The Future is Bright
Creating a Clean Energy Economy

20th Annual Conservation Conference
Hawaii Conservation Alliance
August 1, 2012

Mark B. Glick, Administrator
Hawaii State Energy Office
Overview

• State Energy Office purpose & role

• Clean energy as an economic development strategy for Hawaii
Most Isolated Population Center on Earth

- Russia: 5,312 mi
- China: 5,251 mi
- Taiwan: 5,285 mi
- Indonesia: 6,276 mi
- Papua New Guinea: 4,492 mi
- Australia: 5,205 mi
- Fiji: 3,157 mi
- New Zealand: 4,613 mi
- Alaska: 3,022 mi
- Canada: 3,550 mi
- Mexico: 3,397 mi
- U.S. Mainland: 2,471 mi
- Costa Rica: 4,822 mi
- Colombia: 5,551 mi
- Ecuador: 5,450 mi
- Chile: 6,698 mi
- Japan: 4,036 mi
- Hawaii
US vs Hawaii Electricity Prices

State electricity prices are currently approximately 22 cents higher than US average
Oahu Energy Cost
Fuel oil at $132/BBL

Energy Cost ($/kWh)

- Hawaiian Electric generation
- PPA 1
- PPA 2
- PPA 3
- PPA 4
- PPA 5
- PPA 6
- PPA 7
- PPA 8
- PPA 9
- FIT Tier 1 Wind
- FIT Tier 2 Wind
- FIT Tier 1 PV
- FIT Tier 2 PV
- FIT Tier 1 Hydro
- FIT Tier 2 Hydro
- FIT Tier 1 CSP
- FIT Tier 2 CSP
- NEM (Commercial)
- NEM (Residential)

PPA - Power Purchase Agreement
FIT - Feed-in Tariff
NEM - Net Energy Meeting
Energy Administrator Background

7-years at Office of Hawaiian Affairs
  • Office of Board Services
  • Economic Development

3 terms as Chair of Sierra Club Hawaii Chapter Executive Committee
  • Lifetime Member
Carrots & Sticks

LAWS & REGS
• RPS & EEPS Goals codified as law
• FIT, Net Metering, Decoupling, RSWG
• Transportation Goals

INCENTIVES & TTA
• Tax Credits
• Public Benefits Fee Administrator
• US Dept. of Energy – formula grants, ARRA, technical assistance
Hawaii Clean Energy Initiative
Scenario Analysis

Scenario Analysis 2008–2009
• US DOE effort with input from Hawaiian energy stakeholders and US DOE National Labs.
• Techno-economic evaluation of clean energy alternatives.
• Strategies added to HCEI Roadmap.

Scenario Analysis Updates – 2012
• Updated analysis based on latest RE technology and market information.
• Incorporate several new scenarios.
• To be updated routinely.
## Scenario Installation & Capital Requirements

Assumes $16 billion NPV CAPEX & “break-even” when oil is $65 to $85 per barrel (bbl).

<table>
<thead>
<tr>
<th>Renewable Energy Sources ($/kWh)</th>
<th>Scenario 8</th>
<th>Capital Cost Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Biomass</td>
<td>83 MW</td>
<td>$2,000 – $6,000</td>
</tr>
<tr>
<td>Wind</td>
<td>1,060 MW</td>
<td>$2,400 – $2,800</td>
</tr>
<tr>
<td>Geothermal</td>
<td>102 MW</td>
<td>$3,000 – $5,000</td>
</tr>
<tr>
<td>Small Hydro</td>
<td>24 MW</td>
<td>$2,500 – $4,000</td>
</tr>
<tr>
<td>Solar – Residential Roofs</td>
<td>179 MW</td>
<td>$8,125 – $9,375</td>
</tr>
<tr>
<td>Solar PV (large roof/utility scale)</td>
<td>651 MW</td>
<td>$6,500 – $7,500</td>
</tr>
<tr>
<td>MSW/Landfill Gas</td>
<td>77 MW</td>
<td>$2,100 – $3,500</td>
</tr>
<tr>
<td>Ocean Energy (wave)</td>
<td>53 MW</td>
<td>$2,000 – $7,600</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>495 MW</td>
<td>$70 – $100</td>
</tr>
</tbody>
</table>
A Focused Strategic Plan

Mission:

*Deploy clean energy infrastructure as a catalyst for economic growth, innovation, and test bed investments.*
Strategies & Tactics: FOCUS

On high-impact clean energy solutions that maximize economic development, especially in innovation sector ...

