



Hawaii Energy

Your Conservation and Efficiency Program



PROGRAM OVERVIEW & UPDATE

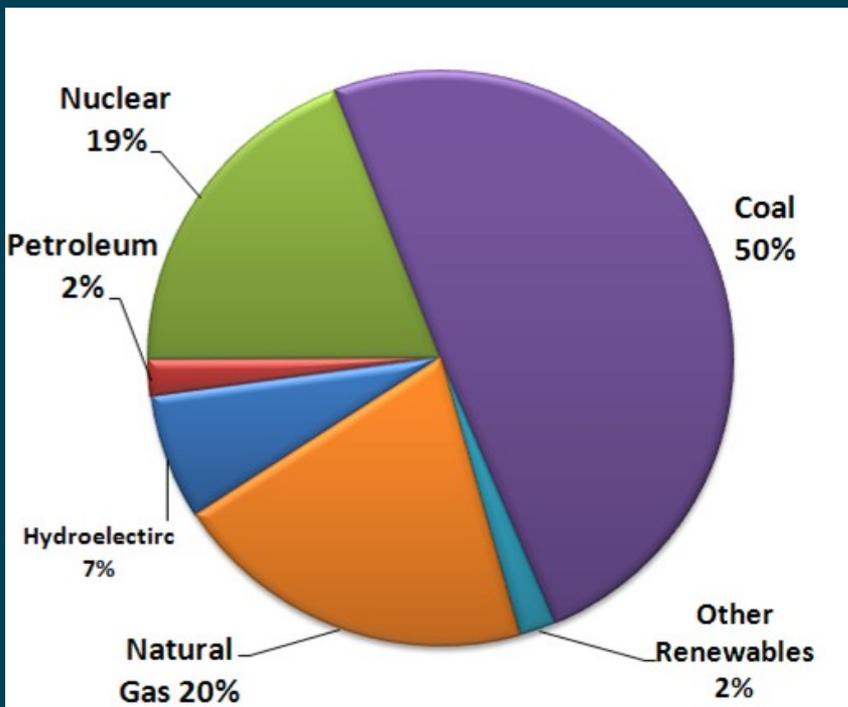
Michael Chang
Deputy Program Director
Build and Buy Green Presentation, May 10, 2013

ROADMAP FOR TODAY

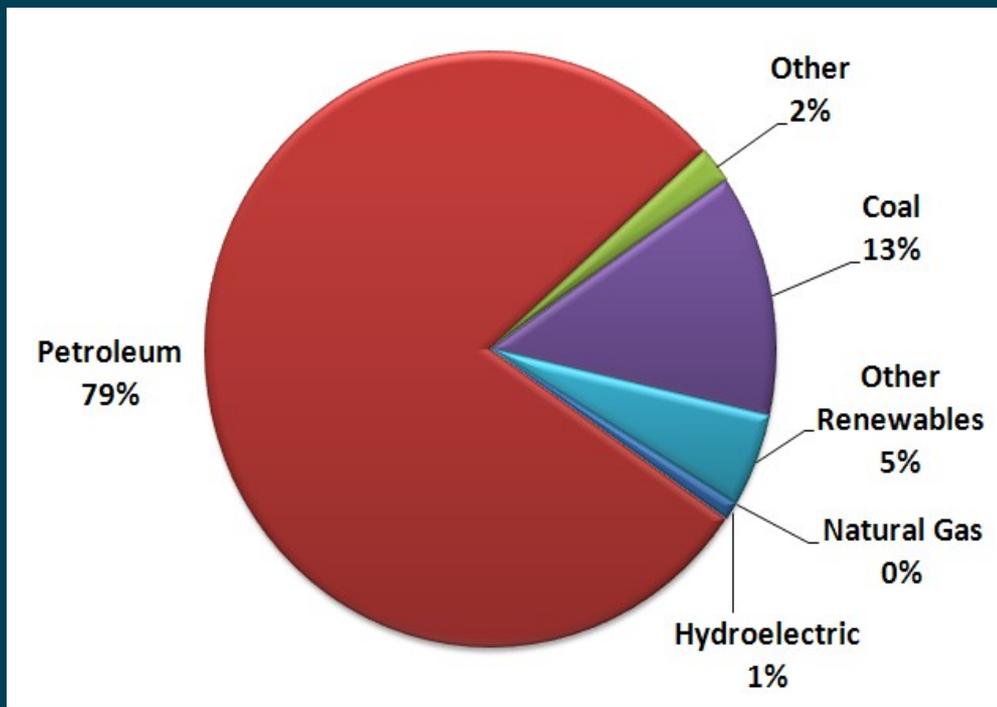
- **Agenda**
 - Overall PBFA Background
 - Data Mining
 - Solar Water Heating vs. PV
 - Specific Programs

