Attachment A: Case Study - Hawaii

Introduction

In 2014, the U.S. Energy Information Administration reported that the average retail price of electricity in Hawaii reached $0.37 per kilowatt-hour (kWh); three times the national average.[1] The State's history of having the highest electricity costs in the nation is underpinned by its geographic isolation and subsequent dependence on petroleum fuels. Hawaii relies on imported petroleum products to supply nearly 80% of its energy needs, resulting in nearly 10% of the state's gross domestic product (GDP) being directed towards meeting these energy costs. However, Hawaii has taken an impressive array of actions to overcome these challenges and create new economic opportunities that draw on the state's indigenous resources.

With strengthening political and regulatory support, growing consumer and investor confidence, and emerging smart energy technologies, Hawaii is now leading the nation in the development of local, clean energy resources. The state has an abundance of all forms of renewable energy, including solar, wind, biomass, and geothermal, and in recent years has experienced a rapid uptake in renewable market penetration, particularly in residential distributed solar. While the shift to diversify energy supply through the integration of renewable resources presents a sustainable option in the electricity sector for Hawaii,, an increased reliance on variable generation sources also creates new challenges in the form of concerns about grid stability, more complex integrated resource planning, constraining utility business models, a need for new policy and regulatory frameworks, and ongoing affordability issues. Moving forward, Hawaii's successful state energy vision incorporates the strengths, challenges, and interdependencies of the state's traditional energy and electric system with the mounting potential of variable generation resources, enhanced energy efficiency, and new electric system technologies.

Case Study

In order to provide a mechanism to overcome the above energy system challenges and create a clean energy strategy that could support the state's economic development goals, Hawaii signed a Memorandum of Understanding (MOU) with the U.S. Department of Energy (DOE) in 2008 to create the Hawaii Clean Energy Initiative (HCEI). The core mission of HCEI is to coordinate with stakeholders in Hawaii across all energy sectors to identify and evaluate energy system challenges, opportunities, and interdependencies in order to devise a comprehensive strategy for addressing these issues. In successive legislative session in 2009 and 2010, the State Legislature formally recognized the contributions of HCEI by strengthening its renewable portfolio standard, establish an energy efficiency portfolio standard, and ratifying its role in leading Hawaii's clean energy efforts. In 2011 an HCEI Road Map was completed to serve as an integrated framework that supports each energy sector independently while simultaneously coordinating across all sectors to provide a holistic approach to energy planning. With guidance by the HCEI Management Team and Steering Committee, the HCEI Road Map was developed with technical support of the National Renewable Energy Laboratory and identified four key sectors of the Hawaiian energy economy: electricity generation, end-use energy efficiency, transportation, and, fuels. Once acknowledging these priority energy sectors, the Road Map systematically established goals for each and created short and mid-term "multi-faceted strategies for success" to develop a comprehensive strategy in which all sectors of the energy economy are aligned with the goal of reaching 70% clean energy by 2030.

[1] http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a

Clean Energy and Energy Efficiency

In order to realize the goal of a 70% clean energy economy by 2030, Hawaii has undertaken a host of initiatives aimed at facilitating the deployment of renewable energy and increasing energy efficiency. The cornerstone of HCEI is the Hawaii Renewable Portfolio Standard (RPS) that mandates "renewable electric energy" sales to be 40% of the net electricity sales of each electric utility in the state by the year 2030[2]. This target is preceded by a graduated set of RPS goals that require 15% and 25% renewable electric energy sales by 2015 and 2020, respectively. By the end of 2013, the Hawaii Public Utility Commission had acknowledged that the state had exceeded its 2015 RPS target of 15%.[3] In 2015, the Hawaii Legislature established the nation's first 100% RPS when it upgraded the interim 2020 RPS to 30% and set new targets for 2040 and 2045 at 70% and 100%, respectively.

