

Forecast Assumption Working Group (FAWG) Meeting Notes

8:30 am to 3:00 pm – May 22, 2019

8:30 am to 2:00 pm – May 23, 2019

AmeriSavings Bank Tower, 8th Floor, Training Room 2**Attendees:**

Attendee	Organization	5/22/2019	5/23/2019
Steven Rymsha	TASC	WebEx	
William Rolston	Energy Island	WebEx	
Wren Wescoatt	Progression Energy	WebEx	
Dave Parsons	Public Utilities Commission	WebEx	
Jay Paul Lenker	Public Utilities Commission		In Person
Ashley Norman	Public Utilities Commission	In Person	In Person
Clarice Schafer	Public Utilities Commission	In Person	
Jason Prince	RMI (PUC consultant)	WebEx	In Person
Ramsey Brown	Hawai'i Energy	In Person	In Person
Rene Kamita	Consumer Advocate	In Person	In Person
Pono Shim	O'ahu Economic Development Board	In Person	In Person
Rocky Mould	County of Honolulu	In Person	In Person
Jacqui Hoover	Hawai'i Island Economic Development Board (HIEDB)	In Person	In Person
Teena Rasmussen	Maui County Community	In Person	
Binsheng Li	DBEDT	In Person	In Person
Carl Bonham	UHERO	In Person	
Omar Siddiqui	EPRI	WebEx	
Calvin Opheim	ERCOT	In Person	In Person
Terry Baxter	NV Energy	WebEx	
Amber Riter	Portland General	WebEx	WebEx
Patrick McCoy	SMUD	WebEx	WebEx
Henry Curtis	Life of the Land	In Person	In Person
Ingrid Rohmund	Applied Energy Group, Inc.	In Person	In Person
Paul De Martini	Newport Consulting Group - Facilitator	In Person	In Person
Joanne Ide	Hawaiian Electric - Lead of FAWG (load forecasting)	In Person	In Person
Christopher Lau	Hawaiian Electric - Co-lead of FAWG (non-load forecasting assumptions) Corporate Energy Planning	In Person	In Person
Lisa Giang	Hawaiian Electric - Advanced Planning	In Person	
Collin Au	Hawaiian Electric - Advanced Planning (Corporate Energy Planning)	In Person	In Person
Sorapong Khongnawang	Hawaiian Electric - Advanced Planning (Corporate Energy Planning)	In Person	In Person
Cathy Hazama	Hawaiian Electric - Forecasting	In Person	In Person

Attendee	Organization	5/22/2019	5/23/2019
Anne Fuller	Hawaiian Electric - Forecasting	In Person	In Person
Therese Klaty	Hawaiian Electric - Forecasting	In Person	In Person
Divesh Dhingra	Hawaiian Electric - Forecasting	In Person	In Person
Pam Anukoothamchote	Hawaiian Electric - Forecasting	In Person	In Person
Thomas Yokota	Hawaiian Electric - Forecasting	In Person	In Person
Lisa Dangelmaier	Hawai'i Electric Light - System Operations & Planning	WebEx	WebEx
Ellen Nashiwa	Maui Electric - Customer Solutions & Planning	WebEx	WebEx
Mike Ito	Maui Electric - Planning	In Person	In Person
Kolter Kalberg	Maui Electric - Customer Solutions & Planning	In Person	In Person
Peter Young	Hawaiian Electric - Technical Planning Services	In Person	
Keith Yamanaka	US Army Garrison-Hawaii	In Person	In Person
Tracy Tonaki	D.R. Horton Hawaii	In Person	
Kevin Chock	RHA Energy Partners	In Person	
Benjamin Sigrin	NREL	In Person	
Thomas Maslin	IHS Markit	In Person	In Person
Matteo Muratori, Ph.D.	NREL	In Person	In Person
Marco Mangelsdorf, Ph.D.	ProVision Solar, Inc.	In Person	
Chris De Bone	Hawaii Energy Connection	In Person	
Robert Harris	SunRun	In Person	
Roger Morton	Oahu Transit Services	In Person	
Dan Ahuna	Roberts Hawaii	In Person	In Person
Rob Mora	Lyft	In Person	
Kurt Speas	Tony Nissan	In Person	
Amber Stone	Aloha Charge	In Person	
John Uekawa	Hawaii Auto Dealers Association	In Person	
Richard Chinen	KTA Super Stores		WebEx
Grant Chun	Hale Mahaolu		In Person
Caroline Carl	Hawaii Energy		In Person
Gwen Yamamoto-Lau	Hawaii Green Infrastructure Authority		In Person
Ted Pope	2050 Partners, Inc.		WebEx
Yvette Maskrey	Honeywell Smart Grid Solutions		In Person
Ian Morikawa	Hawaiian Electric	In Person	In Person
Gregg Kresge	Maui Electric	In Person	
Susan Lee	Hawaii Electric Light	In Person	
Marc Asano	Hawaiian Electric	In Person	
Dennis Lee	Hawaiian Electric	In Person	
Yoh Kawanami	Hawaiian Electric	In Person	In Person
Jimmy Yao	Hawaiian Electric	In Person	In Person
Tandy Tabata	Hawaiian Electric	In Person	In Person

