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2. All documents are required to be submitted in an electronically *searchable* format.
3. Documents need to reference the reason for the mandate that ordered the filing in Section B or C. If you are unable to reference a proceeding or explain the origin of your filing, please contact Energy Division Central Files.
4. To find a proceeding number (if you only have a decision number), go to <http://docs.cpuc.ca.gov/DecisionsSearchForm.aspx>; enter the decision number, and the results shown include the proceeding number.

A. Document Name

Today's Date (Date of Submittal) **3/31/2020**

Name:

1. Utility Name: **San Diego Gas & Electric**
2. Document Submission Frequency (Annual, Quarterly, Monthly, Weekly, Once, Ad Hoc): **Semi-Annual**
3. Report Name: **SDG&E's Demand Response Emerging Technologies Semi-Annual Report 2020**
4. Reporting Interval (the date(s) covered by the data, e.g. 2015 Q1): **2019 Q4 to 2020 Q1**
5. Name Suffix: **Cov** (for an Energy Division Cover Letter), **Conf** (for a confidential doc), **Ltr** (for a letter from utility)
6. Document File Name (format as 1+2 + 3 + 4 + 5): **SDG&E Semi-Annual DR Emerging Tech Report 2020Q1**

Sample Document Names:

Utility Name + Submittal Frequency + Report Name + Year + Reporting Interval

SCE Annual Procurement Report 2014

SDG&E Ad Hoc DR Exception 2015Q1 Conf

SEMPRA Monthly Gas Report 201602

SEMPRA Daily Gas Report 20160230 <no suffix for regular, non-confidential compliance data>

SEMPRA Daily Gas Report 20160230 Cov

SEMPRA Daily Gas Report 20160230 Ltr

7. Identify whether this filing is original or revision to a previous filing.
 - a. If revision, identify date of the original filing:

B. Documents Related to a Proceeding

All submittals should reference both a proceeding and a decision, if applicable. If not applicable, leave blank and fill out Section C.

1. Proceeding Number (starts with R, I, C, A, or P plus 7 numbers): **A.11-03-001**
2. Decision Number (starts with D plus 7 numbers): **D.12-04-045**
3. Ordering Paragraph (OP) Number from the decision: **59**

C. Documents Submitted as Requested by Other Requirements

If the document submitted is in compliance with something other than a proceeding, (e.g. Resolution, Ruling, Staff Letter, Public Utilities Code, or sender's own motion), please explain: **N/A**

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D. Document Summary

The Demand Response Emerging Technologies (DR-ET) Program Semi-Annual Report for the period of Q4 2019 and Q1 2020 is being submitted pursuant to Ordering Paragraph 59 and the discussion at pages 145 – 146 of Decision (D.) 12-04-045. During Q4 2019 and Q1 2020, San Diego Gas & Electric's DR-ET program completed two (2) projects, continued to manage five (5) ongoing projects, and stated on (1) new Demand Response project.

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F. Confidentiality

1. Is this document confidential? No Yes
 - a. If Yes, provide an explanation of why confidentiality is claimed and identify the expiration of the confidentiality designation (e.g. Confidential until December 31, 2020.)

G. CPUC Routing

Energy Division's Director, Edward Randolph, requests that you not copy him on filings sent to Energy Division Central Files. Identify below any Commission staff that were copied on the submittal of this document.

1. Names of Commission staff that sender copied on the submittal of this Document: [Aloke Gupta, ED](#)

ver.7/6/2016

**DEMAND RESPONSE
EMERGING
TECHNOLOGIES
PROGRAM**

**SEMI-ANNUAL
REPORT 2020**

March 31, 2020



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Summary

The Demand Response Emerging Technologies (DR-ET) Program Semi-Annual Report for the period of Q4 2019 and Q1 2020 is being submitted pursuant to Ordering Paragraph 59 and the discussion at pages 145 – 146 of Decision (D.) 12-04-045. During Q4 2019 and Q1 2020, San Diego Gas & Electric's DR-ET Program completed two (2) projects, continued to manage five (5) ongoing projects, and started one (1) new Demand Response project.

I. Completed Projects During the Reporting Period

A. *Whole Connected Home*

1. Overview

Whole Home Demand Response (WHDR) is defined as a DR approach where multiple end use systems are triggered by a single DR signal delivered by the utility to either an in-home or a cloud gateway. The purpose of the project is to evaluate various emerging Internet of Things (IoT) connected device technologies as one unified system for their capability to be developed and integrated into WHDR programs. The demonstration is done at three selected residences. The evaluation considers both technologies and other program impact factors such as customer adoption, ease of recruitment, persistence, and data availability for measurement & verification (M&V).

