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March 31, 2011

Ms. Julie Fitch
Director, Energy Division
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102

Subject: Pacific Gas and Electric Company's Emerging Markets and Technology Demand Response Projects 2010 Annual Report

Dear Ms. Fitch:

In accordance with Decision 09-08-027, Section 12.2.3 Paragraph 3 and Ordering Paragraph 14, attached is Pacific Gas and Electric Company's (PG&E) annual report referenced above. This report is also being served on the most recent service list in Application 08-06-001 et al.

If you have any questions, please call Steve Haertle at (415) 972-5603.

Sincerely,

/s/

Steve Haertle
Principal Regulatory Case Manager

cc: A.08-06-001 et al – Service List

Enclosure

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Pacific Gas and Electric Company®

Emerging Markets & Technology
Demand Response Projects
2010 Annual Report

March 31, 2011

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I. Summary

Pacific Gas and Electric Company (PG&E) submits this annual report as directed in *Decision Adopting Demand Response Activities and Budgets for 2009 through 2011*, D.09-08-027, pp. 88-89. As described in Section 3 F of the Amended Testimony in Support of Pacific Gas and Electric Company's Amended Application for Approval of Demand Response (DR) Programs, Goals, and Budgets for 2009-2011 (A.08-06-003), the DR Product Development Group continues to explore DR technologies including advanced energy management control systems (EMCS), direct load controls, and advanced lighting controls.

In particular, PG&E will continue to investigate the following Emerging Technology (ET) projects during 2011:

- Smart thermostats (aka programmable communicating thermostats (PCTs)) which enhance DR and energy efficiency (EE) capability for residential and small business customers
- "Smart appliances" capable of receiving DR signals
- Energy Storage systems, e.g. battery and thermal storage
- DR technologies compatible with the AMI/HAN system
- Advanced DR enabled lighting technologies
- Advanced EMCS in all targeted markets
- New Automated DR communication technologies
- DR potential in data centers

In 2010, PG&E chartered emerging markets and technology projects in the following areas: development of Auto Demand Response (DR) standards, AutoDR potentials in small and medium business (SMB) customers, Smart Appliances and incorporation of DR enabling technologies in Title 24 building standards. The groundwork was also established for an assessment of an agricultural irrigation optimization tool, Industrial DR, Mainstreaming DR, and DR for Data Center projects.

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II. Projects Completed in 2010

A. Electric Heat Pump Water Heater

1. Overview

PG&E Energy Efficiency and Demand Response ET teams collaborated to evaluate the efficiency and DR capabilities of Heat Pump Water Heater (HPWH). Two water heaters (General Electric and RHEEM) were evaluated on their EE performance and one was evaluated on its DR function, including but not limited to:

- Overall energy use compared to traditional water heater;
- Validating the different energy claims by the manufacturers;
- The DR capability of the water heater (Standard mode, eHeat mode, Hybrid mode and High Demand Mode);
- The connection capability of the communication module attached to the HPWH;
- How well the HPWH respond to SEP 1.0 signal; and
- Vacation settings energy use.

The DR ET team worked with internal Applied Technology Services (ATS) and Technology Innovative Center (TIC) at San Ramon to evaluate this technology. ATS has experience in testing EE appliances and the TIC was set up to test HAN related technologies.

2. Collaboration

PG&E's DR ET team collaborated with an internal EE Emerging Technology team on this project on funding and project administration and implementation. Results were shared with other investor-owned utilities (IOUs) during scheduled monthly conference call.

3. Results

PG&E conducted the DR assessment utilizing the GE unit. PG&E tested the end to end communication and DR capability of this water heater by installing a Smart Meter™ and communication software. The goal of this DR test is to validate whether or not the water heater will switch to different operational modes when it receives signals from the Smart Meter™. For the test, the Smart Meter™ Zigbee® communication device was used to communicate directly with the water heater, so the test environment will be very similar to actual deployment of this technology in the future.

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Test was completed in 2010 and results were gathered and analyzed. The water heater received and responded properly to the DR signals by switching the unit's mode of operation.

A final report was generated and it is posted to the ETCC website on the following link:

http://www.etcc-ca.com/component/content/article/29/3012-evaluation-of-the-general-electric-heat-pump-water-heater

4. Next Steps

As the data that was gathered during this lab assessment validated the communication attributes of HPWH to respond appropriately to the DR signal, it presented the possibility of some DR potential, depending on the real-life water consumption conditions. To further assess this technology, PG&E will analyze the findings from a field study that is being conducted by a third party and incorporate the results of this lab assessment to validate the DR potential. The field study will look at normal home energy consumption due to HPWH usage during different seasons. This will provide PG&E information regarding the demand on hot water and associated energy consumption and usage behavior of HPWH during peak periods.

B. AutoDR Technology for Small and Medium Business

1. Overview

All SMB customers will be defaulted into the Peak Day Pricing Program on November 1, 2011.[1] PG&E would like to assist this group of customer to adopt this new rate schedule by exploring and assessing new DR technologies that utilize AutoDR infrastructure.

