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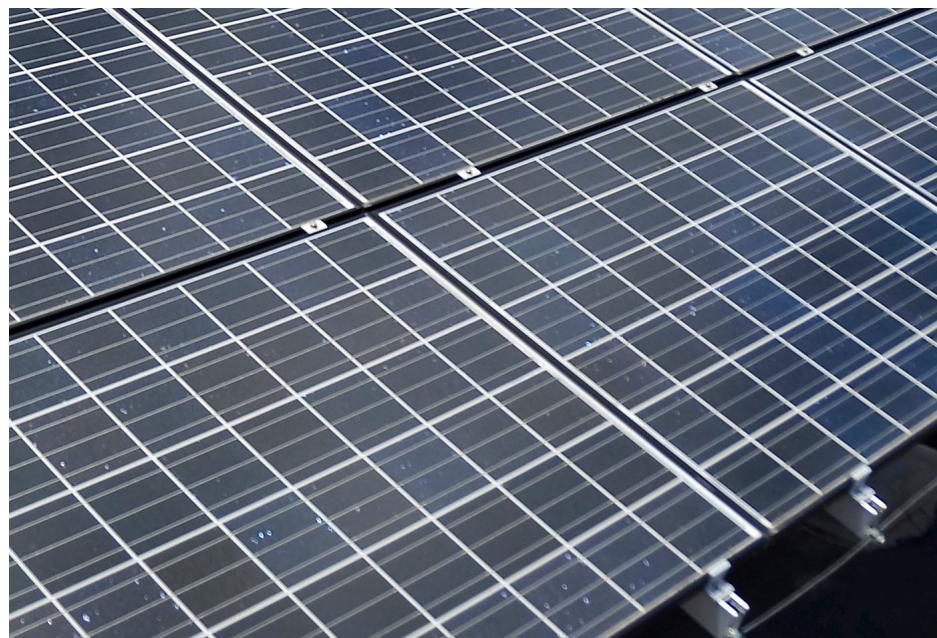
# GOVERNING GREEN POWER: HOW SHOULD UTILITIES OF THE FUTURE MAKE MONEY?

JUNE 18, 2018



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# How Should Utilities of the Future Make Money?

## A Report of a Conference in Honolulu, Hawai'i, April 12 – 13, 2018

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### Overview

This report summarizes a two-day conference that addressed how future electric utilities will make money, a question provoked by advances in renewable energy and other distributed resources that cast doubt on conventional regulatory and business models. Engagement with issues in all of the sessions was strong, giving expression to a wide range of observations, opinions and questions. This report attempts to capture what took place, but the high level of engagement makes it impossible to capture everything of importance. Conference participants are encouraged to share thoughts on what was omitted, under reported or misinterpreted by going to the conference website where this report is now posted:

<http://www2.hawaii.edu/~govgreen/events/conference2018.html>. This site soon will have a place for moderated commentary. Participants also can share feedback directly with the Governing Green Power Group.

### Acknowledgements

This conference would not have been possible without the funding support received from the Vice Chancellor for Academic Affairs at the University of Hawai'i at Mānoa, individual donors, and the invaluable administrative and logistical assistance provided by the University of Hawai'i Sea Grant College Program. We thank conference participants for their thoughtful and enthusiastic engagement with the issues, and to all of those who provided feedback on a draft version of this report. We have attempted to characterize the range of views fairly, but take responsibility for any remaining errors or misrepresentations.

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## I. The Goals of Governing Green Power

New Technologies have markedly reduced the cost of renewable energy, particularly wind and solar. Power from these sources varies uncontrollably, unlike traditional fossil fuel power plants, and new institutions are needed to manage them in an efficient and socially regarding way. We believe the institutional and regulatory framework associated with traditional power generation restrains us. Hawai'i, rich in renewable energy but isolated and unable to use transmission to help achieve its ambitious renewable energy goals, is on the leading edge in making these institutional and technological challenges. Governing Green Power's goal is to narrow the time lag between technological change and the associated institutional changes needed to make better use of advancing technology in the energy sector. If we can help navigate the required institutional changes, then this island state can have a broad regional and global impact in reducing fossil fuel emissions and limiting global warming.

