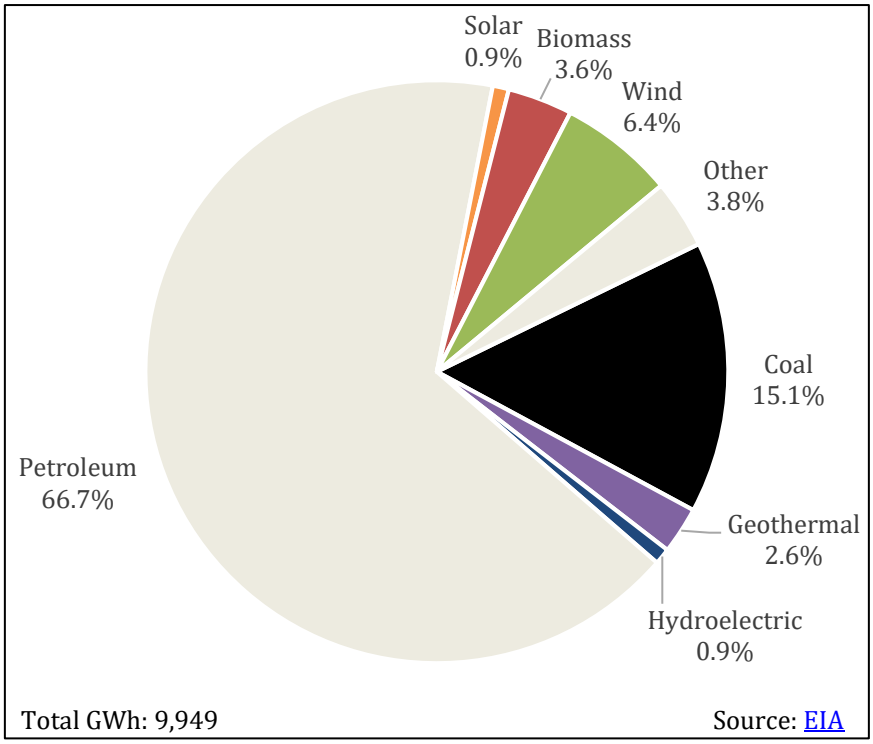
State Brief: Hawaii

BACKGROUND

Hawaii has few energy resources and is the most geographically isolated population center on Earth. As a result, the state must import nearly all of its energy resources – primarily crude oil and other petroleum products. Each of Hawaii's islands has its own electric grid, owned by the utility serving that island. Because transmission cables do not connect the islands, each island must generate its own power.

Dependence on imported petroleum and isolated grids result in the highest retail electricity prices in the nation. Due to the state's mild climate, residential energy consumption is the lowest in the nation. The transportation sector, led by aviation, accounted for more than half of the state's total energy demand in 2015.

Hawaii's Electricity Mix, 2016



The Aloha State has been a national leader in renewable energy production for several years. When distributed generation is accounted for, the share of Hawaii's net electricity generation from renewable resources approached 25% in 2016. The state produces more solar electricity per capita from distributed facilities than any other state in the nation. Hawaii is one of seven states in the U.S. with the potential to implement utility-scale geothermal energy production. District cooling using ocean thermal technology – using deep sea water to chill air-conditioning units – is being commercially developed in Honolulu. The Hawaii Clean Energy Initiative, a partnership between the state and the U.S. Department of Energy (DOE) established in 2008, aims to unite business leaders, policy makers, and citizens to help Hawaii achieve its clean energy goals and energy independence. In 2015, Hawaii became the first state to set a 100% clean energy goal. Hawaii has a separate energy efficiency standard, aimed at reducing anticipated consumption 30% by 2030.

Hawaii is currently under unified control. Democratic majorities control both chambers of the state's legislature, and Governor David Y. Ige (D) was sworn into office in December 2014. The governor appoints the three members of the Public Utilities Commission (PUC), which regulates Hawaii Gas, Kauai Island Utility Cooperative (KIUC), and the Hawaiian Electric Company (HECO).

POLICY STRENGTHS AND OPPORTUNITIES[1]

The National Renewable Energy Laboratory (NREL) developed the notion of "policy stacking,"[2] an important framework for policymakers to consider. The basic idea behind policy stacking is that there is an interdependency and sequencing of state policy that, when done effectively, can yield greater market certainty, private sector investment, and likelihood of achieving stated public policy objectives.

