR, +0.65% the global leader in cloud-based software for the utility industry, and Hawaii Energy, the conservation and efficiency program for Hawaii, Honolulu and Maui counties, today announced the expansion of Opower's Energy Efficiency program to nearly 250,000 residential customers across Hawaii. The program -- which has helped customers save over $5 million on their energy bills to date -- will now be available to approximately 110,000 additional participants across the state.

"We are excited to expand the Home Energy Report program to more residents in Hawaii, Honolulu and Maui counties," said Ray Starling, Hawaii Energy Program Director. "Battling one of the nation's highest costs of living, Hawaii Energy's priority continues to be to empower residents with personalized energy information so we can each take action to decrease electric usage and bills. By working together, we can also reduce our state's dependence on imported oil to generate electricity."

Opower's Energy Efficiency program includes Home Energy Reports (HERs) that pair behavioral science with big data analytics to provide residents with information on their energy usage and empower them to track their energy consumption over time. Customers also have the ability to compare their usage to similar homes and create personalized energy-saving plans.
Hawaii Energy first collaborated with Opower in 2011 and has steadily expanded the HER program since then. To date, the program is estimated to have helped residents save 18.1 million kilowatt hours (kWh) of electricity, totaling approximately
$5.43 million in energy costs.

"The success and rapid growth of Hawaii Energy's program is a perfect example of how conservation and efficiency programs can work with utilities to leverage technology that empowers customers with actionable information so they can make smarter energy decisions," said Dan Yates, Opower co-founder and CEO. "As Hawaii's program continues to expand, we look forward to seeing increased levels of energy conservation that not only yield significant savings for consumers, but also benefit Hawaii's environment."
About Opower

Opower OPWR, +0.65% is an enterprise software company that is transforming the way utilities engage with their customers. Opower's customer engagement platform enables utilities to reach their customers at moments that matter through proactive and digitized communications that drive energy savings, increase customer engagement and satisfaction, and lower customer operation costs. Opower's software has been deployed to more than 95 utility partners around the world and reaches more than 50 million households and businesses. For more information, please visit www.opower.com and follow us on Twitter at @Opower.

Forward-looking Statements

This release contains forward-looking statements, including statements regarding benefits from the use of Opower's solutions. Any statements in this press release about future expectations, plans and prospects for Opower represent the Company's views as of the date of this press release. These forward-looking statements are subject to a number of risks, uncertainties and assumptions. While the Company may elect to update these statements at some point in the future, the Company specifically disclaims any obligation to do so.

About Hawaii Energy

Hawaii Energy is the ratepayer-funded energy conservation and efficiency program administered by Leidos Engineering, LLC under contract with the Hawaii Public Utilities Commission, serving the islands of Hawaii, Lanai, Maui, Molokai and Oahu. Hawaii Energy is independent of the utilities. The program offers cash rebates and other incentives to residents and businesses to help offset the cost of installing energy-efficient equipment.

In addition to rebates, the program offers education and training for residents, businesses and trade allies to encourage the adoption of energy conservation behaviors and efficiency measures. For more information, visit www.HawaiiEnergy.com.

Pacific Business News
"Honolulu energy firm wins regional award for making buildings more efficient"
9.29.2015

Honolulu energy firm wins regional award for making buildings more efficient

Sep 29, 2015

By Duane Shimogawa

Chelsea Group Ltd., an energy efficiency consulting firm, has garnered a regional award from the Association of Energy Engineers for a program the Honolulu-based company took part in that deals with the installation of metering and data logging systems for air-conditioning units in commercial buildings.

George Benda, chairman and CEO of Chelsea Group, accepted the 2015 Energy Project of the Year for Region V award on Tuesday at the World Energy Engineer Congress in Orlando, Florida.

Enlarge

The Queen's Medical Center helped a Honolulu firm win a regional award for making… more

Chelsea Group partnered with Hawaii Energy, a conservation and efficiency program, on the program, which provides real-time and trend data reflecting actual tons of cooling and measured efficiency in kilowatts-per-ton.

This way makes it easier for building owners to set meaningful energy efficiency goals and track progress towards those goals.

The program has resulted in dramatic energy savings across Honolulu through central plant optimization and/or chiller replacement if needed, according to Benda, who said that the most notable installation was done at The Queen's Medical Center, the state's largest private hospital.

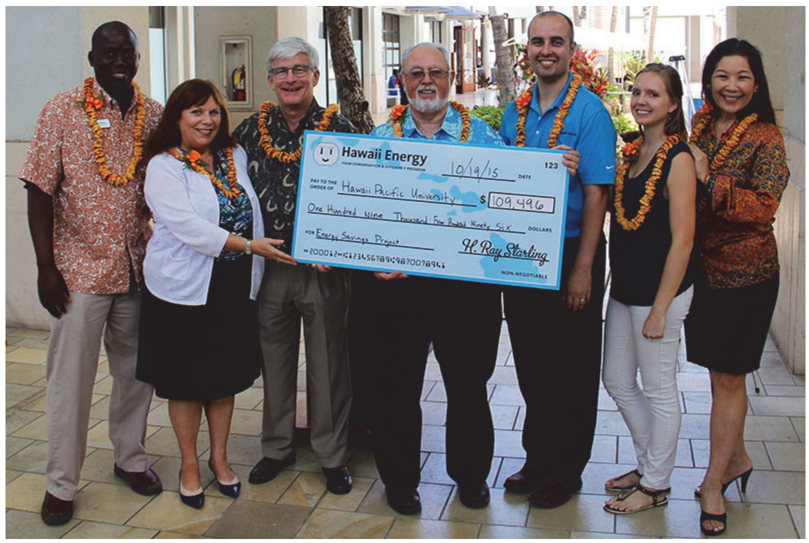
The Queen's Medical Center, which consists of nearly 3 million square feet across an 11-building campus in Honolulu, saved 687,000 kilowatt-hours in the first year alone, equating to $200,000 in electric bill savings.

Queen's has invested about $289,000 in equipment and services in order to achieve the savings.

Hawaii Energy presents six-figure rebate to HPU for Aloha Tower Marketplace improvements

October 19, 2015

Honolulu, Hawaii — Sustainability Week at Aloha Tower Marketplace kicked off with the presentation of a $109,496 rebate check by Hawaii Energy to Hawaiʻi Pacific University, for its commitment to energy efficiency, Oct. 19.



HPU Project Coordinator Dingilizwe Ncube, HPU Executive Vice President for Administration and General Counsel Janet S. Kloenhamer, Hawaii Energy Program Director Ray Starling, HPU President Geoffrey Bannister, Hawaii Energy Efficiency Advisor Andre Parente, HPU student and Leaders for a Sustainable Future club President Lara Applegate and Hawaii Public Utilities Commission Commissioner Lorraine H. Akiba at the Oct. 19 presentation of a $109,496 rebate check for HPU's significant improvements at Aloha Tower Marketplace.

Hawaii Energy, the state's conservation and efficiency program, recognized HPU's energy efficiency measures at the revitalized **Aloha Tower Marketplace**. These include CFL exterior lighting, LED interior and exterior lighting, ENERGY STAR refrigerators in student residences and more. These measures qualified the university for the $109,496 rebate incentive check from Hawaii Energy.

Sustainability Week at Aloha Tower Marketplace continues, with several events open to the community, including a Farmer's Market by the Hawaii Farm Bureau on Oct. 24, a Sustainability Fair Oct. 22, presentations and more. See www.hpu.edu/alumni/Sustainability-Week/.

Business Wire
"Report: 86% of Hawaii Energy Project Participants Had Improved Awareness of Energy Usage Due to CEIVA Energy Technology"
10.27.2015

Report: 86% of Hawaii Energy Project Participants Had Improved Awareness of Energy Usage Due to CEIVA Energy Technology

Hawaii residents say real-time information helped them get to know energy usage better

October 27, 2015 08:01 AM Eastern Daylight Time

HONOLULU--(BUSINESS WIRE)--CEIVA Energy, a smart home energy company, today announced results from its pilot project collaboration with Hawaii Energy, the energy conservation and efficiency program for Hawaii, Honolulu and Maui counties. The project, which ran from April to September, revealed that real-time energy data technologies can make a significant impact in raising awareness around energy use. Based on the project, 86 percent of the 44 pilot participants reported preferring to get real-time energy information from an in-home display (IHD) over any other communications channel, including mobile apps and a website. The same customers also concluded that the IHD helped them get to know their energy usage better.

"This is a great tool that has shown me a realistic breakdown of daily electricity usage."

Tweet this

As part of the "Smart Home" pilot, Hawaii Energy chose CEIVA Energy to provide selected participants with its Homeview customer engagement solution, which collects detailed real-time energy data directly from smart meters and presents it alongside personal photos on an IHD, as well as via a website and mobile apps. Hawaii Energy also worked with CEIVA Energy to develop compelling conservation messages that were delivered on the IHD to encourage Hawaii residents to save energy.

Hawaii Energy saw a positive customer response to the program. Along with reporting improved awareness of energy usage, participants' additional program feedback via survey included:

- "Real-time energy information did change my thinking about energy."
- "It's working great. Find myself moving the IHD from room to room, turning off and on stuff to determine the energy impact."

- “This is a great tool that has shown me a realistic breakdown of daily electricity usage.”

Technical Services Manager Kate Aurilio of Hawaii Energy commented, “Hawaii Energy was tasked by the Hawaii Public Utilities Commission to accelerate the Smart Grid Initiative and enhance smart meter technology benefits to electric utility customers. We are excited to have worked with Home Area Network (HAN) expert CEIVA Energy and secure technology to help residents learn about their energy use in real-time in this pilot. This collaborative project has also been greatly supported by Hawaiian Electric Companies and Silver Spring Networks. Hawaii Energy will incorporate lessons learned to facilitate smart technology as part of Hawaii’s transformation to a cleaner, more sustainable future.”

“These findings reinforce what we’ve seen in deployments around the country: personalized energy data that’s easy to understand ignites engagement around their energy use,” said Dean Schiller, CEO of CEIVA Energy. “We look forward to helping Hawaii Energy further harness the power of engaged customers to improve demand side management programs and address the tremendous energy challenges facing the state.”

Hawaii Energy collaborated with CEIVA Energy to support the Smart Grid Initiative on Oahu with this pilot project. The pilot’s goal was to provide residents with benefits from smart meter technology and a Home Area Network (HAN).

About CEIVA Energy

CEIVA Energy provides a field-proven, end-to-end utility-controlled Home Energy Management and Demand Response System that helps utilities comply with regulatory mandates to reduce energy use and engage with customers. CEIVA Entryway is a demand response management system that makes it easy for utilities to analyze home energy use, manage the smart meter HAN and deliver effective residential DR at scale. CEIVA Homeview is a complete engagement solution that enables utilities to deliver compelling real-time energy consumption data and energy efficiency messages that influence customers. For more information, please visit: http://ceivaenergy.com.

About Hawaii Energy

Hawaii Energy is the ratepayer-funded energy conservation and efficiency program administered by Leidos Engineering, LLC under contract with the Hawaii Public Utilities Commission, serving the islands of Hawaii, Lanai, Maui, Molokai and Oahu. The program is independent of the electric utilities. Hawaii Energy offers cash rebates and other incentives to residents and businesses to help offset the cost of installing energy-efficient equipment. In addition to rebates, the program offers education and training for residents, businesses and trade allies to encourage the adoption of energy conservation behaviors and efficiency measures. For more information, visit www.HawaiiEnergy.com.

Mauinow.com
"Rid-A-Fridge Program $aves, Raises Food Bank Funds"
10.28.2015

Rid-A-Fridge Program $aves, Raises Food Bank Funds

By Maui Now

(From left) Richard Yust, executive director; Steph Kaplan, community relations manager; Erick Acidera, warehouse coordinator; Lynn Curtis, director agency Relations – Maui Food Bank; Walter Enomoto, business program specialist (Maui County), Hawai‘i Energy. Photo courtesy: Hawai‘i Energy.

Maui residents raised $1,170 for the Maui Food Bank, while saving energy in the process, through Hawai‘i Energy's "Rid-A-Fridge to Fight Hunger" program.

Hawai‘i Energy, the ratepayer-funded energy conservation and efficiency program for Hawai‘i, Honolulu and Maui counties, developed the program in August 2011 to encourage residents to properly recycle old working refrigerators or freezers.