DEPENDENCY MESSAGE

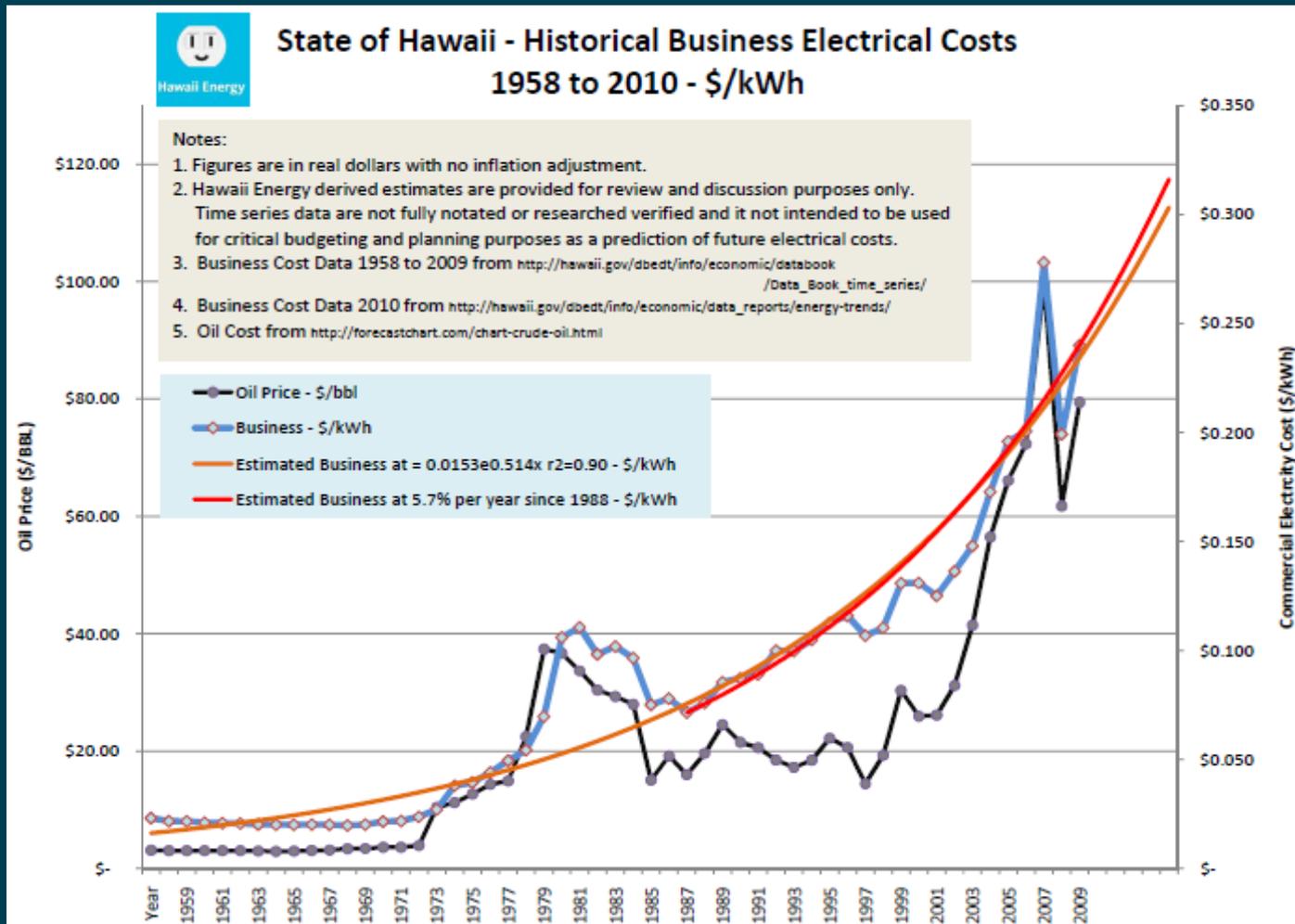
U.S. Electricity Generation



Hawaii Electricity Generation



BUSINESS RISK & SENSE OF URGENCY



**“Progress is not created
by contented people”**
— *Frank Tyger*

PROGRAM TARGETS

1. **Maximizing Impact of Capital Investments**
2. **Commissioning / Optimization Work**
3. **Small Business Participation**
4. **Landlord / Tenant Issues**

PROGRAM TARGETS

5. **Master Metered Account**
6. **Building & Equipment Code Changes**
7. **Renewable Curtailment on Neighbor Islands**
8. **Individual Behavior Based Changes**