2. Collaboration

The progress and results have been shared with other California Investor Owned Utilities (IOUs) DR-ET Leads, as well as with various interested attendees at the Internal Technology Transfer meetings.

3. Status

The project has been fully completed. Handoff meetings have occurred, knowledge transferred to internal teams, and the final report posted to the Emerging Technologies Coordinating Council (ETCC) website for public review. Report link: <https://www.etcc-ca.com/reports/whole-home-demand-response>

4. Next Steps

None.

B. Behind-the-Meter Battery Market Study

1. Overview

This study seeks to better understand the commercial & residential battery market in SDG&E's service territory. The focused research shall uncover the current and future state of the market in the territory, understand key drivers, and identify opportunities for energy efficiency, demand response, and Distributed Energy Resource program applications. Specifically, this project seeks to understand the following issues:

- Number and size of batteries,
- Major battery companies active in the San Diego area,
- Usage patterns,
- Demographics of early commercial and residential adopters,
- The nature of the contracts between the battery vendor and the commercial site or homeowner,
- Rates that commercial battery-owning customers are on,
- Peak kW control setpoint of the installed commercial batteries, and
- Battery participation in other non-Company DR programs, including capacity markets, CAISO, etc.

The end goal of SDG&E is to enable customer choice, foster a growing battery marketplace, maintain grid reliability and affordability, and identify opportunities for the utility to reap the benefits of new technologies. This market study draws from all available information resources, including first-person interviews from numerous industry stakeholders (e.g., manufacturers, system integrators, contractors, consultants, analysts, business customers). Contractor staff manages engagement with dozens of stakeholders in creating this market study.

2. Collaboration

The progress and results have been shared with other California Investor Owned Utilities (IOUs) DR-ET Leads, as well as with various interested attendees at the Internal Technology Transfer meetings.

3. Status

The project has been fully completed. Handoff meetings have occurred, knowledge transferred to internal teams, and the final report posted to the Emerging Technologies Coordinating Council (ETCC) website for public review. Report link: <https://www.etcc-ca.com/reports/behind-meter-battery-market-study>

4. Next Steps

None.

II. Ongoing Projects Through the Reporting Period

A. *Permanent Load Shifting Evaluation of a Refrigeration Battery*

1. Overview

The project will demonstrate the Refrigeration Battery's ability to maintain the desired temperature set-points of a supermarket's medium temperature refrigeration systems without running the central compressors or condensers for up to 8 hours at a time. By turning off medium temperature refrigeration compressors and condensers during on-peak hours, as defined by SDG&E's AL-TOU rate schedule, the Refrigeration Battery is expected to reduce the facility's monthly peak demand by up to 75 kW. If successful, it would achieve a decrease in monthly peak demand of up to 25%.

2. Collaboration

The progress and results have been shared with other CA IOUs DR-ET Leads as well as with various interested attendees at the Internal Technology Transfer meetings. This project has attracted some national media attention and strong interest from Electric Power Research Institute (EPRI) who is aiming to build on SDG&E's initial research in this space.

3. Status

Per the post measurement and verification data, a decision was made to extend the post trending time period to allow for enough data to be collected and ensure a higher correlation to the money saved at the facility. The extended time period will last another few months and then the project findings will be finalized.

4. Next Steps

Analyze and finalize the project's economics as well as complete the final report by Q2 2020. The final report will be published to the ETCC website for public review and reference.

B. Dehumidification & Water Purification Demand Response Project

1. Overview

This project is to evaluate the electric load and demand response capabilities of two (2) types of dehumidification drinking water systems. Ten (10) dehumidification units from two different vendors were installed in buildings around the SDG&E service territory. These units cool air below the dew point to produce water. The collected water is filtered, ozone is injected, then chilled or heated to use as an office “water dispenser” for drinking water.

The primary purpose of the assessment is to:

- Determine the load profile, baseline energy use, and peak demand of the units.
- Determine the available peak load reduction of the units for a demand response event. Multiple reduction strategies may be analyzed, including but not limited to turning the unit off or adjusting the water delivery temperature set points.

The secondary purpose of the assessment is to:

- Understand the added load (load growth potential) to the SDG&E territory assuming a penetration rate.
- Use the micro data to theorize what impact these products could have on the embedded energy in water distribution throughout SDG&E service territory.

