

SUPPORTING HAWAII'S CLEAN ENERGY TRANSFORMATION

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Abstract

Hawaii has embarked on an ambitious program to free it from costly dependence on imported fossil fuels. This paper describes the evolution of the State of Hawai'i's goals and policies that are central to this remarkable initiative, the initiative's current status, and the need now to move beyond its early successes. This will require going beyond the goal set in 2008 of 40 percent renewable energy by 2030, creating an integrated modern grid, and utilizing cheaper, transitional fuels that can support the state's energy goals, such as liquid natural gas.

Introduction

Hawaii is undergoing what is arguably the most significant energy transformation since the introduction of oil to the Islands more than 100 years ago. Over that time petroleum has grown to account for more than nine-tenths of the state's energy use, making Hawaii the most oil-dependent state in the nation by far. This lack of diversity has exposed Hawaii to rising costs and price volatility associated with imported oil, particularly in the power sector. Hawaii's per capita energy consumption is among the lowest in the nation, yet it leads the country in energy costs on a per unit basis. Compared with the national average for each of the following, Hawaii residents pay roughly four times more for a synthetic version of natural gas, three times more for electricity and 25 percent more for gasoline. Spurred by a realization that Hawaii's over-reliance on oil is unsustainable over the long term, the state has begun a dramatic shift away from the status quo.

It is also clearly apparent that Hawaii needs new engines of economic growth. The two traditional pillars of the economy, tourism and federal expenditures are not forecasted to generate new growth opportunities on their own. A recent University of Hawaii Economic Research Organization (UHERO) report stated, "Hawaii's economy is dominated by sectors that contribute only modest productivity growth and cannot be sources of long-term improvements in the quality of life for Hawaii residents." The report concluded "if Hawaii is to improve the quality of life and increase living standards for its citizens, we must rely on industries that can both contribute to and benefit from technical change."

Such change will come from Hawaii's export or traded sectors that are any region's driver for job creation and economic growth. Historically, Hawaii's export/traded sectors have been tourism and federal expenditures, accounting for roughly 30 percent of Hawaii's economy. The reality is, however, that these sectors are not growing. In order to create new high wage job opportunities for our people we need to invest in new sources of economic growth.

In today's global economy, the "innovation sector" is the main source of economic growth and job creation. This sector is characterized by the use of entrepreneurial human capital as inputs and knowledge, ideas and innovation as outputs.

The new landscape is one that embraces clean energy to the fullest extent possible, putting Hawaii on the path toward greater energy, environmental and economic security. Hawaii's strategic energy plan encourages full use of the state's diverse, abundant indigenous natural resources, such as solar, wind, geothermal, biomass, and hydro.

Hawaii's Strategic Energy Plan

As the center of energy policy, planning and deployment and delegate of the Energy Resources Coordinator (ERC), the Hawaii State Energy Office is positioning the State as a global leader in clean energy deployment and innovation. This will be realized through ambitious energy policies, notable achievements in renewable energy and efficiency installations, and growing numbers of green jobs and test bed investments. Hawaii's clean energy policies are designed accordingly to transform the most oil dependent state in the nation to a national model for job creation, industrial transformation, environmental compliance, and technological innovation.

Since 2008, this transformation has been embodied by energy policies and a stakeholder alliance known as the Hawaii Clean Energy Initiative (HCEI). Since passage of HB 1464 by the Hawaii Legislature in 2009, State energy policy has been driven by the separate renewable energy and energy efficiency targets. Hawaii's renewable portfolio standard requires each electric utility company that sells electricity for consumption in the state to establish a renewable portfolio standard (RPS) of:

- (1) Ten per cent of its net electricity sales by December 31, 2010;
- (2) Fifteen per cent of its net electricity sales by December 31, 2015; [and]
- (3) Twenty-five per cent of its net electricity sales by December 31, 2020; and

(4) Forty per cent of its net electricity sales by December 31, 2030.

HB 1464 (2009) also required the Hawaii Public Utilities Commission (PUC) to establish energy-efficiency portfolio standards (EEPS) that will maximize cost-effective energy-efficiency programs and technologies. The EEPS must be designed to achieve four thousand three hundred gigawatt hours of electricity use reductions statewide by 2030 with interim goals established by the PUC for electricity use reduction to be achieved by 2015, 2020, and 2025. The PUC may also adjust the 2030 standard by rule or order to maximize cost-effective energy-efficiency programs and technologies and establish incentives and penalties based on performance in achieving the EEPS. The combined RPS and EEPS equate to a target of 70 percent clean energy by 2030.

