Overview of Hawaii Clean Energy Policies

USAID/PURA/NARUC
The 3rd Gambia National Forum: Policy for Small Scale Renewable Energy Regulation

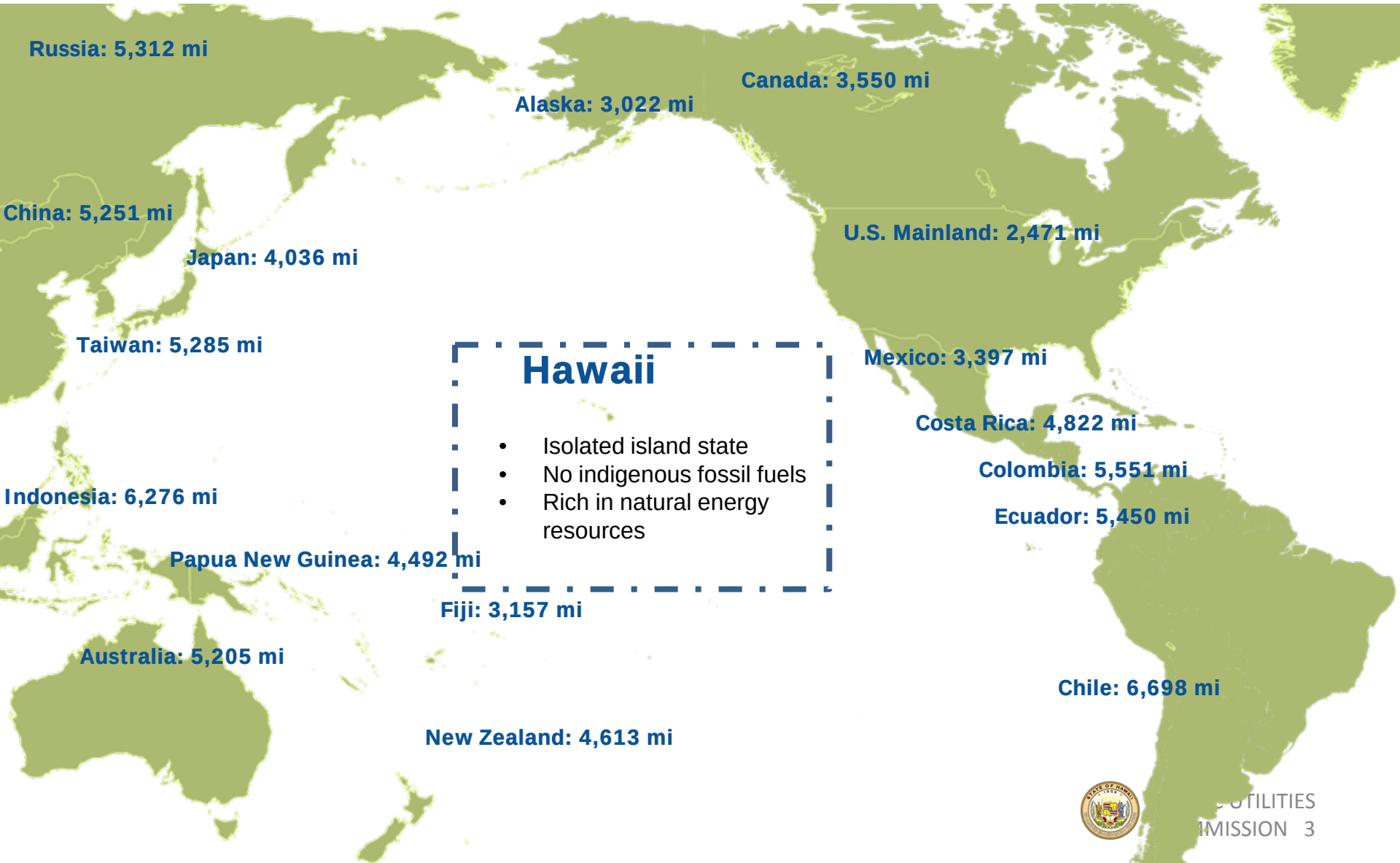
June 18-19, 2014
Banjul, The Gambia

James “Jay” Griffin, Ph.D.
Chief of Policy and Research
Hawaii Public Utilities Commission

Presentation Overview

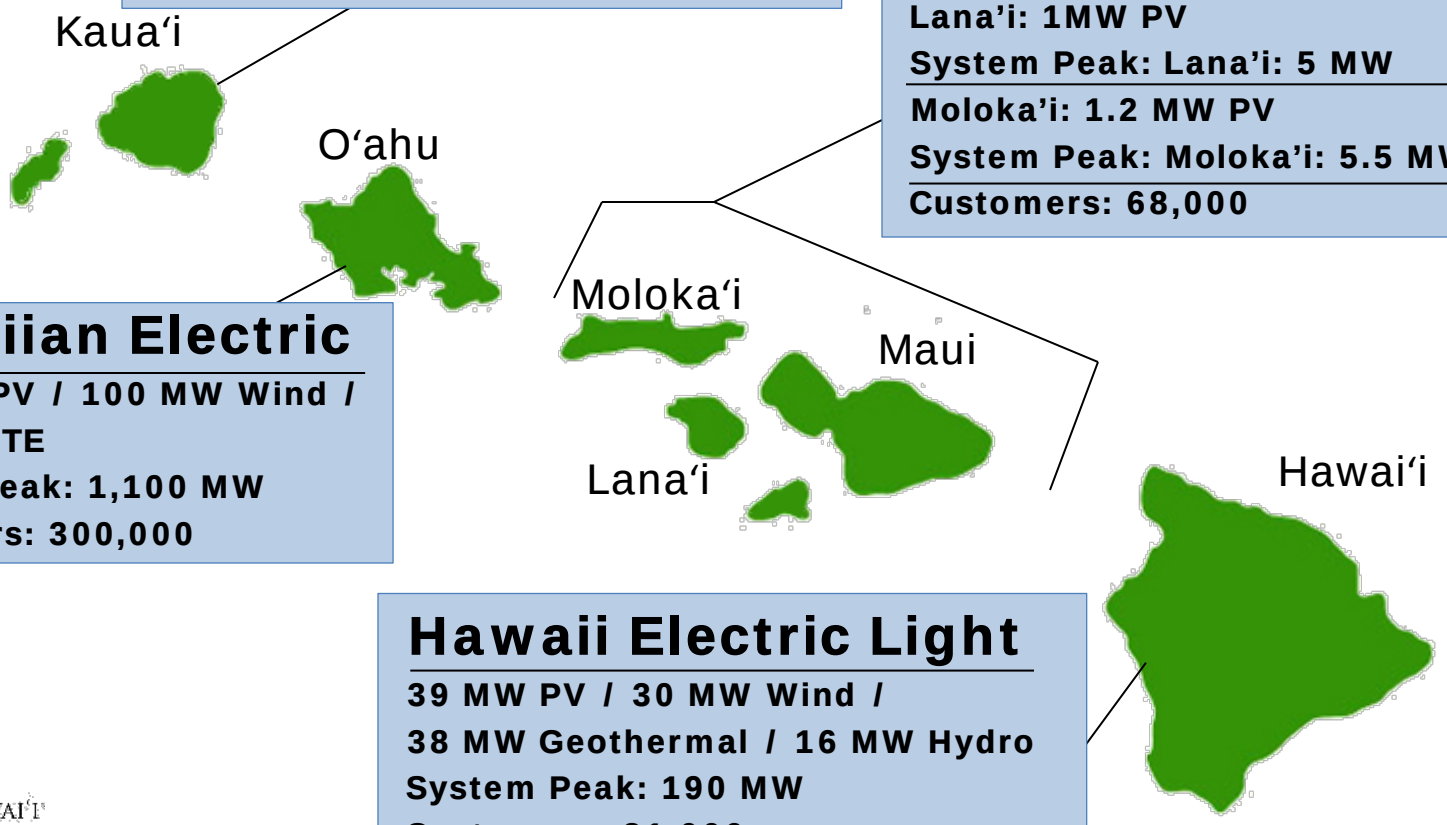
- **Hawaii Overview**
- Summary of Key Energy Policies and Progress to Date
- Focus on Net Energy Metering Policy
- Emerging Challenges and Future Opportunities

Most Isolated Population Center on Earth



Hawaii Electric Systems

4 electric utilities; 6 separate grids



Kauai Island Utility Cooperative

27 MW PV (24 MW in development)
System Peak: 78 MW
Customers: 32,700

Maui Electric

Maui: 60MW PV / 72MW Wind
System Peak: Maui 200 MW
Lana'i: 1MW PV
System Peak: Lana'i: 5 MW
Moloka'i: 1.2 MW PV
System Peak: Moloka'i: 5.5 MW
Customers: 68,000

Hawaiian Electric

221 MW PV / 100 MW Wind / 69 MW WTE
System Peak: 1,100 MW
Customers: 300,000

Hawaii Electric Light

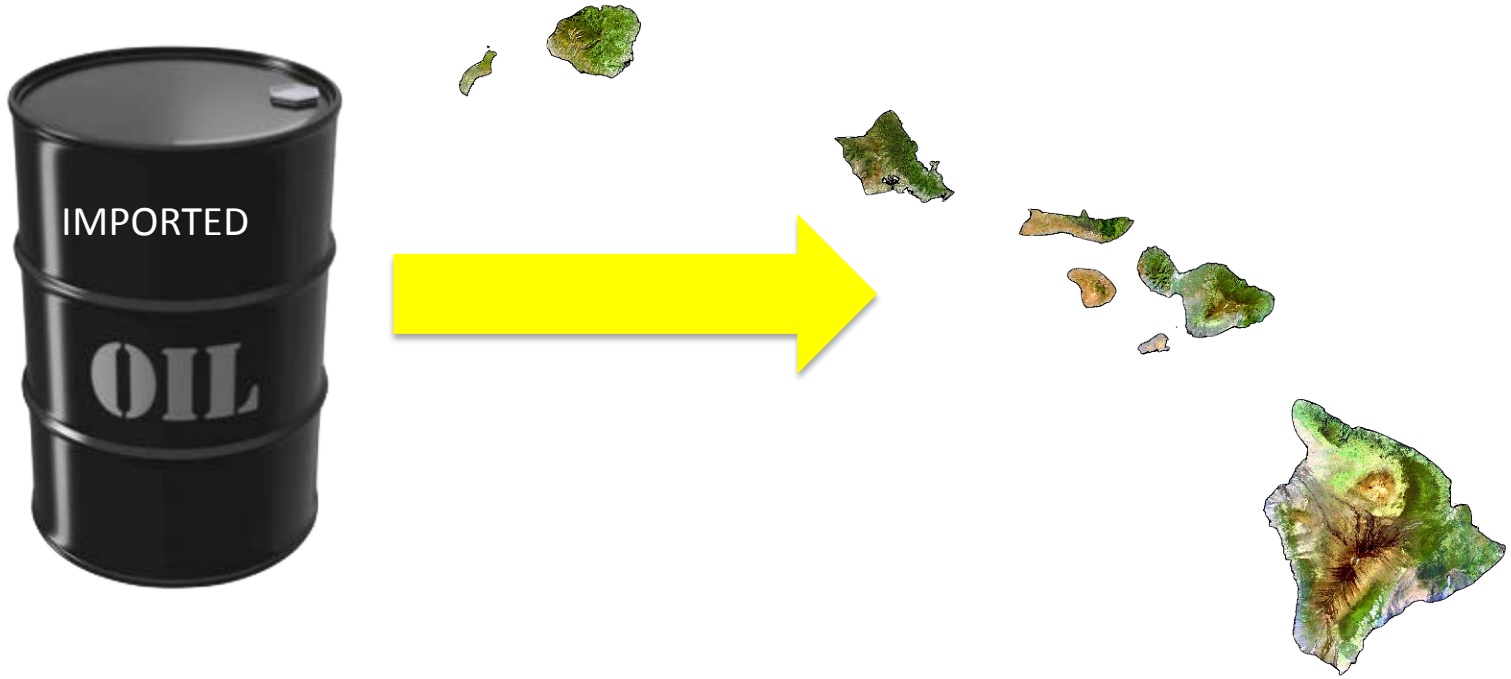
39 MW PV / 30 MW Wind /
38 MW Geothermal / 16 MW Hydro
System Peak: 190 MW
Customers: 81,000

