A Postcard from the Future
IRENA Innovation Week
Plenary II: Systemic Innovation

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Former Chair of the State House Committee on Energy & Environmental Protection
Renewable Watch - Oahu

May 07, 2016
1:24 PM

Information

Renewable Watch shows at a glance the levels of solar and wind power generated on Oahu and how that energy varies throughout the day.

Below Are Descriptions of What is Currently Displayed:

- Net System Load: System Load Served By Hawaiian Electric Company
- Gross System Load: Net System Load + Load Served By Behind the Meter PV
- West Oahu Solar Irradiance: Solar Irradiance [W/m²] Measured in West Oahu
- South Oahu Solar Irradiance: Solar Irradiance [W/m²] Measured in South Oahu
- Central Oahu Solar Irradiance: Solar Irradiance [W/m²] Measured in Central Oahu
- East Oahu Solar Irradiance: Solar Irradiance [W/m²] Measured in East Oahu
- Oahu Wind Production: Wind Power Production on Oahu

Renewable Watch - Previous Day

Current Renewable Power Production (by regions)

- West Solar MW: 5.04
- Central Solar MW: 22.33
- Wind MW: 20.28
- East Solar MW: 14.05
- South Solar MW: 70.29

North Solar Information to be included at a later time.

Weather Forecast:

- Today: 83/72 °F, Mostly sunny
- Tomorrow: 82/71 °F, Partly cloudy with isolated rain showers
- Monday: 81/71 °F, Partly cloudy with isolated rain showers

Use Link Title for Caption.
Renewable Watch - Hawai‘i Island

May 07, 2016
1:24 PM

Current Renewable Power Production
- Island Wide PV [MW] 25.4
- Island Wind [MW] 11.8

Information

Renewable Watch shows at a glance the levels of solar and wind power generated on Hawai‘i Island and how that energy varies throughout the day.

Below are descriptions of what is currently displayed:
- Net System Load: System Load Served By Hawai‘i Electric Light Company.
- Gross System Load: Net System Load + Load Served By Behind the Meter PV.
- Island Wide PV Generation: PV Power Generation throughout Hawai‘i Island.
- Island Wind Generation: Wind Power Generation on Hawai‘i Island.

Renewable Watch - Previous Day

Use Link Title for Caption

“Renewable Watch” or “REWWatch” display is updated daily and shows system information as well as wind and solar production.
Renewable Watch - Maui

Information
Renewable Watch shows at a glance the levels of solar and wind power generated on Maui and how that energy varies throughout the day.

Below are descriptions of what is currently displayed:
- Gross System Load: Net System Load + Load Served Behind the Meter PV.
- Island Wide PV Generation: PV Power Generation throughout Maui.
- Island Wind Generation: Wind Power Generation on Maui.

Current Renewable Power Production
- Island Wide PV [MW]: 0
- Island Wide Wind [MW]: 4.5

Renewable Watch - Previous Day

Weather Forecast
- Today: 86/67 °F, Mostly cloudy with scattered showers.
- Tomorrow: 84/65 °F, Mostly cloudy with scattered showers.
- Monday: 84/66 °F, Partly cloudy with scattered showers.
Renewable Watch - Lanai
May 07, 2016
1:05 PM

Information
Renewable Watch shows at a glance the levels of solar power generated on Lanai and how that energy varies throughout the day.

Below are descriptions of what is currently displayed:
- Gross System Load: Net system load + behind the meter PV + LSR.
- Island Wide PV Generation: PV power generation throughout Lanai + LSR.

Current Renewable Power Production
- Island Wide PV [MW]: NaN

Weather Forecast
- Today: 75/66 °F, Overcast with occasional rain showers.
- Tomorrow: 75/65 °F, Partly cloudy with isolated rain showers.
- Monday: 75/65 °F, Partly cloudy with isolated rain showers.
Renewable Watch - Molokai

May 07, 2016
1:15 PM

Information
Renewable Watch shows at a glance the levels of solar power generated on Molokai and how that energy varies throughout the day.

Below are descriptions of what is currently displayed:
Gross System Load: Net System Load + behind the meter PV.
Island Wide PV Generation: PV power generation throughout Molokai.

Current Renewable Power Production
Island Wide PV [MW]
NaN

Renewable Watch - Previous Day

Today
80/67 °F
Partly cloudy with scattered rain showers

Tomorrow
80/67 °F
Partly cloudy with isolated rain showers

Monday
79/68 °F
Partly cloudy with scattered rain showers.

