

ISOLATED POWER SYSTEM CONNECT 2018



IPS CONNECT MAUI ORGANISING COMMITTEE

Chair: Professor Michael Negnevitsky – University of Tasmania

Secretary : Ben Thiessen – Conference Designs

Professional Development Committee:

James Hamilton - University of Tasmania

Xiaolin Wang - University of Tasmania

George Roe - Alaska Centre for Energy and Power

Jennie Potter - Hawaii Public Utilities Commissioner

Simon Benmarraze - International Renewable Energy Agency

Workshop Committee:

Frederick Redell – Maui County Office of Economic Development

Jeanne Skog - Jeanne Unemori Skog LLC

Richard Rocheleau – Hawaii Natural Energy Institute

Jeremy Kasper – Alaska Centre for Energy and Power

Simon Gamble – Enernet Global

David Pollington – UPC Renewables

Ray Massie – Hydro Tasmania

James Hamilton – University of Tasmania

Xiaolin Wang – University of Tasmania

Marc White – Goanna Energy

Jennie Potter - Hawaii Public Utilities Commissioner

Simon Benmarraze - International Renewable Energy Agency

Frank De Rego - Maui Economic Development Board

FOREWORD

Message from the Chair

Globally, the electrical power industry is undergoing significant change, and in the next 10 years, it will undergo more changes than in the last century. In opposition to network growth, Australian utilities are among the first participants to consolidate their distribution networks, actively disconnecting edge of grid communities. This step-change in market approach and participation is creating enormous opportunity for new thinking and innovative technologies and approaches. The power industry has to become smarter, much more flexible and deliver new products and services to the customer.

The power grid is transitioning from a traditional system of poles and wires to a high-tech network – the “smart grid”. The smart grid and distributed generation technologies are demanding a new generation of engineers equipped with a much more diverse skillset than ever before. Only innovative smart solutions will assure the affordable, reliable and environmentally responsible electricity supply for the future.

This workshop aims to expand the success of IPS Connect events across Asia Pacific. For 2018 this experience is brought to North America, facilitating truly global knowledge sharing and capacity building. The successful professional development course and energy hack-a-thon will be supported by an excellent team of international, national and local speakers who will address a focused syllabus covering integration of energy storage in isolated power systems, increasing PV penetration, microgrid technologies and customer expectations. The workshop presenters and attendees will discuss their experiences and share latest developments in the field of remote area power supply.

We gratefully acknowledge the support of our sponsors, the County of Maui, Maui Economic Development Board, the International Renewable Energy Agency (IRENA), Pacific Power Association (PPA), Hawaii Natural Energy Institute, Goanna Energy Consulting and the Centre for Renewable Energy and Power Systems, University of Tasmania. Such support goes a considerable way to ensuring the success of this workshop.

On behalf of the organising committee I have great pleasure in welcoming you to what we are sure will be a most stimulating and worthwhile event.



Professor Michael Negnevitsky
IPS CONNECT Maui Chair

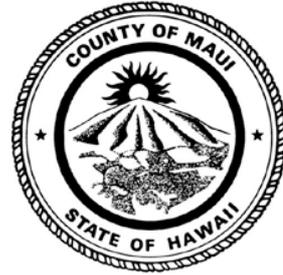


Building Pathways to Innovation, Jobs, and Opportunity

Join us at the 2019 Maui Energy Conference | March 27 & 28

Maui Arts & Cultural Center | mauienergyconference.com

www.medb.org | 1.808.875.2300



OFFICE OF THE MAYOR

County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

A MESSAGE FROM MAYOR ALAN M. ARAKAWA

Aloha kakou,

On behalf of the County of Maui, it is my pleasure to welcome you all to the 2018 Isolated Power Systems Connect Conference. Our Mayor's Office of Economic Development and the Maui Economic Development Board are proud to be hosts of this event. This conference is a unique opportunity for industry, academia, and international experts working in the field of remote area power supply and isolated power systems to connect, discuss and share their ideas, present results, reflect on past experiences and discuss future projects.

Over the next three days you will have the opportunity to attend panels with internationally-recognized experts and interact with individuals and businesses from across the world along with visiting some great projects on Maui. Your deep participation in this conference will be a big part of its success. We appreciate you coming to Maui to share what is working in your home location so we all can continue to collaboratively improve our futures.

We gratefully acknowledge the many partners and sponsors and their generous contributions that have helped bring this conference to Maui. A special mahalo to the University of Tasmania for working with us and bringing such an important event here.

Best regards,

A handwritten signature in black ink, appearing to read "Alan Arakawa". The signature is fluid and cursive.

Alan M. Arakawa
Mayor, County of Maui

SHAPING MAUI COUNTY'S ENERGY FUTURE!



**MAYOR'S OFFICE OF
ECONOMIC
DEVELOPMENT
MAUI COUNTY**

GENERAL THEME – IPS CONNECT 2018

The workshop is convened by the Centre for Renewable Energy and Power Systems, University of Tasmania, to expand last year's successful IPS Connect Rottneest Island. For this year's event we are excited to expand the professional development course proceeding the workshop, with support from the International Renewable Energy Agency (IRENA), Hawaii Natural Energy Institute, Artic Remote Energy Network Academy (ARENA), and the Pacific Power Association. The workshop will engage, share and connect the latest developments in remote area power technologies with utility owners, remote area communities and system operators and engineers.

The workshop will be hands on, including case studies of Australian, Alaskan and Hawaiian hybrid diesel power systems. A number of technology tours will also be undertaken with local utility support.