In the transportation sector, the ERC will present to the governor a new roadmap by the end of fiscal year 2015 for reducing petroleum based fuels in the transportation sector that will emanate from a year-long engagement with HCEI stakeholders and consultants. The recommitment of the strategic alliance between the State of Hawaii and the U.S. Department of Energy in support of the next phase of HCEI was formally consummated in September of 2014.

Clean energy has propelled Hawaii into one of the world's leading test beds for energy innovation. Hawaii's isolated, island setting has attracted entrepreneurs from around the world, looking to develop, test and prove emerging technologies and strategies before going to market. By leveraging state funding sources with federal and private sources, Hawaii is seeding an innovation ecosystem to spur the development of clean energy solutions while also creating high-wage jobs and economic opportunities for the people of Hawaii.

Hawaii's energy policy encourages full use of the state's diverse, abundant indigenous natural resources, such as solar, wind, geothermal, biomass, and hydro; each would compete favorably with the avoided cost of oil for power generation. The positive impact of distributed generation on Hawaii's economy is tangible. Solar-related construction expenditures, averaged \$475 million a year from 2010 through 2013 after totaling just \$93 million in 2009. (DBEDT) And Hawaii has emerged as a leader nationally in solar energy. The rapid growth in PV propelled Hawaii to number one in PV installations per capita in the United States in 2013, and fifth overall in total capacity. (Interstate Renewable Energy Council)

Hawaii is also one of only eight States with installed geothermal capacity, which is seen as a

long term anchor to Hawaii's diverse energy mix due to its potential to serve as a distributable, firm baseload resource to balance intermittent renewables.

The electric utility marketplace has changed across the United States in the past decade and those changes are accelerating. Hawaii's old Integrated Resource Planning (IRP) model is insufficient for this new world. The marketplace now includes more distribution planning and customer decision-making. This new world includes innovative regulatory structures and infrastructure development, with new technology such as smart meters and distributed generation. Hawaii must act more quickly to adapt to these changes.

Hawaii's energy transformation is forcing policymakers to be more forward thinking as they plot Hawaii's course into uncharted territory. Our clean energy vision can be broken down into three steps:

- First is a firm commitment to go beyond the goal of 40 percent renewable energy by 2030, invest smarter in efficiency and realistically tackle energy use in transportation;
- Second is the creation of an integrated modern grid to ensure that Hawaii can successfully incorporate its renewable resources cost effectively;
- And third, the state will need cheaper, transitional fuels to support its renewable goals through lower costs and more responsive, resilient generation and fuel delivery systems.

The 40 percent renewable energy target appeared to be a reasonable estimate when it was unveiled in 2008, but in hindsight we now know that it was too conservative. Moving to step 1 of the vision will give Hawaii an opportunity to reexamine its clean energy potential and to develop new low-cost strategies to tap that potential. Hawaii homeowners and businesses -- faced with the highest electricity rates in the nation -- have adopted renewable energy with a vigor that has exceeded expectations. More than 500 megawatts of generating capacity from wind, solar and biomass have been installed statewide since HCEI was launched. Rooftop solar PV has been a major contributor to the effort, producing enough clean, renewable energy to save Hawaii ratepayers nearly \$250 million on their electric bills during those six years. So demand for renewables is not a question. That growth has helped boost the share of Hawaii's energy generated from renewable sources to 18 percent at the end of 2013, putting the state two years ahead of its interim 2015 RPS target. Hawaii is also ahead of its EEPS interim goal. A consensus is emerging that an RPS upwards of 60 percent could be achievable by 2030. Strategies should

be built around the new target so that investments can be optimized around utility scale and distributed generation solutions, grid improvements and other technological advances for Hawaii's new energy ecosystem.

The PUC, meanwhile, has taken a fresh look at the state's energy efficiency resource potential. A report prepared for the PUC earlier this year concluded that Hawaii has the potential to significantly exceed its 2030 target of 4,300 gigawatt-hours of savings. The study estimated the cumulative energy efficiency potential in 2030 is 6,210 gigawatt-hours, or 144 percent of the current EEPS goals.

The renewed effort to reduce petroleum use in the transportation sector is key because it accounts for about two-thirds of state's oil consumption. To make a significant impact on the consumption of petroleum in Hawaii's transportation sector it is apparent that the range of solutions be expanded to alternatives such as natural gas and hydrogen. This is discussed further in the section on diversifying Hawaii's fuel mix.

