



Hawaii Solar Energy Association  
Serving Hawaii Since 1977

# Hawai'i's PV Challenge/Opportunity

UWIG Solar Integration Workshop

Lahaina, Maui

October 11, 2011

**Mark Duda**

President, Hawai'i Solar Energy Association

PO Box 37070

Honolulu HI, 96837

[www.hsea.org](http://www.hsea.org)

[mark@dephawaii.com](mailto:mark@dephawaii.com)

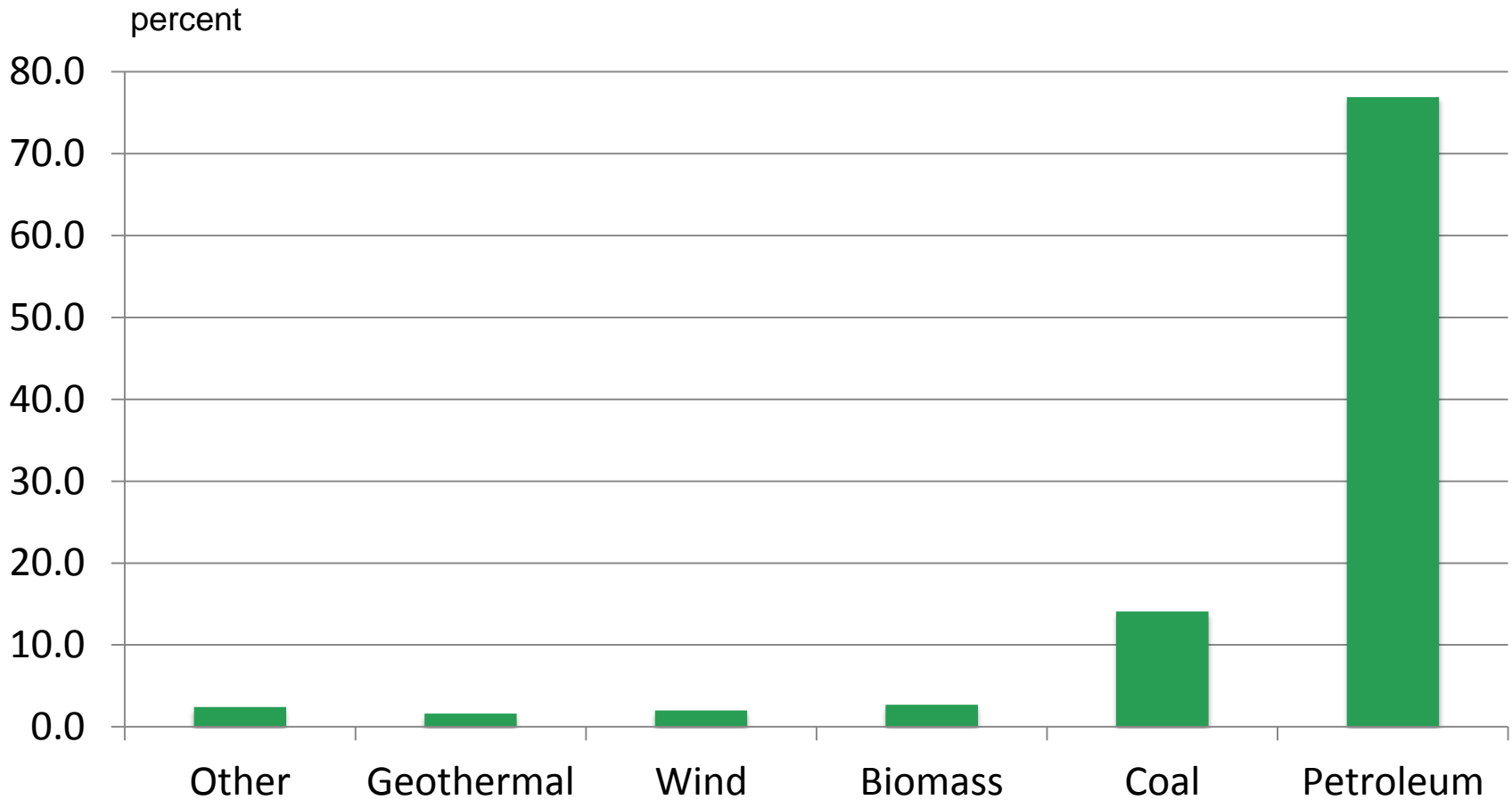


Hawaii Solar Energy Association  
Serving Hawaii Since 1977

# Hawai'i Market Drivers



# Generation Mix



Source: Energy Information Administration, *Hawaii*, Apr. 1, 2010, [http://tonto.eia.doe.gov/state/state\\_energy\\_profiles.cfm?sid=HI](http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=HI)