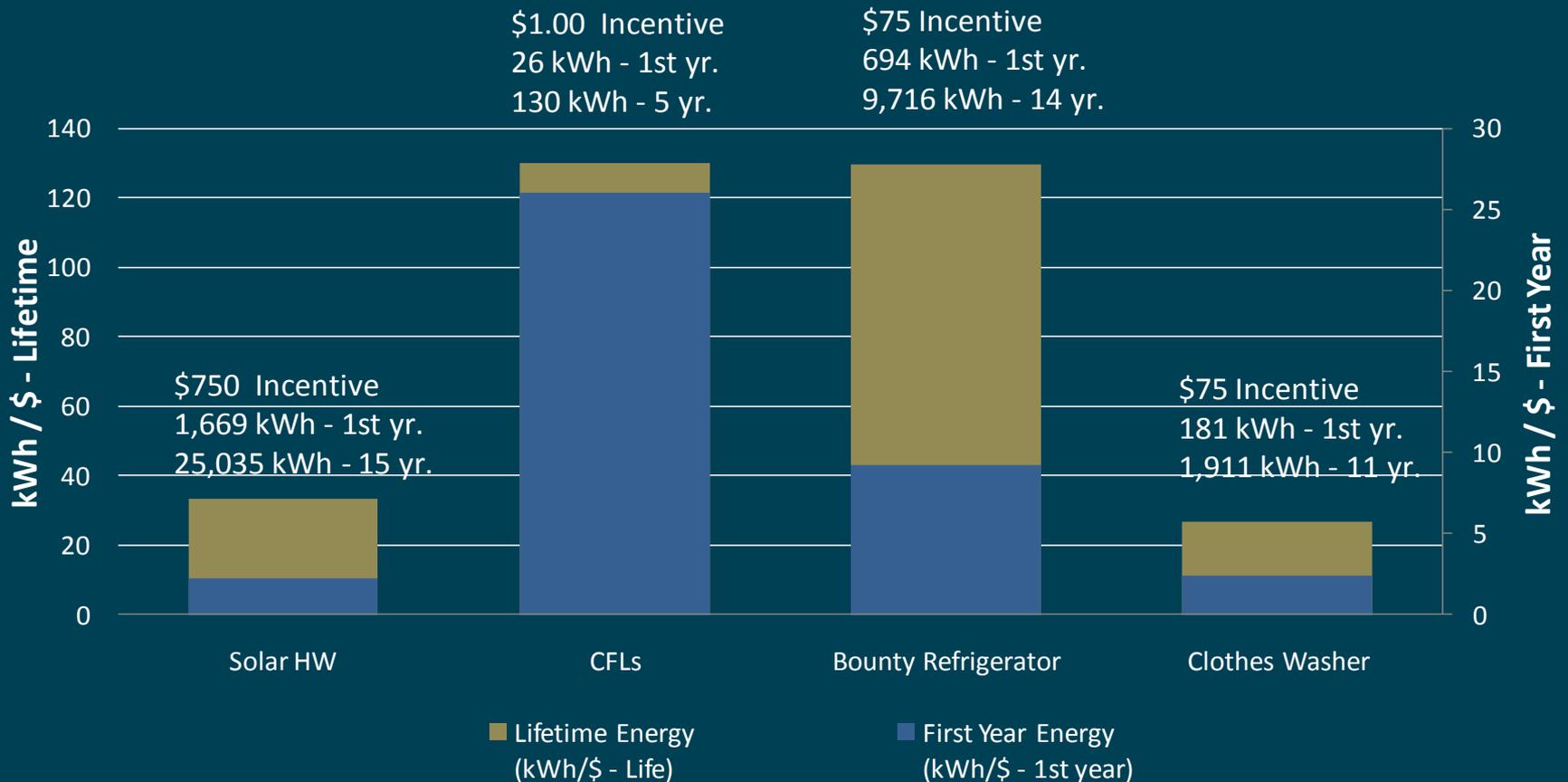
PROGRAM SAVINGS IMPACTS

PY2010 Contribution by Category in Order of Lifetime Energy Impact

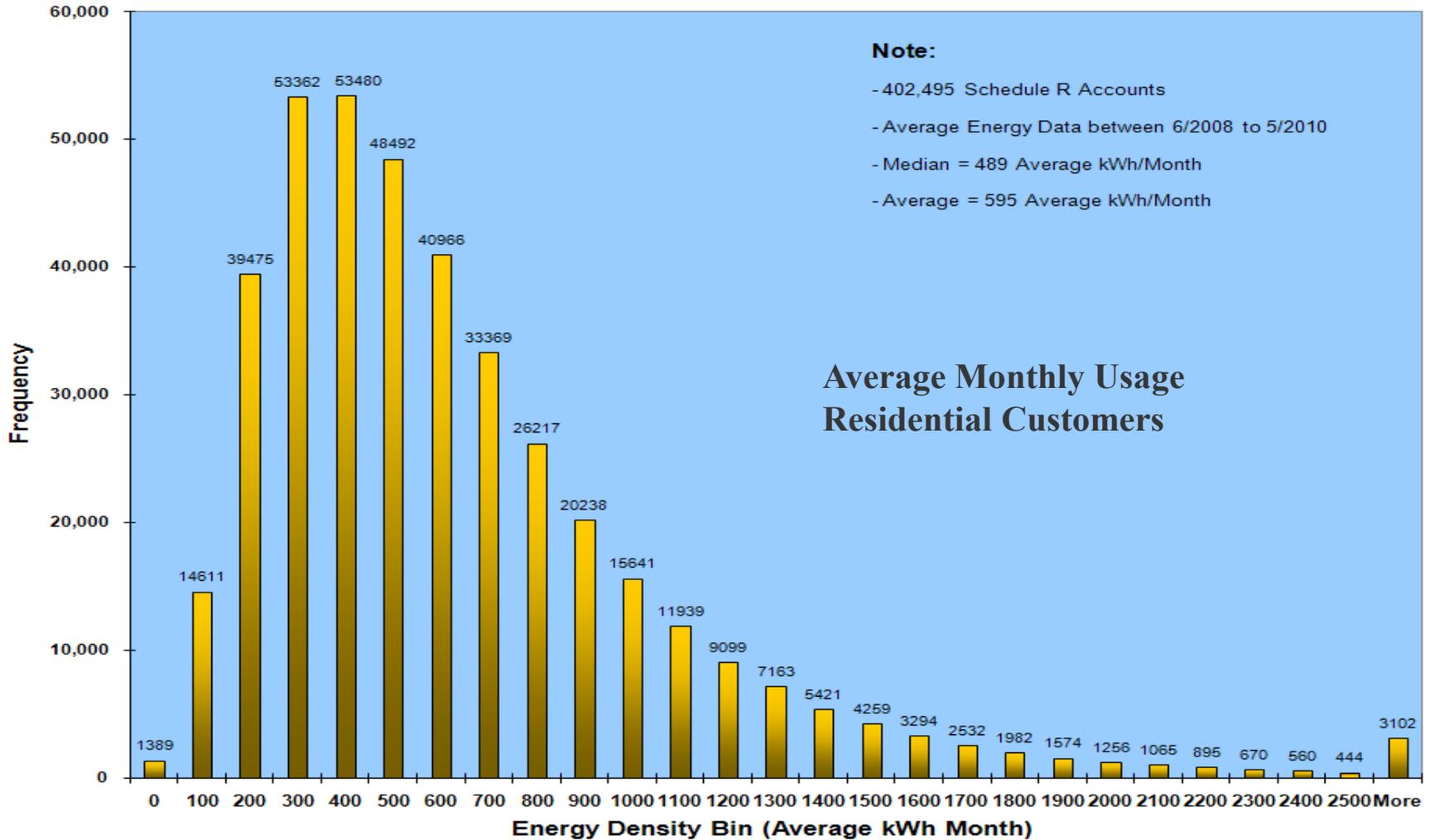
	Measure	Program Demand		Program Energy (kWh 1st yr.)		Program Energy (kWh Life)	
		(kW)	%		%		%
1.	CFL - Residential	6,970	41.0%	45,779,857	39.8%	228,899,287	20.0%
2.	T8	1,671	9.8%	14,445,561	12.6%	202,237,854	17.6%
3.	Building Envelope Improvements	568	3.3%	4,424,902	3.8%	86,971,989	7.6%
4.	T5 / T5HO	692	4.1%	6,212,285	5.4%	86,971,989	7.6%
5.	HVAC - Chiller	530	3.1%	3,442,410	3.0%	68,438,924	6.0%
6.	HVAC - Package & Split Units	791	4.6%	3,439,369	3.0%	51,590,534	4.5%
7.	High Efficiency Water Heating - Heat Pumps	232	1.4%	1,864,449	1.6%	37,288,981	3.3%
8.	Solar Water Heating - Contractor - PBFA \$750	533	3.1%	2,402,913	2.1%	36,043,698	3.1%
9.	ENERGY STAR - Refrigerator - ARRP/SEP	282	1.7%	2,141,950	1.9%	29,987,304	2.6%
10.	Delamping - T8/T12	272	1.6%	1,790,631	1.6%	25,068,834	2.2%
11.	Delamping with Reflectors - T8/T12	152	0.9%	1,701,894	1.5%	23,826,523	2.1%
12.	Building Controls	211	1.2%	1,664,489	1.4%	22,475,446	2.0%
13.	LED	641	3.8%	3,924,237	3.4%	20,381,786	1.8%
14.	ENERGY STAR - Clothes Washer	213	1.2%	1,618,697	1.4%	19,424,362	1.7%
15.	New Home - Energy Modeling	-	0.0%	950,106	0.8%	19,002,119	1.7%
16.	CFL - Business	621	3.7%	4,985,218	4.3%	16,982,427	1.5%
17.	HVAC - Cooling Tower VFD	78	0.5%	934,847	0.8%	14,022,709	1.2%
18.	ENERGY STAR - Refrigerator with Recycling	39	0.2%	965,743	0.8%	13,520,407	1.2%
19.	ENERGY STAR - Refrigerator	155	0.9%	958,035	0.8%	13,412,492	1.2%
20.	ENERGY STAR - Window AC	552	3.2%	1,092,618	1.0%	13,111,415	1.1%
21.	CO Demand Control Ventilation - Parking Garage	88	0.5%	767,847	0.7%	11,517,702	1.0%

