

Members of the public wishing to address the Board are requested to complete a sign-up slip at the lobby information center. Statements shall not exceed three minutes, unless the Board President grants special permission.

AGENDA

**SACRAMENTO MUNICIPAL UTILITY DISTRICT
BOARD OF DIRECTORS' MEETING
SMUD CUSTOMER SERVICE CENTER
RUBICON ROOM - 6301 S STREET
SACRAMENTO, CALIFORNIA**

October 20, 2016 – 6:00 p.m.

Call to Order.

a. Roll Call.

1. Approval of the Agenda.
2. Approval of the minutes of the meeting of October 6, 2016.
3. Committee Chair Reports.
 - a. Committee Chair report of October 18, 2016, Strategic Development Committee
 - b. Committee Chair report of October 19, 2016, Policy Committee

Items 5 through 8 were reviewed by the Policy Committee on October 19, 2016. Item 9 was reviewed by the Energy Resources & Customer Services Committee on October 5, 2016.

Comments from the public are welcome when these agenda items are called.

Consent Calendar:

4. Approve Board member compensation for service rendered at the request of the Board (pursuant to Resolution 02-12-14) for the period of October 1, 2016, through October 15, 2016.
5. Accept the monitoring report for **Strategic Direction SD-2, Competitive Rates**. Policy Committee 10/19. (Jim Tracy)

- 6. (a) Accept the monitoring report for **Strategic Direction SD-9, Resource Planning.**
- (b) Approve revisions to **Strategic Direction SD-9, Resource Planning.**

Policy Committee 10/19. (Jim Tracy)

- 7. Accept the monitoring report for **Strategic Direction SD-13, Economic Development Policy.** Policy Committee 10/19. (Jim Tracy)

- 8. Authorize the CEO and General Manager, or his delegate, to negotiate and execute all agreements necessary to facilitate SMUD's participation in the **California Independent System Operator (CAISO) Energy Imbalance Market (EIM).** Policy Committee 10/19. (Laura Lewis)

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Discussion Calendar:

- 9. Adopt the **California Environmental Quality Act (CEQA) Initial Study and Mitigated Negative Declaration (IS/MND)** for the **Franklin Electric Transmission Project (Project)**, adopt the **Mitigation Monitoring and Reporting Plan**, and approve the **Project.** Energy Resources & Customer Services Committee 10/5. (Gary King)

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Public Comment:

- 10. Statements from visitors (non-agenda items).

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Board and CEO Reports:

- 11. Directors' Reports.
- 12. President's Report.
- 13. CEO's Report.
 - a. Board Video re SMUD's Work with Freedom Schools

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ANNOUNCEMENT OF CLOSED SESSION AGENDA:

- 1. Conference with Real Property Negotiator

Pursuant to Section 54956.8 of the Government Code:

Property: A portion of APN 132-0132-029 in Sacramento County.
 Agency negotiator: Blandon Granger.
 Negotiating parties: Renee Kloss Trust, Laurent Henry Kloss and Craig Clayton Kloss.
 Under negotiation: Price.

Board Committee Meetings and Special Meetings of the Board of Directors are held at the SMUD Customer Service Center, 6301 S Street, Sacramento

| | | | |
|------------------|---|---------------|-----------|
| October 18, 2016 | Strategic Development Committee and Special Board of Directors Meeting | Rubicon Room* | 5:30 p.m. |
| October 19, 2016 | Policy Committee and Special Board of Directors Meeting | Rubicon Room | 5:30 p.m. |
| November 1, 2016 | Finance and Audit Committee and Special Board of Directors Meeting | Rubicon Room | 5:30 p.m. |
| November 2, 2016 | Energy Resources & Customer Services Committee and Special Board of Directors Meeting | Rubicon Room | 5:30 p.m. |

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2017 Budget Review

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|-------------------|--|--------------|-----------|
| November 9, 2016 | SMUD 2017 Budget Overview, including Debt Service, Pay Schedule and Special Compensation and Corporate Services Business Unit 2017 Budget; Internal Services Business Unit 2017 Budget; Energy Operations Business Unit 2017 Budget. | Rubicon Room | 5:00 p.m. |
| November 10, 2016 | Customer and Community Services Business Unit 2017 Budget; Technology Business Unit 2017 Budget; Energy Assets Unit 2017 Budget; and CVFA, SCA, SPA, SFA and NCGA1 2017 Budgets | Rubicon Room | 5:00 p.m. |

**The Rubicon Room is located on the first floor of SMUD Customer Service Center, 6301 S Street, Sacramento, CA*

**Board of Directors' Regular Meetings are held at the SMUD Customer Service Center,
6301 S Street, Sacramento**

| | | |
|-------------------|--------------|-----------|
| November 3, 2016 | Rubicon Room | 6:00 p.m. |
| November 17, 2016 | Rubicon Room | 6:00 p.m. |

**The Rubicon Room is located on the first floor of SMUD Customer Service Center, 6301 S Street, Sacramento, CA*

Members of the public wishing to address the Board should complete a sign-up form available at the table outside of the meeting room. Members of the public shall have up to three (3) minutes to provide public comment on items on the agenda or items not on the agenda, but within the jurisdiction of SMUD. The total time allotted to any individual speaker shall not exceed nine (9) minutes.

Members of the public wishing to inspect public documents related to agenda items may call 916-732-7143 to arrange for inspection of the documents at the SMUD Customer Service Center, 6301 S Street, Sacramento, California.