UNIVERSITY of HAWAI'I MĀNOA

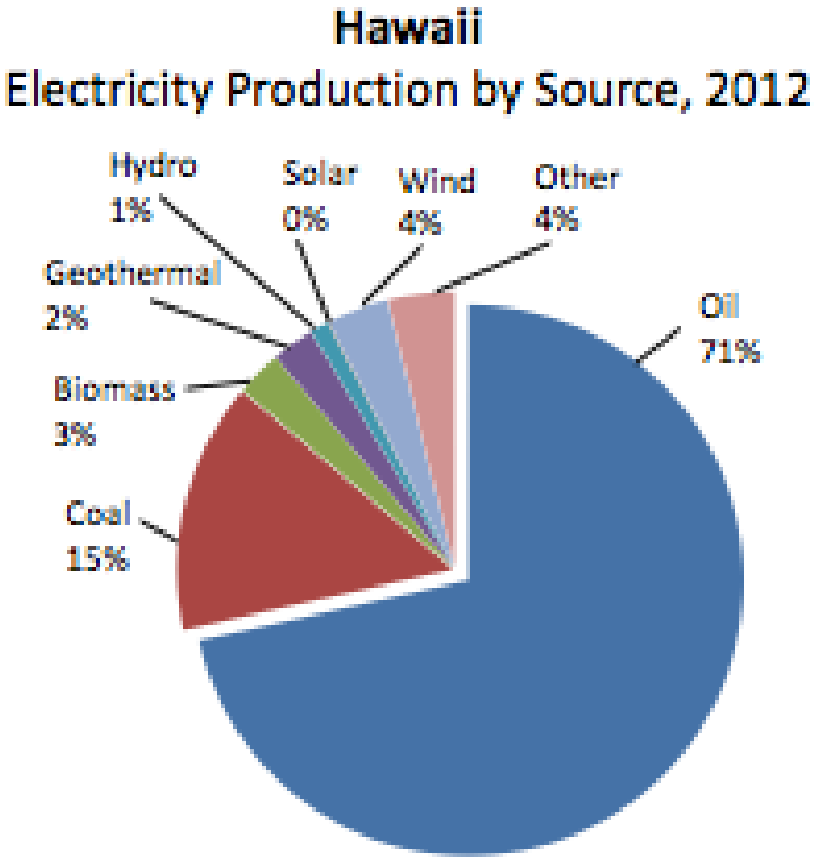
Source: Hawaii Natural Energy Institute

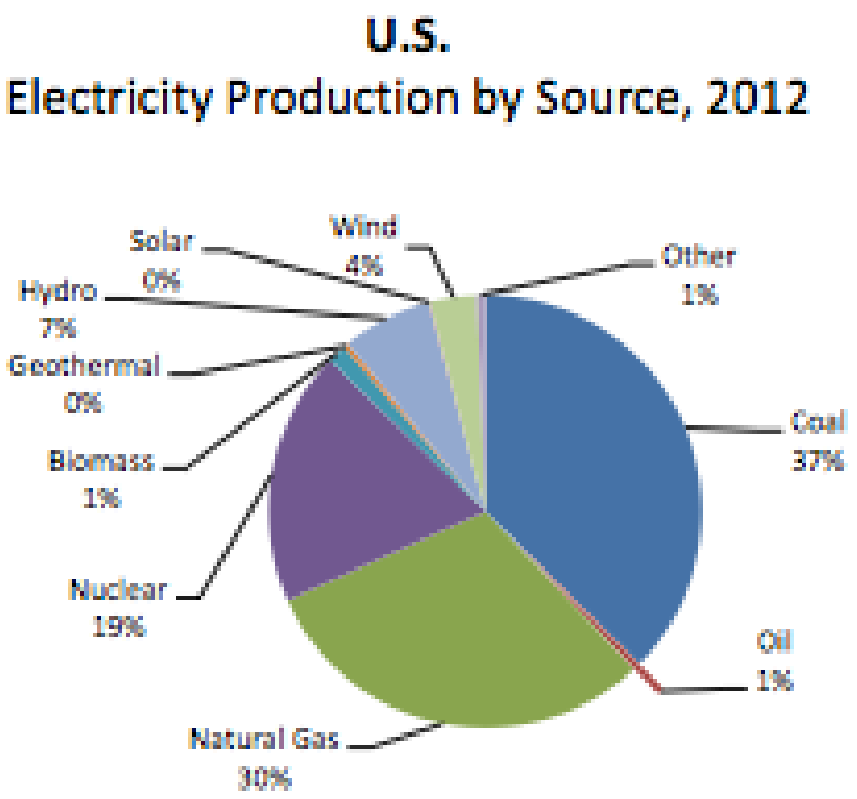
Hawaii's State of Clean Energy

- Most oil dependent state in the U.S.
  - imported 92% of our energy in 2011
- Highest electricity rates in the U.S.



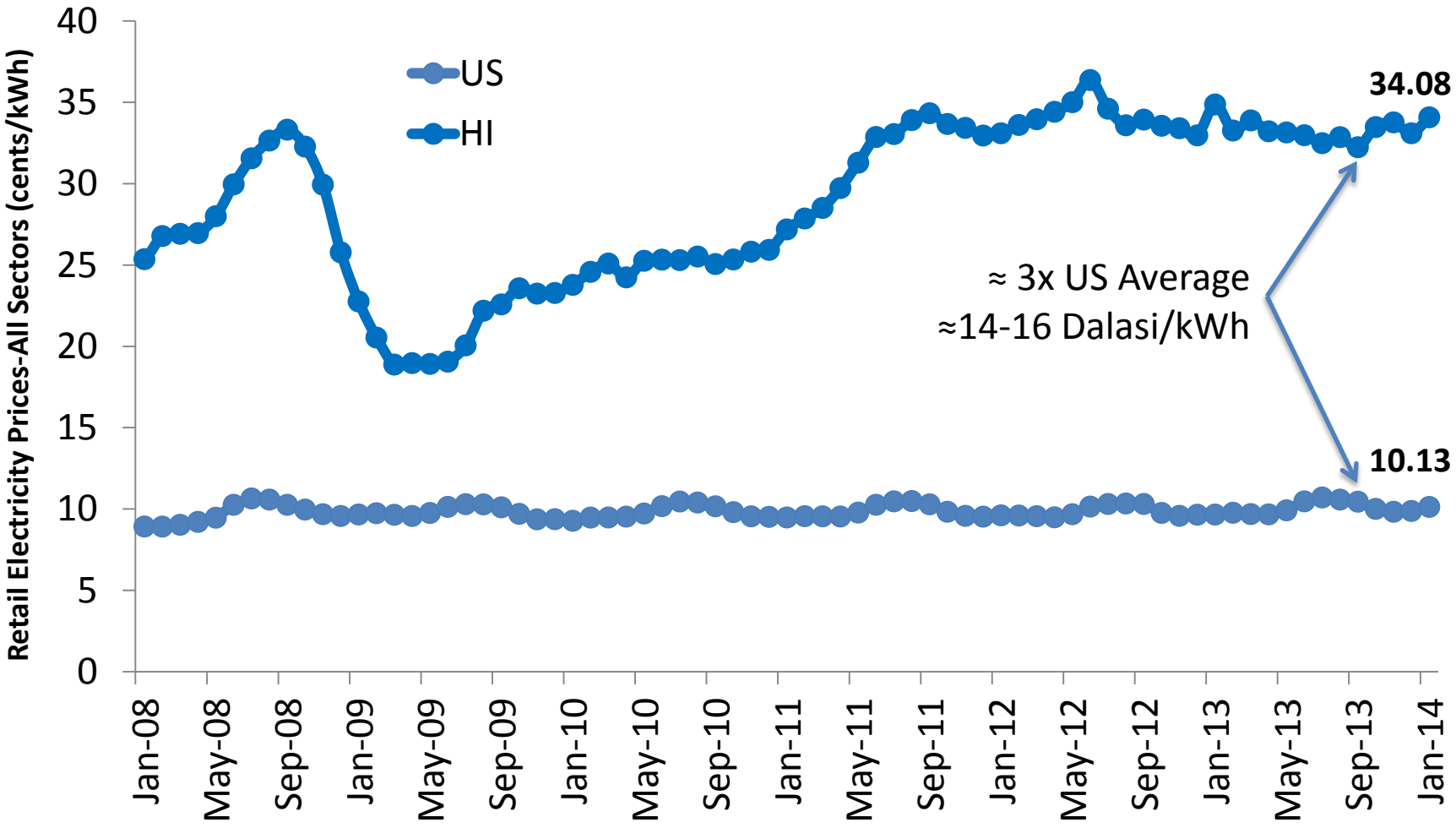
Fuel Oil and Diesel Remain Primary Fuels for Electricity





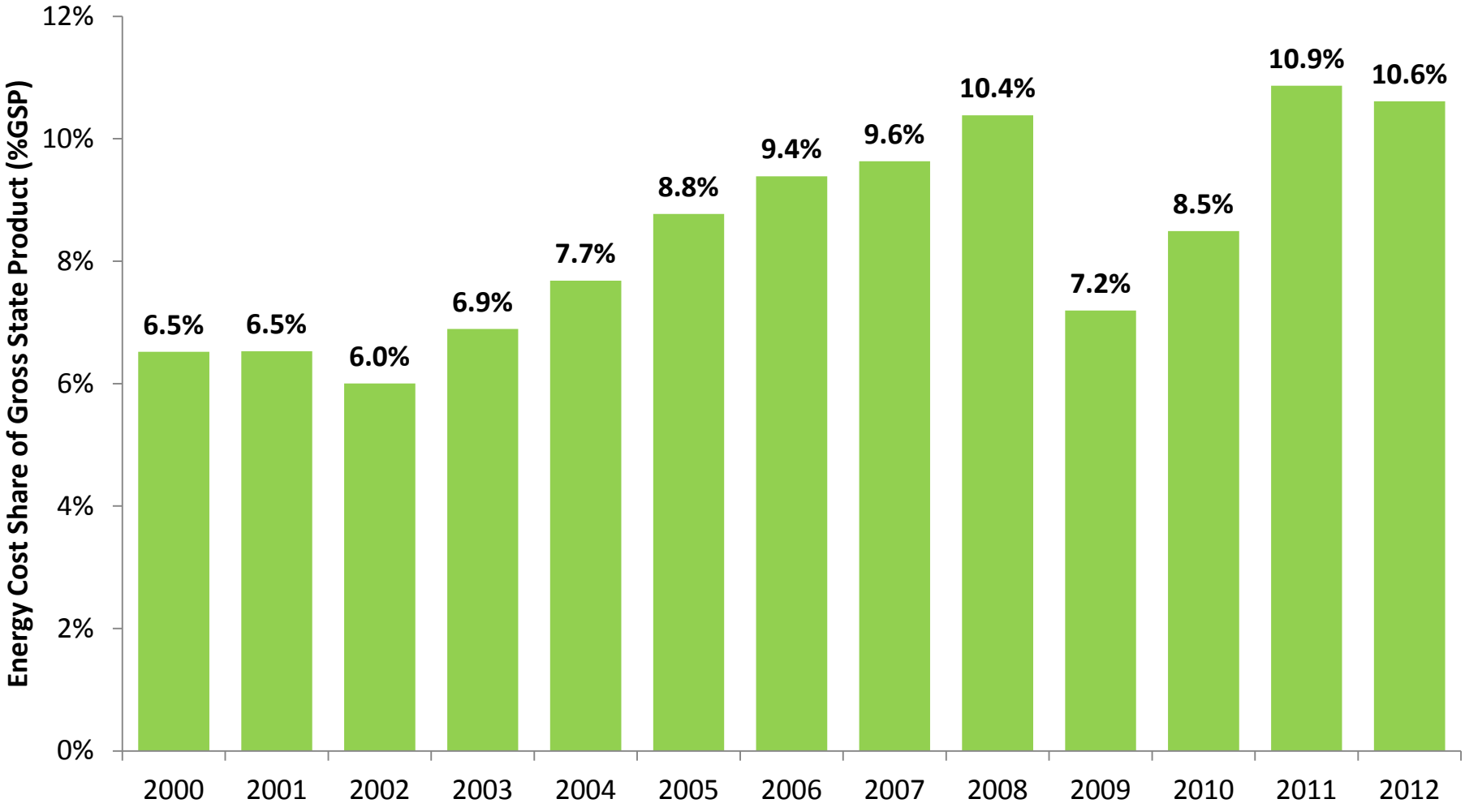
Source: Energy Information Administration