In addition to saving energy, Hawai‘i Energy provides a $65 cash rebate for Maui and Hawai‘i Island residents and $50 for those on O‘ahu.

With Rid-A-Fridge, residents have the option to donate their rebate to support their island's respective food banks.

By recycling a refrigerator or freezer, residents on Oʻahu can save approximately $283 annually on their energy costs based on an average of 33 cents per kilowatt hour. Refrigerators and freezers built prior to 1993 can be two to three times more expensive to operate than new ENERGY STAR® models.

All residential electric utility customers on Hawaiʻi Island, Maui and Oʻahu are eligible to participate. To qualify, refrigerators or freezers must be full-size (at least 14 cubic feet) and in working condition.

Hawaiʻi Energy provides free curb-side pick-up and proper recycling.

Since Hawaiʻi Energy began the recycling program, approximately 2,876 refrigerators and freezers have been recycled and kept out of landfills as of June 2015. Recycling ensures that the inefficient units will not be resold or handed down, thus continuing to waste energy. An estimated 2.37 million kWh and $808,363 in electricity costs have been saved annually based on an average 32 cents per kWh across Hawaiʻi Island, Maui and Oʻahu.

To schedule a pick-up for your working refrigerator or freezer, call (877) 231-8222 toll-free on Maui and Hawaiʻi Island and (808) 537-5577 on Oʻahu.

For more information, visit www.HawaiiEnergy.com/rid-a-fridge.

Pacific Business News
"Social Capital: Ray Starling on Energy Efficiency"
10.30.2015

Ray Starling on energy efficiency

Ray Starling is the top executive of Honolulu-based Hawaii Energy, the ratepayer-funded energy conservation and efficiency program administered by Leidos Engineering LLC that's under contract with the Hawaii Public Utilities Commission serving Oahu, Lanai, Maui, Molokai and the Big Island. Its contract ends with the PUC on June 30, 2016, but it plans to re-apply to keep running the program, which it has been for several years.

Hawaii Energy, which currently has about 40 employees located in a Downtown Honolulu office building, has an annual budget of nearly $40 million.

Ray Starling Program Director at Hawaii Energy, the conservation and efficiency… more

Starling spoke to PBN reporter Duane Shimogawa regarding how the program has been helping with the state's efforts to become more energy efficient and how the state is currently measuring up to its stated goals.

Where is the state in terms of its energy efficiency goal?(Former goal was 70 percent renewable by 2030, with 40 percent on renewable and 30 percent on efficiency). That goal has been updated to 100 percent renewable energy by 2045. Hawaii Energy is responsible for about 75 percent of the energy efficiency goal. We're doing a pretty good job, but we've got to work hard to keep efficiency important in people's lives. We are ahead of the goal. We have part of that responsibility. We know what part we have, but there are other folks that have a responsibility but it's vague about who's responsible for what. For instance, codes and standards, what the law requires you to do to build a house or building, that is not under our purview. It's more and more important as we continue to build large buildings here, that we do codes and standards and stick to them. The other codes and standards have to do with what the feds require in terms of appliance efficiency. There's a huge part, maybe 25 percent, of the goal that is really not clear who is responsible, like us. We know we are responsible for 75 percent.

What are some of the program's accomplishments? We've done a lot to try to encourage the first users of LED lighting. In the early days, LEDs were quite expensive and we had great deals on LEDs. All you had to do was get that momentum started and pretty soon LED prices were coming down because of competition and they were head high volume. Now, there is plenty of exposure, people see them. What we went after in the early days are entities who had large lighting requirements and needed to get efficient. When you have lots of lights, that's a big undertaking, in terms of kilowatt hours. If you could cut half of the lighting kilowatt hours, that's a big deal if you've got a lot of lights. The Honolulu International Airport just got finished putting in LED lighting, and the other airports are doing the same thing. We gave rebates for all of that and the air-conditioning systems. If you do that, you get people interested.

How has the program been helpful to the ratepayers? I really believe the way the program is set up with all of these third-party independent entities coming in and pointing out what we're doing right, what we're doing wrong and accounting for all the money we spend, that's a good way to do it. A lot of other entities could do better at spending the public money if they had the same kind of oversight. It is the way to do it as far as I'm concerned. It's so well covered, and then the PUC sets the policies and decides what they want.

How have you helped businesses become more energy efficient? We, like other programs like us, have put in a program that hires contractors to go to business owners to get them to change out their lights to more efficient lights. We went to Molokai. They had really high prices for electricity, and yet you couldn't get them to change out their lights. We went over, and with the help of Blue Planet Foundation, we engaged with the people on Molokai and ended up doing most of the businesses in town. We found out that this way works, and we saved them a lot of money and it's the right thing to do. We can't do to much of that, but we do it for the small businesses.

What are your thoughts on NextEra Energy Inc.'s proposed $4.3 billion acquisition of Hawaiian Electric Co.? I'm glad we're taking our time. There's a lot of discussion about what's the best way to do it. I think that's good for us, good for society. It's really hard for the PUC because they're staffed to be doing what they've always done. They have a bigger staff now. All that's going on is good and necessary. I think we will get some good out of this, even though it's been painful. It could be that NextEra is not the right one for us, or it could be that they are the right one for us, but they would do right by Hawaii with conditions in the approvals that are solid and it makes sure this merger ends up good for Hawaii. The PUC could change the whole way we do energy here, with discussions about [different utility ownership options such as] municipalities or co-ops. Those have their own set of issues. We are asking the right questions and going through the process.

Ray Starling
Program Director at Hawaii Energy, the conservation and efficiency program for Hawaiian Electric Co., Maui Electric Co. and Hawaii Electric Light Co. ratepayers.

Address: 1132 Bishop Street, Suite 1800, Honolulu, Hawaii 96813 **Phone:**(808) 537-5577

Website: www.hawaiienergy.com

Pacific Business News

"Hawaii Energy Program Saves Almost $1B Over Last Six Years"

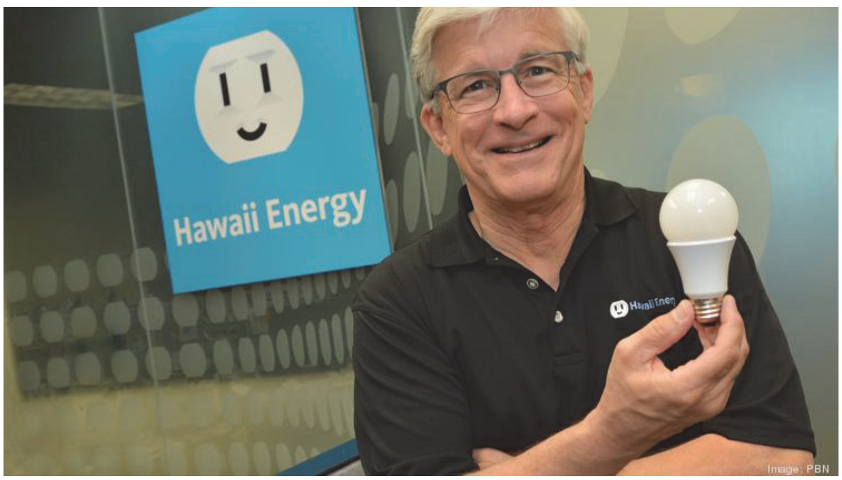
10.30.2015

Hawaii Energy program saves almost $1B over last six years

By **Duane Shimogawa**

Hawaii Energy, the energy conservation program for Oahu, Maui, the Big Island, Molokai and Lanai, has helped save residents and businesses nearly $1 billion over the last six years.

Hawaii Energy, the electric utility customer-funded energy program under the direction of the Hawaii Public Utilities Commission, as administered by Leidos Engineering LLC, recently revealed details from its 2014-15 program year



Ray Starling, program manager for Hawaii Energy

The $965 million in savings equate to nearly 3 billion kilowatt-hours in energy savings, which is enough to fill two Aloha Stadium venues with oil, five years of current solar photovoltaic generation and 90,000 electric vehicles driven for a year, the program said.

This year alone, Hawaii Energy has helped save enough electricity to power 9,000 homes for a year, achieved nearly $1 million in energy savings per year for Honolulu International Airport, established 226 participating allies from 140 businesses and reached over 19,000 students through teacher education.

Hawaii Energy offers cash rebates and other incentives to residents and businesses to help offset the cost of energy-efficient equipment. It also offers education and training for residents, business and clean energy allies to encourage the adoption of energy conservation behaviors and efficiency measures.

PBN recently spoke with Hawaii Energy’s top executive, Ray Starling, about the where the program stands today and in the future, for a feature in Friday's print edition.

Hawaii Energy's contract ends with the PUC on June 30, 2016, but it plans to re-apply to keep running the program, as it has been for several years.

Hawaii could get to 100% renewable energy a lot sooner than 2045, exec says

Oct 30, 2015

Hawaii recently set a new renewable energy goal of attaining 100 percent clean energy by 2045, the first state in the nation with such a goal, but a veteran energy exec in the state says Hawaii can get there even faster.

Ray Starling, program manager for Hawaii Energy, the energy conservation and efficiency program for Oahu, Maui, the Big Island, Lanai and Molokai, told PBN in a recent exclusive interview, that the state can get to 100 percent renewable energy long before 2045.

Enlarge

Hawaii Energy Program Director Ray Starling drives what he preaches. He's standing in… more

Courtesy Ray Starling

"I think we can do better," the retired major general for the U.S. Air Force said. "I think technology will continue to progress and we will be, don't know exactly what that will look like, but my guess is everybody will have an electric vehicle and some kind of charging station at their house that goes two ways."

The mechanical engineer, who also has a law degree from Wake Forest University, thinks that the state will have enough diversity of a wide range of renewable energy technologies.

"Then, we will have a little safety valve — the utility — which will produce whatever we need that is in excess of what we already have," said Starling, who has been the head of Hawaii

Energy for nearly eight years. “I think we will have 100 percent renewable energy before 2045. If you put your mind to it, you can make things happen.”

He likens the challenge to former President John F. Kennedy’s proclamation to put a man on the moon.

“I remember when John Kennedy said that within the decade, we just put Sputnik in space a few years ago, and we will put a man on the moon and bring him home safely,” Starling said. “That’s what he said. It was like nine years and we did it. I mean our program has almost been here for nine years, that’s not a long time. To go from Sputnik to a man on the moon in a very short period of time, that was a big deal.”

To get to that renewable goal faster, he pointed out that it doesn’t even have to be a big breakthrough, such as boiling water and turning it into electricity.

“I think a combination of all of the efficiencies that we will have over that period of time and all of the unknown sources of energy that we will acquire over that time and the storage capability, I think will get us there long before 2045,” Starling said.

Read more about his views and regarding the energy efficiency program he runs in Friday's print edition of Pacific Business News.

Hawaiʻi Tribune Herald
'Rid-A-Fridge' raises $2,015 for Food Basket
10.31.2015

'Rid-A-Fridge' raises $2,015 for Food Basket

Published October 31, 2015 - 3:48pm

Hawaii Island residents raised $2,015 for the Food Basket while saving energy in the process through Hawaii Energy's "Rid-A-Fridge to Fight Hunger" program.

Hawaii Energy, the ratepayer-funded energy conservation and efficiency program for Hawaii, Honolulu and Maui counties, developed the Rid-A-Fridge program in August 2011 to encourage residents to properly recycle their old, second refrigerators or freezers.

In addition to saving energy, Hawaii Energy provides a $65 cash rebate for Hawaii Island and Maui residents and $50 for those on Oahu.

With Rid-A-Fridge, residents had the option to donate their rebate to support their island's respective food banks.

By recycling a refrigerator or freezer, residents can save up to $300 annually on their energy costs. Refrigerators and freezers built prior to 1993 can be two to three times more expensive to operate than a new Energy Star model.

All residential electric utility customers on Hawaii Island, Maui and Oahu are eligible to participate. Refrigerators or freezers must be full size (at least 14 cubic feet) and in working condition. Hawaii Energy provides free curb-side pickup and proper recycling.

Since Hawaii Energy began the recycling program, approximately 2,876 refrigerators and freezers have been recycled and kept out of landfills as of June 2015.

Recycling ensures the inefficient units will not be resold or handed down thus continuing to waste energy.

To schedule a pickup on Hawaii Island, call 877-231-8222. For more information about the program, visit www.HawaiiEnergy.com/rid-a-fridge.

For more information about the Food Basket, visit www.foodbaskethi.org.

