HAWAII ENERGY STORAGE POLICY

STORAGE POLICY SNAPSHOT

Does Hawaii have a renewables mandate?	YES, 100 percent by 2040
Does Hawaii have a state mandate or target for storage?	NO
Does Hawaii have a policy for the strategic deployment of Non-Wires Alternatives or Distributed Energy Resources to defer, mitigate, or obviate need for certain T&D investments?	NO
Does Hawaii offer financial incentives for energy storage development?	NO
Does Hawaii have a policy addressing multiple use applications for storage?	NO
Does Hawaii have a policy on utility ownership of storage assets?	NO
Does Hawaii allow or mandate the inclusion of energy storage in utility IRPs?	YES
Has Hawaii modified its permitting or interconnection requirements specific to energy storage?	NO, but this effort is in progress
Does Hawaii allow customer-sited storage to be eligible for net metering compensation?	NO, the net metering program in Hawaii was disbanded in 2015.
Has Hawaii revised its rate structures to drive adoption of behind-the-meter storage	YES
Approximate development of storage capacity in Hawaii	About 74 MWh as of August 2019

STORAGE POLICY ASSESSMENT

The state of Hawaii has many characteristics that make it an important and unique "test bed" for the development of energy storage solutions and the necessary policy structure to support those solutions. In fact, Hawaii is a prototype for a state—historically dependent on expensive, imported oil—moving to a 100-percent renewables market as a means to become self-sufficient regarding its energy supply. And it is doing so without the benefit of having an inter-island grid system to enable the transition, but rather through the development of stand-alone supply solutions independently placed across the state's eight separate islands and their isolated island grids. The result? Presently Hawaii is at the leading edge of incorporating renewable energy and energy storage, outpaced only by California, which tops the market for solar, storage and plug-in electric vehicles, the main technology manifestations of the clean-power revolution.

Hawaii's path toward its current market position has arguably been pursued out economic necessity. Again, we must keep in mind Hawaii's unique geography. Separated by thousands of miles of ocean, for decades Hawaii has required the importing of petroleum fuel to support its energy needs, which has consistently resulted in electricity rates that are more than double (and sometimes triple) the national average. In fact, Hawaii has historically had the highest energy prices in the country, which due to on historical fossil fuel prices have averaged about $0.15/kWh but historically has run as high as $0.30/kWh. The development of alternatives to the state's dependence on fossil fuel resources has largely been driven by policy directives. Only recently have we started to witness utility plans drive the market, with the economic impetus of lucrative power purchase agreements (PPAs) for solar + storage that are now beating petroleum-based power contracts.

Ten years ago, about 6 percent of Hawaii's electricity was powered by renewables. In 2018/2019, that level has increased to about 28 percent. Unlike most U.S. states, up until recently the bulk of solar project in Hawaii have been distributed rooftop solar projects. much of it comprised of rooftop distributed solar, which moves the state ever closer to its goal of 100 percent renewables by 2040. With an expanded focus on new, utility scale solar + storage solutions, the state's well-publicized commitment to clean energy has provided the "welcome mat" to a host of companies with innovative technologies designed to support the transition At last count, there are approximately 60 utility scale, clean energy projects in operation in Hawaii, including solar power plants, wind farms, and hydroelectric facilities. While the separation of individual islands and the lack of a comprehensive grid system in the state has been mostly seen as an operational challenge, what has also proven to be true is that technology demos can be replicated from one island to another. While the continually increasing amounts of renewables that contribute to Hawaii's total energy mix are impressive, it is likely that the inclusion of energy storage will be essential in order for Hawaii to reach its 100 percent renewables goal by 2040.

The move toward a self-sufficient, clean energy infrastructure has been in place for well over a decade, with a mix of executive directives, legislation and regulatory mandates continuing to increase and accelerate the commitments placed on incumbent utilities. Perhaps more than any other state, Hawaii's transition to a carbon-free marketplace has been primarily driven by policy as opposed to utility-driven business initiatives. However, utility initiatives are expanding the use of renewables from what has been primarily a distributed solar market into one that is continuing to grown quickly through utility-scale initiatives. Within the last several years, new PPAs between Hawaiian Electric, Inc. (HEI) have included record-low prices for solar + storage contracts with unique capacity-promoting features, underscoring the competitiveness of renewables contracts when compared against fossil fuel contracts and validating the long-term clean energy goals of the state.