NOTE: Accommodations are available for the disabled public. If you need a hearing assistance device or other aid, please call 916-732-7143 in advance of this Board Meeting.

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: Board of Directors

DATE: September 30, 2016
Audit Report No. 28006452

FROM: Claire Rogers 

SUBJECT: Board Monitoring Report; SD-9—Resource Planning

Audit and Quality Services (AQS) reviewed the SD-9 Board Strategic Direction on Resource Planning 2016 Annual Monitoring Report. AQS performed the following review steps:

- Inquired and reviewed the methodology utilized to prepare this monitoring report;
- Based on AQS's cumulative audit knowledge and experience, validated the reasonableness of statements and assertions; and
- Analytically reviewed the monitoring report as a whole to determine the possible existence of material misstatements.

AQS did not audit all source data used to prepare this report. During the course of the review, nothing came to the auditor's attention that would suggest the report did not fairly represent the source data available at the time of the review.

CC:

Arlen Orchard

SD-9 – Board Strategic Direction on Resource Planning October 2016

I. Background

It is a core value of Sacramento Municipal Utility District (SMUD) to provide its customer-owners with a sustainable power supply through the use of an integrated resource planning process. A sustainable power supply is defined as one that reduces SMUD's net long-term greenhouse gas (GHG) emissions to serve retail customer load to 350,000 tonnes (10% of its 1990 carbon dioxide emission levels) by 2050, while assuring reliability of the system, minimizing environmental impacts on land, habitat, water quality, and air quality, and maintaining a competitive position relative to other California electricity providers. In reducing its net GHG emissions, SMUD will utilize energy efficiency, renewable and net carbon free resources, including large hydroelectric resources and biogas. SMUD may also use offsets to support these goals to the extent their use is cost effective and beneficial to SMUD customers and the region.

To guide SMUD in its resource evaluation and investment, the Board sets the following interim goals:¹

| Year | Net Greenhouse Gas Emissions (tonnes) |
|------|--|
| 2012 | 2,608,000 |
| 2020 | 2,318,000 |

In keeping with this policy, SMUD shall also achieve the following:

- A.** SMUD's goal is to achieve energy efficiency equal to 15% of retail load over the next 10-year period. On an annual basis, SMUD will achieve energy efficiency savings of 1.5% of the average annual retail energy sales over the three-year period ending with the current year.

To do this, SMUD will acquire as much cost effective and reliable energy efficiency as feasible through programs that optimize value across all customers. SMUD shall support additional energy efficiency acquisition by targeting one percent (1%) of retail revenues for above market costs associated with education, market transformation, and programs for hard to reach or higher cost customer segments. The market value of energy efficiency will include environmental attributes, local capacity, value, and other customer costs reduced by an efficiency measure.

- B.** Provide dependable renewable resources to meet 20% of SMUD's load by 2010, and 33% of its load by 2020, excluding additional renewable energy acquired for certain customer programs. In acquiring renewable resources, SMUD shall emphasize local and regional environmental benefits.

- C.** Promote cost effective, clean distributed generation through SMUD programs.

¹ These goals do not take into account the potential impacts of the electrification of transportation.

II. Executive Summary

SMUD's IRP process has allowed SMUD to create a portfolio of resources, which balances reliability, environmental, financial, and customer objectives while achieving the goals set forth in SD-9 in a reasonable and affordable way. SMUD continues to invest in the development and implementation of new programs and projects to meet all future goals and objectives.

This report demonstrates the ways in which SMUD complies with the goals set forth in the Resource Planning Strategic Directive (SD-9). **Currently, SMUD complies with each of the goals established in SD-9.** A detailed list of compliance for interim GHG reduction goals, energy efficiency (EE) savings, demand reduction (DR), renewable energy supply, and local environmental benefit objectives are summarized within this report.

In 2015, SMUD had normalized GHG emissions of 2,476,221 metric tons. This puts SMUD well on the path to meet its 2020 SD-9 goal of 2,318,000. SMUD exceeded its EE goal of 167.8 GWh with 179.8 GWh of energy saved in 2015. Currently, SMUD is on track to meet both its 2016 & 2020 Renewable Portfolio Standard (RPS) targets of satisfying 25% and 33% of retail sales with qualifying renewables.

III. Additional Supporting Information

Sustainable Power Supply (GHG targets and Goal)

SMUD's adjusted GHG footprint in 2015 was approximately 2.48 million metric tons, and adjustments to the actual 2015 footprint include:

- Decreases to account for lower than expected hydro and wind production
- Increases to account for lower energy usage by SMUD customers
- Increase for "banking" of renewable energy credits (REC)

In 2015, SMUD procured more RECs than was required to comply with California's RPS. SMUD assumes the renewable attribute of the surplus power is banked for future use; the remaining energy component is not a renewable resource, which adjusts the emissions upwards. Table 1 summarizes actual emissions and adjustments to reflect normal weather conditions, expected energy usage, and the REC banking adjustment.

Table – 1 Carbon Footprint & Targets

| 2015 SD-9 Carbon Footprint & Near-term Targets ² | | |
|---|-----------------|---------------------|
| Source | Net Power (MWh) | CO2e Emissions (MT) |
| Net Generation and Power Purchases ³ | 12,705,292 | 3,299,260 |
| Wholesale | (1,677,566) | (507,567) |
| SMUD Electric Sales, SMUD Usage and System Losses | 11,027,726 | 2,791,693 |
| Adjustment for Normal Load | | 14,024 |
| Adjustment for Normal Wind and Hydro | | (339,854) |
| REC Banking Adjustment | | 10,357 |
| SMUD Normalized Total | | 2,476,221 |
| 2020 Target | | 2,318,000 |

A. Meet Energy Efficiency Goals

2015 Energy Savings

SMUD's EE savings exceeded the SD-9 energy savings goals established for 2015. Table 2 summarizes energy savings from SMUD's residential and commercial energy efficiency programs.