Pacific Business News
"Hawaii Airport Energy Upgrade Project to Save $500M Over 20 Years"
11.11.2015

Hawaii airport energy upgrade project to save $500M over 20 years

By **Duane Shimogawa**

The state Department of Transportation's Airport Energy Savings Program is expected to result in nearly $500 million in energy cost savings during a 20-year period, the state's Energy Office said this week.

In 2013, the DOT entered into an energy savings contract with Johnson Controls Inc., which guaranteed reduction of energy use by nearly 50 percent.

The view of Honolulu International Airport from Hawaiian Airlines' offices nearby.

The project provides energy reduction improvements at 12 state aiports and is part of the DOT's overall revitalization project that aims to transform these airports into world-class facilities.

It's worth noting that the state's airport system in the third largest consumer of electricity in state government.

The project started construction in Jan. 2014 and is expected to be completed with the installation of efficiency improvements in Dec. 2016.

Besides the $496.2 million in guaranteed savings in energy costs over a 20-year period, the project is expected to save $20.2 million in tax revenues, $148.5 million in income to households and generate 867 jobs each year for the first two years of construction/installation.

It also will use $4.3 million in energy efficiency rebates from Hawaii Energy, 74,500 light fixtures and 372 transformer replacements, as well as 8,748 solar photovoltaic panels for a total of 5.2-megawatts installed.

Additionally, there will be upgrades and the replacement of chilled water and air conditioning systems, installation of smart controls to maximize efficiency, indoor air quality and occupant comfort.

The contract is being recognized as the largest single state contract for energy performance contracting in the nation by the Energy Service Coalition.

For the entire project, 75 percent of the work will be done at the Honolulu International Airport, 17 percent at Kahului Airport, 3 percent at Hilo International Airport, 3 percent at Lihue Airport, 1 percent at Kalaeloa Airport and the remaining airports are less than 1 percent.

Over 20 years, the energy saved could power 126,206 homes, according to the state Department of Business, Economic Development and Tourism.

Ashrae Hawaiʻi News Letter
11.12.2015

HE EA MAKAME

ASHRAE Hawaii Chapter

November 12, 2015

P.O. Box 3916, Honolulu HI 96812-3916
Ashraehawaiichapter.info

INSIDE THIS ISSUE

Chapter President

Presidents Message

By Donna Kishi

Aloha,

This month is the beginning of the holiday season. I cannot believe we have less than two months before the end of 2015. I can certainly relate to the old saying that the older one gets, the faster the year goes by for this has been an extremely fast year for me!!

Again thank you for great attendance to the October membership meeting. The speakers for both sessions were great and informative

Ruben Whillmart representing the Carrier Corporation included very practical applications for VRF systems as well as a good review for the attendees.

Michael Chang from Hawaii Energy presented a comprehensive picture of Hawaii's energy usage. He stated his company's role in the identification of target markets where there are energy savings opportunities. He also stated how Hawaii Energy developed programs that assist residential and commercial energy users address the common and specific barriers to achieving energy efficiency in their homes and facilities.

Michael is also a past president of the AHSRAE Hawaii chapter and it was very nice to see him again

I invite you to attend the November meeting on Thursday November 12 for another great evening of continuing education, fellowship and good food.

Have a great Thanksgiving to all of you

Join me in offering gratitude for being allowed to live in this great place called Hawaii and for all of the blessings for wonderful families, friends and associates.

Star Advertiser
"Swapping bulbs appliances can ease energy costs"
11.22.2015

Swapping bulbs, appliances can ease energy costs

Question: What are some easy ways that people can cut back on energy use and save on their electrical bill?

Answer: There are lot of ways you can reduce energy use with good common sense, (such as) walking around and being aware of what is using power and looking to see if the power needs to be on at the particular time.

The simplest way is to turn the lights off when you don't need them. Most of the day my lights are not on. If you have an office that is lit adequately from outside sunshine, you don't need the bright lights.

If you are walking around the house, or you put your hand on some device and it's warm, you need to ask yourself, "Does this need to be on?" Usually the answer is no.

With an electric water heater, reducing your shower time by two minutes can save you about $56 per person per year in electricity costs. Wash your clothes with cold water instead of hot water in your Energy Star washing machine. You can save about $50 a year. If you hang your clothes to dry instead of using a dryer, you can save $70 or more.

Lighting has always been a big factor in energy reduction. Lighting is the key thing you start with.

If you still have old lighting such as incandescents, you need to seriously think about going to (light-emitting diode) LEDs. They are cost-effective now, and they last for a long time. That's a big one.

Q: What is the energy reduction for switching to LEDs?

A: The reduction has gone from a 100-watt light bulb just a few years ago to about 10 watts for an LED. That's a 90 percent drop.

Q: How can residents save money on their electrical bills this holiday season?

A: Starting Nov. 24 we are offering two energy-saving kits. You can choose from a free home energy kit, upgrade and purchase the $10 home energy kit, or get both.

The free home energy kit contains three energy-efficient LED A19 bulbs. With the kit you can save about $15 per year on your electrical bill. The bulbs in the kit are used in many common household fixtures such as desk lamps and wall lighting.

By recycling a refrigerator or freezer, residents on Oahu can save about $250 annually on their energy costs. Refrigerators and freezers built prior to 1993 can be two to three times more expensive to operate than a new Energy Star model.

With our Rid-A-Fridge program, we provide free curbside pickup and proper recycling of your old, second working refrigerators or freezers. You also get a rebate: $50 for Oahu or $65 for Big Island and Maui.

Q: What are ways residents can save energy while keeping cool during the holidays?

A: Give your AC a vacation by leaving it off. If you need to stay cool, consider an efficient ceiling fan. Get a $35 rebate when you buy an Energy Star ceiling fan with a light kit. You can save about $18 a month by using one versus a window AC.

For those no-tradewind days when AC is a must, trade up to a new Energy Star model. We offer a $50 rebate for qualifying units and will recycle the old working one for free. You can save about $67 per year on your electrical bill.

Q: What can residents and businesses do to learn more about their energy usage and how to save money on their electrical bills?

A: For the first time, we are offering online portal access for home energy reports to all Hawaii, Honolulu and Maui county residents. The tool offers personalized energy insights and recommendations to help you take control of your energy use and save money on electrical bills. Helpful tips range from behavioral changes such as reducing water heating temperature to investment ideas.

Island 98.5

Hawaiʻi Energy Radio Interview featuring Rachel Fukumoto from Hawaiʻi Energy

Big Island Now
"Hawai'i Energy Offers Free Energy Saving Kits"
11.24.2015

Hawai'i Energy Offers Free Energy Saving Kits

By Big Island Now Staff

Hawaii Energy's Rachel Fukumoto and Hoang Tran show items from the energy-saving kits. Photo courtesy of Hawai'i Energy.

Big Island electric utility ratepayers, along with those in Honolulu and Maui County, are being offered a free home energy saving kit from Hawai'i Energy, the ratepayer-funded conservation and efficiency program administered under a contract with the Hawai'i Public Utilities Commission.

The free energy kit contains three energy-efficient A19 LED bulbs, which are valued at $25.

According to Hawai'i Energy, the kits can save households an average of $15 per year in electricity costs.

"Earlier this year, Hawai'i Energy offered two energy-saving kits that sold out faster than we anticipated," said Deputy Program Manager, Caroline Carl. "Since we had such positive feedback, we are launching another promotion now until the end of the year or while supplies last."

Hawai'i Energy is also offering a paid kit, the $10 home energy kit which includes an advanced power trip and three LED BR30 bulbs, a value of $53. These kits can save households up to $40 annually.

Utility ratepayers can choose only the free kit, the $10 kit, or both.

Those interested should visit the Hawai'i Energy website and enter their zip code and mailing address. Shipping is free. Each household can request up to one of each type of kit and they should arrive in four to six week.

Hawai'i Energy is independent of the electric utilities.

West Hawaiʻi Today
About Town
11.28.15

Hawaii Energy offers energy-saving kits

Hawaii Energy is offering two energy-saving kits to electric utility ratepayers of Hawaii, Honolulu and Maui counties. Customers may choose from a free home energy kit, upgrade and purchase the $10 home energy kit, or get both.

The free home energy kit contains three energy-efficient A19 LED bulbs (60 watt equivalent), which is valued at $25. The kit is estimated to save a household about $15 each year in electricity or the equivalent of 58.5 kilowatt hours based on $0.25 per kilowatt hour.

The $10 home energy kit contains an advanced power strip and 3 LED BR30 bulbs, which is valued at $53. The kit is estimated to save a family about $40 annually or the equivalent of 161.3 kilowatt hours. The bulbs in this kit are typically used in track and recessed fixtures.

Info: www.hawaiienergy.com/kits. Each household is limited to one free kit and one $10 kit.

Building Industry Hawaii
"HPU Check Presentation"
12.1.2015

Hawaii Energy recently presented Hawaii Pacific University with a $109,496 incentive check for HPU's completion of an energy-efficiency project for its newly renovated Aloha Tower Marketplace. The project is expected to save HPU $125,633 in annual energy costs each year. Attending the event are, from left, Dingilizwe Ncube, HPU facilities project coordinator; HPU Vice President Janet S. Kloenhamer; Ray Starling, Hawaii Energy program director; HPU President Geoffrey Bannister; Andre Parente, Hawaii Energy efficiency adviser; Lara Applegate, HPU student president of Leaders for a Sustainable Future club; and PUC Commissioner Lorraine H. Akiba.

Hawai'i Food Bank
Kokoo – Partnerships in Fighting Hunger
12.1.2015

Kōko'o – Partnerships in Fighting Hunger

August 27, 2015 - Mahalo to **Oahu residents** who **raised $3,850** for the Hawaii Foodbank, while saving money on their electric bills through **Hawaii Energy's "Rid-A-Fridge to Fight Hunger"** program.

Pictured Left to Right: **Burk Gingerich**, Program Manager, Honeywell; **Megan Norris**, Development Assistant, Hawaii Foodbank; **Rachel Fukumoto**, Junior Residential Program Specialist, Hawaii Energy; **Dick Grimm**, President & CEO, Hawaii Foodbank.

September 16, 2015 - The Hawaii Lodging & Tourism Association (HLTA) put its "Best Slippah Forward" by presenting the Foodbank with a $2,000 check from proceeds raised at the 2015 Visitor Industry Charity Walk (VICW).

Pictured Left to Right: **Benjamin Rafter**, VICW 2015 Chair; **Lori Kaya**, Grants & Communications Manager, Foodbank and **Mufi Hannemann**, HLTA President & CEO.

July 9, 2015 - The Walmart Foundation donated $100,000 to help distribute **fresh produce and assorted food through the Hawaii Foodbank Ohana Produce Plus Program. Ray Griego**, Downtown store manager (right) presented a check to the Foodbank at the Surfing the Nations, Kalihi Palama distribution. Polly Kauahi Hawaii Foodbank Vice President & COO (left) and Senator Suzanne Chun Oakland (center) gratefully accepted on behalf of the Kalihi community.

November 4, 2015 - Kraft and the Hawaii Foodbank kicked off its 23rd Annual Check-Out Hunger holiday giving campaign at Tamarind Park. **Stacy Cobb**, Kraft Heinz Customer Business Lead (third from left) presented a $5,000 check to **Polly Kauahi**, Hawaii Foodbank Vice President & COO (fourth from left) and Hawaii Foodbank 2nd Vice Chair **Gerald Shintaku** (right) for a successful campaign start.

Joining them were some of this year's grocery and retail partners. From left to right: **Tad Fujiwara**, Times Supermarkets; **Liza Garcia-Mitchell**, Don Quijote and **Clayton Eto**, Safeway Kapahulu.

October 30, 2015 - Deloitte Services had a friendly completion between the Men and the Women. Pictured are the women of Deloitte in their glory having collected **over 700 pounds of food. Together, the Deloitte Services team raised 1,434 pounds of food and $320 to help feed Hawaii's hungry.**

June 23, 2015 - A big MAHALO to the **Ball Corporation** for its gift of **2,680 pounds of food that was matched by its Foundation dollar-for-pound, $2,680!** These efforts will help provide food **for 8,810 meals to help feed Hawaii's hungry!**

Maui Now
“Hawai‘i Energy Offsets Costs at Meadow Gold”
12.9.2015

Hawai‘i Energy Offsets Costs at Meadow Gold

By Maui Now

Michael Reyes, engineering/maintenance manager at Meadow Gold Dairies; Ross Yamamoto, lead mechanic at Meadow Gold Dairies; Louis Seles of Mr. Sandman Inc.; Bob Freeman, CEO of Mr. Sandman Inc.; Jimmy Pastor, energy advisor at Hawai‘i Energy. Photo credit: Hawai‘i Energy.

