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Smart Grid Deployment Plan

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1 KEY TAKEAWAYS AND HIGHLIGHTS

As stated in its *Smart Grid Deployment Plan 2011-2020*[1] *("SGDP"),* San Diego Gas & Electric (SDG&E) defines the Smart Grid as "an end-to-end transformation of our electric system that applies advances in technology to deliver a range of new benefits to all stakeholders." This transformation is being driven by choices customers are making today including the adoption of renewable energy technologies, electric vehicles and emerging energy management tools and information services, as well as by the enactment of California's ambitious energy policy goals. SDG&E's vision for its Smart Grid transformation is to work in collaboration with key stakeholders to create the foundation for an innovative, connected and sustainable energy future.

While SDG&E's Test Year (TY) 2012 General Rate Case[2] (GRC) application is awaiting a California Public Utilities Commission (CPUC) decision, deployment of Smart Grid solutions are nonetheless urgently needed to successfully implement state energy policy goals and to keep pace with the needs of customers. Driven by that urgency, SDG&E is already moving forward with most of its planned Smart Grid projects, while regulatory approval of its GRC is still pending. This *Smart Grid Deployment Plan – 2012 Annual Report* (*"Annual Report")* provides stakeholders with an update on SDG&E's Smart Grid deployment as the San Diego region continues its rapid advance towards a smarter and cleaner energy future.

This *Annual Report* provides a status update to SDG&E's Smart Grid metrics, deployment costs, and benefits for the period of July 1, 2011 through June 30, 2012 ("the Reporting Period"). Other information provided in the report includes additional highlights through September 2012.

Highlights of SDG&E's Smart Grid deployment update include:

- Overall Smart Grid investments of ~$156 million and ~$40 million in benefits during the Reporting Period
- 63 Smart Grid and related enterprise[3] projects underway or in the planning process
- Completion[4] of deployment of Smart Meters to SDG&E residential customers, with a realized benefit of an estimated 10% decrease in SDG&E's fleet emissions
- Innovative new services enabled by Smart Meters introduced to customers, such as energy analysis tools in SDG&E's My Account online services, the Green Button, SDG&E's Reduce Your Use[SM] program, the Biggest Energy Saver Challenge, and the San Diego Energy Challenge

[1] A.11-06-006 filed June 6, 2011.
[2] A.10-12-005 filed on December 15, 2010.
[3] "Enterprise" projects are those that meet the broader needs of SDG&E's business but are also related to Smart Grid
[4] While not 100% complete, Smart Meter deployment is materially complete with a few exceptions, such as "hard to reach" customers, where additional network connectivity solutions are necessary. As of June 30, 2012 SDG&E's deployment was 98.7% complete.

- Nearly completed major transformative foundation projects such as the Geospatial Information System (GIS) and Outage Management System/Distribution Management System (OMS/DMS)
- Continued strong growth in distributed generation, with 4,426 new systems (primarily solar) connected by customers during the Reporting Period, for a total of 17,969 residential and commercial systems connected (over 1% of SDG&E's customer base) as of the end of the Reporting Period
- The San Diego region includes approximately 1,600 total plug-in electric vehicles (PEVs) connecting to SDG&E's system at the end of the Reporting Period[5], with 701 of those customers enrolling in time-differentiated electric vehicle rates to encourage off-peak charging and reduce their transportation fueling costs in addition to the avoidance of emissions as a result of displacing gasoline consumption[6]
- As one of the initiatives launched through SDG&E's collaboration with the Smart City San Diego effort, SDG&E supported the launch of car2go, the world's first deployment of an all-electric car sharing pilot sponsored by Daimler AG in November 2011; in the first 100 days of operation more than 6,000 people registered as members and more than 25,000 trips were taken in the smart electric car2go vehicles[7]
- SDG&E's Reduce Your Use program was launched in July 2012 to all residential and small business customers with Smart Meters[8] – the program called seven events to date, with more than half a million of SDG&E's customers receiving bill credits per event, and a 5X increase in the number of customers viewing their energy usage data online from June through August
- Continued engagement & outreach via regular briefings with feedback from key stakeholders across the SDG&E service territory
- Development of automated energy usage data transfers through the Green Button Connect My Data service, and companion mobile and social applications
- The operation of Condition-Based Maintenance (CBM) systems and processes has resulted in three avoided catastrophic equipment failures at three different substations during the Reporting Period, avoiding potential forced outages

[5] An exact number of PEVs connected to SDG&E's system is unavailable, as PEV drivers are not obligated to notify the utility, so estimates are compiled from a variety of data sources.
[6] Time-differentiated or time-of-use (TOU) rates at SDG&E include EV-TOU, EV-TOU-2, and the temporary experimental PEV rates EPEV-X, EPEV-Y and EPEV-Z. For details on the experimental rates, refer to Project 9 in this *Annual Report.*
[7] car2go press release, http://www.prnewswire.com/news-releases/6000-new-electric-vehicle-users-in-first-100-days-of-car2go-service-in-san-diego-141945933.html retrieved 9/26/2012
[8] Exceptions include those who have 'opted out' of a Smart Meter, as detailed in D.12-04-019 - http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/164785.PDF

COMPLETION OF A STRONG FOUNDATION

SDG&E has been developing and implementing the foundation for its Smart Grid platform for three decades – beginning with its innovations in automation and control technologies in the 1980s and 1990s, through its most recent Smart Meter deployment and re-engineering of operational processes enabled by new software applications in its OpEx 20/20 (Operational Excellence with a 20/20 Vision) program. Enabled by Smart Meters, SDG&E's Smart Grid foundation continued to grow during this past year with nearly every residential and small business customer empowered to monitor and manage their energy use via online tools and be rewarded for energy savings on Reduce Your Use event days[9].

Before Smart Grid initiatives were kicked off at most utilities, SDG&E was already developing advanced capabilities in CBM to optimize asset performance. At the same time, an advanced, community-scale microgrid project now known as the Borrego Springs Microgrid has been launched. Additionally, major new Smart Grid systems such as GIS, integrated with both an advanced OMS and DMS, are nearing final implementation moving SDG&E closer to the Smart Customer, Smart Market, and Smart Utility vision outlined in SDG&E's *SGDP* and further refined in this report. These advances and comprehensive deployments of technology position SDG&E on the vanguard of Smart Grid development nationwide.

MEETING THE RENEWABLE PORTFOLIO STANDARD (RPS)

In 2011, SDG&E led the three California IOUs by procuring 20.79% of electricity deliveries from renewable power sources[10]. Also in 2011, the company signed a record 1,482 MW of renewable energy contracts, which leverage renewable resources such as solar and wind in San Diego and Imperial counties as well as Mexico's Baja California region. Many of these contracts are taking advantage of great wind resources on the ridges of eastern San Diego County and the abundant sunshine in the Imperial Valley region. These contracts include 265 MW of wind from the Pattern Wind project, and two contracts with Tenaska Solar Ventures for a combined 270 MW of photovoltaic (PV) generation, all located in the Imperial Valley region.

These contracts show the immense potential for renewable energy development in the greater San Diego/Imperial Valley/Baja region, which some have calculated to be nearly 12,000 MW[11]. The need to deliver energy from these clean, yet intermittent sources continues to be a major driving factor in SDG&E's Smart Grid plans.

[9] The Reduce Your Use program was tested in July 2012, with the first 5 event days in August 2012, and one in September 2012.

[10] California Public Utilities Commission – "Current Renewable Procurement Status", http://www.cpuc.ca.gov/PUC/energy/Renewables/index.htm.

[11] "Renewable Energy Transmission Initiative Phase 2A Final Report", September 2009, p.B-5, http://www.energy.ca.gov/2009publications/RETI-1000-2009-001/RETI-1000-2009-001-F-REV2.PDF

STAKEHOLDER ENGAGEMENT

As stated in its *SGDP*, SDG&E is working in collaboration with key stakeholders to create the foundation for an innovative, connected and sustainable energy future and these collaborations have continued to grow in productivity and scope during this past year. Of note in this area, SDG&E celebrated the grand opening of its Energy Innovation Center (EIC)[12] on January 18, 2012 and has since hosted over 475 events and welcomed more than 14,000 guests (including three of the five sitting CPUC commissioners) to the facility. The EIC is a showcase facility where customers can learn about energy efficiency, renewables, alternative fuel transportation, Smart Grid as well as other topics, and is open to the public for hosting energy education-related events. Organizations utilizing the center have included the U.S. Department of Energy, San Diego Unified School District, San Diego Housing Commission and the U.S. Green Building Council and other organizations and industry groups such as CleanTECH San Diego.

In January 2011, SDG&E became a founding member of a bold, multi-year collaboration known as Smart City San Diego that combines the resources of the City of San Diego, San Diego Gas & Electric, GE Digital Energy, the University of California San Diego (UCSD) and CleanTECH San Diego. This collaboration grew throughout the Reporting Period and continues to make a positive impact on the San Diego region. Smart City San Diego's priorities are to:

- Support California's goals for localized electricity generation and 33% renewable energy by 2020
- Empower consumers with real-time knowledge and intuitive technology to manage their energy use
- Minimize the need for additional infrastructure by optimizing and automating the electric grid with two-way communications and monitoring technologies
- Demonstrate the value and impact of innovation to the San Diego region and the community through public Smart Grid projects and displays

On an ongoing basis, SDG&E continues to collaborate with external stakeholders that provided input to its *Smart Grid Deployment Plan*, and who remain engaged with SDG&E on Smart Grid and other issues. These organizations include environmental interests, academia, business organizations, municipal utilities and governments, ratepayer advocates, energy non-governmental organizations, large customer/corporate interests, collaborative organizations, and workforce interests.

Other focused stakeholder engagement efforts have included the Grid ComForum West 2012 conference[13] that SDG&E hosted from March 7 – 9, 2012 in San Diego. This event included an SDG&E programming day focused specifically on Smart Grid education for the utility's workforce, with the

[12] More information on SDG&E's Energy Innovation Center is at http://sdge.com/node/2760
[13] http://gridcomforum.com/GCFWest/index.aspx

remaining days open to all stakeholders focusing on the critical business issues of the deployment and management of Smart Grid technologies. Keynote speeches were given by CPUC President Michael Peevey, San Diego Mayor Jerry Sanders, and Google Vice President and Chief Internet Evangelist Vint Cerf. At the conference, SDG&E also announced its collaboration with Dr. Ann Cavoukian, the Information and Privacy Commissioner of Ontario, Canada, and an internationally known privacy advocate, in its release of a joint white paper called *Applying Privacy by Design Best Practices to SDG&E's Smart Pricing Program.* This paper describes SDGE's effort to apply the Privacy by Design principles in the early phases of a major initiative.

SDG&E has also continued working with the Environmental Defense Fund (EDF) on several aspects of the Smart Grid OIR (R.08-12-009) including the *Smart Grid Deployment Plan* and Smart Grid Metrics & Goals (workshop-based stakeholder discussion on these topics). In addition, SDG&E was featured in EDF's 2011 annual report not only for the productive partnership between both organizations but also for SDG&E's strong leadership in the Smart Grid.

Other collaborative efforts include teaming with the County of San Diego in leveraging some of the digital channels provided by Smart Grid to connect remote fire stations with fire and weather data collections sources. The University of California, San Diego (UCSD) has also joined this team, bringing its analytical and network resources to create additional applications for planning and crisis management purposes.

More generally, SDG&E has continued to engage stakeholders across a wide spectrum of Smart Grid issues seeking input and ideas related not just to SDG&E's Smart Grid technology deployment, but the accompanying issues raised, such as customer data privacy.

OPPORTUNITIES TO WORK WITH DIVERSE BUSINESS ENTERPRISES

Smart Grid projects represent exciting new initiatives that will bring more opportunities for SDG&E to work together with Diverse Business Enterprises (DBEs) and help the region's communities thrive. From integrating new technology and renewable energy projects that will transform the electric grid into a Smart Grid to the development of the new SDG&E East County (ECO) Substation Project, many opportunities lie ahead to work with DBEs. These exciting new endeavors will require SDG&E to seek out DBE partners in its region with the technological know-how to implement sophisticated "smart" networks to continue to strengthen the electric grid and serve the region's communities with reliable and environmentally sustainable energy.

Just as SDG&E sought out DBEs for its Smart Meter deployment which resulted in approximately $200 million in spending with these businesses over 2010 and 2011, SDG&E has assembled an internal Smart Grid DBE team to identify near-term opportunities. An example of this is SDG&E's recently signed $1.2 million contract with a minority-owned business to install microwave equipment as part of wireless communications infrastructure deployment.

Another part of SDG&E's DBE/Smart Grid efforts is providing technical assistance and capacity building to grow awareness and capabilities among DBEs wishing to participate in the Smart Grid space. During the second quarter of 2012, SDG&E sponsored two DBEs to participate in the University of California, Los Angeles' (UCLA) Advanced Technologies program, and in September, SDG&E is sponsoring a Technical Assistance program which includes Smart Grid panelists at San Diego State University (SDSU). In addition, SDG&E will continue to utilize its Energy Innovation Center to host workshops to educate the general public and DBEs about Smart Grid and provide opportunities for DBEs to meet SDG&E Smart Grid project managers. SDG&E anticipates there will be many opportunities in the next few years for business owners from diverse backgrounds to get involved and be a part of this exciting new effort.

INDUSTRY RECOGNITION

San Diego and SDG&E's Smart Grid deployment efforts have been consistently acknowledged by industry observers. SDG&E's commitment and progress has been recognized by IDC Energy Insights and *Intelligent Utility Magazine* as the nation's "Most Intelligent Utility" for three consecutive years, winning this award each year since its inception. SDG&E also received the "Top Ten Utility" award for excellence in Smart Grid development from GreenTech Media in April, and in May, SDG&E was honored with a Climate Leadership Award (Organizational Leadership Award) from the U.S. Environmental Protection Agency[14]. Also in August 2012, *POWER Magazine*, one of the most widely read power industry trade publications, recognized SDG&E with its "Smart Grid Award" noting its customer-focused and all-inclusive *Smart Grid Deployment Plan* as a major factor in their selection.

In November 2011, SDG&E was recognized by PA Consulting Group (PA) as the recipient of both the ReliabilityOne™ award and Balanced Scorecard Achievement award among Western U.S. electric utilities. SDG&E has taken home tops honors at the past six ReliabilityOne™ awards, including the national award in 2010. These awards for electric reliability and excellence in customer service are due to outstanding employee performance during outages, continued improvement in work methods, and continued system infrastructure upgrades, including extensive Supervisory Control and Data Acquisition (SCADA) deployed on SDG&E's transmission and distribution (T&D) system.

All of these recognitions demonstrate that SDG&E has consolidated its position as a national leader in implementing a comprehensive and effective Smart Grid program focused on providing benefits for its customers and other stakeholders.

Other recognitions of SDG&E's efforts include:

[14] http://www.epa.gov/climateleadership/awards/2012winners.html

- In October 2011, Move San Diego (MoveSD) awarded the corporate innovator award to SDG&E's Clean Transportation Program in recognition of their body of work over the years to bring and advance electric transportation in San Diego.[15]
- In June of 2011, the Public Relations Society of America awarded the national Silver Anvil Award for "Excellence in Community Relations Business Services" to SDG&E for its public outreach plans for the Sunrise Powerlink Project from the proposal through the construction of the project.[16]

Deployment of Smart Grid solutions and technologies for SDG&E customers is already positively impacting the three areas defined in the CPUC's framework for Smart Grid Deployment Plans: Smart Customer, Smart Market and Smart Utility.

