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February 7, 2017

Advice 5015-E
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

Subject: **Request for Approval of New Electric Program Investment Charge (EPIC) Projects between Triennial EPIC Applications**

Purpose

In compliance with Ordering Paragraph (OP) 1 of California Public Utilities Commission (CPUC or Commission) Decision (D.) 15-09-005, Pacific Gas and Electric Company (PG&E) seeks Commission approval of six new EPIC projects between triennial EPIC applications.

Background

Rulemaking (R.) 11-10-003 was instituted to address funding and program issues related to utility research, development, and demonstration projects. D.11-12-035, in Phase 1 of R.11-10-003, established the EPIC Program to fund public interest investments in applied research and development, technology demonstration and deployment, and market facilitation of clean energy technologies and approaches for the benefit of electricity customers of PG&E, San Diego Gas & Electric Company (SDG&E), and Southern California Edison Company (SCE).

The Commission conducts a public proceeding every three years (known as the triennial review) to consider EPIC investment plans for clean energy technologies and approaches, pursuant to a schedule set in D.12-05-037. That Decision directed the California Energy Commission (CEC) and the three IOUs, as Administrators of the program, to present their investment plans for the triennial program periods for joint consideration by the Commission. The CEC's investment plan included Strategic Objectives made up of Strategic Initiatives, and the IOUs' investment plans included projects under four Investment Areas.

D.13-11-025 capped the collection of EPIC funds at $162 million annually and approved the first triennial investment plans for the collection years 2012-2014. D.15-04-020 approved 2015-2017 EPIC budgets. D.15-09-005 authorized EPIC Administrators to file

Tier 3 advice letters (or equivalent business letters for the CEC) to request approval of new EPIC projects between triennial funding cycles.

Request

PG&E requests CPUC approval of the following six new EPIC projects for its EPIC 2 triennial plan – amounting to an estimated total of $7.9M - $9.6M out of PG&E's previously approved 2015-2017 EPIC triennial budget of $51,080,000:

1. Aggregated Behind-The-Meter Storage Market / Retail Optimization
   This project will demonstrate how aggregated behind-the-meter energy storage systems that are operated by a third party dispatcher may address wholesale market needs, while also operating as a customer resource to reduce customers' retail electric bills.
2. Service Issue Identification Leveraging Momentary Outage Information
   Demonstrate approach to proactively identify potential service issue problems related to locations with frequent momentary outages, which may be caused by imminent failures of conductors, insulators, transformers and/or vegetation contact.
3. Predictive Risk Identification with Radio Frequency (RF) Added to Line Sensors
   Demonstrate approach to integrate real-time radio frequency (RF) monitoring technologies into Line Sensor devices to potentially improve outage prediction and identify areas for grid reliability improvement.
4. Call Center Staffing Optimization
   Create and demonstrate an algorithm to optimize call center staffing to better match call volumes (including for major events) through predictive modeling, incorporating data from historical volumes correlated with data such as general news, PG&E announcements, regulatory proceedings, rate schedule seasons, weather information, restoration times, and/or other data sources.
5. Electric Load Management for Ridesharing Electrification
   Understand and demonstrate grid impacts from Electric Vehicle (EV) charging used for ridesharing fleet applications and assess the ability to manage the resulting electric load using active demand management.
6. Dynamic Rate Design Tool
   Develop and demonstrate new analytical solutions and modeling to bring increased flexibility and speed to designing more dynamic rates while understanding the impact on customer bills, as well as better understanding of potential customer load changes as a result of different rates.

Further project detail can be found in Attachment A, which includes a description of the technology or strategy to be demonstrated, the concern, gap, or problem to be addressed, the potential benefits at full deployment, and the project-specific reason each proposed project should be considered immediately.

In compliance with OP 3 of D.15-09-005 and as presented in Attachment A, PG&E confirms the following:

a. Each project is within the scope of EPIC investment areas approved for funding in PG&E's EPIC 2 triennial plan, including: Renewables and Distributed Energy Resource (DER) Integration, Grid Modernization and Optimization, Customer Service and Enablement, and Cross-Cutting / Foundational Strategies and Technologies (as identified in Attachment A);
b. The funding for the new proposed projects does not cause the overall EPIC funding to exceed the total funds authorized in the applicable and effective EPIC triennial plan;
c. This advice letter (as shown in Attachment A) contains at least the same level of detailed description and support for the projects as the Commission has approved for other projects included in the applicable and effective EPIC triennial plan;
d. The new projects do not result in any adverse expected changes in funding for other approved projects;
e. This proposal should be considered immediately and not simply included in the next cycle for EPIC funding consideration by the Commission for the key overall reasons noted below:
    - New research and development priorities as well as technological / market advances have developed since filing the EPIC 2 Investment Plan on May 1, 2014.
    - Waiting until the approval of the Third Triennial Investment Plan will delay the ability to use the knowledge and/or benefits gained from these high-potential proposed projects, including areas where future potential EPIC 3 proposed projects can build on these learnings.
    - Sufficient funding to cover all projects proposed here remains available in the EPIC 2 investment plan after internal prioritization of the approved EPIC 2 investment plan[1].
f. All other requirements applicable to EPIC projects under PG&E's EPIC 2 triennial plan continue to apply to the new projects.