Hawai‘i Energy presented Meadow Gold Dairies with a $41,493 incentive check to offset the cost of installation of a new 150-HP Variable Frequency Drive air compressor.

The total project cost was $126,290. With Hawai‘i Energy’s incentive of $41,493, the net cost to Meadow Gold was $84,797.

The new VFD air compressor is estimated to save the manufacturing facility $42,6031 annually in energy costs, which will pay for the entire project in less than two years (based on $.22/kilowatt hour (kWh).

Annual energy savings is estimated at 193,652 kWh.

The use of compressed air is critical to the manufacturing of milk, juice and cultured products at Meadow Gold.

Hawaiʻi Energy is the ratepayer-funded energy conservation and efficiency program administered by Leidos Engineering LLC under contract with the Hawaiʻi Public Utilities Commission, serving the islands of Hawaiʻi, Lānaʻi, Maui, Molokaʻi and Oʻahu. For more information, visit www.HawaiiEnergy.com.

Meadow Gold Dairies has maintained a 118-year tradition of giving back to the communities in which it serves. After more than a century of being a part of Hawaiʻi's families and communities, Meadow Gold continues to support efforts that enable positive impacts on children, youth, health, nutrition and education.

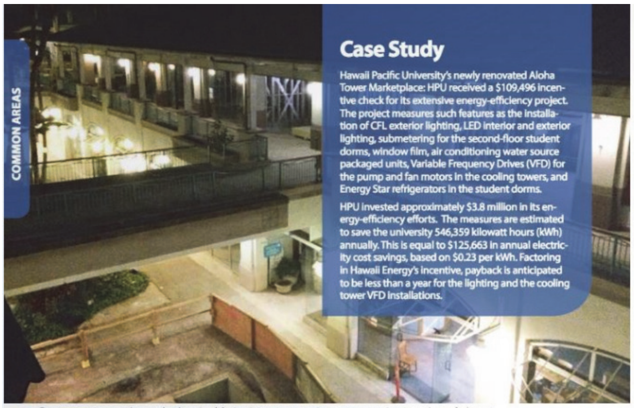
Meadow Gold operates manufacturing facilities on Oʻahu and Hawaiʻi Island, which process milk and manufacture products such as sour cream, cottage cheese and buttermilk, as well as POG, tropical nectars, drinks and yogurt products.

For more information, go online visit http://www.lanimoo.com or contact Hawaii Energy Shan Wirt at (808) 848-8560 or via email.

KSSK Perry & Price Morning Show
Radio interview featuring Carline Carl from Hawaiʻi Energy
12.12.2015

BMH
"Common Area"
1.1.2016

COMMON AREAS



Case Study

Hawaii Pacific University's newly renovated Aloha Tower Marketplace: HPU received a $109,496 incentive check for its extensive energy-efficiency project. The project measures such features as the installation of CFL exterior lighting, LED interior and exterior lighting, submetering for the second-floor student dorms, window film, air conditioning water source packaged units, Variable Frequency Drives (VFD) for the pump and fan motors in the cooling towers, and Energy Star refrigerators in the student dorms.

HPU invested approximately $3.8 million in its energy-efficiency efforts. The measures are estimated to save the university 546,359 kilowatt hours (kWh) annually. This is equal to $125,663 in annual electricity cost savings, based on $0.23 per kWh. Factoring in Hawaii Energy's incentive, payback is anticipated to be less than a year for the lighting and the cooling tower VFD installations.

Onsequam, conse nonescipsum volum haruntus doluptaeptas nos quas sum etur, nos arum eosantum re, exeria eum fugiam aut.

Common Areas Driving Up Your Bills?

Choosing more energy-efficient lighting can save money and likely will last longer

BY KEITH BLOCK

You have been analyzing your working budget and it seems there's a surplus. What should you do? You could splash a bit of paint around and spruce up the place. There would be some immediate benefits of looking a bit nicer.

Or, you could do something that would grow and perpetuate the budget surplus. You can reduce your monthly expenses, now and into the future. But how? What's one of the biggest monthly expenses? Yes, the common area electric bill. But where to start?

The first thing when thinking about reducing the common area electric bill is to look at lighting. Lighting projects can be done relatively cheaply, and generally have the biggest bang for the buck. It's the best expense reduction per dollar invested. In fact, most lighting upgrades have about a two-year payback. But first consider what sort of lighting project to do.

The first thing in lighting is always look for incandescent lamps of any type, screw-in incandescents or halogens. These are little heaters that also produce some light. Let's keep in mind that 90 percent of the energy put into an incandescent lamp is released in the form of heat. Only 10 percent of the energy actually contributes to the light coming out of the lamp. And what happens to that heat? It has to be removed from your common areas by the air conditioning system. Don't make your air conditioner work harder than it has to.

So, if you still have an incandescent lamp anywhere on your property, run to immediately replace it. Replacing incandescents has a payback period of months, not years.

But you say, "I replaced all my incandescents with compact fluorescent lamps (CFLs) years ago." Did you know that you can now replace those CFLs with light emitting diodes (LEDs) and still get that two-year payback?

Here's how. The 26-watt CFLs in the recessed can fixtures, wall sconces or anywhere else can now be replaced by a 12- or 13-watt LEDs. This can save about half of the energy now being used. In most cases, LED lamps retail for around $20 to $30. There is a $7.50 to $10 per lamp incentive available from Hawaii Energy, depending on the shape and if it's dimmable or not. That's about a third the cost of the lamp. Plus, the 13-watt reduction in this example, if it's burning 12 hours per day, 365 days a year, is about $10 a year in energy savings.

So, with one-third the cost in an incentive from Hawaii Energy, about a third the savings in energy in the first year and the same in the second year, LEDs are about a two-year payback. But if those lamps are in your common area and are on 24 hours per day, 365 days a year, then double your savings and half your payback period to one year.

And similar results can be found in other LED sizes and configurations.

The news gets even better. LEDs also have a longer life expectancy. Many LEDs have an expected life of 50,000 burn hours. If that lamp is in your common area and is on all the time, that's almost six years before you have to replace it.

Something to note: Life expectancies of LEDs are based on a certain percentage of lamps lasting for a certain period of time. Some lamps may fail, but by doing due diligence and making sure that the lamps are certified by either Energy Star, DesignLights Consortium or Lighting Facts (requirement for the Hawaii Energy incentive), then you can be reasonably sure that the vast majority of the lamps will perform as advertised.

Key takeaway: Buy a reputable product from a reputable source.

Maybe some are thinking, "OK, I get it, I need to do an energy-efficient lighting project to reduce my monthly expenses and perpetuate my surplus." How do I make sure I get that incentive? There are two ways to get that incentive. Go to Hawaiienergy.com and download the application and worksheet. After completing the installation, turn those in with the invoice and specification sheets for the lamps.

Or go to lighting distributors who are participating in the company's Lighting Distributor Instant Rebate Program and get the incentive at the time of the purchase directly from the distributor. Half as much material cost at the time of purchase means you can do more lamps for the same cost.

To find out which distributors are participating in the program, go to hawaiienergy.com/lighting.

Keith Block

Keith Block is the business program manager at Hawaii Energy and has more than 20 years of experience in the energy conservation and efficiency industry. Hawaii Energy is the ratepayer-funded conservation and efficiency program administered by Leidos Engineering LLC, under contract with the Hawaii Public Utilities Commission.

"Made in Hawaii for Hawaii" - Servicing All Islands!

The Cold Patch with Hot Mix Performance!

Advantages:
- Made with ***Hawaiian Basaltic Rock*** that won't turn white on the roadway.
- Easy to Use - Simply pour from bag and tamp or drive over with car wheels. No heating required.
- PatchMaster can be applied in any weather.
- Fills potholes in both asphalt and concrete. Ideal for full depth repair.
- Packaged in 50 lb. weatherproof bags, 400 & 1100 lb. bags and bulk.
- Ideal for roads, streets, parking lots, driveways, and other pavement surfaces.

SealMaster®
Pavement Products & Equipment

2927 Mokumoa St.
Honolulu, HI 96819-4404

Call Today!
(808) 839-2782

sealmasterhawaii.com

Maui Now

“Hawaii Energy Offers Solar Water Heating Tune-up Rebate”

1.04.2016

Hawaii Energy Offers Solar Water Heating Tune-Up Rebate

By Maui Now

Caroline Carl with Hawaii Energy. Hawaii Energy photo.

Hawaii Energy offers a limited-time Solar Water Heating Tune-Up rebate of $150 for the third year in a row. Since 2014, over 2,500 residents have taken advantage of the rebate.

The Tune-Up rebate is available through May 31, 2016, or while funding lasts.

Residential electric ratepayers on Hawaiʻi Island, Lānaʻi, Maui, Molokaʻi and Oʻahu are eligible (those who received a Tune-Up rebate in the last two years (2014 or 2015) are not eligible).

To find a participating contractor and schedule a tune-up, go online or call Hawaii Energy at 537-5577 or (877) 231-8222 toll-free.

To qualify for the rebate, systems must be at least three years old and the tune-up must be performed by a Hawaii Energy participating contractor. The cost of a tune-up typically ranges between $300 and $500. Hawaii Energy helps reduce this cost by providing a $150 Tune-Up rebate.

To make it easy for residents, participating contractors instantly deduct the rebate from the invoice so that residents do not have to mail in any applications or wait for rebate checks.

“Hawaii Energy encourages you to take advantage of the rebate now, especially if your solar water heater has never been maintained,” said Deputy Program Manager Caroline Carl. “Ask your contractor about the condition of your system before and after the tune-up. You’ll be better informed about maintenance to extend the life of your system.”

Solar water heaters require maintenance every three to five years to check and repair normal wear-and-tear that may include leaks, corrosion or pump failure. A properly maintained solar water heater can last 15 years or more.

For those without solar water heating, Hawaii Energy is offering a $750 instant rebate when a system is installed by a participating contractor. Learn more at www.hawaiienergy.com/solarwater.

Households that replace their electric resistance water heater with a solar water heater can save between 25 and 40 percent on their electric bill. However, without regular maintenance these savings can gradually diminish.

Hawaii Energy is the ratepayer-funded energy conservation and efficiency program administered by Leidos Engineering, LLC under contract with the Hawaii Public Utilities Commission, serving Hawaiʻi Island, Lānaʻi, Maui, Molokaʻi and Oʻahu. The program is independent of the electric utilities. Hawaii Energy offers cash rebates and other incentives to residents and businesses to help offset the cost of installing energy-efficient equipment.

In addition to rebates, the program offers education and training for residents, businesses, and trade allies to encourage the adoption of energy conservation behaviors and efficiency measures.

For more information, visit www.hawaiienergy.com.

Maui Now
"Hawaii Energy offers First-Ever "New Year Giveaway"
1.11.2016

Hawai'i Energy Offers First-Ever 'New Year Giveaway'

By Maui Now

Hawai'i Energy has announced its first-ever "New Year Giveaway." From now until Jan. 30, 2016, residents can enter online for a chance to win an ENERGY STAR refrigerator.
One resident from each county will be randomly selected to win a white ENERGY STAR top-freezer, 18-cubic-foot unit (estimated $650 value). A total of three refrigerators will be awarded.

Hawaii Energy encourages residents to include energy efficiency as the go-to, cost-effective way to save energy and money on electric bills in the coming year.

To enter the "New Year Giveaway," visit Hawaii Energy's Facebook page. Click on the "New Year Giveaway" link for the entry form. Limit one entry per resident.

While on Hawaii Energy's Facebook page, residents can "Like" the page to stay current on the latest energy-saving offers and tips.

For information about the contest and complete rules, visit www.facebook.com/hawaiienergy.

"We appreciate the tens of thousands of residents who participated in our rebates last year," said Shan Wirt, marketing and communications group manager. "For 2016, our goal is to engage with more residents to help reduce their electric usage and bills. With our 'New Year Giveaway,' we hope to generate additional excitement for and commitment to energy conservation and efficiency."

Hawaii Energy is the ratepayer-funded energy conservation and efficiency program administered by Leidos Engineering LLC under contract with the Hawaiʻi Public Utilities Commission, serving the islands of Hawaiʻi, Lānaʻi, Maui, Molokaʻi and Oʻahu.