Step 2, building the electrical grid of the future, will allow Hawaii to integrate the full range of renewables while empowering energy consumers to manage their energy future – electric utilities must change their mindset. The Hawaiian Electric Companies have found themselves behind the curve in the transformation to clean energy, with the limitations of its grid keeping planned PV installations by many homeowners on hold. The traditional utility model of controlling everything from a central location needs to be replaced with more localized solutions that require strong interoperability between devices. The State Energy Office is involved in a host of dockets currently before the Public Utilities Commission that are part of a broad effort to improve the planning process at the Hawaiian Electric Companies (HECO) so the utility will be better prepared to handle the rapid growth of distributed solar PV. Through its responses filed in the various dockets, the State Energy Office is attempting to provide clarity on how to achieve a comprehensive solution to grid modernization.

These PUC dockets are serving as vehicles to help guide HECO's transition to become a utility of the future. The PUC last spring issued directives requiring HECO to produce a Power Supply Improvement Plan, a Distributed Generation Improvement Plan and an Integrated Demand Response Portfolio Plan, all of which are intended to help the utility modernize its generation units and create advanced transmission and distribution systems able to facilitate

increased penetration of renewable generation. Unfortunately, in the case of several of the plans it appears that the utility has not gone far enough and does not appreciate the sense of urgency required to meet and exceed the state's clean energy policy objectives. In the new energy ecosystem a demand response portfolio must be designed and implemented by the utilities as a crucial part of a broader strategy that is designed to achieve the State's renewable energy, energy efficiency, job creation and economic growth goals.

The third step in fulfilling our vision for the state's clean energy future is diversifying its fuel mix. Both liquefied natural gas and hydrogen hold promise. LNG has the potential to be a cost-effective replacement for petroleum in the power and transportation sectors. Initial studies conducted by our utilities project savings in the neighborhood of 25 percent to 35 percent from incorporating a bulk terminal solution. Besides its cost advantage when compared with oil, natural gas provides a low-carbon fuel source with economic, environmental and strategic. First and foremost, natural gas must complement Hawaii's established energy efficiency and renewable energy objectives. We envision LNG as a bridge fuel to replace petroleum while efforts continue on the clean energy front. While electrical generation would be the primary use initially, over time, the ground and marine transportation sectors will eventually play a bigger role.

We also see LNG replacing current synthetic natural gas use, as well as spurring the development of co-generation plants. This will potentially result in the development of micro grids and a generally more distributed and diverse electrical generation portfolio, with independent power producers providing much of the generation through power purchase agreements with the utility. Pursuing alternative fuels will help Hawaii move from being dependent on imported fossil fuels to expanding out international position as a clean energy test bed and efforts to build a clean energy economic cluster.

Conclusion

Hawaii's new energy agenda in the next phase of the HCEI summarizes Hawaii's challenges for greater renewable penetration and energy efficiency measures and the long-term, comprehensive and systematic energy strategies to fulfill that agenda. Hawaii's challenge is to

put in place a framework that will allow its vast renewable potential to be realized. A revamped HCEI can provide the structure to move this agenda forward. The next phase of HCEI will focus on stimulating deployment of clean energy infrastructure as a catalyst for economic growth, energy system innovation, and test bed investments. There also will be a renewed emphasis on engaging a wider group of external stakeholders to continue forward momentum toward meeting Hawaii's clean energy goals.

While such a sea change in energy policy presents significant challenges, it also brings with it tremendous opportunity. Hawaii's aggressive campaign to achieve and exceed 70 percent clean energy by 2030 has set in motion a chain of events that are helping transform the state's economy. Hawaii's isolated, islanded grids, high energy costs and connections to the Asia-Pacific region make Hawaii a uniquely attractive "laboratory" for energy solutions. The state is facing grid saturation issues that won't be encountered in other locales for a decade or more. As a result, innovative companies from around the globe are coming to Hawaii looking to develop, test and prove emerging technologies and strategies in a real-world environment.

References

DBEDT, Research and Economic Analysis Division,
(<http://energy.hawaii.gov/resources/dashboard-statistics>).

Eneroc Utility Solutions, State of Hawaii Energy Efficiency Potential Study, Jan. 15, 2014.

Interstate Renewable Energy Council, U.S. Solar Market Trends, July 2014.