• Identify clean energy RD&D opportunities and promote business development for local companies.
• Concentrate on implementing high-impact clean energy solutions for near term and midterm.
• Improve core competencies in economic development, quantitative analysis, and communication.
Benefits

- Allows for increased renewable energy penetration
- Demand response/load shedding reduces the need for spinning reserves
  - Reduces the amount of oil imported
- Allows for quicker voltage balancing → Increases grid reliability

Strong Market Potential

- $3.4 billion in recent DOE grants for smart grid projects & grid upgrades

<table>
<thead>
<tr>
<th></th>
<th>Oahu</th>
<th>Hawaii</th>
<th>Maui</th>
<th>Lanai</th>
<th>Molokai</th>
<th>Kauai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Capacity (MW)</td>
<td>1672</td>
<td>270</td>
<td>261</td>
<td>9.3</td>
<td>11.8</td>
<td>128</td>
</tr>
<tr>
<td>Statewide Capacity (%)</td>
<td>71.1%</td>
<td>11.5%</td>
<td>11.1%</td>
<td>0.4%</td>
<td>0.5%</td>
<td>5.4%</td>
</tr>
<tr>
<td>Net peak demand (MW)</td>
<td>1216</td>
<td>203</td>
<td>204</td>
<td>5.4</td>
<td>6.3</td>
<td>78</td>
</tr>
<tr>
<td>Total Reserves (MW)</td>
<td>456</td>
<td>67</td>
<td>57</td>
<td>3.9</td>
<td>5.5</td>
<td>50</td>
</tr>
</tbody>
</table>
Solar industry growing at rapid rate as a result of incentives and component price drops.

Solar generation increased from less than 1% of total renewable generation in 2007 to more than 8% in 2011. Solar generation is approximately 1% of total electricity generation.

Cost per watt for PV installation has dropped by half in the past decade.

<table>
<thead>
<tr>
<th>Estimated Cost $/Watt Installed</th>
<th>2002</th>
<th>2012</th>
<th>%Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential PV</td>
<td>$10.60</td>
<td>$5.50</td>
<td>-48%</td>
</tr>
<tr>
<td>Commercial PV</td>
<td>$8.82</td>
<td>$3.75</td>
<td>-57%</td>
</tr>
</tbody>
</table>

Source: 2007–2011 Annual RPS Reports, PUC
Wind: Advancing

❖ Existing and Under Development Projects
  • Wind currently makes up 31% of total renewable generating capacity.
  • 2012 will see the addition of 3 new wind farms, totaling over 100 Mw of new capacity doubling Hawaii's installed capacity.

❖ Challenges of Wind In Hawaii
  • Small non-interconnected electrical grids make adding additional intermittent generating capacity harder and more expensive then traditional generators.
  • Limited land, cultural and social issues are challenging.
  • Hawaii's endangered birds and plants complicate sitting a wind farm.

❖ Solutions
  • Undersea cable linking electricity grids will make adding more intermittent wind easier as well as bring the outer island resources to the load center on Oahau.
  • Increased battery storage and greater EV use can stabilize local grids.
  • Habitat conservations banks will reduce the cost of mitigating for incidental endangered species takes.
Biofuels: Obstacles Remain

- **Shares of total fuel use:** transportation (ground + marine=33%, aviation=32%), electricity (35%)
- **Higher prices in Hawaii:**
  - Fuels (+30%), co-products (+200%), electricity (+300%), gas (+500%)
- **High productivity:** Average 22 dry tons/acre/year; 45 tons possible
- **Year-round growing season:** 3+ crops per year
- **Major land owners invested:** HC&S = 35k acres; HBE = 141k; Fed; State...
- **U.S. intellectual property protection**
- **Agricultural expertise**
  - Highly skilled crop scientists, geneticists (UH–CTAHR, HARC …)
  - BASF, Dow AgroSciences, Monsanto, Pioneer Hi-Bred, Syngenta
- **Long-term purchasing contracts**
  - HECO RFP for up to 215 mgy / 20 year
  - DoD RFI for up to 32 mgy
- **Consensus:** Need for secure, accessible fuels and co-products
Geothermal: Enormous Potential

