INNOVATION PILOT FRAMEWORK
WORKPLAN

November 2021

Hawaiian Electric Company, Inc.
Hawai‘i Electric Light Company, Inc.
Maui Electric Company, Limited

Areas of Collaboration

The following Areas of Collaboration ("AOC") and associated illustrative problem statements and goals will guide development of potential pilot projects under the IPF. Pilot projects will be proposed during the Implementation Phase in the form of Notices of Intent ("NOI").[1] Many potential pilot projects could fall under multiple AOCs. In selecting projects under the IPF, the Companies will give strong consideration to those that may directly or indirectly benefit Low-to-Moderate Income ("LMI") customers from across the State.

1. Decarbonization

In 2018, the State of Hawai'i established a net-zero or less emissions clean economy target to be met as soon as possible and no later than 2045.[2] The Companies support and will play a role in achieving this objective while maintaining electric system reliability, security, and affordability.[3] Decarbonization represents a broad, cross-cutting area that will require multiple sectors to assess new solutions in order to achieve state-wide carbon reduction targets. Piloting in this area can help assess various technical and business model options or applications related to economy-wide decarbonization, including the electric sector. The problem statements and goals related to Decarbonization include:

A. Increasing levels of intermittent renewable energy resources, and corresponding replacement of firm, non-spinning generation, reduces grid system inertia. The Companies must maintain system voltage and frequency under these lower inertia conditions in order to operate reliable and resilient grids. Piloting innovative technologies and standards for grid-forming inverter resources, including the evaluation of the cost-effectiveness of grid-forming with hybrid PV systems, is needed to achieve this goal.

B. Customer generation and load management are envisioned to contribute towards achieving decarbonization goals. The adoption of smart technologies as part of the Companies' grid modernization efforts will require the evaluation and development of innovative solutions and incentives that enable customers to connect and control smart devices and platforms in homes and businesses. In addition, the communications protocols and capabilities of vendors vary widely and would need to be evaluated at a smaller pilot scale to inform future program development efforts and dockets.

C. Certain large customers desire to utilize energy generation from one of their owned sites to offset electricity costs at other of their owned site(s). In order to support critical infrastructure and government objectives, it may be beneficial to model, develop, and test new business models, rates and/or billing mechanisms to incentivize use of private or government property for renewable generation and/or energy storage

[1]See Decision and Order No. 37507 issued in the subject proceeding on December 23, 2021, at 218.
[2] Hawai'i Revised Statutes 225P-5, *Zero emissions clean economy target.*
[3] On November 5, 2021, Hawaiian Electric announced that it has set a goal to cut carbon emissions from power generation 70% by 2030.

at distributed locations that benefits those property owners in a manner that is equitable to other customers.

D. Projects to further decarbonization goals may impact communities in which projects are sited. To serve objectives of social equity and the public interest, and to increase support and acceptance of such projects, innovative community and stakeholder engagement approaches are necessary and pilots may serve to identify the benefits of such different approaches.

E. In order to reach economy-wide decarbonization goals, pilots could assess technologies and business models that enable deep energy efficiency in commercial buildings. Pilot programs could help assess incentives, contractual agreements, costs, and benefits accrued to different types of stakeholders (e.g., landlord, tenant, utility, developer).

F. The reduction and sequestration of carbon emissions will support economy-wide decarbonization targets. However, more work in this area is needed as it is unclear what the most cost-effective and viable options are for the grid from a holistic perspective. Evaluating different types of technologies and business models for carbon capture and sequestration solutions could reduce the uncertainty associated with potential options that support sustainable decarbonization and inform other options.

G. Hydrogen is envisioned to be a key component of economy-wide decarbonization strategies. Industry, governments, academia, and the financial community are evaluating the technologies and policies that will improve the scaling and economic viability of a hydrogen economy. This is envisioned to continue for the foreseeable future as countries, corporations, and states address decarbonization solutions. The unique attributes of Hawai'i (e.g., limited land availability, islanded grids) make it difficult to extrapolate global- or national-based costs of hydrogen production, storage, and utilization technologies and business models. A better understanding of hydrogen technologies, utility use cases, and economics can inform general market cost/price sensitivity and competitive procurements for hydrogen production capacity in Hawai'i such that stakeholders can make more informed decisions on hydrogen in the future.