## II. Who is with Governing Green Power?

The Governing Green Power group (GovGreen) is a diverse mix of faculty at the University of Hawai'i at Mānoa and others from the community who are intimately involved with our renewable energy transition. See Appendix A for its members. The GovGreen website is <http://www2.hawaii.edu/~govgreen>

## III. March 2017 Conference: "Realigning Institutions To Fit New Technologies"

This [first conference](#) brought together more than 30 people from Hawai'i and internationally who are exceptionally knowledgeable about the economics, engineering and policies governing the electricity sector. Using an agenda that allowed for rich but structured participation, they engaged in an open exchange of ideas about improving governance—rules, regulations and incentive mechanisms—in light of rapidly advancing renewable energy and information sharing technologies.

## IV. April 2018 Conference: "How Should Utilities of the Future Make Money?"

### A. Focus.

There is broad that the growth of renewable energy, economies of scale, rapidly falling storage costs, network communication technologies, customer self-generation, evolving load shifting options, among other things, will dramatically change the environment in which utilities operate. Such changes raise questions about whether how investor-owned utilities have traditionally made money -- rate of return on capital investments, cost of service, volumetric

rates -- will be feasible in the future. These questions were a point of departure for discussing options that will promote investor-owned utilities to generate revenues that are adequate, stable, efficient, aligned with the growth of renewable sources, and societally fair.

## B. Conference Attendees

About 40 invitees from Hawai'i joined the conference. (See Appendix A for names and affiliations.) Five traveled from the Neighbor Islands. Participants covered a broad range of expertise and interests in energy issues in the Islands, including the public utilities commission, electric utilities, state agencies, nonprofit organizations, and the university. Richard Sedano, President and CEO of the Regulatory Assistance Project, served as conference adviser, keynote speaker and respondent. The Regulatory Assistance Project provides assistance with changes in the policy and regulatory environment of energy systems in the United States, India, China and Europe.

## C. Proposed Conference Processes and Topics

GovGreen had many discussions about how renewable energy and distributed resources are challenging the traditional business model of investor-owned utilities. From these it was clear that the utility of the future will need to make money in a different way, and that our community needed an appropriate forum and process for addressing this.

The first afternoon of the two-day event would provide background ion the current regulatory structure, how renewable energy and distributed resources are changing the electric utility's natural monopoly, and how variable pricing and demand response can lower the social cost of renewable energy. Time also would be set aside for participants to learn about each other's work and get comfortable with the discussion format. The afternoon would end with a facilitated small group discussion: "What in your opinion is the biggest challenge with meeting our renewable energy goals, and how can we overcome it?"

The second day, Friday, was intended for small group discussions of two issues, each preceded by brief framing of the issues. The morning session would focus on *Alternatives to conventional cost-of-service regulation*, with discussion groups getting three performance-based regulation alternatives as points of departure. The afternoon session would focus on *Rate design in a high-renewable, low-marginal-cost future*. Both discussions would employ a process designed to reveal points of agreement and to clarify the reasons for differences.

## D. Changes to Planned Conference Processes

The conference's first day unfolded as planned. Changes were made beginning the morning of the second day at the start of session 3 in response to diversity of questions and comments following the background information. The conference remained in plenary and active discussion of performance based alternatives to conventional cost-of-service regulation

continued through the morning and after the lunch break. This lasted until mid-afternoon, at which point session 4 focused on rate design in a high renewables system. Small group discussions were followed by presentation of summaries. The altered conference process did not endeavor to identify consensus points or clarify disagreements as originally had been intended.

## E. Issues Discussed

Discussions in all of the sessions were energetic and characterized by a wide range of comments and questions. These summaries pull out the major themes observed, followed by a sampling of other points made.

### **1. Small group discussions: What in your opinion is the biggest challenge to meeting our renewable energy goals, and how can we overcome it?**

Major Themes.