Protests

Anyone wishing to protest this filing may do so by letter sent via U.S. mail, facsimile or E-mail, no later than February 27, 2017, which is 20 days after the date of this filing. Protests must be submitted to:

CPUC Energy Division
ED Tariff Unit

[1] Per CPUC Staff request, PG&E has included a list of EPIC 2 Projects approved in D.15-04-020 which are currently on hold as of the date of this Advice Letter (Attachment B).

505 Van Ness Avenue, 4th Floor
San Francisco, California 94102

Facsimile: (415) 703-2200
E-mail: EDTariffUnit@cpuc.ca.gov

Copies of protests also should be mailed to the attention of the Director, Energy Division, Room 4004, at the address shown above.

The protest shall also be sent to PG&E via either E-mail or U.S. mail (and by facsimile, if possible) at the address shown below on the same date it is mailed or delivered to the Commission:

Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
Pacific Gas and Electric Company
77 Beale Street, Mail Code B10C
P.O. Box 770000
San Francisco, California 94177

Facsimile: (415) 973-1448
E-mail: PGETariffs@pge.com

Any person (including individuals, groups, or organizations) may protest or respond to an advice letter (General Order 96-B, Section 7.4). The protest shall contain the following information: specification of the advice letter protested; grounds for the protest; supporting factual information or legal argument; name, telephone number, postal address, and (where appropriate) e-mail address of the protestant; and statement that the protest was sent to the utility no later than the day on which the protest was submitted to the reviewing Industry Division (General Order 96-B, Section 3.11).

Effective Date

PG&E requests an expedited review process, such that this Tier 3 advice filing becomes effective upon Commission approval within 30 days of receipt. D.15-09-005[2] concluded that an expedited approval process for new EPIC projects is reasonable, as long as due process rights (including full Commission review) are provided.

[2] Pages 14-15

Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically and via U.S. mail to parties shown on the attached list and the parties on the service list for A.14-05-003. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter filings can also be accessed electronically at: www.pge.com/tariffs.

/S/
Erik Jacobson
Director, Regulatory Relations

Attachments

cc: Service List A.14-05-003
Maria Sotero, Energy Division

CALIFORNIA PUBLIC UTILITIES COMMISSION

ADVICE LETTER FILING SUMMARY
ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No. **Pacific Gas and Electric Company (ID U39 E)**

Utility type:	Contact Person: Kingsley Cheng
☑ ELC ☐ GAS	Phone #: (415) 973-5265
☐ PLC ☐ HEAT ☐ WATER	E-mail: k2c0@pge.com and PGETariffs@pge.com

EXPLANATION OF UTILITY TYPE

ELC = Electric GAS = Gas
PLC = Pipeline HEAT = Heat WATER = Water

(Date Filed/ Received Stamp by CPUC)

Advice Letter (AL) #: **5015-E** **Tier: 3**

Subject of AL: **Request for Approval of New Electric Program Investment Charge (EPIC) Projects between Triennial EPIC Applications**

Keywords (choose from CPUC listing): Compliance

AL filing type: ☐ Monthly ☐ Quarterly ☐ Annual ☑ One-Time ☐ Other _____

If AL filed in compliance with a Commission order, indicate relevant Decision/Resolution #: D.15-09-005

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL: _____

Is AL requesting confidential treatment? If so, what information is the utility seeking confidential treatment for: No

Confidential information will be made available to those who have executed a nondisclosure agreement: N/A

Name(s) and contact information of the person(s) who will provide the nondisclosure agreement and access to the confidential information: _____

Resolution Required? ☑Yes ☐No

Requested effective date: **Upon Commission Approval** No. of tariff sheets: N/A

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed: N/A

Pending advice letters that revise the same tariff sheets: N/A

Protests, dispositions, and all other correspondence regarding this AL are due no later than 20 days after the date of this filing, unless otherwise authorized by the Commission, and shall be sent to:

California Public Utilities Commission
Energy Division
EDTariffUnit
505 Van Ness Ave., 4th Flr.
San Francisco, CA 94102
E-mail: EDTariffUnit@cpuc.ca.gov

Pacific Gas and Electric Company
Attn: Erik Jacobson
Director, Regulatory Relations
c/o Megan Lawson
77 Beale Street, Mail Code B10C
P.O. Box 770000
San Francisco, CA 94177
E-mail: PGETariffs@pge.com

Attachment A – Project Descriptions

Below are the new proposed project descriptions, including the description of the technology or strategy to be demonstrated, the concern, gap, or problem to be addressed, the potential benefits at full deployment, and the reason the proposed project should be considered immediately. Each project has been described with the same level of detailed description and support for the projects as the Commission has approved previously, with two additions: 1) the reasons the proposed project should be considered immediately; and 2) an estimated funding amount for each project.