H. The mismatch between high demand for and low availability of land for energy production on the island of O'ahu creates a set of challenges that may be partially addressed by measuring the true cost of building and operating small-scale plants that transport energy between islands, utilization of offshore wind and ocean energy technologies, or importing energy-dense clean chemicals (hydrogen or ammonia for example). Pilot projects could help evaluate regulatory and/or policy matters to assist in resolving some of the uncertainty and help all stakeholders gain empirical evidence to elucidate operational pathways.

2. Customer Resources and Services

This AOC focuses on increasing customer engagement and options for expanding utilization of customer resources to provide grid services. Customer resources continue to be an important component of the Companies' portfolio to meet or exceed the State's renewable energy and decarbonization goals. It is anticipated that utility customers will continue to want options to manage their bills and participate in utility programs using their generation, storage, and loads. As such, the Companies envision the need to continually innovate in this area to meet customer expectations through piloting efforts. The problem statements and goals related to this AOC include:

A. Customer distributed energy resources ("DER") are expected to continue to be an important component of the Companies' renewable energy and decarbonization portfolio. Therefore, continuous improvement and innovation in DER implementation should be an ongoing initiative. There continues to be efforts to reduce costs and time for permitting and interconnection of DER and loads. To address this need, pilot projects should test and develop new process improvements (e.g., simplified and/or standardized system designs) that can automate review processes with the Companies and applicable state or county permitting departments.

B. Ways to enable customers that do not have, or are unable to utilize, rooftop space for PV should be explored to maximize DER on the Companies' grids. In order to provide broader and more cost-effective access to PV options and offerings, different approaches and rooftop utilization programs could be evaluated through pilots.

C. There is high demand for electricians as well as a growing need for specialized services requiring high levels of electrical expertise. Options to train and develop individuals with these skills can be piloted. This could include leveraging the Companies' training efforts to create value for the grid, and expand the skill set of the local workforce to facilitate a healthier local economy.

D. There is a need to collect empirical data to assess the value of customer DER such as battery capacity and compensation for infrequent grid service events. Uncertainties include how and where to deploy distributed assets, how to collect data, how to automatically analyze for signals, how best to operationalize decisions to act on that information, and what value certain types of assets provide during different events. To help fill these gaps, pilot projects are needed to develop solutions to expand aggregation of customer resources, systematically reduce uncertainty by testing different data collection and analytics technologies, rates and/or incentives, and tools to support customers and inform new DER programs.

E. There remains uncertainty on which methodologies are best suited to design programs to obtain grid services from Commercial & Industrial, small businesses, and residential customers. The capability of customer-sited resources needs to be tested to verify their ability to provide different and new types of grid services (e.g., ramping, regulating reserve, distribution grid services, etc.). Pilot projects could

systematically explore technologies and business models to expand grid services delivery.

3. Beneficial Electrification

Beneficial electrification aims to replace "direct fossil fuel use (e.g., propane, heating oil, gasoline) with electricity in a way that reduces overall emissions and energy costs."[4] These strategies, which are applicable to commercial and residential customers, benefit the end-user and the environment. This category includes Electrification of Transportation ("EOT") initiatives and can include broader electrification of industry initiatives. Beneficial Electrification also supports the Decarbonization AOC. Through Order No. 37865, the Commission affirmed that it would continue its independent review of the EBus Make-Ready Infrastructure Pilot ("EBus Pilot") and Charge Ready Hawai'i Pilot Project ("Charge Ready Pilot") in Docket Nos. 2020-0098 and 2020-0202, respectively, but that any approved pilot project resulting from these dockets will be subject to the IPF process. The problem statements and goals associated with Beneficial Electrification include:

A. Electric Vehicles ("EVs") have the potential to support the grid in various ways, but there are no clear standards on technical capabilities of vehicle communications protocols for vehicle-to-X ("V2X") applications. When attempting to forecast cost/benefit aspects of V2X, inclusive of V2G(grid), V2B(building), and V2H(home) solutions, there is no Hawai'i-specific data on customer behavior patterns for example. To test various scenarios that can inform potential V2G applications, pilot projects can provide empirical evidence on cost, value to the grid, and customer behavior.