OTHER INDUSTRY ENGAGEMENT

SDG&E is represented on a number of different boards, including the GridWise Alliance and the Electric Drive Transportation Association, where it influences public policy and other industry issues. It is also regularly consulted by the U.S. Department of Energy and other government agencies for participation in research and development peer review and other activities that promote the development of Smart Grid nationwide.

SMART CUSTOMER

SDG&E's vision of the "Smart Customer" is one who is empowered and able to make informed decisions about their energy usage, management, and for a rapidly growing segment, their generation and other energy resources as a result of Smart Grid investments allowing them to maximize their energy value. In the future, greater numbers of these Smart Customers will continue to adopt new technologies like natural gas fuel cells and home energy storage systems, which will allow them to generate, store, and manage their own energy, dramatically changing their relationships with their utilities.

SDG&E has already begun to create a utility foundation for an innovative, connected and sustainable energy future and has been working with customers and service providers to increase customer engagement with and adoption of new energy management technologies. For instance, now that SDG&E has virtually completed its Smart Meter deployment, all of these customers have been enrolled in the Reduce Your Use program[17] for summer 2012. Under the program, SDG&E notifies customers of event days when they can earn a reward of $.75 per kWh (or $1.25 / kWh if the customer has

[15] http://movesandiegogreenstreets.eventbrite.com/
[16] http://www.prlog.org/11543637-sunrise-powerlink-wins-national-public-relations-award.html
[17] Reduce Your Use is sometimes referred to as 'peak-time rebate'; more information on this program can be found at: http://sdge.com/article/3431/earn-rewards-using-less-power-reduce-your-use-days . This program was piloted with 3,000 customers during summer 2011.

qualifying enabling technology installed) for each kWh below their previous average usage during the 11 a.m. – 6 p.m. period. Over half a million customers, on average, received a Reduce Your Use bill credit during the events called in August and September 2012.

Customers already have the ability to become more aware, informed and knowledgeable about their energy choices and have access to the first generation of tools to help them act upon those choices. Many of these are enabled in part by online services such as SDG&E's Energy Charts, available to all customers with Smart Meters since mid-2011, with incremental improvements being added on an ongoing basis. Additionally, SDG&E was the first utility in the nation to respond to the White House Chief Technology Officer's challenge and commit to implementing the Green Button, which provides a standards-based download of energy usage information, making it available to its customers in December 2011. There are more than 60 Green Button applications available in the marketplace today[18].

SDG&E's standardized platform for the secure and private transfer of customer usage information to the customer (the Green Button), and soon, their authorized third parties (through a service launching in late 2012 known as "Green Button – Connect My Data") is enabling both utility and non-utility services and providers to offer competitive products and services that are valued by customers. Using this information, presented in a timely, understandable and useful form; customers are becoming more familiar with how they are using energy as well as its costs, and the groundwork is being put in place for their evaluation of various dynamic rate options that will become available in the next year.[19]

SDG&E understands that effective engagement with its customers is critical in the success of the Smart Grid and is working on this effort on a number of fronts. For example, SDG&E is working hard to better understand its diverse customer base through behavioral segmentation of all residential and small commercial customers. This work will allow SDG&E to employ messages that resonate with customers and offer programs that are more likely to be of value to those customers. Also as part of its effort to better understand customers, SDG&E has initiated a Customer Analytics System (CAS) project (an element of the larger 'Data Management and Analytics' project) that seeks to unlock the value of customer information for SDG&E – enabling analytics across widely disparate systems and data sources – that will allow more effective program designs and product and service offerings.

Additionally, SDG&E is implementing innovative program elements that will help drive engagement such as social media contests. In 2011, SDG&E sponsored the 'Biggest Energy Saver'[20] contest and in

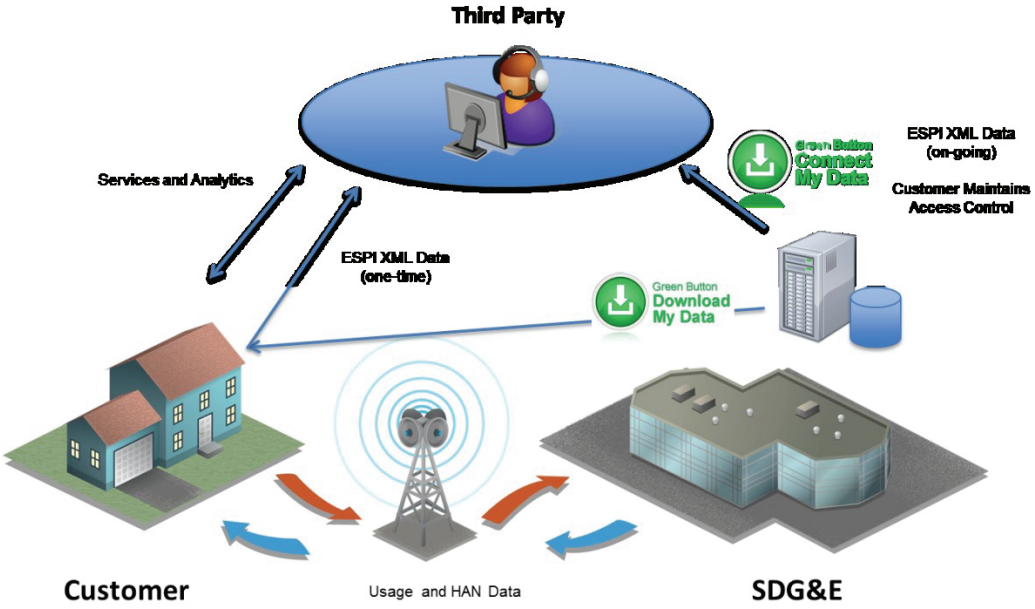
[18] See http://en.openei.org/apps/?keyword=Green%20Button%20Apps for a list of available Green Button applications

[19] On July 6, 2010, SDG&E filed a motion for adoption of a "Joint Settlement Agreement" associated with its Dynamic Pricing Application (A.10-07-009). If approved, this settlement agreement includes provisions for optional dynamic and TOU rates for small commercial and residential customers beginning in March, 2013.

[20] The Biggest Energy Saver contest was part of a national effort coordinated by the White House office of the Chief Technology Officer (CTO) as discussed in his report on Smart Grid released on June 13, 2011.

2012, the San Diego Energy Challenge contest is taking place[21]. Moreover, SDG&E recognizes that its customers are coming to expect more convenience and functionality in the online services it provides and that if such services are lacking, engagement will suffer. To address this, SDG&E has launched an iPhone / iPad app[22] that includes online bill pay functionality and a mobile version of its outage map (among other features), and has continually worked to improve the information available on its My Account web portal. The energy charts functionality available behind My Account has been enhanced, and in September 2012 a solar calculator was added that allows customers to analyze how adding a roof-top solar system might impact their electricity bill[23]. SDG&E also made Green Button Download My Data available in December 2011, and by year-end 2012 expects that Green Button Connect My Data will be available, allowing customers to choose a third-party information services provider to whom SDG&E will then securely transfer usage data. Figure 1-1 illustrates the two Green Button options offered to SDG&E customers.

Figure 1-1: Green Button Options for Customers



In addition to these efforts, SDG&E is undertaking a transformation of its Customer Contact Center, seeking to evolve its telephone interactions with customers from order taking (turn-off/turn-on, payment arrangements, etc.) toward more of an energy advisor role. Furthering this transformation, employees who had been 'Customer Service Representatives' are being trained to become 'Energy Services Specialists', and the incentives and performance metrics associated with this function are also being examined.

[21] https://www.sdenergychallenge.com/
[22] http://itunes.apple.com/us/app/sdge/id489246330?mt=8
[23] The solar calculator tool allows multiple levels of sensitivity analysis around system capacity and roof orientation and sloping (for example).

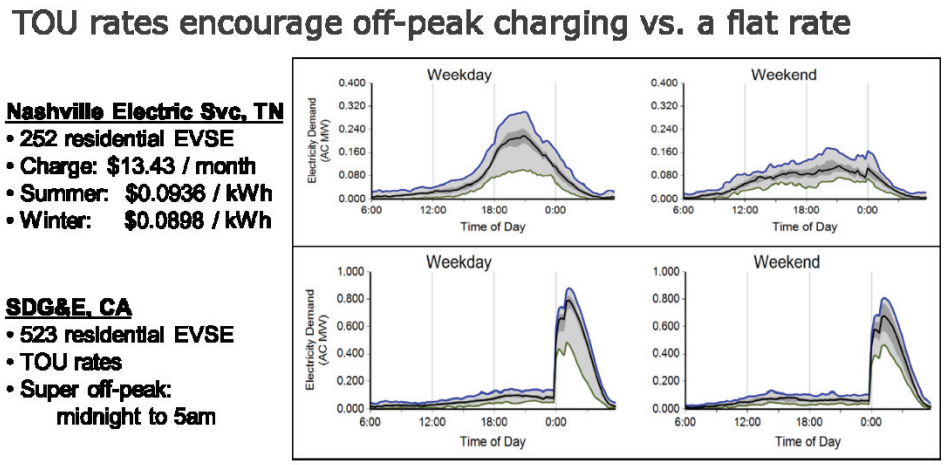
To summarize, in order to effectively engage customers, SDG&E is implementing projects, systems and training in order to offer the right information to the right customers through the right channels at the right times to enable them to adopt smart energy solutions and make informed energy management decisions.

SMART MARKET

SDG&E's Smart Grid investments, including Smart Meters and various optimized, efficient business processes and systems implemented through its OpEx 20/20 program are beginning to change the existing market. SDG&E's Smart Grid platform is already empowering customers who choose to maximize the value of the energy and other services they receive from the grid and/or participate in demand response. It will potentially allow their participation in other markets in the future. For example, more accurate price signals in retail rates, such as the electric vehicle time-of-use rates, facilitate PEV market growth while minimizing adverse impacts on customers without PEVs. Smart Grid investments should also improve efficiency in grid operations and reduce costs for customers over time.

Figure 1-2 illustrates this example of the smarter market – by comparing the times of PEV charging between SDG&E, where PEV time-of-use rates provide a signal to customers, and the Nashville Electric Service, a Tennessee utility where flat rates offer no incentive for off-peak charging. Data from the EV Project are showing that these pricing signals effectively encourage customers with PEVs to charge their vehicles during off-peak periods when they minimally stress the grid and offer the greatest energy cost savings opportunities for customers.

Figure 1-2: Comparing PEV Charging Patterns in Nashville, TN, and SDG&E, CA



Source: INL http://avt.inel.gov/pdf/EVProj/EVProjInfrastructureQ22012.pdf

Also furthering the development of the Smart Market are efforts such as SDG&E's Flexible Demand Initiative (FDI). FDI is a planned project designed to facilitate the aggregation and integration of

distribution-scale distributed energy resources into the California Independent System Operator (CAISO) market, while enabling the growth of the electric vehicle services market[24].

Another example of how SDG&E is supporting and developing the Smart Market is reflected in products and services that leverage open industry standards, such as the Green Button. The Green Button is a technology standard and set of services that create a platform allowing customers to download (and soon, automatically send to authorized third parties) their energy consumption data in an industry standard format known as "ESPI" or the Energy Services Provider Interface, a standard published by the North American Energy Standards Board (NAESB). ESPI is based on the OpenADE (Open Automated Data Exchange) requirements[25]. These and other standards lower the cost and complexity barriers for third-party energy information service providers, enabling their quick entry into the market, demonstrated by the 64 Green Button applications that have already become available. Lowering barriers helps enable the Smart Market to thrive and to provide even more options for customers.

A Smart Market for electric services must include unbundled rates that are designed in ways that communicate the most accurate pricing signals possible to customers. To encourage this accuracy in pricing, SDG&E is advocating for changes to net energy metering (NEM) rates so that accurate pricing is developed for the reliability and storage services provided by the utility. In response, the CPUC has created a residential rate design proceeding.[26]

SMART UTILITY

A "Smart Utility" understands what its customers want, need, and value. SDG&E is now providing customer usage information, prices and critical event notifications through the customer's preferred communication channels (such as online or mobile) – services that not only indirectly benefit the grid, but are those that customers now expect.

Given the state's aggressive energy policy goals and customer behavior, the complexity of operating the grid is increasing. SDG&E, through Smart Grid technologies, is seeking to maintain and/or improve grid reliability in the face of these challenges. As a Smart Utility, SDG&E is putting in place programs that attempt to reliably integrate intermittent distributed and centralized renewable generation sources, operate its system in ways that seeks to minimize losses and maximize efficiency, and give operators real time situational awareness and control with robust, secure communications. As shown in the Project Updates section, SDG&E is actively deploying Smart Grid solutions in all these areas.

[24] See Project 45 for details
[25] http://www.naesb.org/espi_task_force.asp
[26] R. 12-06-013, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/169782.PDF

For example, SDG&E's CBM program, which adds sensors and real-time monitoring capabilities to large assets such as substation transformers, circuit breakers, and bushings, enables system managers and operators to have more awareness of the condition and health of critical system equipment. With these capabilities, SDG&E is already demonstrating how forced outages that would impact customer reliability can be avoided by detecting potential problems with equipment before catastrophic failures occur.

Other examples of Smart Grid technologies that are contributing towards realization of the Smart Utility vision are SDG&E's GIS and OMS/DMS systems, which became fully operational in late September 2012. The GIS, which hosts a complete digital model of SDG&E's electric and gas system assets, including their attributes and connectivity, is fully integrated with the outage and distribution management systems to provide unbalanced three phase load flow analysis, suggested switching plans, more accurate information on outages, improved reliability through advanced system management functions that reduce outage durations and impacts and integrated volt/VAr control to regulate the system voltage. Synchrophasors, time-synchronized data collected from Phasor Measurement Units (PMUs), are improving wide area situational awareness at the utility, and for system operators at the CAISO and the Western Electric Coordinating Council (WECC), via the Western Interconnection Synchrophasor Program (WISP).

A Smart Utility also protects the security of the system and the privacy of its customers. SDG&E's risk-based security management program is continually improving its systems' resistance to physical or cyber-attacks and its resilience so that it is able to limit the impacts of security issues and recovers from them quickly. SDG&E's program is designed around industry best practices and standards and applies resources where the Smart Grid needs them most, based on advanced threat intelligence, vulnerability assessment, monitoring, and forensic capabilities. Several projects are deploying systems and technologies that are enhancing SDG&E's security situational awareness, part of the continuous improvement processes needed to protect the system against ever-evolving threats, as explained in 95 2.7 below.