For more information, visit www.hawaiienergy.com.

Condominium Council of Maui
1.12.2015

Hawaii Energy lighting your way to efficiency.

Hawaii's high energy costs can make it challenging for condominium associations to keep operating expenses down. Did you know that you have the power to lower these costs through proven energy efficiency measures?

Hawaii Energy, the ratepayer-funded energy conservation and efficiency program serving Hawaii, Honolulu and Maui counties, has worked with a number of condos across the islands to provide generous financial incentives to reduce the cost of installing new, energy-efficient technologies. Below are two energy-saving ideas to consider.

Parking Garage Lighting

There are multiple benefits when replacing old parking garage lights with newer more energy-efficient ones. Since parking garage lighting usually operates 24 hours a day, they can be some of the highest energy-consuming light fixtures.

Many of the older buildings in Hawaii have outdated parking garage lights such as T12 fluorescent lights, high pressure sodium lights (HPS) or metal halides (MH). By switching to newer light emitting diodes (LED) technologies, associations can reduce their utility bills and enhance lighting quality for a safer, more comfortable environment.

There are various lamp styles to choose from, and Hawaii Energy can provide both customized and prescriptive incentives to help offset project costs. Often lighting retrofits can have payback periods of 1 – 3 years or less.

Bi-Level Stairwell Lighting

Stairwell lighting can be a costly expense for condos. Stairwell lighting requirements call for increased light levels during occupied times while maintaining minimum level standards when unoccupied. Since most stairwells are required to be lit 24 hours a day and 7 days per week, they represent a significant energy saving opportunity.

Bi-level lighting provides constant low-level illumination until someone enters the stairwell and a built-in motion sensor increases the light levels. The lighting continues to increase automatically as long as occupancy is detected. This type of lighting can lower energy costs as well as provide optimal light levels for a safer environment.

Maui County Outdoor Lighting Ordinance

Facilities with older exterior lighting may want to start planning on upgrading their lighting to conform to the new Maui County Lighting Ordinance (3430) that will become effective on Jan 25, 2017. This lighting ordinance was passed by the County of Maui in 2007 with a 10 year grace period. This ordinance calls for fully shielded lighting for new or existing lighting and even requires partial shielding and turn off at 11pm to sunrise in some instances. For more information on this ordinance, check:
http://www.mauicounty.gov/DocumentCenter/View/7329 .

Hawaii Energy

Hawaii Energy can assist with incentives if the new exterior lighting installed saves energy. For more information on our lighting incentives, check out: https://hawaiienergy.com/for-businesses/incentives/lighting . To help find a lighting vendor who can assist you with upgrading to more energy efficient lighting, check out our Clean Energy Ally search at: https://hawaiienergy.com/find-a-contractor/certified-clean-energy-allies

About Hawaii Energy

Hawaii Energy is the ratepayer-funded energy conservation and efficiency program administered by Leidos Engineering, LLC under contract with the Hawaii Public Utilities Commission, serving the islands of Hawaii, Lanai, Maui, Molokai and Oahu. Hawaii Energy offers cash rebates and other incentives to residents and businesses to help offset the cost of installing energy-efficient equipment.

In addition to rebates, the program conducts education and training for residents, businesses and trade allies to encourage the adoption of energy conservation behaviors and efficiency measures. For more information, visit www.HawaiiEnergy.com.

Contact: Walter Enomoto
Energy Efficiency Advisor, Maui County
(808) 298-4269

West Hawaii Today
“Hawaii Energy Offers Chance to Win Energy Star Refrigerator”
1.12.2016

Hawaii Energy offers chance to win Energy Star refrigerator

Hawaii Energy, a ratepayer-funded energy conservation and efficiency program is offering residents a chance to win an Energy Star refrigerator. One resident from each county, Hawaii, Honolulu and Maui, will be randomly selected to win a white top-freezer, 18-cubic feet unit (estimated $650 value).

To enter, visit Hawaii Energy’s Facebook page at www.facebook.com/hawaiienergy and click on the “New Year Giveaway” link for the entry form. Enter by Jan. 30. Limit one entry per resident

Lahaina News

"Hawaii Energy Offers Limited Time $150 Solar Water Heating Tune-up Rebate"

1.14.2016

Hawaii Energy offers limited time $150 solar water heating tune-up rebate

HONOLULU - Hawaii Energy, the ratepayer-funded energy conservation and efficiency program for Hawaii, Honolulu and Maui counties, is offering a limited time solar water heating tune-up rebate of $150 for the third year in a row. Since 2014, more than 2,500 residents have taken advantage of the rebate.

The tune-up rebate is now available through May 31, 2016, or while funding lasts. Residential electric ratepayers on Hawaii Island, Lanai, Maui, Molokai and Oahu are eligible. However, those that received a tune-up rebate in the last two years are not eligible.

To find a participating contractor and schedule a tune-up, visit www.hawaiienergy.com/tune-up or call Hawaii Energy at 537-5577 or toll-free (877) 231-8222.

Article Photos

Carl

To qualify for the rebate, systems must be at least three years old, and the tune-up must be performed by a Hawaii Energy participating contractor.

The cost of a tune-up typically ranges between $300 and $500. Hawaii Energy helps reduce this cost by providing the $150 rebate.

To make it easy for residents, participating contractors instantly deduct the rebate from the invoice, so that residents do not have to mail in any applications or wait for rebate checks.

"Hawaii Energy encourages you to take advantage of the rebate now, especially if your solar water heater has never been maintained," said Deputy Program Manager Caroline Carl.

"Ask your contractor about the condition of your system before and after the tune-up. You'll be better informed about maintenance to extend the life of your system."

Solar water heaters require maintenance every three to five years to check and repair normal wear-and-tear that may include leaks, corrosion or pump failure. A properly maintained solar water heater can last 15 years or more.

For those without solar water heating, Hawaii Energy offers a $750 instant rebate when a system is installed by a participating contractor. Learn more at www.hawaiienergy.com/solarwater.

Households that replace their electric resistance water heater with a solar water heater can save between 25 and 40 percent on their electric bill. However, without regular maintenance, these savings can gradually diminish, Hawaii Energy reported.

KSSK Perry & Price Morning Show
Radio interview featuring Keith Block from Hawaiʻi Energy
1.22.2016

(NEED PHOTO)

Blue Planet Foundation Announces Winner of Inaugural Energy Innovation Design Challengeon 11 February 2016.

FOR IMMEDIATE RELEASE
February 11, 2016
Contact: Francois Rogers, 808-753-1330

Students from Connect 5 Kids on Kauai receive top prize for their clean energy innovation

HONOLULU—Congratulations to Brianna Ryan, Jackson Gamby, and Zeke Gamby of Connect 5 Kids on Kauai, who took home the top prize—a $2,000 educational scholarship—in **Blue Planet Foundation**'s first annual Energy Innovation Design Challenge. Launched at Blue Planet Foundation's inaugural Student Energy Summit in November 2015, the Design Challenge tasked students from across the state with developing actionable solutions for Hawaii's energy challenges.

Students teamed up to create three- to five-minute videos showcasing their ideas and prototypes, using the design-thinking methodology they learned at the Summit, thanks to expert volunteers from Oceanit. Oceanit was one of several sponsors—including**Hawaii Energy**, **Energy Excelerator**, the **Bill Healy Foundation**, **Hawaiian Airlines**, and the **Department of Business, Economic Development & Tourism**—that made the Summit and Design Challenge a reality.

"The Design Challenge students really impressed us with their creativity and enthusiasm for tackling Hawaii's energy challenges," noted **Francois Rogers**, Special Projects Director at Blue Planet Foundation. "They are now clean energy ambassadors for their schools and communities, and their innovative ideas will be an inspiration for new students attending the 2016 Student Energy Summit."

Also known as "The Megawatts," Brianna, Jackson, and Zeke, produced an inspirational video that walked through each stage of the design-thinking process: (1) **empathizing** by observing and developing an understanding of the problem of climate change; (2) **defining** the problem based on those observations; (3)**ideating** by generating as many ideas as possible for potential solutions; (4) **prototyping** by researching and building working examples of those ideas; and (5) **testing** their prototypes before repeating the process until they achieve a solution. In the end, they successfully tested a prototype using duckweed pellets as an alternative source of energy.

A panel of distinguished judges—comprised of educators, community leaders, and clean energy experts—selected the winning team. **Chelsea Harder**, a Design Challenge judge and Transformational Program Specialist at sponsor Hawaii Energy, offered praise for the program: "Hawaii Energy is pleased to support Blue Planet Foundation's Energy Innovation Design

Challenge. This follow-on from the Student Energy Summit has given students the opportunity to bring their ideas to life and has inspired them to be part of the energy solution for Hawaii. Collaborative and forward-thinking challenges such as these are building our future leaders and innovative thinkers to help Hawaii meet its goal of 100% clean energy by 2045."

A total of eight teams competed in the Design Challenge. All entries—including the winning video—can be viewed on Blue Planet Foundation's website at: blueplanetfoundation.org/designchallenge.

About Hawaii Energy

Hawaii Energy is the ratepayer-funded energy conservation and efficiency program for Hawaii, Honolulu and Maui counties administered by Leidos Engineering, LLC under the direction of the Hawaii Public Utilities Commission.

BMH

"Building Energy Efficiency into Your Next Project"

2.17.2016

ENERGY MANAGEMENT

Build Energy Efficiency into Your Next Project

The garage ventilation system at Nauru Tower

Using the right equipment and technology helps properties reap savings of 80 percent

BY KEITH BLOCK

Common renovations involving aesthetic upgrades may be high on your list, but something to also consider are improvements to lower operating costs. And why not start with the two most utilized areas of a building: common areas and the garage.

How old is the existing lighting?

A lighting upgrade can make an old space seem brand new. Plus, using energy-efficient equipment can significantly reduce your monthly electricity bill. Lighting projects can be inexpensive with financial incentives, and generally have the biggest ROI. Most lighting upgrades have about a two-year payback.

The first thing is to look for incandescent lamps of any type, screw-in incandescents or halogens. Did you know that only 10 percent of the energy actually contributes to the light coming out of the lamp? The rest is heat. And the heat from the lamps needs to be removed from your common areas by your air conditioning system. A harder-working air conditioner usually means a higher electric bill.

What if you already replaced all your incandescents with compact fluorescents lamps (CFLs)? Good news: Now you can replace those CFLs with light-emitting diodes (LEDs) and still get that two-year payback. The 26-watt CFLs in your recessed can fixtures, wall sconces or anywhere else can be replaced by a 12- or 13-watt LED. This can save you about half of the energy you are now using. In most cases, these LED lamps retail for around $20 to $30 (a $7.50 to $10 per lamp incentive might be available from Hawaii Energy).

LEDs also have a longer life expectancy. Most LEDs have an expected life of 50,000 burn hours. If your lights are on all the time, that's almost six years before you need to replace them. Imagine not having to replace light bulbs for six years! I bet you've heard of LED lamps that failed within a month of installation. By making sure that the lamps are certified by Energy Star®, DesignLights Consortium™ or Lighting Facts, you can be confident that the majority of the lamps will perform.

Garage Ventilation

We all know that fans and mechanical ventilation are necessary in parking garages. However, when was the last time you thought of a safe breathing environment for staff and tenants? Carbon monoxide, in particular, presents a threat because it is poisonous, lighter than air and odorless.

With this in mind, carbon monoxide monitoring systems can determine the concentration of carbon monoxide levels and activate exhaust fans only when they are needed to keep the air safe to breathe. Also, monitoring systems can dramatically minimize the amount of time exhaust fans run. On average, the run-times of exhaust fans can be reduced by 83 percent or more.

For those who manage a property with a garage, installing a carbon monoxide monitoring system can result in the following benefits:

- Minimized utility bills: The electricity required to run the exhaust fans 24 hours a day is exceptionally high, causing large utility bills.
- Lower fan usage: Fans run continuously, causing significant wear, frequent equipment replacement and shortening fan motor life.
- Reduced maintenance: Without a carbon monoxide system, the frequency of maintenance is higher for fan belt and lubrication services.

Among the properties that achieved energy savings of 80 percent or higher with a payback period with incentives in three to six months (with approximate annual savings) were the Nauru Tower AOAO ($284,000), Hawaii Prince Hotel ($183,000), Queen Emma Gardens ($135,000), Ward Entertainment Parking Garage ($72,000) and Wailana AOAO ($26,000).