Until January 1, 2015, Hawaii's RPS was complimented by an Energy Efficiency Portfolio Standard (EEPS), which aims to reduce electricity use by 30%, or 4,300 gigawatt-hours (GWh), by 2030. As of this year, the EEPS has been separated from the RPS to become a standalone policy under which energy efficiency measures and displacement or offset technologies will no longer count towards fulfilling the state's RPS.[4]

Infrastructure Analysis and Planning

To create an integrated strategy capable of coordinating all energy sector processes in a holistic fashion, the HCEI Steering Committee incorporated a thorough analysis of Hawaii's energy infrastructure into the roadmapping process. These analyses involved coordination between local, state, and federal government agencies, the private sector, non-governmental organizations, trade associations, and universities to identify core sectors of the energy economy and develop comprehensive strategies to address energy system challenges. To examine how the integration of variable resources would impact the state's infrastructure, wind and solar power grid integration and modeling studies were conducted across the state to identify opportunities and challenges for meeting future clean energy goals. In addition, smart grid demonstration projects have been commissioned by several utilities, including Maui Electric and Kaua'i Island Utility Cooperative (KIUC), to examine the potential role emerging technology will play in mitigating threats to infrastructure and boosting grid resiliency.

The Hawaiian Electric Companies' Integrated Resource Plan (IRP) was an initial step in demonstrating how generators can meet the needs of Hawaiians while ensuring the integrity of energy infrastructure. This group, comprised of the Hawaiian Electric Company, Maui Electric Company, and Hawaii Electric Light Company, proposed in its 2014 IRP to make strides to accelerate the decommissioning of old oil-fired steam generators, procure or develop low-cost utility scale renewable resources, and convert existing generating units to cost effective renewable and lower carbon fuels.[5] Taking into consideration comments and recommendations by the Hawaii State Energy Office, Consumer Advocate and other intervenors, the Hawaii PUC rejected Hawaiian Electric Companies' IRP and associated action plans and ordered the utilities to prepare new plans (i.e., a Power Supply Improvement Plan (PSIP) and a Distributed Generation Interconnection Plan (DGIP)) to better achieve Hawaii's clean energy future. Although the

[2] http://energy.gov/savings/renewable-portfolio-standard
[3] http://www.utilitydive.com/news/hawaii-provides-us-utilities-a-glimpse-of-the-future/272824/
[4] http://programs.dsireusa.org/system/program/detail/4511
[5] http://www.hawaiianelectric.com/vcmcontent/IntegratedResource/IRP/PDF/IRP-2013-Report-Filed.pdf

Hawaii PUC has yet to rule on the PSIP, DGIP and other associated plans, the updated process is regarded as a turning point in State–utility cooperation and reflects the central role in the HCEI model and Road Map in driving the State's clean energy vision.

Energy System Activity

Since the implementation of the HCEI Road Map in 2011, the State of Hawaii and relevant stakeholders have made significant efforts toward reaching the 70% clean energy economy target. These efforts can most readily be seen in the ongoing investments and commitments that partners are making in the electricity, end-use efficiency, transportation, and fuel sectors. A clear indicator of stakeholder consensus and commitment to realizing the state's energy goals was the formal Energy Agreement between the HECO Companies and the State of Hawaii in 2008. Through this agreement, HECO Companies pledged to advance HCEI objectives in the regulated electricity sector by accelerating renewable energy, promoting measures to increase energy efficiency, and investing in grid operation and infrastructure.[6] Since this agreement, HECO investments alone in solar PV have led to an increase from 850 PV systems in 2008 to over 43,000 systems in 2014.[7] Today, 12% of the state's residential homes have distributed rooftop PV, with a total of 600,000 installed systems across the state and an estimated 3.3 million installations by 2020.[8] Similar activity to expand wind production, bring online new biomass facilities, and deploy advanced metering infrastructure are underway across the state as utilities are driven by the RPS, EEPS, and PUC to reduce electricity consumption and improve end-use efficiency. These efforts have also been supported by stakeholder interest in promoting grid resiliency through next generation technologies and multiple awards for smart grid projects from the Department of Energy.