Table 1 summarizes how each of the six new proposed projects align with the Investment Areas. The table organizes the projects by investment area and identifies the primary benefits that PG&E believes the projects may demonstrate to increase safety, promote greater reliability and/or improve affordability. Each of these planned projects has undergone initial benchmarking to avoid duplication. Additionally, each planned project has consulted and collaborated with stakeholders, including coordination with the EPIC Administrators and others in the Research, Development and Demonstration (RD&D) community. These efforts were conducted in order to leverage the benefits of similar projects and to maximize potentially complementary efforts.

Table 1. New Projects Proposed to PG&E's 2015-2017 EPIC Project Portfolio

New Projects Proposed to PG&E's 2015 -2017 EPIC Project Portfolio			
Investment Area: Renewables and DER Integration [Technology Demonstration & Deployment] Objectives in this category: • Integrate DER, Generation, and Energy Storage • Improve Transparency of Resource Information • Increase Generation Flexibility			
Project	**Safety**	**Reliability**	**Affordability**
31. Aggregated Behind-The-Meter Storage Market / Retail Optimization		✓	✓
32. Electric Load Management for Ridesharing Electrification		✓	✓
Investment Area: Grid Modernization and Optimization [Technology Demonstration & Deployment] Objectives in this category: • Optimize Existing Grid Assets • Prepare for Emerging Technologies • Design and Demonstrate Grid Operations of the Future			
Project	**Safety**	**Reliability**	**Affordability**
33. Service Issue Identification Leveraging Momentary Outage Information	✓	✓	✓
34. Predictive Risk Identification with Radio Frequency (RF) Added to Line Sensors	✓	✓	✓
Investment Area: Customer Service and Enablement [Technology Demonstration & Deployment] Objectives in this category: • Drive Customer Service Excellence by Leveraging PG&E's SmartMeter™ Platform • Drive Customer Service Excellence by Offering Greater Billing Flexibility • Integrate Demand Side Management for Grid Optimization			

Project	Safety	Reliability	Affordability
35. Call Center Staffing Optimization			✓
36. Dynamic Rate Design Tool			✓

Project Title: Aggregated Behind-The-Meter Storage Market / Retail Optimization
Project #: 2.31
Investment Area: Renewables and Distributed Energy Resources Integration
Estimated Funding: $2.25M - $2.75M

Description of Technology or Strategy to Be Demonstrated
This project will demonstrate how aggregated behind-the-meter energy storage systems that are operated by a third party dispatcher may address wholesale market needs, while also operating as a customer resource to reduce customers' retail electric bills[1]. In this proposed EPIC project, PG&E will evaluate the multi-use application of behind-the-meter energy storage by analyzing the tradeoffs a resource makes when dispatching to meet bids into the wholesale market, potentially utilizing meter data from energy storage systems, customer meter data and/or CAISO data. Additionally, PG&E will demonstrate to what extent the multi-use application of behind-the-meter energy storage provides value to both customers and the grid and potentially whether customer economic interests align with wholesale market price signals.

Applicable Electricity Value Chain Elements	
☒Grid Operations / Market Design	☐Distribution
☐Generation	☒Demand-side management
☐Transmission	

Concern, Gap, or Problem to Be Addressed
Third parties are currently installing behind-the-meter energy storage systems for customer retail bill management. These third parties work to reduce a customer's electric bill through peak shaving or energy arbitrage. They are responsible for charging

[1] In Decision 16-12-004 in the CPUC's energy storage rulemaking, the CPUC rejected a behind-the-meter storage project that it determined was not cost-effective, even though PG&E stated that the project provided a low-cost means to gain experience utilizing behind-the-meter energy storage to deliver resource adequacy. In rejecting the project, the CPUC agreed that there was value in gaining experience to support behind-the-meter storage, and that enabling multi-use storage applications, particularly as they relate to participation of behind-the-meter storage assets in the wholesale market, is one of the key issues being considered by the Commission. In urging rejection of the project, the Office of Ratepayer Advocates (ORA) argued that the "learning experiences" on behind-the-meter storage from the project were not sufficient justification to approve the project, asserting that such learning experiences should occur other than in the commercial storage program, such as instead in an EPIC demonstration project. Although PG&E disagrees that the storage project rejected in D.16-12-004 was not a commercial project and instead should only be approved as a demonstration project, nonetheless PG&E agrees with the CPUC and ORA that storage projects that provide learning experiences and useful data about multi-use applications of behind-the-meter storage can and should be encouraged, including under the EPIC program.