HEI provides most of the power consumed on the islands through its subsidiaries on Oahu, Maui and the Big Island. HEI issued a Power Supply Improvement Plan (PSIP) in December 2016 that put forth an ambitious five-year plan to double Hawaii's renewable energy penetration from 25 percent to 52 percent in 2021, and also nearly double the state's photovoltaic installations from 717 MW to 1,465 MW in the same time period. This PSIP is expected to put Hawaii on the road to get 100 percent of its electricity by 2040 from renewable sources, with no fossil fuels on the island by 2045.

PROJECT NAME	**ISLAND**	**DEVELOPER**	**SIZE**	**STORAGE**	**COST PER kWH**
Waikoloa Solar	Hawaii	AES	30 MW	120 MWh	$0.08
Hale Kuawehi	Hawaii	Innergex	30 MW	120 MWh	$0.09
Kuihelani Solar	Maui	AES	60 MW	240 MWh	$0.08
Hoohana Solar 1	Oahu	174 Power Global	52 MW	208 MWh	$0.10
Mililani Solar	Oahu	Clearway	39 MW	156 MWh	$0.09
Waiawa Solar	Oahu	Clearway	36 MW	144 MWh	$0.10

These HEI projects are game-changers for the entire industry as they represent instances in which solar + storage solutions are less expensive than both the utility's gas peaker plants and

the current cost of fossil fuel generation (which in Hawaii is mostly petroleum based). As shown, the range of the contract prices falls between $0.08 kWh and $0.10/kWh, compared against the cost of fossil fuel generation, which HEI has said is around $0.15/kWh. Thus, the contracts indicate the dawn of a new era for the "solar peaker," in which solar + storage is replacing existing and new natural gas to support reliability needs across Hawaii's distribution grids.

These transactions are transformative for the industry as a whole because they represent a turning point of sorts in which renewable energy projects will produce less expensive power than new fossil fuel projects. It is anticipated that renewables' ability to beat fossil fuel sources in competitive PPAs is a trend that will continue into the future (in Hawaii in the short term and perhaps as an indicator of price trajectories on the mainland as well).

HEI reportedly wants to add another 1,378 MWh of storage and the equivalent of 135 MW of solar as it faces closures of its fossil-fuel based plants and the 100-percent renewable goal in the state. If pursued and approved, these projects would exponentially grow Hawaii's renewables market.

Aside from the impact the contracts could have on setting new price targets that will have ripple effects in other markets, the HEI contracts also have a clear "capacity promoting" component that represents a game-change for solar + storage PPAs. Specifically, AES's 25-year, 30-MW solar and 120-MW-hour storage PPA uses a monthly "lump sum payment" to the developer based on net energy potential and facility availability, rather than energy delivered. Payment based on capacity instead of energy delivered could be a new standard for solar + storage PPAs going forward, as it provides certainty of payment for developers and certainty of asset dispatchability for utilities and grid operators.

It's also important to recognize the efforts of cooperatives in Hawaii, which are not under the jurisdiction of the Hawaii PUC but have initiated their own industry-leading initiatives. Kauai Island Utility, which serves about 33,000 customer accounts on the island of Kauai, has partnered with AES for what is reportedly the largest solar + storage peaker plan in the world, consisting of 28 MW solar PV facility and a 100 MWh, five-hour duration energy storage system. The plant is known as the Lawa'I Solar and Energy Storage Project. Kauai Island Cooperative in fact led the nation in 2018 for interconnection of storage (based on annual watts per customer) and ranked second in annual energy storage capacity (based on megawatts per hour).

Returning to the concept of Hawaii as a real-time test bed, it continues to be fascinating to watch the state grapple with the array of policy, financial, and operational considerations that are associated with the development of a clean-energy marketplace. Within these three areas, Hawaii continues to make policy-setting precedents that other states are watching.