B. One of the hurdles to EV adoption stems from the need to increase the availability of efficient, effective and reliable charging stations. Pilot projects could be designed to increase the understanding and benefits of novel charging technologies, applications, and offerings, and transparently report on the cost structures of different options.

C. Quality empirical data on EV customer behavior, including data for Hawai'i, is needed. In addition, as the penetration of electric vehicles and charging infrastructure increases, there is a potential for increased stress on the grid (i.e., when customers come home in the evening). In order to further increase and support EV adoption, encourage optimal charging behaviors (e.g., shifting charging to mid-day periods of peak production), affordability, and ease-of-use, testing a number of technologies, business models, and incentive structures could inform future program designs.

D. Customer interest and state policies may support increased all-electric solutions for a variety of products (e.g., lawnmowers, stovetops, heat pumps, forklifts). Pilot programs can help increase customer understanding of the benefits, costs, and pathways in making the switch to all-electric solutions, including assessing incentive

[4] See https://www.eesi.org/electrification/be.

structures for early adopters and then publishing the results as local case-studies that are accessed through a web portal.

E. Various challenges exist in reaching and helping different community groups transition to energy saving devices due to limited communications channels, up-front costs, installation requirements, etc. Piloting work is needed to market and recruit customers from LMI communities by offering solutions such as plug-and-play devices or subsidized costs.

F. Customers who own medium- and heavy-duty vehicles and off-road equipment (including fleet owners) often do not have readily available information to electrify their operations. Similarly, the Companies must address uncertainties in operational costs and timing to transition its fleet of heavy-duty vehicles for which all-electric solutions are only recently coming to market. In order to decarbonize large parts of the transportation sector, pilots are needed to acquire information and test different business models to better understand Hawai‘i-specific benefits, evaluate all-electric alternatives, and inform future programs or tariffs for fleet owners across the State.

G. The shortage of qualified electricians presents a state-wide problem to install and fix EV chargers. A pilot program could be designed to directly address this through utility workforce training, thereby improving EV owner experience and increase adoption.

4. Data Sharing, Access, and Analytics

Data acquisition and analytics, and the safe sharing of this data, is a cross-cutting area of need that will impact a multitude of projects, programs, and pilots. Decision-making and continuous improvement efforts will continue to be highly dependent on the use and analysis of various data streams. This AOC is viewed as an important area that needs further development and innovation. Improved data collection and analytics will foster better planning, solution identification, product and services design, more informed decision making, and better stakeholder collaboration. This area also involves balancing privacy, cybersecurity compliance, regulatory requirements, cost, data monetization, and commercial concerns, among others. Piloting in this area can improve the ability to safely acquire, process, share, and secure data as a comprehensive source of factual information with stakeholders in a way that appropriate users can productively and efficiently use data. Pilots in this area can investigate various technical, governance, and programmatic options to access, share, secure, and analyze various data sets by the Companies and stakeholders. The problem statements and goals for this AOC include:

A. As increasing amounts of wind, PV, and hybrid PV projects come online to meet the State’s renewable energy goals, the Companies will continue to have a need for improved renewable energy forecasting tools to operate the grids with these resources. Current forecasting tools used by the Companies’ operational groups are continuing to be improved to more accurately model operations on islanded grids with high renewable penetration. Pilots can help improve existing tools or develop new tools that develop advanced analytics for simulation/forecasting/predictions.