(drawing more energy) and discharging (load reduction) the energy storage unit based on their forecasts/data of a customer's energy usage. Currently, it is unclear how much value these resources can provide to the wholesale market, while simultaneously optimizing retail bill management. This project seeks to test the valuation of the multi-use application of behind-the-meter energy storage, particularly in how a resource responds to different price signals.

Potential Benefits at Full Deployment
Aggregated behind-the-meter storage market/retail optimization could potentially improve affordability by reducing energy procurement costs if the multi-use application of energy storage can provide sufficient efficiencies.

Reason Proposal Should Be Considered Immediately
The DER market is expanding rapidly with multi-use applications being a key part of enabling this expansion. The lessons learned from this project may inform future procurement decisions, and with these procurements happening in the near term[2], waiting an additional year will delay the ability to use the knowledge gained from this project on customers' behalf. In light of PG&E's prior competitive procurement of the similar storage project which would support this EPIC project, and to directly and expeditiously procure meaningful and useful data from a multi-use, behind-the-meter storage application, PG&E requests a waiver from the EPIC criteria for competitive procurement as appropriate, in order to support this project.

Project Title: Electric Load Management for Ridesharing Electrification
Project #: 2.32
Investment Area: Renewables and Distributed Energy Resources Integration
Estimated Funding: $1.125M - $1.375M

Description of Technology or Strategy to Be Demonstrated
This project seeks to evaluate grid impacts from Electric Vehicle (EV) charging used for ridesharing applications, and to assess the ability to manage the resulting load using active demand management. The project will explore the load shape for the developing use case of rideshare EVs that use Direct Charge Fast Charging (DCFC). Additionally, the project will demonstrate the extent to which load can be shaped through active demand management.

PG&E will work with project partners to develop load management strategies, which may include mock rates or programs, such as fixed pricing structures, variable pricing schemes with direct notification to drivers, reservation systems, and ride/route

[2] Decision Adopting Energy Storage Procurement Framework and Design Program (D.13-10-040) in R.10-12-007; Decision Addressing Competitive Solicitation Framework and Utility Regulatory Incentive Pilot (D.16-12-036) in R.14-10-003; Order Instituting Rulemaking Regarding Policies, Procedures and Rules for Development of Distribution Resources Plans Pursuant to Public Utilities Code Section 769 (R.14-08-013).

management to optimize timing and amount of charging. Depending on site specific conditions and cost feasibility, battery storage and solar photovoltaic (PV) may also be utilized to manage the overall load profile.

Applicable Electricity Value Chain Elements	
☒Grid Operations / market design	☒Distribution
☐Generation	☒Demand-side management
☐Transmission	

Concern, Gap, or Problem to Be Addressed

Currently, companies are exploring EVs for ridesharing applications and seeking fast charging opportunities that minimize operating cost and maximize utilization of the vehicles. It is currently estimated by the San Francisco Treasurer's Office that there are up to 45,000 rideshare drivers in San Francisco alone. Due to the high supply and demand of ride sharing in the San Francisco Bay Area this geography has high potential to be effective for this demonstration.

The load profile of this new EV charging use case has yet to be seen and could present both challenges and opportunities for the grid depending on the timing and flexibility of charging needs. It is important to understand the impacts of this new and potentially significant load, in order to develop new load management programs and/or rates that encourage optimal charging behavior. Additionally, new programs and/or rates may be able to lower the cost of fast charging. The commercial rates currently applied to DCFC deployments can result in high cost of electric fuel if operators have to recoup a monthly demand charge from a relatively few number of charging sessions, this is seen as a barrier to EV adoption for the growing rideshare market.

Compared to the pilots proposed in PG&E's SB 350 Transportation Electrification Application[3] and those underway under the iCharge Forward Pilot[4], this project addresses different use cases, customer types, vehicle types, and charging types. In the SB350 Application, PG&E proposed the following four demonstration projects, which are different in nature and scope from what is proposed to be explored in EPIC:

- Medium/Heavy Duty Fleet Customer Demonstration – Assists customers' operating a fleet of Medium/Heavy Duty vehicles (e.g. transit buses, short haul delivery, etc.) to deploy EVs in place of fossil fuel vehicles.
- Idle Reduction Technology Customer Demonstration – Assists customers' operating fleets to demonstrate idle reduction technologies (e.g. truck stop electrification, truck refrigeration units, etc.) for a customers' operating fleet instead of electric drive technologies

[3] PG&E Application A.17-01-022, PG&E Senate Bill 350 Transportation Electrification Application, in response to Assigned Commissioner's Ruling, R.13-11-007, September 14, 2016.
[4] iCharge Forward Pilot, D.12-04-045.

