BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF HAWAI‘I

In the Matter of PUBLIC UTILITIES COMMISSION Instituting a Proceeding Relating to an Innovative Pilot Process for the Hawaiian Electric Companies.	DOCKET NO. 2022-0212

HAWAIIAN ELECTRIC COMPANIES'

DATA ANALYTICS CLEARINGHOUSE PILOT NOTICE OF INTENT

EXHIBITS A-E

AND

CERTIFICATE OF SERVICE

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NOTICE OF INTENT

In accordance with Decision and Order No. 37507 ("D&O 37507") issued in Docket No. 2018-0088 and Order No. 38663 ("Order 38663") issued in Docket No. 2022-0212, the Hawaiian Electric Companies[1] respectfully submit this Notice of Intent ("Notice") to commence a Data Analytics Clearinghouse ("DACh") pilot project ("Clearinghouse Pilot" or "Pilot") for the Public Utilities Commission of the State of Hawai‘i's ("Commission") review and approval.

I. Executive Summary

The Companies respectfully request Commission approval to commence a Clearinghouse Pilot project. For the Pilot, the Companies propose to establish a DACh, which is a cloud-based repository, to collect, store, and disseminate information, data, and metadata.[2] The DACh will enable Pilot participants to access extensive on-line utility and utility-related data, which they can utilize to support benchmarking, compliance, energy utilization decision-making, research,

[1] Hawaiian Electric Company, Inc. ("Hawaiian Electric"), Hawai‘i Electric Light Company, Inc. ("Hawai‘i Electric Light"), and Maui Electric Company, Limited ("Maui Electric"), are collectively referred to as the "Hawaiian Electric Companies" or the "Companies."

[2] "Metadata" is descriptive information about data.

analysis, and reporting needs. The DACh will also enable data sharing and access to data that would otherwise not be readily accessible. Pilot participation will be initially offered to public research agencies including the Division of Consumer Advocacy of the Department of Commerce and Consumer Affairs ("Consumer Advocate"), the county sustainability and resiliency offices (Honolulu, Maui, and Hawai'i), Hawaii Energy, the University of Hawaii through Hawaii Natural Energy Institute ("HNEI") and the University of Hawai'i Economic Research Organization ("UHERO"), and the Hawaii State Energy Office ("HSEO") (collectively, the "Participants").[3] The Pilot is proposed to commence in January 2023 and end in December 2024 with a total proposed Pilot budget of $2.76 million. During the course of the Pilot, the Companies will implement a series of Minimum Viable Products ("MVPs"),[4] collect and evaluate Participant feedback, and iteratively refine and adjust the Pilot to improve the Clearinghouse user experience and services.

Through the four key services proposed by the Pilot: 1) Packaged Data Sets, 2) Interactive Analytics, 3) Direct Data Access, and 4) Clearinghouse, the project enables key benefits including increasing transparency and availability of data with the ability to safely and securely share utility data. This in turn supports multiple Areas of Collaboration ("AOCs") and is aligned with Performance-Based Regulation ("PBR") and Commission Orders. Furthermore, the Pilot project is intended to facilitate Participant collaboration which may lead to more

[3] These public agencies provide the most immediate value in shaping public policy and addressing long-term initiatives for data sharing. For this Pilot project, the Companies will be limiting the number of participants that have access to the platform in order to control costs and minimize administrative burden. In consideration of the Pilot scope and objectives, the Companies do not intend to have the Clearinghouse available to the general public or commercial interests. Based on requests and further discussion on meeting Pilot objectives, the Companies may allow access/use to other parties on a case-by-case basis. Although Pilot participation will not be offered to the general public, use of the Clearinghouse is intended to result in benefits for both Pilot participants and non-pilot participants. Following completion of the Pilot, the Companies will consider the potential for the Clearinghouse to evolve as a data product for commercial interests.

[4] MVPs are products (e.g., a software application, website, etc.) with sufficient functionality to test and validate a product idea during a product development cycle.

informed decision-making for the people and businesses of Hawaii. Improved information and collaboration will support the ability of the Participants to advance State energy goals, including decarbonization, increased renewable energy utilization, more resilience, and improved energy security.

II. Correspondence and Communications

Correspondence and communications regarding this Notice should be addressed to:

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III. Background

In its Phase 1 Staff Proposal in Docket No. 2018-0088, the Commission staff stated that "Innovation is essential as Hawaii's electricity system and market continues to transform. Innovative products and services will be critical to not only support the functions and opportunities inherent to the evolving utility role, but also to help deliver additional value to customers."[5] One of the options that the Commission staff suggested to encourage utility and third-party innovative technologies, programs and business models was an expedited pilot implementation process that Vermont established to support clean energy and climate goals. In 2014, the Vermont Commission granted Green Mountain Power ("GMP") approval to pursue innovative pilots on a non-tariffed basis. GMP does not need Commission approval prior to commencing non-tariffed pilots but is required to provide written notice at least 15 days prior to commencing the pilot, to make periodic updates at six-month intervals on the progress of its pilot

[5] *Staff Proposal for Updated Performance-Based Regulations* ("Phase 1 Staff Proposal"), filed on February 7, 2019, in Docket No. 2018-0088, at 46.

programs, and to include the costs and revenues of innovative pilots and services in base rate filings for review and approval.[6]

In D&O 37507, the Commission established "a Pilot Process to oversee the expedited review of pilot projects vetted by the Companies, consistent with a Workplan submitted to the Commission, that will facilitate the implementation of pilots that test new technologies, customer engagement programs, business models, and other arrangements."[7] The Commission explained that it intended this process "to support initiatives by the Companies to test new programs and ideas quickly and elevate any successful pilots for consideration of full-scale implementation."[8] The Commission agreed with the Companies' approach that flexibility is important to the success of the Pilot Process and stated the following:

> Consequently, the Companies may exercise flexibility in selecting pilot vendors and need not strictly adhere to traditional contract bidding and selecting processes. As stated by the Companies, "[p]iloting is successful when testing and evaluation can happen fast and at a small enough scale to reduce technical and financial risk." Although this presents some risk, the Commission finds that it is balanced, under the circumstances, by the speed and flexibility this will provide the Companies to explore and execute contracts for innovative new programs and services, as well as by the cap on costs allowed under the Pilot Process (discussed below).
>
> Concomitantly, the traditional nature and scope of Commission review may not be appropriate for expeditiously reviewing pilots. As a result, the Pilot Process will afford the Companies with a greater degree of freedom to pursue pilots, with oversight by the Commission tailored to provide the Companies with greater discretion to proceed with pilots, while maintaining Commission approval for pilot costs, as well as requiring reporting on implementation of approved pilots. Relatedly, the Pilot Process shall be subject to a total annual cap of $10 million. Requests to proceed with a pilot or annual portfolio of pilots in excess of this capped amount must be expressly approved by the Commission.[9]

[6] *See id.* at 47-48.
[7] D&O 37507 at 218.
[8] *Id.* at 166.
[9] *Id.* at 169-170 (emphasis added, footnotes omitted).

D&O 37507 set forth eligibility requirements and a framework for the Pilot Process, which included an initial Workplan Development Phase, during which the Companies would identify and scope areas of interests in a workplan, so as to inform the subsequent Implementation Phase, during which the Companies would submit written notices of specific pilot proposals for an expedited 45-day review by the Commission and implement the pilots upon approval by the Commission. The Commission required the Companies to file an annual Pilot Update by March 31 of each year to report on all active pilots, including the costs and revenues of the associated pilots. The Commission will review the costs and revenues as part of its spring review of adjustments to the Companies' target revenues and will determine at that time the amount of pilot costs that the Companies can recover for that year. The Commission noted that this process is consistent with the cost review process approved by the Vermont Commission for the pilot framework approved for GMP.[10] The Commission directed the Companies to file a written Pilot Process consistent with D&O 37507, followed by the Companies' Pilot Process Workplan.[11]

On April 30, 2021, in accordance with D&O 37507, the Companies filed a written Pilot Process, which the Commission approved subject to certain clarifications and modifications set forth in Order No. 37865 ("Order 37865") issued on July 9, 2021. On July 28, 2021, the Companies filed the Pilot Process modified as Order 37865 directed.

On November 12, 2021, the Companies filed their proposed Innovation Pilot Framework ("IPF") Workplan, which the Commission approved as supplemented on September 23, 2022 and as modified by Order No. 38654 issued on October 19, 2022, thereby completing the initial Workplan Development phase.

[10] *Id.* at 170-179.
[11] *Id.* at 219.

On October 20, 2022, the Commission issued Order 38663, opening the instant docket to receive filings and adjudicate requests related to the Companies' pilot notices, and thereby commenced the Implementation Phase.

With the onset of the Implementation Phase, the Hawaiian Electric Companies are submitting in this filing its Notice for the Clearinghouse Pilot. As explained herein, the Companies demonstrate that this Pilot has met the eligibility requirements and the notice requirements specified in D&O 37507.[12] Although not identical, the Commission-approved Pilot Process is modeled after the pilot process approved by the Vermont Commission for GMP. Exhibit A of this filing provides examples of notices that GMP has filed for its pilots. Although this notice provides more detail than those submitted by GMP, the Hawaiian Electric Companies have sought to strike a balance between providing support for satisfying the eligibility and notice requirements set forth by the Commission and maintaining brevity in this notice to allow for an expedited review process, as the Commission envisioned.

IV. Proposed Data Analytics Clearinghouse Pilot

A. Stakeholder Engagement and Pilot Need

In Order No. 37146 ("Order 37146"), issued on May 21, 2020, in the Grid Modernization Phase 1 proceeding (Docket No. 2018-0141), on the issue of data availability and data sharing, Order 37146 stated:[13]

> The Commission finds that it is in the public interest for Hawaii Energy have access to customer meter data, including data generated by advanced meters,

[12] D&O 37507 (at 173), states that at a minimum, the Notice shall include a narrative explanation of the pilot project, key customer benefits (participants and non-participants) where applicable, eligibility requirements, subscriber cap (if applicable), lifecycle greenhouse gas ("GHG") analysis (if applicable), an estimate of the pilot costs and forecasted revenues (if applicable), project timeline, proposed reporting requirements, and proposed success criteria. These requirements are addressed within this Notice, with the exception of (1) a discussion of a subscriber cap which is not applicable to this Pilot, since the Pilot will be offered to specific public agencies, and the Pilot will not be a program with subscribed customers, and (2) an analysis of GHG emissions, which are not measurable and not applicable in consideration of the scope of this Pilot.

[13] Order 37146 at 16-17 (footnote omitted).

> because this will enable Hawaii Energy to develop energy efficiency programs that promote ratepayer savings, advance the State's environmental and greenhouse gas policies, and help support economic recovery. Therefore, the Commission directs the Companies to provide Hawaii Energy all data from advanced meters under the same terms they provide Hawaii Energy data from traditional meters.
>
> The Commission also finds that it is in the public interest for public entities to have ready access to aggregated, anonymized, customer electricity usage data. As public entities with substantial expertise, the University of Hawaii, the Hawaii State Energy Office and the Consumer Advocate could use aggregated, anonymized electricity usage data to develop programs and insights that provide significant benefits to ratepayers and to the State. Likewise, as local governments, the County of Hawaii, the City and County of Honolulu, and the County of Maui have a direct interest in improving the lives of their citizens, and could use aggregated, anonymized electricity usage data to do so. Therefore, the Commission encourages the Companies to collaborate with the University of Hawaii, the Hawaii State Energy Office, the Consumer Advocate, the County of Hawaii, the City and County of Honolulu, and the County of Maui to ensure they have ready access to such data.

In accordance with Order 37146, the Companies have engaged and collaborated with Hawaii Energy and the Participants to provide access to the electric utility data needed to enable their research, analysis, reporting and decision-making. Subsequent to the issuance of Order 37146, the Companies provided aggregated and anonymized energy load data (at 15-minute intervals) for the period of February 2020 to May 2022 to Hawaii Energy, the Consumer Advocate, the county sustainability and resiliency offices (Honolulu, Maui, and Hawai‘i), the HSEO, and the University of Hawai‘i. However, the high volume of data has posed significant challenges to the agencies' capacity to download, process and effectively utilize the data for analysis. These data challenges will intensify as the current Advanced Metering Infrastructure ("AMI") meter count grows from the current 162,000 meters to full deployment of approximately 470,000 meters. The data, while being accessible, is not readily useable for review and analysis.

Through a number of stakeholder discussions, the Consumer Advocate, the county sustainability and resiliency offices (Honolulu, Maui, Hawai‘i), the HSEO, and the University of Hawai‘i, have conveyed their challenges with the volume of data and difficulty processing and analyzing the data on their computer systems. These agencies have also stated a need for the meter data to be enhanced with associated descriptive segmentation[14] and aggregation[15] features (metadata) to generate insights from system- to meter-level detail. The challenges of usability are related to the voluminous size of the 15-minute aggregated and anonymized records, at the meter/location level, and the resulting time it takes to download the data from the source file location, the hardware requirements to load into active memory for processing, and the need to upgrade analysis software versions to accommodate the current hundreds of millions of records per month.

In March 2022, following multiple individual stakeholder discussions, the Companies issued a survey soliciting stakeholder feedback on the Clearinghouse Pilot concept and objectives. In June 2022, the Companies hosted an open discussion and offered participants to submit follow-up questions. This interactive engagement has helped to shape the proposed DACh services and prioritize the availability of sought-after data.

The Companies have an internal multi-layer vetting process wherein potential pilot concepts are evaluated on a number of dimensions, including customer benefits, ability and costs to execute on a given schedule, and alignment with strategic objectives, Workplan development

[14] Segmentation is the identification of discrete identifiers that allow "segments" of a population of meter data to be analyzed. Examples of these discrete fields are Island, Zip Code, Census Tract, Census Block Group, Rate Schedule, Time-of-Use Program, PV Program, Program Participation Start/Stop Dates, Building Type, Campus Description, End-Use Load Type, Master Meter Flag, Public/Private Owner, Load Shape Description, and Average Energy Use per Month.

[15] Aggregation is a method of combining meter data into groups or deriving values from meter data, such as a segment's total or average.

guiding principles, and AOCs.[16] The pilot concepts are first vetted by a core team responsible for vetting pilot concepts with subject matter experts and making recommendations on pilots within a portfolio. These pilot project recommendations are then reviewed by an investment oversight committee that evaluates and prioritizes investments depending on the type and cost of project and program. This process and governance structure evaluates the Companies' capital and operating budgets and considers all cost recovery mechanisms such that project and program investments are evaluated and approved by the Companies' executives on a corporate-wide basis. The pilot project is then formally summarized and described in a Notice and submitted to the Commission for review. The Clearinghouse Pilot stood out and was selected for submission based on the merits enumerated in this Notice and the attached letters of support from stakeholders involved in the development of the pilot.

The Companies have requested letters of support from the public agencies to help inform the Pilot Process and demonstrate the need for this Pilot in their own words. In response, the City and County of Honolulu ("C&CH") Office of Climate Change, Sustainability and Resiliency ("CCSR"), the Consumer Advocate, Hawaii Energy, the HSEO, and UHERO have provided letters of support, which are provided in Exhibit B. In its letter, the Consumer Advocate noted a common view held among the public research entities stating that "the Consumer Advocate believes that the ability to access anonymized, aggregated, customer-level usage data would provide valuable opportunities for analyses and research in several areas, including but not limited to helping to inform public policy decisions."[17] In the CCSR's letter, the CCSR stated that its "primary interest with this effort is to gain access to raw data as well as

[16] *See* Hawaiian Electric Companies' Supplement to Innovation Pilot Framework Workplan, filed on September 23, 2022 in Docket No. 2018-0088, at 3-5.
[17] Exhibit B at 3.

to be able to run database queries for exportable datasets," and further that "the first phase of this project should focus primarily on user access to data, with further improvements such as analytical applications or compute environments coming in later phases as demand from users becomes clearer."[18] The Companies agree with this phased approach. The Pilot will enable Participants to export voluminous datasets and the Companies will periodically assess how it may improve on the available services and to potentially enable more refined analytical capabilities.

1. Specific Data Challenges

The Companies currently provide energy and program data to public research agencies through static graphics and supporting tables on the Companies' website, financial filings, worksheet formats in Commission filings, and to third-party energy reporting entities such as the Department of Business, Economic Development & Tourism ("DBEDT") and the Energy Information Administration ("EIA"). The Companies have been collaborating with the public agencies proposed to be Pilot Participants and have faced challenges intended to be addressed in part by the Clearinghouse. While detailed interval usage data is generally available there are challenges that the Companies aim to address with this Pilot project. These challenges include:

- **Size:** Data volumes are beyond the sizes that can be utilized by desktop computers and spreadsheet-based analysis
    - gigabytes of data/billions of rows are best handled using cloud-based environments
    - ability to query data in place to avoid dataset file transfers that can be time consuming to execute
    - adding useful features/descriptive information such as rate and program participation information for each record compounds the data size issue

[18] *Id.* at 2.

and providing separate tables of these records for cross-referencing requires the ability to join data sets together

- **Usability:** The ability to analyze data can be constrained by:
    - computational resources – lack of sufficient computer processing ability to view and manipulate data
    - analysis applications – missing tools and corresponding ability to change data structures and interpret relationships among data sets to better understand what the data means
    - data preparation and featurization[19] for analysis requiring data science experience and skillsets
    - cost-prohibitive for organizations to acquire compute resources in-house
    - collaborative environments with pre-built sharing use cases[20] would enable a better collective understanding and use of the data

B. Proposed Solution to Identified Need

In response to data size and usability challenges, the Companies propose a pilot project that establishes a cloud-based Clearinghouse of published Hawaiian Electric data and analytical insights that public research agencies can access and use for collaborative purposes.

The Clearinghouse will be built on the Companies' existing Enterprise Data Analytics Platform ("EDAP"). The EDAP was initially an internal proof of concept effort started in 2021 with a production version established in July 2022. This established a next generation cloud data warehouse/data lake and analytics platform to address key business objectives relating to seamless access to integrated business data, storage of large volumes of (time-series) data, and the ability to process data leveraging analytics and machine learning with computational

[19] "Data featurization," also referred to as "data munging" or "data wrangling," is the process of transforming and mapping data from one raw data form into another format that improves usability, which may include joining data sets, aggregating and transforming the data into more functionally useful views. This improves the quality and useability of the data for business reporting and analysis.

[20] A "use case" is a specific use of a process or system to a) accomplish an objective, or b) to produce results that contribute to achieving an objective.

resources not available in on-premise systems. The Clearinghouse Pilot will further develop upon the Companies' existing investments in a modern, secure EDAP, by adding a layer of enhanced data capabilities with external data sharing services and user interface that enables stakeholder groups to efficiently access and use available utility data that is not readily available currently.

Figure 1 (DACh Concept Diagram) below is a graphical representation of the core platform capabilities currently in place and new proposed additions with the DACh Pilot.

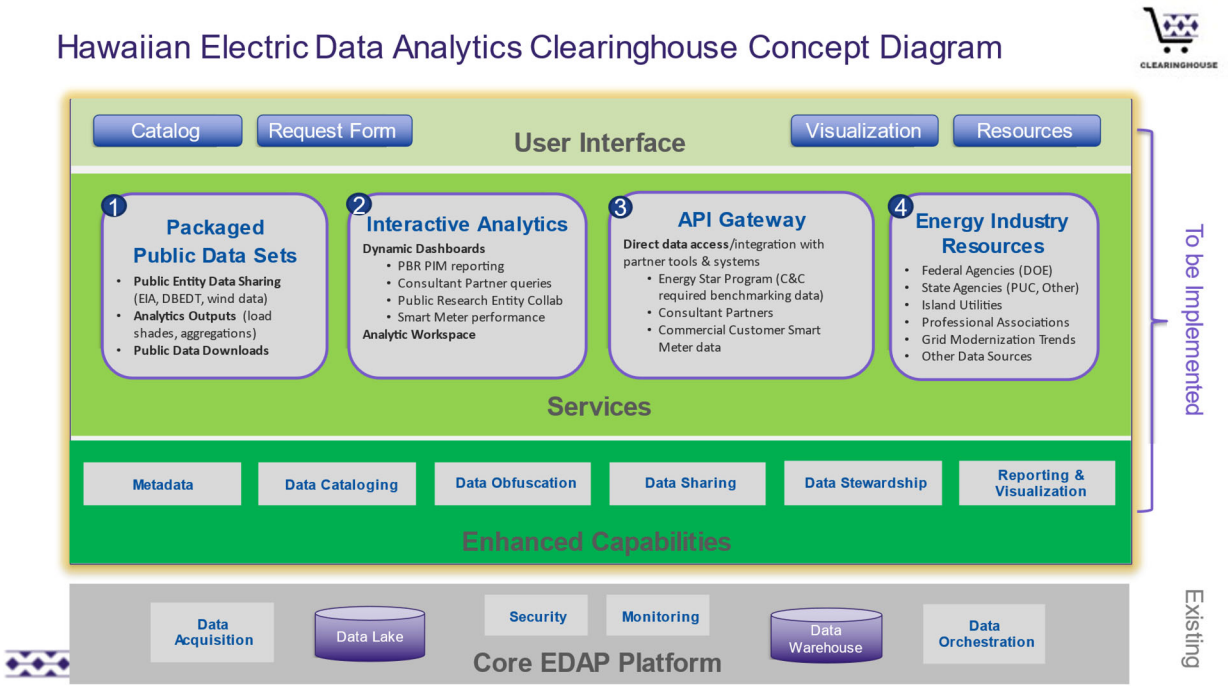


Figure 1. Data Analytics Clearinghouse Concept Diagram.