Oil Dependency Results in High Energy Prices



Source: Energy Information Administration

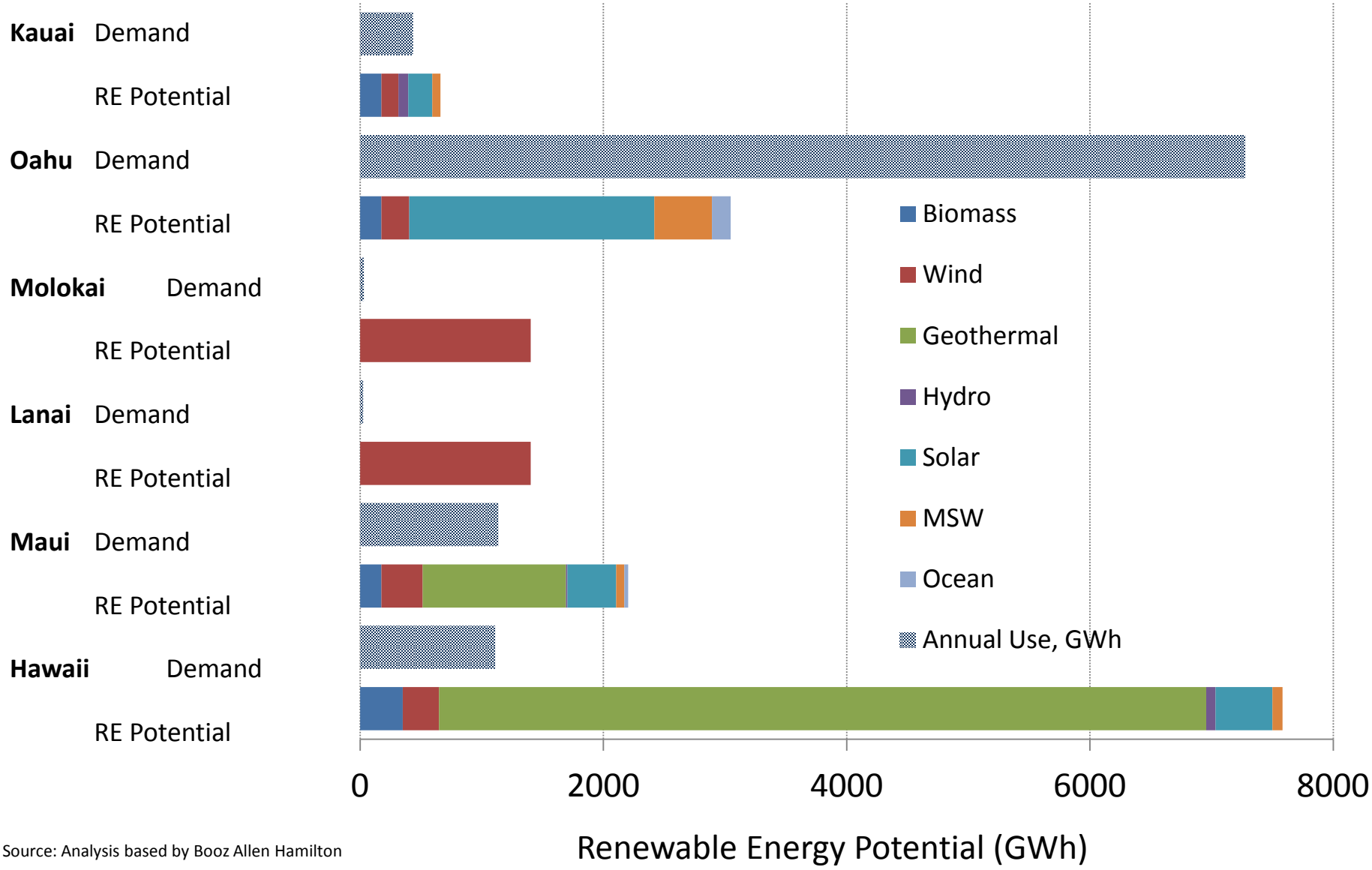
High Energy Costs have Significant Economic Impact



Source: Research & Economic Analysis Division, DBEDT

Equates to ≈ $5+ billion per year spent on imported oil

Hawaii is Blessed with Indigenous Renewable Resources



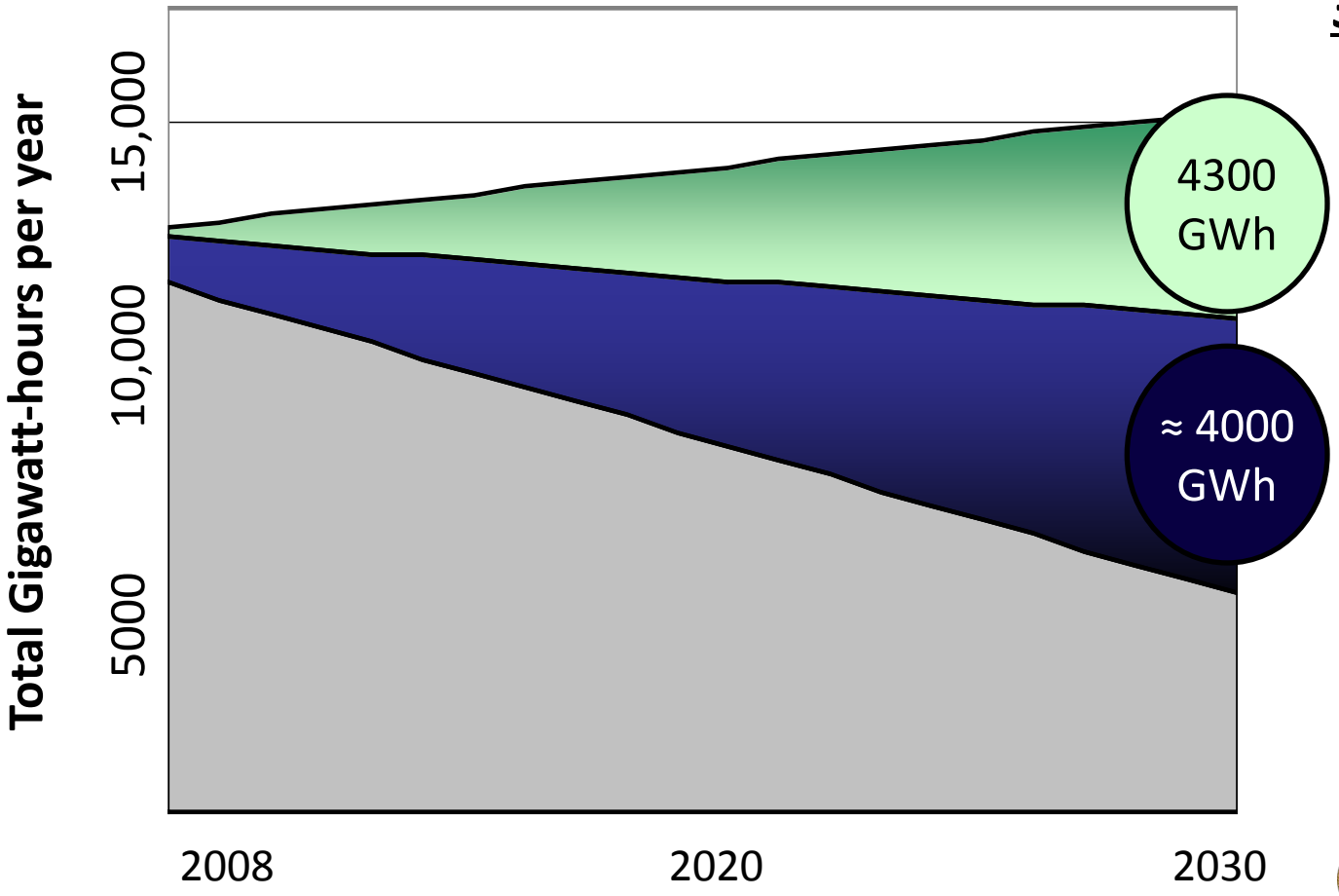
Source: Analysis based by Booz Allen Hamilton

Presentation Overview

- Hawaii Overview
- **Summary of Key Energy Policies and Progress to Date**
- Focus on Net Energy Metering Policy
- Emerging Challenges and Future Opportunities

Hawaii Clean Energy Initiative

Enacted in 2008, the Hawaii Clean Energy Initiative (HCEI) is leading the way in relieving our dependence on oil by setting goals and a roadmap to achieve 70% clean energy by 2030



30% reduction

Energy Efficiency Portfolio Standard

Public Benefits Fee

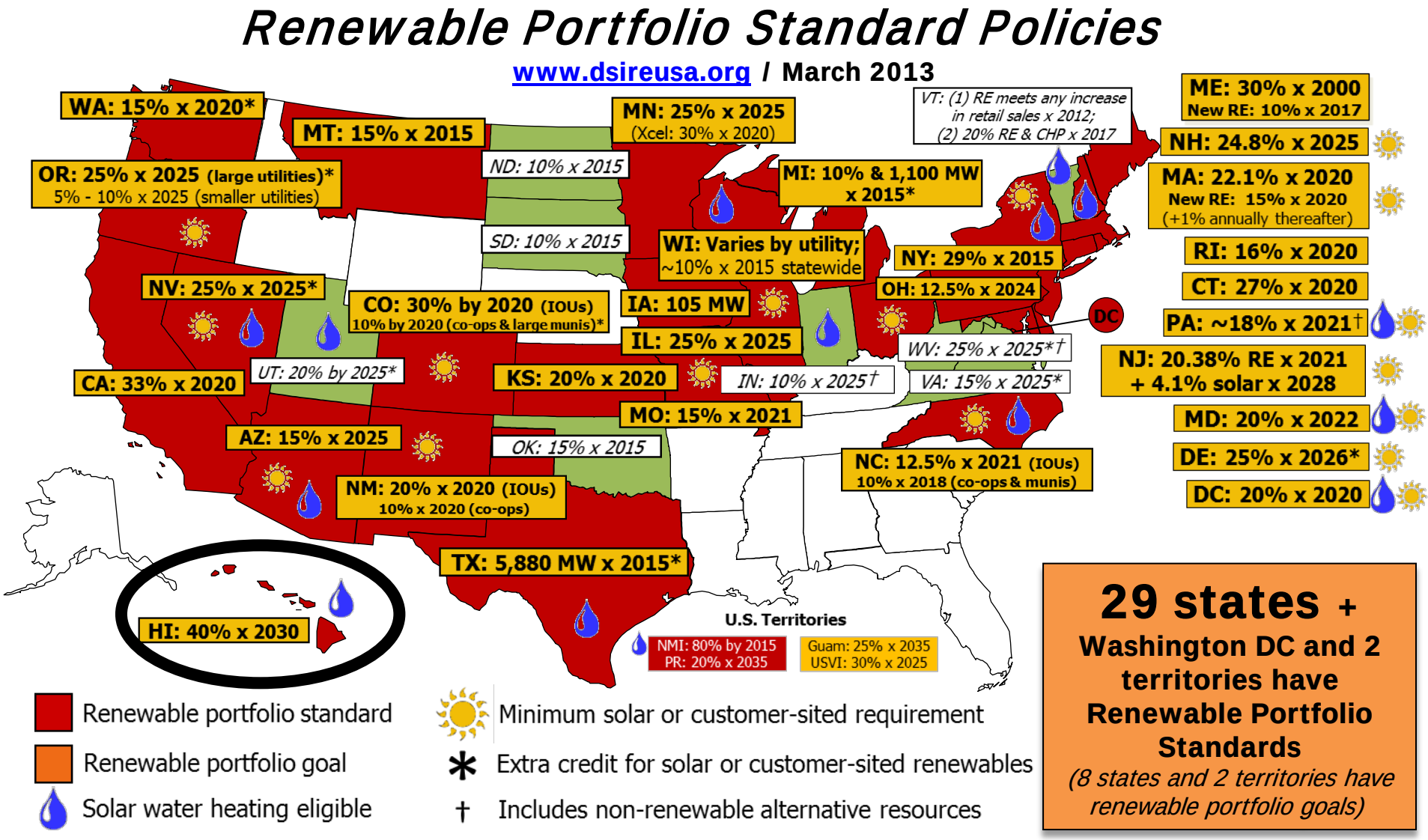
40% clean generation*

Renewable Portfolio Standard

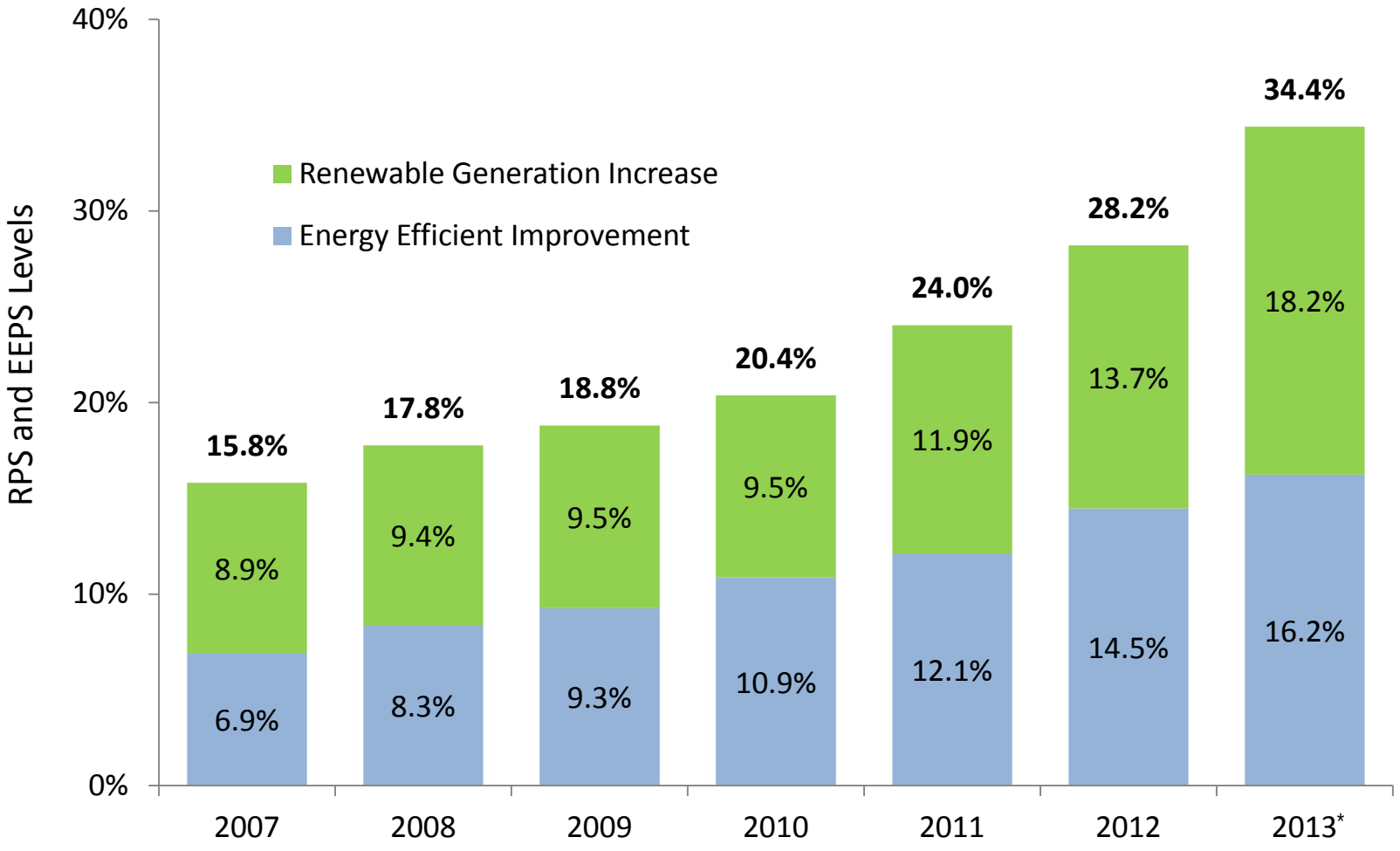
- **Net metering**
- **FiT**
- **Comp. bidding**