- a. Leadership.** “Leadership” means different things to different people. Central to it in this context is individuals occupying roles critical to the state reaching its energy goals to bring to those roles vision, energy, commitment and readiness to make difficult decisions. The risk is that, without at least these components of leadership, movement will be lost to institutional inertia, conflicts of interest, and endless debates about the right course of action.
- b. Institutional Strength.** Institutions and organizations that lack adequate resources, effective policies and procedures, and sufficient insulation from shifting political climates can stymie even the right kind of leadership. The Public Utilities Commission is an obvious instance of this need, but this also applies to the utility, the Consumer Advocate, the Hawai‘i State Energy Office, and the University.
- c. Continuity vs. Rapid Change.** The importance of continuity for reaching Hawai‘i’s long-term goals competes with a sense of urgency to take dramatic action. The challenge is to find the right balance, to recognize what is required at what point, and to ensure that the need for continuity and predictability is not viewed as in competition with the need to take action. Rapid technological change and its attendant uncertainty mean it can be prudent to be experimental, which can be unsettling.
- d. Impact On Customers and Community.** Achieving the state’s clean energy goals will have predictable, and unpredictable, impacts on customers and communities. The impacts will include shifting energy costs, system vulnerabilities, initiatives not working out as expected, and the siting of infrastructure that changes view plains and land use. It is imperative to hear community and customer voices and to address the concerns raised by those voices.

**e. The Need For A Perspective Beyond Clean and Renewable Electricity.** The cost-effective integration of clean and renewable energy is a critical issue, but not the only one deserving attention. It is also important to address energy in the transportation sector, and the larger challenge of reducing greenhouse emissions through policies, such as a cap or taxes on carbon emissions. This broader perspective also should take into account how policies and actions in the Islands affect other people and places.

**f. A sampling of points made**

- The importance of aligning incentives with desired outcomes.
- Making better use of community give back packages.
- The need to give social equity a continuing priority.
- Rethinking/reworking contracts to better meet goals.
- Flexibility in policy and rules so important differences are taken into account.
- Recognizing the regulatory implications of markets evolving quickly.
- The benefits of developing rates that reflect unbundled costs and services.
- The costs of getting the last 15% of state goals.
- Balancing system subsidies.
- The need for transparency.
- The challenge of no reduction of electricity bills in the near term.

**2. Session 3 plenary discussions: Performance based regulation (PBR) alternatives to conventional cost-of-service regulation.**

The session began with a short presentation of three alternative regulatory models as generic alternatives.

- i. New PBR. Add new performance metrics to existing model that is largely based on cost of service.
- ii. New PBR and reduced rate of return. Reduce rate of return on utility's capital to a market-linked rate about half the current rate, and make utility "whole" through more weight on performance metrics.
- iii. PBR Only. Eliminate rate-of-return on utility's own capital and replace with performance metrics.

Cost of service regulation. The utility reports and justifies its costs to the PUC, are approved or not. Costs include operations and maintenance, fuel, purchased power, and a "fair" rate of return on the utility's own capital investments. For some observers the allowed rate of return has tended to far exceed competitive lending rates, leaving the utility little incentive to keep costs low or make wise investments. This in turn fosters growing conflicts between the utility's

capital and capital that might be provided by customers and independent power producers. An excessive rate of return also would be a disincentive to find less capital-intensive solutions that are not obvious to the PUC.

Performance-Based Regulation. PBR connects utility profit to outcomes instead of inputs. Outcomes can include realized cost, in which the utility keeps some or all cost reductions from the baseline approved by the PUC; penalties for excess outages; compensation for reduced pollution emissions; customer satisfaction; and indicators of system efficiency. The utility's management of resources it doesn't own is a new challenge to PBR. These include customer-sited generation (rooftop solar), distributed energy storage, demand response, and power and storage provided by independent operators. PBR also can focus on system wide costs and benefits that are affected by utility actions.

## Major Themes

### a. The Cost of Capital

How PBR, and/or changes in the allowed rate of return on the utility's capital investment, would affect risk and thereby affect the cost of capital. This includes the degree to which the cost of capital could be changed; how the ratio of equity and debt might affect the cost of debt; the importance of the utility as the sole buyer of power from independent providers, which is critical for financing of independent producers; how "Wall Street" might perceive a change in the revenue model that would diminish or remove explicit ties to the utility's capital investment; and how KIUC, the cooperative on Kaua'i, has secured a very low cost of capital.

### b. Roles of the Utility

Discussion about performance-based regulation led to a focus on the utility's roles, how they are changing, and how new roles might benefit from incentives. The newer roles included supporting customer generation and storage, enabling service providers, animating markets (such as trade among customers), providing customer-sided resources, and promoting electrification of transportation.

### c. Visions for the Future Utility

Discussion about the utility of the future evolved from how new utility roles could be incentivized. Some pointed to the PUC's inclinations document, a touchstone for many. A case was made for the future utility as a "platform" for network connectivity and sharing and trading data and resources. One participant referred to Amazon.com, which brokers goods and services, is itself a merchant, and is a platform for other merchants, data and information sharing. No strong differences of opinion were expressed about these visions and comments were different characterizations of a similar vision, albeit one still under development.