Table 2 – Comparing 2015 Energy Savings with SD-9 Goals

| Program Type | Energy Savings (Annual GWh) |
|---------------------------------|-----------------------------|
| Information & Education Savings | 8.0 |
| Existing Residential | 80.4 |
| Existing Commercial | 78.0 |
| New Construction | 13.1 |
| Shade Trees | 0.4 |
| Total | 179.8 |
| SD-9 Goals for 2015 | 167.8 |

B. Meet Renewable Goals; Emphasize Local and Regional Benefits

Meeting RPS 2020 & 2030 Targets

Senate Bill 2 in 2011 (SBX1-2) established a RPS obligation of 33% by 2020 for local publicly owned utilities (POUs) as well as retail sellers. SBX1-2 gave the California Energy Commission (CEC) new oversight responsibilities with respect to the RPS requirements for POUs, and included new interim targets leading up to the 33% by 2020

² SMUD's thermal power plants have been verified by an independent third party

³ Emissions include emissions from SMUD usage and System Losses

target. Senate Bill 350 (SB 350) in 2015 extended the RPS regulation beyond 2020 to a 50% level by 2030.

POUs are required to procure 25% of their retail sales from renewable sources by the end of 2016, and 33% renewables by the end of 2020. Under SB 350 POUs are required to procure 40% renewables by the end of 2024, 45% by the end of 2027, and 50% by the end of 2030. The CEC is currently developing regulations to implement SB 350.

SMUD is on track to meet the RPS requirement for Compliance Period 2 (2014-2016) with continuing procurement, historic carryover, and surplus from the first compliance period. As illustrated in Table 3, any renewable power in excess of an annual or compliance period target will be banked as credit to be applied in future years.

Table 3 – SMUD’s Renewables Goals and Accomplishments

| Program | 2015 Goal | 2015 Net Procurement ⁴ | 2015 Banked Surplus | 2016 Target | 2020 Target |
|-----------|-----------|-----------------------------------|---------------------|--------------|--------------|
| RPS | 20% | 20.3% | 0.3% | 25% | 33% |
| RPS (GWh) | 2,049 | 2,081 | 32 | 2,505 (est.) | 3,475 (est.) |

Meeting Future RPS Goals

To continue progress in achieving future RPS goals, staff has conducted a number of procurement efforts in 2015 including the following:

- SMUD is working with the Rancho Seco LLC to install a 10.88 MW solar photovoltaic (PV) project on SMUD’s Rancho Seco property.
- SMUD supported the development of an anaerobic digester at the Van Steyn Dairy.
- The SMUD Board of Directors approved a plan to buy power from Grady Wind Center LLC, which is developing a 200-megawatt wind facility in New Mexico.
- SMUD staff is planning a new small hydro facility near the current Slab Creek reservoir in the Upper American River Project.
- By the end of 2015, SMUD had 17.6 MW of behind the meter renewable systems through interconnection and incentive payment agreements. SMUD has 9.55 MW certified by the CEC and registered in the regional tracking system (WREGIS).

Renewable Projects, Demonstrations, & Studies

SMUD completed many grant-funded projects, demonstrations, and studies in 2015. A detailed description of these projects is included in Appendix C.

Plug In Hybrids and Battery Electric Vehicles

SMUD continued its efforts to support and advance plug in hybrids and battery electric vehicles through a variety of activities including the following:

- At the 2015 Sacramento Auto Show, over 1000 participants test-drove a plug-in electric vehicle (PEV) as part of SMUD’s outreach booth.

⁴ Net Procurement reflects removal of RPS eligible procurement used to meet Greenergy and Solar Shares.

- As of spring 2016, approximately 4000 PEV's are registered in SMUD's service territory.
- As of the end of 2015, SMUD had two DC Fast Charger stations operational, with four more stations expected to be opened by the end of 2016.
- SMUD's Workplace and Multi-family Charging Infrastructure pilot achieved 100% of its goal of 24 charger installations in 2015.
- SMUD acquired 7 JEMS Trouble Trucks that utilize electricity for auxiliary power and boom operation (versus diesel generator power) at job sites to reduce emissions and noise. SMUD also has 18 PEV's in its light duty PEV fleet.

Additional Grant Opportunities

New South Fork Powerhouse and Boating Flow Valve Project - Project to add a new, small hydroelectric powerhouse (~10 GWh/year) near Slab Creek Dam (Additional details for this project are available in Appendix D)

C. Promote Cost Effective Clean Distributed Generation and Storage

Senate Bill 1 (SB1) Solar Status

The residential installed solar capacity in 2015 was double from 2014, while the commercial sector increased slightly from the previous year. As of mid-2016, SMUD had exhausted all of the SB1 Program funds budgeted for residential and commercial installations, and expects to surpass the established 125 MW SB1 program target by the end of 2016.

SolarShares

Participation in the Residential SolarShares program remained strong in 2015, with 90.3% subscribed by year-end. Customers received 14 GWh of solar energy through the program.