*** 40% calculated on remaining demand**

Hawaii is a US Leader in Clean Energy Policy



State Sustains Progress in Meeting Clean Energy Goals



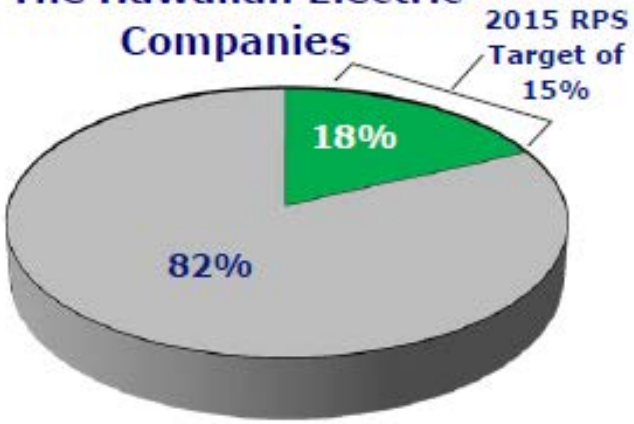
Source: *Renewable Portfolio Standards Status Reports,* 2007-2013 (Hawaii Public Utilities Commission)

* KIUC RPS and EEPS not included for 2013. These figures to be included upon KIUC's Annual RPS Status Report to the Public Utilities Commission.

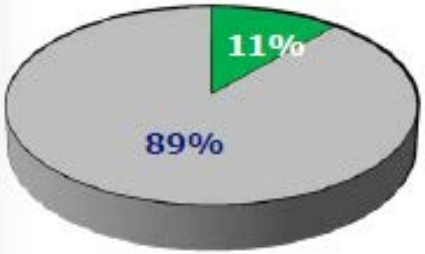
2013 Clean Energy Achievements

- **Hawaii is a leader in forging new ground in integrating clean energy**
  - Hawaiian Electric achieved 18% renewables -- exceeded 2015 RPS target
  - 10% of Oahu customers have solar PV; exceeding other utilities by far
  - Avoided-oil equivalent of 2.9 million barrels, or $350 million of imported oil saved in 2013

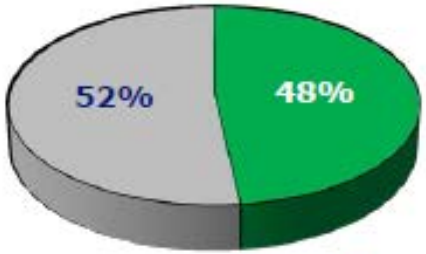
The Hawaiian Electric Companies



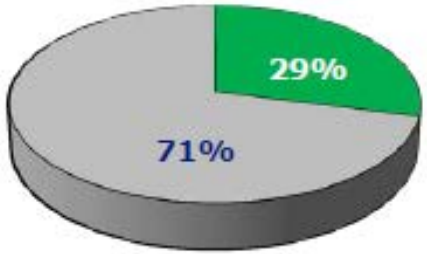
Hawaiian Electric



Hawaii Electric Light



Maui Electric

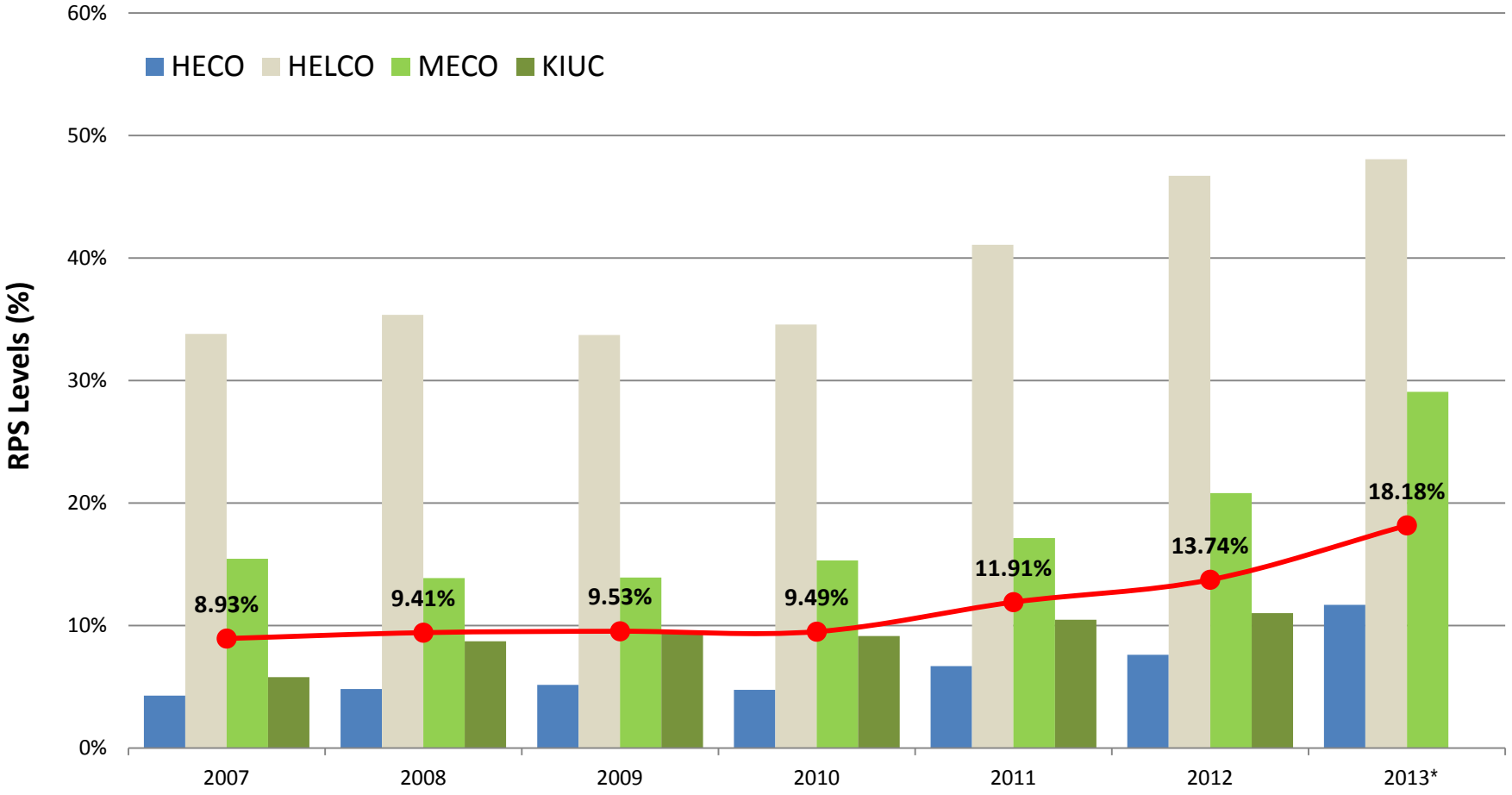


Fossil Generation[1] Renewable Generation[1]

1 Represents preliminary RPS for 2013 percentage of total sales

Big Island and Maui Have Led Renewables Development

Kauai and Oahu are not Far Behind

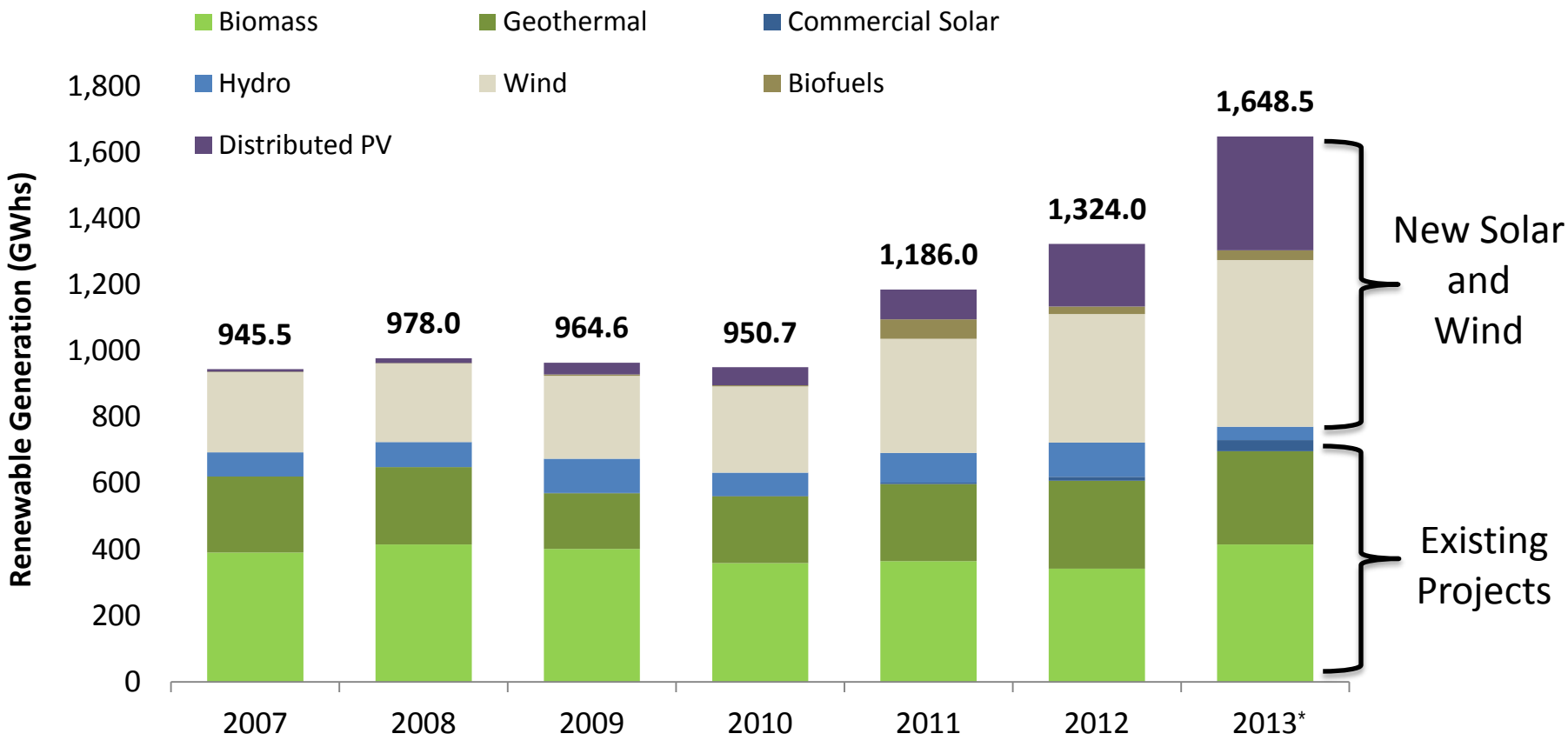


Source: *Renewable Portfolio Standards Status Reports,* 2007-2013 (Hawaii Public Utilities Commission)

* KIUC RPS and EEPS not included for 2013. These figures to be included upon KIUC's Annual RPS Status Report to the Public Utilities Commission.