VENUE

Connect 2018 will be held at the Ka'anapali Beach Hotel
2525 Ka'anapail Pkwy, Lahania HI 96761, United States of America
<https://www.kbhmaui.com/>

MAUI

An essential guide to the services and events on Maui can be accessed at the following address:

<https://www.gohawaii.com/islands/maui>

<https://www.gohawaii.com/islands/maui/travel-info/transportation>

The guide includes events, weather forecast, in addition to a map of the island.

SUPPORTER LINKS

<http://www.utas.edu.au/centre-for-renewable-energy-and-power-systems>

<http://arena.alaska.edu/>

<http://acep.uaf.edu/>

<https://www.hnei.hawaii.edu/>

<https://www.medb.org/>

<http://www.irena.org/>

<https://www.mauicounty.gov>

TRANSPORT/TRANSFERS

Kahului Airport (OGG) is Maui's main airport, and where most visitors will arrive. Travelers arriving on Maui can take a taxi to most resort and hotel destinations, and private airport transfers can also be booked ahead of time. Some hotels in larger resort areas like Kaanapali offer complimentary shuttles to nearby towns and attractions, but airport transportation typically costs extra.

Visitors who are itching to get out and explore can rent a car at Kahului Airport or Kapalua Airport. Other Maui transportation options include tour buses, trolleys, electric bicycles and city buses.

BROADBAND & PHONES:

International travelers need GSM multiband phones. Buy prepaid SIM cards locally. Cell-phone coverage is good on most of Maui. Verizon has an extensive cellular network on Maui, and AT&T and Sprint also have decent coverage.

The venue will have wireless broadband available to all attendees
To call an ambulance, or for medical emergencies, dial 911

NETWORKING DAY

Thursday October 18th has been put aside, as a variety of different events, encompassed in a full day coach tour of the island. The tour will include:

- Kula Sola Farm
- Auwahi Wind Farm
- Maui Brewery Co. Micro-grid and Storage Project
- Picnic Lunch
- Afternoon Pupu (Hawaiian platter)

CATERING: We will provide:

- Lunches, morning and afternoon teas on **Monday, Tuesday, Wednesday, Thursday and Friday.**
- Dinner on **Monday and Wednesday** (Lu'ua) evenings.
- Breakfasts: **No breakfasts** will be provided other than those options your accommodation host provides.

REGISTRATION

The Registration desk will open from 8.00 am on the morning of your first event.

NAME BADGES

Each delegate to the Workshop will receive a name badge on registration. The badge is your official pass and should be worn to obtain entry to all sessions, morning and afternoon teas, lunches, and the dinner.

SPECIAL NEEDS

Every effort has been made to ensure people with special needs or diets are catered for. Should you require any specific assistance, please inform the Ben Thiessen via email (ben@conferencedesign.com.au).

NO SMOKING POLICY

All events have a firm **No Smoking** Policy. Please refrain from smoking inside the venues and at all associated functions unless using a designated smoking areas.

MESSAGES AND ANNOUNCEMENTS

There is a message board at the Registration Desk. All private messages, general housekeeping announcements, and changes to the program will be placed here. Announcements in Plenary sessions will be kept to a minimum.

CURRENCY

Exchange rates vary considerably and should be checked on departure. Local banks will be able to change money. While it is possible to use credit cards for most purchases, many service industries rely on cash tips for staff, so some cash holding is recommended when visiting.

EMERGENCY CONTACTS

Emergency information and important contact numbers you should take with you.

Emergency Contact Numbers

Fire / Police / Ambulance (life threatening cases) – 911

Non-emergency Contacts

Maui Visitors Bureau (Maui County) Phone: (808) 244-3530

USEFUL WORDS AND PHRASES

Beyond just seeing the sights, one of the best ways to celebrate Hawaiian culture is to speak the language. By trying out a few of these phrases on your trip, you can become truly part of the landscape.

Aloha (and its variations)

Even though you'll often hear aloha used as a greeting, it's also a way of life. "Aloha is about acknowledging time, space, and relationship within your community," Embernate said. You can use aloha to send out kindness, positive intentions, and respect to others. On your trip, you can get familiar with aloha by using it at four different times of the day.

Aloha kakahiaka: Pronounced a-lo-ha kah-kah-hee-yah-kah

Use this phrase to say good morning.

Aloha awakea: Pronounced a-loh-ha av-ah-kay-ah

You should use this variation of aloha when it's late morning. It roughly translates to "good noontime."

Aloha 'auinalā: Pronounced a-loh-ha ah-wee-na-lah

Try this out when you want to say good afternoon.

Aloha ahiahi: Pronounced a-loh-ha a-hee-yah-hee

This one means good evening. Watch your pronunciation because "ahi" means tuna. You can prevent yourself the embarrassment of saying "tuna tuna" by using something called a "y-glide" in the middle of the word. Instead of saying "a-hee a-hee," pronounce it like "a-hee-yah-hee."

Lū'au: Pronounced loo-ah-oo

Hopefully, you're going to experience the wonder of a lū'au on your trip. This event is so much more than a party that includes hula dancing. The word lū'au itself actually refers to leaves of the taro plant, which has great significance in the Hawaiian culture. You're bound to find taro in more than a few dishes during this celebration.

Mahalo: Pronounced mah-hah-loh

Mahalo means thank you. It appears on a lot of trash can doors, so a lot of tourists think it means garbage. Not so! Get even more specific with your mahalo by adding a few extra words. Mahalo nui (pronounced mah-hah-loh noo-ee) means "thank you very much." And if you really appreciate something, you can say mahalo nui loa (pronounced mah-hah-loh noo-ee loh-wah).