The enhanced data and platform capabilities of the DACh will introduce additional metadata management, data cataloging, obfuscation[21] and platform augmentation required to enable data sharing services. Based on feedback from stakeholders, the proposed services include:

[21] "Data obfuscation" or "data anonymization" seeks to protect private or sensitive data by deleting, aggregating, or otherwise masking personally identifiable information from records.

1. **Packaged Data Sets:** Catalog-based access to standard digital data products based on known, common external partner needs

2. **Interactive Analytics (Dynamic Dashboards):** Provide basic customized manipulation of standard data sets

3. **Direct Data Access:** Provide direct data access via Application Program Interfaces ("APIs") to external parties with system/application communication capabilities to enable interaction with data sets directly to conduct in-house analytics

4. **Clearinghouse – Energy Industry Resources:** Integrated interface for data catalogs and sources for energy utilization for the State of Hawaii

The Pilot will leverage out-of-the-box technology components where possible. However, iterative refinements will be made to improve user experience through multiple rounds of feedback and discussions with targeted users.

C. Pilot Objectives

The Companies will implement a set of services through a series of three MVP releases. Feedback received to date is that a single solution will not necessarily satisfy all concerns simultaneously. The Companies are therefore proposing to use a time-tested approach of launching multiple MVPs in series. The basic concept is that that each MVP can be geared to a particular stakeholder in order to maximize value, while being able to pivot in response to feedback. Lessons learned from each previous MVP release can also be used to improve the solution set as a whole.

The Pilot project aims to:

- Utilize the DACh to collaborate on the construction of cohesive and feature rich datasets;

- Provide detailed AMI data for performing analysis by public research agencies to enable evidenced-based policy decisions;

- Develop a request form feature to capture and track external data requests with ability to request custom data sets (e.g., subject and dimensions);

- Learn the required collaboration, critical data sets, visualizations and analytics needs;

- Learn the organization and support model required to support the data and insights needs;

- Identify potential market interest for data;

- Refine the Clearinghouse solution content and capabilities for self-service, collaboration, and data sharing, maximizing their value impact; and

- Be responsive to feedback as the Pilot progresses while staying within scope, budget, and time constraints documented in this Notice and any subsequently approved modification requests.

The Companies will target use-cases for MVP releases that may include:

- Meter data sharing and analysis;

    - Provision of access to high value time-series aggregated and anonymized data;

    - Identification and demonstration of metadata by class such as: time period, location, segment, program, rates, etc.; and

    - Validation of number of requests and specific use cases for smart-meter data by key partners in support of key initiatives towards a clean energy future.

- Customer Energy Resources Programs (includes photovoltaic ("PV") and Distributed Energy Resource ("DER") data)

    - Volt/VAR reporting

- Electrification of Transportation

    - Data to support Electric Vehicle ("EV") adoption, load studies, and public charging infrastructure planning

- Support for energy benchmarking

Evaluation of the success of the Pilot will be partially based on the value created for Pilot Participants and supported by measurements for Clearinghouse useability and functionality by:

- Measuring and verifying key use cases with stakeholder feedback based on actual analysis experience;

- Measuring Clearinghouse usage by tracking consumption, audit trail of requests, and fulfillment;
- Determining the costs to maintain the external facing Clearinghouse; and
- Collecting feedback from Pilot Participants through follow-up surveys and discussions.

This Pilot is not designed: (a) to work on data reporting requirements for the Performance Incentive Mechanisms; (b) for unlimited access to data by all entities; and (c) conduct business as usual activities.

V. Alignment with State Energy Goals and Commission Orders

The Clearinghouse Pilot objectives align with State energy goals and Commission orders by enabling efficient access to critical and voluminous data, and data sharing capabilities, which can lead to more informed policy decisions.

The proposed Pilot aligns with State energy efficiency efforts by providing Hawaii Energy with more efficient access to voluminous AMI data, and data in an enhanced format such as AMI datasets in multiple aggregation and time-period resolutions, and thereby improve the usefulness of the data for analysis. The Clearinghouse may assist with program actions such as load profile analysis, program impact evaluation, analysis of customer characteristics, and forecasting. The Clearinghouse may also assist with public outreach by helping to focus planning and outreach efforts in areas of need, and the new AMI provided load profile data could be used to assess the total market size for the targeted design or communication of energy efficiency program opportunities such as demand control programs, that may include incentives for or education about technologies such as timers, smart or connected appliances, and the application of battery energy storage.

The proposed Pilot also aligns with Order 37146 (issued in the Grid Modernization Phase 1 docket), which requires the Companies to provide Hawaii Energy all data from advanced meters under the same terms they provide Hawaii Energy data from traditional meters, as well as finds that it is in the public interest for public entities to have ready access to aggregated, anonymized, customer electricity usage data.[22]

Finally, the Clearinghouse Pilot aligns with the PBR proceeding guiding principles focused on: a) a customer centric approach, b) helping realize administrative efficiency, and c) assisting to ensure financial integrity through informed policy decisions,[23] and the IPF Workplan AOCs.

Exhibit C describes in more detail how the proposed Pilot aligns with State energy efficiency efforts, the Grid Modernization Phase 1 docket, and the PBR proceeding.

VI. Key Customer Benefits (Participants and Non-Participants)

Instead of each stakeholder organization building and paying for duplicative raw data storage and computational resources, and hiring staff and consultants to analyze data, the Companies propose that a single shared system will be far more resource efficient.

This Pilot aims to a) provide immediate value to stakeholder groups by providing improved access to data and analytic capabilities through a shared resource portal, and b) evaluate the costs and benefits associated with processing new requests, education, hosting data and computational resources, etc., to have a more informed market assessment for future large-scale programs. With multiple information systems, there are issues with access, volume, and the processing of data generated by devices ranging from AMI meters to smart chargers to

[22] Order 37146 at 16.
[23] *See* Decision and Order No. 36326, issued on May 23, 2019, in Docket No. 2018-0088, at 6.

grid-connected devices, and more broadly, the wider spectrum of the internet of things ("IOT").[24] As such, a single shared system will provide numerous benefits to stakeholders including:

- Increased transparency and availability of quality data
- Improved ability to share anonymized datasets safely and securely
- Support for evidence-based policies and funding decisions
- Increase additional data sources to augment the datasets currently available

Examples of analyses that can be enabled by and performed by the Clearinghouse are provided in Exhibit D.

Instead of building customized solutions for each user group and use case, the Pilot aims to build a functional set of services and user interface that users and stakeholder groups will be able to mix and match to suit their individual needs. This not only provides the Pilot Participants with the tools and insights that best help them, but it also creates a platform that can more easily adapt to changing needs and be able to handle new use cases more readily.

The Companies envision that the Clearinghouse will incorporate a request form feature that will capture the data and analysis requests to determine what is desired for review and analysis, and future development can be guided by user needs.

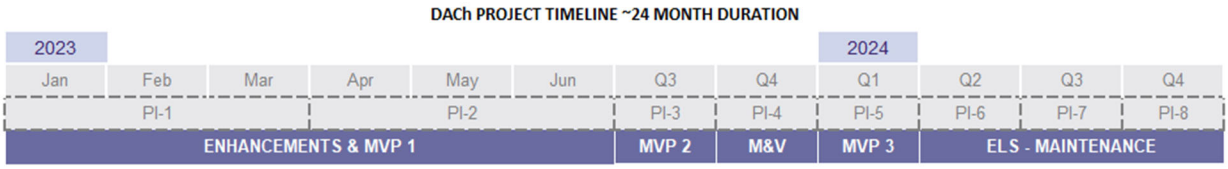
Non-participants are expected to indirectly benefit from the Pilot through the actions of the Pilot Participants who represent the interests of customers across the State. One of the primary benefits is the value of better data-driven decisions, which is expected to benefit all customers over the long term.

[24] The IoT is a network of connected devices and objects which collect and share data about the way they are used and about the environment around them.

For example, the ability to combine AMI data with DER program participation data would enable the analysis of program participant load profiles (e.g., Net Energy Metering, Customer Grid-Supply, and Customer Grid-Supply Plus load profiles) to better inform decisions on DER program modifications. In addition, the Clearinghouse platform could help customer outreach through the identification of energy use trends and load shapes by census tracts, neighborhoods, legislative districts and other locational groupings.

VII. Proposed Project Timeline

The Companies' proposed project timeline to establish the DACh services is illustrated below.[25] The schedule is estimated at approximately fifteen (15) months implementation with an additional nine (9) months Early Life Support (referred to as "ELS" in the project timeline below) phase to include continued data collection and stakeholder feedback on the system. The work is organized into five (5) 3-month program increments (referred to as "PI" below) with a subsequent 9-month Early Life Support program increment to continue monitoring and measuring against objectives. Three (3) production releases of the DACh will be produced with each iteration referred to as a MVP release composed of a set of use cases. DACh MVP releases will coincide with one or more program increments and will be followed up with evaluation steps to review product functionality and incorporate feedback from Pilot Participants to refine scope for future releases.



[25] Timeline is representative and depends on start date for the project.

The table below details each program increment with respect to its primary objective/focus and work elements as well as DACh MVP release.

Program Increment (PI)	PI Objective/Focus	Priority Work Elements/ Minimum Viable Product (MVP) Release
PI 1 (Months 1-3)	Start Enhanced Capabilities	• Enhanced capability work elements
PI 2 (Months 4-6)	Finish Enhanced Capabilities & Complete DACh MVP-Release 1	• Enhanced capability work elements not completed in PI-1 and focused on fulfilling Company-prioritized MVP-1 use cases • Core services work elements focused on fulfilling Company-prioritized MVP-1 use cases • MVP-1 information assurance/security audit • MVP-1 rollout user training
PI 3 (Months 7-9)	Complete DACh MVP-Release 2	• Core services work elements focused on fulfilling Company-prioritized MVP-2 use cases • MVP-2 information assurance/security audit • MVP-2 rollout user training
PI 4 (Months 10-12)	Assess DACh Usability and Start DACh MVP-3	• Usability and operational support assessment • Enhancements to MVP-2 functionality per usability feedback • Begin core services work elements focused on fulfilling Company-prioritized MVP-3 use cases
PI 5 (Months 13-15)	Complete DACh MVP- Release 3	• Complete core services work elements focused on fulfilling Company-prioritized MVP-3 use cases • Complete resource clearinghouse page and links • MVP-3 information assurance/security audit • MVP-3 rollout user training
PI 6, 7 & 8 (Months 16-24)	Early Life Support	• Monitoring and management support • Break/fix support • Minor service request fulfillment support

The Pilot is expected to end by Q4 2024 and depending on the actual start date there may be a reduction in the timeline for Early Life Support. Depending on Pilot Participant feedback and utilization, the Companies may propose to extend and/or expand the Pilot project, and in

accordance with D&O 37507, the Companies will submit a request to the Commission to modify the Pilot no later than one year prior to the scheduled end of the Pilot.[26, 27]

VIII. Estimated Pilot Costs and Revenues

The total proposed Pilot budget of $2.76 million consists of estimates for non-labor outside contract services and system maintenance expense.[28] The Companies are not proposing to recover internal labor and associated labor overhead expenses for this Pilot and these labor expenses have been excluded from the Pilot budget. No capital expenditures are expected for this Pilot at this time. In accordance with Order 37865 and the Pilot Process, pilot cost recovery will be limited to actual costs incurred.[29] Should the Companies determine a need to modify the Pilot budget to request labor or capital cost recovery, the Companies will submit a request to the Commission in accordance with D&O 37507.

The chart below provides details of the estimated Pilot costs by year and key phases.

DACh Cost by Phase (Total Estimate)			2023		2024		TOTAL
			H1	H2	H1	H2	
Outside Services	Non-Labor	O&M					
	Foundational & MVP 1		$ 1,200,554				
	MVP 2 (Primary External Partner)			$ 348,958			
	Usage Assessment & MVP 3 (All External Partners)				$ 541,396		
	Early Life Support					$ 288,657	$2,379,565
Software Maintenance	Non-Labor	O&M		$ 117,881		$ 261,000	$ 378,881
	TOTAL PILOT COSTS			$ 1,830,228		$ 831,431	$2,758,446

The budgeted non-labor outside service expenses are primarily for system development, integration, and staff augmentation to build each program implement represented by the key MVP releases. The Companies have engaged with TEKsystems Global Services, LLC ("TEKsystems") to complete the system development and integration work as detailed further

[26] *See* D&O 37507 at 180.
[27] In addition, should the Pilot be significantly delayed by factors outside the Companies' control, the Companies may request Commission approval to extend the Pilot beyond Q4 2024.
[28] In accordance with the Pilot Process at 6, "[a]ll costs associated with the approved pilot will be deferred and recorded as expense in the applicable functional expense account(s)."
[29] *See* Order 37865 at 9 and Pilot Process at 6.

below.[30] The non-labor Early Life Support maintenance expenses are for outside services support and are intended to provide approximately three quarters of life support to answer pilot questions on stability, supportability, use, and on-going costs. The budgeted non-labor software maintenance expenses are for cloud software usage, data storage, and security, and are estimated through the end of Pilot period.

The existing core EDAP system (i.e., Databricks) software maintenance expenses will be recovered via the MPIR adjustment mechanism up until full deployment completion of GMS Phase 1.[31] The Companies are proposing to recover the incremental non-labor expenses for the additional enhanced functionality of the Clearinghouse through the Pilot Process. The Pilot costs will be tracked and recorded separately with clear distinction for the Pilot outside services (i.e., system development and system integration) and maintenance expense. Software maintenance costs specific to the Clearinghouse will also be tracked and recorded separately through isolated work orders and specific Clearinghouse assigned system usage (i.e., "compute" resource use).[32]

The budgeted non-labor expenses for the Pilot are allocated 70%/15%/15% to Hawaiian Electric, Maui Electric, and Hawai'i Electric Light, respectively, consistent with various regulatory filings and prior rate cases.

One of the Pilot objectives is to determine the requirements for full-scale management of the Clearinghouse and estimate continuing operations and maintenance ("O&M") expenses. The Companies will periodically evaluate the Pilot based on stakeholder feedback and against Pilot

[30] The scope of services will be formalized in a Statement of Work executed with TEKsystems.
[31] Order No. 38444 (at 12, 14), issued on June 24, 2022, in Docket No. 2018-0141, approved the Companies' request to recover their O&M costs for AMI full deployment via the MPIR adjustment mechanism, however, the allowed recovery only applies to O&M expenses that the Companies incur before they complete full deployment.
[32] "Compute" is a measurable resource, e.g., processing power, memory, networking, storage, etc., that can be consumed for computing activities.

objectives and determine whether to terminate the Pilot, propose to continue and/or enhance the Pilot, or transition from a pilot to a full-scale data analytics clearinghouse platform.[33]

At this time, there are no anticipated revenues from the Pilot. However, there is a potential to evolve the Clearinghouse as a data product for commercial interests.

IX. Expected Outcomes of the Pilot, Metrics for Measuring Success, Success Criteria, and Proposed Reporting Requirements

A core objective of this Pilot is to transparently share data to better inform future programs that move everyone toward State policy goals. This Pilot builds out some of the foundational data capabilities to collect, ingest, analyze, and share data more effectively among Pilot Participants through Clearinghouse services.

The Pilot will build a layer of capabilities initially and then organize the work through iterations and releases. This agile process will enable the Pilot to iterate through a series of "beta" versions with a smaller set of users/stakeholders before scaling up further. This is done to set clear goals for each phase and help control the costs of the project. The Companies will use the learnings generated from the Clearinghouse Pilot to help inform the future operational maintenance. This use-case driven iterative and flexible approach will result in a better product than launching a full-scale solution immediately.

To meet these overall Pilot objectives, expected outcomes include completion of five (5) program increments, delivering three (3) MVP releases, and making the core services available to the Pilot Participants including the User Interface, Packaged Public Data Sets, Interactive Analytics, and Direct Data Access.

[33] Should the Clearinghouse platform continue beyond the end of the Pilot, ongoing software, support, and maintenance expenses will need to be incorporated into base rates or an alternative cost recovery mechanism at some point in the future.

This Pilot also aims to work with Pilot Participants in an iterative process in an effort to build the best possible solution while minimizing costs. Gradually stepping through program iterations will better identify and address specific stakeholder/user needs without overbuilding the wrong solution by launching a full-scale effort. The flexibility to pivot during a pilot will help tackle specific use cases and focus on solving the most valuable problems first.

Pilot Participants will be asked to periodically fill out surveys (e.g., useability survey) and to provide feedback through workshops or other vehicles on features and usability of the solutions being implemented. Participant feedback will be requested and collected throughout the Pilot and within the Early Life Support phase. This iterative process will be critical to delivering the most value to the Pilot Participants.

The Companies propose to report on the above measures in their annual Pilot Update report due by March 31st of each year. Specifically, the Companies propose to report on: program increment completion, completion of MVP releases, progress on making the core Clearinghouse services available to Pilot Participants, the issuance of Participant surveys and documentation of Participant feedback, and the Companies' responses to Participant feedback including the Companies' efforts to address the Participants concerns. The Companies will also report on the actual expenses incurred relative to the proposed Pilot budget.

X. Pilot Eligibility Requirements

D&O 37507 describes a number of eligibility requirements that pilot projects should address.[34] Exhibit E provides a discussion of how the proposed Pilot meets each of these requirements or how these requirements are not applicable.

[34] D&O 37507 at 170-171.

XI. Pilot Participant Terms and Conditions

There are no specific terms and conditions for pilot participation as the initial participants are limited to public research agencies. However, there will be data access terms and conditions incorporated into the registration process for usage of Clearinghouse services.

XII. Conclusion

The Companies appreciate the Commission's approval of the IPF Workplan and the Commission's opening of this docket to receive and address pilot Notices submitted pursuant to the Pilot Process. This Pilot is key to providing a data sharing environment with services to collaborate with utility and related utility data that supports streamlined access, transparency, and useability. The broad support of this effort among Participants and the ability of this work to address multiple AOCs will facilitate advancement of broader State energy goals. The Companies respectfully request Commission approval to commence the Clearinghouse Pilot project as proposed herein.[35]

DATED: Honolulu, Hawai'i, October 26, 2022.

/s/ Marissa L. L. Owens
Marissa L.L. Owens

Attorney for
HAWAIIAN ELECTRIC COMPANY, INC.
HAWAI'I ELECTRIC LIGHT COMPANY, INC.
MAUI ELECTRIC COMPANY, LIMITED

[35] As noted in Order 38663, if the Commission does not take affirmative action on a Notice by the end of the forty-five (45) day period following the filing of a Notice, the Notice shall be considered approved as submitted. The Commission may also, where necessary, suspend the Notice for further investigation within the forty-five (45) day period where circumstances warrant (e.g., where more information is required). *See* Order 38663 at 10-11.

CRAIG FERREIRA
Energy Transformation

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Craig.Ferreira@GreenMountainPower.com

Filed in ePUC

April 29, 2019

Judith Whitney, Clerk
Vermont Public Utility Commission
Peoples United Bank Building, 4th Floor
112 State Street
Montpelier, VT 05620-2701

Re: GMP – Resilient Home Innovative Pilot

Dear Ms. Whitney:

Please accept this as Green Mountain Power's ("GMP") initial Pilot filing for the Resilient Home Innovative Pilot ("Pilot"). We submit this filing in regular course pursuant to Attachment 1 of GMP's Temporary Limited Interim Regulation Plan.