2. Collaboration

The progress and results have been shared with other CA IOUs during scheduled monthly DR-ET Leadership conference calls. SDG&E ET is also collaborating with our Energy Innovation Center (EIC) by placing two units for comparison study.

3. Status

All units have been placed in facilities throughout the SDG&E territory. SDG&E is working with our Measurement & Verification consultant and Internal IT Department to get all the units online and ready to receive Demand Response (DR) events. Once they are connected, multiple DR events will be sent to the units to measure their performance. We are also continually monitoring the data from each unit.

4. Next Steps

The next step for this project is analyze the data collected and write the final report by end of Q3 2020. The final report will be published to the ETCC website for public review and reference.

C. *SDG&E's Energy Innovation Center (EIC) – Demonstrating DR Performance of a Variable Refrigerant Flow (VRF) – Indirect Evaporative Cooling (IEC) Hybrid System*

1. Overview

Rooftop package air condition systems, or RTUs, are typical for many small to medium commercial office buildings. Replacing RTUs with more energy efficient HVAC alternatives, such as heat pumps, offers significant energy savings potential. Within the category of heat pumps, variable refrigerant flow (VRF) heat pumps offer even greater savings potential.

The selected vendor is also contracted with the California Energy Commission (CEC) to demonstrate the application of a hybrid system that combines VRF heat pump systems with Indirect Evaporative Cooling (IEC) units to possibly provide even greater energy savings. While the focus of the CEC project is to document the energy savings impact of the VRF-IEC hybrid system, the DR capability of this hybrid system is beyond the scope of CEC's direction.

However, the DR potential of the VRF-IEC hybrid system could be a potentially compelling value proposition that merits demonstration. Being able to understand the DR characteristics of the hybrid system regulated by a "master controller" during all modes of operation (IEC Only, VRF Only, and simultaneous IEC and VRF) is critical to validate and quantify their DR impact.

2. Collaboration

This scope of work is an add-on to a larger CEC project that is focusing on the EE potential of the same combination of equipment and controls strategy. The results are also to be shared with other CA IOUs DR-ET Leads.

3. Status

All DR testing of the controller units at both the Energy Innovation Center (EIC) and the site in SCE territory have been completed. Post trending has

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been concluded, as well as the analysis of the data, the team will be looking at the overall efficiency of the system.

4. Next Steps

The remaining steps of the project incorporate the following: (a) Draft, review, comment and finalize the project report; (b) Schedule and complete the handoff meeting to internal stakeholders to transfer the knowledge gained on the project; and lastly; (d) Post the report to the ETCC website for public review.

D. In-Home Display & Smart Phone Application (PEEK) Behavioral Conditioning with Time of Use Billing for Energy Efficiency & Demand Response

1. Overview

The Peek Smartphone App is available for customer download, registration and activation. The application is complimentary to the in-home device, enabling the customer to view time-of-use (TOU) pricing periods and period prices via their smartphones. The application can also provide other functions such as SDG&E message pushes to the customer, helpful links and other functionality as developed by the vender.

The goal of this project is to verify if a SDG&E residential customer will:

1. Interact with the in-home display.
2. Interact with the smart phone application.
3. Yield any meaningful annual kWh savings verified using the NMEC (Normalized Metering Energy Consumption) analysis.
4. Yield any Demand Response values due to smart phone application messaging using regression analysis as well as a 3-in-5 baseline; and/or
5. Yield a positive residential program design in the form of Total Resource Cost (TRC), Program Administrators Cost (PAC), and Ratepayer Impact Measure (RIM) tests.

2. Collaboration

The progress and results will be shared with other CA IOUs DR-ET Leads. SDG&E's Emerging Technology Team is also collaborating with internal Residential Customer Program Advisors to keep them informed of potential measure value as the project yields positive cost-effectiveness. The ET Team is also collaborating with SDG&E's rates team and marketing groups to ensure effective messaging efforts take place and reach a total number of 500 targeted participants for this project.

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3. Status

All 500 devices have been mailed out to the customers. Of the 500 devices, about half have been registered in the app. A follow up postcard was mailed in Q1 of 2020 to the unregistered customers to remind them to register their devices.

4. Next Steps

The next step in this process is to ensure all participating customers complete registration, installation and commissioning of the devices. After that, a marketing campaign will be launched with the vendor to promote customer participation in demand response events. Post trending and data analysis are expected to start in Q3 of 2020, and the final report to be drafted by Q4 2020.