PROGRAM COST EFFECTIVENESS

Energy Saved per Dollar Invested



RESIDENTIAL TARGETING



RESIDENTIAL AVERAGE BY ISLAND

Bin	Hawaii	Maui	Lanai	Molokai	Oahu
-	333	211	9	13	881
100	3,991	1,428	83	240	9,652
200	7,269	3,723	226	403	28,852
300	9,462	6,068	289	490	38,075
400	10,232	7,095	259	425	36,466
500	9,564	6,788	206	386	32,305
600	7,823	5,844	142	224	27,533
700	6,003	4,754	85	146	22,746
800	4,535	3,616	58	94	18,031
900	3,090	2,752	42	54	14,354
1,000	2,126	2,184	13	50	11,294
1,100	1,483	1,583	8	18	8,783
1,200	1,025	1,238	9	13	6,775
1,300	726	902	7	13	5,415
1,400	525	712	3	4	4,065
1,500	355	532	3	4	3,281
1,600	283	438	1	2	2,505
1,700	208	349	4	2	1,913
1,800	170	277	2	2	1,464
1,900	97	229	1	2	1,209
2,000	91	159	2	2	971
2,100	87	161	-	2	767
2,200	77	126	1	1	653
2,300	53	114	-	-	492
2,400	36	99	-	-	384
2,500	36	69	-	-	317
More	490	527	11	2	1,923
Count	70,170	51,978	1,464	2,592	281,106
Average	528	631	423	383	598
Median	438	511	349	333	481

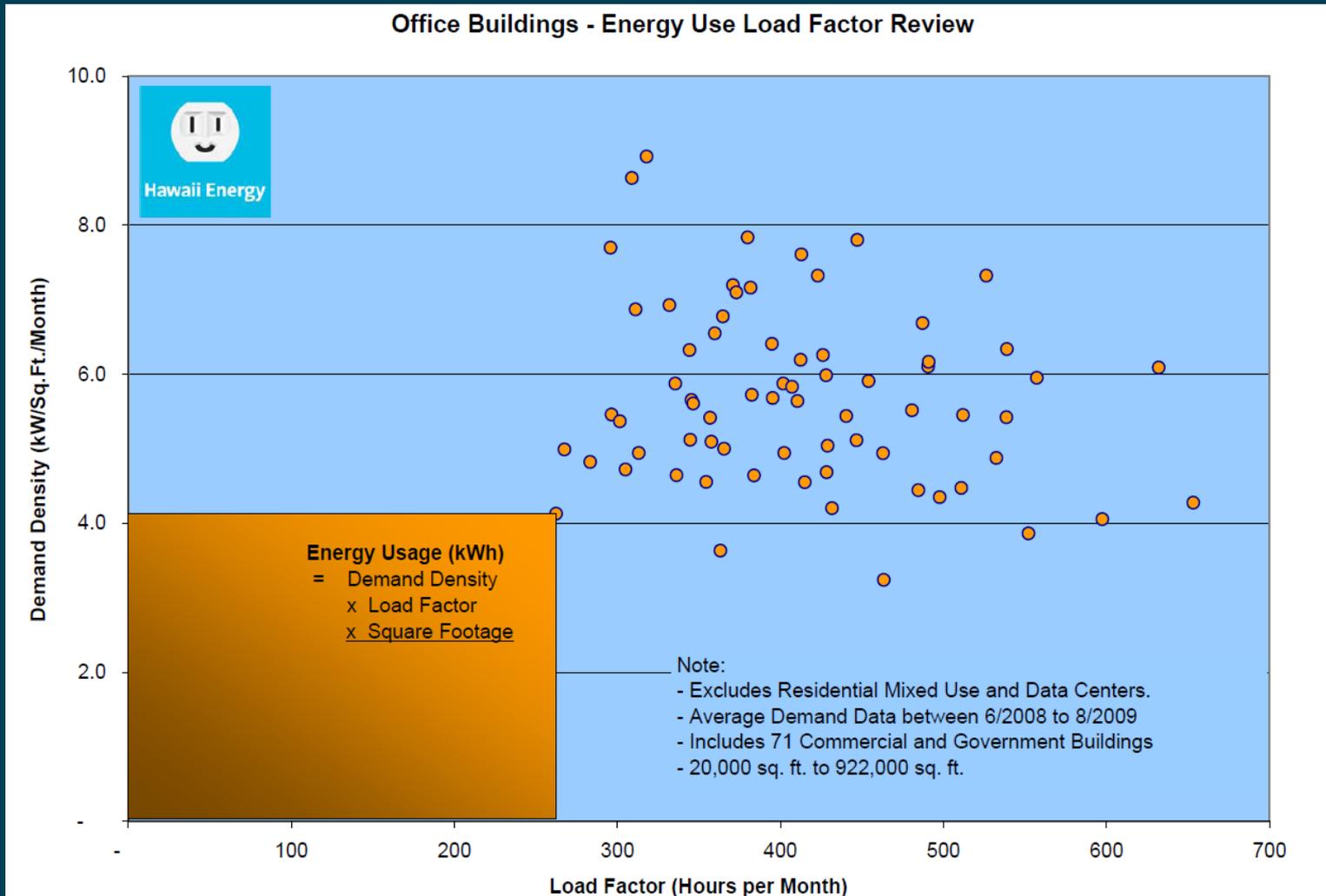
RESIDENTIAL ZIP CODE HIGHEST 15

Rank	Zip Code	Count	Average kWh/Month	City	County
1	96762	830	793	Laie	Honolulu
2	96821	7,095	783	Honolulu	Honolulu
3	96795	2,453	757	Waimanalo	Honolulu
4	96734	15,381	702	Kailua	Honolulu
5	96712	2,680	695	Haleiwa	Honolulu
6	96761	9,403	671	Lahaina	Maui
7	96706	19,186	667	Ewa Beach	Honolulu
8	96743	5,465	663	Kamuela	Hawaii
9	96825	12,544	657	Honolulu	Honolulu
10	96792	13,059	653	Waianae	Honolulu
11	96819	9,398	638	Honolulu	Honolulu
12	96744	18,382	624	Kaneohe	Honolulu
13	96708	3,266	620	Haiku	Maui
14	96707	13,340	617	Kapolei	Honolulu
15	96779	1,164	609	Paia	Maui

