

Energy Division Compliance Report Filing Cover Sheet

A. Document Name

1. Utility Name: SDG&E
2. Document Submission Frequency (Annual, Semi-Annual, YTD, Quarterly, Monthly, Weekly, Ad-Hoc, Once, Other Event): Semi-Annual
3. Report Name:
Demand Response Emerging Technologies Program Semi-Annual Report 2017
4. Reporting Interval (for this submission, e.g., 2015 Q1): 2017 Q3
5. Document File Name (format as 1 + 2 + 3 + 4):
SDG&E Semi-Annual DR Emerging Tech Report 2017Q3
6. Append the confidential and/or cover sheet notation, as appropriate.

Sample Document Names

*Utility Name + Submittal Frequency + Report Name + Year +
Reporting Interval + (COV or CONF or both or neither)*

<i>SCE Annual Procurement Report 2014</i>	<i>PGE Monthly Gas Report 201602 CONF</i>
<i>SDGE Quarterly DR Forecast 2015Q1</i>	<i>PGE Daily Gas Report 20160230 COV</i>
<i>PGE Monthly Gas Report 201602</i>	<i>PGE Monthly Gas Report 201602 COV CONF</i>

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

Energy Division Compliance Report Filing Cover Sheet

D. Document Summary

Provide a Document Summary that explains why this report is being filed with the Energy Division (ED). This information is often contained in the cover letter, introduction, or executive summary.

San Diego Gas and Electric (SDG&E) submits this semiannual report as directed in Decision Adopting Demand Response Activities and Budgets for 2012 through 2014, D.12-04-045, Ordering Paragraph (OP) 59 and continued per D.14-05-025 approving 2015-16 Bridge Funding. The report summarizes the activities funded by SDG&E's Demand Response Emerging Technologies Program during Q4 2016 through Q1 2017. SDG&E is also serving a copy of the report to R.13-09-011 since A.11-03-001 is now closed.

E. Sender Contact Information

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F. Confidentiality

Is this document confidential? No Yes

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, Ed Randolph, requests that you not copy him on filings sent to ED Central Files. Identify below any Commission staff that were copied on the submittal of this document. Names of Commission staff that sender copied on the submittal of this Document:

Bruce Kaneshiro

**DEMAND RESPONSE
EMERGING
TECHNOLOGIES
PROGRAM**

**SEMI-ANNUAL
REPORT 2017**

September 30, 2017



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Summary

The Demand Response Emerging Technologies Program (DR-ET) Semi-Annual Report is being submitted pursuant to Ordering Paragraph 59, and the discussion at pages 145 – 146 of Decision (D.) 12-04-045. During the first and second Quarter of 2017, SDG&E DR-ET completed 1 project and continued to manage 6 ongoing projects.

I. Completed Projects in Q2 & Q3 of 2017

A. 10 kW / 40 kWh Flywheel Energy Storage

1. Overview

Berkeley Energy Sciences Corporation (BESC) has been developing a low-cost flywheel energy storage device. The first-generation device has the target of 40 kWh / 10 kW. This flywheel uses high-strength steel as a rotor, and this design has the potential of a 20-year lifetime with over 90% AC to AC efficiency. If successful, this project leads to BESC's second generation technology which is 125kW / 500kWh.

2. Collaboration

This project was in collaboration with California Energy Commission (CEC) and Public Interest Energy Resource (PIER) program. BESC received a \$1.8M grant from PIER to build the flywheel. SDG&E agreed to provide Measurement and Verification (M&V) support.

3. Status

The final report has been completed and uploaded to the Emerging Technologies Coordinating Council (ETCC) website. The results from the study were delivered to SDG&E DR Team in a technology handoff meeting. The interesting finding from this study is that even though the Flywheel Energy Storage System has a high upfront cost, the economics are very attractive when applying the Self Generation Incentive Program (SGIP) incentives. Based on the output/performance of the system tested, this technology, which isn't currently at scale, would have a 2.09-year simple payback.

The link below is the ETCC website where the final report can be found:
<http://www.etcc-ca.com/reports/flywheel-energy-storage-study>

4. Next Steps

Continue to follow technology development and commercialization progress, and watch out for potential DR opportunities.

II. Ongoing Projects in 2017

A. *Electric Power Research Institute (EPRI) Smart Thermostat Collaborative*

1. Overview

Define methods to translate the value proposition from multiple utility smart thermostat pilots to utility programs of the products and services in the study. Understand all the costs and benefits from the various thermostat hardware and software offerings as well as the data streams that come from the products and services.

2. Collaboration

More than 12 utilities are participating in this study, plus 15 smart thermostat products and/or services, and other stakeholders such as Environmental Protection Agency (EPA), Department of Energy (DOE), Lawrence Berkeley National Laboratory (LBNL), National Renewable Energy Laboratory (NREL) and ICF International. The information from this project is also shared with the statewide ET-DR team on monthly conference calls.