In theory, but not always in practice, clean energy policies can be categorized into one of three tiers of the policy stack. Tier 1, market preparation policies, remove technical, legal, regulatory, and infrastructure-related barriers to

[1] For more information on policy opportunities, please visit the SPOT for Clean Energy. For more information on specific policy actions related to these opportunities, please review the *Clean Energy Policy Guide for State Legislatures*.

[2] V.A. Krasko and E. Doris, *National Renewable Energy Laboratory*, 2012. Strategic Sequencing for State Distributed PV Policies: A Quantitative Analysis of Policy Impacts and Interactions. http://www.nrel.gov/docs/fy13osti/56428.pdf.

clean energy technology adoption. Tier 2, market creation policies, create a market and/or signal state support for clean energy technologies. Tier 3, market expansion policies, create incentives and other programs in order to expand an existing clean energy market by encouraging or facilitating technology uptake by additional market participants.

For example, before financial incentives for combined heat and power (CHP) will be successful, two key considerations for deployment are having clear interconnection standards and favorable stand-by rates for customers who opt to add CHP. In this example, states should adopt policies to address interconnection and stand-by rates before adopting financial incentive programs.

GRID MODERNIZATION

Policymakers can view grid modernization as creating a policy structure that supports and ties together many other initiatives, such as smart metering infrastructure, customer data management, energy storage, electric vehicle infrastructure, and utility business models.

In the last two decades, new digital technologies have enabled utilities to better manage the grid and provide opportunities for consumers to customize their services to fit their priorities. These technologies allow a two-way flow of information between the electric grid and grid operators and between utilities and their customers. Emerging technologies improve system reliability and resiliency by enabling better tracking and management of resources. These technologies allow grid operators to incorporate central and distributed energy resources, energy storage technologies, electric vehicles, and assist in addressing the challenges associated with planning, congestion, asset utilization, and energy and system efficiency. On the customer's side of the meter, advanced metering infrastructure, dynamic pricing, and other emerging technologies allow an exchange of information and electricity between a consumer and their electric provider.

According to the Grid Modernization Index, Hawaii ranks 11th nationally for grid modernization efforts. The state's current grid modernization strategy involves three key steps: adopting the rules and standards recommended by the Reliability Standards Working Group (RSWG), deploying energy storage and advanced grid upgrades, and connecting the islands through undersea transmission cables.

In January 2017, the PUC directed HECO to develop a detailed grid modernization strategy (GMS). The strategy, developed with stakeholder input, was approved in February 2018 and is designed to complement HECO's demand response and new solar programs, also approved in February. The utility estimates that implementing the first segment of the GMS, which will focus on enabling greater solar penetration, enhancing outage management, and strategically deploying advanced meters, will cost about $205 million over six years. The strategy also outlines a new integrated grid planning process, which aims to integrate planning across all levels of the electric system to enable a cost-effective pathway for meeting the 100% renewable energy target. HECO filed its initial Integrated Grid Planning Report with the PUC in July of 2018.

There are additional supportive policies that Hawaii's policymakers could adopt to promote grid modernization.

1. The technologies associated with grid modernization generate a wealth of information about the grid itself and about customer behavior. Policy should include measures to protect this data, but also to encourage the use of this information to facilitate additional improvements to grid management and customer services. Customers participating in HECO's Smart Grid Initial Phase pilot program have access to energy usage data through the online portal "My Energy Use." The portal provides access to data using the Green Button standard. HECO's GMS notes that grid modernization will require that the company expands access to data while continuing to protect privacy.

   Establishing the principles of data access, customer protection, and consumer consent is a critical step in advancing customer data access programs, as is establishing a minimum standard of data resolution available to customers. Allowing customers to access their data and authorize third parties to use their energy data for services opens up a market for IT based energy management companies to expand and offer services directly to customers in Hawaii. Policymakers could develop legislation or rules that, at minimum, do the following: clarify who owns the energy data associated with customer energy usage; protect customer privacy; outline the process for allowing direct access to data by third parties; and promote access to the highest resolution of data.

2. The Hawaii Ratepayer Protection Act (Senate Bill 2939), enacted in April 2018, directs the PUC to establish performance incentives and penalties that tie HECO's revenues to performance on metrics including electric rates, electric service reliability, customer satisfaction and engagement, and integration of renewable resources. Implementing the Act, Docket 2018-0088 will proceed in two phases, both to be completed by January 1, 2020. The first phase will evaluate the state's current regulatory framework and identify areas of utility performance that should be targeted for improvement. The second phase will explore and develop new performance-based regulatory frameworks. Legislation might build on this momentum by specifying the grid modernization goals that HECO is expected to meet under the updated framework.