1.1 CUSTOMER DRIVERS

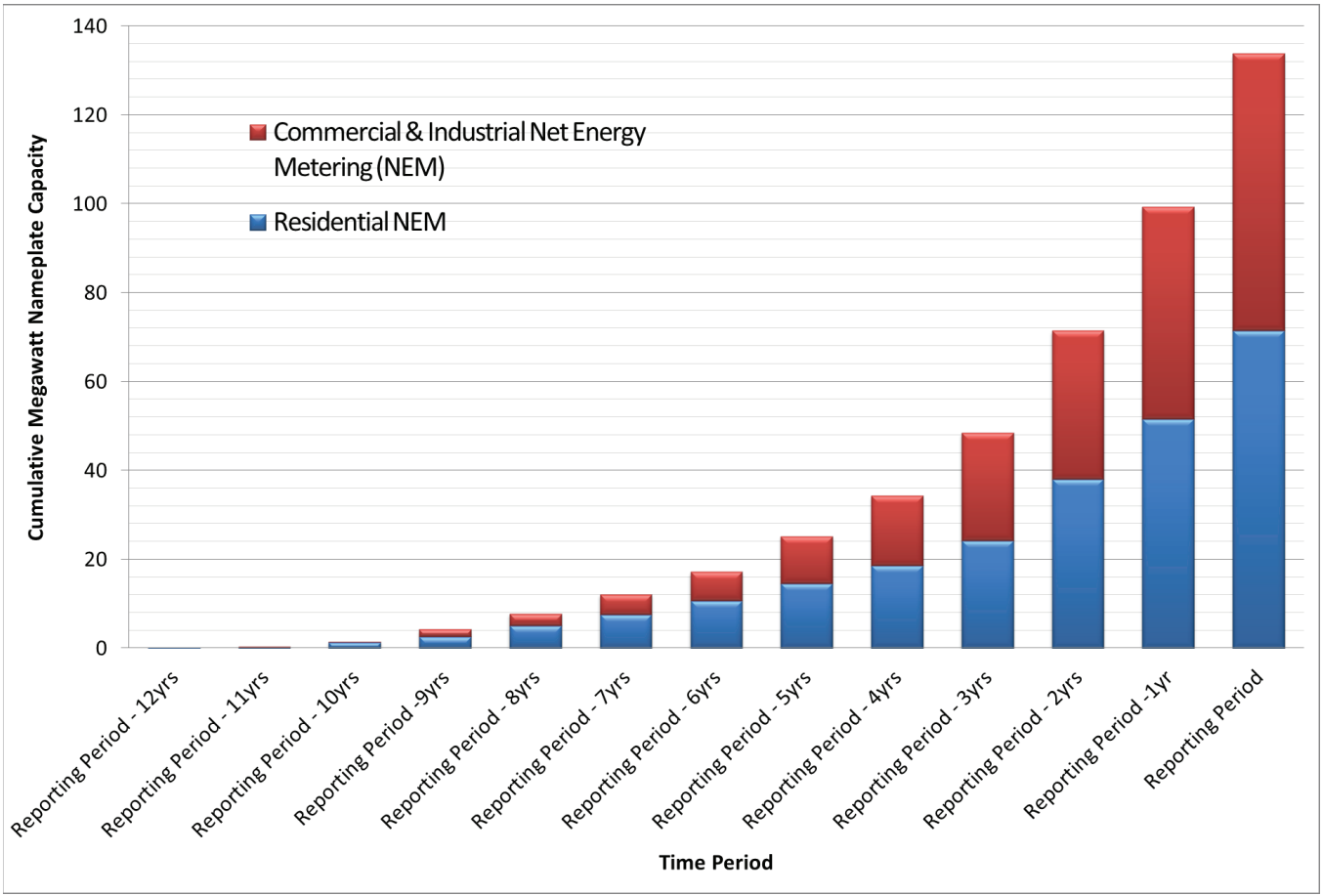
SDG&E is making Smart Grid investments to respond to three major customer-driven factors:

- Installation of PV generation systems, which have intermittent power output;
- Adoption of PEVs by a quickly growing number of SDG&E customers; and
- Geographic clustering of PV, PEVs, and the related disproportionate effects of intermittency and their mitigation requirements

As shown in Figure 1-3, SDG&E customers are continuing their investments in distributed generation systems, primarily PV technology, with over 19,000 systems installed by customers as of September

2012. At a pace that is roughly doubling the installed capacity every two years, this trend demonstrates the urgency driving SDG&E's Smart Grid Deployment Plan and its current and planned implementation of technology solutions that are needed to integrate the growing number of PV installations while maintaining the required level of system reliability that customers expect.

Figure 1-3: Cumulative Net Energy Metering Capacity Connecting to SDG&E's System

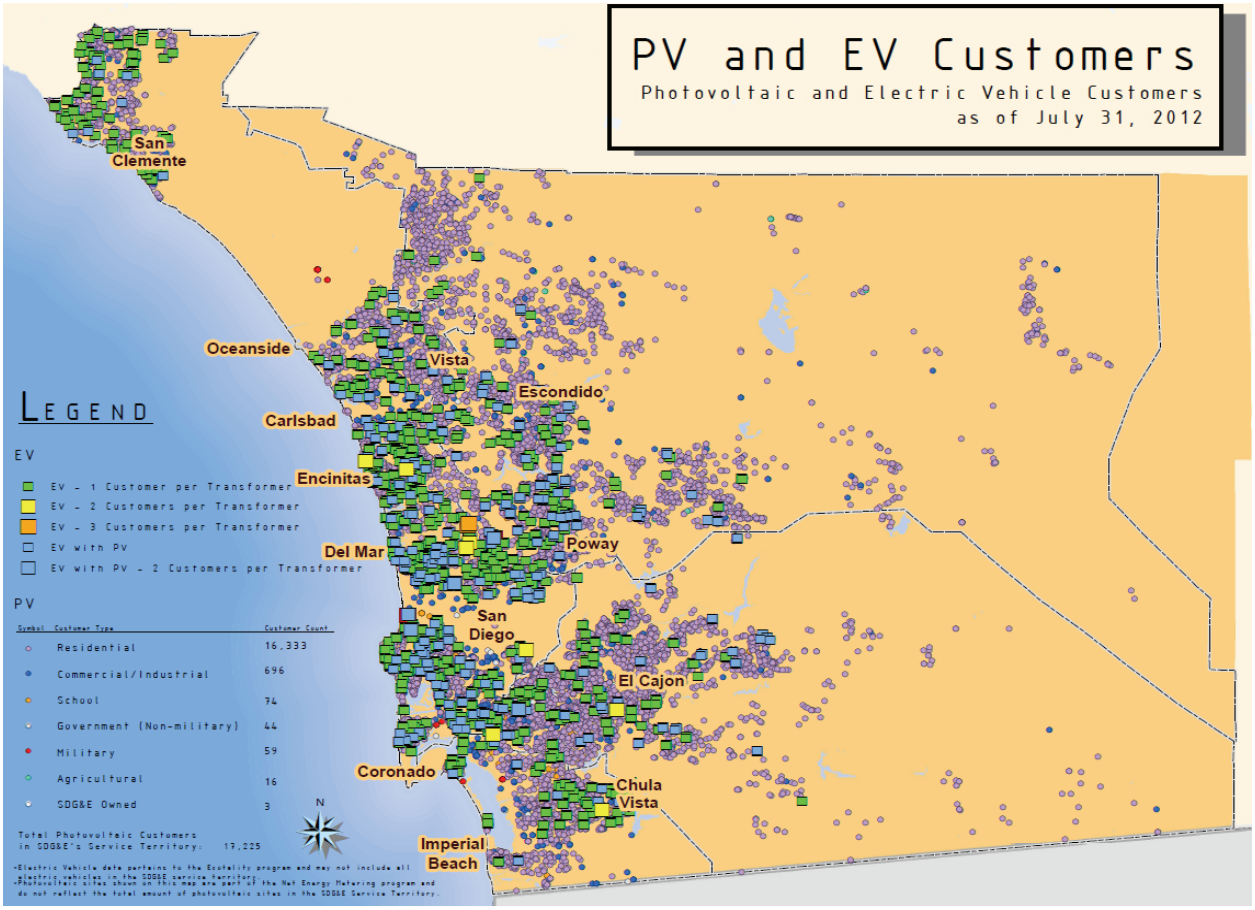


Voltage fluctuations and other reliability impacts resulting from PV systems are particularly pronounced where those systems are clustered together in local geographic areas. Compounding the effects of intermittency from distributed PV generation are the significant changes in electricity demand patterns from PEVs, over 1,600 of which are connecting to SDG&E's distribution system (as of June 30, 2012) – with approximately one-third of those PEV drivers also having installed PV systems at their homes[27]. On SDG&E's system, there are already several clusters of PEVs coinciding with PV systems, where some distribution transformers already have as many as two PEV households with

[27] *California Plug-in Electric Vehicle Owner Survey*; California Center for Sustainable Energy, 2012, http://energycenter.org/index.php/incentive-programs/self-generation-incentive-program/sgip-documents/doc_download/1140-pev-owner-survey-result

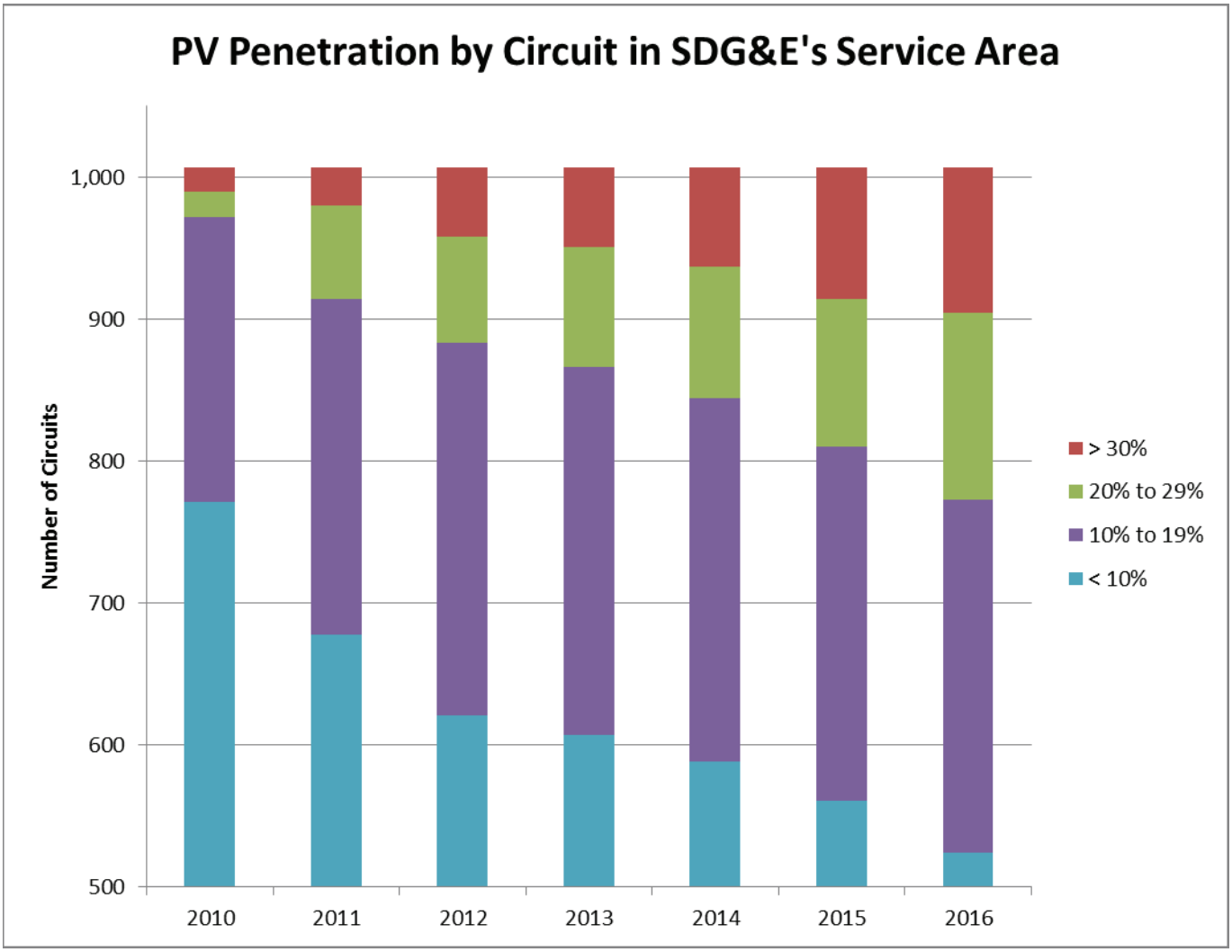
solar PV, and other transformers serving three customers with PEVs. Figure 1-4 shows the geographic distribution of these clusters as of July 31, 2012.

Figure 1-4: Geographic Locations of PV and EV Customers in SDG&E's Service Area, 7/31/2012



Intermittency effects from clusters of PV systems at the distribution circuit level are generally considered to be most likely to cause reliability issues when the installed PV capacity on a given circuit reaches 20% of the peak demand of that circuit on a "lightly loaded" day – that is, when solar generation output is likely to be highest, while peak demand, such as that from air conditioning, is relatively low. In SDG&E's system, as shown in Figure 1-5, as many as 93 of SDG&E's approximately 1,000 distribution circuits already exceed the 20% level by year end 2011, with 27 already exceeding 30%.

Figure 1-5: PV Penetration Rates by Number of Circuits in SDG&E's Service Area, 2010 - 2016



SDG&E's Smart Grid investments that respond to these customer choices are intended to mitigate the impact of these devices. SDG&E provides standby, power quality, and reliability services to net energy metering (NEM) customers; however, the utility's current rate design results in NEM customers receiving these services for free, while those customers that have not and may not have the ability to make a solar investment bear the cost of providing those services. While programs such as SDG&E's proposed "*connected…..to the sun*" initiative will help expand access to solar to those customers that might not otherwise have that opportunity, current rate design is not sustainable, creates the potential for a future backlash against rooftop solar, and must be addressed so the utility business model can equitably achieve the state's policy objectives.

1.2 POLICY AND VALUE DRIVERS

Many California and federal policies underpin SDG&E's *Smart Grid Deployment Plan*, including Senate Bill (SB) 17, the Renewable Portfolio Standard (RPS), Assembly Bill (AB) 32, the state's distributed generation and demand response goals, building and appliance efficiency standards, implementation of the electric procurement loading order, and cybersecurity compliance requirements such as the North American Electric Reliability Corporation's Critical Infrastructure Protection (NERC CIP) standards. The majority of Smart Grid projects undertaken by SDG&E are designed to fulfill the utility's role in realizing these goals or complying with mandatory standards.

Other projects are being undertaken to create value for customers where the projected benefits outweigh the costs or where the investment is necessary to effectively communicate with customers. The benefits of these customer value-driven and other policy-driven Smart Grid investments are already being realized. For example, SDG&E's Smart Meter deployment now provides nearly all residential and small commercial customers with their hourly energy consumption data, viewable online through SDG&E's My Account tool or downloadable in the nationally recognized Green Button standard format. Further, automation of meter reading and related services has avoided more than 3.2 million miles of vehicle travel by SDG&E trucks, saving more than 275,000 gallons of gasoline and over 2,400 metric tons of CO_2e[28] – representing an estimated 10% decrease in SDG&E fleet emissions during the Reporting Period.

Customer value is also created through environmental benefits related to the integration of distributed energy resources, such as solar power generation, electric vehicles, and demand response. CO_2e and particulate emissions associated with conventional generation can be displaced with distributed renewable energy resources, or otherwise avoided through the reliable integration of clean power sources.

[28] These emissions reductions are estimates calculated based on standard assumptions and U.S. Environmental Protection Agency emission factors.