Wind and Solar Leading Renewables Growth

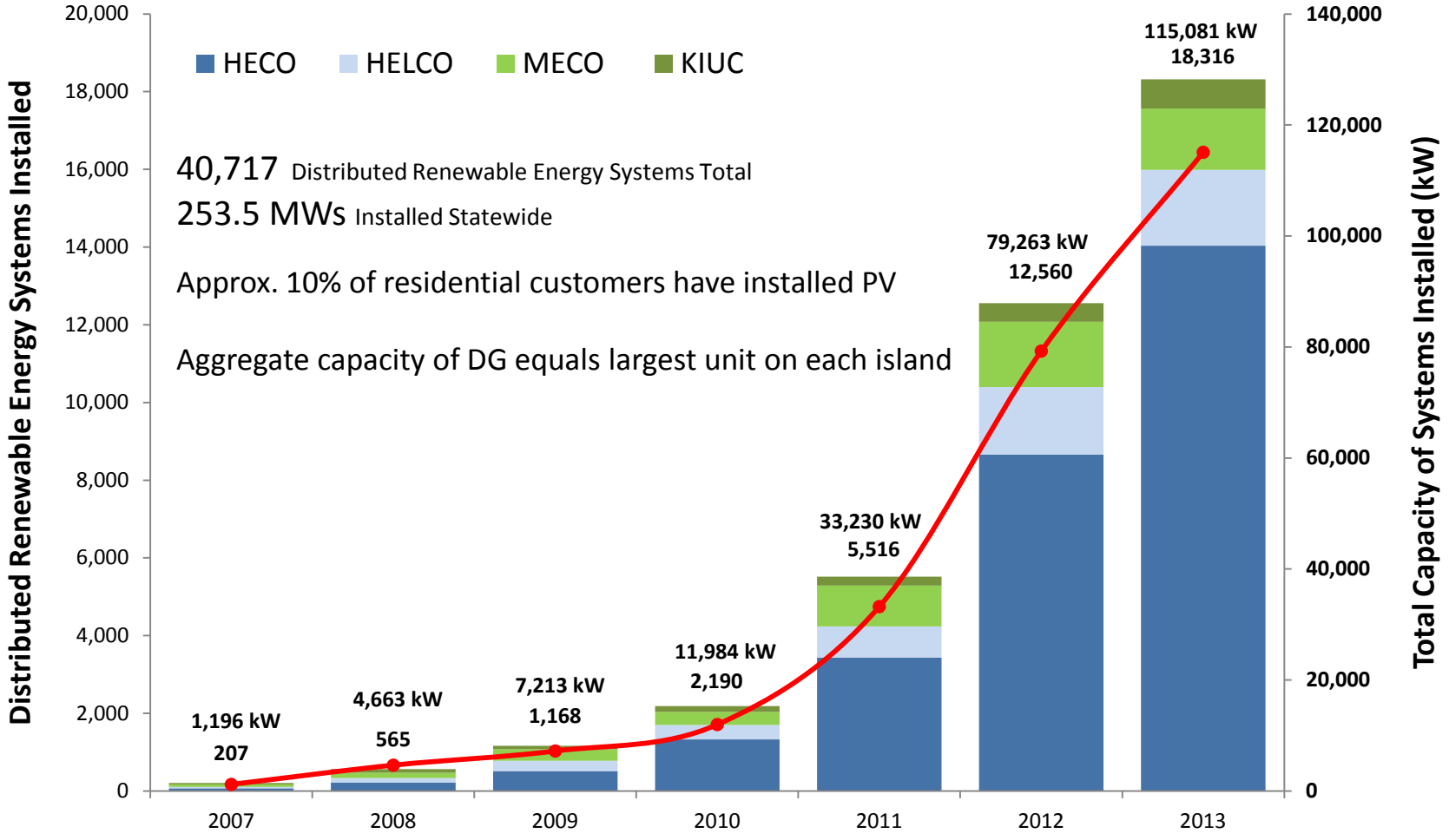
Geothermal and Biomass Projects Significant Contributions



Source: *Renewable Portfolio Standards Status Reports,* 2007-2013 (Hawaii Public Utilities Commission)

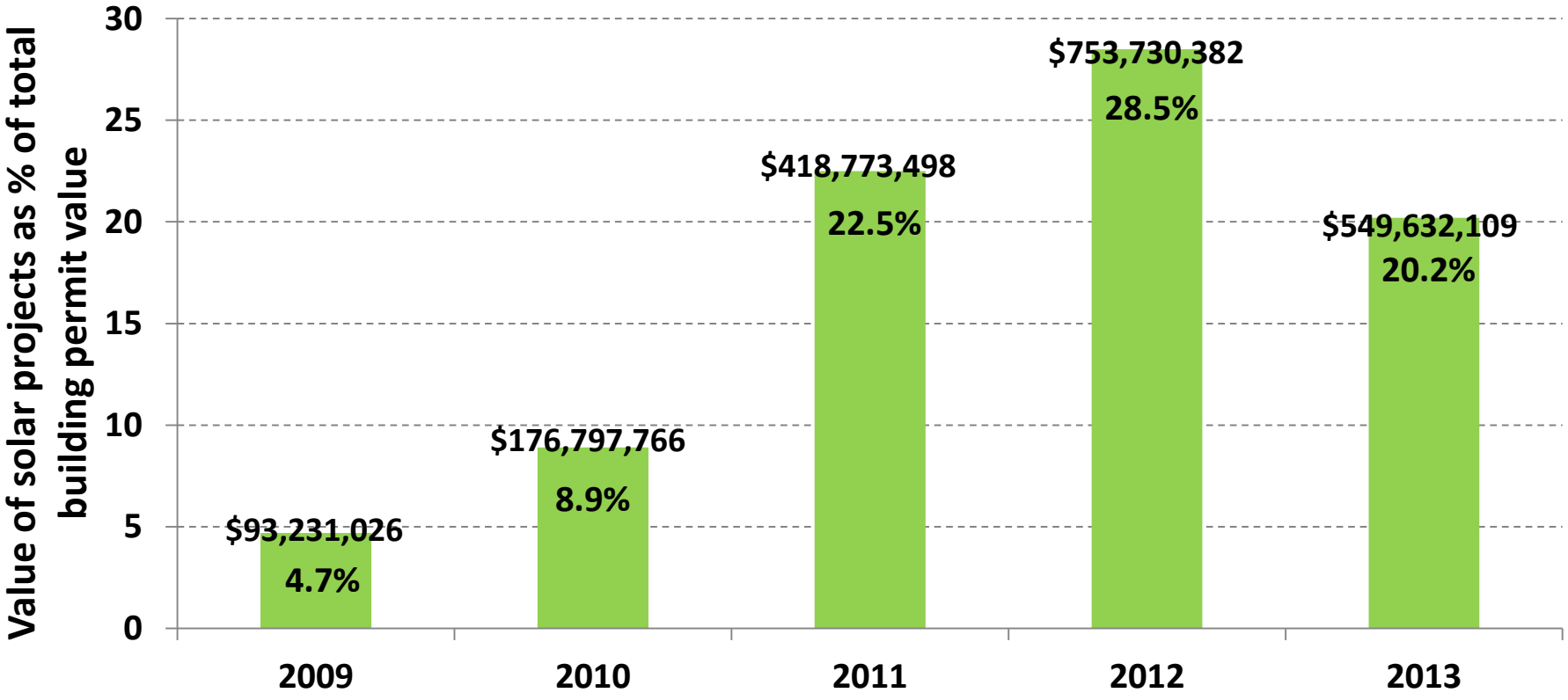
* KIUC RPS and EEPS not included for 2013. These figures to be included upon KIUC's Annual RPS Status Report to the Public Utilities Commission.

Hawaii Distributed Solar Market Has Doubled Since 2005
Until Recently…



Source: *Net Energy Metering and Feed-in Tariff Reports*, 2013 (Public Utilities Commission)

Solar Development Sustained Hawaii Construction Market Through Recession



Source: Research & Economic Analysis Division, DBEDT

Scorecard – Hawaii's National Leadership in Clean Energy

1st Solar Water Heaters per Capita

1st Energy Savings Performance Contracting per Capita

1st Solar Installed per Capita (**5th** for total solar capacity)

1st Best potential for PEV (Plug-in EV) Sales

2nd Renewable Energy Attractiveness

2nd Power Purchase Agreements per Capita

3rd Clean Energy Economy Job Growth

Presentation Overview

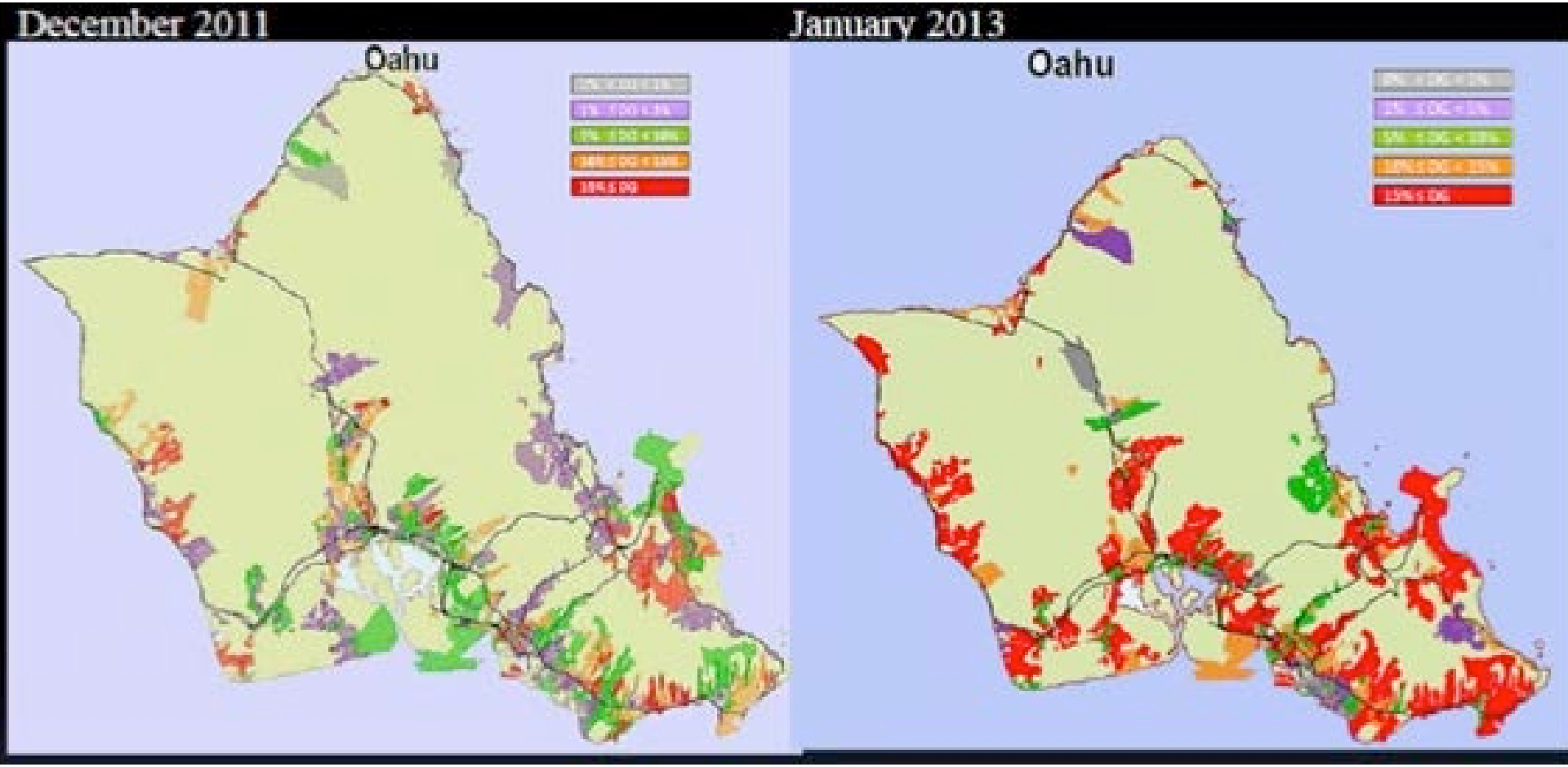
- Hawaii Overview
- Summary of Key Energy Policies and Progress to Date
- **Focus on Net Energy Metering Policy**
- Emerging Challenges and Future Opportunities