- **Cheaper** than oil and most other renewable resources
  - LCOE estimated $0.08–$0.12 / kWh
- **Utility Scale** potential only on Big Island and Maui with potential to provide 74%–210% of the state’s 2030 RPS target if islands were interconnected
- **Fully commercial & mature industry**: Ormat is industry leader
  - Operates only geothermal power plant in Hawaii (since 1993)
    - 30 MW Puna Geothermal Venture; permitted for 60 MW total
    - 8 MW addition → dispatchable
- **Local developers**: Innovations Development Group; Moku Power
- **High upfront costs**
  - Exploration costs as much as 42% of development expenses
  - Production wells cost up to $10 million each; initial success rate only 25%
  - Estimated 5 year minimum lead time to production
- **Demand Constraints**
  - Limited need for base load power
  - Resource is greater than island grids can accept
Strategies & Tactics: LEVERAGE

Resources through federal, county and private sector partnerships using HCEI as a key driver ...

• Serve as business systems integrator, resolve project implementation and permitting barriers.
• Advocate for programs, policies and incentives to make clean energy development cost-effective.
• Connect partnerships and resources to develop business opportunities, resolve policy barriers, and technical hurdles.
• Seek federal funding and private investment opportunities.
Interconnection/Reliability Standards

  - Created KIUC Tariff 2 Distributed Generation Interconnection Policies and Procedures

  - Created HECO FIT, Reliability Standards Working Group (RSWG), Tech Supp Group, Tech Review Comm
    - PUC to re-examine FIT Program Fall 2012

- **Hawaiian Electric Rule 14H – Doc. No. 2010–0015 (open)**
  - Requires IRS review/approval by HECO companies for distribution grids w/ high renewable penetration
    - IRS process streamlined by PUC in 2011

  - Following FIT, directs HECO to develop standards to reliably integrate high renewable penetration
    - RSWG (Independent Facilitator) to recommend by end of 2012 streamlined interconnection screening processes for HECO
    - Incorporate different KIUC and HECO screening processes

- **SB2787 (2012)**
  - PUC to (1) develop, adopt, enforce reliability standards and interconnection requirements, (2) contract 3P Hawaii Energy Reliability Administrator, and (3) create electricity reliability surcharge
    - HERA to implement RSWG/IRS docket findings, new interconnection Hawaii Admin Rules likely req’d

  - HECO to incorporate scenario planning to capture variations in planning assumptions/forecasts
    - RSWG to ID overlaps between IRS and IRP dockets
    - RSWG to develop recommended list of reliability issues and/or related studies
    - Created Advisory Group to represent interests affected by HECO resource plans
Permitting: Breaking Down Barriers

- **Legislative Actions (recent)**
  - Act 97 (2012) – Removes Geothermal Subzone designation, impacts county geothermal resource permit
  - Act 217 (2011) – Allows solar on limited B and C agricultural lands (10% or parcel/20 acres)
  - HRS 201N (Renewable Energy Facility Siting Process)
    - HSEO developing REFSP to assist projects responding to HECO 200MW RFP

- **Regulatory/Policy Actions**
  - Ongoing HSEO consultation and coordination w/ agencies, developers, stakeholders
  - Priority permit processing for renewable energy projects by all state agencies
  - Priority to place renewable energy projects on State-owned lands, can directly negotiate leases w/out RFP
  - City & County of Honolulu: 2012/INT-1 (guidance for utility-scale solar installations)
  - Maui County: Procedure No. DSA 18.0 (guidance on ground and roof mounted solar/wind)
  - Hawaii County: 2012 Ordinance (guidance for alternative energy project permitting)
  - Counties developing policies to appropriately assess renewable energy project property taxes

- **Electronic Processing**
  - HSEA Online Permitting Wizard (ARRA) – Beta form available, expected completion Summer 2012
    - Creates electronic Permit Plan for individual projects, compliments DRAFT Permitting Guidebook
  - DOH ePermitting Portal (ARRA/ESSF) – Beta form available, expected completion Summer 2012
    - DOH/Windsor refining tool after initial public testing period, uploading all DOH permit applications
  - DPP Online Building Permits
    - Obtain solar and electric vehicle Building Permits from City and County of Honolulu
    - BEI Consulting to develop GIS to ID energy resource layers and relevant development information
  - Electric Vehicle Website/Application – under procurement
    - HSEO developing website/mobile application to identify EV charging stations and relevant information
Objectives and maintain strong communication and outreach to key stakeholders and public ...