- ***Policy:*** On energy storage policy, Hawaii remains a "state of firsts." Along with being the first state to enact a 100-percent renewables marketplace, Hawaii was one of the first states to offer a net energy metering (NEM) program to rooftop solar customers wanting to sell power back to the grid. Hawaii was also the first state to dismantle its NEM program as concerns about excessive exported energy on the grid were raised by HEI to the Hawaii PUC. This experience led to Hawaii developing new rate designs specific to solar + storage customers, which replaced its NEM program and represent one of the first efforts by a state to not only replace NEM with more sophisticated rate design, but define rate offerings specific to solar + storage, codifying the role that utility consumer can play as "prosumers" in more sophisticated utility transactions (the first state to take such a formal step). Hawaii also now finds itself charting new pathways applying performance-based regulations (PBR) to renewables / DERs initiatives pursued by utilities. This is also an industry first; a key component of PBR regulation in Hawaii will be assessment of how quickly and easily HEI can connect renewables and other DERs to its grid.

- ***Financial:*** New PPAs reached between HEI and independent power producers include the lowest prices we've seen for solar + storage, setting new market benchmark price targets. HEI has received approval for six new solar + storage contracts. Those seven projects represent more than 260 MW of solar and 1 GWh of energy storage. The projects also represent a new target price for renewables PPAs. The solar projects are backed by four-hour batteries and were priced out as low as $0.08 /kWh. The cost of oil is around $0.17/kWh.

- ***Operational***: Hawaii provides an example of the risks associated with states not taking proactive steps to develop innovative rate designs or other regulatory treatment before witnessing a rapid proliferation of renewables from distributed sources coming onto the grid. As noted, Hawaii experienced a rather sudden and significant increase of distributed energy being injected on its distribution grids as a result of the popular NEM program. In fact, perhaps compared to any other state, Hawaii has experienced an unprecedented amount of distributed solar feeding into isolated island grids. In HECO territory, reportedly 16 percent of customers have net metered rooftop solar, often meaning that distributed solar interjected back to the grid can account for more than 30 percent of an individual circuit peak load. By definition, such distributed generation is outside the utility's control, and largely unmonitored by utilities and grid operators that manage the balance of energy supply and demand. HECO reported to the Hawaii PUC that this was creating problematic technical and operational challenges, which led to the NEM program being discontinued (for more information on the operational impacts that HECO experienced, please Google "Hawaii and Ness Curve"). While Hawaii's approach was to discontinue net metering and replace the program with new tariffs specific to solar + storage, grid planners in other states (e.g., Massachusetts and New Jersey) are presently formulating strategies to deal with a theoretical, exponential growth of DERs in advance of this becoming a reality in their own state.

Moreover, the reason that energy storage development in Hawaii is so important reverts back to its status as a "test bed." Hawaii is the state that is coming close to proving that renewable energy sources can power a grid on a 24/7 basis. Now, through using storage the state can avert the customary limitations around the intermittency of renewables and enable its complete divorce from fossil fuel generation. When the combination of renewables + storage is beating out the price of traditional generation (as is the case now in Hawaii) then the option of replacing all fossil fuels with renewables becomes more realistic.

EXECUTIVE DIRECTIVES

Over the last decade or so, Hawaii's governors have been instrumental in spearheading the clean-energy revolution in the state, to varying degrees of success. Linda Lingle (R) served as governor of Hawaii from 2002 to 2010; Neil Abercrombie (D) from 2010 to 2014; and David Inge (D) is the state's current governor, having assumed office in 2014.

It was under the Lingle administration that Hawaii's clean energy policy was originally launched with the Hawaii Clean Energy Initiative (Hawaii CEI). However, Lingle's record also included opposition to federal policies that would have expanded the Environmental Protection Agency's regulation of greenhouse gases.

The Hawaii CEI was a milestone in Hawaii's path toward clean energy, and should be viewed as the impetus that started Hawaii's journey from fossil fuel dependence to a world leader in clean energy. The CEI was launched in 2008 as a partnership between the State of Hawaii and the U.S. Department of Energy and also brought together an array of business leaders, policymakers, and concerned citizens committed to leading Hawaii to energy independence In 2014, the CEI was renewed with updated policy goals:

- Achieving the nation's first-ever 100 percent RPS by the year 2045.
- Reducing electricity consumption by 4,300 GWh by 2030.
- Reducing petroleum use in Hawaii's transportation sector which has accounted for two-thirds of the state's overall energy usage, due to the state's transportation sector.
- Other policies that have grown out of the HCEI address areas such as regulatory reform, tax policy and clean energy financing.