Keith Block

Keith Block is the business program manager at Hawaii Energy, which is the ratepayer-funded conservation and efficiency program for Hawaii, Honolulu and Maui counties administered by Leidos Engineering LLC, under contract with the Hawaii Public Utilities Commission. For more about Hawaii Energy's Instant Lighting Rebate Program visit hawaiienergy.com/incentives.

Maui Now
"Bulbs.com Offers Rebate Help for Energy-Efficient Lighting"
2.17.2016

Bulbs.com Offers Rebate Help for Energy-Efficient Lighting

By Maui Now

Bulbs.com, one of the largest online distributors of replacement lighting products, has expanded its utility rebate program to Hawai'i, Washington, Maryland and Illinois to help eligible customers receive instant rebates for energy-efficient lighting.

Commercial and Industrial accounts can save up to 70% instantly on their lighting purchases with qualified utility rebate incentives (savings vary by utilities in each state).

"Many customers are not aware that part of their utility bill payments are currently being used to fund rebate incentives for energy-efficient lighting purchases from their local utilities," said Robert Kernweis, vice president of marketing and sales. "We help customers recognize the complete value of energy-efficient lighting for their space and how best to maximize available rebate incentives."

Bulbs.com has expanded its team of certified lighting specialists to include utility rebate and energy service experts. The team helps customers to access incentives and transition to the best energy efficient lighting solution for their project.

Utility rebate programs are very effective at helping customers reduce the up-front cost that may be associated with making the transition to energy efficient lighting. With improvements to LED efficacy, lower LED prices, aesthetic design and increased utility rebate incentives, the time has never been better to make the transition to energy efficient lighting.

Bulbs.com can assist customers even further with its BUY 'N' TRY program; where commercial customers can try out a few LED lamps risk free before committing to a larger purchase. The lighting specialists, utility rebate and energy service professionals can provide more information about the best way to transition to energy efficient lighting.

To learn more about utility rebate incentives, visit bulbs.com/rebates or call (888) 455-2800.

EXPANSION

Over the last year BuIlbs.com has steadily grown its distributor participation agreements with utility companies across the US.

Most recently Bulbs.com earned approval from the following utilities to extend instant rebate program incentives to eligible customers:

Hawaii Energy in Hawaiʻi
Snohomish County Public Utility District in Washington
Southern Maryland Electric Cooperative in Maryland
Ameren Corporation Illinois

The new utility rebate program participation agreements will be added to those that already provide instant rebates for customers in the following states:

California
Rhode Island
Connecticut
Massachusetts
Colorado
Minnesota
North Carolina
South Carolina
Indiana
Ohio
Kentucky

ABOUT BULBS.COM

Bulbs.com, headquartered in Worcester, Mass., is a leading online lighting supplier. Established in August 1999, Bulbs.com provides lighting products to over 150,000 commercial customers operating across 300,000 locations in the hospitality, retail, property-management, healthcare, manufacturing, government, education, industrial, and municipal sectors. For more information, visit Bulbs.com.

With nearly $1B in savings, Hawaii efficiency firm meets most of its goals

Mar 24, 2016

Hawaii regulators have approved a total performance award payment of $660,610 to Leidos Engineering LLC, the firm running Hawaii Energy, the energy conservation program for Oahu, Maui, the Big Island, Molokai and Lanai, according to public documents.

The award was for the 2014 program year. Each year, the Hawaii Public Utilities Commission withholds $700,000 in invoice payments to the firm running the program as a performance award, granted only if the program meets or exceeds expectations.


Enlarge

Hawaii Energy has met most of its goals

Thinkstock

Leidos submitted its annual performance award claim for program year 2014 in October, and requested a total award of $640,142.

An independent observer determined that the program met or exceeded its benchmarks.

Hawaii Energy, the electric utility customer-funded energy program under the direction of the PUC and administered by Leidos, has helped save residents and businesses nearly $1 billion over the last six years, according to its 2014-15 program year report.

The $965 million in savings equate to nearly 3 billion kilowatt-hours in energy savings, which is enough to fill two Aloha Stadiums with oil, and is also equal to five years of current solar photovoltaic generation or 90,000 electric vehicles driven for a year, the program said.

This year alone, Hawaii Energy has helped save enough electricity to power 9,000 homes for a year, achieved nearly $1 million in energy savings per year for Honolulu International Airport, established 226 participating allies from 140 businesses and reached over 19,000 students through teacher education.

Hawaii Energy offers cash rebates and other incentives to residents and businesses to help offset the cost of energy-efficient equipment. It also offers education and training for residents, business and clean energy allies to encourage the adoption of energy conservation behaviors and efficiency measures.

Hawaii Energy's contract ends with the PUC on June 30, 2016, but it plans to re-apply to keep running the program, as it has been for several years.

Kamehameha Schools
Educators Learn to Integrate Energy Education Into the Classroom”
3.31.2016

Heidi Wai'amau (left) and Kalani Soller (right) with KS' Kealapono program learn about integrating hands-on energy education with classroom curriculum.

Educators learn to integrate energy education into the classroom

By Tasha Mero
March 31, 2016

More than 50 teachers—including a handful of Kamehameha Schools (KS) kumu—attended two workshops on Maui and Hawai'i Island this past February. Educators were equipped with training that will help them integrate energy education into their classrooms.

Keonepoko Elementary Teacher Hidi Botelho (left) and Kalani Soller with KS' Kealapono (right) participate in a thermal energy activity.

An additional workshop will take place on O'ahu on April 12 and is open to all K-12 kumu.

The workshops—sponsored by Hawaii Energy and presented by the National Energy Education Development (NEED) Project provided hands-on classroom kits (valued at $300) to those in attendance.

The classroom kits contain materials and activities for teachers and students to measure their energy consumption and make educated energy use decisions. The kits were offered at three different learning levels for haumana of all ages.

"Hawaii Energy is excited to work with The NEED Project and schools such as Kamehameha Schools to provide teachers with engaging classroom materials to help the State accelerate towards our clean energy goals," said **Chelsea Harder**, Hawaii Energy transformational specialist. "In the last year alone, our program was able to work with 292 teachers from 108 schools. Since 2011, we have reached over 19,000 students."

During the workshop, teachers were able to participate in various hands-on energy lessons. One activity taught educators to use Kill-a-Watt meters which measure the electrical consumption for any pluggable device. These explorations allowed kumu to practice using the various tools and instruments in their kit while getting a better understanding of energy use.

"Energy is a significant expense in Hawai'i, and as the use of petroleum must be reduced, residents will need to be increasingly aware of their energy consumption," explains the NEED project curriculum director **Emily Hawbaker**. "[The kit's] activities encourage students to consider how they live each day, while loving and respecting the 'āina (land)."

"These trainings are a great opportunity to infuse sustainability into the classroom and support KS' SP2020 Goal 2 since public and private school teachers are invited to attend and collaborate," said KS sustainability manager **Amy Brinker**. "These types of events provide a venue for us to collaborate with others who share KS' commitment toward the improvement of the well-being of the lāhui."

To register for the O'ahu workshop on April 12, please visit the Hawaii Energy website. Registration should be completed seven days prior to the workshop.

NEED Project curriculum director, Emily Hawbaker explains how to use a light meter and how they can help us make educated energy decisions.

Hawaii Energy

YOUR CONSERVATION & EFFICIENCY PROGRAM

Hawaii Energy is the ratepayer-funded energy conservation and efficiency program helping Hawai'i, Honolulu and Maui residents and businesses to save energy and money on their electric bills by offering rebates and educational opportunities. The program is administered by Leidos Engineering, LLC under the direction of the Hawaii Public Utilities Commission.

Sign up today!

Register online at the Hawaii Energy website.

When:
April 12, 2016
8 a.m. – 3:30 p.m.

Building Industry Hawai‘i
4.1.2016

to the grid and when you need extra power you can pull some out of the batteries and when you've got too much power on the grid we can suck some down into the batteries. That's the way you should be playing with all the people who have batteries in Hawaii."

Rogers takes issue with energy companies unwilling to change. "We, the consumer, are paying much more for solar than we should because the electric company has no storage," he says. "If they had storage they could buy more of the solar and wind and store it away. We would pay less."

For Rogers, there are two kinds of energy companies: one has to generate electricity and sell to customers; the other buys from whoever makes the energy and makes its money on the distribution of electricity. He sees the latter as having a future.

Rogers' battery storage cabinets.

"The real way to do renewable energy is to have distributed energy, not have it generated in one place and wire it everywhere," Rogers says. "Rather, have little bits where everybody makes their own energy. Just to have that capability, that's the way of the future."

Hawaiian Electric Industries recently adopted a new Public Utilities Commission-approved policy that allows solar PV owners to store electricity, connect to the grid and take electricity when needed, but not send any electricity to the grid.

The Rogers home has three cabinets stored in the garage, which hold more than 60 kilowatt hours of stored energy from 96 photovoltaic rooftop

HAWAII'S ENERGY

- 46.3 million barrels of petroleum were imported for Hawaii's total energy use over the past year.
- $5.09 billion left the state last year to pay for imported petroleum; $4,000 for every person living in Hawaii.
- 11.3 million barrels of petroleum were burned by the Hawaii utilities last year to make electricity.
- The average residential meter in Hawaii uses 615 kilowatt hours per month.
- Hawaii ranks #1 in electric energy costs.
- Lanai 34 cents/kWh
- Molokai 32 cents/kWh
- Hawaii Island 32 cents/kWh
- Maui 28 cents/kWh
- Oahu 25 cents/kWh
- U.S. avg. 11-12 cents/kWh
- 10.1 million megawatt hours of power were sold last year by Hawaii's electric utilities.
- Burning fossil fuels increases carbon emissions, which contributes to global warming.

SOURCE: HAWAII ENERGY

Hawaiʻi Business Magazine
4.1.2016

Pono Home: Energy Efficiency Made Easy

www.ponohome.com

The author of this report, Scott Cooney, is both a freelance writer for *Hawaii Business* and a clean-energy innovator. His Honolulu-based company, Pono Home, was part of EEx's inaugural seed-stage cohort in 2014 and now is part of its demonstration track.

The company has made hundreds of homes, businesses and nonprofits more efficient by customizing solutions to each client. Now, it's poised for further growth: efficiency for government-subsidized, low-income housing.

"That project carries great benefits for low-income residents, taxpayers and the state," says Cooney. "We are grateful to Hawaii Energy and the Energy Excelerator for helping us serve this hard-to-reach market" by co-funding the project.

Cooney credits much of his company's success to EEx. "In the seed-stage program, we were introduced to a large military housing-management company (Forest City) and given funding to conduct a 10-home pilot project for them," he says. "The results of that pilot project were strong enough for the company to hire us to continue services across the rest of their properties."

The Forest City contract calls on Pono Home to bring energy- and water-saving technologies to about 7,000 Hawaii homes, help reduce energy and water consumption, educate military residents about conservation, and decrease costs through preventative maintenance and diagnostic analysis of major appliances.

Services include installing more-efficient hardware, such as LED lights, faucet aerators and high-efficiency showerheads. "People can expect 10 to 20 percent savings on their electric bills, and 20 to 25 percent savings on their water bills," Cooney says.

He expects to Pono Home franchise sites to open in a few other states by year's end. "We have over 100,000 homeowner leads from across the U.S. that have requested help with their energy bills and gather about 2,000 more each month just through Google search. We plan to use these leads, as well as direct sales, to help our franchisees succeed."

— *Treena Shapiro*

Big Island Now
“Hawai’i Energy Offers Ratepayers Free Energy Saving Kits”
4.13.2016

Hawai’i Energy Offers Ratepayers Free Energy Saving Kits

By Big Island Now Staff

In celebration of April as Earth Month, Hawai’i Energy is offering two energy-saving kits to electric utility ratepayers on the Big Island, in Maui County, and on Oahu.

Ratepayers can choose from one of the two free kits: the “Water and Energy Saver Kit” and the “Negawatt Kit.”

“With proper use, these kits can help residents save energy and money in their homes instantly,” said Caroline Carl, Deputy Program Manager of Operations. “Even with recent lower electricity costs, the savings can be substantial and help our State move towards a clean energy future.