- Analyze data and results to identify best practices and ensure goals are met.
- Provide access to clean energy data, tools and information online.
- Communicate achievements and provide outreach through mass media, select events and public briefings.
2012 Asia Pacific Clean Energy Summit and Expo

High-level global networking:

- Present your technology, initiative or company
- Find project support from DOD, Hawaii, Korea, Japan, China & Global Partners
- Participate in Defense Energy Challenge

Building a clean energy economy
AUGUST 13-15, 2012
HONOLULU, HAWAI‘I
HAWAI‘I CONVENTION CENTER
www.asiapacificcleanenergy.com
# Energy Office International Agreements

International agreements advance Hawaii’s clean energy infrastructure deployment and solidify Hawaii as the clean energy test-bed of the Asia Pacific.

<table>
<thead>
<tr>
<th>Projects</th>
<th>Japan–US Island Grid Project</th>
<th>Korea Smart Grid Project</th>
<th>Clean Energy Investment and Deployment Program</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Smart grid community demo involving Kihei residential and commercial utility customers</td>
<td>Micro smart grid demo and EV sharing program involving Oahu hotels and resorts</td>
<td>Program facilitating Chinese investment and deployment of clean energy projects in Hawaii</td>
</tr>
<tr>
<td><strong>Objective</strong></td>
<td>Test Bed of the Asia-Pacific</td>
<td>Test Bed of the Asia-Pacific</td>
<td>Clean Energy Deployment</td>
</tr>
<tr>
<td><strong>Partner</strong></td>
<td>NEDO</td>
<td>KSGI</td>
<td>CCPIT</td>
</tr>
<tr>
<td><strong>Participating Organizations</strong></td>
<td>Japan Hitachi, Mizuho, CyberDefense Hawaii US DOE &amp; national labs, HECO, MECO, HNEI, MEDB, Maui County</td>
<td>Korea LG Electronics, Nara Controls, Hyundai, Hyosung, KT Hawaii US DOE &amp; national labs, HECO, HNEI, Royal Hawaiian Hotel, Moana Surfrider Hotel</td>
<td>TBD CCPIT will vet and forward companies interested in investing or deploying clean energy projects in Hawaii, DBEDT to facilitate companies</td>
</tr>
</tbody>
</table>
Midterm Goals & Objectives (2015)
Implement HCEI 70% Clean Energy Benchmarks

- Meet 15% Renewable Portfolio Standard (RPS) target.
- Displace 50 Million Gallons/Year of oil in the transportation sector.
Grow Hawaii’s Clean Energy Innovation Sector

• Develop clean energy RD&D sector with annual revenues of $100 M.
• Attract $100 M in project financing for emerging technologies between 2011 and 2015.
• Add 400 clean energy RD&D jobs between 2011 and 2015.
Expand on Hawaii’s Position as a National Clean Energy Leader

- Maintain top 5 national ranking in renewable energy penetration, performance contracting, and green job growth.
- Receive A rating for net metering and interconnection in national ranking.
- Complete interisland undersea cable project-specific EIS in preparation for permitting and construction.
Short Term Objectives (1 Year)

• Facilitate selection of cable developer.
• Contribute to comprehensive policy on net metering, interconnection and reliability standards.
• Increase federal funding opportunities.
• Serve as online clearinghouse for clean energy information and self-help permitting tools.
• Increase international clean energy trade, investment & RD&D possibilities.
Hawaii Renewable Energy Potential (GWh)

Oahu has the most energy demand, but most renewable energy sources are on the neighbor islands.
# Renewable Resource Abundance by Island (GWh)