Wahine: Pronounced vah-hee-neh

Looking for the women's bathroom? This word will be on the door.

Kāne: Pronounced kah-neh.

This word will appear on the men's bathroom door.

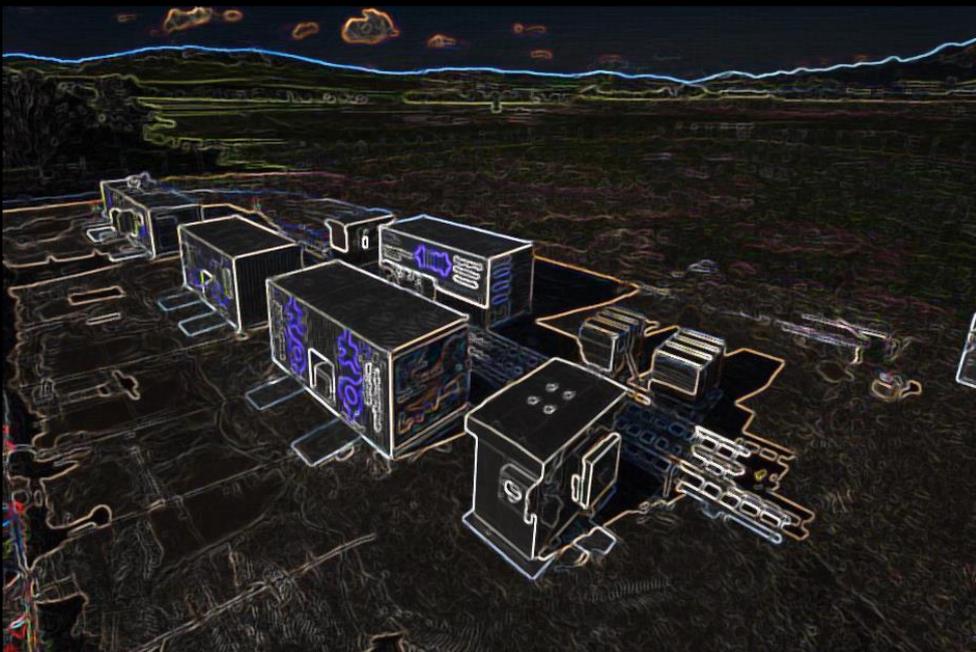
'A'ole pilikia: Pronounced ah-oh-leh pee-lee-kee-yah.

Use this phrase if someone thanks you. It means "you're welcome."

E kala mai: Pronounced eh kah-lah mah-yee.

Spill your drink or bump into someone in a crowd? You can use this phrase to apologize or say excuse me.

ISOLATED POWER SYSTEM CONNECT 2018



Ray Massie

Manager Off-Grid Hybrid Solutions, Hydro Tasmania

Flinders Island Hybrid Energy Hub



Hydro Tasmania are Australia's largest renewable generator, and have a comprehensive track record in assisting remote island communities switch to reliable clean energy systems. The Flinders Island development involves integration of wind and solar generation with the existing diesel power station and the installation of enabling technology, such as a control system, flywheel, dynamic resistor and battery energy storage. Hydro Tasmania has worked with Tasmanian manufacturers to develop a series of modular units to house and ship the enabling technologies essential to the energy solution. Since commissioning in late 2016 the Flinders Island hybrid energy hub has run 100% renewable for approximately half of the time.

With 30 years' experience, Ray continues to be a key player in developing Hydro Tasmania's renewable energy technology expertise. He currently manages a multi-disciplined team of people, identifying and developing project solutions and design innovations for hybrid energy solutions for both internal and external customers.

He managed the development phase of the Hydro Tasmania iconic King Island Renewable Energy Integration Project (KIREIP) and continues to undertake a similar role for a number of projects covering a wide geographic spread.

Simon Gamble

Chief Operating Officer, Enernet Global

Independent Power Producers and Micro-grid Development



Enernet global implements microgrids in the traditional off-grid sectors, such as remote communities and the mining sector. In recent months the deployment of microgrid technology to grid connected clients in the commercial and industrial sectors is becoming more prevalent, as behind the meter solutions are offering cost effective solutions to traditional retailed energy services. Commercial microgrids also offer enhanced energy services with increased levels of energy security and reliability and the prospect for seamless islanding where grids offer less than acceptable reliability. Enernet will outline how the economics of solar PV and energy storage, and the integration of these systems into on-site load and demand management is driving a whole new class of renewable microgrids.

Simon is chief operating officer and Asia Pacific managing director for Enernet Global. Simon was formerly with Hydro Tasmania including roles as Manager, Hybrid Off-Grid Solutions and Project Director for the King island Renewable Energy Integration Project (KIREIP). Simon was awarded a 2010 Fulbright Academic Exchange Scholarship, having previously been acknowledged under the Australia Korea Foundation: Next Generation Leaders Program.

John Whybrow

Smart Islands Programme Lead, Hitachi Europe

Isles of Scilly, Smart Energy Islands



The energy sector is going through a technological and regulatory transformation as electricity becomes an increasingly dispersed and flexible form of energy. On the Isles of Scilly in the far south-west of the United Kingdom, the Hitachi-led Smart Energy Islands project (part-funded by the European Regional Development Fund) is taking advantage of huge technological opportunities and changes. Working with two of the UK's leading smart home technology companies, PassivSystems and Moixa, Hitachi is installing its IoT platform to balance electricity demand and supply on some of the UK's most protected yet carbon-intensive islands.

