Energy Division Central Files Document Coversheet

Directions: Submit all documents and submittal questions to Energy Division Central Files via email EnergyDivisionCentralFiles@cpuc.ca.gov

1. Fill out coversheet completely. Coversheet can be embedded as page 1 of the electronic compliance filing, or can be submitted as a separate document that is attached to the email that delivers the compliance filing.
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) 9/30/2021

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 2021
4. Reporting Interval (the date(s) covered by the data, e.g. 2015 Q1): 2021, Q2 and Q3
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 2021 Q2&3

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: Click here to enter text.

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

Energy Division Central Files Document Coversheet

D. Document Summary

The Demand Response Emerging Technologies (DR-ET) Program Semi-Annual Report for the period of Q2 and Q3 2021 is being submitted pursuant to Ordering Paragraph 59 and the discussion at pages 145-146 od Decision (D.) 12-04-045. During Q2 and Q3 2021, San Diego Gas & Electric DR-ET Program completed one (1) project, continued to manage six (6) ongoing projects, and one (1) new project was started.

E. Sender Contact Information

1. Sender Name: Todd Schavrien
2. Sender Organization: San Diego Gas & Electric
3. Sender Phone: 858-503-5164
4. Sender Email: TSchavrien@sdge.com

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 2021

September 30, 2021

SDGE

A Sempra Energy utility™

Table of Contents

Summary

The Demand Response Emerging Technologies (DR-ET) Program Semi-Annual Report for the period of Q2 and Q3 2021 is being submitted pursuant to Ordering Paragraph 59 and the discussion at pages 145-146 of Decision (D.) 12-04-045. During Q2 and Q3 2021, San Diego Gas & Electric DR-ET Program completed one (1) project, continued to manage six (6) ongoing projects, and one (1) new project was started.

I. Completed Projects during the Reporting Period

A. Data Analytics to Maximize Demand Response

1. Overview

This study was 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 are 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 was centered around six tasks:

1. **Develop a prototype of the tool.** This was done by connecting a statistical computing package (Stata or Python) to Excel. The approach allows the DR programs 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 was 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).
    b) It allows the DR programs 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 customers not just those that currently have battery storage.

d) It allows the DR programs 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 implemented two sets of analysis. The first analysis was based solely on factors observable by aggregators and developers – business type, square footage, location (climate zone). The second analysis incorporated information that required 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 drafted a report (using the Statewide Emerging Technology report template), held bi-weekly progress meetings, and held 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 sit behind a user management system, which requires customers to login and set a password. Only individuals with login credentials are allowed to view the results for a particular customer. This enables the DR programs to compartmentalize what to 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.

6. **Website module that provides the ability to run custom analyses.** This enables 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 have been shared with other CA IOUs ET-DR Leads. SDG&E's ET Team collaborated with its Demand Response

Program Team to help them maximize their customer participation in CBO and BIP programs.

3. Status

The project has been completed, and the report has been published to the Emerging Technologies Coordinating Council (ETCC) website for public review and reference.

II. Ongoing Projects thru 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 eight (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 ET-DR 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

The final report is currently undergoing final review.

4. Next Steps

The final report is being finalized and is expected to be completed in Q4 2021. The final report will be published to the Emerging Technologies Coordinating Council (ETCC) website for public review and reference.

B. Dehumidification & Water Purification Demand Response Project

1. Overview

This project is evaluating 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 reasonable 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's ET Team also collaborated with its facilities by placing two units for comparison study at its Energy Innovation Center (EIC) and Company office.

3. Status

Due to COVID-19, all units that were initially placed in facilities throughout the SDG&E territory have experienced a significant decline in usage due to business operations adjustments in response to the stay-at-home orders. SDG&E is continuing to work with its Measurement & Verification consultant to attempt to resume operation of the units so they can receive and respond to Demand Response (DR) events. Once the units

are operational, multiple DR events will be sent to the units to measure their performance.

4. Next Steps

The project has been extended thru Q4 2021 to allow time for the units to become operational and to analyze the data collected. The final report is expected to be available by Q1 2022. 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 rooftop units (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 ET-DR Leads.

3. Status

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

Due to an unanticipated staffing change, the vendor has experienced a delay in preparing the final report. The vendor is working to finalize the project report.

SDG&E's ET Team will schedule and complete the handoff meeting to internal stakeholders to transfer the knowledge gained on the project. The final report will be posted to the ETCC website for public review and reference.

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

1. Overview

The TOU display device works in conjunction with a smartphone spp that 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 functionalities 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 Metered 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 ET-DR Leads. SDG&E's Emerging Technologies Team has collaborated with internal Residential Customer Program Advisors to keep them informed of potential measure value as the project yields positive cost-effectiveness. The ET Team also collaborated with SDG&E's rates team and marketing groups to ensure effective messaging efforts.