<table>
<thead>
<tr>
<th>Resource</th>
<th>Oahu</th>
<th>Kauai</th>
<th>Maui</th>
<th>Hawaii</th>
<th>Lanai</th>
<th>Molokai</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass</td>
<td>70</td>
<td>180</td>
<td>180</td>
<td>350</td>
<td>-</td>
<td>-</td>
<td>780</td>
</tr>
<tr>
<td>Wind</td>
<td>460</td>
<td>-</td>
<td>700</td>
<td>300</td>
<td>700</td>
<td>700</td>
<td>2,860</td>
</tr>
<tr>
<td>Geothermal</td>
<td>-</td>
<td>-</td>
<td>1,170</td>
<td>6,270</td>
<td>-</td>
<td>-</td>
<td>7,440</td>
</tr>
<tr>
<td>Hydro</td>
<td>-</td>
<td>80</td>
<td>10</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td>170</td>
</tr>
<tr>
<td>Solar</td>
<td>1,050</td>
<td>150</td>
<td>340</td>
<td>390</td>
<td>4</td>
<td>4</td>
<td>1,938</td>
</tr>
<tr>
<td>MSW</td>
<td>670</td>
<td>70</td>
<td>70</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td>890</td>
</tr>
<tr>
<td>Ocean</td>
<td>30</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>60</td>
</tr>
<tr>
<td><strong>RENEWABLE POTENTIAL</strong></td>
<td><strong>2,280</strong></td>
<td><strong>480</strong></td>
<td><strong>2,500</strong></td>
<td><strong>7,470</strong></td>
<td><strong>704</strong></td>
<td><strong>704</strong></td>
<td><strong>14,138</strong></td>
</tr>
<tr>
<td><strong>DEMAND</strong></td>
<td>7,280</td>
<td>430</td>
<td>1,140</td>
<td>1,110</td>
<td>20</td>
<td>30</td>
<td>10,010</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>31%</td>
<td>109%</td>
<td>220%</td>
<td>673%</td>
<td>2,822%</td>
<td>2,240%</td>
<td>141%</td>
</tr>
</tbody>
</table>
Integrating Hawaii’s Renewable Potential

Interconnection for Grid Reliability & Greater Penetration of RE

- Kaua’i Channel between Kaua’i & O’ahu
  - 72 miles across
  - 10,890 feet deep

- Kaiwi Channel between O’ahu & Moloka’i
  - 26 miles across
  - 2,200 feet deep

- Kalohi Channel between Moloka’i & Lāna’i
  - 9 miles across
  - 540 feet deep

- ‘Au‘au Channel between Lāna’i & Maui
  - 9 miles across
  - 250 feet deep

- Palilo Channel between Moloka’i & Maui
  - 9 miles across
  - 850 feet deep

- ‘Alenuihāhā Channel between Maui & Hawai‘i
  - 29 miles across
  - 6,810 feet deep

- Kahu‘olawe Channel between O’ahu & Hawai‘i
  - 26 miles across
  - 2,200 feet deep

- Kaua’i Channel between O’ahu & Hawai‘i
  - 9 miles across
  - 10,890 feet deep
Interisland Undersea Power Cable

☑ Legislation (SB 2785)
Reduce financing costs for inter-island undersea power cables by having a clear regulatory structure in place

☐ Programmatic EIS
NEW effort, to be led by USDOE (not yet announced)
Broad scope: all energy resources, state-wide

☐ HECO RFP
200 MW Intermittent, includes cable (PUC order from 2011)
Firm power RFP (300 MW) and geothermal RFPs are related
PUC may re-consider 2011 order
More than 70 High voltage direct current (HVDC) cables in service worldwide

**BritNed (Britain – Netherlands)**
162 miles undersea: 1000 MW installed in 2011.

**Gotland (Sweden) (1st commercial HVDC submarine cable)**
60 mi: 20 MW in 1954; 260 MW in 1987..

**Inter–Island (New Zealand)**
26 miles undersea: 700 MW installed in 1965.

**Neptune (US, New York–New Jersey)**

**NorNed (Netherlands – Norway) (longest HVDC submarine cable)**

**SAPEI (Italy) (deepest HVDC submarine cable, at 5380 feet)**
261 miles: 1000 MW installed in 2011.

**Trans Bay Cable (US, California)**
53 miles undersea: 660 MW installed in 2010.
How are we doing?
Renewable Energy Vision

On track to meet 2015 targets – Viable Scenarios for the future.

Renewable Energy Strategies to comply with RPS goals
Existing Renewable Energy

Hawaiian Electric Company, Inc.

Goals:
- Goal of 10%
- Goal of 15%
- Goal of 25%
- Goal of 40%

Energy Efficiency

Geothermal
Wind
Biomass
Hydro
Solar

RE added 2011-2015
Existing RE
Range of Biofuels
Existing RE
RE added 2016-2020
Range of Biofuels
Existing RE
Incremental RE added 2016 thru 2030
Biofuels
Geothermal