Maui Electric
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

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

**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

**Hawaii Electric Light**
- 39 MW PV / 30 MW Wind / 38 MW Geothermal / 16 MW Hydro
- System Peak: 190 MW
- Customers: 81,000

Source: Hawaii Natural Energy Institute
Hawaii’s Energy Policy

Hawaii Revised Statutes, Chapter 226-18

Planning for the State’s facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all:

• **Dependable, efficient, and economical** statewide energy systems capable of supporting the needs of the people (1978);
• **Increased energy self-sufficiency** where the ratio of indigenous to imported energy is increased (1978);
• **Greater energy security** in the face of threats to Hawaii’s energy supplies and systems (1981); and
• **Reduction, avoidance, or sequestration of greenhouse gas emissions** from energy supply and use (2000).
Driving & Implementing Energy Policy

Act 99, 2012
Diversify, optimize & minimize the use of fossil fuels

INTEGRATION
Maximize utilization & efficiency of all assets

PUC Decisions & Orders/Inclinations
- Decoupling
- Performance Based Regulation

RPS
Diversify, optimize & increase the use of renewable resources (100%)

EEPS
Electricity use reduction (30%)

HRS 226-18

Community Values & Acceptability
- Indigenous & Clean
- Affordable & Efficient
- Dependable & Secure

Renewable Energy Income Tax Credit
Net Energy Metering
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

Hawaii Energy Policy Goals & Objectives
HRS 226-18

HNEI

DBEDT

Public Utilities Commission (Chapter 269, HRS)
- Regulation of Electric Utilities
- Renewable Portfolio Standards, HRS 269-92
- Energy Efficiency Portfolio Standards, HRS 269-96
- Public Benefit Fee, HRS 269-121

PUC

Hawaii Natural Energy Institute (Act 253, SLH 2007)
- Research & Development
- Technology Validation
KIUC Weekly Average Dispatch – 1.5 Years Ago

- Average of Hydro
- Average of Oil
- Average of Bio
- Average of Solar

Time of the day:
- 12:00 AM to 11:00 PM
KIUC – January 2016

• Jan. 13: Total of 61 minutes at or above 90% renewables with 59 MW of demand and an average resource mix of 71% solar, 8% hydro, 11% biomass, 10% diesel;

• Jan. 16: Total of 34 minutes at or above 90% renewables with 57 MW of demand and an average resource mix of 73% solar, 8% hydro, 9% biomass, 10% diesel;
•
• Jan. 17: Total of 34 minutes at or above 90% renewables with 53 MW of demand and an average resource mix of 72% solar, 8% hydro, 10% biomass and 10% diesel;

• Jan. 18: Total of 5 minutes at or above 90% renewables with 58 MW of demand and an average resource mix of 77% solar, 6% hydro, 7% biomass and 10% diesel.
80% system-wide solar penetration
95% system-wide renewable
Establishing an organizational culture that acknowledges the urgency and cultivates the discipline, mindset and skill sets necessary to survive and thrive in a rapidly changing environment.

The acquisition of skills requires a regular environment, an adequate opportunity to practice, and rapid and unequivocal feedback about the correctness of thoughts and actions. When these conditions are fulfilled, skill eventually develops, and the intuitive judgments and choices that quickly come to mind will mostly be accurate.

Quote from Thinking, Fast and Slow by Daniel Kahneman
What can Hawaii share from its experience in moving towards a clean energy transformation?

- Do not focus solely on the generation side of the equation, a transformation requires a multi-prong, systems approach

- Adopt a “no-regrets” strategy moving forward (reduce demand and carefully scrutinize new capital investments)
  - Energy efficiency, building codes, demand response
  - Maximize and optimize your existing low cost carbon generators and renewable generators

- What’s needed are technical and affordable solutions, therefore the regulatory process must accommodate problem solving in a less legal and political way with good staff and resources

- When decoupling electricity sales from revenue requirements include performance standards (moving from traditional ratemaking to performance based regulation)

- The regulator and utility leadership must be in sync to lay the groundwork for the business model for the electric utility of the future
What are Hawaii’s biggest challenges

- Maintaining political will or avoiding political interference
- Changing the business model of the electric utility and current culture within the utility
- Where to make the best infrastructure investments for the future given rapid technology advancements
- Current tax credits subsidizes most expensive options
- Current low cost of oil, Governor’s reluctance to consider LNG
As closed and bounded systems, the islands of Hawaii are a manageable unit of study of complex systems that can change in a very short time period compared to a larger, continental area. Therefore, Hawaii is a bellwether of what is to come for bigger electric networks and systems. Optimistically, the postcard will beckon one to a competitive-cooperative partnership within a seamless electric system paradise, a sustainable model that can be exported throughout the world. Or the postcard will heed warnings from an electric system dystopia where the commons have been ravaged solely for short-term gains. I hope for the former.

Hermina Morita
“Designing Regulation Around Technology Innovation: Experiences from Hawaii”
Infrastructure Risk Management: Assessing and Managing Dynamic Exogenous Risk