California Solar Initiative: PV Integrated Storage

SMUD tested control strategies to both reduce customer energy bills and provide distribution system benefits for PV integration at the Zero Net-Energy development at 2500 R Street in Sacramento. These strategies included time-of-use pricing and peak load reduction, DR, and load shaping. The analysis considered customer economic and new feature (backup power) benefits, and utility bulk and locational benefits to the distribution system. Findings influenced recommendations for rates and programs that will be presented in a final report by the end of 2016.

IV. Recommendation

It is recommended that the Board accept the Monitoring Report for SD-9. It is also recommended the Board accept updating the SD-9 Renewable Energy goal to incorporate the State's new RPS target of fifty percent (50%) renewables by 2030.

Appendix A – SD-9 History

SD-9, adopted by the Board of Directors in 2014, provides guidance to SMUD staff with goals for carbon mitigation, energy efficiency, and renewable power. In December 2008, the Board added sustainable power supply as the overall objective of the integrated resource planning (IRP) process. The objective's stated goal is the reduction of SMUD's long-term GHG emissions for serving retail load from its current state to 10% of its 1990 GHG emission levels by 2050 (i.e. - <350,000 metric tons/year).

The 2009 policy revision (Resolution 09-11-08) advanced the RPS target to procure 20% of SMUD's annual energy sales from renewables by 2010 (instead of 2011), and added a target of 33% annual energy sales met by renewables by 2020. Subsequently in May 2011, the Board added interim GHG targets for years 2012 and 2020, to establish a trend toward long-term GHG goals, and clarification for alternatives to achieve targets and goals.

SD-9 directs electric energy, renewable energy supply, and clean distributed generation policy through the year 2020. The directive also contains requirements for an IRP process to achieve these directives and balance them with other policies including financial, customer, local environmental impacts, and reliability directives. SMUD will continue its IRP process focusing on achieving the long run resource planning goals established by SD-9.

SD-9 also includes cost effective demand reduction resources (e.g. distributed storage, demand response, direct load management, and time-of-use pricing) as tools available to meet demand reduction goals. Accordingly, demand reduction goals will be updated after staff gains more insight into demand reduction program capabilities from pilot program studies currently under development through the various initiatives.

AB 2514 required the governing board of each local publicly owned electric utility (POU) to initiate a process to determine appropriate energy storage targets, if any, for the utility by before March 1, 2012. AB 2514 specifically provides that all procurement of energy storage systems must be cost effective. These targets were to be achieved by December 31, 2016, and December 31, 2021, if energy storage was determined to be cost effective.

In accordance with AB 2514, on March 1, 2012, the Board initiated a process under which staff considered energy storage options through the IRP. Based on the IRP findings in 2014, staff determined that an energy storage target was not justified because it was not cost effective. Accordingly, on September 4, 2014, the Board determined that adoption of an energy storage target was not appropriate. AB 2514 requires, the Board to re-evaluate its determination of appropriate storage targets at least every three years. SMUD staff will reevaluate potential storage options and make a determination on its cost effectiveness within the three-year requirement.

SMUD is also monitoring and supporting plug-in vehicle market adoption given that these technologies reduce GHG emissions in our community and have other grid benefits.

Appendix B – SD-9 Objectives to Meet Goals

Goal A – Energy Efficiency

Objectives to meet the goal

Explore the potential for cost effective energy efficiency and peak reduction programs in SMUD's territory.

1. Encourage energy efficiency and peak reduction programs through marketing program options, offering rebates, and exploring new technologies that could be adopted in SMUD's service area.
2. Offer customers time-differentiated tariffs that encourage shifting power use to off-peak periods.
3. Provide energy efficiency incentives and load management programs that focus on power shifting or reduction during the summer peak.

Goal B – Renewable Energy

Objectives to meet the goal

1. Support local projects and initiatives that improve air quality in the Sacramento area.
2. Purchase or construct additional renewable generation sufficient to achieve 25% RPS by the end of 2016 and 33% RPS by the end of 2020.
3. Promote the adoption of plug-in electric vehicles to improve the air quality in our region, reduce GHG emissions, and provide for grid benefits.

Goal C – Distributed Generation and Storage

Objectives to meet the goal

1. Support the installation of PV units on customer sites and small solar generation projects connected to SMUD's distribution system.
2. Support the installation of clean distributed generation and storage.
3. Create an established and quality solar industry infrastructure that sustains itself in a subsidy-free marketplace.

Appendix C – Detailed Project Descriptions

Table C-1 summarizes energy and demand savings from SMUD’s residential and commercial energy efficiency programs.

Table C-1 – Comparing 2015 Energy and Demand Savings with SD-9 Goals

| Program Type | Avg. Demand Savings (MW 4-7PM) | Energy Savings (Annual GWh) |
|---------------------------------|--------------------------------|-----------------------------|
| Information & Education Savings | 1.2 | 8.0 |
| Existing Residential | 12.3 | 80.4 |
| Existing Commercial | 11.8 | 78.0 |
| New Construction | 1.2 | 13.1 |
| Shade Trees | 0.2 | 0.4 |
| Total | 26.7 | 179.8 |
| SD-9 Goals for 2015 | 25.5 | 167.8 |

Table C-2 details accomplishments for various energy efficiency programs SMUD offers.