# Rates Are High and Variable

## July 2011

Utility	Schedule Name	Low	Medium	High	Demand/kW
<b>Residential</b>					
HECO	R	\$0.316	\$0.324	\$0.333	
HELCO	R	\$0.409	\$0.431	\$0.439	
MECO-Maui	R	\$0.367	\$0.375	\$0.381	
KIUC	D		\$0.429		
<b>Commercial (General Service Demand)</b>					
HECO	J		\$0.265		\$10.63
HELCO	J	\$0.384	\$0.362	\$0.351	\$9.16
MECO-Maui	J	\$0.352	\$0.342	\$0.311	\$7.68
KIUC	J		\$0.408		\$6.62

**HECO Companies' rate information:**

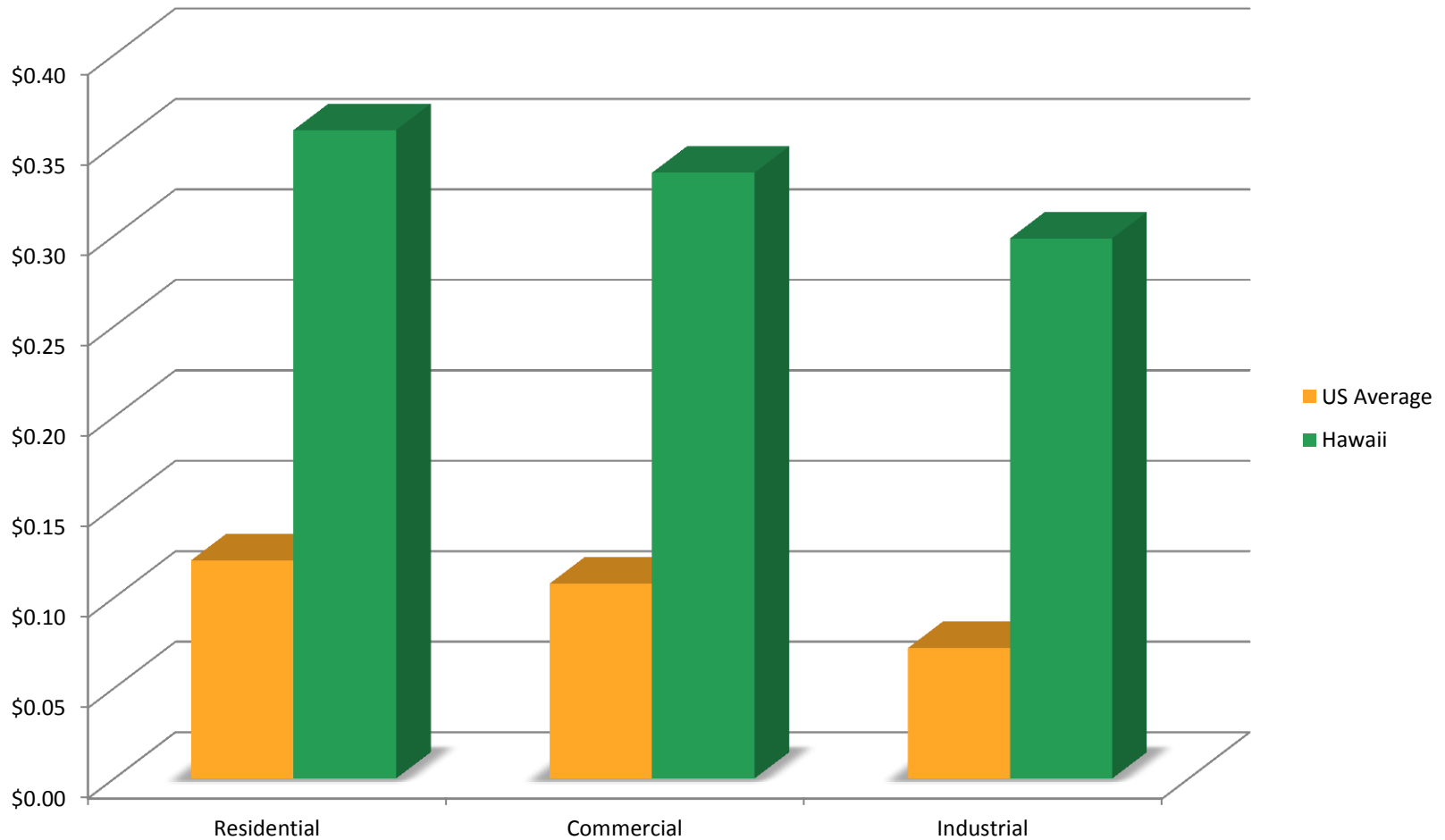
<http://www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=0e1f813dd0aee110VgnVCM1000005c011bacRCRD&vgnnextchannel=10629349798b4110VgnVCM1000005c011bacRCRD&vgnnextfmt=defau&vgnnextrefresh=1&level=0&ct=article>