The £10.8 million project is demonstrating how solar power, batteries, smart heating technologies and electric vehicles can be used to help support the islands' energy system and reduce bills for the whole community.

John Whybrow is the Smart Islands Programme Lead for Hitachi Europe Ltd. based in Maidenhead, UK and delivering on Hitachi's global strategy for Social Innovation Business. Since January 2016 John has helped Hitachi and the Smart Islands Partnership develop a programme of activity to sustainably and affordably tackle some of the Isles of Scilly's main infrastructure and resource issues, whilst providing a model for how other communities can benefit from the transition to a low carbon economy.

Gwen Holdmann

Director, Alaska Centre for Energy and Power, University of Alaska Fairbanks

Alaska Hybrid Diesel Application



ACEP's mission is to develop and disseminate practical, cost-effective, and innovative energy solutions for Alaska and other regions with similar energy struggles. As Director of ACEP, Gwen spearheaded the creation of several programs within the organization to help it accomplish its goals. These programs vary in purpose and scope and have allowed ACEP to delve into research specialties such as hydrokinetics, power systems integration with a focus on microgrids, development of innovative data collection techniques, and creation of economic analysis for a variety energy related purposes.

Gwen Holdmann is the Director of the Alaska Center for Energy and Power (ACEP), which is an applied energy research program based at the University of Alaska Fairbanks focusing on both fossil and renewable/alternative energy technologies. Prior to joining the

University of Alaska, Gwen served as the Vice President of New Development at Chena Hot Springs Resort near Fairbanks. While at Chena, Gwen oversaw the construction of the first geothermal power plant in the state, in addition to numerous other innovative energy projects ranging from hydrogen production to cooling a 10,000ft² ice museum year-round using 150°F hot water. Gwen has been the recipient of several awards throughout her career, including an R&D 100 award, Project of the Year from Power Engineering Magazine, the Alaska Top 40 Under 40 Award.

Sriram Emani

Vice President of Operations at Younicos

KWP II Battery Park, Maui, Hawaii



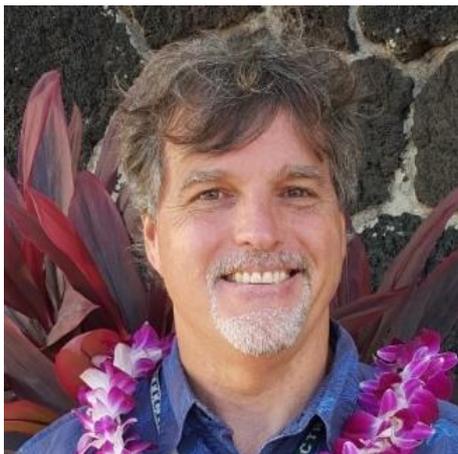
Younicos (an Aggreko company) are delivering a 10 MW/20MWh battery-based energy storage system at the site of the Kaheawa II Wind Farm. This turn-key project includes the use of sophisticated thermal management and fire protection systems for the state of the art Lithium-ion battery system. The batteries will be utilized for capacity firming to smooth wind variability. The system provides 10 MW each of “up reserve” and “down reserve” capability. In addition the system maintains the PPA-required ramp rate of ± 2 MW/minute. Per MECO requirements, the system also provides fast and accurate inertial frequency response for any frequency deviations outside of 59.9 Hz – 60.1 Hz. The utility can also dispatch the storage system via Automatic Generation Control (AGC) to increase or decrease its output at any time to support grid needs. It thus provides multiple services simultaneously while also prioritizing services automatically as defined.

Sriram holds Bachelors and Masters Degrees in Electrical Engineering, and is a licensed Professional Engineer in the State of Texas. Sriram excels in hands-on product development and project delivery. He has led the design, development, engineering, construction, installation, testing & monitoring of world’s largest energy storage facility to be tied with a wind farm at Notrees, Texas. In the current role, Sriram leads the functions of Project Engineering, Project Management, Global O&M, Global Supply Chain, Operations Engineering and manages all aspects of energy storage based project delivery.

Chris Reynolds

System Operations Manager, Maui Electric Company

Molokai Case Study



The Maui Electric Company serves 71,000 customers across Moloka’i, Lana’i and Maui. Moloka’i has a system peak load of 5.8MW, served by 2.3MW of solar PV. Lana’i has a system peak load of 5.9MW, served by 1.5MW of solar PV. Maui has a system peak load of 190MW, served by 105MW of solar PV and 72MW of wind generation.

The 100% Renewable Energy Moloka’i initiative focuses on improving power system operation with high penetration levels of distributed photovoltaics (PV) on a small electrically islanded grid with the goal of reaching 100% of renewable energy.

Chris Reynolds is an experienced system operations manager with a demonstrated history of working in the utilities industry. Chris is a strong information technology professional, skilled in Wind Energy, Smart Grid, Energy Policy, SCADA, and Electric Power. Recent major projects include the Maui Smart Grid project, Wailea BESS, Maui JUMPSmart and the 100% Renewable Energy Moloka’i initiative.

Richard Rocheleau

HNEI Director, Hawaii Natural Energy Institute

Hawaii's 100% Renewable Energy Goals: Policy, Challenges and Opportunity



Although the Hawaiian Islands are blessed with an abundance of renewable energy sources, and have the nation's most aggressive renewable energy standards, the state still rely heavily on fossil fuels. With isolated (unconnected) island grids and sparse systems on some islands, integration of the intermittent renewable generation systems has been challenging. The Hawaii Natural Energy Institute (HNEI) at the University of Hawaii has initiated an integrated effort involving modeling, testing, and demonstration to identify and validate pathways to higher renewable integration. In this talk, I will discuss the analysis being used to identify strategic paths forward and will describe several projects currently underway including the Maui Smart Grid Demonstration Project, the Smart Grid Inverter Project and several grid-scale battery energy storage projects.