3. Status

This extensive collaborative project is nearing completion. Below are some of the project's highlights as they pertain to the Q2 and Q3 of 2017.

- Two participating utilities, Louisville Gas and Electric and Gulf Power, are completing their summer testing and should be done in October of 2017.
- Baltimore Gas and Electric and Lincoln Electric Systems have completed their reports and the public versions can be found here:
 - [Baltimore Gas and Electric Report](#)
 - [Lincoln Electric Systems Report](#)
- The analysis of collected data is complete for Salt River Project and Tennessee Valley Authority.

4. Next Steps

The reports listed below from the various utilities in the collaborative project have the final timeline of:

- Salt River Project's final report to be finished by Q3 of 2017.
- Tennessee Valley Authority's final report to be finished by Q3 2017.
- Gulf Power's, Louisville Gas and Electric's and Kansas City Power & Light's final reports will be completed by Q4 2017.

B. Electric Vehicle to Grid Integration Platform (VGIP)

1. Overview

The purpose of this project is to create requirements and use cases for a unified grid services platform that is secure, low cost, and an open platform. It will also aide in the development of architecture and functionality of the VGIP including OpenADR2.0b, SEP, Home Area Network (HAN). Lastly, this project will assess performance of the VGIP against utility requirements through field tests and trials. BMW, Chrysler, Ford, GM, Honda, Mercedes, Mitsubishi, Nissan, and Toyota have agreed to be study participants.

2. Collaboration

The progress and results have been shared with other CA IOU's during scheduled monthly DR-ET Leadership conference calls as well as with various interested attendees at the Internal Technology Transfer meetings.

3. Status

Below are the highlights of the project from the Q2 and Q3 of 2017:

- Initiated VGIP Charge Control Pilot with Hawaiian Electric Company (HECO) utilizing Nissan Leaf fleet vehicles through OpenADR interface.
- Coordinating the VGIP interface lab demonstration project with Southern Company.
- Instituted requirements for VGIP pilot participation in Con Edison Smart Charge New York Program providing incentives to EV customers to charge off-peak – requires customer enrollment and monitoring and verification reporting of customer charging data.

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- Initiated requirements for Southern California Edison (SCE)/VGIP pilot participation in SCE Capacity Bidding Program (CBP) requiring engagement/enrollment with Electric Vehicles (EV) customers – requires capability to increase & decrease EV aggregated load of 100kW.
- Initiated requirements for Pacific Gas & Electric (PG&E) Excess Supply Side Demand Response project operated through Olivine.
- Provide aggregated EV load capacity bids to be processed and settled in energy market mock program.
- Initiated development of the Demand Clearing House functionality for Implementing Independent System Operator (ISO) 15118 Electric Vehicle Supply Equipment communications demonstration.

4. Next Steps

Below are the objectives for the VGIP collaborative project through the end of 2017.

- Formalize enrollment process which is a key driver for implementing the customer engaged demonstrations.
- Establishing customer agreement documentation and outreach process.
- Defining data privacy terms and conditions for collecting and sharing customer data between Original Equipment Manufacturers (OEMs) and utilities.
- Establishing data requirements and reporting forms.
- Continued development and test of OVGIP/Utility/OEM interfaces, formalization of individual pilot implementation schedules.

C. Battery Power Load Shedding System – ADR Evaluation

1. Overview

The objective of this study is to evaluate the demand response capability of the Energy Storage System (ESS). In addition to peak load shaving

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capability, the impact of the energy storage system on the circuit and the customer bill/economics will be studied.

2. Collaboration

The progress and results have been shared with other CA IOUs during scheduled monthly DR-ET Leadership conference calls as well as with various interested attendees at the Internal Technology Transfer meetings. In Q2 of 2017, this project received an award from Green Tech Media (GTM). GTM is a news outlet that delivers market analysis, business-to-business news and conferences that inform and connect players in the global clean energy market. The 2017 Grid Edge Awards were given to projects that define the future integrated and interactive electric grid. The write-up on the project can be found [here](#).

3. Status

In Q2 and Q3 of 2017, the Green Charge Networks deployed a total of 20 ESS at two school districts. Below are the highlights for this period.

- The total deployed capacity of the current fleet is rated at 4.46 MW with a 2-hour discharge time, or 8.92 MWh.
- The measurement and verification (M&V) team has installed independent energy meters at 15 of the systems in the current fleet per the Project Plan.
- The M&V team also performed analysis of the available data at all 20 sites. To ascertain the performance of the fleet relative to vendor projected values at the beginning of the project.
- Demand Response simulations have been started and are in progress to-date, 3 of the 8 planned simulations have been completed.

4. Next Steps

In Q4 of 2017 the vendor intends to install an additional 4 ESS with an estimated operational date of 10/31/2017. The M&V team will install independent electrical sub-metering systems on these four additional ESS as they become operational.