- Electric School Bus Renewables Integration Pilot - Work with a school district that is deploying electric school buses to test managed charging to consume electricity during peak renewables generation periods.
- Home Charger Information Resource Pilot - Pilot will develop a web-based information resource, enabling EV drivers to research residential charging equipment and search a database of certified electrical contractors who can perform safe installations of charging equipment.

Likewise, the iCharge Forward Pilot is also different in nature and scope from what is being proposed here as it focuses on a Residential, personal use focused use case. Each of these projects provides valuable learnings for this emerging industry and thus are valuable to move forward.

Potential Benefits at Full Deployment

If the rideshare industry utilized EVs, this electrification would help California meet its greenhouse gas emission goals, and could support PG&E reliability and affordability if this project is successful in developing active load management strategies that effectively shift rideshare EV charging to hours of lower generation cost or less grid stress.

Full deployment would involve utilizing the demonstration results about the profile and the ability to ultimately shift EV rideshare charging load to potentially develop new commercial EV rates, demand response programs, or other programs. Successful rates or programs would benefit PG&E customers by shifting Transportation Network Company (TNC) related EV charging load to the most optimal hours for the grid. Additionally, this project may help develop rate structures and incentives that result in lower overall costs to the rideshare drivers (if they charge at optimal times) thus helping TNCs make the business case to accelerate the use of EVs rather than conventional vehicles.

Reason Proposal Should Be Considered Immediately

Transportation Network Companies (TNC) have experienced incredible growth in recent years and have attained maturity in the Bay Area; however, the electrification of this transportation market option is nascent. At least one TNC in San Francisco is in the process of deploying a feasibility pilot with electric vehicles. If PG&E acts now, there is a unique opportunity to both support fuel switching that reduces GHG emissions, while also learning about the potential to manage this load type with ridesharing programs from the onset. If TNCs determine electrification is a benefit to them and their stakeholders, this EV load pattern use case could be quickly adopted in a shorter period of time. The lessons learned from this project may inform PG&E's load management decisions in the near term if electrification of TNCs progresses; therefore, waiting an additional year will delay the ability to use the knowledge gained in this pilot on behalf of California customers.

Project Title: Service Issue Identification Leveraging Momentary Outage Information
Project #: 2.33

Investment Area: Grid Modernization and Optimization
Estimated Funding: $660K - $815K

Description of Technology or Strategy to Be Demonstrated
This project seeks to leverage multiple sources of data, including but not limited to SmartMeter™, time of day, location and weather data, to proactively identify potential problems in the Electric Transmission and Distribution (T&D) system, specifically related to identifying locations with high incidences of momentary outages which may be caused by imminent failures of conductors, insulators, transformers and/or vegetation contact. This project will explore development of an algorithm to identify patterns to predict future outages, potentially by leveraging momentary outage and distress data from SmartMeter™ devices (e.g., last gasps), aggregated to the transformer level, and applying additional data attributes.

Applicable Electricity Value Chain Elements	
☒Grid Operations / market design	☒Distribution
☐Generation	☐Demand-side management
☐Transmission	

Concern, Gap, or Problem to Be Addressed
Equipment failure outages can occur at unpredictable times, often during peak loading or storm situations. These unplanned outages can result in ad hoc restoration work, potential safety issues, and longer outage duration. The current technology to address these types of outages is based largely on responding to a sustained outage. At that point it becomes a restoration event handled by a troubleman or maintenance and construction crew. This project addresses that current condition of waiting for actual failure to identify issues, by enabling the identification of potential sustained outages that could likely happen in the near future.

PG&E's original SmartMeter™ Application[5] provided functionality for PG&E to integrate more advanced, real-time sustained outage detection through the enablement of service point / meter specific outage notification (called SmartMeter™ "last gasp traps," which notify PG&E of an outage). PG&E has incorporated these real-time meter traps into its outage management tool to help identify the scale of sustained outages and potential restoration options. This proposed EPIC project seeks to build upon this outage detection functionality by using repeated sub-second momentary outage information with advanced data analytics to proactively identify potential future sustained outages in advance. This project may enable PG&E to derive additional value from the data made available from the SmartMeter™ investment, through proactive identification of issues prior to sustained outages.

[5] D.06-07-027, approving PG&E Application A.05-06-028, Application of Pacific Gas and Electric Company for Authority to Increase Revenue Requirements to Recover the Costs to Deploy An Advanced Metering Infrastructure.

Potential Benefits at Full Deployment
At full deployment, proactive identification of issues could potentially enable PG&E to more quickly respond to outages and/or schedule repair work in advance (improving customer reliability). Fewer customer outages could also potentially result in improved affordability and enhanced safety from reduced restoration work during storm season and peak loading conditions, and shifting from unplanned corrective work to planned maintenance work.