2010
2015
2020
2030
Currently Proposed Renewable Energy Projects in Hawaii

**75**

Proposed Projects

<table>
<thead>
<tr>
<th>Island</th>
<th>Bioenergy</th>
<th>Combination</th>
<th>Geothermal</th>
<th>Hydro</th>
<th>OTEC</th>
<th>Solar</th>
<th>Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii</td>
<td>10</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Kauai</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Lanai</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maui Island</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Molokai</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Oahu</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TBD</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Source: Department of Business, Economic Development and Tourism, December 2011
Power Purchase Agreements at Four Airports Decrease Electricity Costs Nearly 20%

- **Lihue Airport, Kauai**
  - 1 system, 338 kW

- **Kahului Airport, Maui**
  - 2 systems, 369 kW

- **Kona Airport, Hawaii**
  - 1 system, 61 kW

- **Hilo Airport, Hawaii**
  - 1 system, 111 kW
Decreased Electricity Consumption in Lead-By-Example State Buildings (2007-2010)

- Kalanimoku
- State Capitol
- Princess Ruth Ke'elikolani
- Queen Lili'uokalani
- No. 1 Capitol District (Hemmeter)
- Leioopapa-A-Kamehameha (State Office Tower)
- Kinau Hale
- Kekaunaoa (Territorial Office)
- Keoni Ana (Capitol Center)
- Kekauluohi (State Archives)

Source: State Energy Office
First in Nation
Energy Savings Performance Contracting Per Capita

<table>
<thead>
<tr>
<th>State</th>
<th>Dollars per Capita ($)</th>
<th>Total Performance Contracting ($)</th>
<th>Jobs Created (Job Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii</td>
<td>$117.09</td>
<td>$159,278,011</td>
<td>1,731</td>
</tr>
<tr>
<td>Kansas</td>
<td>$90.81</td>
<td>$259,094,503</td>
<td>2,816</td>
</tr>
<tr>
<td>Idaho</td>
<td>$90.27</td>
<td>$129,000,000</td>
<td>1,402</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>$71.53</td>
<td>$457,696,106</td>
<td>4,975</td>
</tr>
<tr>
<td>Utah</td>
<td>$66.89</td>
<td>$165,195,000</td>
<td>1,796</td>
</tr>
<tr>
<td>National Average</td>
<td>$31.46</td>
<td>$130,846,670</td>
<td>1,379</td>
</tr>
</tbody>
</table>

Source: Performance Contracting Impacts - State Comparison, December 2011 (Energy Services Coalition)
Hawaii Green Jobs

Hawaii is expected to have over 14,000 green jobs by 2012

<table>
<thead>
<tr>
<th>COUNTY</th>
<th>PRIVATE SECTOR GREEN JOBS</th>
<th>% OF COUNTY JOBS</th>
<th>ADDITIONAL GREEN JOBS BY 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii</td>
<td>1,222</td>
<td>2.5</td>
<td>510</td>
</tr>
<tr>
<td>Honolulu</td>
<td>6,866</td>
<td>2.0</td>
<td>1,885</td>
</tr>
<tr>
<td>Kauai</td>
<td>460</td>
<td>1.9</td>
<td>71</td>
</tr>
<tr>
<td>Maui</td>
<td>2,597</td>
<td>4.6</td>
<td>437</td>
</tr>
<tr>
<td>State Total</td>
<td>11,145</td>
<td>2.4</td>
<td>2,903</td>
</tr>
</tbody>
</table>
As of 2011, over 9,000 distributed renewable energy systems have been installed statewide, totaling over 58 MW in capacity.
Solar-related construction expenditures reached nearly 17% of total private building permit value in 2011.
## Second in the Nation

**Cumulative Installed Photovoltaic Capacity per Capita**

<table>
<thead>
<tr>
<th>State</th>
<th>Cumulative Through 2010 (WDC/person)</th>
<th>2010 Installations (WDC/person)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nevada</td>
<td>38.8</td>
<td>25.3</td>
</tr>
<tr>
<td>2. Hawaii</td>
<td>32.9</td>
<td>13.6</td>
</tr>
<tr>
<td>3. New Jersey</td>
<td>29.6</td>
<td>15.1</td>
</tr>
<tr>
<td>4. California</td>
<td>27.4</td>
<td>6.8</td>
</tr>
<tr>
<td>5. Colorado</td>
<td>24.1</td>
<td>12.3</td>
</tr>
<tr>
<td>National Average</td>
<td>7.0</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Source: *2010 U.S. Solar Market Trends, July 2011 (IREC)*
Visit energy.hawaii.gov for a more comprehensive look at Hawaii’s clean energy future.