In line with the notion of policy stacking, discussed above, enhancing energy storage, renewable energy, and electric vehicle (EV) policies would support modernization efforts and improve the chances of successful grid modernization.

ENERGY STORAGE

Energy storage offers a unique opportunity to dynamically manage supply and demand while maximizing the value of grid resources. By deploying storage in strategic locations, utilities can more effectively manage their energy portfolios. First, storage provides management of intermittent demand – helping to flatten peak demand requirements for the utility. Second, the responsiveness of energy storage can allow the utility to implement voltage regulation and other ancillary services, which are useful for improving system efficiency. Third, storage can dispatch power to better integrate intermittent resources like renewable energy. Finally, energy storage can help the commercial sector avoid costly demand charges. As utilities around the country consider extending demand charges to the residential sector, this will become an even more important issue.

The flexibility of battery storage, combined with advanced metering infrastructure, allows customers to control how and when they use energy from the grid or from solar panels installed on their home or business. In most cases, this can provide greater cost savings than standalone solar systems. Combined with time-varying rates or real-time pricing programs, state policy can further support customer choice and open a new market for energy services. Prices that better reflect the time-varying and location-dependent costs of producing and delivering electricity can lead to a number of economic and environmental gains.

Storage provides multiple benefits to both the customer and the utility. State planning and regulatory policies can help maximize these benefits by 1) establishing a framework for easy integration of energy storage into the grid and 2) establishing a marketplace that monetizes the benefits of energy storage for cost effective investment.

In Hawaii, the costs of electricity make energy storage more cost-effective than may currently be the case in other states. Furthermore, the expansion of the EV market in Hawaii points to energy storage as a way to manage spikes in energy demand for charging. More than 17 energy storage projects are planned or operational across HECO's territory. In 2017, KIUC was the number one utility for storage deployment per customer in the U.S. In the summer of 2018, the electric cooperative signed a power purchase agreement (PPA) for less than $0.11 per kilowatt-hour for a solar-plus-storage facility that will become one of its lowest-cost power sources. In July 2018, the PUC issued an order allowing customers with existing solar systems installed under the state's previous net metering rules to add storage without violating their net metering agreement. In Honolulu, the number of energy storage permits granted increased more than 1700% in 2017 after the city and county streamlined the solar-plus-storage permitting process.

There are opportunities for developing supportive state policies:

1. Require the inclusion of energy storage as a critical piece of the energy system as both a demand and supply management resource. Some states have required that utilities evaluate the cost effectiveness of non-wires alternatives (NWAs) to large transmission and generation investments. Alternatively, states might want to require that utilities develop a distribution investment plan that identifies the locations on the distribution system where energy storage or other distributed resources would offer the greatest value.

2. Consider adding a mandatory energy storage procurement target or requirement for energy storage with a documented process for periodic review of progress towards that goal. Procurement targets can jump-start

market creation, spur fast learning, and guide the development of a regulatory framework. Five states currently have energy storage goals that range from five megawatt hours (MWh) to two gigawatts (GW).

3. Finance and incentivize energy storage for customers and utilities. Incentives could enable customers to use storage to manage their electric load and store locally produced renewable energy. Incentives in the form of rebates, grants, and tax credits can provide a bridge to scalable deployment for storage. Incentives can be designed to decline as storage values become more readily monetized. Financing energy storage installations for commercial customers would help reduce their demand charges. For existing financial incentive programs, energy storage can be added as an incentivized energy resource. Policymakers might want to start first with a policy to incentivize solar system owners. Legislators in Hawaii have introduced bills to provide incentives for storage at least three times in the last three years. In 2018, Senate Bill 2016 would have provided an income tax credit for the installation of energy storage equipment.

MAINSTREAMING RENEWABLES

As the renewable energy industry has matured, technology has improved, and global production of generating equipment has increased, renewable energy is increasingly seen as the least cost and lowest risk form of energy (excluding energy efficiency). A Bloomberg New Energy Finance report from this year predicts that at least 50% of total global electricity will be renewable by 2050. With increased deployment, utilities are learning more about how to integrate renewables effectively, investors are becoming more comfortable with the technologies, and building code officials are recognizing common standards and best practices. For these reasons, it is in the interests of policymakers to ensure that their states are well positioned to benefit from the transition to clean and sustainable energy resources.