3. Status

The vendor has completed the analysis of test results and is preparing the final report.

4. Next Steps

The final report is undergoing review and is expected to be completed by Q4 2021. The final report will be posted to the ETCC website for public review and reference.

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 personalized 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 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 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 Metered Energy Consumption (NMEC) at the meter. This measurement is expected to provide a sum of both behavioral operation and automated device operation for DR. More than four events were implemented in each home during Q3 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 formal project handoff to internal stakeholders through a final presentation will be held in Q4 2021. The final report is undergoing final review and is anticipated to be completed by Q4 2021.

2. Collaboration

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

3. Status

The final report is currently undergoing final review and is expected to be published by Q4 2021.

4. Next Steps

The next steps for this project are to complete the final report and publish it to the ETCC website for public review and reference.

F. Electric Vehicle (EV) Charging Impact Study

1. Overview

This study is being conducted to test the real-world impact of Electric Vehicle (EV) charging on a commercial office building located in the SDG&E service territory.

A three-month summer/fall study will examine the impact of introducing EV level 2 charging on a 57,000 sq. ft. commercial office building. The site is equipped with a 90 kW (AC) solar PV system, a 30 kW / 40 kWh Battery Energy Storage (BES), and four level 2 charging stations (8 ports).

The overriding goal of this study is to identify and quantify solar over-generation mitigation as a benefit of interconnected workplace EV charging. The results should provide insight into the potential for mass EV adoptions ability to achieve this goal.

Below are some of the key questions that could be examined in the study:

- Can EV charging help mitigate the impact of solar over-generation on the grid?

- Can a BES system be utilized to help flatten the usage curves, and is daytime EV charging counterproductive to shifting of demand?

- What charging utilization threshold must be achieved to demonstrate reasonable impact, and how long does it take from launch to achieve this level of usage?

- Is workplace charging cost effective for site hosts?

- What impact will EV charging have on solar sizing for a facility?

- Are current tariff structures amenable to the promotion of EV charging and load shifting?

2. Collaboration

The progress and results will be shared with other CA IOUs ET-DR Leads. SDG&E's ET Team is also collaborating with its Demand Response Program and Clean Transportation team on this study.

3. Status

The vendor has begun collecting and analyzing data. The project is being extended thru Q4 2021 due to reduced EV charging as a result of COVID-19 business closures started in mid-March 2020.

4. Next Steps

The study of EV charging events will continue thru Q3 or Q4 2021. The data analysis and final report are expected to be complete by Q4 2021.

III. New Projects Initiated during the Reporting Period

A. Smart Thermostat Software Evaluation

1. Overview

The Smart Thermostat Software Evaluation project will evaluate the energy and on-peak demand savings attributable to a software feature that has been rolled out to selected thermostats in the SDG&E service territory. The software features five energy and demand savings functions:

1) Feels Like - This function detects fluctuations in the home's indoor humidity to ensure that it feels like the temperature homeowners set on their thermostat. This function is designed for both energy efficiency and home comfort even during periods of high or low humidity.
2) Schedule Assistant - This function monitors the thermostat's schedule. When the schedule doesn't match with the home's historic HVAC usage routine, Schedule Assistant recommends a new schedule to the user.
3) Smart Home and Away - This feature adjusts the temperature setpoint when it detects that the home is unoccupied and quickly restores the temperature settings when it detects that the home is occupied again.
4) Time of Use - This function pre-cools and pre-heats the home during off-peak times of day. For customers that are on time of use electricity rates, this function can lower electricity bills by shifting cooling and heating to times of day when electricity is less expensive.
5) Community Energy Savings (CES) - The CES function makes small thermostat setpoint adjustments to reduce energy consumption from cooling or heating during demand response events.

SDG&E worked with the manufacturer to identify customers who would receive the software offer. Of the 1,300 customers who received the offer, 950 enrolled.

The primary objective of this evaluation is to develop ex post load impact estimates for overall energy (kWh) consumption and average reduction of on-peak demand (kW). The evaluation will be completed in accordance with the California Demand Response (DR) Load Impact Protocols adopted by the Commission in Decision (D.) 04-08-050.

The evaluation will include the following tasks: development of an EM&V Plan; data collection and validation; load impact estimation and ex ante forecasting; and a final report that summarizes the findings of this evaluation.

2. Collaboration

The progress and results will be shared with other CA IOUs ET-DR Leads. SDG&E's ET Team is also collaborating with its Demand Response Program team on this study.

3. Status

The project was contracted in Q3 2021. The vendor is preparing the Evaluation, Measurement & Verification (EM&V) Plan and beginning to analyze the data for participating customers.

4. Next Steps

The vendor will continue its analysis and is expected to provide a final report at the conclusion of the study in Q3 2022.

IV. Budget

Program Approved Budget 2018-2022[1]

	2018	2019	2020	2021	2022	TOTAL
ET-DR	$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)