Attendee	Organization	5/22/2019	5/23/2019
Michael Colon	Hawaiian Electric	In Person	
Greg Mandelman	Navigant	In Person	
Riley Saito	County of Hawaii	WebEx	WebEx
Jon Shindo	Hawaiian Electric	WebEx	
Michael Angelo		WebEx	WebEx
Bryant Komo	Hawaii Electric Light	In Person	
Riley Ceria	Hawaii Electric Light		WebEx
Dan Sakamoto	Hawaiian Electric	In Person	
Jeremy Laundergan	EnerNex - Hawaiian Electric Project Management	In Person	
Ron Hee	Roberts Hawaii		In Person
Aaron Kim	Roberts Hawaii		In Person
Michael Rubin			WebEx

May 22 FAWG Notes

The load forecast is developed in layers – underlying forecast (driven by the effects of the economy, weather, electricity price); distributed energy resources; energy efficiency; and emerging technologies such as electrified transportation. Panel discussions covered the main drivers and barriers for adopting distributed energy resources, energy efficiency and electric vehicles from the customer, industry, program administrator and consultancy perspectives. Trends in the respective industries and visions of future technologies and programs were also discussed.

Distributed Energy Resources

Customer Perspective

Speakers:

- Keith Yamanaka, Energy Manager US Army Garrison Hawaii
- Tracy Tonaki, Senior VP of Development DR Horton Schuler Homes Hawaii
- Kevin Chock, Business Solutions Manager RHA Energy Partners

Discussion Summary:

- New Homes are being built to make it easier to adopt PV in the future
 - Fire codes for batteries are well established making the permitting process easier.
 - Battery Energy Storage Systems are available to be added to a newly purchased house as part of the mortgage making it easier for home buyers to adopt renewables.
 - Built with conduit lines into them to minimize the cost of adopting PV in the future
 - New dwellings are being built with stub outs for easy installation of EV charging stations in the future.
 - As of date, no tenants have installed EV chargers at Hoopili.
 - Smart home packages are available.
 - Developers are balancing total initial cost of the home versus measures that have an up-front cost, but provide savings over time. Future savings over time don't help first time or affordable home buyers get over the hurdle of the initial cost of home ownership.
- LED lighting is an easy way to reduce energy consumption in existing structures via retrofits or in new construction.
 - Longer lasting LED lights require changing less often decreasing maintenance costs in the public and private sector.
 - Without much effort, commercial customers can get 20-30% energy savings with LED retrofits. With more effort and controls, can get 60-70% savings. Sensors, controls, manufacturers and products are continuing to evolve and mature in this space.
 - LED lighting is standard in new homes.
- Efficiency and home automation
 - AC and building automation is commonly considered for efficiency
 - May need to be combined with quick payback projects like LED's
 - Adoption rate is a mixed, customers typically may adopt the technologies before end of life of current system and if they see cost savings.
 - The US Army Garrison
 - Have ESPC's (energy saving performance contracts) to conserve energy. However, almost all of the buildings are homes at which energy consumption is managed by the families in the homes.
 - DOD looks to extend available emergency generation run time via energy efficiency measures and PV.
 - Commercial customers' key drivers and barriers:
 - Strong and compelling financial incentives, i.e. how is it going to improve profits?
 - Seamless and simple to implement
 - Organizational priority, which can be the hardest challenge, even if the first two boxes are checked. There are often competing capital priorities that target top-line business growth.
 - 3rd party involvement can help with up-front costs – PPA model
- Drivers and barriers of solar PV with storage adoption
 - Cost savings is the main driver
 - Cost of storage is a barrier
 - Commercial customers