To reduce barriers to customer and utility participation in the renewable energy market, Hawaii might consider several policy options.

Customer-Oriented Policies

1. Streamlined permitting – In general, customers want a clear, streamlined, affordable, and predictable system for connecting renewable energy systems to the grid. To ensure this, Hawaii's policymakers could consider enhancing offerings like the Renewable Energy Permitting Wizard and the Developer and Investor Center by establishing either statewide standards for streamlined permitting processes, or resources to support local governments that have voluntarily implemented a streamlined program. State incentives, such as tax credits, financial incentives, or loans can be tied to systems that are established within a designated streamlined permitting jurisdiction.

2. Shared Renewables – Due to building and property attributes and ownership issues, many customers are unable to install renewable energy technologies. Allowing shared, or community, renewable energy projects addresses these barriers. These projects have multiple owners or subscribers who pay for a portion of the generation provided by the system. In 2015, Senate Bill 1050 mandated that Hawaii's utilities develop community-based renewable energy tariffs. At the end of December 2017, the PUC issued an order outlining a shared renewable energy program for HECO. The program will be developed in phases to allow adjustments based on experience and market trends. By the end of August 2018, both HECO and KIUC had issued RFPs for shared renewable projects.

   Low credit ratings often deter participation in renewable energy markets; this can affect low- and moderate-income (LMI) households' adoption of renewable energy solutions. Supportive policies for shared renewables can be designed to encourage participation by LMI households; this can increase adoption of renewable technologies and reduce energy costs. Low-income participation can be encouraged either through a percentage mandate for the overall annual contracted capacity, or by offering a higher rate of payment for the portion of shared solar capacity attributed to low-income customers. States that have a shared renewable program may want to coordinate this program with implementation of the federal Weatherization Assistance Program to provide recipients of assistance with participation in a shared renewable system.

   In Hawaii, the PUC says that it envisions that 64 megawatts (MW) of capacity will be developed during phase two of HECO's shared renewable energy program. This capacity will be broken down into 30 MW of "standard", 25

MW of "peaker" and nine MW of "utility" projects. At least half of the utility capacity must be dedicated to LMI customers. Peaker projects will need to deliver at least 85% of their electricity during on-peak hours, likely necessitating the use of non-solar technologies and/or solar-plus-storage.

There are several additional policy options that Hawaii might consider to promote renewable energy uptake by low- and moderate-income consumers. Generally, successful state policies should be tailored to these customers, be cost-effective and financially sustainable, have measurable performance indicators, and be flexible enough to allow later changes in design.

3. Corporate Procurement – Many Fortune 100 and 500 companies have established either climate goals or commitments to purchase renewable energy. In just the last four years, over nine GW of renewable contracts have been announced by corporate entities nationwide. In the first quarter of 2018 alone, corporations signed 14 agreements for over 1700 MW of renewable energy. This is leading policymakers to provide additional avenues for businesses to procure renewable energy.

   Hawaii's policy allows companies to purchase renewable energy credits (RECs), participate in shared renewable energy projects, and develop, lease, or purchase onsite renewable energy. State policy could be updated to address the Corporate Renewable Energy Buyers' Principles and policymakers might consider requiring that utilities offer green tariffs. In addition, it is prudent to integrate corporate renewable purchase commitments into the long-term plans that utilities submit to regulators to plan for resource needs over multiple decades. By integrating these renewable purchase commitments into utilities' plans, regulators can avoid over-building resources and stranding generation assets.

Utility-Oriented Policies

Some states have created programs that aim to reduce greenhouse gas emissions and increase investments in clean energy resources. Hawaii is the first state in the nation to adopt a 100% renewable energy target. In July 2017, the PUC approved HECO's Power Supply Improvement Plan, which outlines how the company will meet this target by 2040, five years ahead of schedule. KIUC has a goal to meet a 70% renewable energy target by 2030. Enacted in June 2018, House Bill 2182 set a goal for the state to reach carbon neutrality by 2045. The legislation, sponsored by CELA Alumnus Chris Lee, also creates a greenhouse gas sequestration task force. Also enacted in June, House Bill 1986 provides a framework for a carbon offset program that is intended to complement the 2045 goal.