**KIUC rate information:**

<http://www.kiuc.coop/indexenergy.htm>



# Hawai'i Rates vs. US Mainland



Source: USDOE Energy Information Administration, Electric Power Monthly, 5.6.A: Average Retail Price to End User, September 2011 release (data for June 2011). (<http://www.eia.gov/electricity/monthly/index.cfm>)



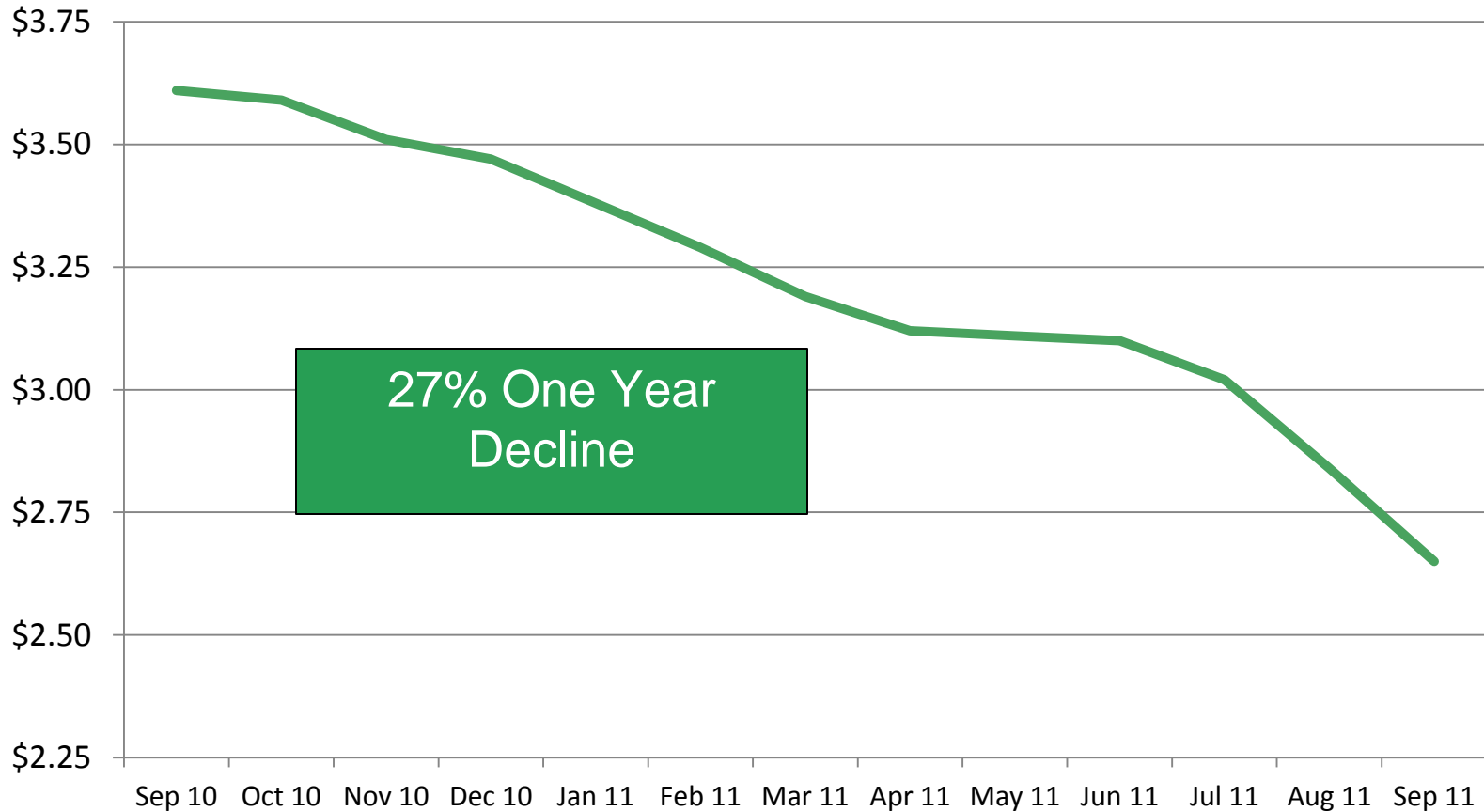
# State of Hawaii Tax Incentives

1. **HRS Section 235-12.5 Renewable Energy Technologies Income Tax Credit (RETITC)**
  - Option 1: 35 percent of installed cost; non-refundable
  - Option 2: 24.5 percent of installed cost; refundable
  - Option 3: 35 percent of installed cost; refundable (only for very low-income (<\$20,000 AGI) or pension-only)
  