The primary objective of this project is to test the deployment of automation equipment for small commercial facilities to enable them to participate in PG&E's AutoDR program and dynamic pricing. PG&E conducted this assessment in collaboration with the Demand Response Research Center (DRRC) of Lawrence Berkeley National Laboratories (LBNL) and Honeywell (formerly Akuacom) in the summer of 2010. The goal is to identify technologies that could be deployed in large quantities in 2011, when new dynamic pricing rates for SMB customers take effect.

[1] On January 14, 2011, PG&E filed a Petition for Modification of D.10-02-032 (the PDP Decision). PG&E's petition proposes to change the November 1, 2011 default date for SMB customers to November 2012 for mandatory TOU and March 2013 for default PD, among other things. PG&E's petition is pending.

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2. Collaboration

This project is a collaborative effort with LBNL, and results will be shared with other IOUs during scheduled monthly conference calls.

3. Results

The RFP process was completed in the second quarter of 2010 and the ET assessment was conducted during the 2010 DR season (summer 2010). The pilot tested technologies from 8 different vendors at 10 SMB sites in different regions within the PG&E service territory. The three types of technologies that were tested were: HVAC control, lighting control and plug-load. Data was gathered and analyzed to be presented in a final report. All the tested devices did receive the Open ADR signal and shed load. Initial analysis of the gathered data showed a DR potential and functionalities that can fit with the market segment under study. A draft report was released in February 2011 to the stakeholders for review and the final report is scheduled to be released to the public around the beginning of the second quarter, 2011.

4. Next Steps

Using the information gathered in this ET assessment, PG&E plans to offer technology incentive to SMB customers who adopt the qualified technologies as part of PG&E's AutoDR program. The final report will be provided to all pilot participants and the public so that technology vendors can improve their technologies based on the report recommendations.

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III. Projects initiated in 2010

A. DR potential in Data Center Phase 2

1. Overview

In 2008, PG&E began to collaborate with DRRC to identify the DR potential in Data Centers. Phase 1 of this project was a scoping study that evaluated both the technical and institutional capabilities and the opportunities and sensitivities of DR in data center operations (http://drrc.lbl.gov/pubs/lbnl-3047E.pdf). Specific research questions addressed include:

- What are the different types of data centers?
- What types of virtualization technologies and strategies are most promising for DR/AutoDR?
- What are the other advanced technologies (load migration, cloud computing, storage, etc) that are used for disaster recovery that may also be used for DR?
- What are the load patterns and potential magnitude of these sheds or shifts with no or minimal impact on business and/or operations?
- How readily can these sheds or shifts be made responsive to the existing AutoDR infrastructure?
- What concepts and opportunities exist for providing AutoDR enabled products that would facilitate automation of data center strategies?
- What are next steps and field study requirements and barriers, if any, for data center participation in DR/AutoDR?

The final scoping study was completed in October 29, 2009. Shortly after, PG&E started to work with DRRC to prepare for the Phase 2 of this project. The objectives of Phase 2 are:

- Develop a draft plan for AutoDR tests in 3 to 5 data centers to examine the range of strategies, data center server designs, load reduction technologies, vendors, and HVAC and server integration issues.
- Develop technology vendor and data center selection criteria and conduct initial discussions with potential sites concerning participation in a demonstration.
- Develop a monitoring and technology evaluation plan, on manual and AutoDR integration approach, and DR test concepts.

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2. Collaboration

This project is a collaborative effort with LBNL and results will be shared with other IOUs during scheduled monthly conference calls. SDG&E is partnering with PG&E on this ET assessment.

3. Status

Negotiations with LBNL on contract terms and conditions negotiations are completed and the contract for the Data Center Phase 2 is in the final approval process.

4. Next Steps

Once the contract with DRRC is completed, technology providers, test sites and Data Center load shed strategies will be identified to prepare for field testing based on the results from Phase 1. After the completion of the field assessment, work will continue with DRRC to summarize results in a report. The report will describe DR Technologies for data centers and summarize the pros and cons (and issues) of recommended DR strategies to enable manual and AutoDR for data centers.

B. Demand Response for Title 24

1. Overview

The primary objective of this project is to develop a case study on DR lighting and HVAC technologies for the next Title 24 release. In 2008, PG&E began working with multiple stakeholders to incorporate DR regulations into the 2009 California Building Energy Efficiency Standards (Title 24). The language in the current Title 24 regarding this topic is as follows:

Section 131(g) 2008 Title 24:
"(g) Demand responsive automatic lighting controls that uniformly reduce lighting power consumption by a minimum of 15 percent shall be installed in retail buildings with sales floor areas greater than 50,000 square feet.

EXCEPTION to Section 131(g): Buildings where more than 50 percent of the lighting power is controlled by day lighting controls."

In this project, PG&E is looking to expand the scope to incorporate other types of commercial buildings in Title 24. The new proposed language for the next cycle of the standard is:

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"(g) In buildings larger than 8,000* square feet, all lighting meeting the requirements of Section 131(b) shall be capable of being controlled over the range of operation described in Table 131-A by a demand responsive lighting control.