B. With increasing numbers of customer DER on the Companies' grids and the need for grid supportive functions that help maintain grid reliability, there continues to be a need to have an efficient automated way to verify the compliance of DER systems with the Companies' requirements and to identify and analyze specific circuits with voltage issues. Piloting is needed to help develop data visualization tools to ensure DER tariff and interconnection requirements.

C. It is difficult to build processes, protocols, tools, and a platform for securing, aggregating, governing, and sharing data across multiple separate and distinct stakeholders. By creating sandbox-type environments, the Companies could more rapidly test methods for sharing data, addressing questions about privacy and cybersecurity compliance, and understanding what it takes to support and maintain such services.

5. Technology Innovations and Cyber Security Improvements

Technology can transform existing processes with new capabilities that bring new insights, improved customer service, improved efficiency and enable new business services. In addition, addressing the escalating cybersecurity threat environment requires continuous innovation and collaboration with key stakeholders. Pilots are needed in this area to test innovative solutions that support the merging of operational and information technologies, telecommunications, digitization of utility operations, applicability of machine learning and artificial intelligence, data analytics, and cybersecurity capabilities. The problem statements and goals for this AOC include:

A. Within the State of Hawai‘i, there are no facilities that provide a safe and controlled environment for interactive testing of enhanced cybersecurity protocols and capabilities in partnership with key stakeholders and customers, such as the State of Hawai‘i and Department of Defense. This type of platform testbed would enable cost-effective on-ramps and off-ramps for subsequent pilot programs, testing vendor equipment, conducting security incident response simulations, and informing request for proposals and related filings, etc.

B. Shared telecommunication paths have broader societal benefits including for grid operations and modernization as well as broadband equity. Piloting is needed to address business model challenges to optimize telecommunication infrastructure and services.

C. Data from utility operations and customers should be fully utilized to support existing practices as well as innovative solutions. Numerous technology innovations could improve customer service, increase worker performance, and reduce risks by increasing safety through the use of artificial intelligence and machine learning to acquire and retain knowledge. Piloting solutions to test artificial intelligence and machine learning will help these gaps.

D. Transferring operations knowledge and field training are difficult and expensive tasks. Testing different types of Augmented Reality/Virtual Reality/Mixed Reality

(AR/VR/MR) applications could enable safer and more cost-effective ways to address workforce training, knowledge sharing, and increased knowledge transfer during employee turnover/retirements. It will also increase the ability to share and support utility teams and customer support calls across the islands.

E. There is a need to explore solutions to increase digitization of utility planning and operations. In order to reduce the cost of planning, design and asset management, solutions such as digital twin technology (the digital representation of infrastructure and environment) could be tested in a pilot and shared with other local entities for similar purposes.

6. Resilience and Innovative Reliability Approaches

A reliable, resilient electric system is essential for our customers and communities. A modernized grid must withstand and/or quickly recover from natural disasters, sudden changes in energy supply, as well as adapt to climate change. The problem statements and goals for this AOC include:

A. It is beneficial to gain an increased and better understanding regarding the costs and performance of different technologies and business models aimed at achieving resilience and reliability for long-tail events. Testing novel solutions on smaller scales could improve resilience and reliability in the near-term, while also stress-testing under infrequent events (e.g., hurricanes) to gain critical Hawai‘i-specific data and information on cost/performance tradeoffs.

B. Sharing skills and costs to maintain Companies, customer and/or IPP generation assets can be beneficial and cost-effective. Piloting could explore service contracts that utilize the Companies' employees for this purpose.

C. Backup-diesel generators at customer sites all across the State must be tested on a regular basis. However, the assets are not always run at full capacity and the generated electricity is not always used efficiently. Additionally, no entity in the State has a full map of assets and fuel supplies. A pilot program could explore coordination of mandatory scheduled testing to coincide with periods of high ramp rates.

D. A lack of standards and available testing data means that there is uncertainty around which types of microgrid controls schemes best support different types of events (e.g., operating as individual units or as aggregated clusters in concert). Implementing and testing microgrid control schemes at a smaller scale will enable the Companies to understand specific use cases which the Companies would be able to use to provide guidance to their customers in further development of the Microgrid Services Tariff, or future programmatic offerings.