2 *SMART GRID DEPLOYMENT PLAN* UPDATE

2.1 CHANGES TO THE DEPLOYMENT PLAN RESULTING FROM REGULATORY ACTION OR LEGISLATION

As discussed in Section 1, while SDG&E's TY2012 General Rate Case[29] application awaits a CPUC decision, deployment of Smart Grid solutions are nonetheless urgently needed to successfully implement energy policy goals and other specific CPUC requirements and to keep pace with the needs of its customers. Driven by that urgency and these priorities, SDG&E is already moving forward with most of its planned Smart Grid projects, while regulatory approval of its GRC is still pending. As Smart Grid deployment continues at its rapid pace in the San Diego region, changes in external requirements inevitably mean changes to SDG&E's deployment plan. Table 2-1 discusses those changes resulting from CPUC or other regulatory action or due to developments in state or federal legislation.

Table 2-1: Changes to SDG&E's *SGDP* from Regulatory Action or Legislation

Project	Change from Original *SGDP*	Reason for Change
Public Charging Infrastructure	Deferred project	The CPUC, in the Alternative Fuel Vehicles (AFV) Order Instituting Rulemaking (OIR) phase 2 decision (R.09-08-009[30]), clarified several CPUC policies, including that utilities would be prohibited from owning and operating electric vehicle supply equipment (EV chargers) at this time; this ruling may be revisited should "market failures" materialize.
Customer Privacy Program	Added project	New privacy rules and standards set by the CPUC in D.11-07-056 led SDG&E to organize a dedicated effort around customer privacy.

[29] A.10-12-005
[30] D.11-07-029

2.2 CHANGES TO SDG&E'S DEPLOYMENT PLAN RESULTING FROM IOU INITIATIVES

Other changes to the *Smart Grid Deployment Plan* are due to new information or understanding of issues, solutions, and market and technology developments, leading to the following changes listed in Table 2-2:

Table 2-2: Changes to SDG&E's *SGDP* from Utility Initiatives

Project	Change from Original *SGDP*	Reason for Change
Dynamic Voltage Control	Added project	Solutions within this technology class were found to be good alternatives or complements to Advanced Energy Storage
Condition-Based Maintenance Expansion	Deferred project	Part of SDG&E's initial TY2012 GRC submission, the project has been deferred because of the current economics of the proposed solution.
"DERMS" > Integrated DER Management & Control Systems	Deferred to late 2012	The urgency of this software with capability to communicate, sense, and control distributed grid assets - both customer and utility owned - continues to increase. An effort to define a new architecture which enables this increased function and at a potentially decreased cost is underway.

SDG&E has already communicated the Condition-Based Maintenance change in its GRC proceeding and the other changes to the *SGDP* do not impact its GRC requests.

2.3 PROJECT UPDATES

2.3.1 PROJECT COSTS

During the Reporting Period, SDG&E estimated expenditures of $156 million breakdown in the areas listed in Table 2-3:

Table 2-3: Estimated Smart Grid Deployment Costs for the Reporting Period

Estimated Spend During the Reporting Period Amounts in Thousands of USD	Reporting Period Value	
Customer Empowerment/Engagement	$	71,756
Distribution Automation/Reliability	$	10,283
Transmission Automation/Reliability	$	2,684
Asset Management, Safety & Operational Efficiency	$	46,475
Security	$	12,727
Integrated & Cross-Cutting Systems	$	12,263
Total Estimated Costs	**$**	**156,188**

Expenditures are estimated and based on total spend, including operations and maintenance (O&M) and capital, excluding Allowance for Funds During Construction (AFUDC), Contribution in Aid of Construction (CAIC) and net of grant-based reimbursements from the California Energy Commission and U.S. Department of Energy.

2.3.2 ESTIMATED BENEFITS

SDG&E used the same comprehensive methodology adopted for its *Smart Grid Deployment Plan* to identify and quantify estimated benefits for the *Annual Report*. The framework of this methodology is primarily based on the benefits evaluation model that the Electric Power Research Institute included in the report titled "Methodological Approach for Estimating the Benefits and Costs of Smart Grid Demonstration Projects"[31]. SDG&E's methodology includes estimates of economic benefits, reliability benefits based on a Value-of-Service Reliability model developed by the Lawrence Berkeley National Laboratory[32], and environmental and societal benefits based on a model developed by SDG&E in collaboration with the Environmental Defense Fund[33].

[31] Final Report No. 1020342, "Methodological Approach for Estimating the Benefits and Costs of Smart Grid Demonstration Projects", January 2010.
[32] Final Report No. LBNL-2132E, "Estimated Value of Service Reliability for Electric Utility Customers in the United States", June 2009
[33] For further details on the methodology for environmental and societal benefits see http://docs.cpuc.ca.gov/PublishedDocs/EFILE/RESP/140924.PDF

Economic benefits are primarily reduced and avoided costs of utility operations. Reliability benefits estimate the societal value of avoided outages for customers among residential, commercial, and industrial classes. Environmental benefits estimate a value of avoided greenhouse gas and particulate emissions, while societal benefits include other costs avoided by customers, such as the avoided cost of gasoline for transportation fuel when electric vehicles are used as alternatives. As with any utility and technology investments, benefits among these categories generally begin to accrue after the asset is placed into service and capabilities are enabled; however, some projects with phased implementations such as Smart Meters or CBM may also accrue benefits during the course of project implementation.

During the Reporting Period, SDG&E completed several projects that generated benefits not only for SDG&E's operations but also for its customers, the environment, and society in general. Those projects were centered primarily in two of SDG&E's main programs, Customer Empowerment and Engagement via the Smart Meters project and the Asset Management, Safety & Operational Efficiency program through CBM. **Error! Reference source not found.** provides a summary of the benefits identified during he Reporting Period:

Table 2-4: Estimated Smart Grid Benefits in the Reporting Period[34]

Estimated Benefits During the Reporting Period Amounts in Thousands of USD	Reporting Period Value
Economic Benefits	$ 29,935
Reliability Benefits	$ 8,572
Environmental Benefits	$ 736
Societal Benefits	$ 627
Total Estimated Benefits	**$ 39,870**

SDG&E's mass deployment of Smart Meters was initiated in 2009. As of June 30, 2012, SDG&E has installed 1,379,362 electric meters and 864,488 gas modules representing approximately 99% of the overall deployment. The Smart Meter program has achieved relevant reductions and avoidance of operating expenses due to the elimination of a significant portion of meter reading activities as well as customer services field activities. During the Reporting Period, SDG&E avoided approximately 3.2 million miles of vehicle travel, 1.2 million from reduction of meter reading activities and 2.0 million from over 270,000 avoided truck rolls for customer services field activities. The avoided truck rolls

[34] Environmental benefits calculated based on prices from a report prepared by the California Environmental Protection Agency, *Updated Economic Analysis of California's Climate Change Scoping Plan*, March 24, 2010 and SDG&E's internal forecasts.

were achieved as a result of the remote operating capabilities of the new Smart Meters. The average monthly vehicle travel for meter reading activities was reduced by over 40% during the Reporting Period compared to levels prior to the deployment of Smart Meters. These reductions of light- and medium-duty vehicle travel for SDG&E's activities translated into savings of approximately 275,000 gallons of gasoline which equates into more than 2,400 tons of reduced CO_2e emissions[35].

The completion and testing phase of projects under the Asset Management, Safety and Operational Efficiency program during the Reporting Period also generated economic and reliability benefits. For example, the CBM project, by monitoring the real time condition of transformer health, was able to prevent catastrophic failures thus avoiding replacement of distribution and transmission infrastructure. In addition, CBM also achieved reliability benefits by avoiding 3 forced outages during the Reporting Period.

SDG&E also identified environmental benefits related to the integration of distributed generation, primarily solar power generation. These environmental benefits include an estimation of the avoided emissions reduction associated with displacing conventional generation with distributed renewable energy resources. The avoided emissions reduction is based on the energy load forecast included in the recent California Energy Demand 2012-2020 Forecast prepared by the California Energy Commission[36] for solar systems in SDG&E's service territory. No incremental environmental benefits associated with the integration of centralized renewable energy were identified, based on the RPS level during the Reporting Period[37].

The integration of 1,600 (as of June 30, 2012) electric vehicles into SDG&E's electric grid also generated additional benefits to the environment and the community. SDG&E estimated that the light-duty electric vehicles integrated into the system during the Reporting Period avoided the consumption of approximately 300,000 gallons of gasoline. This translates into a positive environmental impact to the region by reducing net emissions (the difference between those of gasoline and electricity generation) of approximately 1,800 tons of CO_2e based on estimates by SDG&E[38]. In addition, electric vehicle owners also benefited from the avoided fuel cost of the gallons of gasoline displaced, contributing to the energy independence of the country.

2.3.3 PROJECT SUMMARIES AND UPDATES BY PROGRAM AREA

Estimated project costs for the Reporting Period are shown in nominal thousands of dollars.

2.3.3.1 CUSTOMER EMPOWERMENT/ENGAGEMENT

[35] These emissions reductions are estimates calculated based on standard assumptions and EPA emission factors.
[36] Form 1.2 – Net Energy Load of the California Energy Demand 2012-2022 Staff Final Forecast – Mid Demand Case for SDG&E Planning Area, http://www.energy.ca.gov/2012_energypolicy/documents/demand-forecast/mid_case/
[37] This is based on the assumption that the system can accommodate a 20% RPS without smart grid technologies.
[38] These emissions reductions are estimates calculated based on standard assumptions and EPA emission factors.

Customer Empowerment/Engagement projects provide customers with readily accessible and reliable information regarding their energy usage. In addition, projects in this area should result in customers gaining a better understanding of their energy consumption among their common uses. To further empower customers, price signals must flow to them in a timely and meaningful manner and be integrated into customer energy management and home area network (HAN) systems.

Generally, projects in this area implement information systems, communication infrastructure, and energy management services along with customer-facing tools, services and outreach capabilities. Projects included also enable customer-authorized third parties to disseminate important information and educate customers, recognizing that often other sources of information are valued by customers.

Recognizing that many of today's customers have an ever increasing number of communications and media capabilities from smart phones to tablets, appropriate tools and applications must be provided to allow energy usage and perhaps other utility provided information to flow as customers are 'plugged in' to social networks and as they engage in peer communications. Projects are included to ensure that customers' new communications preferences and expectations are met, and that various tools that provide relevant information to customers (including price signals) are included that will result in greater customer awareness of energy impacts. A critical component to empowering customers is deployment of tools and applications that present customer specific energy-related data in a manner that provides value.

Projects that deliver information, services, and control sought by customers and that enable demand response, dissemination of dynamic pricing information and HAN capabilities are included in this category. Projects included provide customers with transparent and relevant price signals and enable utility and non-utility service providers to offer products and services that provide customer value.

COMPLETED PROJECTS

Project 1: Smart Meters	
Funding Source: Application **Project Timeframe: 4/2007 to 12/2012**[39]	Reporting Period Estimated Costs: $49,468
Description: The SDG&E Smart Meter project was approved by the Commission in D.07-04-043 in April 2007. Smart electric meters are solid state, digital devices that record energy usage data and, unlike traditional meters, transmit and receive data. Hourly electric consumption is	

[39] While the Smart Meter project is materially complete, D.11-03-042 (March 2011) approves SDG&E's Petition for Modification of D.07-04-043 (approving SDG&E's Smart Meter deployment) to allow project costs to be recorded in the Advanced Metering Infrastructure Balancing Account (AMIBA) until such time as deployment of its AMI system is fully complete. SDG&E anticipates that meter installations of final hard-to-reach and commercial/industrial customers will occur in 2013.

Project 1: Smart Meters	
recorded for residential customers and 15 minute consumption is recorded for commercial customers by the electric meters and daily consumption is recorded for natural gas usage.	
Update: As of this report, this project is materially complete with approximately 98.7% installed. On April 19, 2012 the CPUC issued decision D.12-04-019 approving SDG&E's Smart Meter opt-out plan. This decision established the analog meter as an alternative metering solution for residential customers and including a fee structure for such opt-outs ($75 initial fee / $10 Ongoing monthly fee or if on the California Alternate Rates for Electricity (CARE) program, the initial fee is $10 and the Ongoing fee is $5 per month). SDG&E has implemented this opt-out program with 993 participants (as of July 3, 2012).	

Project 2: Green Button Download My Data	
Funding Source: Application **Project Timeframe: Implemented in 12/2011**	Reporting Period Estimated Costs: < $100
Description: SDG&E's Green Button allows customers to download their electricity usage data in a standard format through SDG&E's secure My Account website. This functionality was developed in response to a challenge issued by the White House to give customers timely access to their energy data with the click of a single button. By using the Green Button customers can download up to 13 months of their electricity usage data, and developers and third parties can receive electricity usage data from customers in a machine-readable format.	
Update: SDG&E was the first utility to commit to the White House to Green Button at GridWeek in 2011. SDG&E was among the first to release it to customers in December 2011. In early 2012, SDG&E joined others to sponsor a San Diego Hack-A-Thon, which delivered six energy applications. 9,096 customers have downloaded their usage data via the Green Button tool as of June 30, 2012.	

IN-PROGRESS PROJECTS

Project 3: *connected…..to the sun*	
Funding Source: Application **Project Timeframe: Upon Approval**	Reporting Period Estimated Costs: < $100
Description: In January 2012, SDG&E filed an application with the CPUC for a pilot program	

Project 3: *connected…..to the sun*	
called "*connected…..to the sun*," which will give all SDG&E customers two options to buy solar power, even if they do not own a home, cannot afford the upfront cost of solar or do not have the ability to put PV panels on their roof. Customers could lock in their solar energy cost and take their solar service with them if they relocate within SDG&E's service area. SB843 which proposed similar goals was defeated in Committee. A brief overview of the two solar options are as follows: 1. *Share the Sun* a. Solar provider constructs projects in San Diego for purchase by SDG&E customers b. Customers purchase energy rights from a participating solar provider c. Customers receive solar energy and a credit on their monthly bill from SDG&E 2. *SunRate*[SM] a. SDG&E sets aside local solar projects under contract for customers b. Customers can subscribe to pay the *SunRate* price for 50%, 75%, or 100% of their electricity use c. Customers receive solar energy from SDG&E	
Update: The application is pending approval of the CPUC.	

Project 4: Green Button Connect My Data • **San Diego Energy Challenge** • **SDG&E Social Media Applications** • **Energy Service Provider Interface (ESPI)**	
Funding Source: GRC, DOE Grant, EE & DR Programs **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: $659
Description: San Diego Energy Challenge – This is a social gaming experience created in partnership with Simple Energy. The contest includes rewards including gift cards and tablet computers as well as the ability of contestants to help their local San Diego Unified School District middle school compete for a chance to win a cash grant based on energy conservation and community participation. Schools can earn $500 for school supplies, and the top three overall winning schools will split a cash grant of $30,000. The program is available to all SDG&E customers who live within the San Diego Unified School District boundary, roughly 470,000 households. Social Media Applications - SDG&E is creating mobile and Facebook applications that will allow	

Project 4: Green Button Connect My Data • **San Diego Energy Challenge** • **SDG&E Social Media Applications** • **Energy Service Provider Interface (ESPI)**	
customers to access their Green Button data, updated automatically by the Green Button Connect infrastructure. Energy Services Provider Interface (ESPI) - Green Button is the nationally branded standard process of downloading your consumption data. Green Button Connect My Data will enable these data to be automatically sent to customer-authorized third parties via the ESPI.	
Update: The current San Diego Energy Challenge runs through November 30, 2012. SDG&E's social media applications will be released to customers in 4Q 2012. On March 5, 2012 SDG&E filed application A.12-03-003 in response to ordering paragraph eight of decision D.11-07-056 (Decision Adopting Rules to Protect the Privacy and Security of the Electricity Usage Data of the Customers of PG&E, SCE and SDG&E). SDG&E's A.12-03-003 did not request incremental funding due to the fact that SDG&E had previously requested such funding in its GRC application. Although A.12-03-003 is still pending before the Commission, SDG&E anticipates that the Green Button Connect My Data functionality will be available to customers in October, 2012, along with a mobile application as an initial example.	