Table C-2 – 2015 Energy Efficiency Program Accomplishments

| Measures & Projects | Results |
|---|-----------|
| LED/CFL Bulbs Sold | 1,422,824 |
| LED/CFL Fixtures Sold | 259,236 |
| Shade Trees Planted | 9,838 |
| Old Refrigerators Recycled | 6,384 |
| Residential HVAC Installations | 4,387 |
| Multifamily Retrofits Completed | 2,369 |
| Commercial Projects Through Express Energy Solutions | 1,297 |
| Whole House Fans Purchased | 999 |
| Efficient Room Air Conditioners Purchased | 625 |
| Commercial Projects Completed Complete Energy Solutions | 588 |
| Residential Retrofits Completed | 580 |
| Efficient Clothes Washers Purchased | 173 |
| Efficient Refrigerators Purchased | 142 |
| Custom Commercial Projects Completed | 90 |
| Residential Heat Pump Water Heaters Installed | 84 |
| Efficient Clothes Dryers Purchased | 30 |
| New Efficient Commercial Buildings Constructed | 25 |

New Residential Time-Of-Use Rates

On July 16, 2015, the Board approved a new optional residential time-of-use (TOU) rate to replace SMUD’s current optional residential TOU rates, and declared its intent to make the TOU rate the standard rate for residential customers in 2018. On April 20, 2016, the

Board met with representatives from Solar City, Haas School of Business and Energy Institute, and the Natural Resources Defense Council to gain insight from different perspectives on the development of TOU rates. In July 2016, TOU Qualitative Research will conduct focus groups to gain feedback on proposed TOU rates for 2018.

Existing Demand Response Programs

SMUD maintains a number of operation-ready load management programs, as summarized in Table C-3. These programs are available to Energy Trading & Contracts (ET&C) and Grid Planning & Operations for reliability purposes. In 2015, SMUD used demand response resources 11 times for peak load reduction purposes.

In 2015, the PowerDirect program (Commercial AutoDR) became an operational resource for ET&C. A range of 2.2 MW to 7.1 MW was realized when it was used 11 times during the summer.⁵

Table C-3 - Available Demand Response Programs

| Dispatchable Programs | Expected Load Shed Range (MW) |
|--|-------------------------------|
| Residential Air Conditioning Load Management <ul style="list-style-type: none"> • At participants maximum elected level of cycling (full cycling) • At 100% full shed (emergency shed) | 70 102 |
| Industrial Curtailment (One customer) | 6.5 |
| PowerDirect (Commercial AutoDR) | 10 |
| Total | 86.5 — 118.5 |
| Non-Dispatchable Programs | Expected Load Shed Range (MW) |
| Temperature Dependent Rate <ul style="list-style-type: none"> • Air Products • Linde | 0 - 9.5 0 - 6.5 |
| Total | 0 - 16.0 |

New Demand Response Program Offerings

- By the end of 2015, 4,950 customers were enrolled in either price-based or incentive based offerings. The seven original treatment groups were studied again in 2015 to determine what affects occurred with these customers from year to year.
- Six new treatment groups (1,569 total participants) were added to the residential PowerStat pilot program, using two-way communicating thermostats, in 2015 to test various forms of no-override offerings and different incentive levels. The treatment groups were dispatched 9 times. Load impacts were evaluated and customer satisfaction was assessed. The study will continue into 2016.

⁵ NERC WebDADs report

- The Demand Response Management System was assessed to determine the constraints placed on the underlying back-office systems as programs participants are scaled up, and what upgrades and process improvements are needed. A key take-away from this assessment was a Silver Spring Networks HAN Communication Manager (HCM) upgrade was needed to support direct-to-grid two-way air conditioner switch technology. A planned upgrade of Silver Spring Networks' HCM is planned for late 2016 or early 2017.

Peak Load per Customer

SMUD's projected normal weather peak load for customer base in 2016 was 4.87 kW per customer. Load per customer is a metric used to monitor the effectiveness of SMUD's efficiency and demand reduction programs. Historic load per customer data can be found in Table C-4.

Table C-4 – Actual and Weather-Normal Peak per SMUD Customer (kW)

| Year | Actual | Normal Weather |
|-------------------|--------|----------------|
| 2000 | 5.24 | 5.26 |
| 2001 | 4.73 | 4.96 |
| 2002 | 5.2 | 4.94 |
| 2003 | 5.13 | 5.11 |
| 2004 | 4.75 | 5.14 |
| 2005 | 5.17 | 5.14 |
| 2006 | 5.62 | 5.14 |
| 2007 | 5.27 | 5.14 |
| 2008 | 5.23 | 5.14 |
| 2009 | 4.79 | 5.09 |
| 2010 | 5.01 | 4.99 |
| 2011 | 4.75 | 4.97 |
| 2012 | 4.9 | 4.95 |
| 2013 | 4.95 | 4.86 |
| 2014 | 4.9 | 4.86 |
| 2015 | 4.8 | 4.86 |
| 2016 ⁶ | 4.8 | 4.87 |

Grant Funded Renewable Projects

- Demonstration of Biogas Clean-up and Solid Oxide Fuel Cell – SMUD in partnership with Fuel Cell Energy Inc. and TDA Research Inc. (as Prime), and with grant funding from US Department of Energy, completed the research and demonstration of a biogas clean-up system for solid oxide fuel cell (SOFC) application.

⁶ The current system peak load of 2,972 MW was reached on Wednesday, July 27, 2016. The daily high and low temperatures were 106 and 70 degrees Fahrenheit, respectively, measured at the Sacramento City and Executive Airport weather stations. The actual peak was slightly below than the forecasted peak of 3,027 MW, a difference of 55 MWs or 1.85 percent.

