

2009 PCEA CONFERENCE PANEL DISCUSSION OVERVIEW

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Panelist:

- Shari Ishikawa – Operations Superintendent, HECO
- Dora Nakafuji, Ph.D. - Director, Renewable Energy Planning, HECO
- Scott Seu - Manager, Resource Acquisition, HECO

Can you provide a brief overview of existing renewable energy facilities in the islands, as well as describe some noteworthy projects that are under development?

- HECO, HELCO and MECO all have levels of solar Photovoltaic (PV). Neighbor islands have hydro, geothermal and wind farms. HECO uses waste to energy and net metering programs, for PV, throughout the islands.
- Proposing: Feed-in Tariff (FIT), PV Host and the application process
- Renewable projects in development: Wind projects on Oahu, Interisland wind with High Voltage DC cable linking the islands of Molokai and Lanai as part of HCEI agreement; considering resources for biofuels as well as pursuing demand side management stimulus opportunities for smarting the grid.

What are the technical issues that must be considered when incorporating large amounts of renewable energy?

- Understanding and characterizing the renewable resources is the key to any integration effort – load, demand, seasonal needs, and resource availability. We need high quality data collected over a longer time period.
- Though certain renewable technologies are more mature (technologically demonstrated) than others, managing the resources is something that we're still learning. Wind forecasting is still improving. Solar forecasting and models are being developed. Right now, none of the models are adequate for the operational timeframes (within the hour) that we really need to manage the "ups" and "downs" of wind or solar. Research challenges include predicting clouds. Not something any of the models do well. Lots of national efforts in this area. HECO is also involved in the west coast efforts working with CalISO, SCE and BPA*.
- There is no silver bullet in any one renewable resource. There are pros and cons for every renewable resource so a portfolio approach is needed, from the residential scale to the larger commercial scale projects. The Renewable Portfolio Standard must consider an appropriate mix of renewable resources and the trick is getting them to interact on the grid together.
- Tailoring integration solutions using renewables need to complement existing utility generation resources especially for an island grid. The Hawaiian grid does not have a safety net (i.e. an interconnected grid like the mainland or a market to buy/sell excess energy). Ability to manage existing resources, incorporate flexible resources may need to be considered as we transform the existing infrastructure.
- SMARTing the system requires 1) Sustainable resources suited for the environment; 2) Manageable transitions from legacy to new; 3) Adaptive infrastructure, processes and workforce that can change with technology; 4) Resilient and robust vision and 5) Tangible technologies that provide value today.

What makes a smart grid "smart" and what does it do?

- Installation of an Energy Management System to help monitor and remotely control the transmission system.
- Installation of an Outage Management System.
- Benefits are to operate reliably, efficiently, economically, environmentally friendly, and safely.
- Adding generation at the distribution level allows for 2 way communication allowing customers to be part of the solution on grid management
- Gives options to controlling load.

What avenues are available for renewable developers to enter into agreements to sell power to HECO?

- Currently a variety of mechanisms exist while some are still being developed.
- Small Scale Projects -
 - Net Energy Metering (NEM)
 - Most active for installable renewables up to 100 kW
 - Bilateral Purchase Power Agreements/Rates
 - 3 Key steps evolving to gain a more transparent process
 1. Completion of Non Utility Generator Form by developer that identifies project details
 2. Negotiation between developer and Hawaiian Electric to settle on price, interconnection, and other key points.
 3. Establishment of Final Agreement
 - Developers need to understand expectations of the Feed-in Tariff
 - Feed-In Tariff
 - Decisions & Order from Public Utilities Commission September 2009 (process began October 24, 2008)
 - More streamlined
 - Pricing and Standardized Contracts need to be established
 - Large Scale Projects –
 - Competitive Bidding

How does Hawaiian Electric compare to the mainland on the renewable penetration levels and risks?

- Renewable penetration levels are low on Oahu and reached 30-40% on Maui and Hawaii compared to 11% in California.
- Due to the isolation of the Hawaiian Islands, it is advantageous by design to incorporate renewable as a resource.
- When renewable penetration gets to high levels it is more important to have a need for some backup generation when the wind isn't there or sun isn't shining.
- We are in a paradigm shift that needs to benefit both the island's economy and utilize the natural resources. It is necessary to view this change in a larger dimension and understand that the process will take years to complete.
- This needs to be a partnership that benefits all parties.

Will getting more customers renewable integration automatically improve our system so we can prevent blackouts?

- Integrating renewable continues to be an exciting developing area that carries many technical, economic and regulatory challenges. Renewable integration may degrade the system if not properly done to consider impacts on other system components. Hawaiian Electric would like to demonstrate the capabilities and advantages of renewable integration that can be a model for national and international efforts.
- We continue to strive to minimize transmission and distribution outages through innovation and system maintenance however outage risks remain an integral part of keeping the lights on.
- A potential distributive resource would be the creation of smaller grids that could possibly be used to bring up the entire grid in the event of outages, especially those on larger scales.

What can we learn from California and what are the large mistakes that need to be avoided?

- It's important to understand the characteristics of the resources at hand and to manage for natural recurring conditions like drought, clouds, Kona winds, calm days etc.
- Renewable integration needs to be tailored to individual systems/islands.
- System needs to be adaptable.
- Technology needs to be tangible and up to date.
- Technology is available today and with the use of models and simulations we can better understand what drives the physics behind renewable resources.