Net Energy Metering in Hawaii

Overview and Policy Development

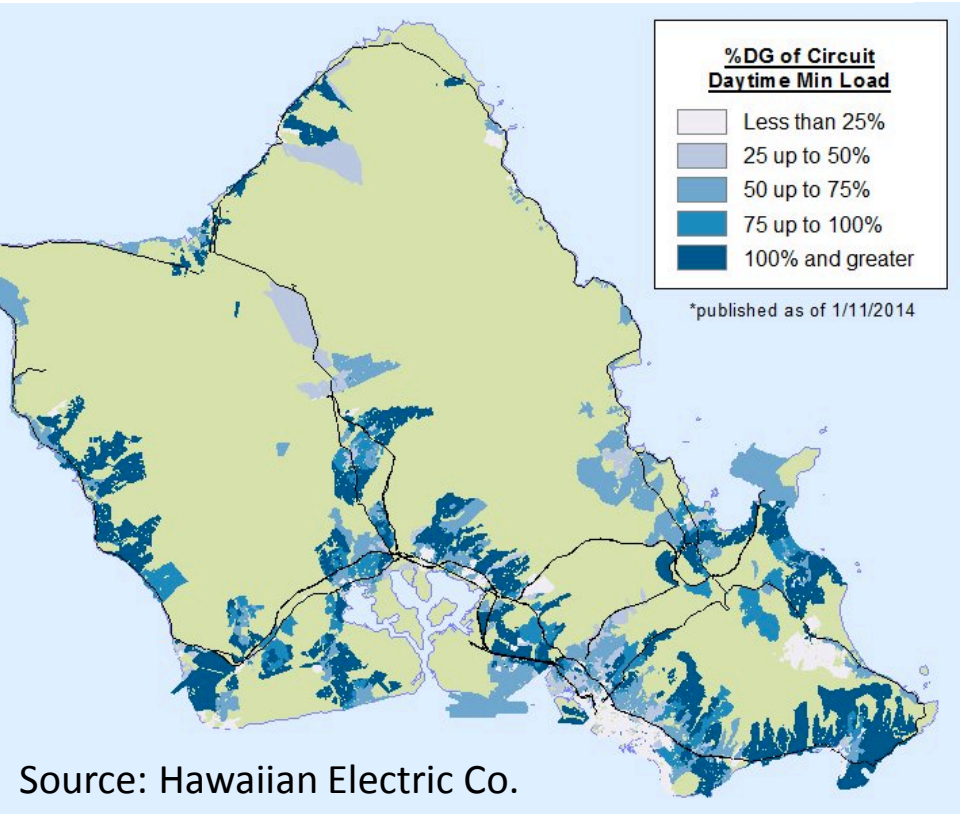
- Established by state legislature in 2001
- Intended to create incentive for early adoption of renewable energy technologies for residential and small business customers
- Initial program details:
  - Limited to 10 kW system size, aggregate capacity limited to 0.5% of peak demand
  - Generation credited at retail rate, monthly “rollover of credits” for 12 months
  - Standard contract, interconnection terms
- System and capacity limits have increased over time:
  - 2004 - system size limit increased to 50 kW
  - 2005 – Bill passed to allow PUC to set system size limits and increase program cap
  - 2008 - PUC increased system size limit to 100 kW and raised program cap to (1% of system peak)
  - 2011 - Moved to caps based on distribution circuit capacity (15% of peak load initial screen)
  - Present – moved to % of daytime minimum load (DML), circuits > 120% DML effectively on hold
- KIUC NEM program filled by 2009, new DG customers compensated based on avoided cost

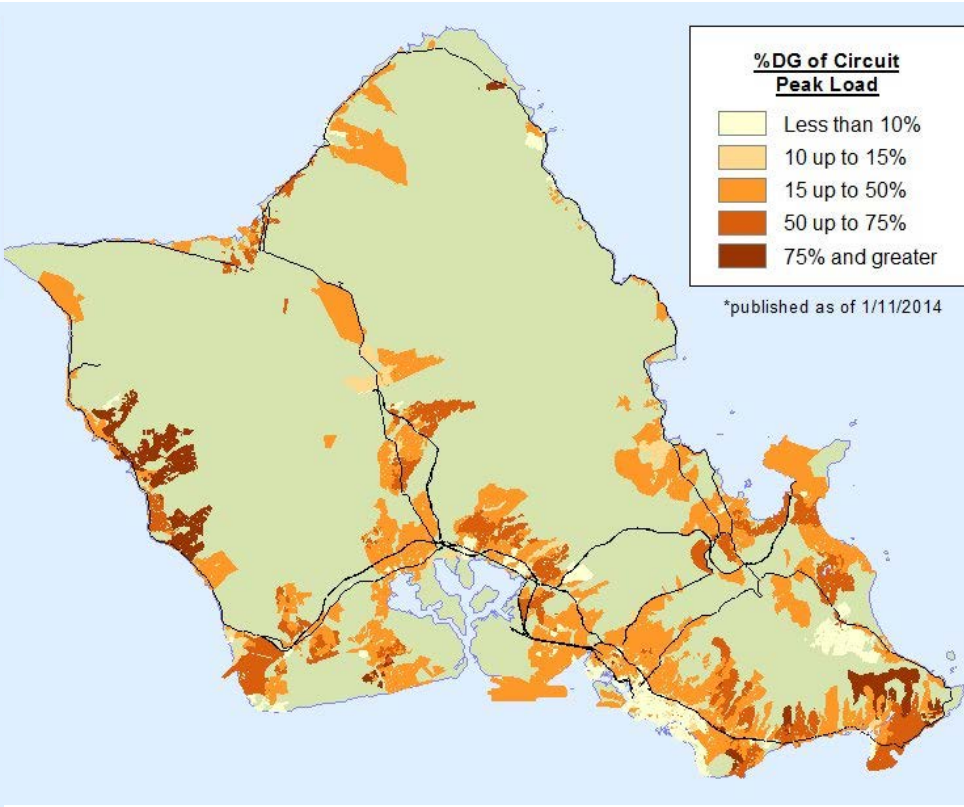
Growth of Distributed PV has Pushed Interconnection Boundaries



Source: Hawaiian Electric Co.

Current Grid Limits have Slowed Interconnection Significantly

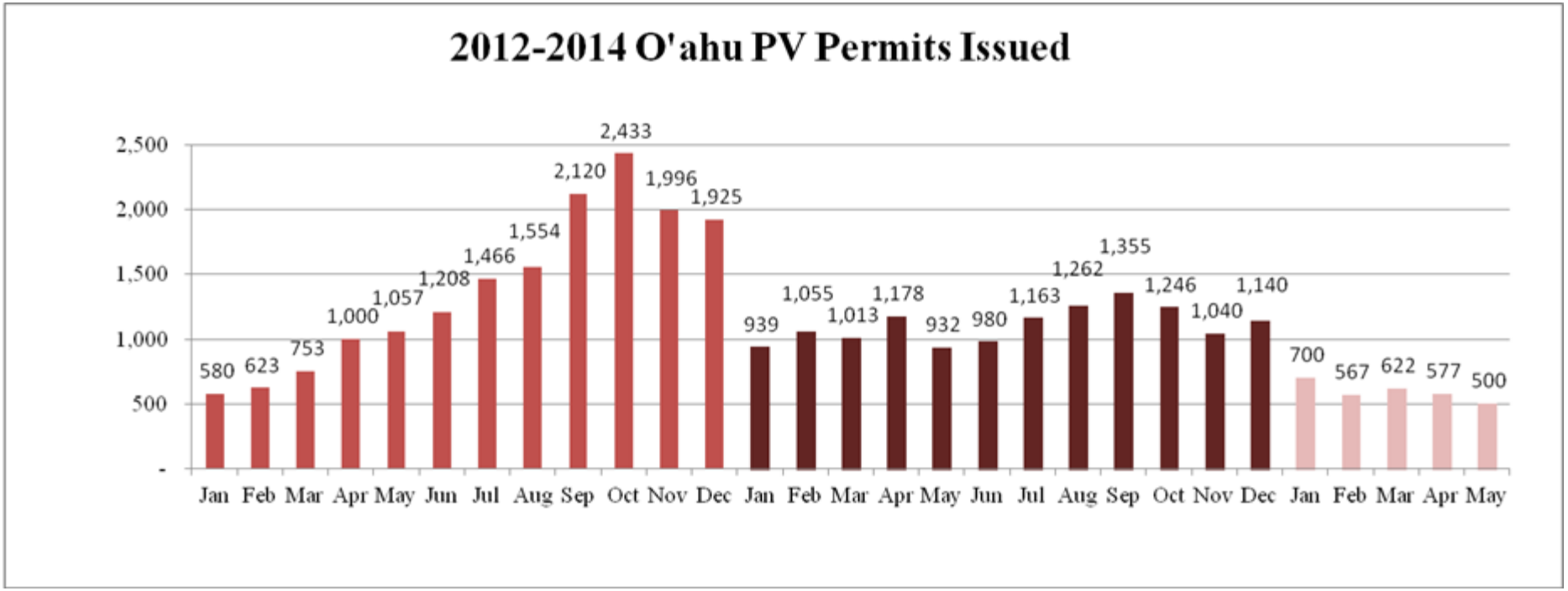




Source: Hawaiian Electric Co.

- Over last 2 years utility has increased distribution circuit cap to current level of 120% of daytime minimum load (DML)
- About 20-25% of state-wide distribution circuits have exceeded the current circuit capacity limits

Market for New PV Projects has Stalled Since Changes to Interconnection Process



- September 2013 - HECO instituted new interconnection rules for “high penetration circuits”
- Market down considerably leading to public criticism of utility practices
- April 2014 – PUC ordered HECO Companies to file Distributed Generation Interconnection Plan (DGIP) in 120 days

Future Outlook for NEM

Long-term challenges: compensation rates, system- and circuit-level integration

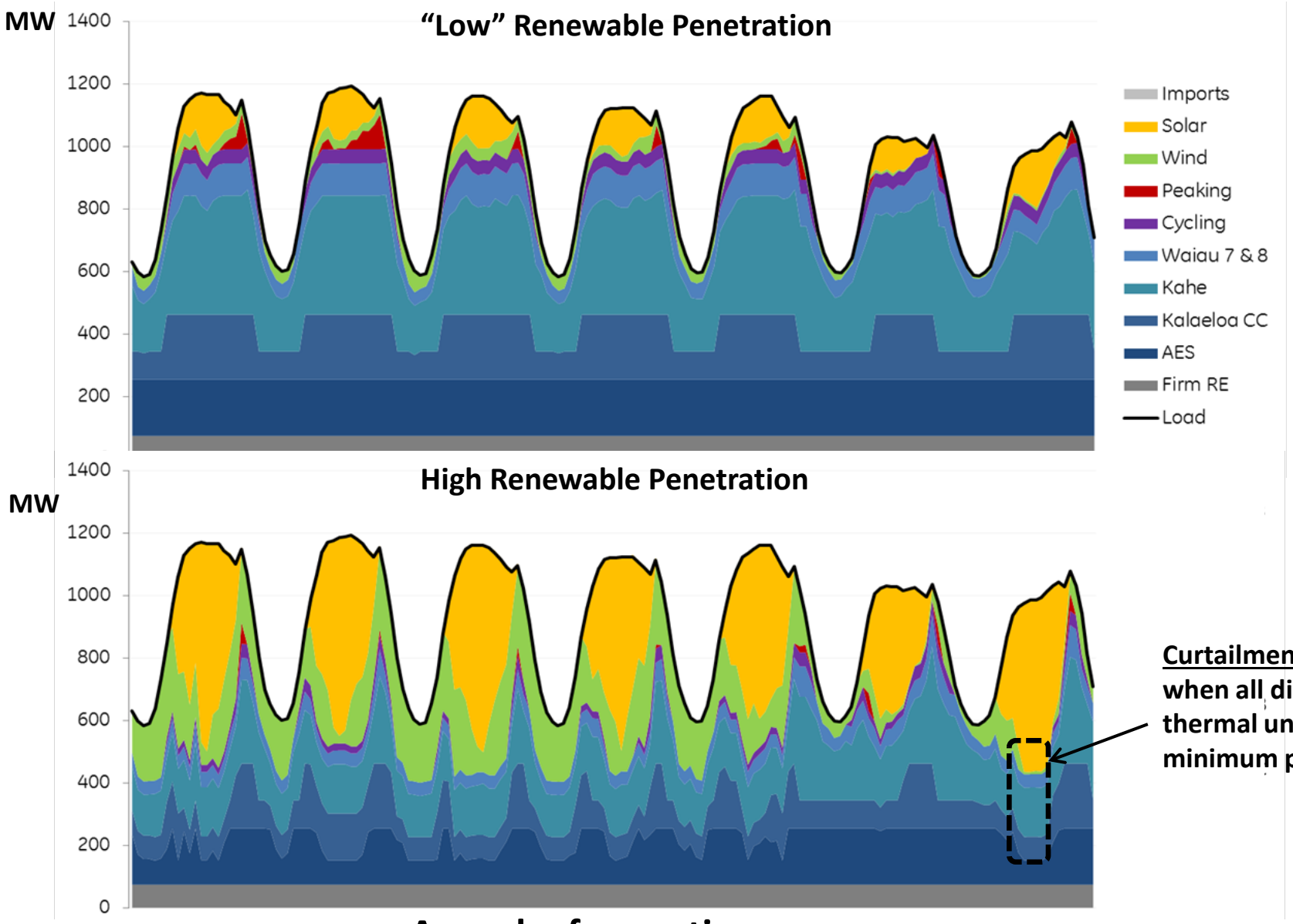
Growing Concerns with current compensation rates:

- NEM payment rates (equal to the retail rate, $0.35 - $0.50/kWh, depending on island) exceed both the cost of the technology and value of the energy to the system
- By law, PUC cannot establish a different rate structure for NEM customers, so any changes must apply equally to NEM and non-participating customers
- NEM system size limit of 100 kW precludes most larger customers from participating

Integration challenges likely limiting factor to future growth:

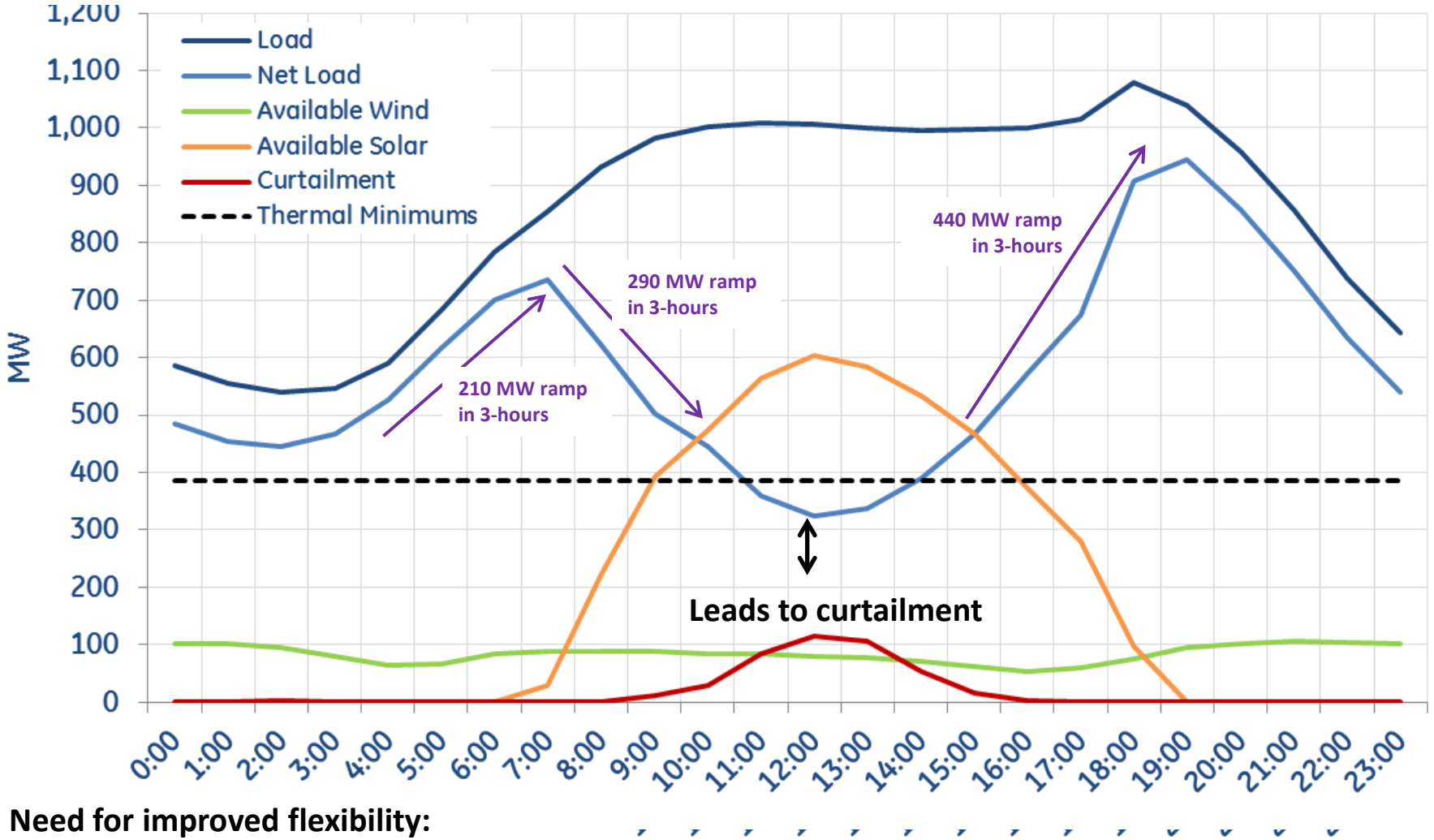
- Utility currently studying high penetration circuits to evaluate possible capacity growth based on distribution system power quality and reliability
- System-level integration challenges emerging for daily operations and contingency events

Increasing Levels of Solar Present New Challenges for Grid Operations



Average Day in March: Oahu, Scenario 8

High Renewable Penetration



Need for improved flexibility:

- ✓ **Lower turn-down capability**
- ✓ **Ability to cycle during the day**
- ✓ **Flexible load/time shifting**
- ✓ **New tools for ancillary services**

Future Outlook for NEM

Next steps for Hawaii PUC: integrate and harmonize distributed generation programs

Develop updated interconnection standards

- Incorporate advanced inverter functionality into interconnection standards
  - Avoid German experience with expensive retrofits of inverters
- Encourage use of new technology (energy storage, demand response) to expedite interconnection
- Develop transparent interconnection queue
- Consider cost allocation for system upgrades

Develop new rate structures

- Fixed costs vs. variable charges
- Bi-directional pricing (exporting energy to the grid vs. consuming energy from the grid)

Develop fair compensation rates

- Fair to NEM/FIT customers
  - Compensate NEM/FIT customers for all benefits provided to system, especially advanced grid support services (for system stability) over and above those required for interconnection
- Fair to non-participating customers
  - Ensure all customers receiving electric service pay fair share of fixed grid infrastructure costs

Key Takeaways

Despite claims to contrary, world will not end with successful NEM program and DG market

Grids fairly resilient to initial additions of variable renewables

However,…

Small, island grids sensitive to operating characteristics of DG

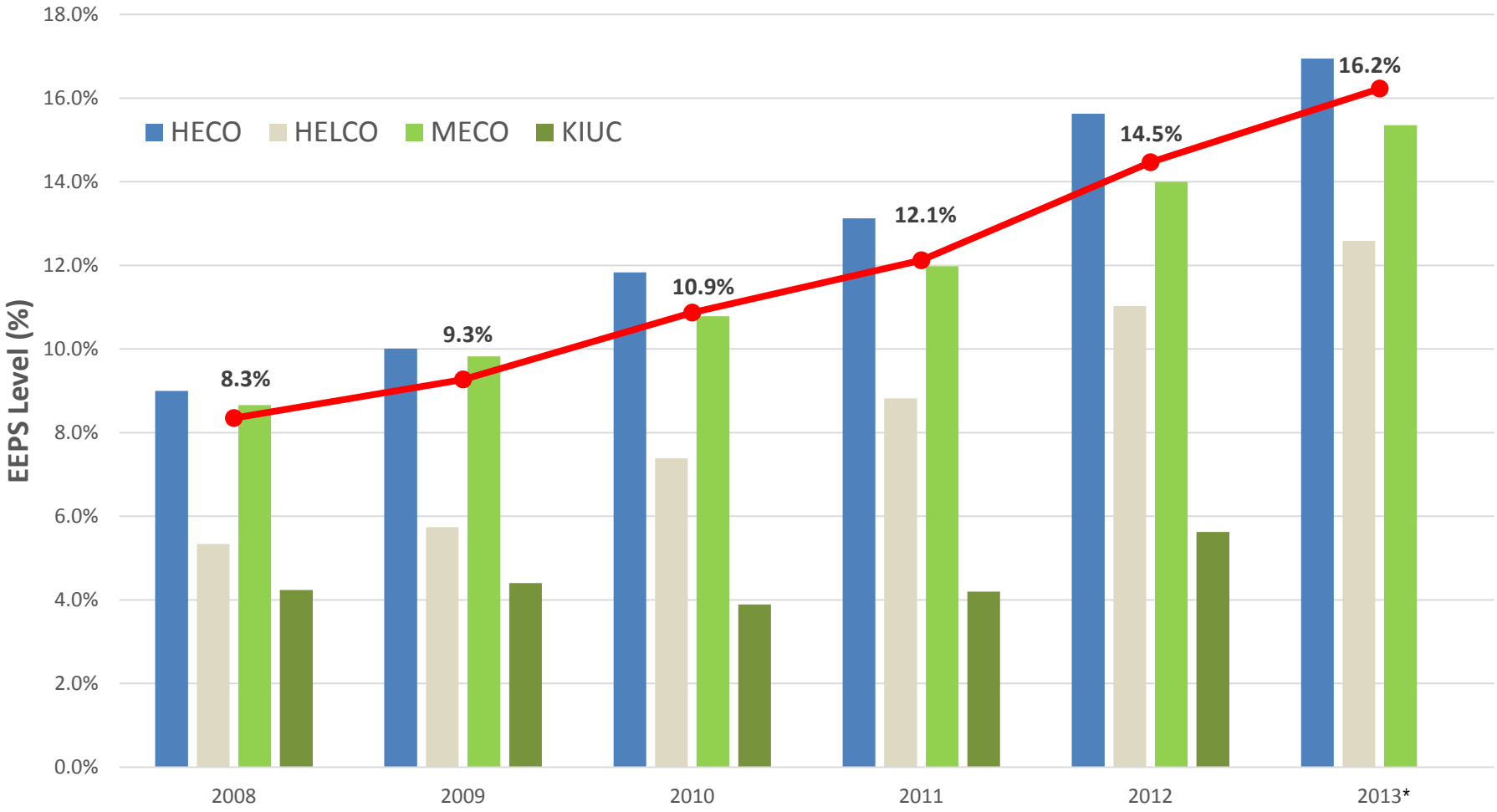
- Frequency, voltage ride through settings important
- DG characteristics need to progress towards conventional generators as levels increase

NEM program interactions with existing rate design and other programs important over time

Mahalo!

For any questions, please contact:
James.P.Griffin@Hawaii.gov
(808) 586-2020

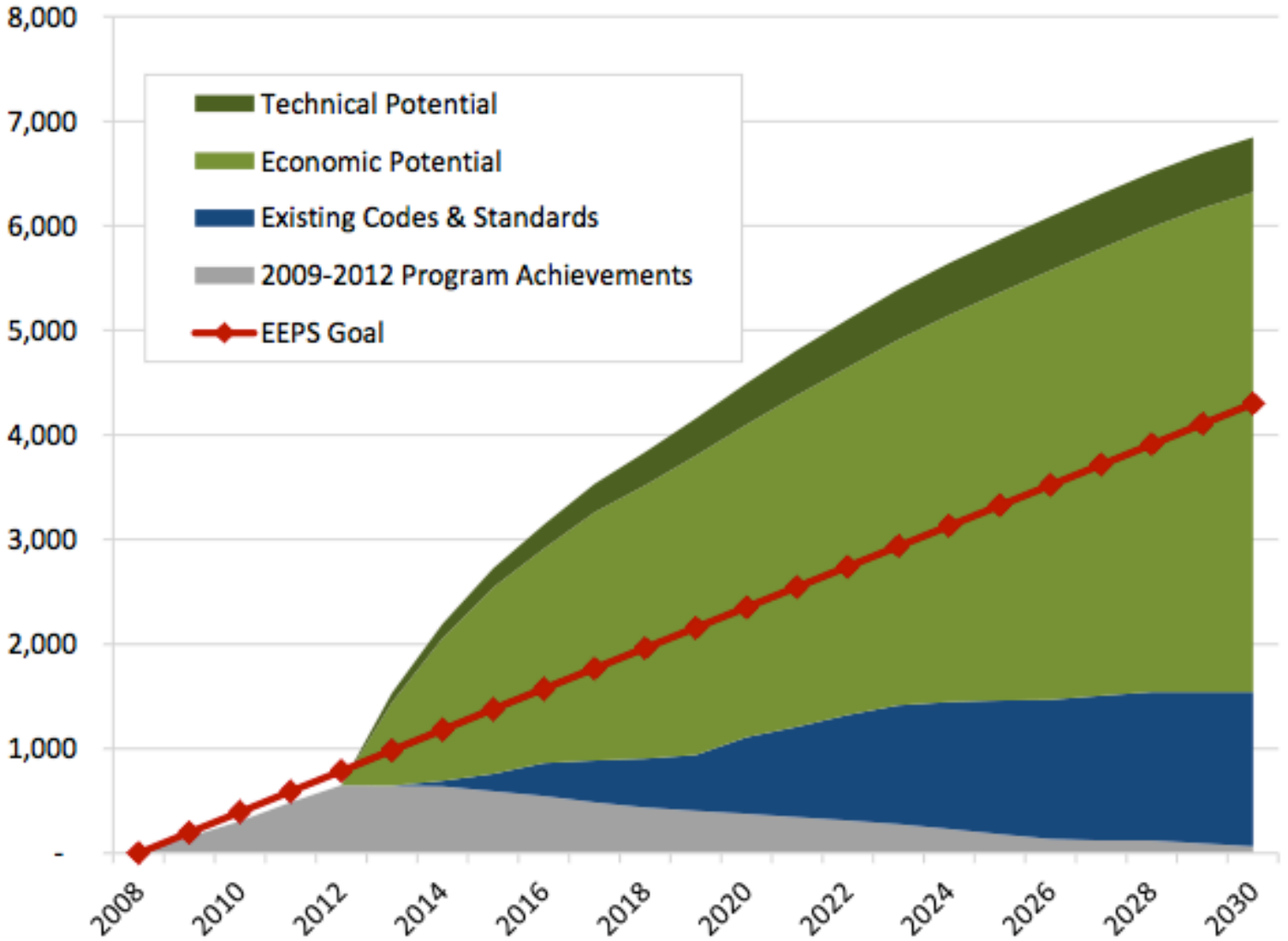
Energy Savings Have Grown for Each Utility



Source: *Renewable Portfolio Standards Status Reports,* 2008-2013 (Hawaii Public Utilities Commission)