- South Area Transfer Station Biogas Energy Plant (SATS Digester) – In collaboration with SMUD, the CleanWorld completed the construction of the 25-ton-per-day (TPD) Phase-I Sacramento BioRefinery #1 (SBR1) at the County of Sacramento South Area Transfer Station (SATS). Further, a larger scaled-up system capable of diverting 100TPD (36,500 tons per year) of source-separated food waste was completed in December 2015.
- Biomass Gasification – SMUD, through AB 32 Cap & Trade Allowances Value Investment Initiative, is providing funds to help study a 3 MW biomass gasification project for distributed generation and combined heat and power (CHP) application. In addition, the SMUD received a US Forest Service grant to fund the pre-construction phase of the project.
- New Van Steyn Dairy Digester project in Elk Grove – SMUD through AB 32 Cap & Trade Allowances Value Investment Initiative provided funds to help implement another dairy digester at Van Steyn dairy farm in Elk Grove. Commercial operation of this digester system began in fall 2015.
- Pellandini Dairy Digester project in Galt – SMUD through AB 32 Cap & Trade Allowances Value Investment Initiative provided funds for the construction of an effluent pool at Pellandini dairy farm located in Galt, CA. This project is waiting for additional grant from US Department of Agriculture Natural Resource Conservation Service and for SMUD's power purchase agreement (PPA) approval. The biogas from Pellandini will be piped to Van Warmerdam dairy digester system.
- Strategic Planning and Operational Tools for Integration of Photovoltaic – SMUD is supporting DNV KEMA in conducting a research, demonstration and deployment project that targets the development of methodologies and software for evaluating high penetration PV on the distribution grids. This was completed in the summer of 2015.
- Intra-hour Dispatch and Automatic Generator Control Demonstration with Solar Forecasting Project – The objective of this project is to integrate new short-term solar forecasting into automatic generator control algorithms; and improve operations room dispatch of regulation resources based on solar forecasting information. This project was completed in the end of 2015.
- Distributed Resource Energy Analysis and Management System Development for Real-time Grid Operations – Hawaiian Electric Company is designing new capabilities to enable visibility to thousands of uncontrolled distributed roof-top PV resources and factor advance short-term wind and solar forecasting capability for the region into the energy management system. SMUD is playing a monitoring and advisory role in the project, and also evaluating the project for applicability. This project will be completed in mid-2016.
- Improving the Accuracy of Solar Forecasting – This is a multi-year project that is led by the University Corporation for Atmospheric Research. The primary objective is to develop a solar power forecasting system that advances the state-of-the-science. This project will be completed in mid-2016.

- Pre and Post Combustion NOx Control with Microwave Energy – This project will study an integrated microwave technology for biogas clean up and lower the NOx emission to 5 ppm level for a biogas-fueled engine-generator.
- Biogas Enhancement Project – SMUD accepted a grant from the CEC for a biogas enhancement project to study the additive mineral treatment process, developed and patented by Argonne National Lab. Bench scale and pilot tests were conducted at Argonne National Laboratory. A field demonstration was performed at CleanWorld's digester in Sacramento. Resource assessment and procurement plan for a potential food waste collection program was also completed to support this project. Construction of this project and initial performance testing was completed in 2015.

Renewable Energy Studies

- Wind Resource Site Evaluations – These projects included preliminary analysis for potential future wind plant development sites at North Lassen, South Lassen, and Abert Rim. The analysis was completed at the end of 2015.
- Quantifying the Externalities of Renewable Generation – This analysis focuses on quantifying difficult to quantify benefits of renewable generation in an objective fashion using existing methodologies to determine/calculate the indirect costs and benefits of renewable generation. These externalities include impacts to water usage, reduction in GHG, etc.
- Anaerobic Digestion of Food Wastes at HP Hood – SMUD completed a feasibility study of anaerobic digestion of organic wastes for CHP application at HP Hood Sacramento processing facility.
- Dairy Update in Sacramento County – SMUD completed a study of dairies in Sacramento County focusing on the potential of anaerobically digesting the dairy wastes to produce biogas for electricity generation.
- Analysis of Integrated Distributed Energy Resource – SMUD conducted an integrated Distributed Energy Resource analysis including the technical and market potential for Energy Efficiency, Demand Response, Photovoltaics, Electric Vehicles, and battery storage. This study is informing SMUD's planning process.
- Biomass Gasification for Pipeline Injection Study – SMUD completed the feasibility study of biomass gasification for pipeline injection. This study evaluated the cost and performance characteristics of thermal gasification of biomass for pipeline injection. Technical/engineering and economic feasibility analyses were performed along with assessments of the implications of thermal gasification of biomass for pipeline injection.
- Potential Utility-Scale PV or Concentrated Solar Power projects near SMUD Territory – SMUD completed a high-level technical and economic feasibility study of a potential utility-scale PV or CSP project near SMUD territory.
- Feasibility of Solar PV and Biogas Storage Integration – SMUD initiated a study on the feasibility of solar PV and biogas storage integration. The objectives of the study are to model the optimum performance of a hybrid biogas-photovoltaic system and assess/analyze the feasibility.

- Solar Irradiance Network Project – Verification of solar irradiance in Sacramento County.