### d. Ways the utility can make money

One plenary session brainstormed the ways utilities can make money. A long list included: capital expansion, returns on equity investments in other firms, shared savings on projects, adder on financing for independent providers, pole rents for uses besides electricity distribution, performance incentive mechanisms (PIMs), demand/sales growth (if no decoupling), revenue for services, grants or government bailouts, improving heat rates, lowering operation and maintenance expenses below allowed levels on a rate case, unregulated operations, wholesale transactions (wheeling), financial services.

**e. Metrics for PBR.**

Discussion about new performance metrics was limited. Other regions are considering performance-based approaches and appropriate metrics. Noted examples included New York and the United Kingdom. SB 2939 indicates certain performance metrics to target. These include customer affordability, reliability, customer engagement and satisfaction, access to system information, rapid interconnection of renewables and distributed resources, timely execution of competitive procurement, and interconnection of third-party resources.

**f. A sampling points made**

- Opportunities for, and rules about, the utility making money in unregulated sectors.
- Differences of opinion about appropriateness of approved rate of return on capital investments.
- Growth of electric transportation increasing electricity sales, lowering costs.
- Distributed services require changes in rate design.
- Distributed services compete with the utility's capital expenditures.
- Revenue for electricity flowing in both directions.
- As the state goes forward with the new PBR legislation the utility will need to work to maintain investor confidence to avoid unintended consequences on renewable projects and customers.

**g. SB 2939 and New PUC docket**

Postscript note: A bill passed the legislature shortly before the conference that would

*“...establish performance incentives and penalty mechanisms that directly tie an electric utility revenues to that utility’s achievement on performance metrics and break the direct link between allowed revenues and investment levels.”*

Governor Ige subsequently signed the bill and, separately but just a few days before signing of the bill, the PUC opened a comprehensive docket to consider performance based regulation.

### **3. Session 4 small group discussions: Rate design in a high-renewable, low-marginal-cost future.**

#### Major Themes

**a. Unbundling costs.** Customer rates often do not reflect underlying costs of electricity and other services. Rate design ought to connect these as much as possible. The various service and time-varying costs of electricity need to be “unbundled” with rates reflecting the costs of service. This unbundling is increasingly challenging as capital costs begin to overtake fuel costs.

**b. Marginal cost pricing.** Volumetric (per-kWh) electricity rates exceed the marginal (incremental) cost in most times and places, and this can be inefficient because the extra cost of a little more electricity is far less than customers’ willingness to pay.

**c. Fixed costs.** Fixed costs do not vary with the amount of electricity used, such as poles and wires, power plants, operations and maintenance. These comprise a growing share of overall costs while fuel costs, once prominent, are declining. In the future, almost all costs will be fixed. Some argued there ought to be higher fixed charges (or customer charges) and volumetric rates that are more closely tied to the incremental cost of power. A fair and sensible way of allocating remaining fixed charges not captured by marginal cost pricing needs to be developed and vetted.

**d. Demand charges.** Broad concern was expressed about demand charges for commercial customers. These are charges that large-scale customers pay depending on their peak load (maximum use over any 15 minute period) during the previous month and year. The idea is to charge customers based on the degree that they affect capacity needs of the system. But since the peaks of individual customers do not align with the system peak, this can be inefficient. This is compounded by Hawai‘i currently having excess capacity, so much that even the system peak does not impose exceptional costs. Customers have a strong incentive to smooth load profiles using batteries, other energy storage, or their own generation in a manner that does not save system costs---in other words, wasteful spending that simply pushes costs onto other customers.

**e. Variable pricing.** Movement toward variable pricing is desirable as renewable energy penetration grows and the incremental cost of electricity becomes more variable. A lot of discussion focused on the value of time of use (TOU) pricing versus more flexible, but less predictable, real time pricing (RTP); whether variable pricing should be “opt in”, “opt out”, or mandatory, depending on the customer class and their use of distributed resources. The need to see how different variable rate structures would affect different customers also was discussed. Some worried about “rate shock.” Which customers should be targeted first, and when and where smart meters should be installed to accommodate variable pricing. Some large-scale commercial customers already have 15-minute interval metering, and some may have more opportunity for adjusting loads in the face of variable pricing.