RESIDENTIAL ZIP CODE LOWEST 15

Rank	Zip Code	Count	Average kWh/Month	City	County
56	96822	19,655	402	Honolulu	Honolulu
57	96757	294	390	Kualapuu	Maui
58	96785	1,554	388	Volcano	Hawaii
59	96728	278	384	Honomu	Hawaii
60	96710	196	384	Hakalau	Hawaii
61	96772	940	383	Naalehu	Hawaii
62	96748	1,574	379	Kaunakakai	Maui
63	96737	1,299	373	Ocean View	Hawaii
64	96777	540	372	Pahala	Hawaii
65	96783	824	355	Pepeekeo	Hawaii
66	96780	187	348	Papaaloa	Hawaii
67	96815	12,361	339	Honolulu	Honolulu
68	96814	7,290	323	Honolulu	Honolulu
69	96826	14,956	320	Honolulu	Honolulu
70	96770	468	310	Maunaloa	Maui

BUSINESS TARGETING



DECISION MAKERS

**How many
energy efficiency experts
does it take to change a
light bulb?**

DEPENDS ON THE SIZE OF BULB



One?



DEPENDS ON THE SIZE OF BULB



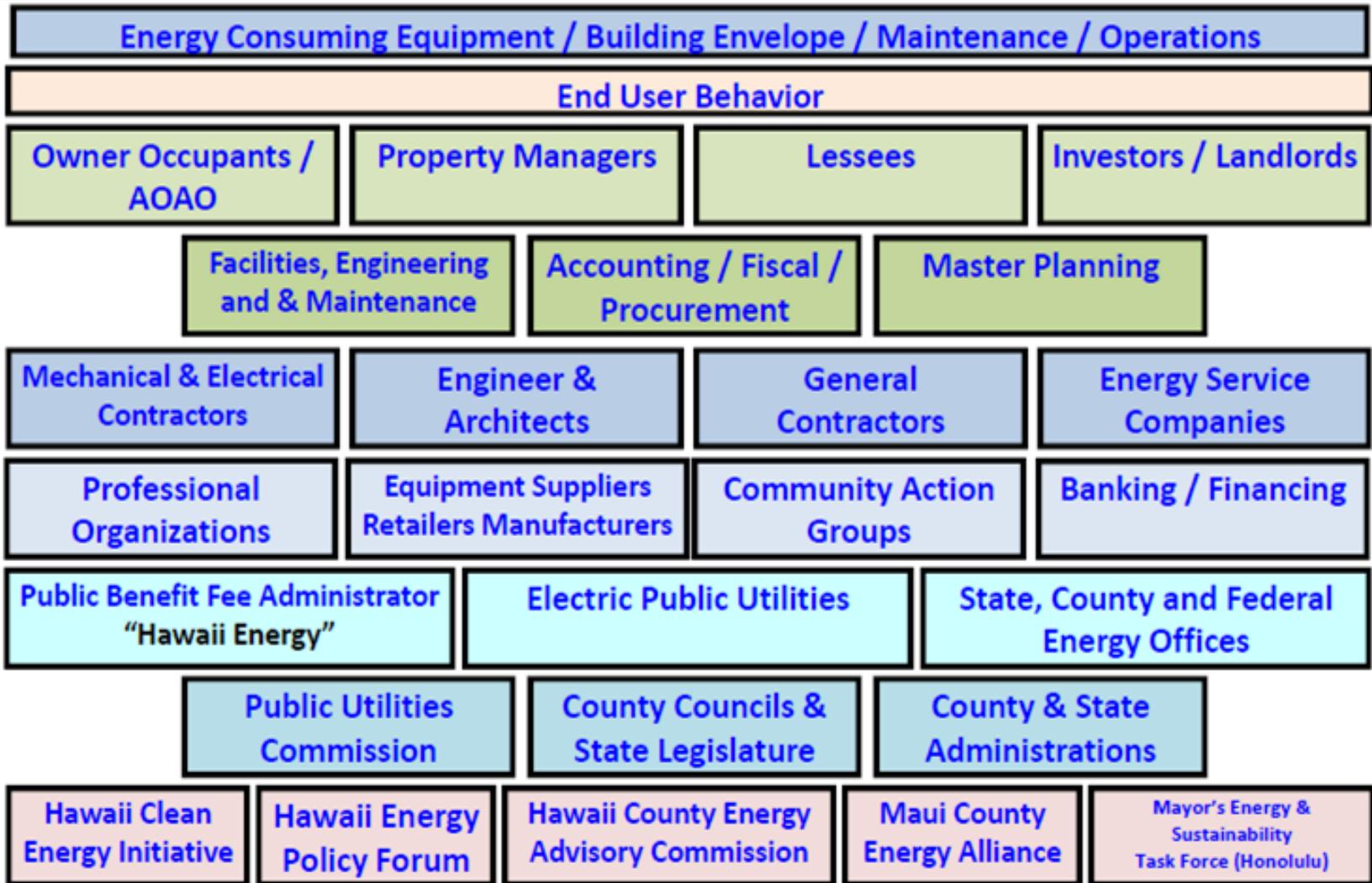
One?

and...