Under his tenure, Governor Abercrombie took policy positions commonly associated with the Democratic party: support for environmental regulation aimed at reducing the effects of climate change; state funding for alternative energy; and Hawaii's interest in seeking energy independence. Perhaps the greatest related achievement of the Abercrombie administration was a partnership between Hawaii and the Republic of Korea to pursue smart grid deployment

in the Hawaiian islands. Similar partnerships were also signed with the governments of China and Japan to develop smart grid projects in Hawaii. In addition, several important pieces of legislation were signed by Gov. Abercrombie, including bills that redefined the definition of "renewable electric energy" to include customer-sited, grid connected energy generation.

Abercrombie also wanted to make significant changes to how energy is regulated in Hawaii, with proposed initiatives to create a new independent authority with policy and regulatory oversight over renewable energy projects and limit the Hawaii PUC to serving as a rate-setting agency.

Since his tenure as governor began in 2014, Gov. Ige has signed a number of important pieces of legislation related to clean energy, renewables and energy storage. Perhaps the central piece of energy-related legislation that can be attributed to Gov. Ige is his signing of the landmark legislation HB 623, which enacted the policy objective of making Hawaii the first state in the nation to set a 100-percent RPS for the state's electricity sector.

LEGISLATION

Act 150 (2008)

- Requires the Hawaii PUC to ensure that a percentage of the total rated generating capacity produced by eligible customer-generators be reserved for electricity produced by eligible residential or small commercial customer-generators.
- Allows the Hawaii PUC to define the maximum capacity for eligible residential or small commercial customer-generators and to evaluate, on an island-by-island basis, the applicability of the generating capacity requirements and, in its discretion, exempt an island or a utility grid system from the generating capacity requirements.
- Enhanced Hawaii's net energy metering statute by providing that every electric utility shall reserve a portion of the utility's net energy metering component for electricity generated by eligible residential and small commercial customer-generators.

Act 50 (2009)

- Deletes avoided cost by a utility in determining a just and reasonable rate for non-fossil fuel generated electricity.

Act 9 (2011)

- Exempts certain third-party owners and operators of on-site renewable energy systems from regulation as public utilities by the Hawaii PUC.

- Intended to stimulate greater participation of renewable energy by independent developers.

Act 10 (2011)

- Amends definition of "renewable electrical energy" to include, beginning 1/1/15, customer-sited, grid-connected renewable energy generation.
- Redefines the Hawaii RPS to include customer-sited, grid connected renewable energy generation.

Act 261 (2013)

- Exempts landlords and lessors who install renewable energy systems on their property and provide, sell, or transmit electricity generated from those renewable energy systems to tenants or lessees on the premises from the definition of public utility, under certain conditions.
- Intended to stimulate greater penetration of distributed renewable energy generation.

Act 37 (2013)

- Authorizes the Hawaii PUC to establish a policy to implement economic incentives and cost recovery regulatory mechanisms to induce and accelerate electric utilities' cost reduction efforts, encourage greater utilization of renewable energy, accelerate the retirement of utility fossil generation, and increase investments to modernize the State's electrical grids.

Act 97 (2015)

- Increases RPS requirements to 30 percent by December 31, 2020, 70 percent by December 31, 2040, and 100 percent by December 31, 2045.
- Requires the Hawaii PUC to include the impact of renewable portfolio standards, if any, on the energy prices offered by renewable energy developers and the cost of fossil fuel volatility in its renewable portfolio standards study and report to the Legislature.
- The law is intended to ensure that Hawaii moves beyond its dependence on imported fuels and continues to grow a local renewable energy industry.
- In addition, the law intends to ensure that electricity from on-site generation not purchased from an electric utility, both on-grid and off-grid, is subject to the same renewable standards as electricity generated by electric utilities.

Act 100 (2015)

- Requires electric utilities to file proposed community-based renewable energy tariffs with the Hawaii PUC.
- Authorizes ratepayer participation in eligible community-based renewable energy projects

HB 2291 (2016)

- A bill that would replace the current renewable energy technology systems tax credit with tax credits for solar energy, wind energy, and energy storage property.

Act 32 (2017)

- Requires the State to expand strategies and mechanisms to reduce greenhouse gas emissions statewide in alignment with the principles and goals adopted in the Paris Agreement.

