INSIDE

4 | Photovoltaic Solar Electricity is Booming
6 | Where Will You Park Your Car in the Future? Maybe in the Carport of the Future
8 | Global Networks Through STEM
10 | Biofuels Will Help Move Hawaii to a Greener Energy Future
To Our Valued Commercial Customers

ALOHA and welcome to this special Fall/Winter issue of Powerlines. Hawaiian Electric publishes this magazine for our valuable commercial customers to keep you up to date on new technologies, energy efficiency and interesting customer projects.

This issue looks to the past as well as the future. In October, Hawaiian Electric celebrated its 120th anniversary. We celebrated it quietly, but it is a great opportunity to remind everyone where we have been and where we are going.

In the late 1800s, King David Kalakaua returned from his round the world voyage — after visiting Thomas Alva Edison in his Menlo Park, New Jersey laboratory — determined to bring electricity to his island kingdom. He electrified Iolani Palace before the White House and encouraged some businessmen to form Hawaiian Electric Company.

Today, we strive to use the same purpose and commitment in our goal of ending Hawaii’s dependence on imported oil for electricity. Our legal mandate is 40 percent of electricity sales from renewable sources by 2030, but our goal is 100 percent clean energy to help stabilize and lower our customers’ energy costs compared to where they would be headed. The articles in this edition offer just a few examples of what we are doing — and how you can take part — in reaching that aggressive goal.

Mahalo,
Robbie Alm
Executive Vice President

On October 13, 2011, Hawaiian Electric Company celebrated 120 years of electric service to Oahu. Inspired by the vision of King David Kalakaua and incorporated by royal charter in 1891, Hawaiian Electric started with one small downtown generating station to power a burgeoning Honolulu town.

Hawaiian Electric expanded and innovated to meet the challenges of a growing economy and population, through World War II, statehood, the resulting boom years, and state-wide expansion.

Hawaiian Electric service expanded to support new residential areas, businesses large and small, schools and universities, modern hospitals, first-class hotels and high-rise condos, strategic military facilities, and everything that makes for modern life.

Continued
Over the years, Hawaiian Electric has modernized power production and distribution to be more efficient, secure, and safe. Back-up generation and alternate power routes were installed to keep services as reliable as possible. Hawaiian Electric continues to apply new technology to improve service, increase efficiency, and control costs.

Today, Hawaiian Electric continues to meet our customers’ changing energy needs and is committed to building a clean energy future for Hawaii. This means working with our partners in government, business and the community to maximize use of energy from renewable sources like the wind, sun, geothermal heat, biofuels and biomass crops, and the ocean. We are also upgrading our grid, making it more reliable and better equipped to integrate sources of clean energy.

One thing has not changed: the commitment of the men and women of Hawaiian Electric to serve our customers and support our community. Whether it is working on a storm-damaged power line in the middle of the night, giving generously to worthy causes, or lending helping hands to volunteer projects, our employees have always put the needs of our communities first.

Every day our employees strive to provide our customers with the electricity they depend on – safely, efficiently, reliably, and with respect for our island environment. We look forward to serving our customers for the next 120 years.
In July, Oahu marked a significant clean energy milestone. Halfway through another banner year for solar photovoltaic electricity on customer sites, Hawaiian Electric Company reached 20-megawatts (MW) of PV projects participating in the net energy metering (NEM) program.

“We thank the nearly 4,000 Oahu customers who have taken advantage of solar power and the hundreds of people in the solar industry who sell, install and maintain the systems,” said Robbie Alm, Hawaiian Electric executive vice president. “The Legislature also deserves credit for establishing net metering, as does the Public Utilities Commission which continues to regulate and expand the program.”

Continued
As it was not possible to individually thank all who helped achieve this milestone, Hawaiian Electric donated $5,000 to Easter Seals Hawaii, which had just added a 55-kilowatt PV system at its headquarters above downtown.

“On behalf of everyone who helped to make this program a continuing success, we are pleased to present this donation to Easter Seals Hawaii in appreciation of its many years of providing critical services to infants, children and adults with special needs and their families in our community,” Alm said.

The Solar Electric Power Association has again named Hawaiian Electric as one of the nation’s Top 10 utilities for solar power added to its system per customer in 2010. All four Hawaii utilities are in the top ten utilities for total solar watts per customer.

Net Energy Metering (or NEM) lessens Hawaii’s dependence on imported oil by encouraging residential and commercial customers to use more eligible renewable resources like solar (photovoltaic), wind, biomass, or hydroelectric power to generate electricity.