**Location,
Funding Source,
Procurement Method,
Legal Review Requirements,
Environmental Compliance,
Generational Technology Compatibility,
Training,
Ongoing Maintenance...**



DECISION MAKERS



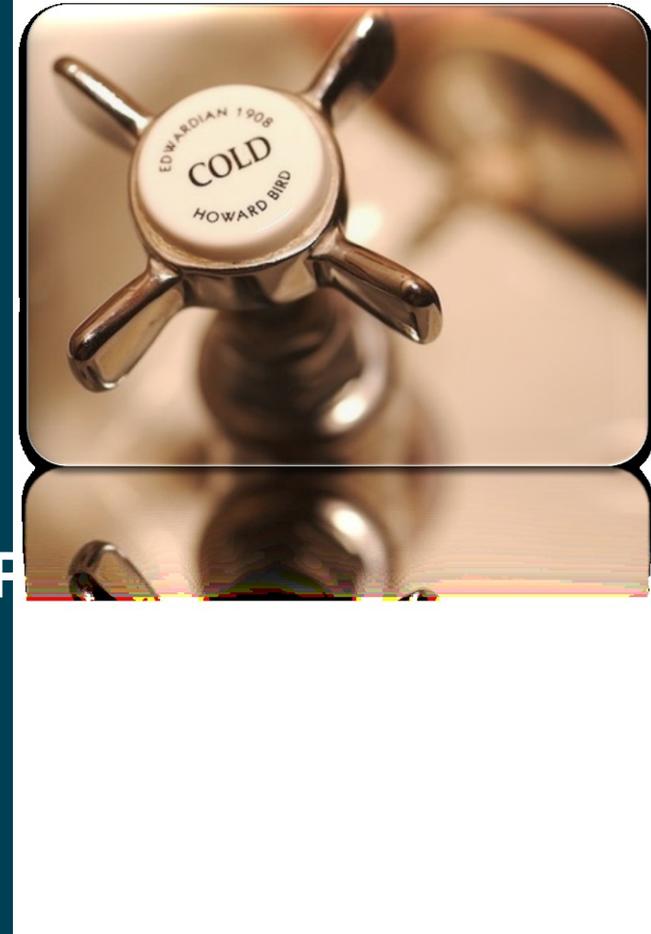
BENCHMARKING

Benchmark your Operations

- Location to location
- Submetering high energy users / equipment
- Energy per production output
- kW/Sq. Ft. & kWh/Sq. Ft. – Local Data Coming Soon

FROM FAUCET TO SOCKET

- Manage Resources and Production
- Optimize Distribution / Ops /Storage
- Consumer Awareness / Behavior
- Catch and Fix leaks
- Use Efficient Fixtures
- Minimize Landscaping Use
- Monitor Cooling Towers / Industrial P
- Optimize Collection
- Manage Processing / Reuse
- Start over

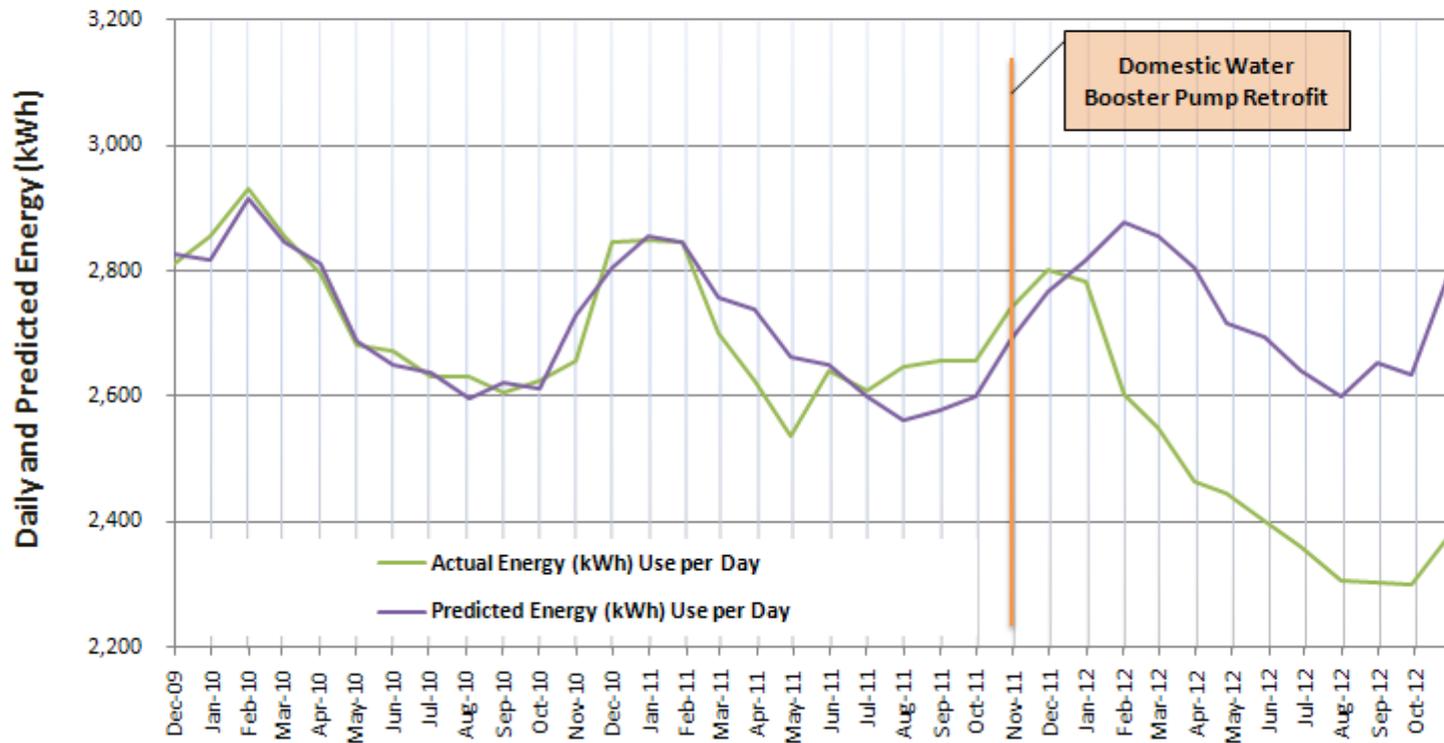


PROJECT RESULT REVIEWS



Hawaii Energy

Weatherized - Baseline Energy Forecast vs. Actual Usage



Hawaii Energy

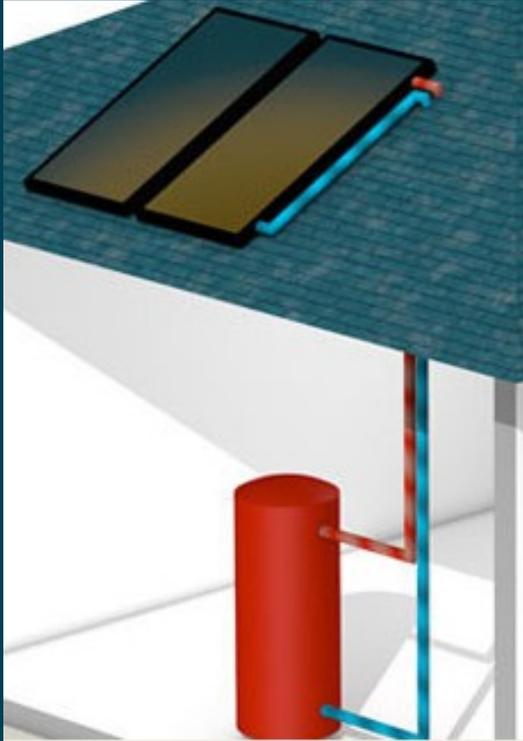
Your Conservation and Efficiency Program

MASTER METERED PROGRAMS

- Incentives and education for the installation of billing submeters
- AOA Residents and Business Tenants within a master metered facility.
- Motivation and ability to directly benefit from energy efficiency improvements and behaviors.