Richard Rocheleau (PhD, Chemical Engineering, University of DE), has over 35 years of experience in renewable energy, with an emphasis in the areas of photovoltaics, hydrogen fuel cells, and energy systems. Dr. Rocheleau joined the faculty of the Hawaii Natural Energy Institute at the University of Hawaii in 1988 and was appointed Director in 2000. Under his direction, the Institute is leading the development of public-private partnerships focused on the development, testing and integration of alternative energy technologies into the electrical grid. HNEI has major funding from the US Department of Energy and the Office of Naval Research.

Colton Ching

SVP Planning & Technology, Hawaiian Electric Company

Hawaii's IGP Planning Program



Hawaiian Electric serves 95% of Hawaii's electric customers with a service area made up of five separate islanded electric systems. At 27% RPS with 17% of its customers deploying various rooftop solar systems, Hawaiian Electric has taken a leading role in the integration of renewable and DER systems. Colton has responsibility for planning Hawaiian Electric's 100% renewable energy grid and integrating needed new technologies into the system. He previously served as Vice President of Energy Delivery as well as Vice President of System Operation and Planning and has 27 years of utility experience.

In addition to his work at Hawaiian Electric, Colton serves on the Metro Board of Directors of the YMCA of Honolulu, the Executive Board of the Aloha Council Boy Scouts of America, and on the Advisory Council to the State of Hawai'i Emergency Management Agency. Colton is also one of 13 inaugural cohorts in the Omidyar Fellows Leadership program. Colton was born and raised on the island of Maui and is a graduate of the University of Hawai'i at Mānoa where he received a degree in Mechanical Engineering. He now calls Kāne'ohe home where he resides with his wife Vicky and their son Jacob.

Leon Roose

Principal and Chief Technologist, Hawaii Natural Energy Institute

Grid Start and Smart Grid Programs



Since spring 2017, Hawaii Natural Energy Institute (HNEI) has been developing a fully integrated, low-cost, high-fidelity grid power monitor. Once fully validated, this device will be utilized to support HNEI's smart grid research and field demonstration by enhancing real-time visibility and control of the electric grid under high penetrations of renewable energy. HNEI has designed and built several iterations of the power monitor. The third version has been deployed to Okinawa Japan and at a Project Frog building at University of Hawaii's (UH's) College of Education. The fourth version, which is undergoing software development, adds significant real-time computational capability for analysis and controls using a field-programmable gate array (FPGA).

Leon joined the Hawaii Natural Energy Institute in 2012 as a faculty Specialist where he has spearheaded the formation of GridSTART (Grid System Technologies Advanced Research Team), an HNEI research team focused on the integration and analysis of energy technologies and power systems, including smart grid and micro grid applications. He was with the Hawaiian Electric Company for 19 years prior serving in numerous management roles, most recently directing the System Integration Department.

Jennifer Potter

Commissioner of the Hawai'i Public Utilities Commission

Demand Side Management and Grid Services



The State of Hawaii Public Utilities Commission was established in 1913. The Commission's primary duty is to protect the public interest by overseeing and regulating public utilities to ensure that they provide reliable service at just and reasonable rates. The Public Utilities Commission (PUC) regulates all chartered, franchised, certificated, and registered public utility companies operating in the State; reviews and approves rates, tariffs, charges and fees; determines the allowable rate of earnings in establishing rates; issues guidelines concerning the general management of franchised or certificated utility businesses; and acts on requests for the acquisition, sale, disposition or other exchange of utility properties, including mergers and consolidations.

Commissioner Jennifer Potter was appointed to the Public Utilities Commission by Governor Ige in March 2018 for a term to expire June 30, 2024. Jennifer was previously a faculty member at the Hawaii Natural Energy Institute (HNEI). Prior to joining HNEI, Jennifer was a Sr. Scientific Engineering Associate at Lawrence Berkeley National Laboratory. Jennifer is an experienced analyst and project manager, dedicated to data-driven decision making and solutions to improve efficiency and effectiveness. Jennifer has spent ten years in the electric utility industry in a variety of roles. Jennifer specialises in energy policy and legislation, electric pricing pilots, consumer behavior analytics, statistical modeling and forecasting, customer and generation energy profiling and analysis, and cost-benefit and financial analysis.

Frederick Redell

Energy Commissioner, County of Maui

Economic and Market Perspectives



The purpose of our office is to support economic development on Maui that is sensitive to our unique island environment. This includes both projects that create energy from renewable sources and energy projects that save money through conservation.

If you own an existing business in Maui County, or are looking to start a new business, we can provide general information about various government incentive programs that might apply to your project.

If you are a resident of Maui County, we have a range of information available to assist with energy education.

Fred was previously the Managing Director of Abengoa Solar's US Business. Prior to joining Abengoa he owned an engineering company specializing in energy facility development. Fred has worked in several roles over his career including operations, engineering, project management, and most recently as the General Manager for the Mojave Solar Project. Fred is a graduate of the Naval Nuclear Power Program, has served on two submarines and has a Professional Engineer license (Mechanical) in the State of California. His education includes an MSME from the University of California, San Diego, a BSME from the University of Illinois, Chicago, along with executive and management education at Georgetown University.