General Overview

In the face of climate change and the urgent need to continue the transformation of GMP's energy delivery system to one that is much more home, business and community based, GMP will be working with customers and residential builders to provide an innovative approach to home energy consumption through the Resilient Home Innovation Pilot. This Pilot will transform how energy is delivered and measured at the home by eliminating the need for the traditional utility meter on the house, instead combining the intelligent metering built directly into a third-party Energy Storage System, and providing customers with an optional tiered structure for fixed rate electricity pricing. We also will work to include other opportunities that exist to manage distributed energy resources ("DERs") in the home, such as electric water heaters, electric vehicle car chargers, and other DERs that are available to benefit customers. Initially, there will be an opportunity for up to 500 customers to enroll in the pilot, which is expected to be comprised of 250 customers enrolled directly with GMP, and another 250 customers enrolled through third parties utilizing GMP's current Bring Your Own Device (BYOD) Pilot. In addition, mindful of the tremendous interest GMP has experienced in past home energy storage offerings and the promotion we are coordinating regarding the BYOD Pilot, we will enroll up to double the number of customers initially targeted if we once again experience such demand within the first six months of the Pilot.

GMP envisions an energy future that is highly distributed, requiring a much tighter choreography of sources and loads all while improving reliability and reducing cost and carbon. This requires a transition in how we think about generation resources and load resources. We need to shift from treating them as two completely separate resources, to considering them as one and the same resource. Increasing a kilowatt of generation resource or turning down a kilowatt of load resource has the same effect on the system. It is for this reason that we see more and more homes and businesses becoming integral components of the transformed grid with storage (and sometimes solar and storage combined); looking ahead, we can imagine a time when every GMP customer has at least a battery storage system in their home.

One of the many benefits of a battery storage system is that it provides a greater level of metering data information than the utility AMI meter system. Although the utility AMI metering system will continue to be a critical tool for GMP for many years to come, we anticipate more and more battery storage installed in homes throughout Vermont and do not want to miss an opportunity to leverage the data that is provided from these devices. Because this data can be obtained through the battery system, it exposes a potentially unnecessary redundancy in equipment being installed in each home. Today, customers may have a traditional AMI meter, a solar inverter, and a battery system installed, all of which can provide some level of data. Through this Pilot, we will leverage the integrated metering of the battery system and attempt to eliminate the need to use the traditional house utility meter at the same time, thereby reducing costs for both GMP and the customer.

We will also work with home builders to plan out and install the battery storage system in new homes during the Pilot period, and make the home 'Grid Ready' by building in the necessary infrastructure in the home up front. An example of this will be to ensure there is a 240V outlet in the garage at an accessible location for an electric vehicle charger to be installed, providing for a seamless transition to electric transportation in each home. Additionally, GMP will work with builders to incorporate water and space heaters that provide thermal storage for the home and are compatible with GMP's distributed energy platform, allowing GMP to manage and make the best use of the available renewable energy from the home or surrounding grid area. Enabling these resources will also provide the customer and GMP with easy access to valuable information about energy consumption that can be used not only to reduce the ongoing costs of the home, but also to help GMP successfully choreograph the needs of the grid in real time.

Finally, taking our cue from popular consumer pricing models for other on-demand services, we will take this Pilot opportunity to explore a different method of pricing: customers may choose a fixed price option in conjunction with the battery system metering. Providing our customers a new pricing option, similar to that of a GMP Budget Payment Plan, will provide insight as to whether or not this type of billing is appropriate and feasible in the electric utility industry.

The Pilot

GMP will work with home developers/builders along with other third parties to include a battery storage system in new home construction as well as to create grid-ready homes with equipment that is compatible with GMP's distributed energy platform wherever possible. The Pilot will require a battery storage system in new homes or a battery storage system to be retrofitted in existing homes. The battery storage system will provide energy storage for backup power during grid outages and a GMP resource to manage the grid and reduce peak- and energy-related costs. GMP will utilize the battery as the house meter and eliminate the need for the traditional smart meter at the home. The cost of the system is outlined in the section below titled *Storage and System Charges*.

While other DER devices are not required as a part of the pilot, we will help enable builders and customers choose to install other devices in the home that will cut carbon, help meet state energy goals and provide new resources to manage the grid. GMP will not be including any of these devices as part of the GMP portion of the offer, however we will assist customers and home builders in specifying equipment from third parties that can also be managed as grid resources. Examples of grid-ready DERs are:

- *Heat Pump Systems* – Can be air to air, air to water or even ground source depending on the needs of the home and can be integrated via smart thermostat controls into the GMP platform
- *Grid-enabled hot water heater* – Whether it is a heat pump water heater or a traditional resistance water heater, the right models can provide GMP a dispatchable distributed resource to be used for demand response/peak shaving
- *Smart Thermostat* – Provides efficiency savings on any backup heating source by learning preferences and lifestyle
- *Electric Vehicle Charging* – GMP will ensure that home builders include an available outlet or wiring termination for an EV charger, to enable quick installation when applicable. GMP would provide a L2 charger free of charge to customers who have purchased a new EV
- *Smart Home Device* – Smart home assistant with the ability to communicate with customers about their monthly consumption and GMP bill. An example is the Amazon Alexa unit.

GMP views the Resilient Home Pilot as an important step toward the lower carbon, distributed energy future that we must achieve. Additionally, the Pilot will provide several benefits to the participating customer as well as the rest of GMP's customer base:

(1) *Carbon Offset* – By ensuring that highly efficient heating and cooling systems are easily made an integral part of every new home, GMP and our developer partners will be reducing the amount of fossil fuels that will be needed to provide climate comfort within each home. In addition, the use of the smart thermostats will ensure that if any fossil fuel system is installed, it is being used as efficiently as

possible. This supports the goal of Vermont's Comprehensive Energy Plan to reduce total energy consumption per capita by 15%, meet 90% of the remaining energy need from renewable sources by 2050, and helps GMP meet its Tier III obligations. The option to easily install EV charging is an additional incentive for customers to purchase electric vehicles, which supports the Comprehensive Energy Plan's goal of powering 10% of Vermont vehicles by electricity in 2025.

(2) *Load Shifting/Peak Reduction* – Each home will provide additional financial benefit for all GMP customers as they enable GMP to take advantage of "off-peak" periods when the wholesale cost of electricity is lower and, to the greatest extent feasible without sacrificing customer comfort, avoiding "peak" periods when demand for energy is greater.

(3) *Reliability* - The battery system provides a backup power source for many hours in the event of a grid outage, giving customers peace of mind during storms and other unforeseen grid issues.

(4) *Simplicity* - The fixed bill pricing option provides a customer with certainty for the energy costs. With the ability for customers to stay up to date on their consumption with a smart home device, they will have a higher level of information and confidence to keep them on track within the limit of their tier.

Pricing

Electricity Charges
GMP will provide two options for monthly electric charges. These offers will be distinct depending upon the systems a customer installs as a part of the Pilot.

With Solar – Customers installing an energy storage system that is paired with solar will remain on volumetric pricing for their electricity consumption. In a new-build scenario, the battery meters will provide the only source of metering for the home as well as the solar. GMP will provide one-line diagrams that detail the necessary wiring for the electrical panel(s), solar, and all related pre-wiring to ensure a complete, effective and efficient installation of the battery system. This will certify that the homes are set up properly for accurate consumption data, and will enable GMP to provide proper billing and credits for net-metering customers.

In a retrofit situation, where the metered components may be physically challenging for optimal wiring and metering, GMP will leave the existing smart meter on the home. GMP will rely on the energy storage system for billing purposes, however during the Pilot, if the energy storage meter data varies more than a 4% margin on either side, GMP will utilize the data from the AMI meter for that given month. This is to ensure accuracy of billing in uncontrolled wiring situations, and will provide a point of measurement and verification for the pilot.

Without Solar – Customers installing a battery system as a standalone backup system who are not part of a group net meter rate will have two options to pay for monthly electric consumption. The first is simply to continue volumetric billing as described above, again applying a monthly correction if the energy storage meter data varies more than a 4% margin on either side when installed as a retrofit where the AMI meter will remain in place. The second option is a fixed monthly energy price, in which all monthly electricity consumption will be included for a fixed amount based on the Tiers displayed in Table 1. The fixed rate aims to offer the convenience of one monthly cost that does not fluctuate throughout the year in order to give customers the benefit of knowing their expenses in advance. Again, the battery system will provide the sole metering in a new construction, while in retrofit installations, the existing smart meter will remain in place as a point of measurement and verification.

Tier	Annual kWh	Monthly kWh	Monthly Price
1	0-3999	0-333	$55.00
2	4000-5999	334-500	$90.00
3	6000-7999	501-667	$120.00
4	8000-9999	668-833	$145.00
5	10000-11999	834-1000	$175.00
6	12000-13999	1001-1167	$205.00
7	14000-15999	1168-1333	$235.00
8	16000-17999	1334-1500	$265.00
9	18000-20000	1501-1667	$290.00

Table 1 – The monthly price is for the electric portion of the bill only. It does not include the monthly cost of the battery system.

Customers will be placed into a fixed rate tier based on the home's historical – or in the case of new builds, expected – consumption, and locked into that tier for 1 year. Tiers will be re-established after every 12th month in the program. Other billing criteria include:

- There will not be a 'true-up' for past usage at the end of each 12-month period. Adjustments to Tier placement will only apply to future bills.
- If the customer averaged higher or lower than their assigned tier during the previous 12-month period, they will be automatically placed into the appropriate tier for the following 12 months.
- If over-consumption is within 5% of the assigned tier, the customer will remain in the current tier for 1 additional year.
- Customers may opt out of Tier pricing at any time, subject to a true up calculated based on a comparison of the last 12-months of actual kWh and what was paid during the same period through Tier billing.
- Tier pricing will adjust with annual rate changes as approved by the PUC and rounded to the nearest whole dollar.

- The monthly price for each tier includes the customer charge and the energy consumption only. Other items collected on the GMP bill such as the Energy Efficiency Charge, the Power Adjustor, or any other line item charge will remain separate.

Storage and System Charges

In order to be eligible for the Resilient Home pilot, BYOD participants must have a whole-home, two Powerwall system installed. There are two methods by which this can be accomplished.

1. Customers may enroll directly through GMP and pay $30.00 per month for ten years. Customers may also choose to make a one-time, upfront payment of $3,000 for the system in place of the $30.00 per month.

2. Customers may choose to enroll via a third party. With this option, customers will enroll their two Powerwall, whole-home system into GMP's BYOD pilot, and must offer the full capacity of the system to GMP. Customers will be paid the incentive as described in the BYOD Pilot, but will also earn the additional $5 per month incentive credit for cooperation and understanding of this Pilot.

GMP is beginning this Pilot with the Tesla Powerwall because we currently have the most experience with their hardware, software, and integration into GMP's systems. We are open to expanding the types of battery systems that are able to provide quality metering data, and will provide our data API requirements to anyone requesting such. We will then review proposals to integrate additional systems during the pilot period.

Goals & Measurement

GMP will answer several questions as part of this pilot.

1. Determine whether the consumption data provided by the battery systems is as accurate or within a reasonable margin of error compared to the existing AMI meter data.
    a. GMP will compare the data from both sources in retrofit installations to determine the accuracy of the battery metering data.
2. Determine customer interest for Fixed Priced Billing and the impact, if any, on customer behavior as it relates to usage.
    a. Because the rate will be optional, GMP will quickly determine the level of interest and engagement from customers.
    b. Over time, GMP will be able to look at the consumption behavior of customers who have elected this billing option to understand where they fall within their assigned tiers and if usage behavior has changed and how much variation exists within the tier.

3. Assess the value of connecting with the home builder market and create grid ready homes from the ground up including a battery storage system
    a. This will be reflected in GMP's ability to successfully help builders integrate technology and resources into new homes that provide value to both the homeowner and all GMP customers.
    b. The ability to repeat this process with multiple partners will also be a measure of success.

Timing and Scope

GMP intends to begin providing this Pilot to customers in Spring 2019. The Pilot will be available to customers who purchase newly constructed homes as well as customers with existing homes that meet the criteria in the section below: *Customer Eligibility and Terms*.

The Pilot will be open initially to 500 customers during the 18-month enrollment period. This will include a mix of new builds, retrofits, GMP installs, and third party installs. GMP anticipates 250 customers participating directly through GMP, and another 250 participating through third party installers. GMP will work with new construction builders to ensure systems are installed properly and ready for participation upon the customer's move-in date. Given the tremendous demand GMP saw with its earlier home energy storage offerings, GMP is planning this Pilot with expansion in mind. If interest outstrips demand in the first six months GMP will double customer participation.

Customer Eligibility and Terms

Participating customers must meet the following requirements:

1. Must be currently on, or must change to, residential Rate 01. If currently participating in a residential time-of-use rate such as Rate 9 or Rate 14 customer has option to switch back to Rate 01 to participate in the program. Cannot have a separately metered rate such as Rate 03 or Rate 13.
2. Must be in good standing with GMP, and not have received a disconnect notice within the past two years. (New customers moving into GMP territory who do not have a history with GMP will be eligible for participation using our standard reference requirements for new customers from a bank or other utility.)
3. Cannot simultaneously be on a Budget Payment Plan and participate in the Tiered Pricing option. Customers can transition from their current budget plan into the Tiered pricing option if they choose.
4. Customer must have a smart meter or allow for one to be installed (retrofit customers only)
5. Existing Powerwall installations are not eligible to participate at this time.

Participating customers will enter into a Customer Agreement setting forth the rules and terms of the Pilot at enrollment.

The Resilient Home Advances State Energy Goals

The Resilient Home Pilot will help advance state energy goals. First, the battery system provides a clean alternative backup power solution for customers who would otherwise likely rely on a fossil-fuel generator. Second, the battery system represents an innovative, dispatchable resource that can be used during peak periods to help reduce GMP's power supply costs, which lowers costs for all customers. Third, the battery system can aid in the development of distributed energy resources called for under Act 56, the Vermont Renewable Energy Standard ("RES") enacted in 2015. Specifically, dispatch control of the battery system can be used to help smooth grid impacts caused by a high penetration of solar energy, potentially avoiding more expensive, traditional grid upgrades. By making these homes 'grid-ready' GMP will be working to ensure new homes are built in a way that increases, and maximizes, the use of renewable energy by strategic electrification of such resources like water heaters and electric vehicle chargers. And lastly, GMP continues to discuss, with the DPS and PUC, the quantification of Tier 3 value for Powerwalls as it relates to the reduction of fossil fuel that would otherwise be needed to provide peaking energy in New England. GMP is confident that a value will be assigned for the amount of fossil fuel avoided as a result of dispatching clean, stored energy, during peak times. Because GMP will be working with builder partners to encourage homes be built with compatible distributed resources, GMP will also have the ability to reduce our overall peak demand with the other devices in the home, compounding the Tier 3 value just described.

Summary of Projected Costs and Revenues

Assuming 500 customers installed over an 18-month period, the Resilient Home Pilot will reflect a net present value of revenues of over $1.4 million for the fifteen-year term. The grid benefits provided by the battery systems will last for up to fifteen years; however, the revenue projection assumes a mix of systems coming to the end of their useful lives starting in year ten, and continuing through year fifteen. Additionally, due to an expected mix of participating homes with and without a solar installation, GMP has assumed, based on actual data from the Grid Transformation Pilot, that just over half of participants will have solar installed alongside the battery system. As such, there will be an expected Federal Investment Tax Credit ("ITC") value for the systems paired with solar. With the expected 250 customers enrolling directly through GMP, the GMP capital investment will total approximately $4.5 million which includes an 8% allocator of administrative and general costs of the program only allocated to the systems offered directly through GMP.GMP will only expand beyond this number if demand outstrips the 250 customer initial allocation in the first six months in which case it will double the allocation to permit additional customer signups (both for GMP-led slots and BYOD).

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
New Build	25	25													
Retrofit - GMP	100	100													
Retrofit - 3rd Party	125	125													
Cumulative Quantities	250	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Revenues															
Battery System Payment (monthly)	$31,500	$63,000	$63,000	$63,000	$63,000	$63,000	$63,000	$63,000	$63,000	$63,000	$31,500				
Battery System Payment (Upfront)	$112,500	$112,500													
Avoided A&G	$163,000	$163,000													
Battery System Power Supply Benefit	$243,185	$702,955	$826,375	$838,795	$863,280	$930,070	$966,885	$1,023,085	$1,082,105	$1,144,560	$500,775	$478,503	$417,123	$319,928	$189,723
Avoided Smart Meters	$4,075	$4,075													
Total Revenues	**$554,260**	**$1,045,530**	**$889,375**	**$901,795**	**$926,280**	**$993,070**	**$1,029,885**	**$1,086,085**	**$1,145,105**	**$1,207,560**	**$532,275**	**$478,503**	**$417,123**	**$319,928**	**$189,723**
Costs															
Equipment and Installation Costs*	($485,730)	($840,599)	($684,973)	($638,204)	($596,500)	($557,655)	($519,550)	($482,751)	($449,028)	($418,426)	($201,854)				
BYOD Monthly Credit	($7,500)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)	($15,000)				
BYOD Incentive	($1,040,625)	($1,040,625)													
Software Fees	($3,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)	($6,000)
Total Costs	**($1,536,855)**	**($1,902,224)**	**($705,973)**	**($659,204)**	**($617,500)**	**($578,655)**	**($540,550)**	**($503,751)**	**($470,028)**	**($439,426)**	**($222,854)**	**($6,000)**	**($6,000)**	**($6,000)**	**($6,000)**
Net Benefit to Non-Participating Customers	($982,595)	($856,694)	$183,402	$242,591	$308,780	$414,415	$489,335	$582,334	$675,077	$768,134	$309,421	$472,503	$411,123	$313,928	$183,723
*Includes 8% A&G allocation for GMP Powerwalls only														**NPV:**	**$1,423,867**

Efficiency Vermont Non-Conflict Explanation and Collaboration Certification

By this filing, GMP certifies that the Resilient Home Pilot does not conflict with work being performed by Efficiency Vermont. GMP has discussed the scope and objectives of this pilot with Efficiency Vermont, and Efficiency Vermont has confirmed that a conflict does not exist. Additionally, GMP provided a copy of the draft filing to Renewable Energy Vermont three weeks prior to the filing for review.

Status Updates

GMP proposes to provide status updates to the Commission regarding the Resilient Home Pilot's progress on a six-month basis until the pilot expires in 18 months. GMP will collect data for an additional year beyond the 18-month enrollment period of the Pilot in order to obtain a substantial-enough amount of data to make the best decision on whether or not to move forward. GMP will provide an 18-month update, but will provide a Final Report for the Resilient Home Pilot 14 months after the 18-month period has ended. In the event that the Pilot does not warrant being advanced to a tariff, GMP will work with customers to transition billing of electrical charges back to traditional methods. In the event GMP decides to terminate the Pilot prior to the passage of 18 months, it will provide prompt notice to the Commission, the Department, Efficiency Vermont, and REV.

If you should have any questions, please contact me at 802-655-8754.

Very truly yours,

Craig Ferreira
Energy Transformation

Enclosure: Customer Agreement
cc: Daniel Burke, Vermont Department of Public Service
Rebecca Foster, Efficiency Vermont
Olivia Campbell Andersen, Renewable Energy Vermont

163 Acorn Lane
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Josh Castonguay *Phone: (802) 655-8754*
Vice President, Chief Innovation Executive *Josh.Castonguay@greenmountainpower.com*

August 5, 2019 **Filed in ePUC**

Judith Whitney, Clerk
Public Utility Commission
112 State Street
Montpelier, VT 05620

Re: **Notice of GMP Innovative Pilot: Energy Bundle**

Dear Mrs. Whitney:

This letter provides notice of Green Mountain Power's Energy Bundle Innovative Pilot (the "Pilot"). Green Mountain Power plans to start offering customers the opportunity to participate in the Pilot after August 23, 2019.

Executive Summary

This Pilot offers GMP customers a simple way to achieve whole-home energy transformation with a convenient, fixed, bundled monthly pricing plan. The Energy Bundle will pioneer energy-as-a-service with a subscription model, furthering GMP's desire to transition to a home, business and community-based energy model. The Pilot is designed to test customers' interest in new energy pricing options that wrap in multiple energy resources. A "bundle" will consist of rooftop solar array, home battery storage, flat-priced grid energy, and an option to add an electric vehicle. The program is structured to encourage third-party participation to help grow the market and speed up energy transformation in Vermont to reduce carbon emissions and overall costs for all customers. The proposed bundle will address clean generation, resiliency, peak management and clean transportation in a simple-to-access package that we believe will drive increased adoption among our customers.