#### **f. A sampling of points made**

- Customers need smart meters to learn their use and implement variable pricing.
- Demand charges should be tied to system peak instead of customer peak.
- Peak demand or peak demand net of non-firm (solar+wind) generation?
- A residential experiment with TOU rates had low participation.
- A tool is needed for customers to simulate bills with different tariffs.
- May need aggregators to buy and sell demand response services.
- Need to avoid “rate shock.”

#### **F. Areas of Agreement**

The discussion format that evolved meant there was no process for explicitly identifying areas of agreement and disagreement. However substantial agreement was evident on some issues during facilitated discussions.

One is the value of the conversation *per se*. We deviated from the agenda and at times, as someone noted, “there was a degree of uncertainty about what direction the conversation was taking.” The same person also observed that participants were remarkably engaged, enjoying the topics and each other. Much discussion was identification of issues, and this along side the candor in expressing opinions had merit *per se*. This underscores the value of a forum that builds relationships and lets people develop a shared language for talking about these complicated and interrelated issues outside of the docket process.

There also was substantial agreement that the role of the utility continues to evolve from the traditional vertical monopoly model, and significant discussion around new roles for the utility and how they feed into a vision for future utility structure. Many offered comments consistent with the idea of the utility becoming “a platform” for network connectivity and sharing and trading data and resources. Response to this idea was positive, but participants did not reach consensus on specific utility roles. Visions for the future utility are still under development.

The need to realign incentives to create a utility of the future also found general agreement. Differences surfaced about how best to do it but with little “drilling down” into the details of, for example, performance-based regulation.

Finally, there was agreement that the utility and the policy and rules that guide its transition to the future must prioritize the public good, not benefits to specific interests or individual segments of customers.

#### **G. Keynote Address: Richard Sedano**

Over dinner after the first afternoon of the conference Richard Sedano, President and CEO of the Regulatory Assistance Project (RAP), gave a keynote address. RAP is a nonprofit

organization that advises public utilities around the world on regulatory policy, energy efficiency, and power sector transformation. Richard formerly served as a commissioner for nine years and before that, held a number of engineering staff positions with the Vermont Department of Public Service. He brings a wealth of experience and knowledge about the way renewable energy and advancing technologies are changing utilities and regulators around the world. His keynote address ([slides here](#)) summarized the changes happening, the imminent changes that are inevitable, and shared some of the ways different countries are dealing with these changes, including China, India, Mexico, South Africa, South America and Europe. He indicated that no place has confronted utility profits and rate design as have some states in the U.S..

## V. Next Steps

This conference underscored the value of people with diverse knowledge, perspectives and interests exchanging ideas in a neutral setting. The question is not whether to continue this kind of discussion, but how, when, and with what focus. This is especially relevant in light of the state's new policy requiring adoption of performance incentives. Work needs to be done to develop appropriate performance metrics, while ensuring that other critical issues are not ignored.

It is clear that reducing greenhouse gas emissions involves more than the electricity sector. But there are good reasons to narrow our focus on renewable electricity. These reasons include the remarkable affordability of solar and wind power, the falling cost of battery storage, and the fact that many if not most energy uses, including transportation, can and likely will transition to electric power. The technical challenges surrounding intermittent renewables can be overcome, and these energy sources will likely comprise the core solution to our climate problem. The crux of the problem is no longer technical, but institutional.

The institutions that govern the electricity sector---mainly municipalities and regulated investor-owned utilities, and the Public Utilities Commissions that oversee them---evolved over a hundred years around centralized fossil fuel power plants and networked grids of wires. These institutions are, understandably, poorly suited to intermittent renewables and distributed resources. Because institutions are intrinsically slow to change, yet change is urgently needed, the goal of GovGreen is to aid in resolving this emerging disconnect between institutions and technology as quickly as possible. What Hawai'i learns from evolving our institutions for renewable energy will, in turn, help other parts of the world transition away from fossil fuels. This state is, of course, fortunate to be rich in renewable energy. More importantly, Hawai'i possesses the political will, community focus, and collaborative spirit to make the needed changes.