- The phenomenon driving physics of resources needs to be understood, especially for wind and solar.
- Ways to leverage the individual islands resources need to be identified.
- Learning how far each utility generator can be pushed helps HECO better handle situations.
- The underground cable will allow interconnectivity between the islands. This ultimately may provide an islanded system with more options but costs will also need to be considered.

Where are we with Energy Storage and how will/can it effect renewable integration?

- Currently batteries and energy storage are not the first solution of choice due to cost and the need to be correctly combined with available resources.
- Storage continues to be costly so the technology needs to be improved.
- It is not THE ONLY solution to manage wind and solar; it can provide part of the solution. It is necessary to find a balance.
- Opportunities via stimulus and pilot demonstrations are arising both for the utilities and the battery manufacturers.
- How storage is used will be an important consideration to what you are trying to achieve.
- Research is currently being conducted to find other uses for batteries once their main usage life has expired. One example is the electric car lithium batteries which have a certain usage life for charging an electric vehicle but could still be viable in other ways. Research is being conducted as to the recyclability of these batteries.
- It is important to understand that batteries have a life span and so do the resources they're coupled with. Managing these differing life spans and having contingencies are part of the new planning paradigm.

Where are we with the Interisland wind and the cable projects? What challenges and technologies exist?

- The underwater cable will help tie the islands together and provide opportunities to better exchange resources between them.
- Majority of the load is on Oahu so the main feed would be to support this load.
- Challenges are –
 - How to connect the cable into the existing infrastructure at the point of entry on Oahu.
 - How to connect the cable into the existing transmission and distribution infrastructure.
 - The cable dynamics itself has its own challenges but the cable technology can be managed.
- Wind technology is relatively mature but more is being demanded from these wind turbines locally and world wide.
- Currently working with experts both internationally and industrial to help integrate the interisland wind projects, address permitting, connectivity and various other components. Also partnering with the State.
- Trying to establish a successful project with the least impact to the environment and the economy.
- Projects are moving targets since it is not possible to stop the clock while waiting for results. Much planning is required to pull it all together.
- The planning cycle needs to consider current, long term and emerging concepts.

What will decoupling accomplish and what does it mean?

- Utility has no static objective to protect kWh sales.
- Decoupling is a regulatory mechanism that de-links the utilities' revenues and profits from electricity sales. This decoupling of revenues from sales will remove barriers for the utilities to pursue aggressive demand-response, load management and customer-owned or third-party owned renewable energy systems while giving the utilities an opportunity to achieve fair rates of return.

What is the newest on BioFuels?

- Although not currently produced locally, Biofuel is our main driver for grid stability.
- HECO is currently looking at proposals for biomass and waste generation since it is both viable and valuable.
- Work is being done to convert existing generators to burn biofuels.
- Many challenges exist such as policies and land use. A balance of these two components needs to be attained.
- There is no easy answer but the stability of the grid is of utmost importance.

How is HECO using Stimulus funding?

- HECO is pursuing a number of Federal stimulus opportunities for Smart Grid, Wind, Solar, Hydro and partnering to look at Plug-in Hybrid Electric Vehicle and training/workforce development.
- We've received \$750k of federal stimulus funds to model, assess and monitor the impact of variable resources like wind on our grid.
- Several projects are being geared for stimulus funding a few such as the following:
 - Partnering with the Department of Defense to improve demand side management of renewable energy.
 - Developing a proposal to produce a model that can be used by others to extend the grid into homes and over the internet. Security concerns need to be addressed.
 - Smart switching to improve reliability such as incorporating automatic versus manual switching would also eliminate the need for trouble crews to drive to the sites to isolate lines. Smart switching would quicken the isolation of troubled areas allowing for a quicker return of power when there are outages due to cable faults etc. (*Since the conference, HECO has received notice of award for this proposal*).
 - Data gathering and conveying the information in a meaningful manner for purposes of understanding the characteristics of renewable and operating with them.
 - Case studies to better adapt and implement new technologies.

H-Power (Waste to Energy)?

- HECO/MECO/HELCO are all working with their respective cities and city councils to negotiate new activity.
- Possibility to purchase waste gas as a renewable.
- There are a lot of resources that are yet to be tapped which are potential sources.

Summary:

Resource Acquisition –

- Need to have different avenues both small and large.
- There have been large challenges –
 - Process and procedures have been muddled.
 - All prospects have different technical and cost issues that need to be analyzed.
 - We continue to strongly encourage renewables while balancing the best solution.
 - Need to provide the most valuable projects to the customer.
- Understand that not all projects will happen. The projects that are best for all parties will be integrated.
- Need to create a process that creates the best projects for our system while finding a happy medium.

Planning –

- No one silver bullet or one technology.
- Working with a moving target.
- Need to continually ask questions and seek solutions while continuing to improve.
- Need to partner together and head in the same direction. Steering the same canoe.
- Need to study how to accommodate while not causing large impacts both environmentally and economically.
- End result is to improve our situation.

Operational –

- Goals are always changing.
- System was originally built to work one way and now needs to be changed and updated to handle new technologies and 2 way communications.
- Things are much more automatic then before.
- With renewables the system will need to be watched much more closely and will not be as programmable as before.
- Integrating renewables into the grid make it more of a live system and more difficult to plan unlike the planning for storms etc.
- Main obligation to customer is reliability.

Overall.....many many people are involved in this transition. There are many technical issues that are arising constantly. We are very excited and optimistic about renewables. Our ultimate goal is their integration.

* CalSO - California Independent System Operator
SCE - California Independent System Operator
BPA - Bonneville Power Authority