Carbon Offset Demonstration and Protocol Development Projects

SMUD is exploring ways to sequester carbon in and around our service territory. Here is a summary of our current research agenda:

- Delta Carbon Capture & Wetlands Farming – SMUD collaborated with the Sacramento San Joaquin Delta Conservancy, The Nature Conservancy, Metropolitan Water District, the California Coastal Conservancy, and the American Carbon Registry to develop a GHG methodology for wetlands and rice farming in California. The draft protocol has been developed was circulated for public comment in late 2015. The revised draft is under peer review as of spring 2016.
- Placer Forest Sustainability Initiative – SMUD partnered with the Placer County Air Quality Management District to conduct research and develop GHG offset protocols for forest fuel management activities that preserve forests by reducing the impacts of catastrophic wildfire and black carbon emissions. This project will develop tool that can account quantitatively the ecosystem services and carbon emission savings. Greenhouse gas offset protocols for forest fuel management activities will be developed that will help reduce the impacts of catastrophic wildfire and reduce black carbon emissions. In addition, this work will allow for the increased pace and scale of management activities to reduce existing forest fuel load and utilization of forest biomass wastes for renewable bioenergy production. A draft protocol for avoided wildfire emissions was completed in 2015 and is now under peer review.

Other Carbon Reduction Research Projects undertaken in 2015

- Carbon Capture & Storage (CCS) Environment Scan – Following the 2014 deep dive into the potential for geologic sequestration of CO₂, staff undertook a high-level summary assessment of prospects for technological carbon capture and storage opportunities. Staff continues to track the development of a new Quantification Methodology for CCS at the California Air Resources Board, which could lead to the creation of a CCS offset protocol in the future.
- Biosequestration – Based on initial research conducted in 2013 and 2014 on the largest potential for local carbon offset project development and the major opportunities for regional carbon neutrality, staff began more detailed research into the potential for public-private partnership to accelerate carbon sequestration in the land base. In 2015, staff began identifying potential project partners and formulating a project approach.
- SMUD Marginal Emissions Factor – To better understand the GHG emissions implications of operational and program decisions as well as investments in renewables, energy efficiency and electrification, SMUD is undertaking an update of its marginal emissions factor and associated marginal costs. This work will assist in overall program planning, historical data tracking and reporting, and forward-looking scenario planning. This work launched in 2015 and is expected to conclude in 2016.

- Short-Lived Climate Pollutant Research and Program Development – In 2015 staff undertook a survey of significant regional short-lived climate pollutants (with very high global warming potential) to understand which of them might be influenced by SMUD via established energy efficiency rebate programs and relationships with commercial and industrial customers. The research revealed a major opportunity within the realm of commercial refrigerants. Staff began work with Custom Solutions to design a natural refrigerant incentive program that is expected to be released in 2016.

Water & Energy Assessment and Demonstration Projects

- SMUD funded four demonstration projects in partnership with local water agencies. The City of Sacramento leveraged the SMUD-funded pilot study to win a \$2.5 million dollar Department of Water Resources grant to expand their leak detection and repair program.

Additional Opportunities

- New South Fork Powerhouse and Boating Flow Valve Project – Staff continues moving forward with a Department of Energy (DOE)-funded project to add a new, small hydroelectric powerhouse near Slab Creek Dam. The new powerhouse would produce on average approximately 10 GWH annually, generated from new and higher minimum releases that are required at Slab Creek Dam under the new UARP license. Staff filed a Final Non-Capacity License Amendment Application with Federal Energy Regulatory Commission (FERC) for the new powerhouse in September 2014. SMUD's Owner's Engineer contractor has developed preliminary function designs and prepared a construction cost estimate. Staff has also submitted permit applications to several permitting agencies in preparation for constructing the project. Staff expects an Order from FERC authorizing project construction in August or September 2016. Staff has received SMUD Board of Directors approval to award a contractor to McMillen Jacobs to perform final design and construction of the project. A contract is in place and design work will begin in summer 2016, with project completion expected in late 2018.
- Sacramento Solar Canal – SMUD partnered with a private developer for a pilot proposal for a PV system suspended over the US Bureau of Reclamation (USBR) owned Folsom South Canal. The project was unsuccessful in securing WaterSMART grant funding, but USBR staff have continued working with SMUD to further refine the project.

Plug In Hybrids and Battery Electric Vehicles

- A residential light duty electric vehicle incentive program was launched in May 2016, with a \$300 per vehicle incentive to cover the cost of electricity for one year. The program is marketed as "Free fuel for a year". At the 2015 Sacramento Auto Show, over 1000 participants test-drove a PEV as part of SMUD's outreach booth. As of spring 2016, approximately 4000 PEV's are registered in SMUD's service territory.
- Recently a DC Fast Charger was installed at the Sacramento International Airport, bringing SMUD to three. The City of Sacramento requested the construction of the

Amtrak DC Fast Charging station to be delayed from 2015 to 2016 to accommodate additional parking lot design changes. The planned station at the Nugget Market in the Pocket Area was cancelled when contract negotiation for a property lease were unsuccessful

- SMUD's Workplace and Multi-family Charging Infrastructure pilot achieved 100% of its goal of 24 charger installations in 2015. Over a dozen have also been subscribed so far (out of a planned 24) in 2016.

Senate Bill 1 Solar Status

As of mid-2016, SMUD has exhausted all of the SB1 Program funds budgeted for residential and commercial installations. On July 5, 2016, SMUD moved to a contractor stipend payment of \$500 to assure the installation of PV production meter equipment. Table C-5 summarizes SMUD's progress by year in the five market sectors covered by the SB1 program.