Worajit Setthapun

Dean at Asian Development College for Community Economy and Technology, Chiang Mai Rajabhat University, Thailand

Chiang Mai World Green City (CMGC)



Asian Development College for Community Economy and Technology (adiCET) facilitates sustainable development of the local community. adiCET established the Chiang Mai World Green City (CMGC) as the living laboratory for green technologies. CMGC is developed from over 60 sustainable energy research and development projects. CMGC covers over 3 hectares and comprised of 3 distinct zones. Zone A is the 100% renewable energy-based Smart Community with DC/AC microgrids. Zone B is the green college. Zone C is the Green Technology Exhibition and Training Center. CMGC and the Smart Community focuses on the implementation of Community Power for small rural communities. The aim is to develop an affordable/appropriate sustainable energy system to enhance the livelihood and occupation of the community. adiCET provides short course and technology transfer training at the CMGC and in the local community.

Dr. Worajit Setthapun is the Dean at the adiCET, Chiang Mai, Thailand. She received her MS and PhD from University of Michigan, Ann Arbor, and Argonne National Laboratory. Currently, she manages the Graduate Program in Community Energy and Environment, and oversees the Renewable Energy Research and Training Center in the Chiang Mai World Green City. She was the ASEAN-U.S. Science and Technology Fellow and worked at the Ministry of Energy, Thailand on the Thailand's Decentralized Community Power Project.

Gooi Hoay Beng,

Associate Professor, School of Electrical & Electronic Engineering, Nanyang Technological University, Singapore

Renewable Energy Integration Demonstrator - Singapore (REIDS)



Off-grid microgrids will increasingly become the key energy infrastructure to address the need for better and more affordable energy access in Southeast Asia. To support development of microgrids in Southeast Asia, NTU is leading the Renewable Energy Integration Demonstrator - Singapore (REIDS) project, which will be the largest hybrid microgrid test and research platform in the tropics. REIDS is strongly supported by the Singapore Economic Development Board (EDB) and the National Environment Agency (NEA). REIDS and its partners are testing and demonstrating the integration of solar, wind, tidal, diesel, storage as well as waste-to-energy and power-to-gas technologies as well as other production, storage, end-use technologies and solutions suitable for deployment in Southeast Asia.

H. B. GOOI received his PhD degree from Ohio State University in 1983. From 1983 he was an Assistant Professor in the Electrical Engineering Department at Lafayette College, Easton, Pennsylvania, USA. From 1985, he was a Senior Engineer with Empros (now Siemens), Minneapolis, Minnesota. In 1991, Dr. Gooi joined the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore as a Senior Lecturer. In September 2008, he was appointed Deputy Head of Power Engineering Division.

Chris Pye

Division Manager – Renewable Energy, ComAp

Microgrid Co-ordination and Control



Remote places are often located outside of the national electricity grid reach and therefore, have to use their own micro-grids to generate electricity. Usually these micro-grids rely heavily on diesel gensets. However, when the gensets are combined with renewable energy sources we speak about hybrid systems. With hybrid systems two goals are always crucial - save fuel and system reliability. ComAp have recently completed projects in Vanuatu and Kiribati which demonstrate some of the integration challenges unique to hybrid systems.

Vanuatu is a small island nation located in the South Pacific Ocean. The Republic of Kiribati is an island nation in the Pacific Ocean.

Chris is a chartered electrical engineer with over 10 years' experience, specialising in generator control systems. Chris has designed, tested and commissioned packages to suit a wide array of applications and industries and is currently the Division Manager for ComAp's Renewable Centre of Excellence (RCE). ComAp's RCE is dedicated to developing products and solutions that meet the growing needs of the renewable energy market

Andrew Daka

Executive Director, Pacific Power Association

Renewable Ready Pacific



The PPA is an inter-governmental agency and member of the Council of Regional Organisations in the Pacific (CROP) to promote the direct cooperation of the Pacific island power utilities in technical training, exchange of information, sharing of senior management and engineering expertise and other activities of benefit to the members.

The PPA's objective is to improve the quality of power in the region through a cooperative effort among the utilities, private sector and regional aid donors. The PPA's members pool their resources and expertise for their common benefit, gain international representation and improve access to international power sector assistance programmes.

Andrew Daka is currently Executive Director of the Pacific Power Association (PPA) an inter-governmental agency and member of the Council of Regional Organizations in the Pacific (CROP) to promote the direct cooperation of the Pacific island power utilities in engineering expertise, technical training, exchange of information, sharing of senior management and and other activities of benefit to the members.

The PPA provides direct links between the private sector and member utilities to improve private sector services and thus make their presence in the region more productive.

Simon Benmarraze

Analyst, International Renewable Energy Agency

Small, Strong and Resilient Islands: Insights from the IRENA SIDS Lighthouses Initiative



Launched at the 2014 Climate Summit, the SIDS Lighthouses Initiative supports the development of a global framework for energy transition on islands. By 2020, it aims to:

- Provide islands members renewable energy roadmaps;*
- Mobilise USD 500 million;*
- Deploy 120 MW of renewable energy capacity.*

The Initiative facilitates coordinated support for islands to transform their predominantly fossil-based power systems to renewable energy through partnerships with public, private, intergovernmental, and non-governmental stakeholder organisations.

Simon is a renewable energy professional with international experience in project development and financing with public and private organizations. Passionate about the global transition to a sustainable future. Simon has previously held roles with Solar Euromed, CRH, imec and GE across business development, development and research assignment.