The Hawaii State Energy Office has also taken an innovative approach to pursuing HCEI goals and assisting potential investors, policy makers, and other energy stakeholders by designing a website that presents an integrated resource hub that catalogues information on the state's energy portfolio. Through the website, stakeholders have access to GIS systems for resource siting and planning, streamlined permitting services and information, and ease of access to key programs such as the Green Energy Market Securitization and Energy Savings Performance Contracts programs. The resources presented through this online suite of self-help tools overlay every energy sector to create an innovative and transparent platform to facilitate project development and strengthen investor confidence.[9]

Analysis

While Hawaii is unique in many ways, it presents a familiar case in which growing electricity costs and a staggering reliance on imported petroleum, coupled with the steady emergence of variable generation technologies, threatens grid reliability and applies pressure to the prevailing utility business model. Despite the efforts of the HECO Companies, the Hawaii PUC maintains that the companies' utility business models lack strategic focus and fail to provide a clear connection between energy sector interdependencies and HCEI clean energy goals.[10] According to a white paper issued by the Hawaii PUC after rejecting HECO's 2014 updated IRP, HECO companies failed to develop a sustainable business

[6] http://www.hawaiianelectric.com/vcmcontent/StaticFiles/pdf/HCEI.pdf
[7] http://www.utilitydive.com/news/hawaii-provides-us-utilities-a-glimpse-of-the-future/272824/
[8] http://www.nytimes.com/2015/04/19/business/energy-environment/solar-power-battle-puts-hawaii-at-forefront-of-worldwide-changes.html
[9] http://energy.hawaii.gov/
[10] http://www.greentechmedia.com/articles/read/hawaii-crosses-the-energy-rubicon

model that will ensure customer service and affordability while maintaining reliable and innovative energy services.[11] The PUC contends that while HECO Companies are capable of aligning utility investment and development strategies with the holistic energy vision of the HCEI Roadmap, utilities are slow and in some cases unwilling to adapt to the changing energy landscape. Since 2013 the number of PV permits awarded annually for rooftop solar has dropped significantly. This can be attributed to the interconnection challenges associated with rapid solar penetration, but many suggest it is also a result of the threat distributed energy resources pose to utility revenue streams.

Outcome

While these challenges can be seen across the country, the HECO Energy Agreement signed by then Governor Linda Lingle and the Hawaii-DOE MOU in support of the HCEI in 2008 was the catalyst that signaled to the public, potential investors, stakeholders, and the nation that a clear, clean, and comprehensively designed energy pathway would be a permanent fixture in the state's energy future. These agreements identified the interdependent nature of emerging energy sector concerns and were established to holistically approach the challenges of ongoing state supply restrictions, growing electricity costs, increasing variable resource deployment, and transitioning to a modern electricity infrastructure. While the goal of reaching a 70% clean energy economy is a long term prospect, confidence in the strategy has been repeatedly reaffirmed. In September 2014, Governor Abercrombie and DOE Secretary Moniz signed a new MOU to support a renewed HCEI 2.0.[12] In a resounding endorsement of HCEI's progress to date, the Hawaii State Legislature voted in May of 2015 to make electricity generation 100% renewable in the state by 2045.[13] Building on the statutory, regulatory and incentive structures established by the initial phase of HCEI, HCEI 2.0 intends to meet this lofty generation goal and maintain the state's status as a clean energy leader while making additional efforts to maximize stakeholder collaboration and engagement, identify new key areas and energy sector interdependencies, and facilitate the sharing of resources and solutions.

[11] http://puc.hawaii.gov/wp-content/uploads/2014/04/Commissions-Inclinations.pdf
[12] http://energy.hawaii.gov/testbeds-initiatives/hcei
[13] http://www.hawaiicleanenergyinitiative.org/hawaiian-lawmakers-say-aloha-to-100-renewable-energy-by-2045/