1. **Depreciation: MACRS**
  - Basis = full installed cost
  - Five year schedule follows normal federal



# Module Prices Continue Decline

## Retail Price \$/watt

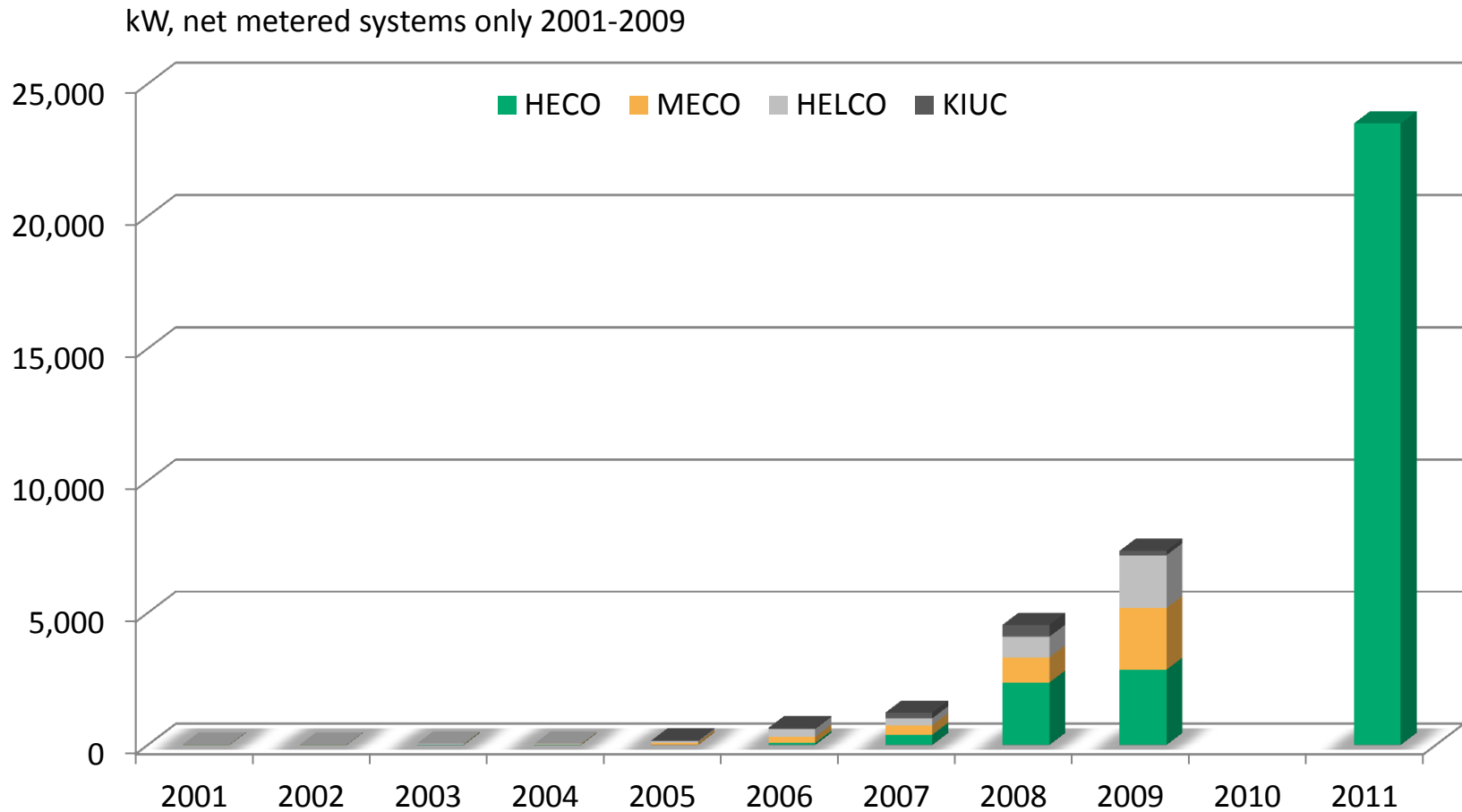


Source: Solarbuzz. <http://solarbuzz.com/facts-and-figures/retail-price-environment/module-prices>