GMP has been developing customer-facing innovative energy programs for individual energy devices, with a longer-term goal to package these individual programs together into bundled price options. This offers customers a simple way to make a significant transition to clean and resilient energy systems that also provide the benefits of new, controllable grid resources, which has value to all GMP customers. This Pilot leverages the experience GMP has gained from our successful battery storage pilot programs and continues the momentum we are trying to create toward understanding how to help our customers more rapidly and more fully transition to clean energy solutions. To date, GMP's existing battery pilot program has provided customers with more than $486,000 in total value and cut an estimated 300,000 lbs. of CO2 emissions during peak times. These batteries have provided customers with thousands of hours of backup power since the start of the program. This proposed Pilot, as currently structured, is estimated to provide over $5.6M of net present value benefit to non-participating customers.

This filing meets our Innovative Pilot program criteria because it bundles products and services beyond the sale of basic electric service, which provide shared access to GMP for load control, comply with Tier

III goals, and advance state energy policy and carbon reduction goals. The Pilot is focused on providing customers with access to a combined, simple package of clean energy solutions, while providing GMP with a fully dispatchable renewable generation asset (including dispatchable charging with the EV) that is aimed at the continued transformation and de-carbonization of Vermont, benefitting all customers. As with all pilots, along with participating customer value, the program will deliver additional value to all GMP customers, essentially turning each participating home into a grid resource to help manage peaks.

In addition to pushing ourselves to innovate for our customers, we continuously encourage other parties, such as Vermont solar installation companies, to innovate with us, under the assumption that together, we will move transformation much more quickly and sustainably than would otherwise be possible. With this in mind, GMP will allocate half of the 1,000 available slots in this pilot to third-party providers, who will be able to leverage the fixed pricing structure we developed for a solar plus storage solution that mirrors the Tesla model outlined in the remainder of this Pilot Filing. This creates tremendous opportunity for Vermont solar companies and customers. It is through active collaborations and strong partnerships that GMP will be able to achieve or exceed our goal of becoming 100% carbon free by 2025 and 100% renewable by 2030 while also focusing on decarbonizing the thermal and transportation sectors in Vermont.

The GMP direct offer in this Pilot will provide customers with an installed rooftop solar array sized at 6kW, 8kW, or 12kW. The solar system will be financed through a lending partner under applicable terms and conditions and owned by the customer. GMP will be using Tesla Solar PV systems, and Tesla will manage the signup process and installation of both the solar component and the battery component. The Pilot also includes a battery component which will be bundled into the fixed monthly rate. This model and customer offer can be replicated with other solar plus storage options provided by other third parties, explained further in the 'Third-Party Bundle Providers' section below.

Any customer who wishes to include an electric vehicle will have the option to add an EV with a controlled charger to the overall package. The EV can be any all-electric vehicle compatible with a home Level 2 charger. The customer will have the choice to finance the vehicle with their own lending institution, pay cash, or lease the vehicle. GMP will contribute our standard Tier 3 incentive for the EV and provide a smart Level 2 charger equipment at no cost.

Finally, GMP is able to offer this entire suite for a fixed monthly price with only a portion of the price (the resulting grid energy payment) escalating annually. GMP will apply a fixed PV credit per installed kWdc to the solar, which is used to reduce the cost of the fixed Grid Energy Payment that will be made to GMP. The solar and grid payments together add to a total fixed monthly price. This packaged resource of solar and storage allows us to reduce our total system energy procurement needs while helping manage the distribution system as we continue to move to a home, business and community-based system.

While these systems will be connected to the grid and apply for a Certificate of Public Good using the same process as traditional net metering systems (as authorized under 30 V.S.A §8007(a)), they are not net metering systems per se, as contemplated under Board Rule 5.100. Production of the systems will still offset usage by the customer, but under this Pilot customers will receive a fixed value stream for installing systems, which will reduce the monthly fixed Grid Energy Tier. The Renewable Energy Credits will be transferred to GMP and ultimately used for Tier 2 or Tier 3 compliance. These RECs will not be sold outside of Vermont. Any additional Tier 3 value under the Vermont Renewable Energy Standard, such as for the battery system peaking, will be retained by GMP and used towards our annual Tier 3 compliance needs.

Pilot Details

The GMP Energy Bundle Pilot will include a GMP Direct Offering through an integrated solution manufacturer/provider, Tesla, and a market solicitation of other solar/storage providers that choose to work with GMP to set up a bundled offering. Tesla or other 3rd party solar/storage providers will undertake the marketing, customer acquisition, and customer promotion of the Pilot and GMP's Pilot support will be limited to customer issues, such as GMP billing, energy Tier inquiries, and other similar or related matters.

GMP Direct Offering
There are several individual components that comprise the total package of the offering utilizing Tesla solar and storage. The total monthly cost to the customer will be the sum of each of the components below. An example is provided in Attachment A.

1. *Tesla Rooftop Photovoltaic (Solar) Array* – Tesla will install a solar array, utilizing a $100 refundable deposit to secure their installation. Solar arrays will be sized at 6kWdc, 8kWdc, or 12kWdc. By pricing the solar array based upon its size with built-in assumptions regarding average array output, GMP is able to offer customers a stable and predictable monthly credit for the energy generated by the system. There will be a fixed PV credit of $12.75 per installed kWdc per month for the PV array during the system's 20-year lifetime. The value $12.75 is based on an assumed cost of solar that results in the customer's total monthly energy payment (solar loan plus grid power) matching the undiscounted energy tier amounts in Table 1. The system will carry a 20-year workmanship warranty from Tesla in addition to other system guarantees that can be seen in Appendix C. The system will be owned by the customer and can be financed through a lending partner. Customers will receive separate bills from the lending partner under its terms and conditions for the monthly price of the solar and EV – if chosen – and from GMP for the batteries and resulting fixed Grid Energy payment. Customers will be subject to a one-time $110-meter fee for the installation of the gross meter, as well as the $37 per kWac TGFOV fee that will apply only to systems installed on applicable substations.

2. *Two Tesla Powerwall 2s* – Two Powerwalls will be installed by Tesla for no upfront cost to provide customers with access to whole-home backup. The Powerwalls will provide resiliency for the participating customer, while helping GMP reduce peak and energy costs, saving money for all GMP customers. GMP will lease the batteries to customers and maintain ownership, and the storage systems will remain in place for 10-15 years before being returned to Tesla to be recycled. Because GMP owns the batteries and they will be paired with a PV array, there is an opportunity to utilize the federal investment tax credit to help lower the cost of the system. The Powerwalls will be charged by solar power a minimum of 75% of the time for the first five years in order to satisfy the ITC requirements. In the event of a grid outage, this solar-paired system will enable participant homes to stay powered in backup mode longer, depending on weather. The Powerwalls will be re-charged by the solar PV array during the day, while systems not paired with solar would be not have this capability. The monthly cost of the Powerwall component will be $30.00. Starting January 1, 2020, the federal investment tax credit will be reduced from 30% to 26%. GMP will have the flexibility to increase the percentage charged by solar of the annualized measurement period, which will cover the reduced ITC value for systems installed after January 1, 2020. Solar arrays that are not connected to battery backup systems are not able to provide energy to homes during grid outages, which is why the bundled system is a better resiliency option for customers. The

battery payment will last for 10 years, at which point the batteries will continue to operate for up to an additional five years and no additional cost to the customer. The customer monthly payment will drop after year 10 with the removal of the battery payment. At the end of its useful life the battery will be recycled by Tesla.

Each Powerwall will come with Tesla's standard 10-year battery system warranty. Additionally, customers will have access to the Tesla smart phone app that enables users to monitor the Powerwall and solar array, and if applicable, monitor and manage other Tesla products such as a vehicle. We will also assure that these systems are constructed in such a way that, in the future, we can take advantage of the Resilient Home pilot results and allow for direct energy metering through the battery system as an alternative to the traditional utility meter.

3. *Fixed Grid Energy Power* – In some cases, the PV array will provide all of the consumption needed at the home, and will be sized to target production at the home's anticipated consumption. In some cases, however, customers will still need to procure some additional amount of grid energy over the course of a year. In order to ensure the stability of a fixed rate, GMP has created fixed "Grid Energy Tiers" that will dictate the added monthly cost of grid power at the start of the program. The Grid Energy Tier price includes both the cost of the kWh energy as well as the GMP Customer Charge, which are separated out on a standard residential customer bill. Other items that are collected on a standard residential customer bill will remain separate on the GMP Energy Bundle bill, including the Energy Efficiency Charge, Power Supply Adjustor and any other line item that would be considered "non-bypassable," Customers will be placed into an energy tier based on their historical gross consumption. Regardless of PV size and credit, GMP will require a minimum grid payment that starts at $5 per month and escalates annually as identified below. The resulting payment of the Grid Energy Tier component will be escalated annually at a rate of 2%. This increase will not affect the customer payment for the solar, EV or battery component.

   The Energy Tier Payments in Table 1 below provide the total energy charge, which is then discounted by the monthly PV credit based on the specific solar size the customer chooses. As a representative example, we show the solar credit for an 8 kWdc solar array and resulting grid energy payment. Note that the exact payment to GMP will depend on the size of the solar array and may differ from the example values in the rightmost column of Table 1. Appendix A shows an example of two customers in the same tier with different sized solar arrays. The Energy Tier payments in Table 1 exclude the monthly cost of the Powerwall system.

				Example			
	Min Annual kWh Consumption	**Max Annual kWh Consumption**	**Grid Energy Tier**	**Solar Discount (8 kWdc)**	**Resulting Payment**	**Powerwall Payment**	**Total Payment To GMP***
Tier 1	0	7999	$120	$102	$18	$30	$48
Tier 2	8000	9999	$145	$102	$43	$30	$73
Tier 3	10000	11999	$170	$102	$68	$30	$98
Tier 4	12000	13999	$195	$102	$93	$30	$123
Tier 5	14000	15999	$220	$102	$118	$30	$148
Tier 6	16000	17999	$245	$102	$143	$30	$173
Tier 7	18000	19999	$270	$102	$168	$30	$198
Tier 8	20000	21999	$295	$102	$193	$30	$223
Tier 9	22000	24000	$320	$102	$218	$30	$248

*Table 1 *Not including Solar PV or EV payment which will vary depending on Terms.*

On a twelve-month basis, GMP will reassign a customer's tier if necessary based on gross consumption for the previous twelve months. Customers will have the opportunity to reduce their consumption and reduce their grid payment, or if consumption increases enough to reach the next tier, their resulting payment will increase. This method will protect all GMP customers from drastic increases in electric consumption by participating customers that may decide to strategically increase their electric consumption with the purchase of an electric vehicle or other high consuming electric device over time. However, it should be noted that the Grid Energy Tier and solar system can also be sized in a way to take into account the addition of an EV if the customer chooses to purchase one as part of the bundled system. Energy used to charge the battery (either from the solar or grid) that is later discharged to the grid will not count towards the customer's gross consumption. Only the home's actual energy consumption will count towards the gross consumption when calculating Tier assignments. Round trip efficiency losses in the battery are projected to increase the home's consumption by at most 168 kWh per year.[1] However, in a typical peak event, the battery is not cycled the full 100%, therefore it is likely to be lower over the course of a year.

Customers choosing to exit the Pilot will be removed from fixed tier pricing and will automatically be placed into net metering. The net metering adder in effect at the time the solar was originally installed will apply, and will be set for a duration equal to 10 years minus the number of months that the customer has participated in the Bundle. Exiting the fixed tier pricing will not affect the battery lease payment. EV and Solar payments will remain between the customer and their lending institution. Customers may not return to the fixed tier pricing after they exit.

1 Based on following assumptions: 5 round trip cycles per month, 27 kWh of battery capacity, 11% round trip efficiency loss.

4. *Electric Vehicle* – The GMP Bundle will also include the choice of an all-electric vehicle. A participating customer can choose to procure an all-electric vehicle at the same time they are signing up for this bundled energy offering. GMP will provide our standard $1,500 incentive for an all-electric vehicle (with a higher incentive available for income-qualified customers), which helps reduce the overall cost of the electric vehicle. Each vehicle will also come with a dispatchable Level 2 charger for faster home charging, under our Tier 3 program. Customers will agree to allow GMP access to the vehicles or Level 2 smart chargers for additional load control during peak events. Recognizing that not all customers are in the market for a new vehicle at this time, this component of the bundle is optional.

GMP will provide the above total bundle for up to 500 customers.

Third-Party Bundle Providers

The second option is for other providers and manufacturers besides Tesla to set up with GMP the same basic program as will be offered through Tesla; GMP will reserve 500 slots in this pilot for third-parties to take advantage of the same bundled pricing structure for solar plus storage systems. Once established, customers who enroll under this option would have the ability to utilize a similar fixed tier pricing structure as described above, all inclusive of the solar, storage, and grid energy components. Bundles may also include technologies like electric vehicles and heat pumps if desired, although only the solar and storage components are required. Third parties can provide the Tesla Powerwall if certified to do so, or can provide a storage system on GMP's approved battery storage list per our Bring Your Own Device program.

GMP will provide the same starting Tiers as shown in Table 1 above. GMP will then apply a fixed PV credit amount of $12.75 per kWdc per month of solar installed regardless of size, installer, and cost of PV. The customer's resulting payment to GMP will be calculated as:

Monthly Grid Energy Tier Payment - ($12.75 * kWdc PV Array Size) = Grid Energy Payment to GMP

The cost of the solar array to the customer is therefore independent of the fixed energy tier payments being made to GMP. As a result, this also allows for customer flexibility in financing should they wish to procure financing independent of their solar provider.

On the battery component, if the installer has become a Tesla certified Powerwall installer, GMP will purchase the batteries from the third-party installer for a price of $16,300, which will include installation of the system. These Powerwall systems will then be rolled into GMP's total aggregate fleet of Powerwalls and offered to the customer at the same monthly price of $30. These Powerwalls will be treated no differently than Powerwalls procured through the GMP Direct offer. Third-parties also have the freedom to choose and utilize different battery technologies. However, because GMP will not have the same level of control, uniformity, and value guarantees that are provided by the Powerwall fleet, GMP cannot yet purchase these systems from third-parties to provide similar monthly pricing to customers.

Any storage solution currently eligible for the BYOD pilot is by default eligible for the third-party bundle option. GMP will not own these batteries, but will continue to provide an upfront incentive or monthly bill credit for access to each compatible battery system pursuant to the active BYOD Innovative Pilot. Third-parties may also include other storage providers in their proposals, and GMP will explore the viability of integrating each system into our distributed energy management platform.

As mentioned above, the third-party bundle may include an electric vehicle. While the vehicles must be all electric, they can be any make and model. Customers choosing to purchase a vehicle as part of the bundle will also be given the $1,500 incentive (or higher incentive if income-qualified), as well as the free Level 2 smart vehicle charger. Customers will agree to allow GMP access to the chargers to ensure these assets can be managed during peak times as well.

Pilot Outcomes

This Pilot will make room for up to 1,000 customers to get the benefit from a resilient personal energy system utilizing a packaged pricing structure and eliminating the need for traditional, fossil-fuel-fired backup generators. Although less than ½% of our total customer base, this number of customers will provide us with a wide enough sample of participation so we can anticipate having customers in various usage tiers and solar sizes. In turn it will allow us to understand if there is a natural cutoff where customers are no longer interested in a program like this, such as if their own consumption exceeds a certain amount, or the solar size they can accommodate is limited. Participating companies will be able to test the interest of customers in this convenient package, and customers who enroll will have the benefit of a more certain, stable cost for their hyper-local, renewably generated electricity over the term of the program. While the overall program may provide more or less benefit to each individual participating customer in a particular month than would pursuing net metering and/or storage (through tariff or BYOD) separately, it allows GMP to test customer's interest in the convenience and certainty of bundled flat pricing utilizing kW, rather than kWh payments, and will also slightly lower the cost to non-participating customers compared to separately-pursued net metering. In addition, the aggregated dispatch of storage systems will produce value for non-participating customers by reducing peak-related costs. For the first time, this Pilot will allow GMP to test the interest of customers in the convenience and certainty of bundling equipment pricing with fixed Grid Energy payments. The advantages of bundling and fixed pricing – convenience to the consumer and a known, controlled load package for GMP with established interfaces – can be tested with this overall low number of eligible customers, to determine whether this type of model is viable for expanding opportunities for renewable self-generation and load management for our customers and all energy service providers.

Measurement & Verification

An important component of this pilot is measuring the use of these dispatchable resources for reducing demand during peak events and verifying that these systems are reducing costs for all GMP customers. GMP's prior pilot programs have already demonstrated the benefits of dispatching grid resources through Tesla's GridLogic platform, and GMP is confident in the system's capabilities to provide continued benefits for customers. Tesla and GMP are continuously measuring the performance of the Powerwalls during peak events, and Tesla will continue to provide reporting for available capacity of grid services, monitor which resources are sent dispatch signals, and most importantly, provide the total capacity and energy of the DERs for each event that is called. Ensuring that the resources are actually realizing the expected value for GMP customers, Tesla has agreed to a performance guarantee that states if the system fails to meet expectations in reducing peak costs, GMP customers will be made financially whole.

Similarly, Tesla and each participating third-party installer will be required to provide GMP with real-time generation data from each of the solar arrays, which will allow us to measure actual production against the assumptions made for total PV output per system. We will also be able to use this data to determine if the cost of the system remains a benefit over the existing per kilowatt-hour compensation being employed today as expected. Finally, GMP will also require access to total household consumption

from both the Tesla and third-party metering systems and the GMP AMI meters, which will enable GMP to monitor where customers fall within their tier range. Doing so will provide valuable insight as to whether or not the fixed pricing method will ultimately serve as a benefit to all GMP customers, or if the fixed tiers need to be adjusted in order to make it a plausible path forward in GMP's effort to transform the way customers procure energy and interact with their electric utility.

The installation of a separate gross solar meter will allow GMP to track generation just as it does with net metered systems. GMP will therefore provide consistent data to the DPS and PUC for their annual net metering reporting, and will commit to clearly designate those systems participating in the Bundle pilot so that they can be segregated from the net metering reporting as needed.

Timing and Scope

The GMP Bundle Pilot will be available to all residential customers who do not currently have a net metered PV system installed and operating, and are not part of a net metering group. Beginning on August 23, 2019, customers may choose the GMP Direct Offering or enroll through a participating third-party as soon as one becomes available. The partnership between GMP and Tesla targets 500 Energy Bundle installations over the course of the next 18 months. This will deploy 5MWs of battery storage. Additionally, there will be 500 slots allocated for third-party installations and GMP will actively work with any party interested in the program to assure equal access.

The Pilot Advances State Energy Goals

The Energy Bundle Pilot will help advance state energy goals. First, we are forecasting over 8 MW of added solar capacity in the pilot between all parties, which will help Vermont meet the Comprehensive Energy Plan's (CEP) goal of 90% renewable energy by 2050, as well as help GMP meet its Tier II obligations under the Vermont Renewable Energy Standard (RES) and provide additional resources to support Tier III if necessary. Second, the combination of solar and storage provides renewable generation and a clean alternative backup power solution for customers that would otherwise rely on a fossil-fuel generator, or not have a backup power source. Third, the system represents an innovative, dispatchable resource that can be used during peak periods to help reduce GMP's power supply costs, which lowers costs for customers. These peak periods are characterized by higher carbon emissions on the regional grid. By charging during off-peak times and discharging during peaks, each Powerwall provides an additional benefit of offsetting 4,152 pounds of CO2 over its lifetime.[2] Fourth, the Pilot significantly increases the development of distributed energy resources called for under RES. Combining energy storage with the solar arrays enables GMP to smooth grid impacts caused by the increase in solar energy, potentially avoiding more expensive, traditional grid upgrades. The program also helps drive adoption of electric vehicles by providing a simple "one-stop shop" for energy transformation, with multiple technologies wrapped into a unified offering, thereby contributing to the CEP's goal of achieving 10% renewable transportation by 2025.

Summary of Projected Costs and Revenues

GMP's O&M costs will be limited due to the structure of the customer intake as well as the partnership with each of the solar providers. Each provider will be the primary point of customer interest, intake, and qualification. They will be responsible for enrolling customers for participation in the Pilot and all aspects

2 Calculated in *Operational carbon offsets from peak shaving with battery energy storage system* (2018). Prepared for GMP by EarthShift Global.

of design, site review and installation. Installers will also be responsible for scheduling and completing installation of the System, and lastly the customers will be passed over to GMP for final program enrollment.