Reason Proposal Should Be Considered Immediately
Much of the foundation for this technology is now available (e.g., SmartMeter™ devices), making this an ideal time to explore this technology approach. By accelerating this project, the technology can be more quickly tested and then potentially implemented for improved customer experience, shorter outage times, and reduced costs to customers. Given the potential benefits, it is important that this project be pursued now to avoid unnecessary delay to the benefits for our customers if the technology is proven.

Project Title: Predictive Risk Identification with Radio Frequency (RF) Added to Line Sensors
Project #: 2.34
Investment Area: Grid Modernization and Optimization
Estimated Funding: $1.62M - $1.98M

Description of Technology or Strategy to Be Demonstrated
This project seeks to integrate radio frequency (RF) analysis into communicating "smart" line sensors and demonstrate the ability to use that Line Sensor platform to monitor the grid and possibly predict potential outages. The project will explore development of a smart line sensor capable of RF detection and analysis, potentially including demonstrating the technology in the field.

Applicable Electricity Value Chain Elements	
☒Grid Operations / market design	☒Distribution
☐Generation	☐Demand-side management
☐Transmission	

Concern, Gap, or Problem to Be Addressed
Currently, technology exists to use RF detection as a way to monitor instability and risk in the grid and to predict potential outages before they occur. However, this technology requires trucks or helicopters to patrol the feeders frequently, which is not cost effective at large scale. This project would seek to combine RF analysis technology with communicating "smart" line sensors to determine the potential to reduce the need for more costly patrolling with RF scanners. Additionally, by utilizing permanently installed RF smart line sensors, RF measurements could be taken on a regular basis, instead of just once or twice a year with current technology.

Potential Benefits at Full Deployment
At full deployment, this new technology could potentially enable affordability benefits, such as reduction in the operation and maintenance of patrolling and inspecting lines with RF scanners. Additionally, if the technology is proven capable to predict potential outages before they occur, full deployment could potentially result in improved affordability from shifting from unplanned corrective work to planned maintenance work. This technology would also seek to drive reliability benefits by identifying, and therefore potentially repairing equipment before an outage occurs, resulting in few customers experiencing unplanned outages.

Reason Proposal Should Be Considered Immediately
PG&E recently completed piloting Line Sensor technology as part of the Smart Grid Pilot Program, which was shown to help PG&E locate and address a fault more quickly, which ultimately shortens customer outage time.[6] One of the key recommendations from the pilot was to deploy the sensors on a larger scale, while also supporting the continued advancement of the line sensor technology to build upon reliability and affordability benefits. Following the pilot, multiple points of feedback were provided to the line sensor industry on additional potential enhancements to the technology, including the integration of additional grid monitoring and stability capabilities. By moving forward with this EPIC project now, the technology can be better shaped earlier in the interest of customers, building on the learnings from the Smart Grid Pilot Program in a way that increases the benefit from future smart Line Sensor deployments.

Project Title: Call Center Staffing Optimization
Project #: 2.35
Investment Area: Customer Service and Enablement
Estimated Funding: $655K - $810K

Description of Technology or Strategy to Be Demonstrated
This project seeks to further optimize call center staffing by developing a real-time algorithm that integrates with and improves upon existing call center staffing software to potentially predict variability in call volume impacts in near real-time. The project expects to develop a more granular understanding of factors impacting call volume, including utility-specific influences such as regulatory proceedings, rate schedule seasons, weather information, restoration times, and other associated events that may drive call volume. Based on that data, the project will explore development of a learning algorithm, which would leverage identified call volume factors to devise a more accurate staffing model and integrate with the existing staffing software. The model may then be demonstrated at a subset of call center locations as a field trial to explore assessing the improved accuracy of the call center staffing forecast curves.

[6] Advice 4990-E. PG&E Smart Grid Pilot Program Final Status Reports Pursuant to Decision 13-03-032

Applicable Electricity Value Chain Elements	
☒Grid Operations / market design	☐Distribution
☐Generation	☐Demand-side management
☐Transmission	

Concern, Gap, or Problem to Be Addressed
PG&E call center operations currently has an understanding of factors that impact volume based on leveraging traditional methods and data points; however, there is opportunity for improvement in predicting and validating the wide range of potential influences to call volume, particularly at a more granular level. This call center staffing optimization project could help address this improvement opportunity, identifying additional utility-specific factors impacting call volume and integrating them into a learning algorithm. Such improvements could potentially reduce the variability in expected versus planned call volume, which can impact cost and customer service levels.

Potential Benefits at Full Deployment
Optimizing call center staffing to better match call volumes focuses on affordability goals by improving call center operational efficiency, as well as customer experience. For instance, by improving the forecast of call volumes, PG&E may reduce instances of temporary overstaffing, ultimately saving operational expense. With 51 million minutes of call time spent annually by PG&E call centers, there is a significant opportunity to make operational efficiencies through this new learning algorithm.