# Est. 2011 PV

## HECO only, all PV permits, through Sept. 30

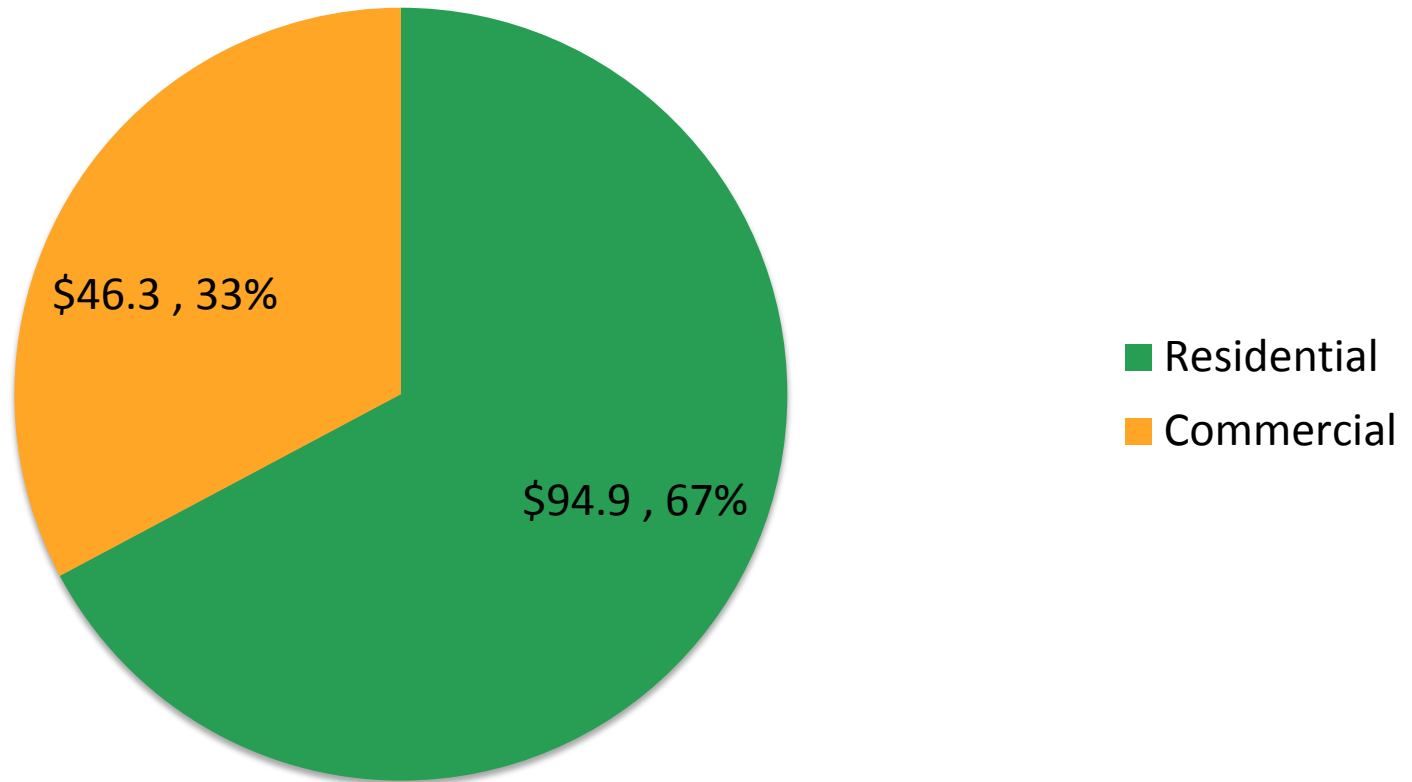


Note: Net metered installs are only a portion of the total. In 2009 total installs were 14 MW indicating about only half of installs were NEM.  
Source: HECO Companies Net Energy Metering Annual Status Report 2009 for HECO/MECO/HELCO, personal communication with KIUC staff for KIUC. KIUC had 93.1 kW installed prior to 2005. HECO 2010 data based on approved or pending NEM applications as of August.