Table C-5 – Installed and Expected PV under SB1 Program⁷

| | Residential Retrofit | | Solar Smart Homes | | Solar Shares & Multifamily Affordable VNM ⁸ | | Commercial Retrofit | | Totals | |
|---|----------------------|------|-------------------|-----|--|-----|---------------------|------|-------------------|-------------|
| | Installed Systems | MW | Installed Systems | MW | Installed Systems | MW | Installed Systems | MW | Installed Systems | MW |
| 2007 | 55 | 0.2 | 105 | 0.2 | 0 | 0 | 5 | 0.3 | 165 | 0.7 |
| 2008 | 73 | 0.2 | 255 | 0.5 | 1 | 1.1 | 10 | 1.5 | 339 | 3.3 |
| 2009 | 215 | 0.8 | 188 | 0.4 | 0 | 0 | 12 | 4.2 | 415 | 5.4 |
| 2010 | 368 | 1.5 | 222 | 0.5 | 1 | 0.5 | 20 | 8.9 | 611 | 11.4 |
| 2011 | 611 | 2.3 | 154 | 0.4 | 0 | 0 | 39 | 8 | 804 | 10.7 |
| 2012 | 752 | 3.4 | 298 | 0.8 | 3 | 0.1 | 29 | 7.6 | 1,082 | 11.9 |
| 2013 | 1,310 | 6.2 | 656 | 1.4 | 0 | 0 | 33 | 5.5 | 1,999 | 13.1 |
| 2014 | 1,406 | 7 | 476 | 1 | 0 | 0 | 34 | 2.3 | 1,925 | 10.3 |
| 2015 | 3,102 | 15.3 | 153 | 0.3 | 0 | 0 | 24 | 3.3 | 3,052 | 18 |
| 2016⁹ | 2,104 | 11.2 | 0 | 0 | 0 | 0 | 52 | 16.9 | 2,173 | 48.1 |
| TOTALS | 9,996 | 48.1 | 2,507 | 5.5 | 5 | 1.7 | 224 | 58.5 | 12,565 | 132.9 |
| Total MW Installed through the end of 2015 | | | | | | | | | | 84.8 |

SolarShares

SMUD is selling a Large Commercial SolarShares product in 2016, and is actively designing the Residential, Small and Medium Commercial for redeployment in 2017.

⁷ The Commercial Retrofit quantity increased. Current quantity reflects interconnection points rather than number of projects. Three multifamily projects had multiple interconnection points. Revised numbers more closely reflect the DOE EIA826 report. Solar Smart Homes was recalibrated after the close of that program in 2015. Quantities in 2015 reflect straggling installations from previous year commitments.

⁸ Virtual Net Metering

⁹ 2016 values are forecasted values based on June 20, 2016 data

SMUD BOARD POLICY

| | |
|--|---------------------------------------|
| Category: Strategic Direction | Title: Resource Planning |
| | Policy Number: SD-9 |
| Adoption Date: May 6, 2004 | Resolution No. 04-05-11 |
| Revision: May 6, 2004 | Resolution No. 04-05-12 |
| Revision: September 15, 2004 | Resolution No. 04-09-11 |
| Revision: May 17, 2007 | Resolution No. 07-05-10 |
| Revision: December 18, 2008 | Resolution No. 08-12-15 |
| Revision: November 19, 2009 | Resolution No. 09-11-08 |
| Revision: May 6, 2010 | Resolution No. 10-05-03 |
| Revision: May 19, 2011 | Resolution No. 11-05-05 |
| Revision: December 20, 2012 | Resolution No. 12-12-12 |
| Revision: October 3, 2013 | Resolution No. 13-10-09 |
| Revision: September 17, 2015 | Resolution No. 15-09-11 |
| <u>Revision: October 19, 2016</u> | <u>Resolution No. 16-10-XX</u> |

It is a core value of SMUD to provide its customer-owners with a sustainable power supply through the use of an integrated resource planning process. A sustainable power supply is defined as one that reduces SMUD's net long-term greenhouse gas (GHG) emissions to serve retail customer load to 350,000 tonnes (10% of its 1990 carbon dioxide emission levels) by 2050, while assuring reliability of the system, minimizing environmental impacts on land, habitat, water quality, and air quality, and maintaining a competitive position relative to other California electricity providers. In reducing its net GHG emissions, SMUD will utilize energy efficiency, renewable and net carbon free resources, including large hydroelectric resources and biogas. SMUD may also use offsets to support these goals to the extent their use is cost effective and beneficial to SMUD customers and the region.

To guide SMUD in its resource evaluation and investment, the Board sets the following interim goals:¹

| Year | Net Greenhouse Gas Emissions (metric tonnes) |
|------|---|
| 2012 | 2,608,000 |
| 2020 | 2,318,000 |

In keeping with this policy, SMUD shall also achieve the following:

- a) SMUD's goal is to achieve Energy Efficiency equal to 15% of retail load over the next 10-year period. On an annual basis, SMUD will achieve energy efficiency savings of 1.5% of the average annual retail energy sales over the three-year period ending with the current year.

To do this, SMUD will acquire as much cost effective and reliable energy efficiency as feasible through programs that optimize value across all customers. SMUD shall support additional energy efficiency acquisition by targeting one percent (1%) of retail revenues for above market costs associated with education, market transformation, and programs for hard to reach or higher cost customer segments. The market value of energy efficiency will include environmental attributes, local capacity value and other customer costs reduced by an efficiency measure.

- b) Provide dependable renewable resources to meet ~~20% of SMUD's load by 2010, and 33% of its load by 2020~~33% of SMUD's load by 2020, and 50% of its load by 2030, excluding additional renewable energy acquired for certain customer programs. In acquiring renewable resources, SMUD shall emphasize local and regional environmental benefits.
- c) Promote cost effective, clean distributed generation through SMUD programs.

Monitoring Method: GM Report
Frequency: Annual

¹ Note: These goals do not take into account the potential impacts of the electrification of transportation.