Additionally, improving call volume forecasts may support improvement in customer service levels and customer satisfaction by helping to reduce instances of understaffing, which would ultimately shorten customer wait time and improve customer experience.

PG&E estimates that these improvements could potentially positively impact up to 1.4 million customers per year (based on number of distinct Person ID's in 2015 live agent call data).

Reason Proposal Should Be Considered Immediately:
This project will explore new data analytics improvements that have the potential to increase affordability for customers. The sooner the project starts, the sooner the potential benefits can be realized for the operational efficiencies expected to be gained. This is particularly timely given the upcoming rate reform changes. In 2019, most residential electric customers will be automatically enrolled in a Time-of-Use rate plan where the price of electricity will depend on the time of day[7]. These rate changes will likely impact call volume, though it is relatively unknown what specifically the impact will be at a granular level. An opportunity to begin on this proposed project as soon as possible would enable

[7] D.15-07-001, *Decision on Residential Rate Reform for PG&E, SCE, and SDG&E and Transition to Time-of-Use Rates* in Rulemaking (R.)12-06-013; CPUC General Rate Case Plan (Phase 2 General Rate Cases and Rate Design Window applications, generally.)

PG&E to potentially better understand the impacts of the rate reform pilots on call volume and thus improve the customer experience for the full roll out in 2019.

Project Title: Dynamic Rate Design Tool
Project #: 2.36
Investment Area: Customer Service and Enablement
Estimated Funding: $1.605M - $1.895M

Description of Technology or Strategy to Be Demonstrated
This project seeks to improve on current rate design tools by demonstrating an exponentially more dynamic rate design tool approach for modeling the customer bill and impact to utility revenue requirements from changes to rates, as well as impact from the inclusion of next generation billing determinants in tariff design and adoption of distributed energy resources. This project will explore how to potentially leverage advanced approaches that can be applied to the rate design process, potentially including distributed computing or parallel processing. Functionalities may include additions such as machine readable tariff tables (residential and non-residential), an expanded billing determinate generator, holistic bill calculator backend (for customer and revenue requirement impact), DER load impact simulator, sample usage database, user and summary interface, and other potential improvements to help enable future rate design.

The tool would have front end / user interface components, as well as back end / bill calculation components. The project seeks to obtain user input on the front end, while developing a standardized and machine readable rate table on the backend. This could include energy charges by hour, as well as demand charges and other billing determinants. As part of the project, a comparison of methods will be explored using qualitative and / or quantitative criteria to assess impact of the improvements developed. Example criteria may include speed to complete analysis, barriers to and ease of use (including technical ability/training required), ability to experiment and develop new billing determinants, ability to export and share results via visualizations in a timely and meaningful way, and/or other associated criteria.

The development of billing calculation capabilities for various audiences (Residential, Small and Medium Business (SMB), large Industrial, large Commercial, Agricultural, Transmission, etc.) may be explored based on the complexity of the underlying rates and size of the customers impacted.

Additionally, several systems may be considered for integration with the tool, such as publically available online resources to develop the previously mentioned machine readable rate schedule table, customer usage inputs, the number of or specific nodes and supporting systems, DER impact shapes (both generating and load) that have been developed for other efforts, including the IDER and DRP proceedings in order to ensure consistency.

This project may also seek to provide customer access to improve understanding of rate options and help customers understand usage and DER adoption impacts, which can be particularly timely given upcoming rate reform changes[8]. It is not only important for the utility to be able to model the impact of DERs at scale, but for customers to be able to do the same for themselves. Current tools often utilize average customer data and not a customer's own usage information. Further confounding customer utilization of existing tools is the fact that they are developed and promoted by the company trying to sell the DER. Creating an interactive tool where customers can gain an independent assessment of the true bill impact of changes to their usage and rate schedule may provide a valuable added customer service. Such a user interface would utilize the same backend calculations used in the en masse bill impact assessment automation process described above if proven successful.

Applicable Electricity Value Chain Elements	
☒Grid Operations / market design	☐Distribution
☐Generation	☒Demand-side management
☐Transmission	

Concern, Gap, or Problem to Be Addressed

As the penetration of DERs grows, there is opportunity to expand on rate design practices through added analytics process to better understand bill impact on the customer of potential new dynamic rate options. Current production grade models used for rate design and filing provide limited flexibility to experiment with more dynamic rate designs.

In order for the utilities and regulators to be prepared for the expected substantial growth in DER penetration, there is a need for the capability to effectively model the interaction between DER adoption and rates. This project may help improve that understanding, especially in relation to en masse bill impact assessment automation, enabled rate schedule experimentation, and DER adoption scenario impact modeling.

If proven successful, this project may enable more experimentation to help create valuable new options for our customers in this growing DER market.