The Pilot includes a total estimated capital cost of up to $17.6M for the procurement and installation of the battery systems (assuming all systems are Powerwalls purchased by GMP) which is identified in the 'Equipment and Installation Costs' section of the Appendix B. Under the terms of its regulation plan, GMP is not seeking to rate base this capital cost at this time and would do so only through a separate request to the Commission within our annual base rate adjustment filings.

This Pilot provides significant value to 'non-participating' customers through program revenues and power supply cost reductions. As structured today, this Pilot would provide over $5.6M of net present value benefit to non-participating customers, which is comprised of a combination of value streams including the power supply benefit provided by the batteries, as well as the lesser impact of solar installations compared to the same systems being installed under traditional net metering.

See Appendix B for a detailed Financial Summary.

Efficiency Vermont and REV Non-Conflict and Collaboration Certification

GMP has discussed the scope and objectives of this pilot with Efficiency Vermont and confirmed that the pilot does not conflict with their work. GMP has discussed the scope of this Pilot with Renewable Energy Vermont, and has gained valuable insight into how to structure the third party offering to make it a success for all involved.

Status Updates

GMP proposes to provide status updates to the Commission regarding the GMP Energy Bundle Pilot's progress on a six-month basis until the Pilot expires in 18 months. In the event GMP decides to terminate the Pilot prior to the passage of 18 months, it will provide prompt notice to the Commission and the Department. The amount of customer uptake will be a leading indicator as to whether this Pilot is desirable to customers. However, it will be important to understand exactly which components were the ultimate catalysts for participation. It is reasonable to suggest that one or all of the components are the driving factors in a customer's decision, but having a deep understanding of this will inform how future programs and services are formed and offered. GMP is unaware of any pilot or program like this across the country, and will be on the forefront of testing customers' preferences on bundled services and fixed rates for electric consumption. GMP will be tracking a number of metrics and gathering information to determine the overall effectiveness of the program. This will include the following:

- In order to best understand the driving force behind each customer's decision, and to gain a detailed understanding of why this pilot is, or isn't successful, GMP will create a short survey that will be sent to customers once their install is complete. The survey will include questions about which components were desirable, as well as seeking input for what could be changed or improved.
- In the event of a customer outage, confirming that the Powerwall and PV Array performed as required in back-up mode.
- GMP will have access to data necessary to show that the use of the systems has been successful in reducing GMP peak demands.

- Utilizing an abundance of data, GMP will be able to easily compare the actual solar output of the installed systems to the assumptions made for the Pilot.
- GMP will monitor gross household consumption to determine where customers are falling within their tier ranges and verify that they are set appropriately or need to be adjusted.
- Track total consumption from the grid regardless of solar production.
- Because GMP will prioritize backup energy for customers during potential grid outages due to storms, we will monitor and record how often GMP decides to pull back on any dispatches due to storm predictions.

Thank you, and if you should have any questions, please contact me at (802) 324-8359.

Sincerely,

Josh Castonguay,
Vice President, Chief Innovation Executive
cc: Dan Burke; Public Service Department
Barry Murphy; Public Service Department
Rebecca Foster; Efficiency Vermont
Olivia Campbell-Anderson; Renewable Energy Vermont

Appendix A

Customer Payment Example

Solar Size (DC)	6 kWdc	8 kWdc	
Annual Gross Consumption (kWh)	12,500	12,500	
Monthly Payments to GMP			
Grid Energy Tier	$195	$195	Tier 4
*Solar Discount ($12.75 * kWdc)*	-$77	-$102	
Grid Energy Payment	**$118**	**$93**	
Battery Payment	**$30**	**$30**	
Total Monthly Payment to GMP	**$148**	**$123**	
Solar Loan Payment*	**$77**	**$102**	
Total Monthly Payment	**$225**	**$225**	

* Actual cost will depend on solar price and financing terms – this example uses Tesla pricing and financing terms.

Appendix B

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
New Customers	300	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3rd Party Customers	300	200																
Total Customers	600	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
New EVs	20	10																
Costs																		
Equipment & Installation Costs*	($1,633,297)	($2,606,617)	($2,411,734)	($2,228,472)	($2,065,967)	($1,916,298)	($1,768,662)	($1,626,551)	($1,500,145)	($1,385,356)	($536,199)							
EV T3 Incentive	($30,000)	($15,000)																
Software Fees	($14,400)	($24,000)	($24,000)	($24,000)	($24,000)	($24,000)	($24,000)	($24,000)	($24,000)	($24,000)	($15,400)							
Total Costs	**($1,677,697)**	**($2,645,617)**	**($2,435,734)**	**($2,252,472)**	**($2,089,967)**	**($1,940,298)**	**($1,792,662)**	**($1,650,551)**	**($1,524,145)**	**($1,409,356)**	**($551,599)**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Revenues																		
Battery Power Supply Value	$514,812	$1,126,424	$1,427,076	$1,501,152	$1,521,058	$1,630,224	$1,745,946	$1,811,030	$1,854,980	$1,902,340	$1,815,392	$1,678,474	$1,500,900	$1,202,800	$786,006	$361,556	$80,800	
EV Power Supply Value	$1,569	$2,793	$3,227	$3,355	$3,416	$3,514	$3,663	$3,823	$1,292									
Avoided A&G	$776,532	$517,688																
Customer Battery Payments (Monthly)	$151,200	$252,000	$252,000	$252,000	$252,000	$252,000	$252,000	$252,000	$252,000	$252,000	$100,800							
Customer Battery Payments (Upfront)	$540,000	$360,000																
Powerwall System T3 Value	$77,100	$51,400																
EV Tier 3 Value	$17,520	$8,760																
Total Revenues	**$2,078,733**	**$2,319,065**	**$1,682,303**	**$1,756,507**	**$1,776,474**	**$1,885,738**	**$2,001,609**	**$2,066,853**	**$2,108,272**	**$2,154,340**	**$1,916,192**	**$1,678,474**	**$1,500,900**	**$1,202,800**	**$786,006**	**$361,556**	**$80,800**	**$0**
Bundle vs NEM Grid Payments	$68,649	$244,064	$248,092	$252,275	$256,632	$261,115	$265,750	$270,523	$275,403	$280,466	$195,472	$252,481	$160,615	$166,169	$171,990	$177,975	$184,075	$190,385
Subtotal	$469,685	($82,488)	($505,339)	($243,690)	($56,861)	$206,555	$474,697	$686,824	$859,530	$1,025,451	$1,560,065	$1,930,955	$1,661,515	$1,368,969	$957,996	$539,531	$264,875	$190,385
Incremental Gross Revenue Tax	$482	($85)	($519)	($250)	($58)	$212	$487	$705	$882	$1,052	$1,601	$1,981	$1,705	$1,405	$983	$554	$272	$195
Total Value to GMP COS	**$470,167**	**($82,573)**	**($505,858)**	**($243,940)**	**($56,919)**	**$206,767**	**$475,184**	**$687,529**	**$860,412**	**$1,026,503**	**$1,561,666**	**$1,932,936**	**$1,663,220**	**$1,370,373**	**$958,979**	**$540,084**	**$265,147**	**$190,581**

*Includes 8% A&G allocation for all batteries.

APPENDIX C

Solar panels	Your solar panels are covered by a warranty from their manufacturer. This warranty will be at least 12 years for workmanship and will guarantee at least 80% of nameplate power capacity for at least 25 years. This warranty will be transferred to you automatically when you pay the Contract Price. At your request we will make any claim under this warranty on your behalf and perform any related labor at our cost.
Inverter	Your inverter is covered by a warranty from its manufacturer. This warranty will cover defects for at least 10 years, and will be transferred to you automatically when you pay the Contract Price. At your request we will make any claim under this warranty on your behalf and perform any related labor at our cost. If you need to replace your inverter after this warranty expires, please contact us and we will help you obtain and install a replacement, both at your cost.
Powerwall	Your Powerwall is covered by the Tesla Powerwall Limited Warranty. The Tesla Powerwall Limited Warranty includes the arbitration provision contained in Section 18 below. By approving this Agreement, you accept the terms of the Tesla Powerwall Limited Warranty.
Workmanship	We warrant that (a) our installation workmanship will be free from defects for 20 years from the date your Products are installed (or, in the case of main panel or structural upgrades, 1 year from the date those upgrades were performed); (b) our installation workmanship will not invalidate the manufacturer's warranty for your solar panels or inverter, or the Tesla Powerwall Limited Warranty; (c) all roof penetrations we make will be watertight for the longer of 10 years or until the end of any existing installation warranty or new home builder performance standard for your roof; and (d) we will not damage your property during our installation of your Products. If we breach this warranty, we will repair the defective work, roof penetration or damage at our cost. If we can't do this ourselves, we will pay for someone else to do it. This shall not extend the original warranty period, but the remainder of the original warranty period shall apply to the repair work.

CRAIG FERREIRA
Innovation Development

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Filed in ePUC

August 23, 2019

Ms. Judith C. Whitney, Clerk
Vermont Public Utility Commission
112 State Street
Montpelier, VT 05620-2701

Re: GMP – Energy Storage Aggregation Innovative Pilot Notice

Dear Ms. Whitney:

Please accept this notice of Green Mountain Power's ("GMP") Energy Storage Aggregation Pilot ("Pilot") for filing with the Public Utility Commission ("Commission").

Executive Summary

There are a number of energy storage manufacturers and industry players that are interested in installing energy storage for mutual customers in GMP territory. Energy storage systems provide a wide array of technological approaches to managing power supply in order to create a more resilient energy infrastructure and bring cost savings to utilities and consumers. GMP continues to explore ways to maximize this value, and working with third party energy storage aggregators ("Aggregator") is a natural progression of these efforts. GMP believes that Aggregators will provide value by assuming responsibility for the operation and performance of an individual device and utilizing sales operations tailored to residential energy storage consumers, which will increase deployment and support program success, while offering customers differentiated and competitive technology, financing, and ownership options.

The Pilot will provide for the aggregation of various energy storage devices through Aggregators, and, in a pay-for-performance model, will provide a monthly payment to the Aggregator based on the actual capacity performance of the aggregate load each month, and the actual value of those services that year. The Aggregator will determine how to pass on any portion of the performance payments to their end customers, and bear responsibility for any underperforming systems. GMP and the Aggregator will split the value of the Energy Storage's demand reduction. Aggregators will earn 70% of the value to be passed on to their customers, while GMP will retain 30% of the value for all of its customers (or an 80/20% split if the Aggregator uses beneficial solar charging for the storage). This model shifts risk and capital investment onto Aggregators and off of individual customers and the utility, while providing

an estimated 10-year NPV of over $2 Million that will flow back to all GMP customers. The following is a summary of roles and responsibilities of GMP and the Aggregator:

Aggregator:

1. Identify customers and deploy energy storage to those customers. Participating customers must be situated in GMP's service territory.
2. Responsible for ensuring that customers understand optimal usage of their energy storage system, how their energy storage system will be used in an aggregated fleet of systems, and will be used during GMP's peak events.
3. At the cost of the Aggregator, Aggregators will integrate any necessary software with GMP's energy platform to receive dispatch signals for GMP's peak events.
4. Ensure that batteries are available to perform backup power for the customer as quickly after a peak event as possible. If batteries are grid-charged, aggregator will limit post-event charging to a trickle charge for a minimum period of two hours after the end of the Peak Event.
5. Responsible for ensuring that operating protocols for participating resources comply with Federal Investment Tax Credit ("ITC") requirements, if applicable.
6. Responsible for function, communication, and performance of energy storage systems to be measured as follows:
    a. At the Aggregator level during Peak Events. The energy delivered on the a.c. side of the inverter by the energy storage device in an Aggregator's aggregation will be measured.
    b. Based on demand reduction during GMP actual settled peak hours. As such, payment will be made only for demand reduction provided during such hours.
        i. Should GMP not signal a peak event during the actual GMP peak hour, Aggregator will be compensated based on the description in the *Value of Energy Storage* section below.
7. Responsible for contracts with customers that will explain how performance payments may be shared with the customer. Examples include discounts on storage deployment, or an ongoing share of revenue.
8. If additional value streams, such as distribution investment deferral, renewables hosting capacity expansion, emissions reductions value or grid reliability are identified by GMP, Aggregator will assist GMP in realizing this value by:
    a. Targeting deployment to high-value locations for elevated contracted value; and
    b. Supporting battery discharge optimization, as needed, to stack value; and
    c. Co-optimizing more complex battery discharge with future customer needs, such as EV charging or complex tariffs; and
    d. Other methods as agreed.

9. Aggregator will assume responsibility for costs associated with controlling their enrolled devices, such as inverter costs and software integration costs
10. Aggregator will agree to provide an 'end of life plan' for the energy storage systems, which may include a recycling plan, or a secondary use for the systems if possible.

GMP:

1. If additional value streams are added as set out in section 8 above, GMP will incorporate additional value in performance payments as it determines appropriate.
2. GMP will notify Aggregators of peak events a minimum of four hours in advance. A peak event is defined as a period of time in which GMP will require energy storage systems to discharge. Peak events are anticipated to occur an average of 5 to 8 times per month for a period of three hours. In years 6-10 of the Pilot, GMP reserves the right to increase the duration of peak events to 4 hours.
3. GMP will be responsible for providing Aggregator with information about geographical locations that may be adversely affected by a weather event, so the Aggregator is informed if and may choose to avoid discharging batteries that may adversely impact the availability of customers' backup power. Using this information, the Aggregator will be responsible for omitting energy storage systems from a GMP Peak Event, if necessary, that may leave the customer without backup power during a grid outage, should GMP specify they should be omitted.
4. GMP will make payments to the Aggregator when the peak settlement occurs as follows in the form of check or credit on account, whichever is appropriate:
    a. RNS – Approximately 90 days after the end of the month, as confirmed by Vermont Electric Power Company ("VELCO") the following month.
    b. FCM – Upon final settlement of annual peak by ISO-NE.
    c. Other value streams realized shall be included with payments made for RNS monthly capacity value
5. GMP will assume responsibility for any costs associated with its software management platform.
6. If GMP declines to signal a peak event during a peak hour, Aggregator will be compensated as described in the Value of Energy Storage section below.

Value of Energy Storage

GMP will split the value of the energy storage system's demand reduction with the Aggregator. The Aggregator will earn 70% of the value to be passed on to their customers, while GMP will retain 30% of the value for GMP's customers. Table 1 below represents the value of a single kW for each of the various value streams that the Aggregators will be providing with their fleet of energy storage systems. In order to ensure that GMP customers maintain a balanced and positive value throughout the duration of this Pilot, the value per kW for each of these categories will be

adjusted annually based on GMP's latest forecasted values, while the value split between GMP and the Aggregator will remain consistent throughout. Additionally, if and when additional value streams are identified, GMP will add a new line item to Table 1.

Value Type	Total Current Value per kW	Aggregator Value per kW	Aggregator Value per kW w/ Solar Shifting*
RNS	$9.64	$6.75	$7.71
FCM	$63.60	$44.52	$50.88

Table 1

*Solar Shifting – Any installed systems that are set to charge from a PV array during periods of high solar output will increase the Aggregator's share of the total value from 70% to 80%. This shall be done during the months of May through September, each day between the hours of 10am to 2pm.

In the event that GMP does not properly predict and signal a peak event during an actual RNS or FCM peak, GMP will compensate the Aggregator at the full value until the unrealized value exceeds 10% of the total annual value. The Aggregator will be made whole up to this point (i.e. between 100% and 90% of total value realized). Once the unrealized value exceeds the 10% mark, Aggregators will not be compensated further (i.e. GMP will retain 10% of the total value at all times). See Appendix A for the schedule of value sharing between GMP and the Aggregator. (This same process will apply for Aggregators earning the 80% split for solar shifting as well.)

In the event that GMP does not signal a peak event, but there is an actual peak event and an Aggregator performs for that event the Aggregator shall receive 80% of the actual value, with solar shifting aggregators receiving 90%.

In the event that an Aggregator charges the energy storage systems from the grid during a peak hour after being notified of a peak event, GMP will reduce the compensation to the Aggregator by the total capacity multiplied by the Total Current Value per kW identified in Table 1 during the GMP peak hour.

Finally, if an Aggregator dispatches its resources during a peak hour without GMP's signal, the reduced kW will be treated as capacity that performed during the peak event and compensated according to the schedule in Table 1.

Measurement & Verification

Measurement and verification are a key component of the Pilot to test the assumptions made regarding benefits to the grid and savings to all GMP customers. To that end, GMP's Energy Platform will report the available capacity for grid services, monitor which resources are sent

dispatch signals, and most importantly, provide the total capacity and energy of the DERs for each peak event that is called. This monitoring will be done by measuring the output on the a.c. side of the device inverter, as opposed to the utility meter, which enables GMP to observe the actual performance of the device. This approach, compared to baselining, provides a more accurate measure of performance of the device because it removes onsite load performance from the calculation, which may mask true performance. GMP will be using data provided by the platform to determine the overall effectiveness of the Pilot in reducing GMP peak demands and realizing other identified value streams. The energy platform provides enough flexibility to group each Aggregator's installed systems as their own, which will provide the granular data necessary to provide accurate measurement for each participating Aggregator.

Timing & Scope

GMP expects to begin accepting Aggregator capacity in September. The initial Pilot enrollment will last for 18 months and will be available to a maximum cumulative capacity of 5MW of energy storage systems. Each individual Aggregator may enroll a maximum of 2MW of capacity. Participating Aggregators must agree to terms consistent with the roles and responsibilities discussed above.

The Pilot Advances State Energy Goals

The Energy Storage Aggregation Pilot will help advance state energy goals. First, the battery capacity will provide a clean alternative backup power solution for customers who might otherwise likely rely on a fossil-fuel generator. Second, the battery system represents an innovative, dispatchable resource that can be used during peak periods to help reduce GMP's power supply costs, which lowers costs for all customers. Third, the battery system can aid in the development of distributed energy resources called for under Act 56, the Vermont Renewable Energy Standard ("RES") enacted in 2015. Specifically, dispatch control energy storage systems can be used to help smooth grid impacts caused by a high penetration of solar energy, potentially avoiding more expensive, traditional grid upgrades. And lastly, GMP continues to discuss with the Department of Public Service ("Department") and the Commission the quantification of Tier III value for energy storage as it relates to the reduction of fossil fuel that would otherwise be needed to provide peaking energy in New England. GMP is confident that a value will be assigned for the amount of fossil fuel avoided as a result of dispatching clean, stored energy, during peak times.

Summary of Projected Costs & Revenues

The projected costs and revenues for this Pilot are simple and straightforward. GMP will realize peak demand savings, while sharing this value with the Aggregators to pass onto the end customer. Table 2 below represents these expected values assuming the max of 5MW is installed during the Pilot period, and results in a 10-year NPV of over $2 Million that will flow back to all non-participating customers.

Year	1	2	3	4	5	6	7	8	9	10	11
Revenue											
FCM	$0	$260,442	$413,548	$349,245	$323,847	$330,347	$384,485	$426,114	$434,636	$443,327	$452,186
RNS	$565,958	$648,971	$681,828	$708,091	$733,596	$758,187	$782,828	$808,270	$834,538	$861,661	$889,665
Total Revenue	$565,958	$909,413	$1,095,377	$1,057,336	$1,057,443	$1,088,534	$1,167,313	$1,234,384	$1,269,175	$1,304,988	$1,341,851
Costs											
70% Customer Split	($237,702)	($381,954)	($460,058)	($444,081)	($444,126)	($457,184)	($490,272)	($518,441)	($533,053)	($548,095)	($563,578)
80% Customer Split	($181,106)	($291,012)	($350,521)	($338,348)	($338,382)	($348,331)	($373,540)	($395,003)	($406,136)	($417,596)	($429,392)
Total Costs	($418,809)	($672,966)	($810,579)	($782,429)	($782,508)	($805,515)	($863,812)	($913,444)	($939,189)	($965,691)	($992,970)
Net Benefit to GMP Customers	**$148,635**	**$238,836**	**$287,675**	**$277,684**	**$277,712**	**$285,878**	**$306,567**	**$324,182**	**$333,319**	**$342,724**	**$352,405**
										NPV	**$2,175,313**

Table 2

Efficiency Vermont and REV Non-Conflict and Collaboration Certification

GMP has discussed the scope and objectives of the Pilot with Efficiency Vermont and confirmed that the Pilot does not conflict with their work. GMP has also shared this Pilot with REV, and has gained valuable insight into how to structure the Pilot to make it a success for all involved.