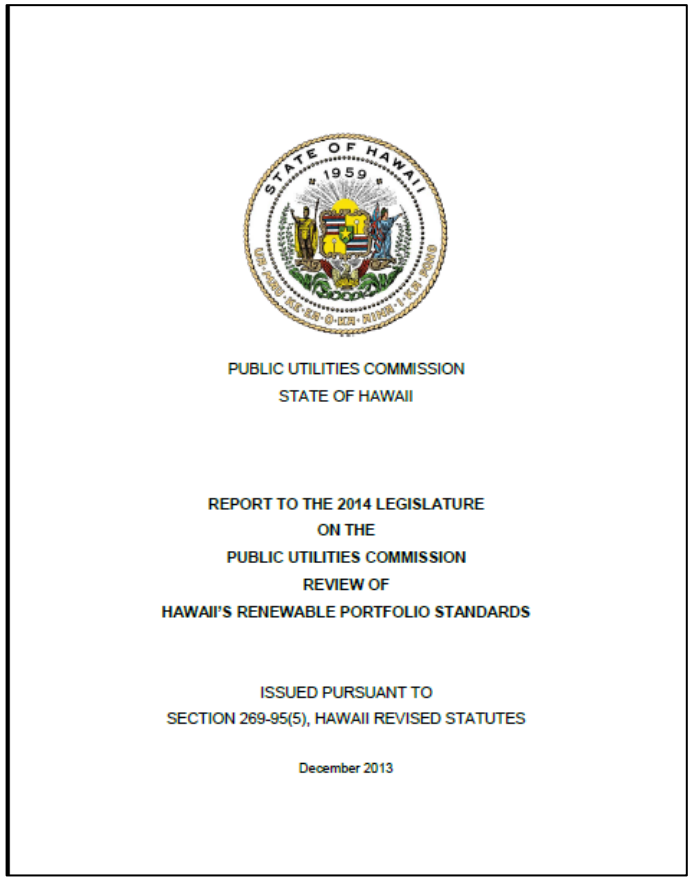
* KIUC RPS and EEPS not included for 2013. These figures to be included upon KIUC's Annual RPS Status Report to the Public Utilities Commission.

Significant Untapped Efficiency Potential Remains



Source: PUC EEPS Report, 2013

State On Track to Meet Near-Term RPS Targets



PUBLIC UTILITIES COMMISSION
STATE OF HAWAII

REPORT TO THE 2014 LEGISLATURE
ON THE
PUBLIC UTILITIES COMMISSION
REVIEW OF
HAWAII'S RENEWABLE PORTFOLIO STANDARDS

ISSUED PURSUANT TO
SECTION 269-95(5), HAWAII REVISED STATUTES

December 2013

1. **Renewable energy projects saved ratepayers over $60 million in 2012**
   - Current savings vary between roughly 1% to 16% of each utility's total system cost
2. **KIUC and HECO Companies can achieve 2015 requirement (15%)**
   - Assumes existing renewable generation and projects under construction
3. **KIUC and HECO Companies are likely to achieve 2020 requirement (25%)**
   - Assumes "reasonably expected" amounts of currently-proposed projects come online
4. **KIUC and HECO Companies may achieve 2030 requirement (40%)**
   - Achievement depends on overcoming several challenges and uncertainties

PUC RPS Report can be found:
http://puc.hawaii.gov/wp-content/uploads/2013/04/2013-PUC-RPS-Report_FINAL-w-Appnds.pdf

Key Challenges and Uncertainties

- Siting and permitting new renewable energy projects

  Limited by site availability, environmental and cultural impacts, and community acceptance

- Grid integration of variable renewables and distributed resources
  - Most cost-effective renewables require improved power system flexibility and ancillary services support
  - Large amounts of variable generation on neighborhood power circuits require special attention to ensure safety and reliability

- Diverse portfolio/Optimal resource mix

  Value trade-offs between centralized vs. distributed resources, as well as among technology types (wind, solar, geothermal, biofuels, etc.)
  - Regulatory and tax policy can have large influence on whether the most cost-effective resources are deployed, and whether benefits accrue to individual customers, the utility, third-parties, or are shared among all ratepayers

- Technological change for renewables and key enablers

  Cost declines, technological innovation can quickly change relative attractiveness of different resources

- Future Energy Demand

  Higher than forecasted energy consumption will require additional renewable development

Storage Helping Integrate Wind and Solar Power Today

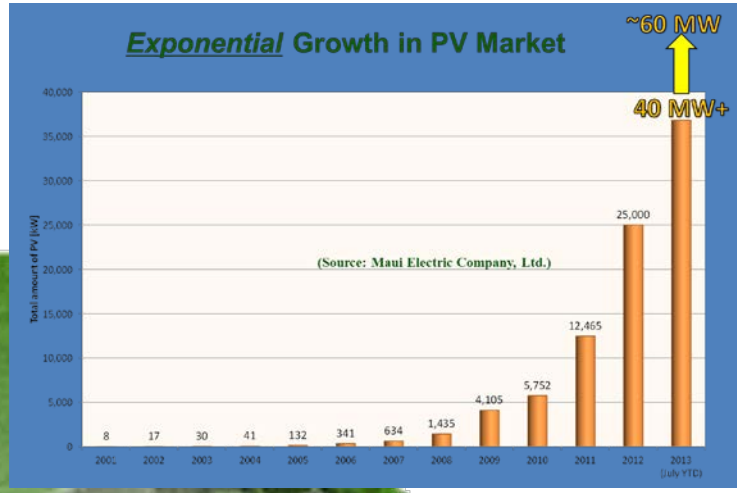
Maui Island Case

Kaheawa I
(30 MW)

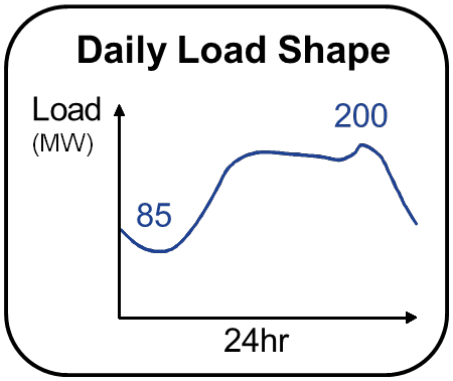
Kaheawa II
(21 MW)

Auwahi
(21 MW)

72 MW Wind
60 MW PV
132 MW Total



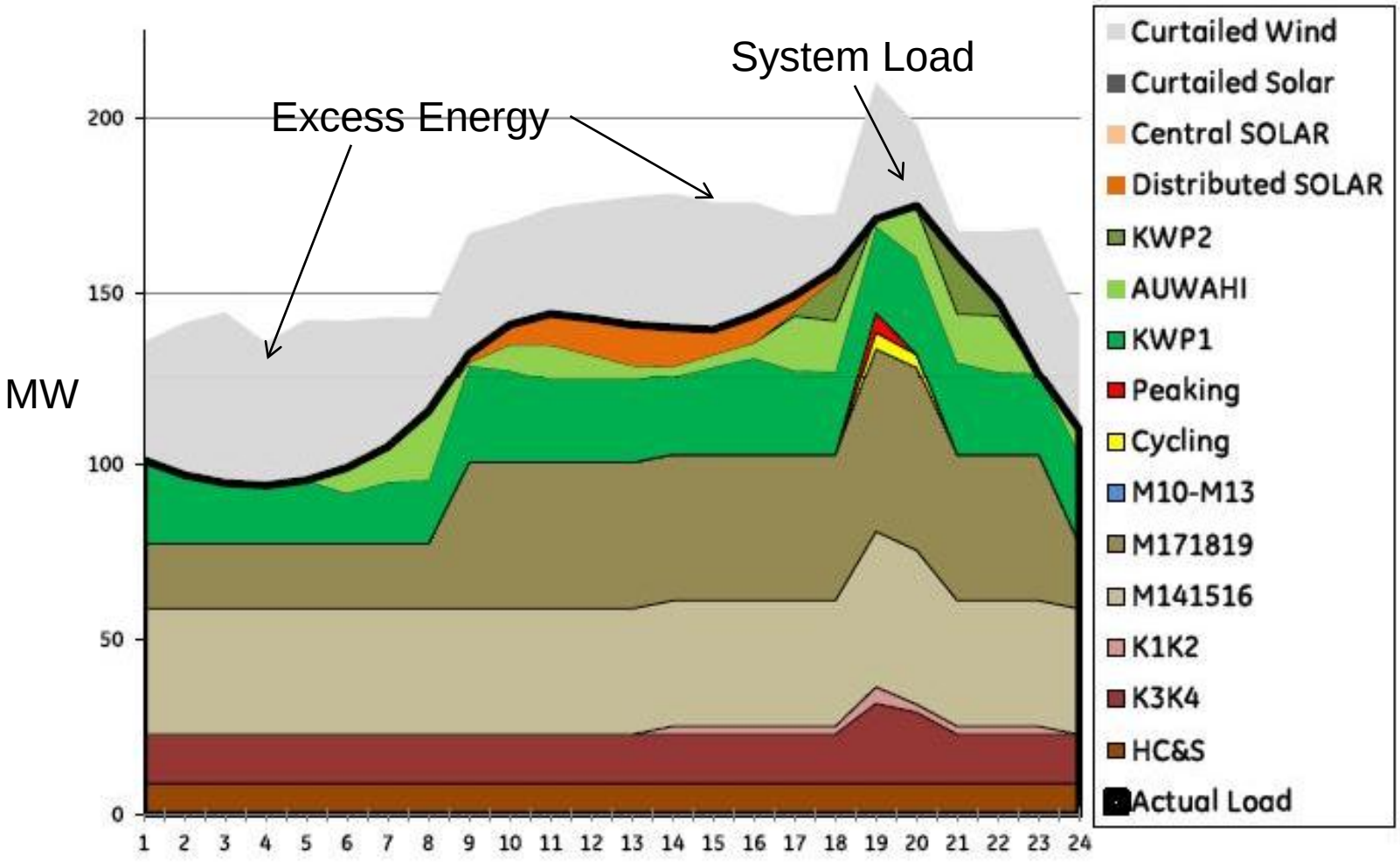
63,000 Customers



UNIVERSITY of HAWAI'I
MĀNOA

Source: Hawaii Natural Energy Institute

Storage Installed at Wind Plants to Reduce Variability and Operate as "Virtual" Generation Unit



Source: Hawaii Solar Integration Study, 2012.

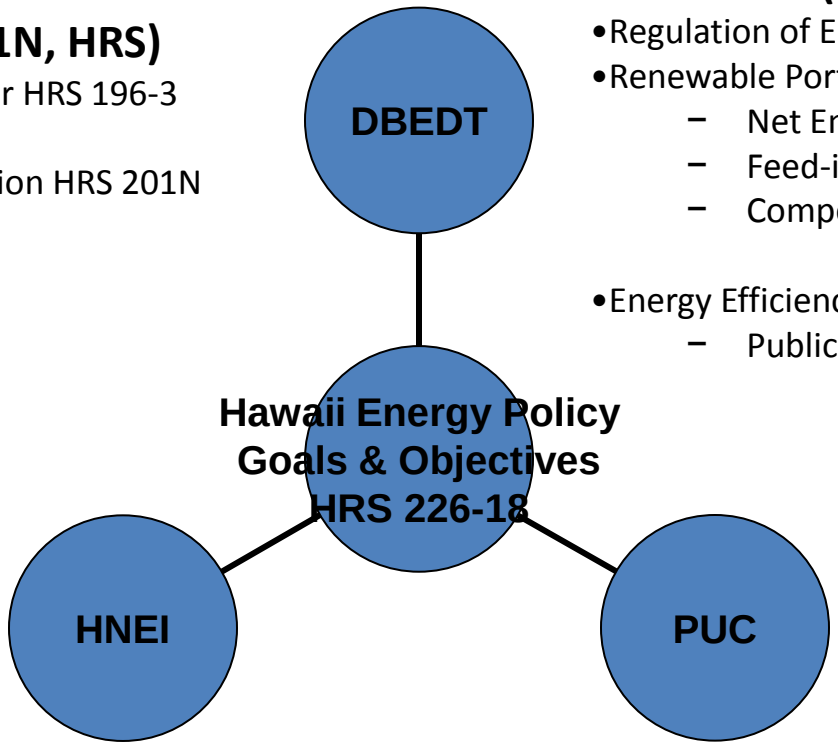
Implementing & Sustaining Hawaii's Energy Policy

DBEDT
(Chapters 196 &201N, HRS)

- Director the Energy Coordinator HRS 196-3
- Policy & Economic Analysis
- Permit Coordination & Facilitation HRS 201N

Public Utilities Commission
(Chapter 269, HRS)

- Regulation of Electric Utilities
- Renewable Portfolio Standards, HRS 269-92
  - Net Energy Metering, HRS 269-102
  - Feed-in Tariff
  - Competitive Bidding
- Energy Efficiency Portfolio Standards, HRS 269-96
  - Public Benefit Fee, HRS 269-121



Hawaii Natural Energy Institute
(Act 253, SLH 2007)

- Research & Development
- Technology Validation