# Project Type Mix

Oahu Building Permits through 9/30/2011  
million \$/percent





# Solar Installed Capacity

Cumulative Installed PV Capacity (w/DC) per Capita thru 2010	
Nevada	38.8
Hawaii	32.9
New Jersey	29.6
California	27.4
Colorado	24.1
New Mexico	21
Arizona	17.2
Dist of Colombia	7.4
Connecticut	6.9
Oregon	6.2
National Average	7

Ranked by Cumulative Installed PV Capacity  
Source: U.S. Solar Market Trends 2010, June 2011. Page 9.



# Planned/Likely HI Solar Capacity Increases

- + 10 MW bilateral contracts approved by PUC for Oahu in 2011
- + Various other 2.7 or 5 MW bilateral projects planned and/or in negotiation
- + KIUC 10 MW RFP
- + 6 MW approved by PUC for Kauai in 2011
- + 4 MW approved by PUC for Kauai in 2010
- + FIT program 2010-2012 = 80 MW (HECO/MECO/HELCO)
- + Sempra 300 MW proposal
- + Cancellation of 200 MW wind contract/HECO reissue
- + DG at 15% of peak load ~100-200 MW



Hawaii Solar Energy Association  
Serving Hawaii Since 1977

# Procurement: Tariffs and Other Channels



# Net Energy Metering

## ✦ HECO/MECO/HELCO

- applies only to systems  $\leq$  100 kW per meter
- No program limit but subject to feeder penetration restrictions at 15% of peak load

## ✦ KIUC

- Limited to 50 kW system size and 1% of peak load
- Program is full
- NEM Pilot pays \$0.20/kWh for exported energy; system sizes up to 200 kW



# Standard Interconnect

- ✦ Typically commercial systems > 100kW
- ✦ All kWhs used to offset load
- ✦ System sized to never export any electrons/no compensation for exported energy



# Feed-In Tariff

- + Program set at 5 percent of peak load
- + Pricing set based on technology type (PV, Wind, CSP, In-Line Hydro), system size, and state tax credit level
- + For PV currently available on systems up to 500kW on HECO, 250kW on HELCO & MECO (<20 kW = Tier 1; >20 kw – Tier 2)
- + Larger systems coming at some point (up to 5 MW for HECO, 2.72 MW for HELCO & MECO)
- + Two choices:
  - Interconnect behind the utility meter – offset contemporaneous load at retail rate, paid for excess generation, pay for excess consumption
  - Interconnect outside the meter and sell all kWhs



# Bilateral Utility PPA

- ✦ Systems up to 5 MW (HECO); 2.72 MW (MECO & HELCO)
- ✦ All energy exported to (or at least available for export to) utility
- ✦ Pricing, interconnection requirements, and other terms negotiated with utility
- ✦ PPA must be approved by PUC



# Sample: One Year Net Cost, Grid-Tied Commercial PV System

Installed Cost	(\$1,000,000)
Federal Credit	\$300,000
HI Credit	\$350,000
Value of Federal Year 1 Depreciation (at 35%, no bonus)	\$57,800
Value of HI Year 1 Depreciation (at 6.4%)	\$12,800
Energy Savings (250 kW system, 450 sun zone, \$0.30/kWh)	\$115,00
Net Cost after One Year	(\$154,400)



# Residential PV with Batteries

	Grid-Tied	Off-Grid
<b>PV System Size (watts)</b>	5,000	6,667
<b>kWh available to homeowner (Year 1)</b>	7,640	7,640
<b>PV System Cost at \$5.75/watt</b>	\$28,750	\$38,333
<b>Batteries Cost (3 days of full storage)</b>		\$36,000
<b>Total Cost</b>	\$28,750	\$74,333
<b>Cost after Tax Credits</b>	\$10,063	\$26,017

<b>Years to Payback Based on Current Utility Rates and 5% Annual Escalation</b>		
	Grid-Tied	Off-Grid
HECO	4	9
HELCO	3	7
MECO (Maui)	3.5	8
MECO (Molokai)	3.5	7
MECO (Lanai)	3	7
KIUC	3	7

Note: Years rounded to nearest half year.



Hawaii Solar Energy Association  
Serving Hawaii Since 1977

# Issues & Impacts Raised by PV's Value Proposition in Hawai'i



# 1. Lots of PUC Dockets

<http://dms.puc.hawaii.gov/dms/>

- + Competitive bidding (03-0372)
- + Net energy metering (2006-0084)
- + Intra-governmental wheeling (2007-0176)
- + Feed-in tariff (2008-0273)
- + PV Host (2009-0098)
- + DG interconnection/Rule 14H (2010-2015)
- + On-bill financing (2011-0186)
- + Reliability standards (2011-0206)



## 2. Interconnection Studies: Rule 14H Applies to FIT, SIA, and NEM

Additional technical study may be needed based on:

1. Complexity of the grid where system is being interconnected
2. Connection to a network system
3. Plan to export power
4. **Feeder penetration > 15%**
5. Starting voltage drop
6. Generating facility capacity
7. Short circuit contribution ratio >5%
8. Type of interface transformer

Source: Rule 14, Appendix III, Sheet 34D-8 and 34D-9.

