11\textsuperscript{th} Annual Legislative Briefing
Hawai‘i: The State of Clean Energy

State Capitol Auditorium

Friday January 16, 2015
1:30 PM – 3:45 PM
Jay Fidell,
President & Founder, ThinkTech Hawaiʻi
Representative Chris Lee,
Chair, House Energy & Environmental Protection Committee
Sharon Moriwaki,
Co-Chair, Hawai‘i Energy Policy Forum
The State Energy Office

Mark Glick,  
Administrator, State Energy Office
HSEO is Driving Clean Energy

- Establish Integrated Energy Policy Agenda
- Transform Economy by Deploying Energy Infrastructure & Innovation
- Support Energy Transformation with Stakeholder Assistance & Tools
- State Energy Office
- Leadership in Clean Energy Innovation

- $1 million to Renewable Funding & subcontractors in 2014 to operate Green Market Energy Securitization (GEMS) program.

- $478,500 to Sidley Austin LLP in 2014 to provide legal services related to the issuance of GEMS bonds.

- $178,000 to Accuity LLP to provide professional project management and program collateral and documentation to support the GEMS program.
• State Energy Office
• Advancing High Impact Solutions

- **$250,000 to Duncan Weinberg Genzer Pembroke** in 2014 to chart utility planning efforts through DBEDT comments filed in PUC dockets.

- **$100,000 to the International Council on Clean Transportation** in 2014 to support HCEI petroleum-reduction goals in the transportation sector.

- **$114,000** to support a baseline analysis of major downtown buildings to assess the potential for increased efficiency for cooling requirements.
• State Energy Office
• FY16 Budget Priorities

- Take the results from the HCEI transportation charrettes and conduct further analysis and implement solutions.

- Fund grid improvements/modernization toward the greater interconnection of renewable resources without compromising grid safety or reliability.

- Contract with subject matter expert to advise SEO on necessary changes in utility systems planning to drive investments in grid modernization.

- Analyze suitable renewable energy development sites and resource potential, including geothermal.
Mahalo

- **Mark Glick**
  - 587-3807
  - mark.b.glick@dbedt.hawaii.gov
The Public Utilities Commission

Hermina Morita,
Chair, Public Utilities Commission
The Consumer Advocate

Jeffrey Ono,
Executive Director, Division of Consumer Advocacy
Financing Clean Energy

Mike Hamnett,

Co-Chair, Hawai‘i Energy Policy Forum
Non-renewable sources: Oil & LNG

Shasha Fesharaki,
COO & Managing Director, FACTS Global
Long-Term Oil Price: A Range to Consider

- Short term prices are largely driven by changes in inventories
  - Seasonally, OECD stocks draw in Q4 but in 2014, they remained flat
  - Current OECD inventories are at seasonal highs of 58-days’ supply and expected to reach 61 days’ supply by March if OPEC does not cut output

- Long term prices are driven by investment levels required to maintain oil supply-demand equilibrium
  - Higher US tight oil production and improved efficiencies mean that the high-cost production such as Canadian oil sands and Venezuelan heavy oil projects are not the price-setters any more for long term oil prices

Oil Prices to Remain Volatile

2005 to 2014 are actuals, forecasts in $2014 thereafter
Hawaii oil blend of LSFO and Low Sulfur Diesel to average $14/mmBtu through 2030.

US sourced LNG from Gulf Coast forecast to average a premium to Hawaii oil blend through 2030.

Oil linked long-term LNG forecast to average 15% discount to Hawaii oil blend through 2030.

OIL LINKAGE FOR LNG PROVIDES BEST PRICING AND GUARANTEES DISCOUNT TO OIL THROUGH FORECAST
LNG & Potential Savings for Hawaii’s Economy

Numbers atop columns are average annual savings in million real dollars.

*Assumes 100% RPS met
LNG for Hawaii: Concluding Remarks

• The US Shale Gas Revolution has moved into the oil patch and has had a dramatic effect on prices in the short and long-term. Oil prices are forecast to average between $55-75/b from 2015-2020 and $75-95/b from 2020-2030.

• The potential of LNG to cut fuel costs in Hawaii is real though absolute savings have decreased as oil prices have come down. However, LNG is not only about economics but also about meeting tightening environmental specs.

• Price forecasts offer a possible path forward but the only way to get true costs is to test the market via an RFP. Hawaiigas has begun the process and results should be forthcoming in Q2 2015.