Julia McDonald

Renewable Energy Engineer, ITP Power

Federated States of Micronesia (FSM) Energy Sector Master Plan



The FSM Energy Master Plan project involved development of a comprehensive 20-year energy sector Master Plan for the Federated States of Micronesia. The project was led by Castalia, with ITP as lead engineering contractor responsible for technical analysis. The Master Plan covers all four states of the FSM – Pohnpei, Kosrae, Chuuk and Yap – and was formulated to address all the FSM’s energy sector goals including reduced cost of electricity, electrification of rural and remote villages to achieve 100% energy access, and renewable energy integration.

Due the large area and distributed nature of the FSM islands, key challenges for the project included approaches to energy access, affordability, reliability and renewable energy targets. Remote islands and communities must be treated quite differently from larger population centres. This project presents a realistic approach to achieving the country’s energy sector goals

Julia is a Senior Engineer at ITP Renewables and has 11 years’ experience in the energy industry. She has a background in power systems and renewable energy engineering, specialising in renewable energy integration projects in the Pacific region. Much of Julia’s energy sector experience is in the Pacific Islands, giving her a detailed understanding of the specific challenges of working in such environments. Recent major projects include design of island hybrid systems for Tuvalu and the Cook Islands, and high-penetration renewable energy integration for the Marshall Islands.

James Mason

Renewable Energy Engineer, Entura

Yap Renewable Energy Development Project



Although solutions combining solar power with battery storage are already available and can provide 100% renewable energy in small off-grid systems, new commercially viable solutions are needed to achieve safe and reliable renewable penetration and dispatchability in larger off-grid and on-grid systems.

Smart control and integration of generation assets, storage and other enabling technologies are at the heart of any successful hybrid renewable energy project.

The Yap remote area power system reduces Yap’s dependence on diesel generation via a combination of 825kW of wind and 500kW of solar generation.

James Mason is the International Business Development Manager for Entura-Hydro Tasmania and holds a Bachelor of Engineering degree (Mech/Elec) and an Advanced Diploma in Project Management. James is the Project Director for all Entura’s renewable projects in the Pacific including Cook Islands, Micronesia, Marshall Islands, Tonga, Samoa and Tuvalu and was instrumental in Entura’s engagement with the Pacific region. He has strong skills in overall Renewable Energy planning, Development and Implementation of projects in the Pacific.

Paul Pauze

VP Business Development, Innovus Power

Aklavik Variable Speed Diesel Pilot Program



Variable Speed Generation technology (VSG) maintains microgrid stability at any renewable penetration level, while keeping the cost of energy low. The approach decouples engine speed from electrical frequency, allowing the generator set to run at the most advantageous operating speed power at any given load. This leads to greatly improved fuel economy across the generator set's entire power range. The approach is in operation at Aklavik, NWT, Canada.

In Aklavik, electricity is now being provided to the more than 300 NTPC customers using a VSG platform. This approach is projected to reduce diesel consumption by approximately 80,000 litres per year.

Paul Pauze is the Vice President of Business Development and Sales for Innovus Power Inc., a North American company who has developed the first microgrid control system combining variable speed generation (VSG). Paul has been a professional engineer for 20+ years, and a member of the Ontario Society of Professional Engineers holding a Bachelor of Science in Electro-Mechanical Engineering from Queens University.

Fumitoshi “Frank” Emura

General Manager, General Manager of IoT Business Project Division, Hitachi, Ltd.

Beyond JUMPStart Maui



The JUMPSmartMaui project implemented from 2011 to 2016, which Hitachi led as the key technology provider together with several industrial stakeholders in Japan and Hawaii, was engaged in the development and demonstration of Vehicle to Grid integration in Maui. The objective of the project is to install and operate infrastructure to help the island transition to clean energy to transportation and also to help electrical grid introduce more renewables by utilizing distributed energy resources especially electric vehicles (EVs). The project integrates 13 stations / 44 ports of DCFC charging stations and also 200 home chargers for V1G and 80 home chargers for V2G. The number of EVs in Maui was around 80 on starting the project in 2011. At the end of the project, the number of EVs went up around 780

Frank Emura is the Division Manager, Social Innovation Business Division, IoT Business Division at Hitachi, Ltd. Emura-san has been mainly in charge of overseas project promotion, new business developments as well as business alliances. He was dedicated to smartgrid demonstration project on Maui Island in Hawaii as the the president of Hitachi Advanced Clean Energy Corporation in Hawaii from 2014 to 2017.

Yuichi Kado

Professor, Faculty of Electrical Engineering and Electronics

Kyoto Institute of Technology



Kyoto Institute of Technology history extends back to two schools, Kyoto Craft High School (established in 1902 at Sakyo-ku, Yoshida) and Kyoto Sericulture Training School (established in 1899 at Kita-ku, Daishogun, under the jurisdiction of the Ministry of Agriculture and Commerce), which were forerunners of the Faculty of Engineering and Design and the Faculty of Textile Science, respectively. The former was moved to Sakyo-ku, Matsugasaki in 1930 and changed its name to Kyoto Industrial High School in 1944. The latter developed into Kyoto Sericulture High School, under supervision of the Ministry of Education in 1914, and changed its name to Kyoto Sericulture Technical High School in 1931 and then to Kyoto Technical High School of Sericulture in 1944. The two forerunners merged in 1949, due to educational system revisions, to establish the present School of Science and Technology.