E. The current Microgrid Services Tariff allows the development of private hybrid microgrids. Compensation to the Microgrid Operator is provided by the participants

(or sponsor) of the microgrid. Piloting programs to develop microgrids funded by ratepayers would enable wider adoption but questions remain on the valuation of services.

F. Exploration of microgrids utilizing utility investments to offer reliability services during normal operations while providing resilience to critical infrastructure after unforeseen events is an area of need. Reducing uncertainty in how to value and fairly compensate both utility and customer participants in microgrid projects would enable wider adoption and improve grid reliability and resilience more broadly. Piloting will help evaluate increased grid and community resilience through the assessment, design, and deployment of critical customer hubs.

G. Current planning tools are adequate but are reaching their capabilities to accurately model future scenarios with higher (e.g., 100%) inverter-based resources on the system. The Companies rely on these tools and analyses to determine the grid needs (investments) of the future, balancing cost, reliability/operability, and resilience of the system. In addition, planning tools that incorporate uncertain impacts of climate change, provide valuable insights into long-term modeling efforts, and improve cost/performance tradeoffs are still in earlier stages of development. Piloting can help identify several candidate tools (software and/or hardware) needed to further inform planning models and analyses.

H. High-impedance fault detection equipment currently has high false trip signals and does not adequately detect conductor issues. Testing advanced equipment on a small-scale could lead to improved wildfire monitoring, mitigation, and response.

I. Implementing, testing, and validating performance of equipment to mitigate power quality and reliability issues. Piloting devices prior to wide-scale deployment will provide the Companies with better knowledge of the devices' capabilities and short-comings. Newer technologies are needed to leverage existing T&D infrastructure as the grid continues to evolve with increasing DER, inverter-based resources, and non-linear loads.

J. Increasing renewable penetration on the grid is envisioned to require the integration of more advanced hardware and software (e.g., analytics and automation). Due to the uncertainty and unique cost-performance tradeoffs of newer technologies, further understanding of the scale and timing of deployment is needed. Understanding Hawai‘i-specific performance of grid technologies, including energy storage, through piloting will enable the deployment of improved utility infrastructure, create actionable insights to enable more reliable, efficient, and intelligent grid operations, as well as establish metrics to make informed decisions on feasibility and usefulness.

7. Equity, Access, Affordability, and Sustainability

Equity, Access, Affordability, and Sustainability pilots are options to ensure that everyone benefits from the clean energy transformation and no one is left behind because of where they

live or their economic status. Special considerations will be given to projects for LMI customers across the State. Piloting in this area is needed to further understand pathways and programs that can directly support LMI communities. Sustainability pilots can be more focused on enabling local supply chains. Problem statements and goals that address equity, access, affordability, and sustainability include:

A. Transitioning to new energy technologies can sometimes require upfront capital that LMI customers cannot afford. Different approaches, business models, and incentive programs could achieve an affordable energy transition without putting additional burden on LMI families directly. Piloting is needed to assess the adoption of new technology solutions by LMI customers with reduced financial burden.

B. Customers in LMI communities are a customer segment that needs unique communications channels and customer outreach programs. Historically, these communities have been more difficult and expensive to reach. Pilot programs could test innovative outreach strategies, communication channels, energy efficiency programs, subsidization, and equity training with lessons learned to improve education and adoption of programs and technologies that save customers money. Piloting is needed to develop and test specific marketing strategies to increase awareness of and enrollment in targeted programs by qualified customers.

C. The Companies have observed difficulties in connecting customers in need with applicable aid programs or non-profit organizations. There is no clear visibility by all parties to connect the dots. To address this gap, piloting could be conducted to create and evaluate a centralized portal that meets privacy requirements while also connecting LMI customers with the aid they need.