**E. Voice Activated Assistant for Energy Savings
(Integrated Demand Side Management Project)**

1. Overview

Voice Assistant type products have found nearly a 30% market penetration in the US in under a year. This is an incredible rate compared to hubs for energy management that have been tried and tested over the last 15 years. Given that voice assistants have now become a gateway for many consumer products, it is critical to understand how they can advance utility customer engagement and drive energy benefits acting as the point of entry for residential customers (and potentially small commercial customers as well). EPRI research from 2017 and 2018 indicated the potential for voice assistants to enable growth in customer engagement from basic messaging to personalizing customer experiences, with varying degrees of engagement in between. From a customer programs perspective, it is important to understand how voice assistants could play a role in allowing new programs or increasing adoption of existing programs.

This project consists of the following tasks:

Task 1: Site identification. SDG&E will provide EPRI with up to five (5) qualified sites where the site owners are willing to accept proxy (or actual) TOU rates. EPRI intends to interview potential site owners to convey optimal and suboptimal scenarios with new technologies, gauging the potential site owner's interest to engage despite potential outcomes. Site owners will also be interviewed by EPRI to see if they can be adopted into

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SDG&E’s TOU rates with bill payment protection. Selected site owners will be required to provide EPRI with access to two years of prior Advanced Metering Infrastructure (AMI) data to conduct the evaluation.

Task 2: EE cost saving measure selection for individual sites. This project will involve a total of up to five homes, with up to three of those homes with behavioral load management, providing messaging through voice assistants for higher cost periods and emergency events, and up to three of those homes with a mix of energy tools for cost savings through TOU rates. The site owners will be allowed to select from a pre-approved pool of end-use systems and devices illustrated in the table below:

Thermostats	Ecobee, Venstar, Rheem
Batteries	Sonnen
Water Heaters	Rheem
Blinds	Hunter Douglas

Task 3: Development of Voice Assistant Skills.

EPRI will work with SDG&E to develop versions of voice assistant skills that may include:

1. Integration of voice assistants to end-use devices using cloud-based integration. This is a technically complex initiative, EPRI has prior experience with some end use devices.
2. Messaging to homeowners about upcoming high price periods.
3. Messaging a high-price period and recommend a specific set of changes for customers to make (reset thermostats, etc.).
4. Messaging a high-price period and, based on customer response, automatically adjusting settings on end-use devices.
5. Provide customers feedback using AMI data (and device data as available) on energy use during normal and high-price periods using the voice assistants.
6. Providing customers an opt-out functionality for high-price periods (a “don’t bother me” command).

Task 4: Device installation and testing. This task involves working with the homeowners to install devices (voice assistants or voice assistants + energy management devices). The end-use devices selected for

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installation may be influenced by the time required for procurement, installation, and code official approval. Should the time for installation of end-use devices jeopardize the time schedule required by SDG&E, those devices may be omitted from the project. Homeowners will then be required to enroll in the SDG&E TOU plans. Information is expected to be delivered through the voice assistants on pricing and energy savings.

The intent is to measure customer engagement and end-use device performance over a range of weather conditions, including summertime when the potential for electric use reduction is high. If batteries are to be installed, EPRI will need to seek and obtain permits, which have a variable timeline. EPRI will notify SDG&E and seek permission (if needed) for installation contractors selected.

Task 5: DR events. This task initiates DR events through the voice assistants and measures impact through Normalized Metering Energy Consumption (NMEC) at the meter. This measurement is expected to provide a sum of both behavioral operation and automated device operation for DR. Up to 4 events should be implemented in each home during the Q3 of 2020.

Task 6: Analysis. The project seeks to compile energy use data using both AMI data and additional monitoring points (using device level data and circuit metering). The energy data should then be correlated with pricing signals to understand cost savings over the test period. These cost savings should be extrapolated to annual savings using building energy performance models. Working with SDG&E, the resultant data is expected to be plugged into program development tools for subsequent filings.

Task 7: Reporting. The reports will include a preliminary report that outlines the costs and implementation challenges for voice assistants in a programmatic setting as well as any measured savings using real TOU rates for selected homes. A final report is anticipated in October 2020 that includes both EE and DR impacts over the summer. A formal project handoff to internal stakeholders through a final presentation is expected at the end of 2020.