ELECTRIFICATION OF THE TRANSPORTATION SECTOR

An estimated 55% of new car sales will be electric by 2040. Therefore, a key part of building a modernized grid involves designing infrastructure that will facilitate easy connection of EVs to the grid. One of the most important barriers to increased adoption of EVs is the consumer's awareness of the availability of EV charging stations. Ultimately, drivers want to be sure that their car will get them where they need to go. Another important barrier to increased adoption of EVs is their higher up-front cost as compared to similar conventionally fueled vehicles. The good news is that both supportive policies for developing charging infrastructure and technological advancements have eased "range anxiety."

A handful of incentives are available to promote the EV market in Hawaii. Qualified plug-in EVs (PEVs) can use HOV lanes regardless of the number of passengers and are exempt from certain parking fees. The state requires that all publicly accessible parking facilities with at least 100 parking spaces include at least one dedicated space for PEVs. The State of Hawaii also provides a free EV charging station locating app. HECO offers time-of-use rates to commercial customers that have installed EV supply equipment (EVSE).

At the end of March 2018, HECO released its Electrification of Transportation Strategic Roadmap. According to the Roadmap, Hawaii already has the second highest rate of electric vehicle adoption in the U.S., and HECO envisions that by 2045, most personal light duty vehicles in the state will be powered by electricity generated from renewable resources. The plan outlines five near-term action items: 1) partnering with automakers, dealerships, and advocates to reduce the purchase price of EVs and educate customers on EV options and benefits; 2) developing partnerships to facilitate the build-out of EVSE; 3) aiding customers in transitioning to electric buses; 4) aligning charging with grid needs; and 5) coordinating EV initiatives with ongoing grid modernization activities.

There are a number of additional policy opportunities in Hawaii:

1. EV and EVSE Financing and Financial Incentives – Providing additional financial incentives and innovative financing options can help spur greater market penetration of EVs. Sales, property, and income tax credits are some of the simplest methods for addressing high up-front costs of EVs and EVSE. While sales tax credits are typically applied at the time of purchase, property and income tax credits may do less to address upfront cost barriers as receipt of the credit is typically removed in time from the purchase.[3] States have adopted other financial incentives including low-interest loans, grants, vouchers and rebates. A handful of states qualify EVSE under their property assessed clean energy (PACE) programs. A simple solution is to increase and expand existing tax credits to incentivize commercial, publicly available charging stations.

2. Charging Infrastructure Plan – Locating charging infrastructure is different from locating conventional fueling stations. For the most part, EVs are cars used for commuting and local trips. Furthermore, while a driver of a conventional vehicle stops only briefly at a gas station for the specific purpose of filling up, a driver of an EV is generally looking to refuel when they are parked for a longer period of time, for example when going shopping, going to a restaurant, or going to work. Charging infrastructure plans should target these types of locations and attempt to pair the appropriate level of charging infrastructure with a reasonable amount of time a person will be at that location. Legislation could direct a state agency to develop such a plan through a stakeholder process.

3. Parking Infrastructure Requirements – Legislation could incentivize utilities to develop make-ready locations. These locations supply power to the point where a utility or third-party developer might install an EV charging station. Hawaii's building codes could also be updated to include requirements for EV charging infrastructure.

NEWS

- September 5, 2018: Residential Energy Storage Surging, No Longer Just a 'Cool Toy'
- August 28, 2018: Hawaii's Solar Industry Calls Tropical Storm Lane a 'Wake-Up Call'
- August 27, 2018: Ride Like the Wind: Makani Energy Kite Test Flights in the Works, Lift Off Later this Year
- August 12, 2018: UH Mānoa Launches Ambitious Renewable Energy Project
- August 9, 2018: Electrifying Hawaii's Transportation Sector Includes More Than Electric Vehicles
- August 3, 2018: Hawaii Panel Signs off on Molokai Renewable Energy Project
- August 2, 2018: Mapping out Hawaii's Path to 100% Renewable Energy
- July 17, 2018: Verizon and Hawaiian Electric Partner to Install Smart Sensors on Grid
- July 12, 2018: Hawaii Energy Launches New Nonprofit Program, Increases Rebates
- June 18, 2018: Why Resilience is Resonating in Grid Modernization Dialogues
- June 15, 2018: Lessons from Hawaii's Clean Energy Transformation for Transportation