Yuichi Kado received M.S. and Ph.D. degrees in electronics from Tohoku University, Miyagi, Japan, in 1983 and 1998. In July 2010, he joined the Department of Electronics, Kyoto Institute of Technology, Kyoto, Japan. His current research interests include multi-port power routers to build energy interchanging systems. He is a board member of NPERC-J (<http://www.nperc-j.or.jp>) and a member of IEEE.

Peter Lilienthal

CEO Homer Energy

Storage Optimisation



Dr. Peter Lilienthal is the CEO of HOMER Energy. Since 1993, he has been the developer of the National Renewable Energy Laboratory's HOMER® hybrid power optimization software, which has been used by over 180,000 energy practitioners in 193 countries.

HOMER Energy microgrid modeling software is used to optimize and simplify microgrids. HOMER software can analyze diverse distributed energy systems, including grid-tied renewable and cogeneration systems, or situations where the grid is non-existent or insufficiently reliable - such as islands and remote communities.

The HOMER Energy collective vision is to empower people around the world with tools, services, and information in order to accelerate the adoption of renewable and distributed energy.

Dr. Lilienthal was the Senior Economist with International Programs at NREL from 1990 – 2007. He helped create NREL's Village Power Programs. He has a Ph.D. in Management Science & Engineering from Stanford University. He has been active in renewable energy since 1978, including teaching at university, project development, and consulting to industry and regulators.

Steven Schiller

Schiller Consulting

Strategy, implementatin and economics



Emerging technologies, even when economic from a societal, utility or end-user perspective, face many challenges to bridge the 'valley of death' or the chasm that separates innovators and early adopters from the majority that can utilize an appropriate technology. To achieve what is known as a market transformation requires not only innovation but funding and market deployment support and a process that moves from research and invention to innovation and commercialization; while addressing technical, economic, regulatory and market risks. This presentation will review the basics of emerging technologies in the context of their barriers to adoption/commercialization and how utilities (and governments) can support emerging technology advancement and adoption in a manner that supports cost-effective market transformation.

Steve Schiller is a professional engineer with 35 years of domestic and international experience in the energy and environmental industries with a focus on efficiency, renewables, independent power and climate change mitigation. His career has included senior management, engineering, research, training and project development and management roles. Steve's current activities include supporting private and public sector clients with strategic planning and implementation as well as provding negotiation and dispute resolution services.

James Hamilton

Centre for Renewable Energy and Power Systems, University of Tasmania

King Island Low Load Diesel Pilot Program



Australian utilities are at the fore of innovative diesel based enablers, able to substantially reduce the cost and complexity of high penetration renewable integration. The technology progression can be traced back to 2003, with low load diesel units commissioned at Denham, WA. More recently the application has been validated across a range of utility application, including Rottnest Island and King Island. This presentation also covers the development of variable speed diesel platforms, a natural extension to low load application, providing for efficiency improvements of 40% at low load. The technology provides a pathway to renewable integration without a requirement for battery storage, significantly reducing the cost and compexity of system hybridisation.

James Hamilton is a research fellow at the University of Tasmania, leading implementation low load and variable speed diesel research programs. He is currently a director with Renewable Ready and has formerly held roles as director of Joule Logic, a specialist renewable energy IPP and consultancy who develop, deliver and own embedded wind power systems across Australia (including Flinders Island), and as Senior Commercial Engineer with Windlab Systems. James has worked within the renewable sector for over a decade, across roles in Australia, Indian, China and South Africa. James curenrtly lives in Hobart, Tasmania, with his wife and two young children.

Bob King

President, Pacific Biodiesel Technologies

Sustainable BioDiesel



Headquartered in Kahului, Hawaii, Pacific Biodiesel was conceived in 1995 in response to unmanageable quantities of used cooking oil at the Central Maui Landfill. The original small-scale plant — recognized as one of the first commercially viable biodiesel plants in the U.S. — marks the beginning of the company. Since opening and operating the very first retail biodiesel pump in America, Pacific Biodiesel has built a solid reputation as a leading pioneer in the rapidly expanding biodiesel industry. Today with more than 100 employees statewide, the business is the only commercial producer of liquid biofuels in Hawaii. Its refinery on Hawaii Island incorporates state-of-the art distillation technology to produce 5.5 million gallons of premium biodiesel annually, sold entirely in Hawaii. The company supports diversified, sustainable agriculture on Maui through its farming operation which is growing sunflowers and other biofuel crops for food, fuel and other high value products —

creating jobs in agriculture and supporting energy and food security in the counties and State of Hawaii. Check out their website, www.biodiesel.com.

Robert King is president and co-founder of Pacific Biodiesel. He has over 30 years experience in the waste-to-energy conversion sector and is a passionate advocate for landfill diversion and recycling.

Jordan Little

Portfolio Manager at Elemental Excelerator

Hawaii Start-up Innovation



Elemental Excelerator helps startups change the world, one community at a time. Each year, we find 15-20 companies that best fit our mission and fund each company up to \$1 million to improve systems that impact people's lives: energy, transportation, water, agriculture, and beyond.

To date, we have awarded over \$22 million to more than 60 companies. What makes us unique? We co-fund, co-design, and co-develop projects and strategies that improve infrastructure and sustainably enhance communities.

Our program is funded by a diverse coalition of utility partners, corporate partners, the U.S. Navy, the U.S. Department of Energy, and philanthropic organizations. We are a non-profit created in collaboration with Emerson Collective.

Jordan is an electrical engineer with an extensive background in renewable and energy storage technology development and deployment. For the past year, Jordan has led a portfolio of innovative start-ups through the Elemental Excelerator program contributing to innovation across the energy sector.