Customers with a NEM agreement can produce power for their use and also send excess electricity produced by their renewable energy systems to the utility grid for full retail credit. Among the eligible renewable resources, solar is by far the most popular.

The Solar Electric Power Association has again named Hawaiian Electric as one of the nation’s Top 10 utilities for solar power added to its system per customer in 2010. All four Hawaii utilities are in the top ten utilities for total solar watts per customer.

As the year 2011 comes to an end, total NEM projects for Hawaiian Electric utilities’ service territories combined had reached nearly 45 MW, with 25 MW on Oahu, nearly 10 MW in Maui County and nine MW on Hawaii Island. For more information on the NEM program, visit our website at nem.heco.com.

In addition to net energy metering, Hawaiian Electric promotes and administers a Feed-in Tariff, standard interconnection agreements as well as negotiating with developers of utility-scale renewable energy projects like wind farms and solar farms to purchase power.

Photovoltaic Solar Electricity is BOOMING Continued

As it was not possible to individually thank all who helped achieve this milestone, Hawaiian Electric donated $5,000 to Easter Seals Hawaii, which had just added a 55-kilowatt PV system at its headquarters above downtown.

“On behalf of everyone who helped to make this program a continuing success, we are pleased to present this donation to Easter Seals Hawaii in appreciation of its many years of providing critical services to infants, children and adults with special needs and their families in our community,” Alm said.

The Solar Electric Power Association has again named Hawaiian Electric as one of the nation’s Top 10 utilities for solar power added to its system per customer in 2010. All four Hawaii utilities are in the top ten utilities for total solar watts per customer.

Net Energy Metering (or NEM) lessens Hawaii’s dependence on imported oil by encouraging residential and commercial customers to use more eligible renewable resources like solar (photovoltaic), wind, biomass, or hydroelectric power to generate electricity.

Customers with a NEM agreement can produce power for their use and also send excess electricity produced by their renewable energy systems to the utility grid for full retail credit. Among the eligible renewable resources, solar is by far the most popular.

The Solar Electric Power Association has again named Hawaiian Electric as one of the nation’s Top 10 utilities for solar power added to its system per customer in 2010. All four Hawaii utilities are in the top ten utilities for total solar watts per customer.

As the year 2011 comes to an end, total NEM projects for Hawaiian Electric utilities’ service territories combined had reached nearly 45 MW, with 25 MW on Oahu, nearly 10 MW in Maui County and nine MW on Hawaii Island. For more information on the NEM program, visit our website at nem.heco.com.

In addition to net energy metering, Hawaiian Electric promotes and administers a Feed-in Tariff, standard interconnection agreements as well as negotiating with developers of utility-scale renewable energy projects like wind farms and solar farms to purchase power.
As the trickle of electric vehicles into Hawaii becomes a wave, Hawaiian Electric is staying ahead of the technology. While some EV owners will want to charge their vehicles overnight (preferably using renewable energy) others who have or will add solar photovoltaics (PV) to their roofs will want to charge directly from the sun. So Hawaiian Electric Company has teamed up with an industry research group to test the “Carport of the Future,” an experimental solar-powered charging station for electric vehicles at the utility’s Ward Avenue facility.

Utilities from around the country are concerned that without proper preparation, the additional demand for electricity from widespread EV charging could put stress on their grids. Hawaiian Electric will also use the experimental carport to help answer questions from customers who want to know how EV charging might affect their electric bills.

The charging station features a nine-panel PV array mounted on a carport complete with a battery storage system. The project will allow Hawaiian Electric and the Electric Power Research Institute (EPRI) to collect and analyze a range of data on the potential impact PV systems combined with vehicle charging in a distributed energy storage environment will have on electrical grids as the number of electric vehicles (EVs) on the country’s roadways grows.

As the trickle of electric vehicles into Hawaii becomes a wave, Hawaiian Electric is staying ahead of the technology. While some EV owners will want to charge their vehicles overnight (preferably using renewable energy) others who have or will add solar photovoltaics (PV) to their roofs will want to charge directly from the sun. So Hawaiian Electric Company has teamed up with an industry research group to test the “Carport of the Future,” an experimental solar-powered charging station for electric vehicles at the utility’s Ward Avenue facility.

Utilities from around the country are concerned that without proper preparation, the additional demand for electricity from widespread EV charging could put stress on their grids. Hawaiian Electric will also use the experimental carport to help answer questions from customers who want to know how EV charging might affect their electric bills.