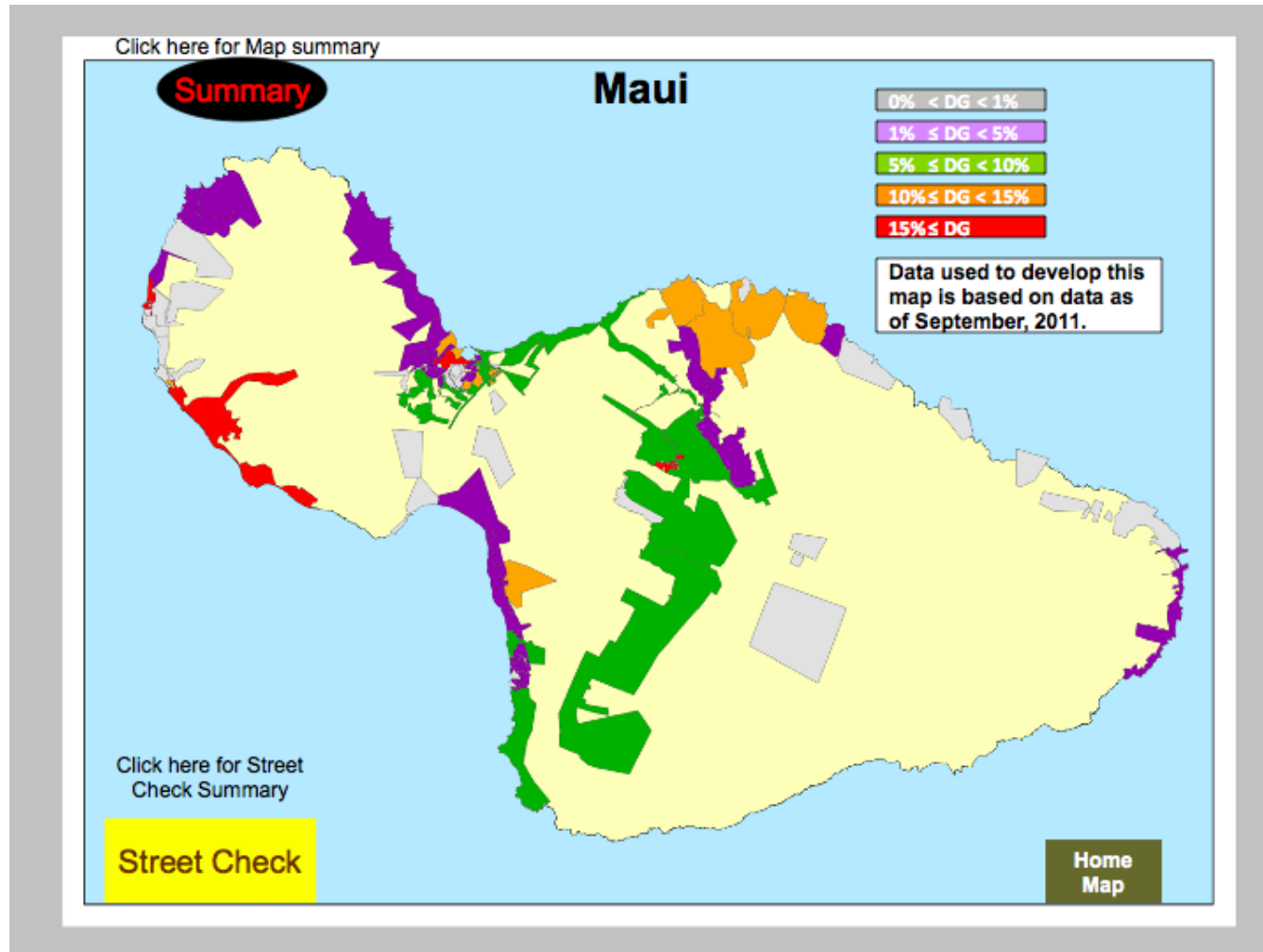


# Impact of Interconnection Study

- ✦ Cost of existing commercial level studies has been \$30,000-\$75,000 for distribution level systems
- ✦ Time frame > 6 months: typically shifts placed-in-service tax year
- ✦ Outcome can be purchase of additional equipment
- ✦ Interaction with legislative calendar



# Location Value Maps





# LVM: High DG Penetration

**Street Penetration Check**

Data used to develop this map is based on data as of September, 2011.