The “Water and Energy Saver Kit” is valued at $42 and can help reduce energy and water use at home. Hawai’i Energy says the kit can help households save up to $127 in electricity costs on a yearly basis. Included in the kit are two 10-watt A19 LED bulbs, one low-flow showerhead with massage and pause features, two low flow faucet aerators, one toilet tank displacement bag, and two leak detection dye tabs.

The “Negawatt Kit” is available to plug-in Electric Vehicle owners and is valued at $64. Hawai’i Energy says the kit can save up to $150 in electricity costs per year. The kit includes two 10-watt A19 LED bulbs, one low flow showerhead with massage and pause features, two low-flow faucet aerators, and one advanced power strip with seven outlets.

Kits can be ordered on the Hawai’i Energy website and will take between four and six weeks to be shipped.

Mauinow
“Program Offers Free Energy Savings Kits for Earth Month”
04.14.2016

Program Offers Free Energy-Saving Kits for Earth Month

By Maui Now

For a limited-time and while supplies last, Hawaii Energy will offer two energy-saving kits to electric utility ratepayers of Hawaiʻi, Honolulu and Maui counties in celebration of Earth Month.

Allow four to six weeks for shipping. Participants can choose from one of two kits (limit one of either kit per ratepayer)—the Water and Energy Saver Kit or the Negawatt Kit.

• The Water and Energy Saver Kit, valued at $42, can help reduce energy and water use at home, since saving hot water also saves electricity used for water heating. The kit can help households save up to $127 in electricity costs or 575 kilowatt hours (kWh) per year ((estimated savings are based on 22 cents per kWh).

The kit includes two 10-watt A19 LED bulbs (60-watt equivalents, which are used in many common household fixtures), one low-flow shower head with massage and pause features, two low flow faucet aerators, one toilet tank displacement bag and two leak detection dye tabs.

• The Negawatt Kit is available to plug-in electric vehicle owners to help offset the electricity used to charge EVs at home. The kit is valued at $64 and can save up to $150 in electricity costs or 679 kWh per year.

The kit includes two 10-watt A19 LED bulbs (60-watt equivalent), one low flow shower head with massage and pause features, two low-flow faucet aerators and one advanced power strip with seven outlets (which prevents electronics from drawing power when turned off or not in use).

Although EVs vary, it is estimated that 8 kWh of charge is required for every 25 miles driven. This kit can help offset approximately 2,122 miles worth of charge.

“With proper use, these kits can help residents save energy and money in their homes instantly.” said Caroline Carl, deputy program manager of operations. “Even with recent lower electricity costs, the savings can be substantial and help our state move towards a clean energy future.”

To order a kit, go to www.Hawaiienergy.com/kits.

For more information, visit www.HawaiiEnergy.com.

Star Advertiser
"Hawaii Energy Offering Money Saving Kits"
4.15.2016

Hawaii Energy offering money-saving kits

By Star-Advertiser staff

Hawaii Energy, a ratepayer-funded, energy-efficiency program, is offering two energy-saving kits to electrical utility ratepayers in Hawaii, Honolulu and Maui counties during April.

The program said Wednesday that the two kits, the Water and Energy Saver Kit and Negawatt Kit, are free and available while supplies last.

The Water and Energy Saver Kit includes two 10-watt A19 light-emitting diode bulbs (60-watt equivalents, which are used in many common household fixtures), one low-flow shower head with massage and pause features, two low-flow faucet aerators, one toilet tank displacement bag and two leak-detection dye tabs. Hawaii Energy said the kit is valued at $42 and can help households save up to $127 in electricity costs.

The Negawatt Kit is available to plug-in electric vehicle (EV) owners to help offset the electricity used to charge EVs at home. The kit includes two 10-watt A19 LED bulbs (60-watt equivalent), one low-flow shower head with massage and pause features, two low-flow faucet aerators and one advanced power strip with seven outlets. The power strip prevents electronics from drawing power when not in use.

Hawaii Energy said the kit is valued at $64, can save households up to $150 in electricity costs and can help offset approximately 2,122 miles worth of charge for an EV.

To order a kit, go to Hawaiienergy.com/kits.

PBN

"Virginia firm scores new contract to help Hawaii conserve energy"

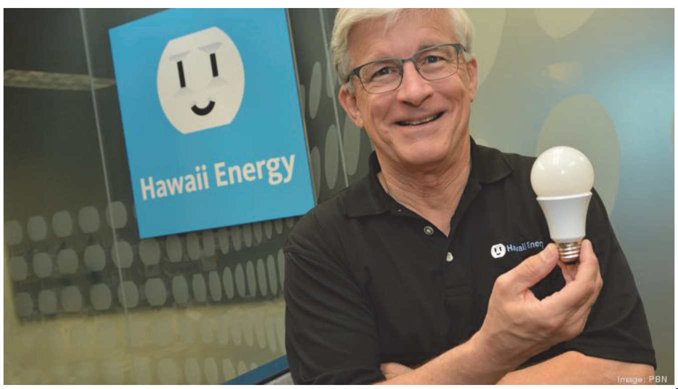
4.15.2016

Virginia firm scores new contract to help Hawaii conserve energy

Apr 15, 2016

Hawaii regulators have chosen to go with Virginia's Leidos Engineering to continue running the state's ratepayer-funded energy conservation and efficiency program called Hawaii Energy, which serves Oahu, Maui, the Big Island, Lanai and Molokai, a spokeswoman for Leidos confirmed to PBN.

Leidos Engineering, a Fortune 500 science and technology solutions company, was recently selected by the Hawaii Public Utilities Commission and now has a new contract, although details of the contract are still being finalized. The firm's previous contract with the PUC ends on June 30, but it re-applied to keep running the program, as it has been for several years.



Enlarge

Ray Starling, program manager for Hawaii Energy. Leidos Engineering was recently selected… more

Hawaii Energy offers cash rebates and other incentives to residents and businesses to help offset the cost of energy-efficient equipment, and has helped save residents and businesses nearly $1 billion over the last six years.

It also offers education and training for residents, business and clean energy allies to encourage the adoption of energy conservation behaviors and efficiency measures.

Last year alone, Hawaii Energy has helped save enough electricity to power 9,000 homes for a year, achieved nearly $1 million in energy savings per year for Honolulu International Airport, established 226 participating allies from 140 businesses and reached over 19,000 students through teacher education.

AM 690 KHNR
Radio interview on the Mike Buck Show with Keith Block from Hawaiʻi Energy
4.18.2016

PBN
"Energy conservation program to have some continuity"
4.22.2016

Energy conservation program to have some continuity

Apr 22, 2016

A Virginia firm has scored a new contract to continue running Hawaii's ratepayer-funded energy conservation and efficiency program called Hawaii Energy, which serves Oahu, Maui, the Big Island, Lanai and Molokai, a spokeswoman for the company confirmed to PBN.

Leidos Engineering, a Fortune 500 science and technology solutions company, was recently selected by the Hawaii Public Utilities Commission and now has a new contract, although details of the contract are still being finalized. The firm's previous contract with the Hawaii Public Utilities Commission ends on June 30, but it re-applied to keep running the program, as it has been for several years.

Hawaii Energy offers cash rebates and other incentives to residents and businesses to help offset the cost of energy-efficient equipment, and has helped save residents and businesses nearly $1 billion over the last six years.

It also offers education and training for residents, business and clean energy allies to encourage the adoption of energy conservation behaviors and efficiency measures.

Last year alone, Hawaii Energy has helped save enough electricity to power 9,000 homes for a year, achieved nearly $1 million in energy savings per year for Honolulu International Airport, established 226 participating allies from 140 businesses and reached over 19,000 students through teacher education.

KAPA-FM (Big Island)
Radio Interview featuring Graceson Ghen from Hawaiʻi Energy
4.28.16

KPOA-FM (Maui)
Radio Interview featuring Walter Enomoto from Hawaiʻi Energy
4.28.16

West Hawaiʻi Today
"Water Department's energy savings efforts translate into big rebate"
5.5.2016

Water Department's energy savings efforts translate into big rebate

Published May 5, 2016 - 9:05am

Department of Water Supply takes receipt of a big rebate from Hawaiʻi Energy. Pictured from left to right: Graceson Ghen of Hawaiʻi Energy, Water Board members Leningrad Elarionoff, Kanoe Wilson, Brenda Iokepa-Moses, Susan Lee Loy, Vice-Chairperson Russell Arikawa and Jay Uyeda, along with Department of Water Supply Manager-Chief Engineer Keith Okamoto. (photo courtesy Department of Water Supply)

HILO — The Department of Water Supply scored a big rebate recently for its energy conservation efforts.

The water utility's governing board at its monthly meeting on April 26 took receipt of $130,000 from Hawaii Energy, to support the purchase of equipment and loggers for energy savings, through reduction of water loss as part of Water Supply's leak detection program.

"This substantial rebate is the result of the diligence and commitment of our staff in collaboration with Hawaii Energy, and we accept it gratefully," said Keith Okamoto, manager-chief engineer of the Department of Water Supply.

Hawaii Energy energy efficiency advisor Graceson Ghen told the Water Board that the department had in fact earned a total of $325,000.00 in cash rebates over the past three years, for leak loggers, LED lighting, and more energy-efficient air conditioning.

Hawaii Energy is a rate-payer funded energy conservation and efficiency program under contract with the state's Public Utility Commission, which offers cash rebates and refunds to residential and commercial energy users who adopt energy-saving measures such as LED lighting, energy-efficient appliances and renewable energy sources.

The Department of Water Supply continues to commit efforts to introduce innovative energy-saving programs to reduce its electricity costs — and in turn to reduce power costs to its customers.

PBN
"Head of Hawaii energy conservation program named"
5.9.2016

Head of Hawaii energy conservation program named

May 9, 2016, 2:58pm HST

Brian Kealoha — an energy industry veteran who led Opterra Energy Services, formerly known as Chevron Energy Solutions, for almost eight years — has been named the head of Hawaii Energy, the ratepayer-funded energy conservation and efficiency program for Honolulu, Hawaii and Maui counties, he confirmed to PBN.

Kealoha replaces Ray Starling, who is retiring after leading Hawaii Energy for the past seven years. Kealoha also previously worked with Pacific Gas & Electric, Avista Utilities and Maui Electric Co.

Brian Kealoha is the new executive director of Hawaii Energy

Kealoha began his new position as executive director of Hawaii Energy last week.

"It's a great opportunity to make a bigger impact on the state," he said, noting that he learned about the opening up of the position through Starling. "When I took a look at each of its programs and its ability to move the needle in energy conservation and efficiency in the state, it made a lot of sense."

Starling, who is retiring after a more than 30 year career in the energy industry, will continue to stay on as an advisor for Hawaii Energy on a part-time basis.

“Hawaii Energy has been very successful and hitting goals each year that are set by the [Hawaii Public Utilities Commission],” Kealoha said. “We need to continue to deliver on that success and build upon that.”

Brandon Hayashi, who had been the program manager for OpTerra Energy Services since February, has since been promoted to interim regional manager of the company’s Hawaii office, replacing Kealoha. OpTerra Energy Services has a big contract with the state Department of Education to help the department undergo numerous energy upgrades.

Hawaii Energy, which is administered by Virginia-based Leidos Engineering LLC under a contract through the PUC, serves more than 450,000 electric utility customers on the Big Island, Lanai, Maui, Molokai and Oahu.

Hawaii Energy offers cash rebates and other incentives to residents and businesses to help offset the cost of energy-efficient equipment, and has helped save residents and businesses nearly $1 billion over the last six years.

It also offers education and training for residents, business and clean energy allies to encourage the adoption of energy conservation behaviors and efficiency measures.

Last year alone, Hawaii Energy has helped save enough electricity to power 9,000 homes for a year, achieved nearly $1 million in energy savings per year for Honolulu International Airport, established 226 participating allies from 140 businesses and reached over 19,000 students through teacher education.

PBN
"Three questions with Brian Kealoha"
5.13.2016

Three questions with Brian Kealoha

May 13, 2016

The executive director of Hawaii Energy, the energy efficiency and conservation program for the islands of Oahu, Maui, Molokai, Lanai and the Big Island sat down with PBN.

Why did you take this job? I joined Hawaii Energy because I felt I could have a much bigger impact on the state's clean energy goals in this role. Hawaii stands to be negatively impacted by the effects of climate change and a rise in sea level. With our economy driven primarily by the hospitality industry, there is a lot at risk. Most importantly, it is the next generation we are impacting, so we owe it to our keiki to address climate change. I feel this role will allow me to contribute in solving critical issues, while helping residents and businesses save money in the process.