Act 200 (2018)

- Directs the Hawaii PUC to establish a microgrid services tariff to encourage and facilitate the development and use of energy resilient microgrids.
- This act initiates the process to standardize and streamline the related interconnection processes for microgrid projects in a manner that benefits utility customers. It also aims to prevent defection from the grid that would leave those connected vulnerable to rising costs of an energy system to be paid for by fewer customers.
- Intended to facilitate development and use of microgrids in Hawaii.
- The legislation noted that "Few microgrids have been developed [in Hawaii] and their development has been inhibited by a number of factors, including interconnection barriers, and a lack of standard terms regarding the value of services exchanged between the microgrid operator and the utility."

HB 1801 (2018)

- This bill is still technically alive but appears to have stalled at the Hawaii Senate.
- Current law uses a formula to calculate the percentage of renewable energy used in the state.

    - The current formula: *(Electricity generated from the utility's renewable resources (ex. Wind turbines)) + (Energy generated by customers (ex. Rooftop solar)) / (Total utility sales from electricity (renewables and fossil fuels)) = % Renewable Energy*
- Because the formula puts electricity sales and not electricity generation in the denominator, it could include both fossil fuels and renewable resources. Hypothetically, utilities could include 50 percent fossil fuels in their portfolio and still meet their 100 percent renewable target because the energy generated by consumers wouldn't count towards "sales" and could offset fossil fuel use.
- HB1801 would change the formula to: *(Renewable electricity generated by grid-connected systems) / (All electricity generated by grid-connected systems) = % Renewable Energy*
    - The proposed formula would directly compare renewable energy generated to all electricity generated and would exclude fossil fuels entirely from being counted in the percentage.

SB 2939 (Performance-based ratemaking)

- Directs the Hawaii PUC to create a framework for rewarding utilities based on performance (performance-based ratemaking).
- As with typical PBR approaches, the intent of the legislation is intended to break the direct link between allowed revenues and investment levels. This is accomplished through "decoupling," which simply means that a utility does not have to increase its sales to meet financial targets and/or earn a profit. This process allows a utility to promote initiatives that might reduce their revenues (e.g., energy efficiency, customer sited DERs) without jeopardizing cost recovery of allowable expenses. Performance-based ratemaking is not a new concept, but its application to solar specifically, and certainly to solar + storage, has been minimal up to this point.
- Criteria for rewards or penalties include "rapid integration of renewable energy sources, including quality interconnection of customer-sited resources."
- The law appears to be the first in the nation to that provides the opportunity for financial rewards for utilities tied to renewable energy projects (there are some similar, utility-specific policies in New York and Rhode Island, but Hawaii's approach is uniquely directed toward DERs).
- Other issues to which the PBR will apply: reliability, purchased power, and customer satisfaction.
- It will likely take at least 18 months for the specifics of the new PBR policy in Hawaii to be finalized (the deadline for implementation is 2020)
- It is not clear how the PBR approach will deal with stranded costs HEI might incur from the accelerated retirement of fossil fuel plants in the state.

- The new policy does not apply to Hawaii's member-owned electric cooperatives.

REGULATIONS

The Hawaii PUC's role has expanded from traditional rate regulation to oversight of energy policy directives and program implementation.

Net energy metering (NEM) went into effect in Hawaii in 2001. The program was fairly typical in that rooftop solar owners were paid the retail rate for power sent back to the grid. However, in comparison to other states that have NEM programs in place, Hawaii witnessed an unanticipated and unprecedented solar penetration as a direct result of its profitable program (the retail rate in Hawaii is the highest in the country). The solar market and NEM participation reportedly doubled in Hawaii each year throughout the early 2010s.

More universal concerns regarding how NEM programs shift costs from NEM customers to non-NEM customer was certainly a concern for Hawaii Electric (HEI), which provides most of the power consumed on the islands through its subsidiaries on Oahu, Maui and the Big Island. However, a more concerning factor, which ultimately led to the discontinuation of Hawaii's NEM program was the impact of a large amount of electricity coming onto the grid from distributed sources and constraints placed on hosting capacity on certain circuits. The rather sudden and significant increase of solar power coming on to the grid from rooftop solar owners HEI petitioned to the Hawaii Public Utilities Commission (Hawaii PUC) that its circuits were being compromised due to the include of daily solar injections onto the grid.