Status Updates

GMP will provide status updates to the Commission regarding the Pilot's progress on a six-month basis until the Pilot expires in 18 months. In the event GMP decides to terminate the Pilot prior to the passage of 18 months, it will provide prompt notice to the Commission and the Department.

Success will be measured in multiple parts:

a. Pace of program subscription indicating a value stream that is sufficient to drive adoption;
b. Whether the Aggregator model creates a valuable transaction both for GMP and the customer to achieve the MWs desired and drives diverse offerings in the VT energy marketplace;
c. Once aggregated, system performance during peak events will indicate that systems outside of GMP control can prove to be valuable grid assets. This will also indicate which hardware solutions show promise for use in the market;
d. Demonstrate successful partnerships with third-parties that provides value to mutual customers as well as the rest of GMP customers; and
e. Determining and defining other values the Aggregator can derive from these systems – work to identify at least one or two other values whether they are local or regional.

GMP appreciates the attention of the Commission and stakeholders to this Pilot filing. If you have any questions, please contact me at 802-747-6818.

Sincerely,

Craig Ferreira
Innovation Development

Enclosure
cc: Dan Burke, Esq., Vermont Department of Public Service
Rebecca Foster, Efficiency Vermont
Olivia Campbell Anderson, Renewable Energy Vermont

Craig Ferreira
Innovation Development
Craig.Ferreira@GreenMountainPower.com
Direct Dial Number: (802) 353.5659

Electronic and Hand Delivery

Holly Anderson, Clerk
Public Utility Commission
112 State Street #4
Montpelier, VT 05620

Re: GMP Innovative Pilot: Span

Dear Ms. Anderson:

This letter is to provide notice of Green Mountain Power's Span Smart Panel Innovative Pilot (the "Pilot"). Green Mountain Power plans to start offering customers the opportunity to participate in the Pilot after May 6, 2021.

Executive Summary

GMP is continuing to create a more dynamic, accessible and choreographed grid. Over the past several years, we have worked with customers to deploy numerous distributed energy resources ('DERs') ranging from water heater controls to Level 2 electric vehicle (EV) Smart Chargers and energy storage among a few. These devices help to lower cost and carbon and boost reliability for customers, with the benefits proven through our pilots and programs. As we continue to innovate on behalf of our customers, GMP is always looking for hardware, software and services that can deliver solutions to improve reliability, reduce carbon and reduce cost for all. As more devices in the home gain the ability to help with load management, creating a central gateway, or access point, will help to reduce the number of one-by-one integrations needed, providing greater ease and flexibility for both our customers and GMP. The first point of electrical connection, beyond the meter, into the home is typically the customer's main electrical panel. This key piece of electric infrastructure has often been overlooked when it comes to adding intelligence to the smart home. By adding connectivity to the customer's main electric panel, customers will be able to monitor, control, and even more easily integrate devices such as storage and solar in the future as well as be the central communications gateway to other intelligent devices in the home such as smart car chargers and water heater controls.

The Pilot will work with a small set of customers to provide and install the Span Smart Panel ("Span panel") at no cost to the customer, and then test load management and metering capabilities, as well as integrating the Span panel with distributed resources like storage, EV chargers, and solar panels. Customers will benefit from information garnered by circuit-level data that will empower them to make smart energy choices in the home, while GMP and all customers will benefit by having additional resources available for grid needs, as well as by learning about how this new technology can be successfully leveraged in the utility space. As described in our recently-concluded Resilient Home pilot that tested an alternative metering option using energy storage system data, GMP believes it is beneficial to continue testing alternative devices that could serve as the next-generation metering solution for customers.

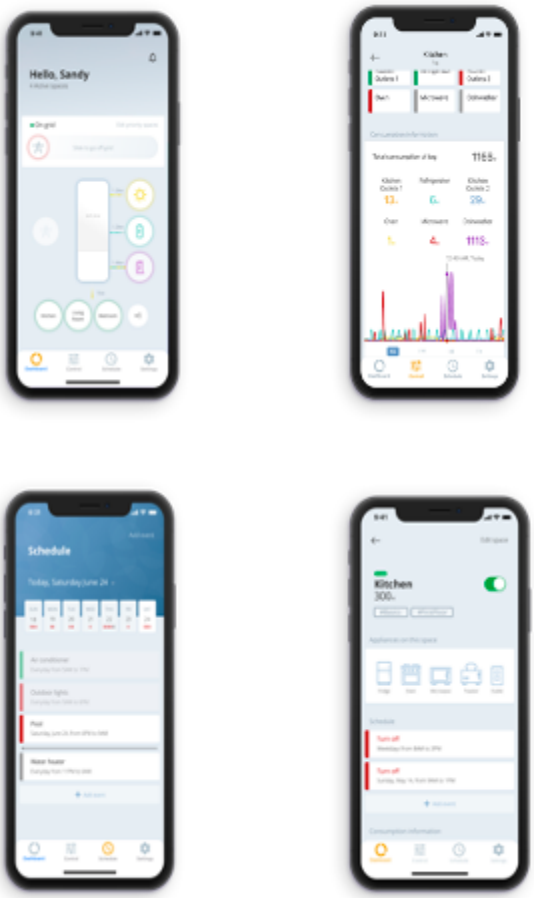
The Span panel provides all the safety features of a standard electrical panel with added functionality for the homeowner and GMP. The Span panel integrates various types of devices that GMP has deployed in partnership with customers over the past several years, such as energy storage, water heaters, heat pumps and EV Chargers. Importantly, the Span panel also allows for whole-home metering and load management by individual circuit in the home. For example, in the event of an outage where the home is running on a backup battery, a customer would be able to remotely disconnect certain circuits in the home extending the duration of the backup. This can even be automated to provide the longest duration of backup possible for the customer.

What is the Span Panel and Why this Pilot

GMP has been watching the smart electric panel space for years including conversations with various companies starting up in this space. Span is the first one to have developed and UL certified a fully integrated panel with controls, monitoring, metering and the ability to expand to include other devices such as storage and solar. With full UL listing for a 200 amp electrical panel, a service entrance and an energy management device, Span has created a full replacement of the traditional electrical panel that allows for the combination of both circuit level data as well as the ability to manage each individual load, which has been largely separated by available devices that strive to accomplish one or the other. With growing deployments of rooftop solar, energy storage, and EVSEs at the residential level, GMP wants to explore how this system can improve upon the installation process, as well as the user experience, of these resources. With the Span app, customers are empowered and can interact with, monitor and control their home energy usage all with their smartphone. It provides

customers greater visibility into the home's energy consumption, from anywhere, at any time. It provides the capability of scheduling, control, and alerts so that customers know exactly what is going on in their homes at all times at the individual circuit level.

Testing a whole home approach will also potentially help GMP and our customers participate more easily in new markets that utilize load managed devices as they emerge, to help lower costs and carbon. In 2020, the Federal Regulatory Energy Commission ("FERC") issued Ferc Order 2222 which essentially opens the Wholesale Energy markets managed by the various Independent System Operators to DERs. This means that more and more resources will be able to participate in these markets and will require a greater level of monitoring, control and metering to assure system stability, reliability and safety while producing as much value for customers as possible. Having a central gateway type device like this panel that can monitor every circuit as well as communicate with various devices would greatly simplify that work.



This same intelligence through the smart panel allows for more Distributed Energy Resource ("DER") interaction directly with GMP. It provides a central point of communication that will allow for management of multiple devices within a home, without needing a separate communication channel with each distributed asset. With this type of intelligent load panel, GMP can work with customers to make any electrical load in the home a smart DER, driving down cost and carbon in a simple effective way.

The Span panel also provides an opportunity to simplify the installation of solar and energy storage by reducing the number of components needed during installation and will be an important type of configuration to understand.

When energy storage is installed in conjunction with the Span panel, customers will be able to maximize the backup duration during an outage utilizing the panel controls. The Span panel allows for intelligent switching of loads. In grid-outages, customers have the ability to seamlessly prioritize loads within the home, specify priorities for backup, and even create backup profiles that can be toggled to ensure the longevity of backup power from their installed system. For example, a customer could automatically curtail EV charging during a grid outage event in order to preserve the energy stored in the home battery for other purposes. Now, customers who wish to optimize the usage of battery storage during an outage have to take a more manual or more-planned approach; with the Span, they would have dynamic and flexible control based upon their needs at the time and the expected duration of the event.

GMP is aiming to test a variety of use cases with the Span panel. As described in further detail below, GMP will work with enrolled customers to review data, manage various loads and devices within each home, as well as determine if the Span panel can enable voluntary demand response actions or the installation of devices that customers may not have otherwise chosen. Additionally, GMP will work with installers to confirm that the installation of the Span panel is simple and feasible as a new alternative to a main electrical panel, and how it interacts with energy storage and/or a solar array. We will also test the metering functionality, in line with our previous testing to use alternative methods to meter the home energy consumption and other metrics such as power quality information compared to the AMI metering system.

Pilot Details

GMP will seek 100 residential customers who want to have the Span panel installed in their home at no cost to them, in exchange for collaborating with GMP on the objectives of the PIlot. GMP will own the panel and customers will not be required to make any payments to participate in this program. We chose to have the Pilot be for 100 customers because it allows for a large enough sample size to capture the cross section of customer segments we are interested in learning about, as well as providing for additional subsets that we may not currently have in mind. 100 customers will provide ample opportunity to achieve the pilot objectives while staying within a reasonable cost for testing this new technology.

Traditionally, the meter is the line between a utility and customers. We follow that model today: GMP owns the meter at our customer's home, and equipment beyond the meter is typically owned by our customer. This Pilot will help us explore whether, in this new era of electrification to combat climate change and distributed devices that are capable of load management, a Span panel should set a new line, where GMP provides the electrical panel as the main entrance point for electricity into the home to provide for a variety of potential opportunities in billing and load management to help cut costs and carbon, and improve reliability.

In this Pilot, GMP will purchase 100 Span panels from Span directly, and provide them to participating local installers to place them in participating customer homes. We will seek a variety of residential customer segments that will include customers in need of a main panel upgrade, existing and new solar installs, and existing and new battery installs. Additionally, GMP will be allocating a minimum of 30% of the systems for customers qualified for our Energy Assistance Program to ensure equity in participation.

In order to be sure that we get a good sample size for each customer segment, GMP will make direct outreach efforts to the following customer segments. GMP will do customer intake and assign spots in the program based on qualifications and customer segment needs. This does not necessarily mean that customers will be given spots on a first come, first served basis. For any segments that GMP cannot make direct outreach for, such as the New Solar Only group, GMP will rely on the installation partners to refer qualified customers into the program.

Customer Segment*	**Description**	**Minimum # of Customers**
Existing Solar Only Retrofit	Customers with a pre-existing solar array, but no energy storage. Span will be added to the existing setup.	10
New Solar Only Installations	Customers without energy storage, but adding a solar array. Span panel will be installed at time of solar array installation	10
Existing Energy Storage Only Retrofit	Customers with pre-existing energy storage, but no solar array installed. GMP Powerwall and BYOD customers are eligible.	10
New Energy Storage Only Installations	Customers with no solar or energy storage. Span panel will be installed at the time of installation of energy storage.	10
Solar + Storage (existing or new)	Customers with an existing or new combination of solar plus energy storage.	10
EV Customers	Customers with an electric vehicle and a Level 2 charging station. These customers may also fall into any of the above categories.	10
Span Only	Customers that do not have any solar, storage, or EVSE installed	10
Electric Water Heater	Customers with an electric resistance water heater. Customers may fall into this category as well as any others	50
Heat Pump Customers	Customers with mini-split heat pumps. Customers may fall into this category as well as any others.	10
EAP Qualified Customers	Customers may fall into this category as well as any of the above.	30

*Due to the small pilot nature of the program and installation requirements of the panels, all customers must be in single family homes; experience will teach us whether installations at multi-family homes, mobile homes, and other buildings will be possible.

The panel is compatible with three major manufacturers[1] of circuit breakers, and therefore should not be a limiting factor for customer participation, however we have built in some costs for replacement breakers for 15% of the participants.

System Installation and Pilot Mechanics

Span will certify local licensed electrical contractors to perform the installation of the total system. By doing so, GMP will again be partnering with Vermont installers to provide this program and service to customers in a collaborative way. GMP will purchase the equipment directly from Span, and will subcontract the installation component to any certified installer participants.

Becoming a Span certified installers will involve three main components.

1. Sign the Span Certified Installer Agreement;
2. Attend a 1.5 hour webinar about installing the Span system which occurs weekly
3. Pass an online test regarding proper installation

Once certified, installers will each be allocated an initial 10 customer installations, and thereafter we'll allocate remaining customers based upon how many installers become certified. Ultimately, the number of customers each installer will be allocated will be dependent on the number of participating installers.

GMP has included installation costs for a standard install that is defined by a straight-forward swap out of the existing panel with no additional work needed on the electrical situation of the Customer's home. If there is additional work needed, the customer may still participate, but will be responsible for any additional costs specified by the installer.

Each participating installer will be required to provide feedback about each specific type of installation to gain a clear understanding of the benefits or complexities of using the Span panel.

Participating customers will execute an agreement with GMP that will allow for data access, management of certain loads within the home, such as an electric water heater, and to relieve the customer from bearing responsibility for repairing the panel should any issues arise. As GMP will maintain ownership of the panel, the agreement will extend the panel's 10-year warranty to the customer and allow for GMP and its partners to physically access the panel if needed.

[1] SquareD HOM (including Homeline plug-on neutral style), Eaton BR, Siemens QP / Murray MP

Customers will also agree to share their experience with GMP regarding the installation process and the actual user experience of the Span panel itself. We will accomplish this through traditional surveys that will allow us to aggregate data to ensure quality installation partners, but also to understand if and how the Span panel works for the participating customers.

Demand Response

The Span panel allows for direct management of loads within the home, as well as increased ease of customers to respond voluntarily to peak event notifications by switching off loads with the smart phone app. GMP will aim to ensure that at least 50% of the customers who participate also have an electric resistance water heater that will provide a familiar asset for testing the ability of the panel to provide effective direct control of loads. The ability for customers to switch each circuit back on with the Span app provides opt out capabilities for the customer during any peak event.

Additionally, Span provides an opportunity for voluntary demand response from participating customers, by notifying them of a peak event with a request to use the Span app to manage their loads during the peak event window. GMP will be able to monitor how much, if any, action is taken during the event windows. To date our customers have wanted a more simple and hands-off management approach, but testing voluntary demand response again with customers receiving the request to lower usage in a new way with Span will help determine if customer demand response is a tactic worth deploying further.

To that end, GMP will send electronic notifications of peak events requesting that customers voluntarily reduce their energy consumption for a period of time, typically three to five hours. The Span data will confirm if customers have taken any action, and provide the data necessary to determine effectiveness of this portion of the program.

GMP assumes that customers will be able to reduce an average of 1kW during peak events, which has been factored into the overall financials of the Pilot.

Metering

GMP recently concluded the Resilient Home Pilot, which used energy storage systems as a source of metering instead of the traditional meter. The Span panel provides an opportunity to test an additional device for this same purpose. Not only does the Span panel provide whole-house consumption data, it also provides highly granular, circuit-by-circuit consumption data that can

potentially be used for future billing cases. For example, electric vehicles could be billed at a separate rate from a plugged load consumption without needing a specific GMP compatible charger. GMP will compare all Span panel data to that of the onsite AMI meter to determine the level of accuracy and ability to be potentially used as a viable alternative to the traditional utility meter. This data may prove useful in determining the level of viability for segmented billing, such as varied rates for flexible end uses like heating and cooling, or an enhanced water heating rate, as an example.

Data

GMP will also look at data points such as voltage, frequency, and power quality. This set of data may prove to be another tool for GMP to benefit customers by increasing the reliability of the grid by being proactive when circumstances require it.

Summary of Projected Costs and Revenues

This pilot will put our customers on the leading edge of technological advances in the utility space, partnering with GMP to learn what is, or isn't, possible with a smart electrical panel. Our installer partners will help us understand how having a Span panel installed interacts with the installation of solar and energy storage, two resources that continue to grow in GMP territory. And, as these types of resources, as well as Level 2 electric vehicle charging stations and heat pumps proliferate, we will be able to determine if adding a Smart panel can reduce customer costs in the long run by avoiding service upgrades in favor of allowing the Span panel to intelligently manage the total load of the home by switching and curtailing individual circuits to avoid over-taxing the system.

Including installation, each system will cost $4,800-$4,900 depending on whether or not new breakers and a surface mount are needed (see Appendix A). This translates to approximately $500,000 of capital costs for 100 installations in the first year of the pilot, which we strongly believe is justified by the innovation this Pilot will support, as described above. GMP will own the Span panels with no cost to the customer, which will be covered by the included 10-year warranty. There are no regular expected ongoing expenses associated with this Pilot, however, it is possible that customers will need to have the panel removed and replaced due to potential equipment failure or desire to opt-out of the program. Any equipment failures will be covered by the warranty and allow for replacement of the system or a refund on the system. If the customer wishes to continue in the Pilot, the panel will simply be replaced, but if the customer chooses at this point to opt out of the program, GMP will request a refund from Span and use this money to replace the system with a traditional electrical panel. In the case where a customer simply

chooses to opt out of the program, the customer can simply shut down the communications of the panel and it will continue to operate as a traditional electrical panel. However, GMP has built in some additional costs for replacing the Span panel with a traditional panel should that be necessary. We would expect that no more than 5% of customers to opt-out of the program, needing a replacement panel. These costs are included in the table below.

The Span panel is designed to last well beyond the 10-year warranty, being designed to last for 25 years. As such, GMP has not included any costs for panel replacements at the end of the Pilot.

The Pilot is also expected to bring in some demand response value. GMP will learn how we can interact with a single point of entry into home devices, rather than linking to the various resources within the home that may all need a dedicated control device otherwise. For now, the following model uses an assumed 1kW of demand reduction for voluntary demand response events, and .35kW for water heaters (with 50% of customers having an electric tank that will be managed), GMP anticipates a power supply value of over $150,000 (NPV) over ten years, reducing the overall impact of the Pilot.

Year	1	2	3	4	5	6	7	8	9	10	11	
Costs												**Lifetime NPV**
Equipment & Installation Costs	($93,632)	($88,218)	($82,647)	($77,790)	($73,485)	($69,344)	($65,203)	($61,239)	($57,934)	($55,010)	$0	($553,629)
Total Costs	**($93,632)**	**($88,218)**	**($82,647)**	**($77,790)**	**($73,485)**	**($69,344)**	**($65,203)**	**($61,239)**	**($57,934)**	**($55,010)**	**$0**	($553,629)
Revenues												
Power Supply Value	$10,345	$16,289	$17,703	$17,274	$20,433	$21,989	$22,593	$23,215	$23,854	$24,512	$25,190	**$156,195**
Total Revenue	**$10,345**	**$16,289**	**$17,703**	**$17,274**	**$20,433**	**$21,989**	**$22,593**	**$23,215**	**$23,854**	**$24,512**	**$25,190**	**$156,195**
Net Benefit	**($83,286)**	**($71,928)**	**($64,945)**	**($60,516)**	**($53,052)**	**($47,355)**	**($42,610)**	**($38,024)**	**($34,080)**	**($30,498)**	**$25,190**	**($397,434)**

This Pilot Advances State Goals

The 2016 Vermont Clean Energy Plan ("CEP") states,

> "Distributed energy resources and communications capabilities are still evolving, but the path is relatively clear. Distributed energy resources such as solar and wind, combined with distributed storage, flexible loads (such as electric vehicles and controllable devices), and a centrally managed platform, offer great potential for improving the grid's performance. The central question is: How do regulators, system operators, and electric distribution utilities need to evolve the system to remove barriers, enable the distributed grid to emerge, and motivate the DUs to function as a cooperating partner in facilitating these changes?"

This Pilot will aim to discover how this emerging technology can help improve the performance of the electric grid. With granular data and management to provide a high level of flexibility, this Pilot could show that entire homes can become distributed resources that allow for faster,

easier, and higher levels of integration of the renewable resources demanded under the State's and GMP's own goals.

Efficiency Vermont Non-Conflict and EVT/REV Collaboration Certification

GMP shared a draft of this Pilot with EVT, REV and the DPS on March 19, 2021, and appreciates the input and feedback to improve upon the pilot's structure.