In Q4 of 2017 the M&V team will complete the remaining Demand Response simulations, complete the 16-week data collection period (for each site) and perform all analyses per the Project Plan. In addition, the team will produce a final report summarizing the project's findings.

D. Whole Connected Home

1. Overview

Whole Home DR (WHDR) is defined as Demand Response (DR) 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 evaluation will consider both technologies as well as other program impact factors such as customer adoption, ease of recruitment, persistence, and data availability for M&V.

2. Collaboration

The progress and results have been shared with other CA IOUs during scheduled monthly DR-ET Leadership conference calls as well as with various interested attendees at the Internal Technology Transfer meetings.

3. Status

Installation on the 3 test homes has started. One home has all the physical upgrades completed, commissioned, and is waiting for the controls installation and commissioning. The other two homes are still working through the installation process of the new controllable equipment.

4. Next Steps

Installation and commissioning of all new controllable equipment and controls should be completed in Q3 of 2017. The Demand Response testing should be underway in Q3 and may continue through the beginning of Q4 of 2017. SDG&E is currently revising a draft Measurement & Verification (M&V) Plan which highlights the testing procedure, for each home, in accordance with the SDG&E residential Demand Response Programs. This M&V Plan will have an evaluation procedure that utilizes a 3-in-5 baseline in accordance with SDG&E's current Reduce Your Use (RYU) program.

E. 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"

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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, representing a decrease in monthly peak demand of up to 25%.

2. Collaboration

The progress and results have been shared with other CA IOUs during scheduled monthly DR-ET Leadership conference calls 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 the Electric Power Research Institute (EPRI) who is aiming to build on SDG&E's initial research in this space.

3. Status

The product vendor has executed their contract with their general contractor selected to perform the installation of the approved scope of work. The draft plans have been submitted to the test site for review, comments, and final approval. Due to some site logistics and on-site sub-metering information, the M&V plan is being slightly altered to accommodate these changes.

4. Next Steps

Installation plans and logistics are currently being worked out with the test site and should be approved in Q3 of 2017. Permit approval and ground breaking are also slated for Q3 of 2017. Project commissioning and post trending will be completed sometime late in Q4 of 2017. Final report and transfer of the project to Customer Programs are expected to happen in Q1 of 2018.

F. Demand Response with Variable Capacity Commercial HVAC Systems

1. Overview

This project seeks to evaluate and demonstrate new potential for otherwise unrealized demand response capability from new-to-market variable capacity commercial HVAC systems. Utilities and their customers will benefit from this effort by unlocking a new resource for both utility based demand response and customer directed demand management.

Variable capacity HVAC systems are primarily associated with energy efficiency (EE) and superior customer comfort. One key element in all these advancements is the use of sophisticated controls. These systems have extensive instrumentation and processing power that acts as its own data cloud. With extensive on-board measurement and high onboard processing power the system always seeks to operate in an optimized

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fashion providing superior comfort with maximum efficiency. Efficiency gains between 20% to 40% were seen by using Variable Refrigerant Flow (VRF) systems as compared to baseline (code minimum requirement) systems.

Variable Capacity systems, with their onboard instrumentation and communications capabilities, are candidates for implementing both EE and DR at the same time. Efficiency incentives/rebates have been in place for such equipment in certain territories but DR capabilities can push the technology further into the mainstream market, which is dominated by rooftop units, split systems and chiller / boiler combos. Commercial HVAC systems being a coincident load (peak power draw occurs during the hottest days) is a prime candidate for DR while being an efficient technology during normal operation.

2. Collaboration

This project is being led by the Electric Power Research Institute (EPRI) as a collaborative effort aiming to build off existing installations in SDG&E's service territory.

The progress and results will be shared with other CA IOU's during scheduled monthly DR-ET Leadership conference calls as well as with various interested attendees at the Internal Technology Transfer meetings.

3. Status

EPRI and SDG&E have collaborated with customers in SDG&E's service territory to find sites that already have the desired technology installed. This will keep the project costs low as well as speed up the project progression (no waiting for installation & commissioning, etc.). Test sites have been narrowed down and a final site selection will be made shortly. The M&V Plan is currently being derived and the output of the designed tests will be evaluated in accordance with the rules of SDG&E's Critical Peak Pricing Program (CPP-D) and the Capacity Bidding Program (CBP) rules for comparison.

4. Next Steps

SDG&E and EPRI need to finalize the site for the project, finalize the M&V Plan, and start to design the controls strategy that VRF HVAC systems will respond to.

III. New Projects in 2017

None, due to full subscription of the annual budget.

IV. Budget

Approved Budget per D.16-06-029 (dated June 9, 2016) “Decision Adopting Bridge Funding For 2017 DR Programs and Activities.”

Projected Program Budget

Program Name	2017 Budget
Demand Response Emerging Technology (DR-ET)	\$722,961