Brian Kealoha, executive director of Hawaii Energy

What are your plans to help the state conserve more energy? Lowering energy demand from energy efficiency and conservation is the first and most cost-effective step in the process. Technology is evolving in every part of our lives, and energy is no different. Hawaii Energy helps facilitate the implementation of these innovative technologies by removing barriers and providing education. I seek to collaborate with businesses, non-profits, residents, and energy stakeholders to achieve the State's goals while helping share the message about the benefits of becoming more energy efficient and conservation.

What are the opportunities for businesses to get involved with Hawaii Energy and its initiatives? Hawaii Energy's programs can help businesses save money on their energy-efficient investments and on their electric bills. The program offers cash incentives for cost-effective energy efficiency projects. Businesses can get started by visiting www.hawaiienergy.com and choose from a list of energy efficiency solutions that apply to their industry. If they are a business that provides energy-efficient products and services to business and residential utility customers of Hawaii, Honolulu, or Maui counties, we encourage them to become a registered ally. The Clean Energy Ally program is a network of contractors, architects, engineers, equipment vendors, distributors, manufacturers and retailers who provide energy-efficient products and services. Clean Energy Allies help us extend our reach by delivering energy-saving incentives, education and other direct program benefits to electric customers. To become a Clean Energy Ally, businesses can follow this link: www.hawaiienergy.com/for-contractors.

Hawaiʻi Public Radio interview
Hawaiʻi Energy Business Program with Keith Block
5.19.2016

The Conversation

Weekdays 8:00-9:00 am on HPR-2

Hosted by Beth-Ann Kozlovich, Chris Vandercook

AM 690 KHNR
Radio interview on the Mike Buck Show with Lisa Harmon
5.26.2016

Community Job Fair June 4 at UHMC

By Maui Now

Hawaii Energy is supporting the WorkSource Maui Job Fair at the University of Hawaiʻi Maui College on Saturday, June 4, which will offer free services to job seekers and employers, including job search assistance, personal career planning services, training opportunities, available to all Maui residents.

The free fair will be held from 9 a.m. to 2 p.m. in UHMC’s Paʻina building, located at 310 W. Ka’ahumanu Avenue.

Hundreds of job seekers across Maui are expected to attend the fair to network and find new prospects.

The fair will provide the opportunity to meet with over 80 employers and organizations in a variety of industries and learn about community-support agencies and resources.

Attendees are encouraged to bring copies of their resumes.

“We created the Job Fair with Hawaiian Commercial & Sugar Company and Makena Resort in mind.” said, Elaine Young, Development Division administrator. “We are hopeful it will provide opportunities for both them and their family members to find new work.”

The job fair is a partnership of the Department of Labor and Industrial Relations Workforce Development WorkSource Maui, UHMC, Maui Economic Opportunity, Maui Chamber of Commerce, Maui Job Service Employer Committee and County of Maui.

Hawaii Energy is providing assistance by distributing free energy-saving kits to job fair attendees.

The energy-saving kits are valued at $56, and can help households save up to $90 in electricity costs or 376 kilowatt hours per year. It includes one advanced power strip, two 10-watt A19 LED bulbs (60-watt equivalents, which are used in many common household fixtures), one low-flow shower head with massage and pause features, and three low-flow faucet aerators. The devices in the kit can help reduce energy and save water at home—since saving hot water also saves electricity used for water heating.

“We have been very thankful for the show of support the community has shown our employees during this transition, and thank Hawaii Energy for stepping forward and putting this program together,” said Rick Volner, Plantation general manager. “Financial support in the form of energy savings kits is a meaningful contribution that has a direct and immediate benefit for our employees."

For more information about the job fair, go to www.labor.hawaii.gov or call (808) 984- 2091.

Hawaii Energy is the ratepayer-funded energy conservation and efficiency program administered by Leidos Engineering LLC under contract with the Hawaiʻi Public Utilities Commission, serving the islands of Hawaiʻi, Lānaʻi, Maui, Molokaʻi and Oʻahu. The program is independent of the electric utilities.

For more information, visit www.HawaiiEnergy.com.

AM 690 KHNR
Radio interview on the Mike Buck Show with Keith Block from Hawai'i Energy
6.1.2016

iHeart Media
Community Matters Show featuring Chelsea Harder from Hawai'i Energy
6.26.2016

Sustainability students graduate from energy fellowship program

June 28, 2016

Kiha Sai and Mark Ryan with Charlotte Burville, RISE program manager (far left) and Nicole Fisher, Kupu director of Sustainability Initiatives (far right)

University of Hawaiʻi at Mānoa students **Mark Ryan** and **Kiha Sai** completed the Energy Fellowship program through the UH Office of Sustainability. The fellowship is a collaboration between the Office of Sustainability, Hawaiʻi Energy and the Kupu Hawaiʻi Rewarding Internships for Sustainable Employment (RISE) program.

"Our partnership with Hawaiʻi Energy and Kupu RISE bolsters our operational capacity while enhancing the teaching and learning environment at the University of Hawaiʻi," said Sustainability Coordinator **Matthew Lynch**. "Students help to solve real-world challenges through innovation, while building the kind of practical and multidisciplinary skill sets that are highly sought after by employers."

Ryan and Sai's RISE project analyzed lighting in the UH Mānoa athletics facilities and identified areas where upgrades to LED lights could reduce overall energy use. Their next pilot project aims to reduce energy consumption at Hawaiʻi Hall through simple changes in workplace behavior.

Both students became involved with the Energy Fellowship because of their interest in sustainability, energy efficiency and lessening Hawaiʻi's dependence on imported energy.

"I've worked with some amazing people at Kupu that care deeply about each other and about the sustainable future of Hawaiʻi," said Ryan. "Seeing that there are programs and organizations in the world that are willing to invest in the youthful generations and that are working to further sustainability makes me immensely hopeful for the future of Hawaiʻi and the future of the world."

"Sustainability has become a huge part of my life and it will not end with this internship," said Sai. "I plan to continue in this field for as long as needed, which I believe is an extreme necessity for society and for the world. The best takeaway I received that is short and precise is remembering 'Only you can prevent energy loss!'"

The RISE graduation ceremony was held June 28.

ATTACHMENT G

Hawaiʻi Energy Historical Summary

Hawaiʻi Energy 1.0

On July 1, 2009, responsibility for the “demand-side management” programs was transferred from the electric utilities to a third-party Public Benefits Fee Administrator (PBFA) reporting directly to the Hawaiʻi Public Utilities Commission (PUC). The scope and goals of the contract were developed to provide a focus to the energy efficiency and conservation efforts supporting the PUC’s Legislative charge to meet the State of Hawaiʻi’s Energy Efficiency Portfolio Standard.

Phase I: Initial 3-Year Contract

In its **first** year (PY09), the Program established its name, Hawaiʻi Energy and associated branding as well as a local office. The small team provided a smooth and seamless transition of ongoing programs whereby prior obligations and commitments to customers and trade allies were supported. Program design enhancements included introducing residential appliance incentives to the neighbor islands as well as standardizing commercial incentives across Hawaiʻi Energy’s jurisdiction.

In its **second** year (PY10), Hawaiʻi Energy continued to build-out neighbor island resources by creating and hiring permanent Energy Advisor positions on Maui and Hawaiʻi Island to serve those communities. The Program also broadened its reach to participating manufacturers, distributors and retailers that provided an increasing selection of efficient products to more locations. Programs and processes were refined to increase efficacy of staff and incentives and notably, the program helped the State secure and implement Federal Stimulus Funding in 2011 (e.g. ARRA) while addressing the needs identified to help hard-to-reach and commercial projects.

In its **third** year (PY11), the PUC increased the PBFA from 1.0% to 1.5%, which challenged Hawaiʻi Energy to scale very quickly. Market Transformation programs were introduced to Hawaiʻi Energy’s portfolio of offerings with the intention to lay a foundation of educational and behavior change programs that would lead to future energy savings. This included programs like *Sharing the Aloha*, which offered workshops to hard-to-reach communities, the *NEED Project*, that provided training for grade school educators, who in turn would convey the knowledge to their students and professional development training, which offered professional energy certifications as well as energy efficiency sales training. Hawaiʻi Energy also launched its *Small Business Direct Install program for Lighting (SBDIL)*, which offered 100% incentives (e.g. full cost) for small businesses and restaurants to retrofit their lighting through a network of participating contractors. This program overcame technical, financial and trust barriers to implement lighting projects for this underserved customer segment. The program also began working with non-profit organizations in Hawaii and Maui to provide “in-need” households with solar water heating systems that for various reasons could not qualify for other assistance programs (e.g., ARRA, Weatherization Assistance Program (WAP), etc.).

Phase 2: First 2-Year Contract Extension

In the **fourth** year (PY12), Hawaiʻi Energy hit its stride in a number of areas as funding remained stable from the prior year. For example, by working with the Hawaiʻi Community Economic Opportunity Council (HCEOC), 169 solar water heating systems were installed for “in-need” households and the SBDIL program scaled to serve over 580 small businesses and restaurants.

In the **fifth** year (PY13), Hawaiʻi Energy continued its aggressive engagement with hard-to-reach residential and business customers on the neighbor islands; helped more underserved small businesses participate with our Direct Install Lighting Program; accelerated facility-wide LED retrofits, introduced benchmarking and metering programs for Hawaiʻi’s large buildings; and continued development of multi-island opportunities to assist water and wastewater operations with energy efficiency upgrades and practices, including publication of a Water & Wastewater Best Practices Manual for Hawaiʻi.

Hawaiʻi Energy also conducted its first Energy Auction, which solicited projects and turn-key programs to augment the program's existing portfolio. This netted three participants, which included IBIS Networks (plug load controls), Matrix Energy Services (lighting and refrigeration measures) and Honeywell (smart thermostats). Although selected in PY13, much of the implementation carried over into PY14.

Hawaiʻi Energy (as PBFA) was charged to design and build the online intake infrastructure and processes to support the PUC's now discontinued On-Bill Financing (OBF) initiative, which aimed to provide consumers the opportunity to finance investments in energy efficiency (initially solar water heating systems) and repay participate directly in the benefits of Hawaiʻi's clean energy future.

Phase 3: Second 2-Year and Final Contract Extension

In the **sixth** year (PY14), Hawaiʻi Energy was asked to expand the efficiency Program's scope to help facilitate acceleration of Hawaii's transformation to more efficient, clean-energy-tolerant and customer-accommodating electric grids. This included collaborative engagement with the utilities and others to identify and integrate energy efficiency and demand response capabilities through pilot projects focused on identifying controllable loads, energy storage, electric vehicle (EV) charging infrastructure and effective Time-of-Use (TOU) rates. This convergence of our team's continued service and proven capability as PBFA, along with the new initiatives that the PUC added to Hawaiʻi Energy's portfolio of programs, and the strong working relationships we have established thus far promise transformational advances in Hawaiʻi's clean energy progress going forward.

Within the traditional energy efficiency scope, Hawaiʻi Energy launched a number of new and innovative programs and initiatives to spur greater participation. For the Business portfolio, the Lighting Distributor Instant Rebate program offered instant rebates to commercial customers through a network of participating lighting distributors. This greatly expanded the opportunity for businesses to participate, while being less burdensome and costly to administrate. Notably, uptake has been significant on the neighbor islands. To develop force multipliers, Hawaiʻi Energy formalized its work with contractors and other third parties by formalizing its efforts and launching its Clean Energy Ally Program. This program is a network of contractors, architects, engineers, equipment vendors, distributors, manufacturers and retailers who provide energy-efficient products and services to residential and business electric and help extend Hawaiʻi Energy's impact by delivering energy-saving incentives, education and other direct Program benefits to electric customers. In the residential portfolio, Hawaiʻi Energy introduced the Multi-Family Direct Install program, which offered retrofits of inefficient lighting, showerheads and aerators to low-income multi-family housing. The program also piloted on-line kit giveaways and discounted sales with much success.

ATTACHMENT H

Comparison of Program's kWh Benefits and Cost Effectiveness at the Program, Customer and System Levels				
Level	Program Cost (Table 15)	Lifetime (kWh)	$/kWh	Table
System	$36,894,871	**1,679,458,177**	$0.0220	18
Customer	$36,894,871	**1,516,826,586**	$0.0243	19
Program	$36,894,871	**1,327,245,454**	$0.0278	17