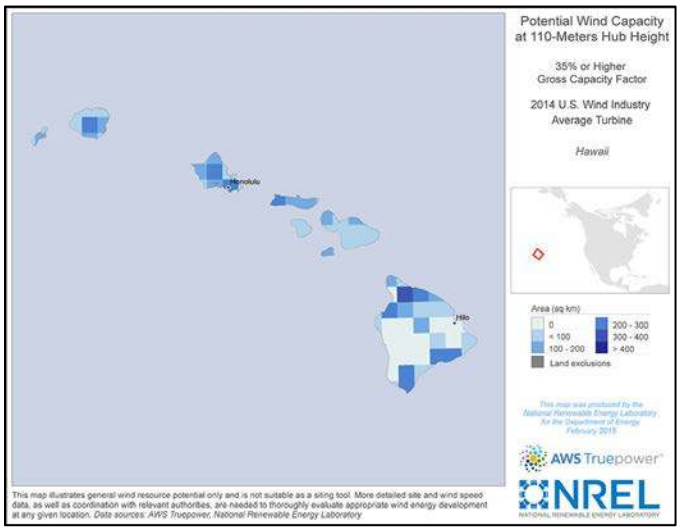
OTHER RESOURCES

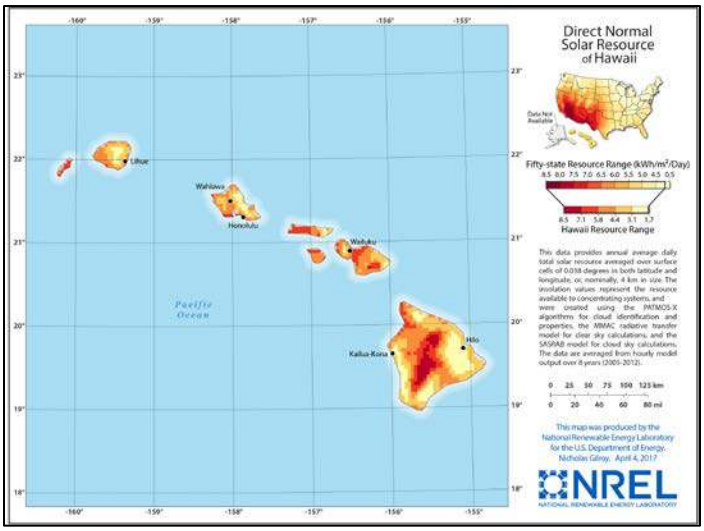
- American Wind Energy Association (AWEA), Hawaii: http://awea.files.cms-plus.com/FileDownloads/pdfs/Hawaii.pdf
- Distributed Energy Resources Council: http://www.dercouncil.org/
- Hawaii State Energy Office: https://hawaiienergy.com/
- The American Council for An Energy-Efficient Economy, Hawaii: http://database.aceee.org/state/hawaii
- The Database of State Incentives for Renewables & Efficiency (DSIRE), Hawaii: http://programs.dsireusa.org/system/program?fromsir=0&state=HI
- U.S. Energy Information Administration, Hawaii: https://www.eia.gov/state/?sid=Hi
- National Renewable Energy Laboratory Biomass Maps: https://www.nrel.gov/gis/biomass.html
- U.S. Department of Energy's Alternative Fuels Data Center, Hawaii: https://www.afdc.energy.gov/states/hi
- Spot for Clean Energy, Hawaii: https://spotforcleanenergy.org/state/hawaii/
- The GridWise Alliance, EVs - Driving Adoption, Capturing Benefits: http://gridwise.org/evs-driving-adoption-capturing-benefits/
- The Regulatory Assistance Project, Performance-Based Regulation: https://www.raponline.org/event/performance-based-regulation-the-power-of-outcomes-part-1/

[3] A study by the Congressional Budget Office however suggests that tax credits are important tools for ensuring increased adoption of alternative-fueled vehicles.

HAWAII'S WIND AND SOLAR RESOURCES

WIND https://windexchange.energy.gov/states/hi[4]
SOLAR https://www.nrel.gov/gis/solar.html





Our Resources

CNEE Homepage: http://cnee.colostate.edu/

The SPOT for Clean Energy: https://spotforcleanenergy.org/

The Advanced Energy Legislation (AEL) Tracker: https://www.aeltracker.org/

Clean Energy Policy Guide for State Legislatures: http://cnee.colostate.edu/cleanenergypolicyguide/

The Energy Policy Podcast: http://energypodcast.colostate.edu/

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[4] Please see your packet for a higher resolution wind energy capacity map.