SOLAR WATER HEATING



- **\$1,000 Contractor Incentive or**
- **\$1,000 Interest Buy-Down**
- **100 point inspection**
- **90% water heating cost reduction - about \$10-\$15 per person**
- **35% Hawaii State Renewable Energy Tax Credit**
- **30% Federal Tax Credit**
- **Opportunities for Water Conservation actions**

SOLAR CONTRACTOR INCENTIVE

SCENARIO 1

No Rebate	Tax Basis		\$	6,600	Limited by Max Credit
No Financing	State Tax Credit	35%	\$	(2,250)	
	Federal Tax Credit	30%	\$	(1,980)	
	Net Cost		\$	2,370	

SCENARIO 2

With Rebate	Contractor Price		\$	6,303
\$ 750.00	State GET	4.712%	\$	297
			\$	6,600
	Rebate		\$	(750)
	Tax Basis		\$	5,850
	State Tax Credit	35%	\$	(2,048)
	Federal Tax Credit	30%	\$	(1,755)
	Net Cost		\$	2,048

Net Rebate Benefit	No Rebate	\$	2,370
"Deleveraged"	Rebate	\$	2,048
	Effective Savings	\$	323

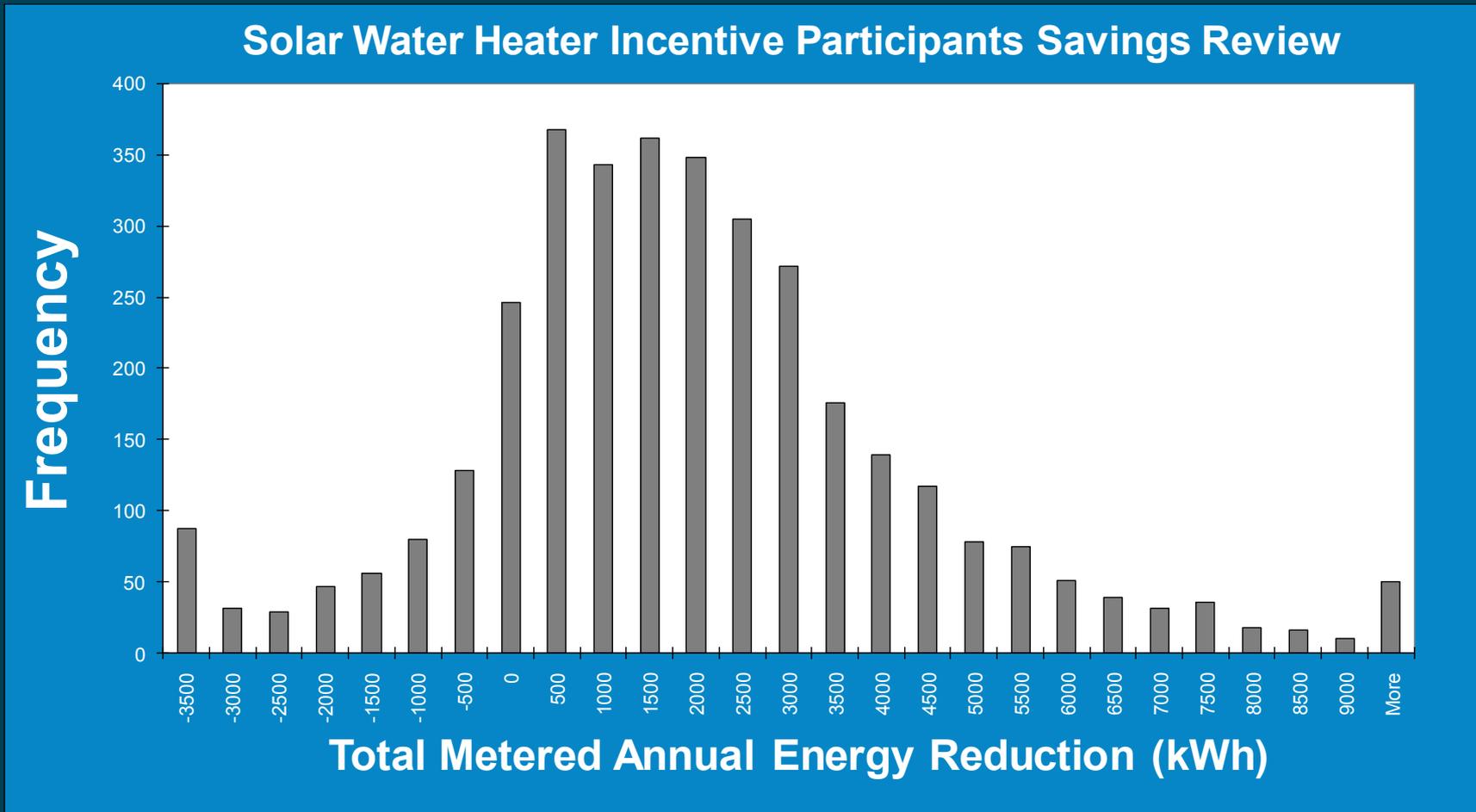


SOLAR INTEREST BUYDOWN

SCENARIO 3

No Rebate	Tax Basis		\$	6,600	
with Financing	State Tax Credit	35%	\$	(2,250)	Limited by Max Credit
No Buydown	Federal Tax Credit	30%	\$	(1,980)	
			\$	2,370	
	Interest Payments		\$	964	
	Net Cost		\$	3,334	5.9 years

SOLAR WATER HEATING PROGRAM



ELEC. RES. WATER HEATER

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	
Average Occupants	x 3.77 Persons	KEMA 2008
Household Hot Water Usage	50.2 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 23,006 BTU/Day