Project 5: Smart Grid Demand Response Programs	
Funding Source: Application **Project Timeframe: 1/2012 – 12/2014**	Reporting Period Estimated Costs: $0
Description: Smart Grid related Demand Response programs are a subset of the programs included in SDG&E's Demand Response application (A.11-03-002) filed on March 1, 2011. Specifically, these include SDG&E's Reduce Your Use program (referred to as 'Peak Time Rebate' in A.11-03-002), the Small Customer Technology Deployment (SCTD) and new construction programs.	

Project 5: Smart Grid Demand Response Programs	
Update: On April 19, 2012 the CPUC issued decision D.12-04-045 approving SDG&E's demand response applications, with modifications. No Reduce Your Use events were called during the Reporting Period[40].	

Project 6: Electric Vehicle (Clean Transportation) Education and Outreach	
Funding Source: GRC **Project Timeframe: Ongoing requirement, per the CPUC[41]**	Reporting Period Estimated Costs: $900
Description: Provide education and outreach to all customers and electric transportation stakeholders in various venues and means (printed and digital/online collateral, website, web tools, call center, utility-hosted seminars), at SDG&E's Energy Innovation Center, community events, in person meetings and training on the following topics: • Rates, metering and billing analysis (service choices) • Safety and reliability • Line extension rules • Basic information about PEVs, information resources, PEV supply equipment and support services • Environmental and financial benefits (AB32, off-peak charging) In addition to addressing the information needs of SDG&E customers and the various PEV stakeholders, the overarching outcome of these education and outreach efforts (as well as the projects listed below) leads to broader PEV market developmental and support.	
Update: SDG&E participated in or conducted 128 Outreach Events during the Reporting Period. The audiences and venues included: • Multi-family residences (owners, renters, HOA, property managers) • Workplace and fleet charging • CPUC, CARB, and California Energy Commission staff and commissioners • Legislators and government officials (local and state) • Communities and community events • Dealers and original equipment manufacturer (OEM) vendors • Plug-in electric vehicle customers	

[40] See Section 1: Key Takeaways and Highlights for information on post-Reporting Period RYU events.
[41] D.11-07-029

Project 6: Electric Vehicle (Clean Transportation) Education and Outreach	
• SDG&E employees • Media • Technology partners (electric vehicle supply equipment, load management, IT, HAN home area network, metering, analytics) • Contractors (electrical, electric vehicle supply equipment installers, electric vehicle service providers and related third parties, diverse business enterprises)	

Project 7: HAN Projects • **DRCA** • **Reduce Your Use (RYU) In-home Display (IHD) Pilot** • **DRCA/HAN Pilot & Study**	
Funding Source: GRC, Customer Programs & Assistance (CP&A) O&M, Smart Meter capital/GRC **Project Timeframes: 5/2012 and is Ongoing, 4/2012 to 12/2012, 8/2010 to 12/2012**	Reporting Period Estimated Costs: $<100, $<100, other costs captured in Smart Meter
Description: **DRCA:** The objective of this project is to implement a Home Area Network Demand Response Control Application (HAN DRCA). This project will achieve the functionality in the CPUC Energy Division mandate. The project will achieve the following benefits: • Provide the ability to provision, or join, a HAN device to a Smart Meter • Provide the ability to de-provision, or un-join, a HAN device from a Smart Meter • Provide the ability to run historical reports on provisioning and de-provisioning **RYU IHD Pilot**: The objective of this project is to study the impact of customer energy savings on RYU events when they have an IHD. • Provide 650 customers with an IHD • Conduct load impact study on RYU days • Use results to decide on potential tariff change for RYU to include in-home displays as enabling technology and eligible for the higher RYU credit **DRCA/HAN Pilot & Study:** The objective of this project was to implement a back-office system (DRCA) in order to manage and control HAN devices, study the HAN technology and customer's response to the technology. • Test various HAN technology devices • Test customer web portal with historical consumption data and bill projection data	

Project 7: HAN Projects • **DRCA** • **Reduce Your Use (RYU) In-home Display (IHD) Pilot** • **DRCA/HAN Pilot & Study**	
• Test demand response signals and device messages	
Updates: **DRCA:** This project is currently in implementation and is expected to be operational by the end of 2012. **RYU IHD Pilot:** 650 customers have enrolled and received an IHD. Four events have been called and preliminary results indicate savings between 4-6%. **DRCA/HAN Pilot & Study:** A total of 715 customers were enrolled and had varying HAN devices installed in their home. A complete process evaluation was completed and posted on the California Measurement Advisory Council (CALMAC) website. These customers were extended into 2012 until such time that a retail offering is available.	

Project 8: Smart Pricing Program (Dynamic Pricing)	
Funding Source: Application **Project Timeframe: 9/2010 to 12/2015**	Reporting Period Estimated Costs: $19,751
Description: SDG&E's Smart Pricing Program was proposed via application A.10-07-009 filed on July 6, 2010 and modified as described in the Joint Party Settlement Agreement filed on June 20, 2011. The application and settlement agreement describes SDG&E's plans to implement various time-of-use and dynamic rates, along with the necessary information technology (IT) and billing system upgrades as well as the customer outreach and educational efforts necessary for customers to be aware of the new rates and have the tools to make informed rate decisions.	
Update: SDG&E's Smart Pricing Program made significant progress during the Reporting Period, including enabling capabilities such as energy charts, bill-to-date estimates, bill highlights (identifying for the customer why their bill may have changed), neighborhood usage comparisons, and past period comparisons. Additionally, the project helped to enable SDG&E's Reduce Your Use program whereby the interval usage of residential and small commercial customer with a Smart Meter is analyzed to see if the customer qualifies for a rebate of $.75 per kWh (or $1.25 per kWh with enabling technology) on event days.	

Project 9: PEV Rate Experiment (Study)	
Funding Source: Load Research and RD&D balancing account **Project Timeframe: 10/2010 to 9/2014**	Reporting Period Estimated Costs*: Load Research Capital $583, RD&D Balancing Account <$100
Description: The objective of this research is to examine PEV consumer time-of-use charging preferences, the use of smart-charging enabling technology, and other relevant factors through a study that includes the use of CPUC approved experimental PEV rates[42]. This research is being conducted in collaboration with ECOtality's EV Project and Nissan during the introduction of the Leaf PEV to the greater San Diego region, which commenced December 2010. This study will shed light on the price elasticity of demand for electricity by time-of-day among plug-in electric vehicle consumers as an indicator of the sensitivity of electricity demanded to its change in price. *These costs do not include SDG&E labor in implementing this study.	
Update: With almost 400 study participants since January 2011 through June 2012, the following are the interim findings: • TOU rates work to encourage EV customers with financial incentives to charge the vehicle during off peak time periods (only 7% of the kWh used for charging were consumed on-peak). • Use of on-board PEV technology and the electric vehicle supply equipment technology (to set charging start and stop times) helped enable super off-peak charging (82% of the kWh used for charging were consumed between midnight to 5 a.m. PEV charging routines (at home) take about five months to mature to a steady state, while monthly consumption during the same time increases to over 240 kWh per month – reflecting increased use of the PEV and increased customer confidence in using the EV for daily driving needs.	

PROPOSED / PLANNED PROJECTS

Project 10: Vehicle to Home (V2H) Pilot	
Funding Source: GRC **Project Timeframe: 1/2012 and is Ongoing**	Reporting Period Estimated Costs: $0

[42] For information on the temporary experimental PEV rates EPEV-X, EPEV-Y and EPEV-Z see http://www.sdge.com/electric-tariff-book-residential-rates

Project 10: Vehicle to Home (V2H) Pilot	
Description: Commence tracking the progress and findings of the Vehicle-to-Home pilot sponsored by Nissan in Japan to determine if a parallel pilot should be conducted in SDG&E's service territory. Although frequency and voltage characteristics of the utilities between the two countries are different, the applications introduced by Nissan and others are being evaluated for U.S. application and potentially limited testing. The investigation of the safety features of the applications is paramount, for example, understanding the safety precautions embodied in the application in islanding and re-closing of the circuits of the home from the utility grid can be safely accommodated during a period of outage or a planned interruption of service.	
Update: Tracking the progress as reported by Nissan as recently published at the Plug-in 2012 Conference. Next step is to investigate the safety electronics necessary to island the home from the utility grid to assess adaptability to SDG&E's system and forthcoming outcome of IEEE 1547.8 standards (e.g., automation of the disconnect and re-connect functionality under Rule 21).	

ENTERPRISE PROJECTS

Project 11: Digital Roadmap • **Facebook Page** • **My Account Redesign** • **Customer Campaign Management** • **Mobile Applications**	
Funding Source: GRC **Project Timeframe: Ongoing**	
Description: The Digital Roadmap provides for six initiatives that provide customers with greater accessibility to information and easier navigation for more effective communications and time savings in addressing customer energy-related information needs: (a) Re-architecting My Account website; (b) eServices; (c) digital research; (d) including social media into two-way communications; (e) digital advertising; and (f) mobile applications.	
Update: During the timeframe significant activity related to the Digital Roadmap included: sdge.com underwent a complete re-design and re-architecting; development of automation of	

Project 11: Digital Roadmap • **Facebook Page** • **My Account Redesign** • **Customer Campaign Management** • **Mobile Applications**	
eService for start, stop and transfer services; the number of followers of SDG&E's Twitter account increased 10 fold to reach over 16,000; the SDG&E Facebook page was launched; digital advertising continued to support a variety of promotional efforts; and the SDG&E iPhone app was launched. Additionally work began on an Android version of the app; a social media sub-strategy to the Digital Roadmap was written; and work began on making sdge.com mobile optimized.	

Project 12: Enterprise Notification System (ENS)	
Funding Source: GRC **Project Timeframe: 5/2012 to 7/2012**	
Description: This project doubled the ENS system capacity and enabled the system to utilize both RB and MPK Data Centers' resources during activation through unique Avaya gateways and Level3 talk paths. The upgraded system is capable of handling an estimated call volume of 50,000 three-minute calls per hour and its application supports Phone, TTY, Text, Mobile Email, Email, Alpha and Numeric Paging.	
Update: The ENS system continues to be used daily. All existing programs (Emergency Operations, HR, Crisis Management, Smart Meter, IT…) continue to utilize its ability and continue to customize their usages on the system. Since the expansion new programs have been launched. The programs include: • Electrical Outage and Restoration • Conservation Calls (Borrego Springs, 6,000 customers and "Reduce Your Use") • Employee Alerts	

Project 13: Community & Stakeholder Engagement • **Energy Innovation Center (EIC)** • **County Fire Network Services** • **Smart City San Diego** • **Grid ComForum West** • **Imperial Valley Renewable Center** • **US-Russia Presidential Bi-lateral Commission on Energy**	
Funding Source: Various **Project Timeframe: Ongoing**	

Description: SDG&E's Community and Stakeholder Engagement effort is intended to provide campaign level coordination in the utility's engagement effort and ensure that the overarching connections between programmatic outreach and education efforts are present. Encompassed in this effort is a wide variety of stakeholder focused events and efforts, all significantly associated with Smart Grid and specifically SDG&E's Smart Grid efforts. SDG&E has been actively working with business association and residential groups to educate them on the changing landscape of the energy industry, by raising their Energy IQ. After the Smart Meter deployment education effort, SDG&E recognized the need to continue community and business outreach on energy issues. SDG&E is working hard to ensure its stakeholders – in particular, customers – look to SDG&E as a trusted energy advisor.

Update: **Energy Innovation Center (EIC):** The Energy Innovation Center opened in January of 2012 with the mission to help San Diego achieve its Energy Efficiency (EE) potential. The mission includes educating businesses and resident, encouraging the adoption of EE technologies and training San Diego's workforce to install, operate and maintain EE projects.

County Fire Network Services: The County Fire Network Services effort involves provisioning new broadband network links to 70 fire stations in the county. This is a collaborative effort among San Diego County, the San Diego County Fire Authority, HPWREN, CalFire, and other agencies, to improve those agencies' access to Internet and other data sources that contribute to the region's overall fire preparedness.

Smart City San Diego: Smart City San Diego is a bold, multi-year collaboration combining the resources of the City of San Diego, San Diego Gas & Electric, GE Digital Energy, UCSD and CleanTECH San Diego. Together, these leading organizations from government, business, education and non-profit are maximizing synergies to drive existing energy programs forward,

Project 13: Community & Stakeholder Engagement • Energy Innovation Center (EIC) • County Fire Network Services • Smart City San Diego • Grid ComForum West • Imperial Valley Renewable Center • US-Russia Presidential Bi-lateral Commission on Energy	

identify new opportunities, embrace additional collaborators and move the San Diego region beyond today's boundaries of sustainability.[43]

Grid ComForum West: In March 2012, SDG&E co-hosted the Grid ComForum West in San Diego in partnership with the International Engineering Consortium (IEC) and the Electrical and Computer Engineering Department Heads Association (ECEDHA). The Forum focused on critical business issues of deployment and management of Smart Grid technologies.[44]

Imperial Valley Renewable Center: The Imperial Valley (IV) Renewable Center opened in May of 2009 with the mission is to accelerate the development of clean energy and green jobs in IV. The facility will serve as a "one stop shop" for developers and IV residents as IV attempts to become the renewable center of the nation.

US-Russia Presidential Bi-lateral Commission on Energy: In May of 2011, SDG&E was asked by the Department of Energy to contribute to a Smart Grid bi-lateral program working with Russian counterparts. The purpose of this commission is to allow for collaboration on the development of programs to advance EE and joint development and integration of cutting edge technology.[45]

2.3.3.2 DISTRIBUTION AUTOMATION AND RELIABILITY

Distribution Automation/Reliability (DAR) includes projects which improve SDG&E's information and control capabilities for distribution systems. These capabilities may be used to address the complexities associated with integrating distributed energy resources and electric vehicles, advanced outage management, and/or volt/VAr control. DAR would provide the ability to safely and reliably

[43] http://smartcitysd.org/
[44] http://www.gridcomforum.com/GCFWest/index.aspx
[45] http://www.whitehouse.gov/the_press_office/FACT-SHEET-US-Russia-Bilateral-Presidential-Commission

incorporate high penetrations of distributed energy resources by mitigating voltage fluctuations resulting from intermittent power generation. DAR projects would also provide the ability to safely and reliably incorporate the increasing load of charging electric vehicles (EV). The incremental customer load from EV charging is expected to be clustered in specific distribution circuits of the power grid that are not currently designed to manage high levels of electric vehicle penetration.

DAR would detect and isolate faults when they occur, immediately restore service to customers as soon as possible and provide information to customers about outages in real-time. "Self-healing" circuits will reduce the number of customers affected by system disturbances and enable faster service restoration. DAR would also provide optimization of voltage and reactive power on the system to enhance power quality and decrease energy consumption.

DAR helps enable electricity markets to flourish and helps deliver a Smart Grid that has the infrastructure and policies necessary to enable and support the integration of demand response, energy efficiency, distributed generation and energy storage into energy markets.