Objectives and Evaluation

There are a number or objectives for this Pilot as described above. Appendix B synthesizes these into one location and describes how each will be measured or evaluated.

Status Updates

GMP proposes to provide status updates to the Board regarding the Pilot's progress on a six-month basis until the Pilot expires in 18 months. In the event GMP decides to terminate the Pilot prior to the passage of 18 months, it will provide prompt notice to the Board, the Department, Efficiency Vermont and Renewable Energy Vermont. If you should have any questions, please contact me at 802-747-6818.

Sincerely,

Craig Ferreira
Innovation Development

cc: Daniel Burke, Vermont Department of Public Service
Rebecca Foster, Efficiency Vermont
Olivia Campbell Andersen, Renewable Energy Vermont

Appendix A

Assumptions	
Number of Customers	100
Cost per unit	$3,520
Install per unit	$1,200
Shipping (per 20 panels)	$1,775
Replacement Panel (200 amp)	$300
# customers opting out	5%
Replacement panel install	$1,000
New Breakers	$595
Customers needing new breakers	15%
Surface Mount Bracket	$52
Customers needing mount bracket	20%

Capital Costs	
Equipment Costs	$352,000
Shipping costs	$8,875
Installation Costs	$120,000
Replacement Breakers	$8,925
Surface Mount Brackets	$1,040
Total Capital Costs	**$490,840**

Additional Costs	
Replacement Panels	$1,500
Replacement panel Install	$5,000
Total Additional Costs	**$6,500**

Total Pilot Costs	**$497,340**

Appendix B

Objective	Measurement/Evaluation Method	Metrics for Success
Determine how well Span integrates with energy storage and solar from both the customer and installer perspectives.	GMP will be able to determine if the data from energy storage and solar is sufficient through availability of data. Customer and installer surveys will provide insight into their perspectives	• Does GMP receive accurate data from a PV system? • Does GMP receive accurate data from an energy storage system? • Do customers respond positively to their experience with the Span in conjunction with their systems? • Do installers respond positively to their experience with the integration of the Span and DERs generally?
Quality of metering data.	GMP will perform the comparison between Span data and GMP AMI data in-house	• Does the monthly data from the Span system remain within 4% of the GMP AMI data?
Compare DER installations between traditional electric panel and Span to determine if it provides simplicity and/or efficiency and cost savings.	Installer Survey	• Do installers provide positive feedback about the installation process?
Determine customer engagement with Span features	Customer Survey and app data	• Do customers use the features in the Span app? • Do customers provide positive feedback about their experience

		and use of the Span system?
Determine if the Span panel can help avoid service upgrades	Simulate smaller service using Span system, and verify using Span backend data	• Can we successfully show that home amperage can be maintained below a simulated threshold without issue?
Determine demand response capabilities	Data verification	• Do the DR events scheduled with Span happen at the scheduled time? • Do the end devices respond to the DR events? • Do customers opt-out?

OFFICE OF CLIMATE CHANGE, SUSTAINABILITY AND RESILIENCY
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR • HONOLULU, HAWAIʻI 96813
PHONE: (808) 768-2277 • EMAIL: resilientoahu@honolulu.gov • INTERNET: www.resilientoahu.org

RICK BLANGIARDI
MAYOR

M ATTHEW GONSER, AICP, CFM
EXECUTIVE DIRECTOR &
CHIEF RESILIENCE OFFICER

July 11, 2022

SENT VIA E-MAIL: joel.wasson@hawaiianelectric.com

Mr. Joel Wasson
Hawaiian Electric Company
Manager, Enterprise Project Management
AL19
PO Box 2750
Honolulu, Hawaii 96840

Dear Mr. Wasson:

Subject: HECO Data Analytics Clearinghouse

I am writing to express my support for Hawaiian Electric Company's (HECO) Data Analytics Clearinghouse Project (Data AC Project) and emphasize its importance for our work here at the City and County of Honolulu Office of Climate Change, Sustainability and Resiliency (CCSR).

The Data AC project has the potential to have a significant positive impact on our work here within CCSR. In support of City sustainability and climate action work, CCSR, through the Energy Program, has increased our use of data and recognizes the critical role that access to utility data plays in our work. The City's recently passed Better Buildings Benchmarking Program, which supports building owners in tracking energy and water use within their buildings, is an example of a City program that is intended to support better policy and program development through accurate and well-managed data.

It is our view that increased access to data is a key enabler to innovation on the grid, and essential to achieving our very ambitious statewide energy and climate action goals. By making energy data more available while protecting customer privacy, HECO enables participants across the market. With the need for much greater integration of buildings and vehicles on the grid comes a need for greatly increased collaboration across a broader set of stakeholders. Improved data access supports this need and enables improved innovation, policymaking, and projects across Oʻahu.

Our primary interest with this effort is to gain access to raw data as well as to be able to run database queries for exportable datasets. We believe that the first phase of this project should focus primarily on user access to data, with further improvements such as analytical applications or compute environments coming in later phases as demand from users becomes clearer.

We are also keen to help establish shared methods for identification of buildings across O‘ahu, which will be key to collaborating in a multi-stakeholder setting. We are available to participate in end-user testing, and to share the use-cases that may evolve in our office resulting from this new functionality. We encourage an extended and iterative development timeline to enable HECO to build the system out with the evolving needs of the users.

Our Office extends our full support for this important effort. Thank you in advance for your efforts in developing this project.

Sincerely,

Digitally signed by Gonser, Matthew
Date: 2022.07.11 17:13:19 -10'00'

Matthew Gonser
Executive Director and
Chief Resilience Officer

DAVID Y. IGE
GOVERNOR

JOSH GREEN
LIEUTENANT GOVERNOR

CATHERINE P. AWAKUNI COLÓN
DIRECTOR

DEAN NISHINA
EXECUTIVE DIRECTOR

STATE OF HAWAII
DIVISION OF CONSUMER ADVOCACY
DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS
335 MERCHANT STREET, ROOM 326
P.O. Box 541
HONOLULU, HAWAII 96809
Phone Number: 586-2800
Fax Number: 586-2780
cca.hawaii.gov/dca/

August 23, 2022

Mr. Joel Wasson
Manager, Enterprise Project Management
Hawaiian Electric Company, Inc.
AL19
P.O. Box 2750
Honolulu, Hawaii 96840

Re: Docket No. 2018-0088: In the Matter of the Public Utilities Commission Instituting a Proceeding to Investigate Performance Based Regulation – Notice of Intent Regarding Proposed Data Analytics Clearinghouse Pilot.

Dear Mr. Wasson:

Thank you for inviting the Division of Consumer Advocacy ("Consumer Advocate") to provide this letter of general support regarding the Hawaiian Electric Companies'[1] Data Analytics Clearinghouse Pilot ("Pilot") proposal.

The Consumer Advocate believes that the ability to access anonymized, aggregated, customer-level usage data would provide valuable opportunities for analyses and research in several areas, including but not limited to helping to inform public policy decisions. Examples of potential uses for the data that were previously identified by the Consumer Advocate include 1) the use of data aggregated by island for integrated resource planning and load research; 2) the use of data aggregated by substation/circuit/section to assist in distribution planning, the assessment of non-wires alternatives, distributed energy resource placement, interconnection analyses, or microgrid feasibility analyses; and 3) the use of data aggregated by certain customer subsets to inform demand-side management program research and cost-effectiveness

[1] The "Hawaiian Electric Companies" or "Companies" include Hawaiian Electric Company, Inc., Maui Electric Company, Limited, and Hawaii Electric Light Company, Inc.

testing.[2] Access to anonymized customer-level usage data would also be instrumental to assessing the expected impacts of time-varying rate design, and would help to inform the design of distributed generation and electrification of transportation programs, in addition to helping assess and verify the impacts of such programs on participants and ratepayers. When combined with data regarding customer demographics, this data could also help to inform energy equity issues and help to assess the impacts of the programs or policies designed to address them.

The Consumer Advocate has been working with the Hawaiian Electric Companies to access the customer usage data available as a result of the ongoing advanced meter deployment, and believes that the proposed Pilot can provide value to the extent that it will put in place certain foundational capabilities to process, aggregate, and produce reports and/or visualizations of the advanced meter data. As this letter is being provided in advance of the filing of the Notice of Intent ("NOI") regarding the proposed Pilot, the Consumer Advocate notes that it reserves its right to provide additional comments regarding the NOI after it has been filed. Should the Commission approve the proposed Pilot, the Consumer Advocate will continue to work with the Companies to provide feedback regarding the value of the Pilot, including regarding key features, data aggregations, and general usability.

Sincerely yours,

Dean Nishina
Executive Director

DN:tz

[2] Division of Consumer Advocacy Statement of Position on Data Privacy and Access, filed on January 21, 2020, in Docket No. 2018-0141, at 9.

July 29, 2022

The Honorable Chairman and Members
State of Hawai'i Public Utilities Commission
465 South King Street, Room 103
Kekuanaoa Building
Honolulu, HI 96813

Re: Letter of support for Hawaiian Electric's "Data Analytics Clearinghouse" Innovation Pilot Framework Proposal

Honorable Chairman and Members of the Commission:

With the increase in collaborative efforts between Hawaiian Electric and Hawai'i Energy, we recognize the significance of the exchange of data to support Hawai'i Energy's program implementation. Therefore, we support the utility's Data Analytics Clearinghouse Innovation Pilot Framework Proposal.

Hawai'i Energy can provide in-kind support to help jointly develop use cases for customer targeting. We see great value in the Data Analytics Clearinghouse project capabilities to provide:

- On-demand fulfillment of external data requests for the City & County of Honolulu's Building Benchmarking program (recently passed as Bill 22)
- Cloud computing/big data processing capacity outside of Hawai'i Energy's current capabilities
- Analytical applications for customer targeting and analysis of customer characteristics
- Additional raw and processed datasets including census data, health-related datasets, PV generation, EV load profiles, and circuit capacity constraints

We look forward to a collaborative process where we support the development of the Data Analytics Clearinghouse.

Respectfully submitted,

Caroline Carl

Caroline Carl, Executive Director
Hawai'i Energy (Public Benefits Fee Administrator)

DAVID Y. IGE
GOVERNOR

SCOTT J. GLENN
CHIEF ENERGY OFFICER

HAWAII STATE ENERGY OFFICE
STATE OF HAWAII

235 South Beretania Street, 5th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-3807
Fax: (808) 586-2536
Web: energy.hawaii.gov

August 8, 2022

Mr. Joel Wasson
Hawaiian Electric Company
AL 19, P.O. Box 2750
Honolulu, Hawai‘i 96840

Dear Mr. Wasson,

I am writing to express Hawai‘i State Energy Office’s (HSEO) support for greater transparency and access to energy data for stakeholders and consumers. HSEO reserves the right to comment on HECO’s “Data Analytics Clearinghouse” once we have reviewed the application since greater access to energy data is in line with HSEO statutory roles.

Hawai‘i Revised Statues (HRS) §196-72 (d) identifies a number of the duties of the Chief Energy Officer of HSEO that are supported by increased access to energy data. HRS §196-72 (d) (5) requires HSEO to collaborate with stakeholders to develop tools to encourage private and public exploration, research, and development of energy resources, distributed energy resources, and data analytics that will support the State's energy and decarbonization goals. HRS §196-72 (d) (13) identifies HSEO to act as the State's energy data clearinghouse by identifying, collecting, compiling, analyzing, and publishing energy and clean transportation data and analyses. The utility is a significant source of data and greater transparency, and having access supports HSEO’s statutory roles.

Analyses necessary to develop strategies and pathways for Hawai‘i to achieve a net-negative carbon economy as soon as practicable but no later than 2045 need to be ground in data. HRS §196-72 (d) (9) directs HSEO to develop and maintain a comprehensive and systematic quantitative and qualitative capacity to analyze the status of energy resources, systems, and markets, both in-state and in other states and countries, particularly in relation to the State's economy, and to recommend, develop proposals for, and assess the effectiveness of policy and regulatory decisions, and energy emergency planning. HRS §196-72 (d) (13) goes on to state that HSEO advocate for the State's energy and decarbonization goals at relevant venues and departments to ensure that State energy policies and regulations align with the state strategic goals and are data driven. HSEO’s role to provide analysis to inform policies is predicated on access to data.

HSEO looks forward to reviewing and commenting on HECO's application for a "Data Analytics Clearinghouse". Advancing transparency and access to energy data is a building block on which Hawai'i can identify strategies to help achieve our decarbonization goals.

Sincerely,

Scott J. Glenn

Scott J. Glenn

College of Social Sciences
University of Hawai'i Economic Research Organization

July 26, 2022

Joel Wasson
Hawaiian Electric Company
AL19 PO Box 2750
Honolulu, HI 96840

Dear Mr. Wasson,

I am writing as the Executive Director of the University of Hawaii Economic Research Organization (UHERO) to express our support of the "Data Analytics Clearinghouse," being developed by Hawaiian Electric.

Over the past several decades, UHERO researchers have collaborated with various units at Hawaiian Electric on a wide variety of projects. Some of these projects have involved data sharing agreements, enabling UHERO researchers to build on Hawaiian Electric's data to produce policy-relevant and academic deliverables that inform stakeholder discussions about the State's clean energy future.

UHERO is committed to providing rigorous data analytics, to assess the current electricity use and payments by customer groups; and the efficiency and billing impacts of alternative rate design. A number of UHERO research fellows, including Michael Roberts, Mathias Fripp, and Nori Tarui, have expressed interest in providing theoretical, computational, and statistical input for these purposes. They are prepared to work with Hawaiian Electric analysts to provide feedback on the overall data clearinghouse design and on user-definable queries to create exportable datasets, visualization of static and dynamic data. They are also proposing to combine Hawaiian Electric's data with other data—such as water bill, housing value, census data and other geospatial attributes—to provide energy policy insights that would be otherwise unavailable. Such projects would involve University of Hawaii students, providing them with valuable hands-on experience in data analytics.

By engaging with Hawaiian Electric during the development of the Data Analytics Clearinghouse, and through the independent, rigorous publicly available research UHERO is known for, this collaboration will inform decision making focusing on the impact of energy policy in Hawaii.

Sincerely,

Carl Bonham Digitally signed by Carl Bonham Date: 2022.07.26 13:13:09 -10'00'

Carl Bonham
Executive Director, UHERO

2424 Maile Way, Saunders 540
Honolulu, Hawai'i 96822
Telephone: (808) 956-2325
Fax: (808) 956-4347

Alignment with State Energy Goals and Commission Orders

The Data Analytics Clearinghouse Pilot ("Clearinghouse Pilot" or "Pilot") objectives align with State energy goals and Commission orders by enabling efficient access to critical and voluminous data, and data sharing capabilities, which can lead to more informed policy decisions. The following sections focus on how the proposed Pilot aligns with State energy efficiency efforts, the Grid Modernization Phase 1 docket, the Performance-Based Regulation ("PBR") docket, and the Innovation Pilot Framework ("IPF") Workplan.[1, 2]

A. Alignment with State Energy Efficiency and Public Outreach Efforts

In its response to a collaboration survey dated March 2022, Hawaii Energy described the usefulness of the Clearinghouse to State energy efficiency efforts. In response to the survey, Hawaii Energy indicated that Clearinghouse data would be useful for customer targeting, load profile analysis, program impact evaluation, and the analysis of customer characteristics, targeting, impact evaluation, and forecasting.

Similarly, in response to the Companies' request for a letter of support, Hawaii Energy stated that:

> *With the increase in collaborative efforts between Hawaiian Electric and Hawai'i Energy, we recognize the significance of the exchange of data to support Hawai'i Energy's program implementation. Therefore, we support the utility's Data Analytics Clearinghouse Innovation Pilot Framework Proposal.*

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[1] Hawaiian Electric Companies' Innovation Pilot Framework Workplan, filed November 12, 2021, in Docket No. 2018-0088.

[2] Decision & Order No. 37507 (at 173-174) states that the Notice shall address "Areas of potential overlap with other existing project(s)/program(s) and, if so, how such overlap will be addressed by the pilot project." Although the Pilot objectives align with existing energy efficiency efforts, the Grid Modernization Phase 1 docket, and the PBR docket, the proposed Pilot is a distinct initiative that is separate from and additive to existing projects or programs. The aim of the proposed Pilot is to provide improved access to data and tools that will better enable stakeholders to advance on broader State energy goals.

Hawai'i Energy can provide in-kind support to help jointly develop use cases for customer targeting. We see great value in the Data Analytics Clearinghouse project capabilities to provide:

- *On-demand fulfillment of external data requests for the City & County of Honolulu's Building Benchmarking program (recently passed as Bill 22)*
- *Cloud computing/big data processing capacity outside of Hawai'i Energy's current capabilities*
- *Analytical applications for customer targeting and analysis of customer characteristics*
- *Additional raw and processed datasets including census data, health-related datasets, PV generation, EV load profiles, and circuit capacity constraints*[3]

Consistent with Hawaii Energy's response to the survey, its letter of support, and the Companies' proposed Pilot, the Clearinghouse will enable more efficient access to voluminous data, including Advanced Metering Infrastructure ("AMI") data, and data in an enhanced format such as AMI datasets in multiple aggregation and time-period resolutions,[4] and thereby improve the usefulness of the data for analysis. The Clearinghouse also will be able to be used to provide metadata driven groupings such as program participation for Hawaii Energy for initial review/discovery of load shapes.

Regarding public outreach, the ability to provide descriptive features (i.e., metadata) within the Clearinghouse can be used to help identify segments of customers, including low-to-moderate income ("LMI") customers using aggregating identifiers such as Census Track, that allows the use of demographic data readily available from the U.S. Census Bureau. These location and demographic identifiers can be used to focus planning and outreach efforts in areas of need, and the new AMI provided load profile data could be used to assess the total market size for the targeted design or communication of energy efficiency program opportunities such as

[3] Exhibit B at 5.

[4] An example of datasets in multiple aggregation and time periods are to have one set that presents 15-minute averages (the aggregation period interval) per day for a month (time period), and another that contains hourly demand averages (the aggregation period interval) representing each of the 8,760 hours for a year (time-period).

demand control programs, that may include incentives for or education about technologies such as timers, smart or connected appliances, and the application of battery energy storage.

The Clearinghouse can be also used to collaborate with public agencies to develop tables with location site descriptors such as Shopping Center, Hotel, Apartment, School, Warehouse, etc., and the use of county data such as Tax Map Keys to identify property types, can be used to aggregate anonymized data into meaningful site-type segments to gain insight on typical patterns of energy use, and complement benchmarking programs such as the Better Buildings Benchmarking Program the City and County of Honolulu will be implementing. The recently passed Better Buildings Benchmarking Program, which supports building owners in tracking energy and water use within their buildings, is an example of a city program that is intended to support better policy and program development through accurate and well-managed data.[5]

B. Alignment with Grid Modernization Phase 1 (Docket No. 2018-0141)

The Clearinghouse Pilot provides the fundamental environment where the use of Grid Modernization AMI meter data can be made available and utilized for analytical purposes by external parties. The proposed Pilot aligns with Order No. 37146, which requires the Companies to provide Hawaii Energy all data from advanced meters under the same terms they provide Hawaii Energy data from traditional meters, as well as finds that it is in the public interest for public entities to have ready access to aggregated, anonymized, customer electricity usage data.[6]

While the Companies have made AMI data available to Hawaii Energy and public entities, the Companies have received feedback on the challenges of downloading, processing, and effectively utilizing large amounts of data for analysis. This problem will only be

[5] *See* Exhibit B at 1.
[6] Order No. 37146 at 16.

exacerbated as more AMI meters are installed. The Clearinghouse Pilot will mitigate these issues and help enable Hawaii Energy and public agencies to develop insights and better-informed programs that provide benefits to all customers and the State.

C. Alignment with PBR Proceeding (Docket No. 2018-0088)

The Clearinghouse Pilot aligns to PBR guiding principles, focused on: a) a customer centric approach; b) helping realize administrative efficiency; and c) assisting to ensure financial integrity through informed policy decisions.[7] The Pilot will serve current public agency needs and growing demand from Pilot Participants[8] for efficient access to information and analytics capabilities, and may lead to serving broader stakeholder interests. The Pilot project will lead to better informed decision-making for the people and businesses in Hawaii. Improved information and collaboration will also improve the ability to advance State energy goals, including decarbonization, increased renewable energy utilization, more resilience, and improved energy security.