2. Collaboration

The progress and results have been shared with other CA IOUs DR-ET Leads. SDG&E's ET team is also collaborating with our Residential Program Advisors to keep them informed of potential measure value as the project yields positive cost-effectiveness.

3. Status

Phases 1 and 2 on Development of Voice Assistant Skills have been finalized and lab tested. Installation of HVAC and Smart thermostats have been completed in one of the homes. Our contractor is working to installing a heat pump water heater and smart thermostat in 3 other homes.

4. Next Steps

The next steps for this project is to finalize installs by the end of Q2 2020 with field testing of TOU messaging and voice interaction by late Q2 2020 through the end of the summer. Once that portion of the scope is completed, post trending can start to occur.

III. New Projects Initiated during the Reporting Period

A. *Data Analytics to Maximize Demand Response*

1. Overview

This study is being conducted to develop a data analytics tool that incorporates battery storage to maximize Demand Response (DR) programs enrollment and DR event participation. The key objectives of the tool will be to drive up participation in Base Interruptible Program (BIP) and Capacity Bidding Program (CBP), allow SDG&E to analyze customer benefits from battery storage, understand the degree to which customers with battery storage can benefit from participating in DR programs, and identify which customers will benefit the most.

The scope will be centered around six tasks:

1. **Develop a prototype of the tool.** This would be done by connecting a statistical computing package (Stata or Python) to Excel. The approach allows the DR program to focus on defining the inputs, user options, outputs and development of the computational engine. Because the tool relies on interval data analysis and simulation, it inherently needs to rely on a statistical computing package.
2. **Apply the underlying code to the full population of non-residential SDG&E customers.** This would be done for a preset number of scenarios. There are four main reasons to do so:
 - a) It helps assess how well the design works for the full target population (versus a handful of selected customers)

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- b) It allows the DR Program to analyze which type of customers benefit from BIP or CBP and specifically from battery storage under different designs/program.
 - c) It helps identify which customers would benefit most from battery storage and generate a list – ranking customers from those who benefit most to those who benefit least from battery storage plus DR (targeting). The analysis would include all customer not just those that currently have battery storage.
 - d) It allows the DR Program to produce individual reports for customers and plot figures that can be uploaded to the tool website.
- 3. Run analysis to identify the characteristics of customers that benefit most from DR participation in BIP and CBP, plus customers with battery storage.** The goal is to understand who benefits most and to enable SDG&E to direct aggregators and developers to them. SDG&E plans to implement two sets of analysis. The first analysis would be based solely on factors observable by aggregators and developers – business type, square footage, location (climate zone). The second analysis would also incorporate information that would require access to customer bills and load shape – e.g., concentration of load duration, load shape, ratio of energy to demand charges, etc.
- 4. Reporting and training.** As part of the project, the project team would draft a report (using the Emerging Technology Coordinating Council report template), hold bi-weekly progress meeting, hold an in-person workshop to present results and train users.
- 5. Development of an online website that allows customers to access the site-specific analysis implemented in Task 2.** The website contents would sit behind a user management system, which requires customers to login and set a password. Only individuals with login credentials would be allowed to view the results for a particular customer. This will enable the DR Program to compartmentalize what show to each user (e.g., the content for Gmail is different for different users). Because the analysis is static, it may need to be updated periodically (e.g., once a year) to remain relevant. The budget does not include costs for updating the analysis and website with new results.

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- 6. Website module that provides the ability to run custom analyses.** This would enable developers, aggregators, and/or sophisticated customers to upload interval data and custom inputs for individual customers or for a batch of customers.

- 2. Collaboration**

The progress and results will be shared with other CA IOUs DR-ET Leads. SDG&E's ET team is also collaborating with our Demand Response Program Team to help them maximize their customer participation in CBO and BIP program.

- 3. Status**

The Project Team has been meeting with the vendor on a regular basis to finalize the hosting server and site for the tool. After which, the vendor will use the data that has been provided to them, to create the tool.

- 4. Next Steps**

The next major step in the project is to complete tasks 1 and 2, secure a hosting server and site for the analytical tool, and move on to task 3. The Project Team plans to have these completed by Q2 2020 so customers can be identified to enroll in the programs in time to participate in summer demand response events.

IV. Budget

Program Approved Budget 2018-2022¹

	2018	2019	2020	2021	2022	TOTAL
DR-ET	\$656,100	\$675,900	\$695,700	\$717,300	\$738,900	\$3,483,900

¹ Approved Budget per D.17-12-003 (dated December 14, 2017)