## Next steps for Governing Green Power

1. Issue Prioritization. Prioritize the most significant and timely issues, incorporating feedback from stakeholders. Many issues will be related to the new legislation on performance incentives. A deliberate effort also should be made to focus on issues not getting sufficient informed attention in other areas, such as thinking directly about the transition process, the real value of infrastructure investments in smart meters, and so forth.

2. Address the prioritized issues through:

Research.

Blog posts and exchanges. Governing Green Power and UHERO blogs:

<https://govgreenpower.com/>

<http://uhero.hawaii.edu/news/index/category:10>

Popular media (newspaper, Civil Beat....).

Involvement in the policy process.

Involvement in the rulemaking process.

3. Small Groups. Make use of small groups and focused discussions to bring together stakeholders and people with diverse expertise and institutional roles to develop working relationships and talk openly about priority issues in a neutral setting. The process might, for example, be called the GovGreen Focus Groups.

4. Share the Hawai'i Experience. Pay attention to the ways in which policies and cutting-edge initiatives in the Islands may benefit other places, and then look for ways to establish connections with those places. This could be done, for example, by extending invitations to activities and events in Hawai'i, targeted introductions to the GovGreen website, or to a particularly relevant blog.

5. Outside Expertise. Bring into the discussion of prioritized issues the knowledge, experience and perspective of people outside of Hawai'i who are working on the same issues.

## VI. Future Events

In the spring of 2019 GovGreen will hold its 3rd conference, bringing together national and international scholars, engineers, policymakers and other experts. While the agenda has not yet been set, it will focus broadly on the issues we have prioritized. Given how quickly things are changing, particularly with the attention now on performance-based regulation, we will strategically invite some visitors to give seminars and meet with local stakeholders and policymakers.

## Appendix A. The Governing Green Power Steering Group

Carl Bonham	Director, University of Hawai'i Economic Research Organization
Makena Coffman,	Professor and Chair, Urban and Regional Planning, UH Mānoa
Matthias Fripp	Assistant Professor, Electrical Engineering, UH Mānoa
Carl Freedman	Consultant
Mark Glick	University of Hawai'i Natural Energy Institute
Isaac Moriwake	Staff Attorney, Earthjustice
Dick Pratt	Professor Emeritus, Public Administration, UH Mānoa
Michael Roberts	Professor, Economics and Sea Grant, UH Mānoa
Sherilyn Wee	Division of Consumer Advocacy, State of Hawai'i

## Appendix B. Conference Participants

Paul Bernstein	NERA Consulting
Tim Blume	Kauai Island Utility Cooperative
Carl Bonham	UHERO – UHM
Colton Ching	Hawaiian Electric Company
Doug Codiga	Schlack Ito
John Cole	Hawai'i Natural Energy Institute
Makena Coffman	Urban and Regional Planning, UH Mānoa
Henry Curtis	Life of the Land
Kyle Data	Ulupono Initiative
Jose Dizon	Paniolo Power Company LLC
Carl Freedman	Haiku Design and Analysis
Matthias Fripp	Electrical Engineering, UH Mānoa
Mark Glick	Hawai'i Natural Energy Institute, UH Mānoa
Richard Harris	SunRun
Rene Kamita	Division of Consumer Advocacy, State of Hawai'i
Brian Kealoha	Hawai'i Energy
Shelee Kimura	Hawaiian Electric Company
Dawn Lippert	Elemental Excelerator
Matt Lynch	Center for Sustainability, UH Mānoa
Mina Morita	Energy Dynamics
Issac Moriwake	Earthjustice
Dean Nishina	Division of Consumer Advocacy, State of Hawai'i
David Parsons	Public Utilities Commission, State of Hawai'i
Jennifer Potter	Hawai'i Natural Energy Institute, UH Mānoa
Dick Pratt	Professor Emeritus, UH Mānoa

Michael Roberts	Department of Economics, UH Mānoa
Rick Rocheleau	Hawai'i Natural Energy Institute, UH Mānoa
Richard Sedano	Regulatory Assistance Project (Keynote speaker)
Scott Seu	Hawaiian Electric Company
Gerald Sumida	Carlsmith Ball
Nori Tarui	Department of Economics, UH Mānoa
Maria Tome	Public Utilities Commission
Miles Topping	Director of Energy Management , UH Mānoa
Richard Wallsgrove	Richardson School of Law, UH Mānoa
Sherilyn Wee	Division of Consumer Advocacy, State of Hawai'i
Chris Yunker	Hawai'i State Energy Office

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