The nine PV panels have a combined rating of about two-kilowatts powering a 220-volt charge station. The station also has roughly a 20-kilowatt-hour lithium-ion battery that can be used to store energy collected during the daytime for EV charging at night.

Continued
When the energy stored in the charging station battery is insufficient to charge the EV, it can draw power from the grid to make up the difference. The battery has the capability of PV charging in which the charging station battery follows the actual PV output and EV discharging which will be tested in this demonstration project.

The test project, funded largely by EPRI, includes monitoring equipment to collect the data and transmit it to a computer through a wireless internet connection. The charging station was designed primarily as a research project and was not intended to be a prototype to be commercialized.

Since October 1, 2010, the Hawaiian Electric companies offer three-year EV pilot charging rates to help make Hawaii EV-ready. The rates are designed to promote early adoption of electric vehicles and to encourage customers to charge EVs during off-peak times when electricity demand is lower.

Hawaiian Electric offers its Oahu customers a discount of about 6 cents per kilowatt-hour on electricity used for charging electric vehicles between 9 p.m. and 7 a.m for residential customers and about 5 cents per kilowatt-hours for commercial customers. On the neighbor islands the EV rate ranges from 7 cents to 10 cents lower per kilowatt-hour.

EV owners who have PV panels on their homes can also offset the cost of charging their cars during off-peak times when the electricity being used is coming from the Hawaiian Electric grid. Under the utility’s net energy metering program, a customer can receive credit for unused solar energy that is fed back into the grid during daylight hours. That credit can then effectively be used to pay for the electricity being drawn from the grid at night. For more information on the Net Energy Metering program, visit Hawaiian Electric website at nem.heco.com.

The adoption of EVs and PVs are important steps towards meeting Hawaii’s clean energy goal of supplying 70 percent of our overall energy needs, including ground transportation, from renewable energy resources by the year 2030.
Global Networks through STEM (Science, Technology, Engineering and Mathematics)

At the center of making science, technology, engineering and math (STEM) popular in Hawaii schools and making Hawaii an international leader in robotics and more, you will find Art and Rene Kimura – master educators with a life long commitment to Hawaii’s children. Hawaiian Electric is proud to have played a part in supporting their pioneering work.

For example, recently Art and Rene joined five students from Iolani School and three Waiakea High students and four teachers at the first Japan Super Science Fair/9th International Super Science Fair (http://www.ritsumei.ac.jp/fkc/jssf2011/index.html), hosted by Ritsumeikan High School and Ritsumeikan University in Kyoto, Japan.

Hawaii students joined 300 participants from 46 schools representing 19 countries. They shared science projects, hosted poster sessions, attended lectures and tours, and participated in international team problem solving activities. They also toured local industries and cultural sites, shared cultural presentations, and made connections with students and educators from around the world.

In part, this unique, inspiring, life changing experience can be traced back to Hawaiian Electric eight years ago. Through in kind support of Hawaiian Electric volunteers and use of company conference facilities for workshops, Art and Rene initiated the Hawaii Botball program; now in its 8th season.

Botball in Hawaii has become one of the largest programs in the nation. In July 2012, Hawaii will host the Global Conference on Educational Robotics and the international Botball championships for the second time. For the last two years, the contest has been won by Mililani’s Hanalani School Botball team.

Through the Japan Ministry of Education, teachers and students from Japan came to participate in the Hawaii Botball program, bringing with them their unique micro-robotics program. As a result, Waiakea High School...
participated in the International Micro-Robotics Maze Contest at Nagoya University for the past five years. Waiakea High School was the first U.S. high school to compete against college teams from Japan, Korea, and Thailand. Waiakea High School has consistently won awards in the one-cubic-inch category, and has developed a statewide outreach program using the Letry robot and introducing brushbots to thousands of students, parents, and educators.

During the first micro-robot contest in Nagoya five years ago, Art and Rene met staff from Ritsumeikan High School who shared their status as one of Japan’s Super Science High Schools in which they host an annual International Super Science Fair (http://www.ritsumei.ac.jp/fkc/jssf2011/index.html).

The week-long, all-in-English program aims to foster students’ dreams to become scientists or engineers with a role in resolving global issues such as energy, natural disasters, and global warming. Through research presentations and collaborative work with other students from math-and-science high schools from abroad and Japan, participating students as well as educators can exchange their ideas and get insights into the future of science education.