- Looking at storage as a way to avoid their retail cost versus getting something lower like 14 cents, for instance.
 - They would like to share in the value of what they can provide to the grid to help offset the capital costs, but it remains to be seen how that can work.
 - Expect steady adoption of PV paired with storage over the next many years, but not boon years like NEM. There is financial merit, although it is challenging right now. Expectation is for it to become more and more viable as costs decline or PPAs free customers from having to justify up front capital costs.
 - Resiliency at sites that value resiliency, like disaster recovery, may become a more important driver over the next 5-10 years.
- Impacts of renewable project adoptions
 - The US Army Garrison is cognizant of the effects that renewable adoption would have on the rest of the rate base.
 - The Garrison does not have any resources or plans to go off grid.
 - Current PV installations are in front of meter rather than behind the meter.
 - The Garrison considers DR as part of the DER portfolio. Their energy portfolio includes non-firm PV generation, so they look to have an equivalent amount of DR to use in the event of a loss of generation.
 - Policies could require measures that would dramatically increase housing prices making it harder for first home buyers and the lower demographic.
 - Ensure that any policy affects all people equally
- Many customers are using gas for thermal loads
 - Hoopili will provide gas to single family homes for oven, laundry, and instant hot water heating. Since the pipeline was installed some time ago, there are no impact fees for using gas.
 - For a single family, the instant hot water is about \$5000 less than a solar water heater.
- The forecast does not take into account specific end-uses for factors such as an increasing aging population and increasing demand for dialysis that will require more medical equipment thus increasing the future load. Although, if the trend is occurring already, the forecast may account for it to some degree in the underlying trend.
- Many energy saving mechanisms are too complicated to be integrated to every day use
 - Anecdotal event: A LEED system has some of its more complicated energy saving mechanism turned off after inspection for LEED certification is complete

Policy/Consultancy Perspective

Speakers:

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|--|-------------------|
| ● Benjamin Sigrin, Researcher – Model Engineer | NREL |
| ● Thomas Maslin, Associate Director | IHS Markit |
| ● Marc Asano, Director of T&D and Interconnection Planning | Hawaiian Electric |
| ● Dennis Lee, Director of Pricing | Hawaiian Electric |

Discussion Summary:

- Drivers for DER rapid growth
 - Lower technology cost
 - PV price down 80-90% over last 8-10 yrs
 - Projections are sensitive to real estate costs, natural gas prices and enacted policies
 - Technology advancements
 - Better communications and control capabilities
 - Compatible with Demand Response programs
 - Further adoption in grid management, more tech firms to manage DERs
 - Economics alone are not sole factor for adoption
 - Values and beliefs such as environmental reasons
 - Social influence (e.g. friends, neighbors, coworkers)
 - Wanting to have the latest technology
- Headwinds for DER growth
 - Solar+Storage still expensive for residential customers
 - Rate design solutions are complex, and involve an increasingly complex electrical system
 - Competition between DER resources (e.g. storage vs. demand response)
- Consumer
 - Consumers demand more choice
 - More engagement in how they use their energy
 - Overall costs of solar and batteries
 - Energy storage in residential space still expensive
 - Complexity of designing rates and managing more complex systems
- Hawaiian Electric
 - Must maintain the reliability and security of the system when adopting DER resources.
 - DER is a significant part of plans; we may be land constrained for utility scale PV and storage, so customer sited becomes more important
 - Need opportunities for customers to adopt DER and expand choices
 - Look at hosting capacity - ability for each circuit to integrate more rooftop DER
 - Lessons learned from NEM- systems sized to meet their needs; not aligned to when they consume power and how circuits were designed
 - Programs need to be better aligned so we don't incur more infrastructure costs (grid costs)
 - Making DER options accessible to customers, i.e. CBRE; for segments of customers that don't have rooftops or access to DER adoption
 - Leveraging the grid services that DER customers can provide
 - Considers the following and more factors when doing rate design
 - Provision of fair and equitable rates
 - Simple, easy to understand
 - Ease of implementation
 - Encouragement of customer load management

- Other – Such as elasticity in the demand of electricity
 - Does not have a declining rate for schedule J customers
 - Currently have a pilot ToU project with about 2500-3000 residential customers
 - There will most likely be a new ToU program to leverage AMI
- It is difficult to determine the effects of AES going offline will have on ToU rates.
 - The marginal costs will be analyzed closer to approaching 2022.
 - Hawaiian Electric acknowledges that there will be difficulty due to uncertainty in future investments.

Industry Perspective

Speakers:

- | | |
|--|--------------------------|
| • Chris DeBone, Managing Partner | Hawaii Energy Connection |
| • Marco Mangelsdorf, President | ProVision Solar Inc. |
| • Robert Harris, Director of Public Policy | Sunrun |

Discussion Summary:

- Solar sales in Hawaii are much lower than they were from 2011-2015
- Electricity costs today are at 2007 levels; Cost of PV+BESS today is at 2007 levels for PV.
- Estimating 6-18 months before the capacity caps on the Customer Grid-Supply Plus and Smart Export programs will be reached on Hawai'i Island
- Stacking services will be the value stream to drive DER adoption
- 80-90% of PV systems now include batteries.
- NEM – only 30% of the energy produced by the PV system is used by the customer. 70% of the energy is used at another time. Having a battery allows that energy to be stored and used at another time...virtual NEM.
- Try to solve the problem of using the assets smarter to the benefit of all rate payers.
- Will run out of space trying to reach the renewable energy goals. DERs will be in the mix.
- Need stability in the market
- Pricing signals - what is the true market value of DER?
- Hawaiian Electric must find mechanisms to incentivize customers to allow the use of part of their storage for grid functions.
 - Currently BESS's value is to offset their own usage, leaving little energy available for grid services.
- Provide greater value to grid services.
- It's a challenge with the various options to make it simple for customers to understand. There are a lot of tariffs.
- Other challenges include the delays in interconnection and permitting.
- Tariffs with China will result in price increases on products such as inverters due to the internal electronics.
- Electric Vehicles (EV)

- National studies show that people who adopt PV are also adopters of EV.
 - Inverters are being built with EV charger compatibility in mind.
 - Permitting is getting more complicated for EV's as higher amperage chargers are requiring higher house BUS.
 - Increasing charging on the grid increases load leading to allowing more PV without curtailment or batteries.
- Batteries
 - There will be an impact of Battery prices due to tariffs with China
 - The cost of batteries are dropping due to EVs. We're at the beginning stages, need scale.
 - The short-term trend for battery prices is going up
 - More manufacturers are handling the battery disposal
 - Out of 250,000 customers, Sunrun recycled about 30 systems
 - Reusing batteries for applications that require less efficiency will help to drive down battery prices
 - The price for individual cells are decreasing however the power electronics are not at a scale in which the prices can go down.
 - Commercial will most likely not adopt batteries as much of their load coincides with solar generation.
 - Limited 3 Phase batteries are also a barrier to entry for the commercial industry