• LNG need not conflict with the goals of the HCEI and could play an important role in assisting renewables to be accommodated in Hawaii’s energy system.
Renewable Sources

Rick Rocheleau,
Director, UH Hawaii Natural Energy Institute

Email: rochelea@hawaii.edu
Website: www.hnei.hawaii.edu
Technologies Choices

• Can and Must Do
  • Energy Efficiency and Conservation
  • Waste to energy

• Can cost-effectively contribute large amounts of energy to grid but intermittency, siting, and interconnection may limit potential
  • Solar (Photovoltaics)
  • Wind

• Can contribute significantly but constrained by resources, geography, and other considerations
  • Geothermal
  • Hydroelectric
  • Bioenergy and Biofuels

• Potential game changers but not technologically proven
  • Wave Energy
  • Ocean Thermal Energy Conversion
Solar and Wind Integration

- HECO PSIP and HNEI RPS modeling shows we can integrate large amounts of wind and solar with or without cable (improved cycling, reducing min run conditions)
  - High penetration of wind and solar not dependent on changing to LNG
  - Depending on contract pricing LNG for “major” generation units can reduce total production fuel cost by up to 30%
  - Battery storage used as a reserve can reduce total production costs

- Need decisions on cable and LNG

- Need to assure grid reliability and stability

- Need to address barriers to siting and community acceptance

- Need distribution level solutions for high penetration of distributed PV
  - Equity for ratepayers and utility
  - Smart grids; EVs and distributed storage; advanced inverters
  - Advanced substation technology
Analysis and Demonstration

- **Renewable Portfolio Assessment** - Renewable integration, grid reliability, fuels study supporting PUC and HCEI

- **Energy Assurance Project** – Power grid modernization and renewable energy integration action plan for Hawaii bases

- **US DOT Electric Vehicle Transportation Center** - Partnership with FSEC to address EV integration, battery performance

- **Smart Grid Inverter Project** – Development of advanced inverter functionality and communications for SG control w hi penetration PV

- **Maui Smart Grid Project** – Control of distributed resources and energy storage for peak demand reduction

- **Molokai Renewable Microgrid** – Management of grid scale battery for system stability and integration of distributed resources

- **Battery Energy Storage** – Evaluation of BESS operations and algorithms for grid ancillary services (power quality, power smoothing, reserves, regulation)
Navy Wave Energy Test Site at MCBH

Grid connected; 30m, 60m, and 80m berths to be completed by May 2015

**Funding Partnership**
- Navy: Infrastructure and Developer Support
- USDOE: National Marine RE Center at HNEI
- Office of Naval Research: Technology Support
- State of HI: Technology Support

**HNEI Role**
- Support NAVFAC EA process
- Environmental impacts
- Provide site-dedicated support vessel
- Independent evaluation of device performance

**Northwest Energy Innovations**
18 kW Azura device
Feb 2015 for 1 year, 30m berth

**Sound and Sea Technology/Fred.Olsen**
240 kW Lifesaver device
∼ June 2015 for 6 months, 80m berth

**Columbia Power Technologies**
Utility scale StingRAY device (∼500 kW)
∼ May 2016 for 1 year, 80m berth

**Ocean Energy, Ltd.**
Utility scale device (∼1000 kW)
∼ August 2016 for 1 year, 60m berth

**Northwest Energy Innovations**
Utility scale device (TBD)
∼ May 2017 for 1 year, 80m berth
HNEI Fuel Cell/Hydrogen Research

- **HI Sustainable Energy Research Facility (HISERF) (ONR, USDOE, HECO, NASA, Industry)**
  - Testing of fuel cell and battery systems for vehicle and grid applications manned and unmanned vehicles

- **Marine Corps Base Hawaii Dual Pressure “Fast-Fill” H2 Fueling Station (USDOE, ONR)**
  - Basis for design of public stations
  - Unattended operation, > 60 fills since Nov 2014
  - Less than 5 min fill time to 700 bar (10,000psi)

- **Hydrogen Energy Systems for Grid Management (USDOE, ONR, SOHI, Industry)**
  - Demonstrate the use of electrolyzers to mitigate the impacts of intermittent renewable energy
  - Evaluate effect of multiple revenue streams on overall hydrogen costs.
Energy Efficiency

Jim Flanagan,
Contract Manager, Hawai‘i Public Benefits Fund
Grid Modernization

Colton Ching,
Vice President of Energy & Maintenance,
Hawaiian Electric Company
Inter-Island Cable

Rene Kamita,
Research Branch Chief,
Division of Consumer Advocacy
Interisland Cable

• Could sources of low-cost, renewable energy be efficiently and cost effectively matched to areas of high demand via inter-island cable(s)?

  – Act 165 established the regulatory structure to develop, finance and construct interisland undersea transmission cable system(s).

    • Oahu-Maui Cable (Docket No. 2013-0169)
    • Lanai Wind (Docket No. 2013-0168)
Interisland Cable

- Most analyses suggest that under certain conditions, an Oahu-Maui grid tie and/or Oahu gen-tie can result in savings.