As a result of a year-long preparation by Art and Rene, students, and educators from McKinley High, Waiakea High and Iolani schools have attended the fair over the...
past four years. In exchange, the Hawaii schools host Ritsumeikan super-science students and educators for a two-week, science-and-technology-centered visit to Hawaii which includes family home stays.

Hawaii educators played a prominent role in the Super Science Fair, including hosting four workshops and planning and producing the world’s first Global BrushBot Olympics, which was so well received that the Hawaii team was invited to do the same in Thailand, Canada, United Kingdom, Indonesia, New Caledonia, China and other countries.

Hawaii schools took a 50-pound box of Aloha to Japan this year filled with donated children’s clothing, snacks, and educational materials. It was shipped to a Sendai relocation center for displaced families who had lost their homes in the March earthquake and tsunami. The goal was to allow a few Japanese children to smile, if just for a day.

Hawaiian Electric’s support of these educational programs has far-reaching effects, not only through direct support but through linkage to other opportunities such as the Super Science Fair participation including in 2012: Island Pacific Academy being invited to participate in the International Student Science Fair in Calgary, Canada; and an invitation for a school to participate in the 2013 fair in England. And it is possible in the future Hawaii may host the fair.

Hawaiian Electric, through many volunteers and HEI Charitable Foundation grants, was the founding and continuing corporate sponsor of the annual Astronaut Lacy Veach Day of Discovery (http://www.spacegrant.hawaii.edu/Day-of-discovery/). The tribute to the legacy of the late Charles Lacy Veach showcases science and technology with the 600 participating students, parents and educators and the 200 volunteers.

Rene Kimura was honored by with the national 2011 Women in Aerospace Educator Award for her work empowering young women to pursue science careers. She was nominated by Educator Astronaut Barbara Morgan. The award was accepted on behalf of the network of supporters and colleagues who work to make young people’s dreams come true.

Eisha Matsubara, a NASA Jet Propulsion Laboratory electrical engineer, wrote in her letter of support, “I believe a true educator instills so much excitement in her students that they, in turn, cannot wait to pass on that knowledge and love of learning to others. Thus, the phrase, a teacher’s touch is eternal. Rene Kimura exemplifies those words. I am only one of many people whom Rene has touched in life.”

Art Kimura has been honored as Biology Teacher of the Year, with the first Hawaii Presidential Award for Excellence in Science Teaching, as one of two state representatives to NASA Teacher in Space Project, with the Christa McAuliffe Memorial Award and with the national Civil Air Patrol Crown Circle Award of Education. Both Art and Rene were honored by the Board of Education in 2010 with a Recognition Certificate.

One program that Hawaiian Electric helped initiate and support has now spun off into many global opportunities for Hawaii educators and students who have as much to share with as to learn from global partners.

Hawaiian Electric joins in congratulating Art and Rene Kimura – who today are educators with the Hawaii Space Grant Consortium – on their well deserved honors and for their dedication to inspire students to become our future science-and-technology heroes!
Biofuels are expected to play an important part in Hawaii’s energy future both as a bridge to future renewable development and to provide firm back up for variable renewables like sun, wind and ocean power.

Almost all electricity generators in Hawaii use oil, “black” liquid fuel, and have the opportunity to be switched to “green” liquid biofuels. Like oil, biofuels can be stored and moved and used in existing facilities with little or no costly modifications.

Hawaiian Electric’s preference is for locally produced biofuels as soon as it is available and is signing contracts with suppliers to demonstrate there is a market for landowners and agricultural interests to spend the money and time to grow biofuels crops.

Hawaiian Electric recently signed agreements with Pacific Biodiesel, Hawaii BioEnergy, and Phycal for locally produced biofuels to be used in new and existing power plants.

- Maui-based Pacific Biodiesel has agreed to supply 250,000 gallons of local biodiesel during a 3-year period to power the planned 8-megawatt (MW) Honolulu International Airport Emergency Power Facility. The contract must be approved by the Hawaii Public Utilities Commission (PUC) with input from the State Consumer Advocate.

The airport emergency power facility is a partnership to serve the State Department of Transportation and Hawaiian Electric customers. Four biodiesel-fueled generators will provide power to Oahu’s electric grid during normal operations, but can supply power exclusively to the airport during an emergency.

Pacific Biodiesel plans to supply biodiesel from locally recycled cooking oil collected and processed at either its plant on Oahu or at the Big Island biodiesel refinery it is building in Keaau. The biodiesel supply will begin upon completion of the airport facility, planned for October 2012.