Program Administrator Perspective

Speakers:

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|--|------------------------|
| ● Ian Morikawa, Manager, Distributed Energy Resources Programs | Hawaiian Electric |
| ● Gregg Kresge, Manager, Renewable Energy Projects | Maui Electric |
| ● Sue Lee, Supervisor, Engineering Administration | Hawai'i Electric Light |

Discussion Summary:

- Program Efficiencies
 - Online tools help to expedite the interconnection process
 - Information needs to be properly conveyed to the customers about their project
 - Some project delays are caused by developers sending in project revisions past the revision due date
 - This may require another interconnection study causing a delay
 - The reasons are not always being conveyed to customers
 - There are still some customers that need to be connected to the system
 - Oahu, Maui, and Hawaii Island work to keep consistent interconnection procedures
 - Recognize that each island and some areas on each island have their own unique requirements for interconnection
 - For example, Kahului has different requirements when compared to Hana on Maui

- Program Drivers
 - Main driver of NEM+ is to allow customers to add to their existing system to accommodate EV's
 - Program popularity heavily dependent on what the developers like and sell.
 - On Hawaii Island, there is a lot of smart export due to a successful developer marketing
- Barriers to PV/Battery adoption
 - High amount of renters
 - High amount of low-income residents
 - Safety concerns about the technology (specifically batteries)
 - Running into the problem where customers would like to add more, but they are out of roof space
 - Customers affected by the eruption on Hawaii Island are allowed to reinstall their system under certain stipulations

Electrification of Transportation

Customer Perspective

Speakers:

- Roger Morton, President and General Manager Oahu Transit Service
- Dan Ahuna, Director of Maintenance, Tour and Transportation Roberts Hawaii
- Rob Mora, New Market Manager Lyft

Discussion Summary:

- Lyft has a Green mode allowing customers to choose EV for their ride
- Roberts Hawaii is implementing hydrogen and 100% EV vehicles
 - Tariffs are a big factor in adoption
- For electric buses, energy cost should be about 40% less than fuel, but the O&M costs are still unknown
- Barriers for Renewable Fleet Adoption
 - Infrastructure for large fleets is not available and the largest barrier to EV adoption
 - Lyft utilizes contractors for their services. Many local contractors do not own EV.
 - They are creating a program that would provide contractors with vehicles allowing for the possibility of more EV's.
 - Electric buses are not close to the economies of scale and are very expensive
 - Decreasing bus ridership creates more forecast uncertainty and hesitation in future investments
- Multi-modal transportation is not as effective in rural areas, which includes much of Hawaii

May 23 FAWG Notes

Electrification of Transportation

Policy/Consultancy Perspective

Speakers:

- Matteo Muratori, Engineer, Integrated Transportation & Energy Systems NREL
- Thomas Maslin, Associate Director IHS Markit
- Jimmy Yao, Acting Director, Electrification of Transportation Hawaiian Electric

Discussion Summary:

- As of now, less than 1% of transportation in the U.S. is electric.
 - In Hawaii, EV's are about 2% of new car sales
- NREL has a model called EVI-Pro that will output the number of charges required to sustain a given amount of EV's
 - EV-Pro Lite is available for free
- In Hawaii, over half of oil use is for transportation
 - Half of that is from light-duty vehicles
- There are a lot of benefits to having ToU rates for EV's
 - There are many pilots studying this on the mainland
 - Studies have shown that TOU rates do impact customer behavior
- Most people do not need a full charge on their vehicles for daily use.
- The decrease in oil use will influence businesses
 - Example: The convenience store 711 gets many of its customers from people that purchase its gas.
 - Some places in Europe are starting to add EV's chargers to their petrol stations
 - How this affects customers that would not be able to adopt EV's and will still rely on gas has to be researched more
- Ford and GM have made room on their assembly lines for electric trucks
- Key Drivers for Adoption
 - Models forecast EV's reach cost parity with traditional ICE vehicles by late 20's early 30's
 - Future societal trends, i.e. large or small vehicles
 - Incentivize customers to charge during the daytime PV peak
 - If charging at home, EV charging cost will be around 60% compared to charging at the pump
 - Regulation such as a ban on ICE vehicle sales
 - Europe car trends tend to dictate American car trends
- Barriers to adoption
 - Trucks with long routes will have longer trip times due long charge times for a large battery
 - Lack of infrastructure for charging
 - Range anxiety regardless if the consumer does not actually drive that far