Implementation Phase

The IPF process is described in the 'Hawaiian Electric Companies' Pilot Process' filed with the Commission on July 28, 2021.[5] By managing and executing pilots under the IPF process, the Companies envision an improved capacity to innovate by institutionalizing innovative thinking and processes throughout their business. The Implementation Phase will include specific pilot proposals filed as NOIs. Not all pilot concepts will be cost effective or show positive business cases as assessing cost effectiveness of a scaled-up solution may be a key objective of a pilot project. The Implementation Phase will also include the execution of approved pilot projects, and the review of and reporting on those approved projects for the purpose of shared learning and consideration for expansion as described below.

The stakeholder engagement process will attempt to streamline and leverage, when and where feasible, the efforts of other existing collaboration processes (e.g., federal appropriations and competitive grant opportunities from the Department of Energy and other federal and state government, non-profit, third-party, and community-based entities and organizations). The Companies intend to continue stakeholder engagement throughout the Implementation Phase,

[5] Docket No. 2018-0088, Instituting a Proceeding to Investigate Performance-Based Regulation, Hawaiian Electric Companies' Pilot Process, in accordance with Order No. 37865 issued on July 9, 2021.

including having targeted discussions with appropriate stakeholders in developing pilot projects and associated NOIs. This engagement is envisioned to include broad stakeholder meetings as well as pilot-specific discussions that leverage existing working groups or collaborations with specific interested stakeholders. The stakeholder engagement, to the extent applicable, will be documented in the NOIs to support the record of the pilot engagement and collaborations on the pilot projects.

To maximize flexibility and foster innovation, the Companies intend to utilize a variety of mechanisms to solicit, develop, and select pilot projects. These include, but are not limited to, informal discussions and inquiries initiated by the Companies or third-party stakeholders, sole-sourced vendor collaborations, formal requests for proposals, and open invitations for pilot submittals to the Companies' Innovation web portal on its website (upon approval of the Companies' Workplan, the Companies will revise the Innovation web portal[6] to reflect the content of the Workplan and act as one of the public intake mechanisms to solicit pilot projects for consideration).

Workplan Updates

This Workplan may be updated, as necessary and appropriate, should new priorities arise, or existing priorities need to be modified. The Companies recognize the need to be flexible and to take advantage of unforeseen cost-share opportunities (e.g., vendor cost share, start-up accelerator funding, federal funding opportunity announcements, federal-to-state appropriations, etc.).

Reporting

The Companies anticipate filing an annual comprehensive report covering all active pilots ("Pilot Update") by March 31 each year, for the prior year. In addition to providing an update on ongoing pilots, the Pilot Update may include final reporting on completed projects, as applicable.[7] Any final reporting may also include the Companies' marketing efforts and expenses incurred, methods for analyzing impacts, cost-effectiveness, and customer retention.[8] The Pilot Update will include reporting on challenges and lessons learned, process improvements, a listing of performance relative to all key metrics, and any future permanent implementation plans based on an evaluation against the metrics established.[9] The Companies will submit a single, consolidated Pilot Update report sooner than on a biennial basis.[10]

Pilot Expansion

Due to the inherent nature of innovative pilots, not all pilots will necessarily evolve into a commercial program or product. The pilots will be designed to include stakeholder input and be as transparent as possible in order to share learnings and create long-term benefits for all

[6] The website can be found here: https://www.hawaiianelectric.com/about-us/innovation/
[7] D&O 37507 at 176.
[8] Id.
[9] Id.
[10] Id. at 176-177.

stakeholders and customers. At the conclusion of the scheduled operation of the pilot, as previously approved by the Commission, the Companies may seek to extend and/or expand the pilot beyond the initial set of customers.[11] This will allow pilots that are yielding benefits for electric utility customers to continue after the pilot period and can serve to maintain continuity during the evaluation period and any subsequent transition. The intent of the potential transition period is to avoid confusion, minimize disruption to customers, and limit defection from the pilot program while a larger roll-out is under review.[12]

[11] D&O 37507 at 179.
[12] Id. at 179-180; Order No, 37865 at 12.