“Bob and Kelly King formed Pacific Biodiesel 15-years ago and are true trailblazers in the local biofuel industry,” said Robbie Alm, Hawaiian Electric executive vice president. “They have taken their know-how and values across the globe from Japan to the U.S. East Coast but also remain committed to their Hawaii roots. We are pleased to be working with them to help move Hawaii off imported oil to a clean energy future.”

In addition to recycling used cooking oil into vehicle fuel on Oahu, Maui and the Big Island, Pacific Biodiesel is managing the Military Biofuels Crop Demonstration Project in Waialua on Oahu. Funded by a $2.4 million grant, the goal is to develop a production model for fast growing, oil producing plants like safflower, sunflower, and camelina to produce biodiesel for the military and local community.

- Hawaii BioEnergy – a Hawaii-based consortium of Grove Farm, Kamehameha Schools and Maui Land & Pine – has contracted to supply 10 million gallons per year of locally grown and processed biofuels for power generation at Hawaiian Electric’s Kahe Power Plant. This contract also must be approved by the PUC.

Dedicated sustainable energy crops will be grown on Kauai, on largely fallow Grove Farm land. The crops will be
processed into biofuel on Kauai and shipped to Oahu. The 20-year contract offers stable pricing not linked to volatile price of petroleum fuel.

Hawaii BioEnergy has conducted extensive research to assess viable and sustainable biofuel feedstocks and processing technology. Liquid biofuel will be created using high temperature in the absence of oxygen to cause thermo-chemical decomposition of organic matter.

Following an initial test period, shipments are expected within five years after the contract is approved. The biofuel will represent over four percent of Kahe Power Plant’s annual fuel use.

Hawaiian Electric recently successfully tested blends of biofuel and low sulfur fuel oil at the Kahe Power Plant, the largest on Oahu with a total capacity of 650 MW.

To pave the way for a different kind of biofuel testing at Kahe Generating Station, Hawaiian Electric has also reached agreement with Ohio-based Phycal, Inc. for delivery of 100,000 to 150,000 gallons of algae-based biofuels by April 2014.

The agreement calls for this biofuel to be at a fixed price and not tied to the price of fossil fuels and, like all fuel and power purchase agreements, must be reviewed and approved by the PUC.

Local biofuels will take three to seven years to come to market in sufficient volume and to bridge the gap until then, Hawaiian Electric will import biofuels as necessary.

All such imports must meet Hawaiian Electric specifications and conform to guidelines for sustainable production.

Hawaiian Electric recently signed a new contract with Iowa-based Renewable Energy Group, the nation’s largest biodiesel producer, to supply sustainable biodiesel for the 110-MW combustion turbine generator at Campbell Industrial Park Generating Station. The contract has also been submitted to the PUC for approval.

The Campbell Industrial Park Generating Station is the first utility-scale combustion turbine run entirely on biodiesel. With its rapid response capability, it is an essential part of the Hawaiian Electric system, supplying needed reserves during peak demand periods and as needed at other times.

Renewable Energy Group, which currently supplies biodiesel to the generating station, will continue to supply 3 to 7 million gallons of high quality biodiesel annually for three additional years. The biodiesel will be processed from used cooking oil and waste animal fats at prices competitive with other available biofuels.
Hawaiian Electric and Phycal expect a subsequent agreement for up to three million gallons per year for three years for a full-scale demonstration project to build upon the anticipated success of the algae-based biofuel testing at Kahe.

“Hawaii’s abundant sunlight and temperate climate are ideal for cultivating algae,” said Kevin Berner, president and CEO of Phycal, Inc. “If successful, our pilot project will also demonstrate the economic viability of displacing petroleum imported into Hawaii with locally grown feedstock for biofuels.”

Phycal is planning an algae-to-biofuels processing facility at Poamoho in Central Oahu that is expected to cost $65 million over a four-year period and employ about 30 scientists, engineers and workers. Phycal will not use genetically modified algae strains in Hawaii.

A fourth contract, with Hawaii-based Aina Koa Pono (AKP) to supply biodiesel to Keahole Power Plant on Hawaii Island was not approved by the PUC, primarily due to questions about cost. Hawaiian Electric and AKP are negotiating for a possible new contract.

“We must pursue every renewable resource available – the sun, wind, geothermal, ocean energy and more – and take advantage of our unique ability to substitute ‘green’ biofuels in place of ‘black’ oil in our generating units,” Alm said.

All biofuel supplied under these contracts will comply with sustainable sources standards that Hawaiian Electric developed in partnership with the Natural Resources Defense Council.