Additionally, in alignment with the IPF Workplan as a guiding document, this pilot fits directly within the Data Sharing, Access, and Analytics Area of Collaboration ("AOC"). As stated in the IPF Workplan description "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

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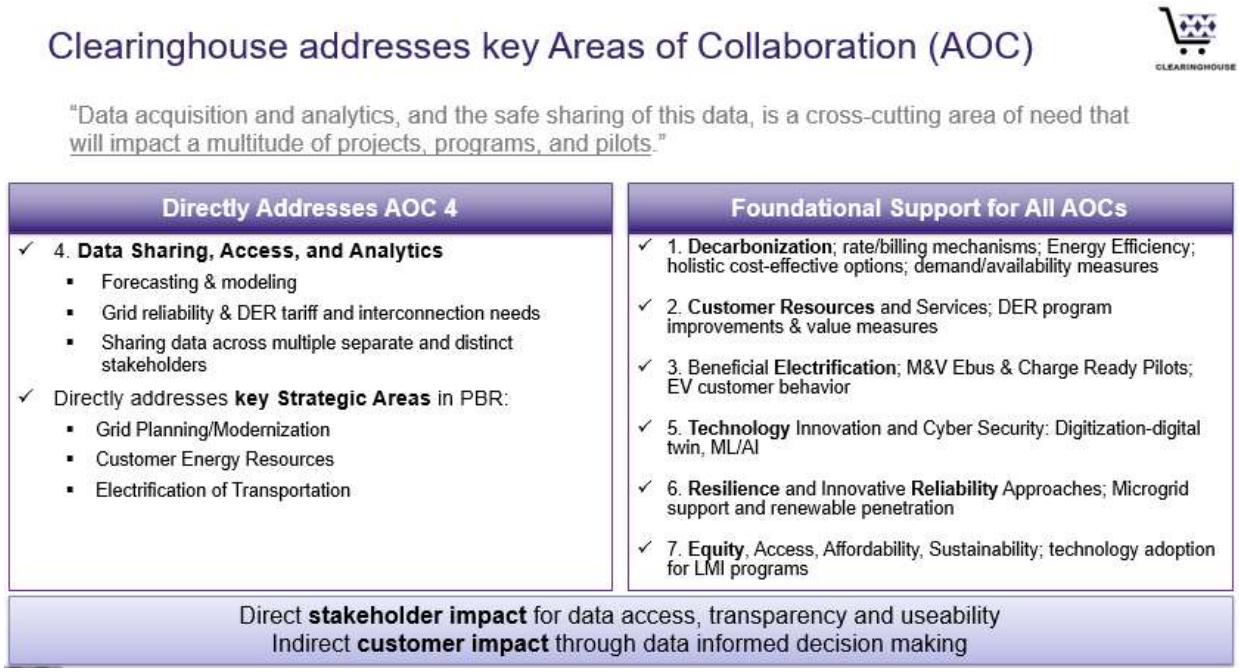
[7] *See* Decision and Order No. 36326, issued on May 23, 2019, in Docket No. 2018-0088, at 6.

[8] Division of Consumer Advocacy of the Department of Commerce and Consumer Affairs ("Consumer Advocate"), the county sustainability and resiliency offices (Honolulu, Maui, Hawai'i), Hawaii Energy, the University of Hawaii through Hawaii Natural Energy Institute ("HNEI") and the University of Hawai'i Economic Research Organization ("UHERO"), and the Hawaii State Energy Office ("HSEO") (collectively, the "Participants").

foster better planning, solution identification, product and services design, more informed decision making, and better stakeholder collaboration."[9] This platform to ingest, store, process, analyze, and report data is expected to be beneficial to future pilot projects.

The Clearinghouse could also potentially support customer equity, access, and affordability through the use of segmentation data, that allows a better understanding of customers' energy use characteristics through the identification of common and unique patterns, that could inform the design of programs that provide system operational benefits and customer choice.

More generally, the Clearinghouse is intended to provide foundational support for projects across all AOCs by building a tool that can be used to design and support data and analytics requirements for other pilot projects (see figure below).



[9] *See* IPF Workplan (Attachment 1 at 6).

Sample Data Enablement and Usage

Examples of analyses that can be enabled by and performed by the Clearinghouse include: detailed usage patterns within rate schedules, site-type load patterns, EV charging patterns, PV program load profile changes and trends, voltage change/trend analysis, time-of-day usage reviews, energy efficiency project impacts, and weather and price change correlations. Another enablement would be providing better access to extensive and voluminous data on demand.

A detailed example includes time-period resolution options as one area where precalculated datasets can provide value to speed analysis and overcome limited storage and computational capacity. Figure 1 shows the various time periods that will be considered for inclusion in the Clearinghouse.

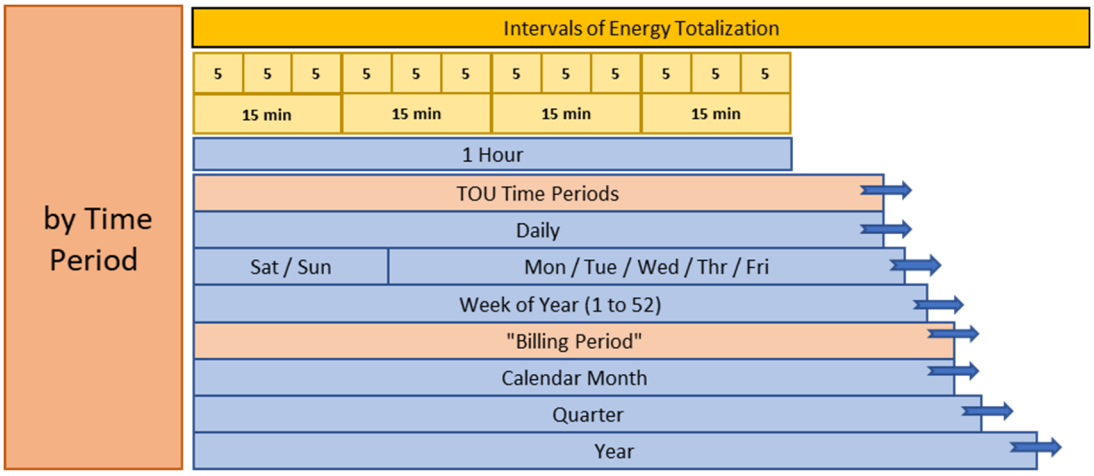


Figure 1. Time period resolution options.

Metadata that is attached to individual energy use records is an important aspect of data analytics as it allows data to be classified, sorted, aggregated into like groups, and quantified, and is essential to enabling data analysis and machine learning. Figure 2 shows various metadata that are utilized in the analysis of energy data and can be provided through the Clearinghouse.

The Clearinghouse effort will follow the Companies' standard governance practices to protect customers' personally identifiable information and other confidential data according to the Companies' privacy policies, as applicable.[1]

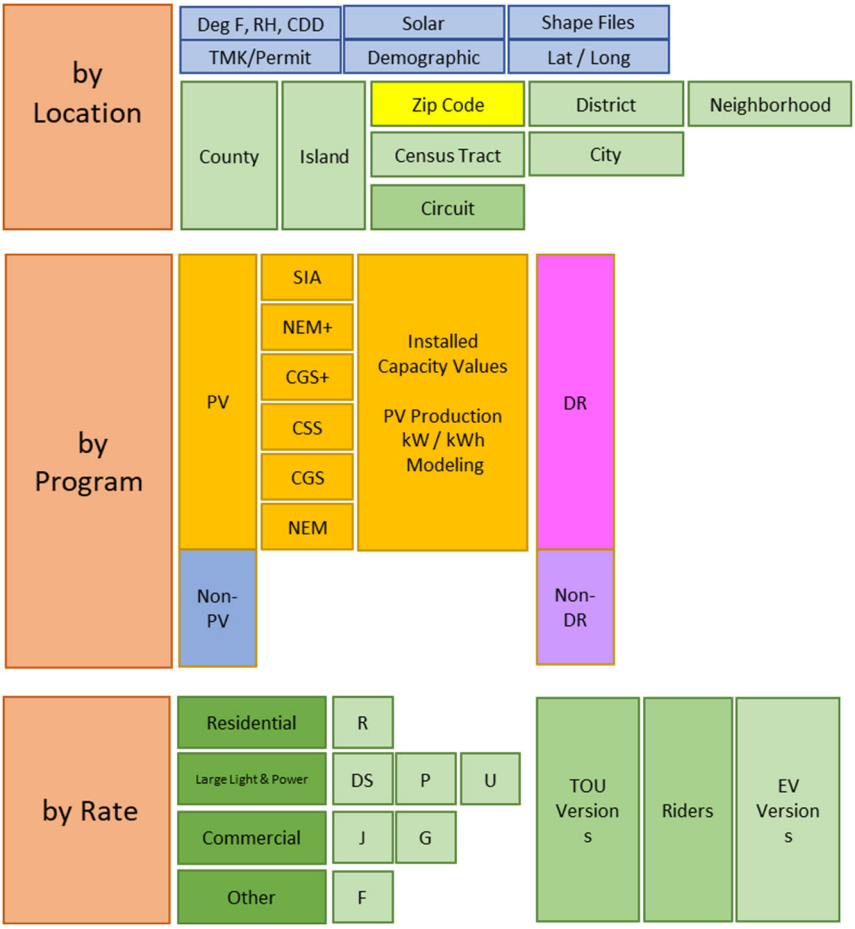


Figure 2. Metadata (also referred to as "labels") can be categorized and utilized to analyze data across numerous dimensions by location, program, and rate.

[1] *See e.g.,* https://www.hawaiianelectric.com/privacy-notice/customer-information-privacy-policy.

Figure 3 shows examples of metadata labels organized by segment, for example, by public versus private segments and by commercial versus residential segments.

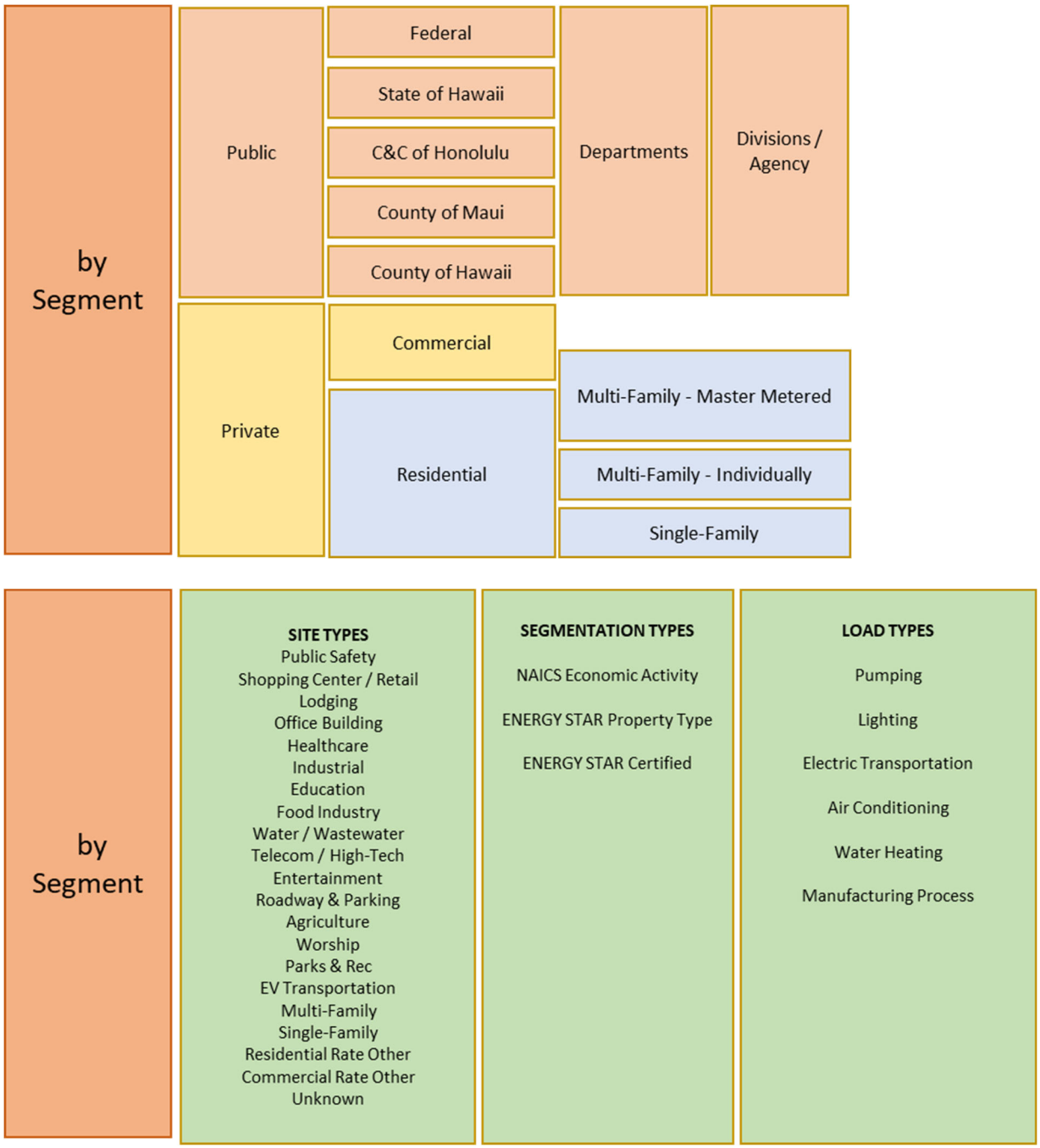


Figure 3. Metadata labels organized by different segments. Examples shown are based on conversations with Pilot Participants.

The Clearinghouse will allow the progressively increasing set of raw data being collected by Advanced Metering Infrastructure meters to be tied with metadata (descriptive data) and then segmented and cross-cut for utilization in developing informative analysis that achieve the desired program development, evaluation, public policy and resulting societal outcomes that the high resolution energy use data can provide.

Pilot Eligibility Requirements

The following sections discuss how the proposed Data Analytics Clearinghouse Pilot ("Clearinghouse Pilot" or "Pilot") meets the eligibility requirements set forth in Decision and Order No. 37507 ("D&O 37507") or how these requirements are not applicable.[1]

A. Products or Services Beyond the Sale of Basic Electric Service and Alignment with Established Regulatory Goals

D&O 37507 states that pilot projects should "[i]nvolve products or services beyond the sale of basic electric service and align with an established regulatory goal, such as those established within the PBR Framework."[2]

The Clearinghouse Pilot will involve a series of Minimum Viable Product ("MVP")[3] releases and set of data and analytic services that are beyond the sale of basic electric service, and the provision of these products and services align with multiple goals as discussed in Section V of the Notice of Intent ("Notice") and in Exhibit C "Alignment with State Energy Goals and Commission Orders."

B. Funding from Alternative Resources

D&O 37507 states that pilot projects should "[s]eek to leverage funding from alternative sources, e.g., grants or third-party investments, to minimize impacts to customers."[4]

The Companies will negotiate cost savings through cost sharing with TEKsystems Global Services, LLC ("TEKsystems") for the outside services expenses for this Pilot. See Section C,

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[1] *See* D&O 37507 at 170-171.
[2] *Id.*
[3] MVPs are products (e.g., a software application, website, etc.) with sufficient functionality to test and validate a product idea during a product development cycle.
[4] D&O 37507 at 170-171.

below, for more detail. The Companies are also not proposing to recover internal labor and associated overhead expenses for this Pilot.

C. Cost Sharing and Hawaii-Based Vendors

D&O 37507 states that pilot projects should "[i]ncorporate a requirement for pilots involving non-local vendors and larger sole-sourced vendors (i.e., vendors with more than 100 employees) to participate in cost-sharing for the pilot (e.g., in-kind contributions, such as engineering or project management support)," and "[i]ncorporate preference for pilot partnerships with Hawaii-based vendors (e.g., contracting for services and/or technologies from local businesses)."[5]

The Companies have engaged TEKsystems for system integration and consulting services to support the implementation and ongoing maintenance of the Enterprise Data Analytics Platform ("EDAP"), initially evaluating several technologies as a pilot effort and ultimately leveraging Azure Data Lake Storage and Databricks service for analytics in a production version in 2022. TEKsystems has provided initial support for the Clearinghouse concept development and will provide the primary support and development throughout this Pilot effort in conjunction with support for the core EDAP.[6] In the initial Request for Proposal process to review the EDAP, four top candidates were evaluated with representation across the Companies, with TEKsystems selected as the highest-ranked bidder based on value provided for the budgeted cost.

TEKsystems has demonstrated willingness to invest in the partnership with the Companies in the development and early pilot initiatives of the EDAP. This has been

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[5] *Id.*

[6] The TEKsystems costs directly associated with the Clearinghouse Pilot will be tracked separately from the core EDAP support costs.

accomplished through commitment to quality and difficult-to-source skilled resources, continuous improvement in delivery, maintaining a knowledge base of the Companies, and bringing forward senior thought leadership to support the strategic growth and maturity of company data and analytics capabilities aligned to the Companies' strategic objectives. Prior engagements with TEKsystems included negotiations for cost sharing resulting in direct hourly discounts on rates and select resources available at no cost. As part of the development of the Statement of Work ("SOW") for this Pilot engagement, a similar cost sharing mechanism will be negotiated with TEKsystems.

With offices in Honolulu, TEKsystems has supported the Companies with local representation of account management, staff augmentation, contract to hire, and talent placements. TEKsystems was selected for the proposed Clearinghouse work based on their expertise in supporting the EDAP and for market competitive rates representing best value for least cost. In parallel with issuing this Notice, a SOW will be drafted to initiate the Pilot project as soon as practical and execute upon Commission approval of the Notice.

D. Estimated Net Present Value and Other Metrics

D&O 37507 states that pilot projects should "[p]rovide estimates of Net Present Value ("NPV") with considerations such as new sources of revenue, cost savings over a defined time period, or other metrics such as a reduction in GHG and contributions to State policy goals via reduction in imported fossil fuels."[7]

While the Companies have identified the Pilot costs to implement the Clearinghouse enhancements and make the platform and its capabilities accessible to Pilot Participants,[8] the

[7] D&O 37507 at 170-171.
[8] The Division of Consumer Advocacy of the Department of Commerce and Consumer Affairs ("Consumer Advocate"), the county sustainability and resiliency offices (Honolulu, Maui, Hawai'i), Hawaii Energy, the

Companies are not assessing user fees and generating revenues, and the cost savings and customer benefits, while anticipated to be realized over the longer term, are not quantifiable at this time. Since the benefits are not quantifiable, there is no current value in estimating NPV. Similarly, while the Pilot is intended to help advance the State toward renewable energy, greenhouse gas reduction, and State policy goals, these benefits are qualitative at this time and not measurable. The Companies discuss the expected outcomes of the Pilot and their proposed success criteria in Section IX of the Notice.

E. Access to Data

D&O 37507 states that pilot projects should "[p]rovide the Commission, Consumer Advocate, and key stakeholders with reasonable access to data (e.g., to assess key performance metrics)."[9]

The Pilot will enable Pilot Participants, including the Consumer Advocate, with access to data directly through Clearinghouse services. In addition to the annual Pilot Update required by D&O 37507,[10] the Companies propose the reporting measures described in Section IX of the Notice.

F. Participant Surveys and Progress Against Success Criteria

D&O 37507 states that pilot projects should "[i]ncorporate participant customer surveys or measurement and verification evaluation to measure progress against program success criteria and metrics."[11]

University of Hawaii through Hawaii Natural Energy Institute ("HNEI") and the University of Hawai'i Economic Research Organization ("UHERO"), and the Hawaii State Energy Office ("HSEO") (collectively, the "Participants").

[9] D&O 37507 at 170-171.

[10] *Id.* at 175.

[11] *Id.* at 170-171.

The Companies plan to issue Participant surveys, incorporate feedback, and report on the overall progress of the Pilot. See the Companies' proposed reporting measures in Section IX of the Notice.

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF HAWAI‘I

In the Matter of PUBLIC UTILITIES COMMISSION Instituting a Proceeding Relating to an Innovative Pilot Process for the Hawaiian Electric Companies.	DOCKET NO. 2022-0212

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing document, together with this Certificate of Service, were duly served on the following party, by electronic mail service as set forth below:

Dean Nishina
Executive Director
Division of Consumer Advocacy
Department of Commerce and Consumer Affairs
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DATED: Honolulu, Hawai‘i, October 26, 2022.

/s/ Kyle Kawata
Kyle Kawata
HAWAIIAN ELECTRIC COMPANY, INC.