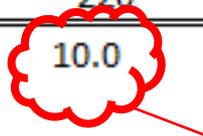
Energy per Day (BTU) Needed in Tank	23,006 BTU/Day
BTU to kWh Energy Conversion	÷ 3,412 kWh / BTU
Energy per Day (kWh)	6.7 kWh / Day
Days per Month	x 30.4 Days per Month
Energy (kWh) per Month	205 kWh / Month
Days per Year	x 365 Days per Year
Energy (kWh) Needed in Tank to Heat Water per Year	2,460 kWh / Year
Elec. Res. Water Heater Efficiency	÷ 0.90 COP
Base SERWH Energy Usage per Year at the Meter	2,733 kWh / Year

2,733
kWh/Year



PV NEEDED TO COVER ELEC. RES. WH

PV Panels to Cover Elec. Res. Water Heater	Low	Med	High	
Elec. Res. Water Heater Energy	2,733	2,733	2,733	(kWh/year)
Days per Year	365	365	365	Days
Peak Equivelant Sun Hours	3.0	4.0	5.0	Hrs/Day
AC PV System Size	2.5	1.9	1.5	kW
DC-AC Factor	0.85	0.85	0.85	
DC PV System Size	2.9	2.2	1.8	kW
PV System Cost per Watt	\$ 4.00	\$ 4.00	\$ 4.00	/Watt
PV System Cost	\$ 11,745	\$ 8,809	\$ 7,047	
Potential Tax Benefit	65%	65%	65%	
Potential Net PV Cost	\$ 7,634	\$ 5,726	\$ 4,581	
DC PV System Size	2.9	2.2	1.8	kW
DC per Panel Output (Micro-Inverter)	220	220	220	Watts
Number of Panels	13.3	10.0	8.0	Panels



10 Panels to Cover Water Heating!

SMALL BUSINESS PROGRAMS

- **Direct Installation Lighting & Restaurants**
 - **Businesses saving over \$1.2 Million per year in reduced operating costs.**
 - **\$3.6 Million of Incentives to Date**
 - **> 3.5 Million kWh and 290 kW**
- **LED Introduction Program**

PEER GROUP COMPARISON PROGRAM

- ARRA / DBEDT 15,000 Homes Kapolei / Ewa Experience
- 62,000 Home – Maui and Hawaii County – 2012
- Social Media – Facebook Contests coming on-line



REFRIGERATOR PROGRAMS

- **Landlord Specials (<\$600 Price Point)**
- **Refrigerators with Recycling**
- **Bounty Program**



LIGHTING INCENTIVES



- **Incandescent Lamps**
 - Ceramic Metal Halide
 - CFL
 - LED
- **Four Foot Lamps**
 - Low Wattage T8s – (25/28 W)
 - High Efficiency Ballasts
 - Delamping
- **Controls**
 - Occupancy Sensor
 - Time Clock / EMCS
 - Bi-Level / Re-circuiting

RESIDENTIAL CFL PROGRAM

- **Status**
- **Education and Awareness**
- **Greater Availability**
- **Recycling**



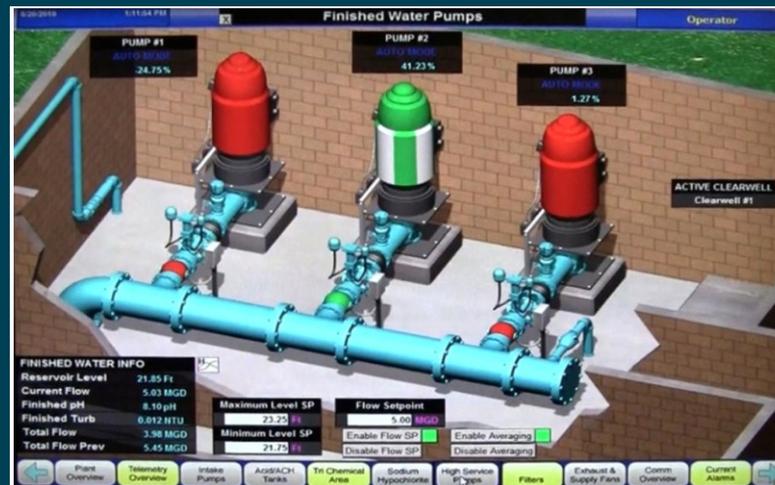
HOME DEVELOPMENT PROGRAM

Energy Efficiency Inside

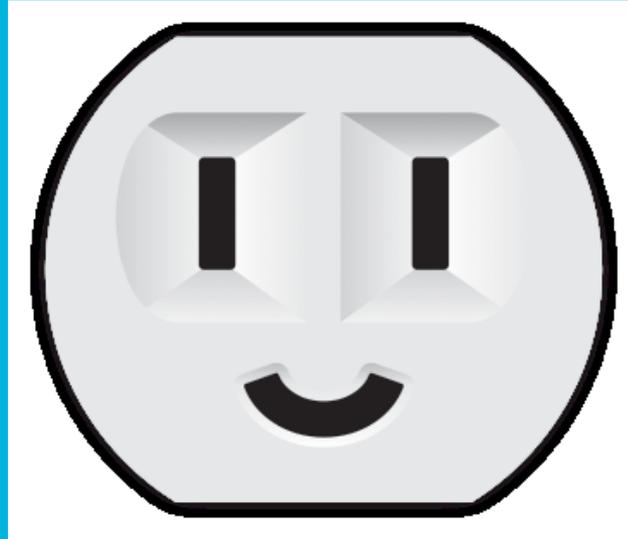
- **IECC 2006 Baseline Home**
- **As-Built**
- **Next Level of Efficiency**
- **Net Zero**

CUSTOMIZED INCENTIVES

Measure of Life	Energy Reduction Incentive	Evening Peak Demand Incentive 5 to 9 p.m.	Day Peak Demand Incentive (HVAC Only) 12 to 2 p.m.
≤ 5 years	\$0.08/kWh	\$125/kW	\$100/kW
> 5 years	\$0.12/kWh	\$125/kW	\$100/kW



US EPA through the New England Water Treatment Technology Assistance Center at the University of New Hampshire.



Mahalo

Oahu 1-808-537-5577

Neighbor Island 1-877-999-7242



Hawaii Energy

Your Conservation and Efficiency Program