COMPLETED PROJECTS (NONE)

IN-PROGRESS PROJECTS

Project 14: Advanced Energy Storage – Distribution	
Funding Source: GRC **Project Timeframe: 10/2011 and is Ongoing**	Reporting Period Estimated Costs: $1,499
Description: The objective of this project is to install advanced energy storage projects that will mitigate the impact of intermittent renewables, as well as provide SDG&E with experience developing, implementing, and operating new energy storage technologies. The scope will include developing utility scale (300 kW+) size energy storage units at substations, and distributed energy storage systems (DESS - typically 25 to 50 kW) on distribution feeders.	
Update: One substation battery has been installed in the service territory with another installation in process. Delivery of additional batteries is scheduled in August, with additional orders for 2013 that will be placed in Q3 of 2012. One distribution battery has been installed with two more in construction.	

Project 15: Dynamic Line Ratings – Distribution	
Funding Source: GRC **Project Timeframe: 9/2012 and is Ongoing**	Reporting Period Estimated Costs: $0

Project 15: Dynamic Line Ratings – Distribution	
Description: Installation of sensors on distribution lines to monitor tension and temperature conditions in order to develop real time dynamic conductor ratings. With this technology as part of a portfolio of projects, increased amounts of renewable generation may be integrated into the grid.	
Update: Evaluation of vendor product continues with power source, wireless communication and data validation as key aspects.	

Project 16: Dynamic Voltage Control	
Funding Source: GRC **Project Timeframe: 12/2011 and is Ongoing**	Reporting Period Estimated Costs: $762
Description: The objective of this project is to perform an engineering study of a circuit with 40+% PV generation to determine the impact of voltage compensating equipment. This project will also install voltage compensating equipment, monitor circuit performance and access impact of voltage compensating equipment.	
Update: Six sites have been selected for installation and land acquisition is in process. Two solutions are being tested from two separate vendors.	

Project 17: Borrego Springs Microgrid	
Funding Source: DOE, CEC and GRC **Project Timeframe: 2009 to 5/2013**	Reporting Period Estimated Costs: $4,729
Description: The objective of this project is to establish a microgrid demonstration at an existing substation to prove the effectiveness of integrating multiple DER technologies, energy storage, feeder automation system technologies, and OMS with advanced controls and communication systems, for the purposes of improving reliability and affecting feeder/substation capacity in normal and outage / event conditions. This project is being performed in partnership with the DOE and CEC. The project objectives are to: • Achieve > 15% reduction in feeder peak load through the integration of multiple,	

Project 17: Borrego Springs Microgrid	
integrated DER – distributed generation (DG), electric energy storage, and price driven load management --- on an SDG&E feeder • Demonstrate capability of Volt-Amps-Reactive (VAr) electric power management - coordinating the DER with existing VAr management/compensation tools • Develop a strategy and demonstration of information integration focused on both security and overall system architecture. • Develop a strategy and demonstrate the integration of advanced metering infrastructure (AMI) into microgrid operations • Develop a strategy and demonstrate 'self-healing' networks through the integration of Fault Location, Isolation and Service Restoration (FLISR) into microgrid operations • Demonstrate the capability to use automated distribution control to intentionally island customers in response to system problems • Develop information/tools addressing the impact of multiple DER technologies	
Update: In Q2 of 2012, 2100 customers were intentionally islanded utilizing microgrid resources to lessen the impact of a five hour scheduled outage • Diesel generators were installed and operational utilizing Constant Output and Load Following modes in Q1 2012 • Substation energy storage unit was installed in Q2 and is expected to be operational in Q3 of 2012 • Community energy storage units are expected to be installed in Q4 of 2012 • HANs are expected to be installed in Q3 of 2012 • Capacitor controls are in the process of upgrades which will allow for remote operation	

Project 18: Phasor Measurement Units (PMU) – Distribution	
Funding Source: GRC **Project Timeframe: 6/2012 to 12/2012**	Reporting Period Estimated Costs: < $100
Description: Installation of high-speed time-synchronized measurement devices in substations and on distribution lines. This information will be utilized to provide an indication of grid conditions that can drive mitigation measures.	
Update: Identifying substations for installations. Two circuits have been identified for PMU	

Project 18: Phasor Measurement Units (PMU) – Distribution	
installation. Equipment procurement has begun.	

Project 19: Smart Community Programs • Smart Grid Demo Project – New Residential Community • Del Lago Academy • The Suites at Paseo • Agua Hedionda Nature Center	
Funding Source: GRC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: < $100
Description: This is a set of pilot projects to test distributed energy resources--such as solar PV, fuel cells and energy storage--and demand-response-enabling technology in a new community. The pilot is directed at residential and a few small commercial customers. The community will be designed to be highly energy-efficient in both the residential and commercial sectors. The goal of the pilot project is to provide enough distributed energy resources to meet the critical energy needs of the community. The requirements for such a pilot are the ability to shed non-critical load through demand response programs and to utilize automatic switches that would reroute power from distributed energy resources to the community and improve reliability with the potential for future islanding.	
Update: **New Residential Community Project:** Publicly announced on September 24, 2012 in conjunction with the San Diego Mayor and Sudberry Properties[46]. Once operational, this integrated development will include SDG&E-owned DER, customer DER and smart technologies and control. **Del Lago Academy:** Project is in construction of the building has begun and PV and battery system installation is expected to begin in October 2012. Once operational in mid-2013, the academy will have Solar PV with battery storage and a Smart Grid curriculum for their students. **The Suites at Paseo:** This project is focusing a student housing facility in San Diego and is in the planning stages. Once operational in mid-2013, the state-of-art facility will incorporate energy storage, solar PV, fuel cell technology, and green building attributes. Construction for	

[46] http://www.marketwatch.com/story/sdge-and-sudberry-properties-work-together-to-create-smart-grid-community-2012-09-24

Project 19: Smart Community Programs • Smart Grid Demo Project – New Residential Community • Del Lago Academy • The Suites at Paseo • Agua Hedionda Nature Center	
installation of the energy storage system and PV has begun. **Agua Hedionda Nature Center:** The project is currently in the planning stages. Once operational, the demonstration project will include a "home of the future", education for customers, premise network technology (HAN and other customer premise networks), smart appliance technology, solar production analysis and battery technology.	

Project 20: SCADA Capacitors	
Funding Source: GRC **Project Timeframe: 3/2011 and is Ongoing**	Reporting Period Estimated Costs: $772
Description: The objective of this project is to convert existing distribution line capacitors to SCADA control in order to provide improved VAr control and improved system efficiency and operability. SCADA controls will also alert utility personnel of operating issues. This will increase capacitor bank reliability, minimize downtime, and expedite repair work. The annual capacitor survey will be eliminated as a result of this project. There are approximately 1,400 capacitors (Overhead (OH) switched, OH fixed and Underground (UG) switched) in the system that will be converted by 2017.	
Update: 12 capacitors with SCADA have been installed; final commissioning is pending.	

Project 21: SCADA Expansion – Distribution	
Funding Source: GRC **Project Timeframe: 1/2012 and is Ongoing**	Reporting Period Estimated Costs: $1,504
Description: Installation of 300 SCADA switches so there is a minimum of 1.5 switches on every distribution circuit (mid-points and ties). This project will also install SCADA at 13 substations. With the completion of this project, automation can occur for a significant portion of a circuit	

Project 21: SCADA Expansion – Distribution	
following an outage.	
Update: Authorization to begin work was approved early 2012. Five SCADA switches have been installed through the end of June and four SCADA jobs are ready to be issued for construction in Q3. The target is to have a minimum of 10 switches completed in 2012 and completion of the Paradise Substation upgrade.	

Project 22: Wireless Faulted Circuit Indicators	
Funding Source: GRC **Project Timeframe: 9/2011 and is Ongoing**	Reporting Period Estimated Costs: $880
Description: The objective of this project is to install up to 10,000 wireless fault indicators (WFI) devices on the overhead and underground electric distribution system. In the event of a circuit fault, WFIs rapidly transmit fault location data via wireless communication to the Distribution Operations Center. This information allows Distribution Operations personnel to direct electric troubleshooters more efficiently, minimizing customer outage time and expediting repair work.	
Update: 840 wireless fault indicators have been installed in the field and are operational.	

Project 23: EV Demand Response – Grid to Vehicle (G2V)	
Funding Source: Demand Response Application **Project Timeframe: 9/2011 and is Ongoing**	Reporting Period Estimated Costs: $0
Description: Demand Response (DR) applications will be tested with SDG&E employees at company charging facilities. To accomplish this, the DR requirements were included in the planning effort to build a PV shaded parking canopy at SDG&E's headquarters facility with ten parking spaces dedicated to Level 1 (120-volt) plug-in vehicle charging for employees and fleet. These are cooperative efforts among multiple SDG&E groups to build a facility to accomplish the following Demand Response related tests: • Demonstrate effectiveness of Level 1 charging for the workplace and Fleet • Develop cost-effective access control and billing systems for potential use at SDG&E facilities for employee charging (adaptable to customer workplace and multi-unit	

Project 23: EV Demand Response – Grid to Vehicle (G2V)	
dwelling settings) • Demonstrate remote charging shut-off and/or load control • Provide a platform for demonstration of employee charging response to time-variant pricing schemes and communications • Demonstrate automatic shut-off during Demand Response events	
Update: SDG&E created plans and issued a request for proposal to construct the infrastructure for the project. Funding for the Demand Response applications for this effort were approved in Q2 2012 of SDG&E's DR filing (spending in 2013 and 2014). Installation is expected to be completed by year end 2012. The testing of the DR applications noted in the description will commence during 2013.	

PROPOSED / PLANNED PROJECTS

Project 24: Solar Energy Project	
Funding Source: Application **Project Timeframe: 2008 to 4/2016**	Reporting Period Estimated Costs: $0
Description: The 100 MWdc Solar Energy Project, which was approved by the CPUC in 2010, includes a program to develop up to 26 MW of utility- owned solar generation and 74 MW of merchant owned generation that was to be delivered via power purchase agreements. The 74 MW portion has since been added to the 81 MW Renewable Auction Mechanism Feed-in Tariff (RAM-FiT) program. The utility owned portion of the program calls for SDG&E to install PV systems up to 5 MW on SDG&E's distribution system. SDG&E anticipates employing smarter inverters at these sites with the degree of "smartness" dependent upon local grid needs and size of the PV installation. This will be a stepping stone for SDG&E to establish inverter and communication protocols for interconnecting distributed generation where intermittency is expected to influence grid performance and to control reactive energy output.	
Update: Performance specifications for Solar Energy Project inverters to be developed by end of Q1 2013. The first phase of the project for 17 MW, on eight SDG&E owned properties, was awarded to Independent Energy Solutions, Inc., a local Diverse Business Enterprise. The CPUC approved this contract in August 2012 and permitting and interconnection was initiated this	

Project 24: Solar Energy Project	
past year as well with commercial operation expected in 2014.	

ENTERPRISE PROJECTS

Project 25: Smart Substations	
Funding Source: GRC **Project Timeframe: 2013 and will be Ongoing**	
Description: The objective of this project is to upgrade old electro-mechanical relays to solid-state relays to allow for improved protection and functionality.	
Update: The project will begin in the near future.	

2.3.3.3 TRANSMISSION AUTOMATION AND RELIABILITY

Transmission Automation/Reliability (TAR) includes projects that would provide wide-area monitoring, protection and control to enhance the resiliency of the transmission system. TAR also includes projects to provide the ability to safely and reliably incorporate utility size intermittent power generation such as centralized solar and wind energy. TAR projects would help mitigating voltage fluctuations resulting from integrating intermittent resources.

The wide-area capabilities of TAR would provide the ability to monitor bulk power system conditions, including but not limited to voltage, current, frequency and phase angle, across SDG&E's geographic area in near real-time. This functionality provides system operators with current information about emerging threats to transmission system stability, enabling preventive action to avoid wide-scale black outs. In addition, the wide-area capabilities of TAR also include projects for coordination of high-speed communicating transmission protection equipment that would detect events or conditions in the transmission systems and automatically respond to stabilize the system.

COMPLETED PROJECTS (NONE)

IN-PROGRESS PROJECTS

Project 26: Automated Fault Location	
Funding Source: FERC **Project Timeframe: 4/2012 and is Ongoing**	Reporting Period Estimated Costs: $276

Project 26: Automated Fault Location	
Description: Development of automated fault location for transmission events, using relay events from all line terminals to improve accuracy. This will assist in service restoration and outage duration.	
Update: Installed server and software at the Data Center. Testing of this communication equipment is underway.	

Project 27: Composite Core Conductor	
Funding Source: FERC **Project Timeframe: 5/2012 and is Ongoing**	Reporting Period Estimated Costs: < $100
Description: The objective of this project is to pursue the evaluation of composite core conductors. The tests will be done to allow for the future use of such conductors system-wide. Due to their material properties, these conductors can be loaded higher than conventional conductors allowing for greater power flow with existing infrastructure. This capability among the conductor's superior sag characteristics will improve operation flexibility. The savings is realized by using composite core conductors that do not require the need to rebuild pole and tower structures.	
Update: Conductor has been ordered and upon delivery performance testing will occur on an already specified transmission line.	

Project 28: Dynamic Line Ratings - Transmission	
Funding Source: FERC **Project Timeframe: 7/2011 is Ongoing**	Reporting Period Estimated Costs: < $100
Description: The objective of this project is to pursue the evaluation of available market technologies capable of identifying and calculating dynamic line ratings in real-time and communicate that information to Grid Operations. The project will determine which product will be most suitable to increase the existing transmission line capacity by realizing the dynamic thermal rating margins available. The selected technology will be used as the basis for	

Project 28: Dynamic Line Ratings - Transmission	
establishing dynamic line ratings for the SDG&E transmission system in conjunction with the developed NERC Assessments for transmission voltage class levels exceeding 138kV.	
Update: Technology from three vendors is being analyzed and evaluated at this time.	

Project 29: Phasor Measurement Units (PMU) – Transmission	
Funding Source: FERC **Project Timeframe: 2010 and is Ongoing**	Reporting Period Estimated Costs: $1,892
Description: Installation of high speed time synchronized Phasor Measurement Units (PMU) in SDG&E's bulk power transmission network that takes near real-time (sub-second) readings. This information through visualization and advanced applications that will be installed in the system will provide accurate picture of the grid conditions. The system will provide the operators, engineers, and planners wide-area situational awareness that will help in understanding system outages and avoid system instability and stress. The Synchrophasor data will be shared with Western Electric Coordinating Council (WECC), CAISO, and neighboring utilities, which will provide SDG&E with situational awareness of the entire western area interconnection.	
Update: During the Reporting Period, 27 PMUs were engineered, designed and installed at five different substations. Using the Western Interconnection Synchrophasor Program (WISP), PMU data has been provided to WECC and CAISO using this technology. By the end of 2012, approximately 80 PMUs will be installed in 500kV and 230kV bulk power substations.	

Project 30: SCADA Expansion – Transmission	
Funding Source: FERC **Project Timeframe: 9/2011 and is Ongoing**	Reporting Period Estimated Costs: $497
Description: The scope of this project is to install, upgrade, and expand SCADA at substations for the transmission portion of substation SCADA Expansion. This will increase reliability for	

Project 30: SCADA Expansion – Transmission	
these substations. The work includes replacing transmission breakers and associated relay panels.	
Update: Substation site has been selected. Paradise Substation is scheduled for the SCADA installation by December, 2012.	