Although extreme, the Hawaii experience demonstrates the limits of a distribution grid system that was not intended to accommodate a sudden, rapid, and often uncontrollable interjection of renewable resources. And the strain on the grid is not only caused by the interjection of renewable resources; even in those instances when a self-supply system does not export, the fact that it is in operation reduces the daytime load firm generation that is needed on specific circuits and creates an overload situation when utility generators are not able to ramp down quickly.

These operational concerns resulted in Hawaii's NEM program being shut down in 2015. HEI also began to decline the applications of new permitted projects due to concerns about continued grid strain. While this has resulted in a noticeable slow-down of Hawaii's residential solar market, the cumulative penetration of solar power in Hawaii far exceeds what is happening in other U.S. states.

It is the discontinuation of the NEM program in Hawaii that has provided the basis for the current growth of storage technologies that is taking place on the islands. Storage was not cost justifiable under the legacy NEM program; participating customers were better off to simply export the energy back to the grid and receive the retail rate as compensation. With the

elimination of the NEM program, energy storage suddenly become very cost justifiable and enticing for those customers who opted to self-sustain their own power needs through storage rather than provide energy back to the utility.

The NEM program in Hawaii was replaced in 2017 with two new regulatory tariff options for customers to interconnect DERs to the utility grid. Not everyone is a fan of these new structures as they are certainly more complicated than the straightforward NEM payback mirroring the retail rate, not to mention the fact that the end payment from these two tariffs will likely pale in comparison to the NEM payout. Nevertheless, customers in Hawaii who own DERs technologies, including solar + storage, now have the option of two new tariffs:

- The "self-supply" tariff (also referred to as "Customer Self-Supply"):
    - Designed for solar projects that don't export any electricity to the grid.
    - PV customers with energy storage in areas of high PV penetration are eligible for an expedited review and approval of their systems.
    - These customers are very limited in the amount of electricity they can send back to the grid.
    - These customers do not receive any compensation for the limited amount of solar power exports they might send back to the grid.
    - The focus of this tariff is the advantages of having back-up power that can be used at night and in the event of power disruptions.

- The "grid supply" tariff (also referred to as "Smart Export" and "Customer Grid Supply"):
    - The program provides HEI customers with the opportunity to export energy to the grid during peak hours in the evening.
    - Similar to the legacy NEM program, allowing PV customers to export electricity to the grid for credits on their electric bill.
    - Requires an energy storage system that customers can charge during the day and use for power at night.
    - PV customers will be compensated at the wholesale rate for electricity exported to the utility grid outside peak solar generation hours.
    - Wholesale prices currently average between 15 cents / kWh and 28 cents/ kWh, which at times is about half of what the retail rate in Hawaii runs.
    - The true-up period for compensation calculation was changed from a monthly to a yearly cycle, which impacted the value proposition for many projects.
    - Under this program, a customer's rooftop solar system will recharge their battery during the day. The stored energy can either be used to power an individual's home at night or it can be exported back to the grid for credit.

The same regulatory order included a provision that existing NEM customers (who entered the program before it was ended in 2015) have the opportunity to add energy storage systems

without voiding the terms of their NEM agreements, as long as the storage equipment is not intended to export power to the grid. The revised NEM program in Hawaii is referred to as "NEM Plus."

The dismantling of the NEM program and subsequent new tariffs, along with the opportunity to add storage onto existing NEM agreements, has resulted in a resurgence of solar in Hawaii but with the key addition of solar technologies being joined with the solar power. New reports indicate that over 60 percent of all newly permitted PV system now include batteries, which were not comparatively economical during the NEM era. However, there are still challenges with this approach, apart from complexity not found in the NEM program, in that determinations of the value of either stand-alone solar or solar + storage remain difficult to reach.