10% ≤ DG < 15%

15% ≤ DG

\*AVAILABLE CAPACITY is not a cap, but the amount of distributed generation (such as PV) that can be installed before the associated circuit reaches 15% penetration.

Only streets with 10% or higher penetration circuits are listed. Also, there can be more than one circuit on these streets, but only the highest penetration is shown. For further information, please contact the respected HECO program (NEM, SIA, FIT).

Home Map

Street Name	*Available Capacity (kW)	Zip Code	Island
IPU KAI LN	0.00	96761	Maui
IPU WAI LN	0.00	96761	Maui
IULANI ST	59.23	96708	Maui
KAAHUMANU AV	0.00	96793	Maui
KAAHUMANU AV	0.00	96732	Maui
KAANAPALI PKWY	0.00	96761	Maui
KAEO PL	0.00	96761	Maui
KAHEALANI ST	59.23	96708	Maui
KAHEKILI PARK RD	0.00	96761	Maui
KAHIAPO PL	5.60	96708	Maui
KAHILI PL	0.00	96761	Maui
KAHOOLAWE ST	52.94	96732	Maui
KAHOPE PL	5.60	96708	Maui
KAHOPE ST	5.60	96708	Maui
KAHU RD	59.23	96708	Maui
KAHULUI BEACH RD	0.00	96732	Maui
KAHULUI BEACH RD	0.00	96732	Maui
KAHULUI BREAKWATER RD	0.00	96732	Maui
KAI ALA DR	0.00	96761	Maui
KAI HELE KU PL	0.00	96761	Maui
KAI HELE KU ST	0.00	96761	Maui
KAIAPA RD	26.21	96708	Maui
KAIHEE PL	0.00	96732	Maui
KAIKOO ST	0.00	96793	Maui
KAILANA ST	0.00	96793	Maui

←
→

back
next

Source: <http://www.mauielectric.com/portal/site/meco/menuitem.ed4aed221358a44973b5c410c510b1ca/?vgnextoid=7a9d812edc035210VgnVCM1000005c011bacRCRD&vgnnextchannel=db1d32db96315210VgnVCM1000005c011bacRCRD&vgnnextfmt=default>



## 3. Curtailment

- ✦ Curtailment provisions in FIT contract have crippled the program because investors cannot calculate rate of return
- ✦ Proposed SCADA requirements down to the residential level perceived as threat to project economics
- ✦ DGs can cause 'invisible' curtailment to existing IPPs
- ✦ Utilities not comfortable with take or pay so engineering and financial concerns are intertwined



## 4. Reliability

- ✦ What standard should non-firm renewables need to meet in order to be safely integrated?
- ✦ Hawai'i has no objective standards
- ✦ Who should bear the cost of mitigation and where should it be located?



Hawaii Solar Energy Association  
Serving Hawaii Since 1977

# Summary/Conclusion



# Summary: PV Value Proposition in Hawai'i Will Remain Strong

- ✦ Cost declines + rate increases driving appeal of PV
- ✦ Consumer preferences
- ✦ Development of companion technologies (storage, smart grid)
- ✦ Policy support (sun shot, etc.)
- ✦ ➔ Economics of PV in Hawai'i will remain strong



# Summary 2: Regulatory Policy Is Not Really Keeping up with the Market

- ✦ Reliability standards opaque and process for improving them is slow and unwieldy
- ✦ No plan/system to optimize ratepayer expense for storage
- ✦ Many gaps in DG procurement system (NEM system caps, FIT contract flaws, etc.)



# Conclusion: The View from Hawai'i

- ✦ High cost of grid power plus low cost of PV is close to forcing a “regulatory reckoning” → stand alone PV will soon be cheap enough to be appealing to many utility customers
- ✦ Regulatory model needs to adapt to make DG/PV work for utilities
- ✦ Or else regulatory bodies need to contemplate a smaller role for utilities in the overall generation mix



Hawaii Solar Energy Association  
Serving Hawaii Since 1977

# Thank You

**Mark Duda**

President, Hawai'i Solar Energy Association

PO Box 37070

Honolulu HI, 96837

[www.hsea.org](http://www.hsea.org)

[mark@dephawaii.com](mailto:mark@dephawaii.com)