2.3.3.4 ASSET MANAGEMENT, SAFETY AND OPERATIONAL EFFICIENCY

Asset Management, Safety & Operational Efficiency (AMSOE) enhances monitoring, operating and optimization capabilities to achieve more efficient and grid operations and improved asset management. AMSOE includes projects that would allow SDG&E to manage the maintenance and replacements of energy infrastructure based on the health of the equipment versus a time base approach. This functionality would help to avoid failures of critical energy infrastructure as well as manage costs associated with maintaining and replacing equipment.

COMPLETED PROJECTS

Project 31: Geospatial Information System (GIS)	
Funding Source: Application OpEx 20/20 **Project Timeframe: 2007 to 10/2012**	Reporting Period Estimated Costs: $21,400
Description: The objective of this project is to migrate several disparate and aging manual/automated mapping systems to an industry standard GIS. This GIS provides intelligent networking and layering of data/information to support engineering, planning, construction and compliance processes, while also supporting essential system integrations. The benefits of this project are: • Consolidation of multiple data/information sources into a single enterprise-wide solution • Improved integration and services for essential planning and operational (e.g., outage management) systems • Provides data/information to spatially enable business processes • Position GIS to better support growing technologies associated with Pipeline Integrity and Smart Grid	

Project 31: Geospatial Information System (GIS)	
Update: Gas implementation completed Q4 2011 and electric implementation scheduled for October 2012.	

Project 32: Outage Management System / Distribution Management System (OMS/DMS)	
Funding Source: Application OpEx 20/20 **Project Timeframe: 2007 to 9/2012**	Reporting Period Estimated Costs: $12,395
Description: The objective of this project is to replace the existing OMS system and install a new integrated OMS/DMS system to improve outage restoration response, predict potential grid issues, increase loading on existing assets, and manage customer impact and increase process efficiencies. This project will also redesign the planned switching process to take advantage of mobile terminals in the field, automated generation and testing of switch plans. OMS/DMS integrates with the GIS system for the as-built distribution system equipment and connectivity. It uses SCADA device status, AMI power off alarms and customer calls to predict where outages have occurred on the distribution system. It will automatically send orders to the crew dispatching system (SORT) to dispatch a trouble shooter to assess the predicted outages. Additional orders can be sent to the Click crew dispatching system for crews to repair and restore the outage.	
Update: The project activities completed during this Reporting Period include system testing, end-to-end testing, user acceptance testing, end user training and pilot production operations. The system users were able to practice using the system in a parallel mode to process both planned and unplanned outages to reinforce their training. Pilot production operations will continue until the planned implementation at the end of September 2012.	

IN-PROGRESS PROJECTS

Project 33: Advanced Ground Fault Detection	
Funding Source: GRC **Project Timeframe: 6/2011 is Ongoing**	Reporting Period Estimated Costs: < $100
Description: The objective of this project is to provide enhanced ground fault detection schemes for distribution circuits to allow for improved detection of operational issues. The	

Project 33: Advanced Ground Fault Detection	
project will also install protective relay systems to detect high impedance faults, where the fault current may be very low and the resulting arcing fault may provide erratic current input to the protective relay. The effort is concentrated on the protective relays for distribution feeder and on pole-mounted service restorers. The advanced protection system will provide faster isolation of downed conductors, promoting enhanced safety and improved service reliability.	
Update: The project is in deployment phase with 60 reclosers targeted for software upgrade and 15 for hardware upgrade in 2012. The project team will continue working with manufacturers as needed to support deployment.	

Project 34: Advanced Weather Station Integration & Forecasting	
Funding Source: GRC **Project Timeframe: 4/2011 to 12/2014**	Reporting Period Estimated Costs: $220

Description: The objective of this project is to develop a weather network consisting of:

- MesoNet weather stations - A network of automated weather stations to observe mesoscale meteorological phenomena
- Portable Weather Stations
- Back country weather cameras

This weather network will support forecasting capabilities, research and real-time operations. SDG&E will utilize this system to:

- Model and forecast the costal marine layer
  - Statistical approach and research
  - Numerical weather prediction
  - Integrate the marine layer forecasting into PV generation forecasting and Net Load forecasting
- Net Load Forecasting Model
  - Understand load at the feeder level to improve management of PV generation and load forecasting
- Model historic years for wind, solar radiation and temperature for the last 50 years
  - Enhance design of system
  - Provide insight for fire hardening needs
  - Support understanding of Santa Ana Winds and Fire Potential
- Acquire Atmospheric Profiles
  - Improve marine layer forecasting

Project 34: Advanced Weather Station Integration & Forecasting	
○ Improve weather forecasting ○ Improve PV generation forecasting	
Update: SDG&E is utilizing the system to collect 130,000 data points daily from 135 weather stations. Historical data collection for the Coastal Marine Layer forecasting model is complete and a Classification and Regression Tree model development is in process. 50 years of historic wind, solar radiation, and temperature data has been acquired, and the project team is in process of applying data to wind/temperature forecasting weather models. Atmospheric Profilers are being researched for equipment capabilities and functionality. PV generation forecasting pilot model successful, and working towards model improvement. Net load forecasting model in the startup phase.	

Project 35: Arc Detection – Distribution	
Funding Source: GRC **Project Timeframe: 7/2012 and is Ongoing**	Reporting Period Estimated Costs: $0
Description: The objective of this project is to develop the capabilities for arc detection on 12 kV overhead circuits. The monitoring equipment will perform data collection and analysis of arcing along long spans. The project will utilize a radio frequency signal to provide fault locations. The evaluation and deployment of this technology will assist in fire prevention activities in fire-prone areas.	
Update: Site selection for six installations is underway. Sensor pod development is in process that would provide communication network integration.	

Project 36: Arc Detection – Transmission	
Funding Source: FERC **Project Timeframe: 4/2012 and is Ongoing**	Reporting Period Estimated Costs: < $100
Description: The objective of this project is to develop the capabilities for arc detection on 230 kV overhead conductors on the transmission lines. The project will install arc detection sensors	

Project 36: Arc Detection – Transmission	
and substation grade communication gateways to monitor the transmission lines. The monitoring equipment will perform data collection and analysis of arcing along long spans. The project will leverage wireless communication signals to provide fault locations.	
Update: Sensor and gateway development and evaluation are underway. Two installations are expected in 2012.	

Project 37: Condition-Based Maintenance (CBM) –Substation Transformers	
Funding Source: Application OpEx 20/20 and FERC **Project Timeframe: 2007 to 2020**	Reporting Period Estimated Costs: $8,499
Description: The objective of this project is to extend the useful life and make greater utilization of the distribution substation transformers. The project will utilize technology to monitor the performance/condition of system assets and will provide actionable alerts when attention is required.	
Update: During the Reporting Period, CBM monitors were deployed at 23 substations with 58 transformers bringing the project to date installations to 65 substations and 191 transformers. This online monitoring of substation transformers produced three "saves" during the past year in which abnormal conditions were detected and corrective actions were taken to prevent the asset from failing.	

Project 38: Plug-in Electric Vehicle (PEV) Infrastructure Upgrades • EV Transformer Impact Study	
Funding Source: GRC **Project Timeframe: ongoing**	Reporting Period Estimated Costs: $3,441
Description: Expand utility infrastructure in a manner that enables the safe, reliable and efficient integration of PEV charging loads with the utility grid, including separate, as well as large charging station networks. Upgrades to the electric distribution system to accommodate	

Project 38: Plug-in Electric Vehicle (PEV) Infrastructure Upgrades • EV Transformer Impact Study	
increased numbers of PEVs. Upgrades include facilitating customer panel upgrades, upgrades of residential distribution transformers, services, and potential circuit upgrades.	
Update through June 2012: Total Estimated PEV Customers: 1,605 Total Residential PEV Customers: 1,349 Residential Customers Requiring Upgrades Due to Addition of PEV Load: 3 Total Non-Res PEV Customers to Date: 256 Non-Res Customers Requiring Upgrades Related to PEV Load to Date: 0 Total Costs of Residential Upgrades Related to PEV Load Completed Under Rules 15 and 16: Average: $1,147 Total: $3,441 Range: $666 to $1,719	

Project 39: Smart Isolation and Reclosing	
Funding Source: GRC **Project Timeframe: 4/2012 and is Ongoing**	Reporting Period Estimated Costs: <$100
Description: Application of off-the-shelf pulse closing technology at additional points on the system. SDG&E has already applied this technology which limits the amount of energy that SDG&E re-closes back into faulted circuits, improving public safety.	
Update: Installations are in various stages of planning. Thirteen installations are expected in 2012.	

Project 40: Smart Transformers	
Funding Source: GRC **Project Timeframe: 10/2011 and is Ongoing**	Reporting Period Estimated Costs: $158
Description: The objective of this project is to install monitoring devices on all transformers serving customers with charging stations for plug-in electric vehicles that are purchased	

Project 40: Smart Transformers	
between 2010 and 2020. Sensing devices attached to the transformers will be used to monitor real-time loading and establish accurate load profiles. The project will also include analysis and evaluation of transformer bushing mounted devices presently on the market.	
Update: Ten prototype load monitors have been installed on pole mount transformers. One version of the monitor was installed near the end of 2011. Based on initial testing a second version of the monitor was produced in April 2012 and installed in May at the same locations. Load, voltage, power factor, and temperature data has been collected and is being transmitted via the low power wide area wireless radio system. The test period is being utilized to validate the radio system and to check the accuracy of the load monitor.	

Project 41: Solar to EV Project	
Funding Source: Sustainable Communities Program **Project Timeframe: 9/2012 to 12/2012**	Reporting Period Estimated Costs: <$100
Description: Smart City San Diego and the San Diego Zoo will install a solar canopy that will charge plug-in electric vehicles (PEV) in the Zoo parking lot. One of the first of its kind in the region, the project will use solar energy to directly charge plug-in EVs, store solar power for future use leveraging battery technology, and provide renewable energy to the surrounding community. The Solar to EV project will serve as a new energy infrastructure blueprint that can be replicated throughout the region and beyond.	
Update: The project was publically announced on September 5, 2012. The project is expected to be completed by the end of 2012.[47]	

PROPOSED / PLANNED PROJECTS

Project 42: Advanced Distribution Management System (ADMS)	

[47] http://smartcitysd.org/resources/press/smart-city-san-diego-and-san-diego-zoo-unveil-solar-electric-vehicle-charging-projec

Project 42: Advanced Distribution Management System (ADMS)	
Funding Source: GRC **Project Timeframe: 9/2012 to 7/2015**	Reporting Period Estimated Costs: $0
Description: The scope of this project is to implement new functions within the new OMS/DMS system to support current and future Smart Grid initiatives for managing the electric distribution grid. The project will be delivered in two phases: Phase 1) Implementation of additional features for device monitoring, fault location and control along with reliability reporting. Phase 2) DMS integration with new sources of real time distribution system information (including distributed generation), and third-party systems such as microgrid controllers and faulted circuit indicators.	
Update: Project is scheduled to begin late Q3 2012.	

Project 43: Microgrid Community Hardening	
Funding Source: GRC **Project Timeframe: 1/2013 and will be Ongoing**	Reporting Period Estimated Costs: $0
Description: The objective of this project is to provide additional hardening in the targeted regions of the SDG&E territory, apart from conventional system hardening; these projects would use PV, batteries and other generation technologies to provide energy in the event of outages.	
Update: The project is in its early stages of planning and research.	

Project 44: Vehicle to Grid (V2G) Pilot	
Funding Source: GRC (Sustainable Communities Program) **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: $125
Description: This pilot integrates stationary batteries with fast public and private PEV charging facilities and includes implementation and testing of sites/units with Electric Vehicle Service Provider (EVSP) and technology partners, protocol refinement with automotive manufacturers and PEV integration testing. The aggregated capacity of the batteries will be bid into the CAISO	

Project 44: Vehicle to Grid (V2G) Pilot	
market.	
Update: SDG&E is leveraging its work with stored energy controls and utilization for application to the unique opportunities inherent in the flexible loads of EV charging, and, in the future, vehicle stored energy applications. SDG&E is refining the scope of this framework and developing detailed requirements and configurations for battery integrated EV charging facilities to serve both grid support and EV charging services. Project examples include: • Plans, permits and site approvals were made for a EV public access charging site, owned and managed by an independent third party, combined with a solar PV parking canopy and energy storage assets; longer term this facility will be networked with other similar facilities to provide utility grid support. • SDG&E is testing a PEV battery integrated DC fast charging system with SDG&E EV fleet vehicles. This charging system mitigates the major load impacts of fast charging, limiting distribution system demand to 20 kW, reducing higher load spiking of conventional fast charging and utilizing the associated energy storage.	

Project 45: Flexible Demand Initiative (FDI)	
Funding Source: GRC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: $0
Description: Expanding on the Vehicle-to-Grid work described above, again SDG&E will leverage its work with stored energy controls and dispatch to be applied to the unique opportunities inherent in the flexible loads of EV charging and potential battery integrated charging facilities, expected to be deployed over the next five years. Demand flexibility coupled with stored energy applications at charging facilities will advance efforts to provide utility grid support. SDG&E plans to test such an application to deliver CAISO ancillary services using aggregated energy storage coupled with publically-accessible plug-in vehicle charging.	
Update: SDG&E has worked with a number of potential customer sites who have expressed interest in hosting FDI facilities, reviewing the requirements and assessing costs. Also, SDG&E continues to work with potential technology partners who would develop the FDI assets, including the technology necessary to aggregate and dispatch the stored energy and vehicle charging load management resources of such facilities, per the CAISO's protocols, and SDG&E requirements. SDG&E continues to work with the CAISO to ensure that the FDI application is consistent with their interests.	

Project 46: Micropile Foundations	
Funding Source: Sunrise Powerlink Application & GRC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: Not Available

Description: Micropile foundations are a type of deep foundation used for large design load structures such as transmission lattice towers. Micropiles typically have smaller diameters and use higher strength steel than conventional drilled shaft deep foundations. They are ideal in situations where:

- Acquiring rights of way (ROW) and/or easements for access roads is prohibitively expense or difficult to obtain
- Environmental impacts and disturbances need to be reduced to the extent possible to meet regulatory requirements
- Urban environments with underground man-made obstructions and surrounding buildings create a sensitive drilling environment
- Poor soil environments or karst geology exists

The higher initial costs of materials and installation for micropile foundations is offset by lower ROW and environmental mitigation costs. This technology was used on the Sunrise Powerlink, but future installations are planned for Smart Grid.

Update: On the Sunrise Powerlink substantial benefits were realized.

- Crews completed an average of five foundations per week.
- 234 (53%) of the 438 foundations on Sunrise Powerlink were micropile foundations constructed by helicopters and were not accessible by conventional vehicles.
- The use of steel pile caps on Sunrise Powerlink micropile foundations, an industry first, eliminated the need to fly approximately 15,500 tons of concrete to remote sites and reduced the total number of helicopter flights needed by 11,900.

Project 47: Condition-Based Maintenance (CBM) – Gas Breakers	
Funding Source: FERC **Project Timeframe: 1/2013 to 12/2018**	Reporting Period Estimated Costs: $0

Description: This project is to extend the useful life and make greater utilization of the transmission substation breakers. The project will utilize technology to monitor the performance and condition of system assets to identify issues prior to causing a serious

Project 47: Condition-Based Maintenance (CBM) – Gas Breakers	
unplanned outage and prior to losing the expensive asset prematurely.	
Update: This project is under development for a scheduled start in 2013.	