Other significant regulatory dockets before the Hawaii PUC that address energy storage specifically or are related by addressing renewables or DERs issues include the following:

Docket No. 2018-0165 (Integrated Grid Planning (IGP) –

- (Status: Open)
- The PUC initiated this docket in July 2018 to investigate Hawaiian Electric Companies' proposed integrated grid planning (IGP) process, which through stakeholder engagement, a technical advisory panel, and working groups, intends to merge three separate planning processes (generation, transmission, and distribution) while addressing procurement. The goal is to identify gross system needs, coordinate solutions, and develop an optimized, cost effective portfolio of assets. As IGP integrates all levels of the system, it differs from the traditional resource planning framework known as Integrated Resource Planning (IRP) (between 1990-2014) and subsequent Power Supply Improvement Plan (between 2014-2017). The IGP process was originally raised as part of Hawaiian Electric Companies' Grid Modernization Strategy.
- According to Hawaiian Electric Companies' IGP report: Planning Hawaii's Grid for Future Generations, Integrated Planning Report, the process will be conducted in four steps:
    - Forecasts and Planning Inputs
    - Resource Needs and Sourcing
    - Transmission and Distribution Needs and Alternatives
    - Near-term Action Plan and Long-term Pathway
- Hawaiian Electric Companies propose to complete the bulk of the planning process in 18 months and conduct an IGP cycle every two years, with the first cycle beginning in 2019, resulting in the first plan by the end of 2020.
- Actions taken:
    - In March 2019, the PUC accepted the IGP work plan filed in December 2018. The work plan includes a summary and description of the IGP process including

forecasts, planning inputs, identifying and quantifying system needs, a methodology and process for sourcing solutions, and solution evaluation and optimization. The work plan also includes a stakeholder engagement model consisting of broad engagement, a stakeholder council, working groups and technical advisory panel. The work plan provides a detailed timeline for IGP events, process descriptions, and details of each working group (Decision and Order No. 36218).

Docket No. 2018-0163 (Microgrids)

- (Status: Open)
- The PUC initiated this docket in July 2018 to investigate the establishment of a microgrid services tariff as directed under Act 200, 2018 Session Laws of Hawaii to encourage and facilitate the development and use of microgrids. A microgrid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the utility's electrical grid and can connect to public utility's electrical grid to operate in grid-connected mode and can disconnect from the grid to operate in island mode. Some of the preliminary questions that this docket will address is the coordination of existing tariffs and programs, modification of interconnection standards and procedures, and consideration of services and functions in the microgrid services tariff.

Docket No. 2014-0192 (Distributed Energy Resources (DER))

- (Status: Open)
- The PUC initiated this docket in August 2014 to investigate the technical, economic, and policy issues associated with distributed energy resources (DER). Distributed energy resources include distributed generation, energy efficiency, demand response, electric vehicles, and distributed energy storage. This docket has resulted in the approval of revisions to interconnection standards for inclusion in Hawaiian Electric Companies' Tariff Rule 14H as well as new program offerings (customer self-supply, customer grid-supply, customer grid-supply plus, smart export, net energy metering plus) following the closure of net energy metering (NEM) to new participants in 2015.
- These interconnection standards and programs aim to expand customer options and ensure that customers can efficiently interconnect new DER systems that are configured to provide grid-supportive benefits. This docket also established a residential time-of-use pilot to incent customers to shift their electricity consumption from the evening

hours to the mid-day when the sun is shining. This evolution in DER policies is essential given the State's commitment to meet a 100 percent RPS by 2045.

- Phase 1 of this docket focused on establishing a transitional market structure for DERs.
- Phase 2 of this proceeding builds upon the transitional market structure established to develop a set of longer-term policies to enable continued beneficial deployment of DER across the State. This will include an evaluation of opportunities to integrate and aggregate various forms of DER (e.g., solar PV, energy storage, demand response, etc.) to enhance their value, adoption of new technical requirements for safely and reliably interconnecting DER, as well as detailed consideration of regulatory policies (including rate design) appropriate for cost-effectively acquiring these resources.
- Actions taken:
    - In October 2015, the commission closed the net energy metering program to new participants and approved self-supply and grid-supply tariffs. (Decision and Order No. 33258).
    - In July 2016, revisions to Rule 22 Customer Self-Supply and Rule 14H Interconnection of Distributed General Facilities submitted on May 2, 2016 were approved (Decision and Order No. 33791).
    - In September 2016, the commission instructed the HECO companies to submit tariffs for an interim time-of-use (TOU) program (Decision and Order No. 33923).
    - In October 2016, Docket 2015-0410 (Department of Education Time-Of-Use Rates) was transferred to Docket 2014-0192 (Decision and Order No. 33959).
    - In June 2018, the HECO Companies' Smart Export Tariff and proposed policy for adding non-exporting storage to existing Net Energy Metering (NEM) systems were approved (Decision and Order No. 35563)
    - In September 2018, the CSG+ Tariff is approved (Decision and Order No. 35701).
    - In October 2018, the TOU-RI Tariff Extension was approved (Decision and Order No. 35740).
    - In October 2018, revisions to Rule 14H and the proposed Rule 27 were approved, in part (Decision and Order No. 35746).
    - In December 2018, the revised TOU-RI Tariff Sheets were approved for MECO and HELCO (Decision and Order No. 35970).
    - Related Docket Nos: 2011-0206 (Reliability Standards); 2014-0130 (Tariff Rule 14H); 2015-0410 (Department of Education Time-Of-Use Rates)