Buildings larger than 8,000* square feet, excluding residential common areas, areas with automatic daylight controls, or any space with an LPD less than or equal to 0.5 W/s.f., shall have demand responsive lighting controls capable of temporarily limiting lighting power to no more than 85% of the permanently installed lighting power in the enclosed space. If general lighting is reduced, it must be done in a uniform manner in accordance with Section 131(b)."

2. Collaboration

This project is a joint effort with other IOUs.

PG&E's DR ET team collaborated with internal EE Emerging Technology team on this project on funding and project administration and implementation.

3. Status

The three IOUs are working with the California Energy Commission (CEC) to define the language in the Title 24 standard related to DR Lighting Control and the PCT. A preliminary case study for the lighting standard is completed and it was submitted to CEC for the next code process on March 21, 2011.

4. Next Steps

Once the case study is finalized and approved, it will be incorporated into the next Title 24 code and standard. The IOUs will work with other stakeholders on the education regarding and adoption of this new Title 24 code.

C. Agricultural Irrigation Optimization Tool

1. Overview

The objective of this assessment is to investigate the DR potentials in an agricultural irrigation optimization system that incorporates pump control in the agricultural industry.

Most irrigation takes place in the summer months when there is a higher demand on electricity. 10 Billion kWh is consumed annually during peak months of the year. 81% of PG&E agricultural energy sales are to

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customers on TOU rates. However, crop requirements take a higher priority over the high energy prices during peak periods. In addition, most pumps are manually controlled.

The scope of this project is to investigate market opportunities, research existing technologies and perform technology assessment to verify DR potentials of such agricultural irrigation optimization system.

2. Collaboration

PG&E's DR ET team is planning to collaborate with internal EE Emerging Technology team on this project. Assessment status and findings will be shared with other IOUs during monthly DR ET conference call.

3. Status

PG&E is planning to engage few industry expert consulting firms to set up the system, define the test procedure, gather the data and analyze the finding. A short list of the consulting firms is being identified and discussion is in planning phase. The plans for this project is to be completed by end-of-year 2011 and a final report will be generated to provide a better understanding of the potential of DR in this market.

PG&E has been engaged in discussions with the vendor and has prepared a rough project plan. The target is to have the system implemented at few sites and tests to be conducted over the 2011 summer season.

4. Next Steps

This project is in its initial phases. The ultimate objective is to qualify such applications whether they have DR potential and benefits and based on that, to offer an Enabling Technology incentive for such applications for the Agricultural Irrigation market.

D. Adoption and Outreach of AutoDR

1. Overview

The objective of this project is to facilitate and accelerate the adoption and outreach of AutoDR both in new construction and in existing buildings, engage industry stakeholders and participants, and provide support to codes and standards.

This project consists of two sub-projects:

A) Mainstreaming AutoDR

The goal of this sub-project is to formalize the current AutoDR advancement efforts to mainstream AutoDR for wide-scale

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adoption in form of a) education and training of target stakeholders for different end-use sectors (e.g., Commercial, Industrial), b) assessment of detailed control system capabilities and vendor and c) building load shape changes and shed attenuation. This initiative will engage the IOUs to get involved including working with industry leaders to mainstream AutoDR.

B) AutoDR Codes and Standards

The goal of this sub-project is to incorporate AutoDR technologies and strategies into the California codes and standards (Title 24 and Title 20).

2. Collaboration

This project is a collaborative effort with LBNL. Both SCE and SDG&E are partnering with PG&E on this ET project. The IOUs will discuss project status and issues during monthly IOUs DR ET conference call.

3. Status

PG&E is expecting to have the agreement completed by early second quarter 2011 and will work with the lab to commence the project.

4. Next Steps

Mainstreaming AutoDR – PG&E will work with other stakeholders to publish the marketing and outreach materials.

AutoDR codes and standards – PG&E will work with CEC and other 3rd parties to incorporate the report into a Title 24 case study for code standard consideration.

E. Industrial DR

1. Overview

The objective of this project is to investigate the relationship between demand response (automated and manual), load management, controls capabilities and the level of success experienced by the industrial site in implementing the energy management standard.

2. Collaboration

This project is a collaborative effort with LBNL. SCE is partnering with PG&E on this ET project.

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3. Status

PG&E is expecting to have the agreement completed by early second quarter and we will work with the lab to commence the project.

4. Next Steps

Based on the phase 1 scoping study, it is likely that PG&E will perform a phase 2 study to identify appropriate technology solution and best practices for the industrial customer to participate in DR.

IV. Budget

PG&E is on track to accomplishing the DR ET goal as described in section 3 F of the Amended Testimony in Support of Pacific Gas and Electric Company's Amended Application for Approval of Demand Response Programs, Goals, and Budgets for 2009-2011 (A.08-06-003). Based on the projects executed so far, here are the actual program costs for 2009 and 2010 and the available budget for 2011.

2009 Actual Program Cost:	$198,273
2010 Actual Program Cost:	$240,632
Total Cost Through 2010:	$438,905
Available Budget for 2011:	$1,982,095

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