- Market demand for vehicles
- Customers in Hawaii love trucks
- Military usually bring their cars with them whenever they move

Energy Efficiency and Demand Response

Customer Perspective

Speakers:

- Keith Yamanaka, Energy Manager US Army Garrison-Hawaii
- Richard Chinen, VP of Store Operations KTA Super Stores
- Grant Chun, Executive Director Hale Mahaolu

Discussion Summary:

- Key Drivers for Adoption
 - Ease of certain projects and immediate impacts; quick return on investment
 - Example is LED retrofit
 - Rebates are a big driver for customers
- Barriers to Adoption
 - For military, projects take about 2-3 years to be implemented. In that time, energy prices go up and it is hard to justify the efficiency project upon completion when utility bill is still higher than previous.
 - Have to explain that the bill would have been larger if not for the efficiency upgrades
 - Hard to change people behaviors
 - Military frames it as saving on energy bills mean more money for bullets
 - For privatized housing, a baseline was established that would determine a family's nominal usage
 - Families would start using even more energy to increase their baseline
 - In the senior sites, behavior is sometimes dependent on the resident leaders
 - Policies with an adverse effect
 - In section 8 housing, tenants are given a fixed amount per month for energy and that is decreased if efficiency measures are implemented.
 - In some cases, the decrease was more than the efficiency causing the customer to pay more than they previously did
 - In the retail sector, certain colors are needed for displays that were not available as LED's
 - Adopting PV would not make financial sense without tax credit
 - HUD requires an energy conservation plan

Policy and Consultancy

Speakers:

- Yoh Kawanami, Manager Demand Response Program Hawaiian Electric
- Yvette Maskrey, Hawaii District Manager Honeywell Smart Grid Solutions
- Ingrid Rohmund, Senior Vice President Applied Energy Group, Inc.

Discussion Summary:

- Applied Energy Group plan to have preliminary results to share with the FAWG and final results by the end of the year
- DR is thought of as a peak shaving mechanism
 - Think of as an “act of controlling a DER resource”
 - Variable Frequency Drives, smart water heaters etc
- Customers are becoming increasingly more comfortable with home automation
- Military and other agencies that have strict internet security have difficulty implementing IoT solutions.
 - If it is implemented, any benefits are stripped from implementation as a result of security measures
- Economic potential looks at each individual action and assumes that each customer that will benefit will participate to come up with a max
 - Achievable potential is a more realistic set of assumptions on to what would actually happen

Electrification of Transportation

Policy and Consultancy

Speakers:

- Matteo Muratori, Engineer, Integrated Transportation & Energy Systems NREL

Discussion Summary:

- Clustering of adoption causes problems to specific distribution networks
 - People of similar socio-economic status tend to live in the same area
 - Adoption of PV and/or EV tend to trend in areas
- Value must be assigned to both smart (during peak PV) and “dumb” (coincident with nighttime peak) charging of EV’s.
- Forecasts based on historical data and do not consider trends from the next generation
- Innovation in how existing technology is used can bring down cost of EV charging
 - Using batteries in areas with high demand charge can bring down costs
 - In some pilots, rates reduced to 50 cents per kWh
 - Not much synergy between PV and DC Fast Chargers
- Potential resiliency issues at 100% renewable