<u>Docket No. 2018-0088</u> (Performance-Based Regulation (PBR))

- This docket has been opened to investigate the economic and policy issues associated with performance-based regulation (PBR) for the Hawaiian Electric Companies (HECO), as required by SB 2939.

- Specifically, its scope is on aligning utility incentives with performance on desired outcomes, such as increased renewable energy, lower cost, and improved customer service.
- Phase I focused on evaluating the current utility regulatory framework in Hawaii, as well as identifying areas of utility performance that should be targeted for improvement.
- Phase I ultimately identified 12 key outcomes and a portfolio of priority PBR mechanisms for updating Hawaii's regulatory design. The 12 key regulatory outcomes identified for this docket include:
    - Affordability
    - Reliability
    - Interconnection experience
    - Customer engagement
    - Cost control
    - DER asset effectiveness
    - Grid investment efficiency
    - Capital formation
    - Customer equity
    - Greenhouse gas reductions
    - Electrification of transportation
    - Resilience
- Phase II will explore and develop a new PBR framework, using performance incentives to align utility incentives with the targets identified in Phase I. Phase 2 will focus on the development of PBR mechanisms according to guiding principles, goals, and outcomes determined in Phase 1.

Moreover, with the introduction of TOU rates and peak evening pricing, Hawaii is taking the next step in its renewable energy revolution. By charging less for electricity during peak solar hours and more during the evening when net demand is on the rise, the utility is aiming to encourage customers to use more electricity during the day when low-cost solar is plentiful. Under the TOU pilot program, electricity prices can jump more than four times higher as the sun begins to set in Hawaii. The price increases from a daytime low of $0.10 /kWh to $0.47/kWh at 5 p.m. for residents of the Big Island. Without energy storage, nearly all of the solar generated by residential solar systems throughout the day goes toward offsetting the lowest priced electricity during the daytime hours.

THE FUTURE OF ENERGY STORAGE IN HAWAII

As the state of Hawaii continues to experience a rapid growth of renewables, DERs and energy storage deployments, it is anticipated that future regulatory proceedings will be focused on the

intricacies of the PBR implementation, integrated resource planning, and continued fine-tuning of the new tariffs designed for solar + storage customers.
Although rather surprising, presently Hawaii does not offer any financial incentives for energy storage installations. Previous legislative measures that would have established a new tax credit for the addition of energy storage to existing solar PV systems have failed at the Hawaii Legislature. If Hawaii were to get something passed related to a tax credit specific for energy storage, it would be the first state to do so. Given Hawaii's position as a "test bed" for developing innovative policy applications (e.g., revised NEM policies, use of PBR for solar + storage), it would be interesting to see how Hawaii could develop a financial mechanism to subsidize and encourage the development of storage solutions, particularly among businesses and commercial operations.

The Hawaii PUC is also likely to address the potential unbundling of all technologies including demand response, energy storage, and customer-owned generation to compete in ancillary services to the distribution grids across the islands.

Furthermore, the Hawaii PUC has not addressed the issue of how an increased use of aggregated DERs can be used to replicate or supplement conventional generation resources in the form of "virtual power plants" (VPPs). The question of how to integrate VPPs with the development of microgrids is also unclear and represents a policy gap. If Hawaii were to develop a policy regarding the use of virtual power plants, it would be the first state to do so.

Finally, in comparison to California, Hawaii has not mandated that utilities development a comprehensive distributed energy resource plan to address issues such as location-specific valuation of storage solutions, use of advanced inverters on energy storage systems, how utilities will manage two-way communications with DERs customers attempting to interject resources onto the grid.

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