  - DCA
  - DBEDT
  - NextEra
  - HECO

  PUC Docket No. 2013-0169

  - HNEI-GE Hawaii RPS Roadmap Study (Jan 2014)
  - Coffman and Bernstein (2014)

- HECO/MECO Power Supply Improvement Plan (PSIP): cable is **not** necessary to meet RPS, benefits < costs over a 15 year period.

- Forthcoming HNEI-GE RPS Study (Cable + LNG)
Interisland Cable

Jim Robo (NextEra): Is the cable cost-effective? “That is something that remains to be seen.”

Governor Ige: “This administration is committed to reaching Hawaii’s clean energy goals and continues to explore all options, including connecting the islands through integrated modernized grids... We will continue to listen to the people of Hawaii and any effort to connect the islands will need to be rooted in strong support from all impacted communities.” (emphasis added)
Interisland Cable

Analysis needs to consider:
- LNG
- Impact of forced cable outage(s) on each island’s system
- Feasibility of siting sufficient amounts of renewable generation
  - Costs
  - Impact on affected communities

A lot of moving parts...
- Power Supply Improvement Plans
- Proposed NextEra-HECO Merger

LNG and Cable or LNG vs. Cable?
The NextEra Transaction & Clean Energy

Alan Oshima,
President & CEO, Hawaiian Electric Company
Entrepreneurs in Clean Energy

Dawn Lippert,
Manager, Energy Excelerator
The Energy Excelerator is a startup program that helps solve the world’s energy challenges, starting in Hawaii.
## Innovation is Needed to Achieve HCEI Goals

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrating renewable energy</td>
<td>stem, AMBRI, bidgely, SPIDER9, Shifted Energy, Ballast energy, AMBER Kinetics, PYRO-E, Edisun, Go Electric, INFINITE INVENTION, Open Power Quality</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Ibis Networks, Pono Home, people power, BRIGHT LIGHT SYSTEMS, BrightBox, OroEco, rebound</td>
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<tr>
<td>Financing</td>
<td>Effortless Energy, kWh analytics</td>
</tr>
<tr>
<td>Transportation</td>
<td>AUTOWATTS, Bandwagon, FreeWire, Ridescout, TransitScreen, conscious commuter</td>
</tr>
<tr>
<td>Agriculture &amp; Water</td>
<td>Terviva, Kunoa, PROTA Culture, GEN-X Energy Development LLC, RENEWABLE WATER TECHNOLOGIES</td>
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</table>
Our Success to Date

- Follow-on funding: $182M
- Project finance: $100M
- VC: $82M
28 of our 32 Companies have an Active Presence in Hawaii
Implement Innovation & Assess Results

Together with Hawaiian Electric and 75+ local partners

Capitalize on Momentum at UH

To commercialize more Hawaii-grown technologies

Scale Global Partnerships
Transportation

Asia Yeary,
Hawai‘i Clean Transportation Lead,
US Environmental Protection Agency
Q&A with Livesift
Hawai‘i’s Fiscal Condition

Senator Jill Tokuda,
Chair, Senate Ways & Means Committee
Hawai‘i’s Fiscal Condition

Representative Bert Kobayashi,
Member, House Finance Committee
Q&A with Livesift
Integration of the Parts: The Path Forward

Ben Sullivan, Energy Coordinator, Kauai County

Jeff Mikulina, Executive Director, Blue Planet Foundation

Marco Mangelsdorf, President, ProVision Solar

Sophie Cocke, Energy & Environment Reporter, Honolulu Civil Beat
Q&A with Livesifft
Closing Remarks

Senator Mike Gabbard,
Chair, Senate Energy & Environment Committee
"Hawai`i Aloha"
(Lyons/McGranahan)

E Hawai`i, e ku`u one hanau e
Ku`u home kulaiwi nei,
`Oli no au i na `ono lani ou
E Hawai`i, aloha e

O Hawai`i, O sands of my birth,
My native home,
I rejoice in the blessings of heaven
O Hawai`i, aloha.

Hui:
E hau`oli na `opio o Hawai`i nei
`Oli e! `Oli e!
Mai na aheahe makani e pa mai nei
Mau ke aloha, no Hawai`i

E ha`i mai kou mau kini lani e
Kou mau kupa aloha, e Hawai`i
Na mea `olino kamaha`o no luna mai
E Hawai`i, aloha e

Chorus:
Be happy, youth of Hawai`i
Rejoice! Rejoice!
Gentle breezes blow
Love always for Hawai`i

Na ke Akua e malama mai ia `oe
Kou mau kualono aloha nei
Kou mau kahawai `olino `olono mau
Kou mau mala pua nani e

May your divine throngs speak,
Your loving people, O Hawai`i
The holy light from above,
O Hawai`i, aloha.

It is God who protects you,
Your beloved ridges,
Your ever-glistening streams
Your beautiful flower gardens.
Mahalo and Aloha