Potential Benefits at Full Deployment

This project will seek to develop a dynamic tool that may potentially improve flexibility and speed in the rate design process. The solution may add extra capability to the rate design process, helping to experiment with and potentially even automate the development of new dynamic scenarios for rate considerations. Full deployment would

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D.15-07-001, *Decision on Residential Rate Reform for PG&E, SCE, and SDG&E and Transition to Time-of-Use Rates* in Rulemaking (R.)12-06-013; CPUC General Rate Case Plan (Phase 2 General Rate Cases and Rate Design Window applications, generally.)

yield a production ready solution that fulfills all rate design requirements, including data outputs for process and calculation transparency.

Reason Proposal Should Be Considered Immediately

The continued integration of DERs has prompted the need for broader reforms to how utilities recover costs. Accelerating the development of this tool provides the ability to explore the fundamentals of more dynamic rate design while DER adoption is still in a relatively early adopter phase. The need for the addition of locational net benefits or other currently non-existent billing determinants are on the rise and development of this tool ahead of this can help the commission and the utilities to be more proactive in the rates they offer the customer base.

Attachment B - EPIC 2 Projects Currently On Hold

Per CPUC Staff request, PG&E has included a list of EPIC 2 Projects approved in D.15-04-020 which are currently On Hold as of the date of this Advice Letter. Please note some of these projects may still become Active in line with PG&E's internal prioritization process.

2.01: Evaluate Storage on the Distribution Grid
2.06: Intelligent Universal Transformer (IUT)
2.08: "Smart" Monitoring and Analysis Tools
2.09: Distributed Series Impedance (DSI)
2.11: New Mobile Technology & Visualization Applications
2.12: New Emergency Management Mobile Applications
2.13: Digital Substation / Substation Automation
2.16: Enhanced Synchrophasor Analytics & Applications
2.17: Geomagnetic Disturbance (GMD) Evaluation
2.18: Optical Instrument Transformers and Sensors for Protection and Control Systems
2.20: Real-time Energy Usage Feedback to Customers
2.24: Appliance Level Bill Disaggregation for Non-residential Customers
2.25: Enhanced Smart Grid Communications
2.30: Leverage EPIC Funds to Participate in Industry-wide RD&D Programs

PG&E Gas and Electric
Advice Filing List
General Order 96-B, Section IV

AT&T
Albion Power Company
Alcantar & Kahl LLP
Anderson & Poole
Atlas ReFuel

BART
Barkovich & Yap, Inc.
Bartle Wells Associates
Braun Blaising McLaughlin & Smith, P.C.

Braun Blaising McLaughlin, P.C.
CENERGY POWER
CPUC
California Cotton Ginners & Growers Assn
California Energy Commission
California Public Utilities Commission

California State Association of Counties
Calpine
Casner, Steve
Center for Biological Diversity
City of Palo Alto

City of San Jose
Clean Power
Clean Power Research
Coast Economic Consulting
Commercial Energy
Cool Earth Solar, Inc.
County of Tehama - Department of Public Works

Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Defense Energy Support Center
Dept of General Services
Division of Ratepayer Advocates

Don Pickett & Associates, Inc.
Douglass & Liddell
Downey & Brand
Ellison Schneider & Harris LLP
Evaluation + Strategy for Social Innovation

G. A. Krause & Assoc.
GenOn Energy Inc.
GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz & Ritchie

Green Charge Networks
Green Power Institute
Hanna & Morton
ICF
International Power Technology
Intestate Gas Services, Inc.

Kelly Group
Ken Bohn Consulting
Leviton Manufacturing Co., Inc.
Linde
Los Angeles County Integrated Waste Management Task Force

Los Angeles Dept of Water & Power
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McKenna Long & Aldridge LLP
McKenzie & Associates
Modesto Irrigation District

Morgan Stanley
NLine Energy, Inc.
NRG Solar
Nexant, Inc.

ORA
Office of Ratepayer Advocates
Office of Ratepayer Advocates, Electricity Planning and Policy B

OnGrid Solar
Pacific Gas and Electric Company
Praxair
Regulatory & Cogeneration Service, Inc.
SCD Energy Solutions

SCE
SDG&E and SoCalGas
SPURR
San Francisco Water Power and Sewer

Seattle City Light
Sempra Energy (Socal Gas)
Sempra Utilities
SoCalGas
Southern California Edison Company
Southern California Gas Company (SoCalGas)

Spark Energy
Sun Light & Power
Sunshine Design
Tecogen, Inc.
TerraVerde Renewable Partners

TerraVerde Renewable Partners, LLC
Tiger Natural Gas, Inc.
TransCanada
Troutman Sanders LLP
Utility Cost Management
Utility Power Solutions
Utility Specialists

Verizon
Water and Energy Consulting
Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)

YEP Energy
Yelp Energy