Project 48: Dynamic Reactive Support Project (Ocotillo Sol)	
Funding Source: FERC Application **Project Timeframe: 2012 and is Ongoing**	Reporting Period Estimated Costs: <$100K
Description: Assessment of reactive power needs given future anticipated renewable integration. This project initially focuses on the 1300+ MW of renewables expected to be tied electrically to the Imperial Valley substation. The basic assessment or reactive power needs will be applied to other substations and circuits heavily loaded with intermittent renewables. Proposal for IV substation is 100 MVAr which includes a 20 MW/MVAr PV facility.	
Update: Meetings were held with CAISO to discuss SDG&E's dynamic assessment methodology so they can compare to their static assessment. Decision to proceed is expected in late 2012.	

Project 49: Smart Grid Enabled Energy Efficiency	
Funding Source: Application Energy Efficiency **Project Timeframe: 1/2013 to 12/2014**	Reporting Period Estimated Costs: $0
Description: SDG&E's Smart Grid Enabled Energy Efficiency project consists of the Energy Advisor program included in SDG&E's Energy Efficiency application (A.12-07-002) filed on July 2, 2012. The Energy Advisor program is designed to bring together all services offered to support customer education and participation in energy efficiency, demand response and self-generation, energy reducing opportunities and benefits, along with awareness of greenhouse gas and water conservation activities within one program. These services include benchmarking, an online energy audit tool, non-residential audits, pump efficiency services retro-commissioning and coordination with audits.	

Project 49: Smart Grid Enabled Energy Efficiency	
Update: SDG&E's Energy Efficiency application (A.12-07-002) was filed on July 2, 2012 and a prehearing conference was held August 16. A scoping ruling was issued on August 27 directing a compressed schedule so that a final decision can be issued by year-end.	

Project 50: Second Use of EV/PEV Batteries in Stationary Applications	
Funding Source: DOE **Project Timeframe: 4/2011 and is Ongoing**	Reporting Period Estimated Costs: <$100
Description: A DOE- National Renewable Energy Laboratory (NREL) awarded project focused on developing and testing applications and application-specific load profiles for end-of-life traction (PEV) batteries. The demonstration site hosts a four channel bi-directional power supply capable of consolidating the operation of existing on-site PV generation with second use energy storage systems from vehicles to serve local load, smooth intermittent renewable generation, provide ancillary services (voltage and frequency regulation), test dispatch algorithms and associated duty cycles, and investigate system capability for use in customer applications such as vehicle charging and energy arbitrage.	
Update: Application specific analysis of load profiles and corresponding duty cycle development was completed. Publication of preliminary findings was published and presented at Society of Automotive Engineers World Congress 2012. Test facility has been designed, permitted, installed and commissioned. Data collection has commenced. Consortium participated in CAISO Regulation Energy Management Market Simulation.	

ENTERPRISE PROJECTS

Project 51: Early Fire Detection System	
Funding Source: Sunrise Powerlink Application **Project Timeframe: 10/2011 to 12/2012**	
Description: The objective of this project is to install 36 early detection fire preparedness cameras in high fire-prone areas. The cameras can detect smoke using algorithm software to alert emergency response and reduce wildfire risk to the region.	

Project 51: Early Fire Detection System	
Update: There are 29 cameras installed and currently monitoring fire-prone areas in the SDG&E service territory. Seven additional units will be installed pending United States Forest Service (USFS) approval for locations within the Cleveland National Forest.	

Project 52: Mobile Off-Grid Communications Systems	
Funding Source: Sunrise Powerlink Application **Project Timeframe: 10/2011 to 12/2012**	
Description: The objective of this project is to expand the radio communications system to extend "push to talk" radio coverage along the Sunrise Powerlink Project in areas where coverage had not previously existed.	
Update: The project constructed six self-supported radio sites located in remote areas with no access to the electrical grid. These sites rely solely on solar generation and battery storage for energy needs. The radio expansion enabled two-way communication during construction and will continue to provide communication for future maintenance related activities. The solution also provides the ability to monitor 250 Infrared (IR) lights and nine Federal Aviation Administration (FAA) lights. These mobile units were utilized for communication and logistics during the construction of the Sunrise Powerlink, contributing to the excellent safety record of the project. This technology will be leveraged further by upcoming Smart Grid technology.	

Project 53: Mobile Command Centers	
Funding Source: GRC **Project Timeframe: 2011 and is Ongoing**	
Description: The objective of this project is to build and implement mobile command centers for emergency situations. Offering rapid response to earthquakes, fires and major incidents. Each vehicle includes voice and data telecommunications, self-contained power generation, and video services for use by SDG&E and other emergency personnel.	
Update: There are currently two mobile command centers that are operational. The third is	

Project 53: Mobile Command Centers	
expected to be completed by the end of 2012. During the Banner Fire, because of inadequate communications, CalFire requested and made use of the SDG&E Mobile Command Center which was brought to the Puerta La Cruz Incident Base. During the Chihuahua Valley fire, two Mobile Command Centers were deployed to both the field and the heliport areas. The communications provided by the units were the only means available to both SDG&E and CalFire personnel to maintain contact where no commercial services were available.	

2.3.3.5 SECURITY

Physical and cyber security protection of the electric grid is essential, and becomes more so as the Smart Grid is deployed. The communications and control systems that are required to enable Smart Grid capabilities have the potential to increase the reliability risks of Smart Grid deployments if they are not properly secured. The Security program includes a comprehensive set of capabilities to address the increased physical and cyber security requirements associated with the development, implementation, operation and management of Smart Grid systems and edge devices. These projects would place and execute security throughout the network to resist attack, manage compliance and risk, and support security from the physical to application layers.

IN PROGRESS PROJECTS

Project 54: Cybersecurity Projects	
Funding Source: GRC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: $3,262
Description: SDG&E is deploying several cybersecurity projects in conjunction with Smart Grid deployment. SDG&E's risk-based enterprise security program also includes multiple projects that further enhance the security posture of the company, its operations, and the grid. SDG&E's projects related to cybersecurity include efforts in the categories of Risk and Vulnerability Management, Compliance, Operations, Research, and Privacy. Costs for the physical and cyber security of Smart Grid systems are not isolated within these projects. All other Smart Grid investments include additional security-related costs, particularly those that are specific to the project scope or technology.	

Project 54: Cybersecurity Projects	
As this *Annual Report* is a public document, details of SDG&E's security projects are omitted.	

Project 55: Customer Privacy Program	
Funding Source: GRC **Project Timeframe: 3/2011 and is Ongoing**	Reporting Period Estimated Costs: Not Available
Description: In March 2011 as the CPUC's decision to implement new privacy rules for the electric investor owned utilities was being revised, SDG&E formally established its customer privacy program with the establishment of a cross-functional privacy committee reporting to a lead director on privacy and ultimately the Chief Privacy Officer of the company. Since being established, the program's focus has been to complete the development of a privacy controls framework for the utility and as part of that effort to educate employees of the new rules established by the Commission among other efforts.	
Update: SDG&E's customer privacy program is an ongoing implementation of systems, business processes, and training. During the year, SDG&E partnered with the Information and Privacy Commissioner of Ontario, Canada on a white paper describing how Privacy By Design was utilized during the implementation of SDG&E's Smart Pricing Program (see http://www.sdge.com/privacypaper for more information). Other changes have significantly reduced the number of employees with access to customer data.	

Project 56: Substation Physical Security Hardening	
Funding Source: FERC **Project Timeframe: 2011 and is Ongoing**	Reporting Period Estimated Costs: $9,465
Description: The objective of this project is to install new security systems and upgrade existing security systems at substations to include installation of network based remote manageable security control systems, microwave perimeter intrusion detection; gate and door access control (electronic keys, door card readers), motion detection, video surveillance with night vision capabilities, new access control approval processes with supporting systems and field training of affected personnel. In addition, 23 substations have additional installations to further ready them for Smart Grid technology deployments.	

Project 56: Substation Physical Security Hardening	
Update: 30 sites (substations, power plants, and telecommunications) have been completed.	

2.3.3.6 INTEGRATED AND CROSS-CUTTING SYSTEMS

Integrated and cross-cutting systems refer to projects that support multiple Smart Grid domains, such as grid communications, application platforms, data management and analytics, advanced technology testing, and workforce development/technology training. An integrated approach for these projects will ensure that investments are managed efficiently while creating the platform to deliver a stream of benefits across SDG&E's operations and to its customers.

Integrated communications systems will provide solutions to connect and enable sensors, metering, maintenance, and grid asset control networks. In the mid-to-long term, integrated and cross cutting systems would enable information exchange with SDG&E, service partners and customers using secure networks. Data management and analytics projects will improve the SDG&E's ability to utilize vast new streams of data from T&D automation and Smart Meters for improved operations, planning, asset management, and enhanced services for customers.

Advanced technology testing and standards verification are foundational capabilities for the SDG&E to evaluate new devices from vendors and test them in a demonstration environment prior to deployment onto the electric system. This reduces the risks associated with new technology projects, and helps SDG&E maximize technology performance and interoperability prior to deployment.

Workforce development and advanced technology training enables the successful deployment of new technologies, ensuring that SDG&E's workforce is prepared to make use of new technologies and tools, in order to maximize the value of these technology investments.

IN PROGRESS PROJECTS

Project 57: Integrated Test Facility	
Funding Source: GRC **Project Timeframe: 9/2012 and is Ongoing**	Reporting Period Estimated Costs: $0
Description: The SDG&E Integrated Test Facility will be a test facility used to support electric system technology integration for Smart concept evaluation and testing – both devices and software. Integration spans both utility and customer owned equipment and systems. Key aspects of this project include simulation, experimentation, analysis, visualization, integration,	

Project 57: Integrated Test Facility	
demonstration, testing and validation.	
Update: The site location has been selected and the project is scheduled to begin in Q3 of 2012.	

Project 58: Low Power Wide Area Communications Network	
Funding Source: Application Sunrise Powerlink & GRC **Project Timeframe: 2009 and is Ongoing**	Reporting Period Estimated Costs: $5,695
Description: This project builds out the low-speed wireless network and backhaul connectivity to enable electric T&D to deploy and monitor numerous "smart" devices including faulted circuit indicators (FCIs) and aviation lights required for aviation safety. This capability will also provide fault notification and integration with OMS/DMS and other infrastructure and communication monitoring systems.	
Update: The project completed installation and configuration of the back office infrastructure systems that receive and store data from the endpoint devices being monitored (FCIs and aviation lights). Additionally, 30 communications network wireless access points were installed in strategic locations throughout the SDG&E service territory.	

Project 59: SDG&E Grid Communications Systems (SGCS)	
Funding Source: GRC & DOE **Project Timeframe: 2011 to 2015**	Reporting Period Estimated Costs: $6,564
Description: SDG&E Grid Communication Services will implement an advanced wireless communications system that will allow SDG&E to monitor, communicate with and control transmission and distribution equipment, thus accelerating deployment of Smart Grid applications and devices.	

Project 59: SDG&E Grid Communications Systems (SGCS)	
Update: SDG&E has deployed several network base station sites using licensed 2.3 GHz technology on a pilot basis, while developing its plan for full system deployment. In June 2012, adjacent spectrum holders in the 2.3 GHz bands, specifically AT&T Wireless and Sirius/XM (satellite radio provider), asked the Federal Communications Commission (FCC) for changes to the rules governing this spectrum. Because these proposed changes would limit the effectiveness of SDG&E's 2.3 GHz design, a commercial agreement was reached in August 2012 to transfer the license rights to AT&T Wireless. SDG&E is in the process of selecting alternative solutions for deployment. These alternatives are likely to include a variety of public and private services using both licensed and unlicensed spectrum.	

Project 60: Smart Grid Research, Development, and Demonstration (RD&D)	
Funding Source: GRC **Project Timeframe: Ongoing**	Reporting Period Estimated Costs: <$100
Description: These RD&D projects are organized into multiple program areas of RD&D (operations, customer applications, clean generation, clean transportation, renewable generation and program management and related) and include standards and protocols, customer DER integration, next generation DER and next-generation energy storage systems.	
Update: During the Reporting Period, significant progress was made related to the RD&D projects. RD&D is continuing to focus on a number of projects in multiple Smart Grid areas. For example, RD&D is working on a solution that would allow for low-cost smart charging of electric vehicles and development of standards-based messaging middleware to facilitate communication between the utility and electric vehicle service providers (EVSP).	

PROPOSED / PLANNED PROJECTS

Project 61: Smart Grid 2.0 Engineering & Architecture	
Funding Source: GRC **Project Timeframe: 2013 and is Ongoing**	Reporting Period Estimated Costs: $0
Description: The objective of this project is to insure technical, secure, reliable, efficient, and integrated operation among Smart Grid projects and programs by establishing systems engineering and architectural descriptions for the SDG&E Smart Grid as a holistic "system of systems," meeting the company's overall need for cost-effective deployment.	
Update: The project is currently in the planning stage.	

ENTERPRISE PROJECTS (IN PROGRESS)

Project 62: Workforce Development • **California Smart Grid Center Collaboration** • **Customer Contact Center (CCC) Transformation**	
Funding Source: GRC **Project –Timeframe: Ongoing**	
Description: California Smart Grid Center Collaboration: This project will result in the implementation of recruiting strategies and client partnerships necessary to manage the Smart Grid related workforce. CCC Transformation: This project will put in place the training, communication, policies and practices necessary to ensure that as the many Smart Grid-related initiatives are implemented so that change management is handled consistently and effectively. This initiative develops new job skills for some employees, new positions for other required job skills and new business processes to ensure continued compliance with regulatory and safety mandates.	

Project 62: Workforce Development • **California Smart Grid Center Collaboration** • **Customer Contact Center (CCC) Transformation**	
Update: California Smart Grid Center Collaboration: Curriculum is being developed with input from several utility subject matter experts. Curriculum is 70% complete. CCC Transformation: Customer Contact Center employees' have undergone training to allow a broader range of services to be offered during phone and other interactions with customers to become more of a "trusted energy advisor" rather than a transaction-oriented order taker. In recognition of this evolution, job titles have been updated from Customer Service Representative to Energy Services Specialist.	

Project 63: Data Management and Analytics • **Customer Analytics System (CAS)**	
Funding Source: GRC **Project Timeframe: 4/2011 and is Ongoing**	
Description: The Data Management and Analytics project will provide infrastructure to store and analyze the vast amounts of data generated by existing applications as well as Smart Grid systems. New analytics tools will be deployed and specifically tailored to the Smart Grid business domains to uncover a greater understanding of this new data in areas such as: Demand Forecasting, Situational Analysis, Optimization and Customer Usage Analytics. Underlying foundational capabilities include ensuring that internal company data is consistently used and aligned with external Smart Grid industry standards.	
Update: CAS (Customer Analytics System) is a project to enhance SDG&E's enterprise capabilities to leverage customer data assets into useful, actionable insights for executives, managers, power users and customer-facing personnel. Implementation of the project will begin in Q4 2012.	

2.4 IMPACTS TO THE SMART CUSTOMER, SMART MARKET, AND SMART UTILITY

Table 2-5 discusses the impacts from each of SDG&E's Smart Grid project categories to the Smart Customer, Smart Market, and Smart Utility areas.

Table 2-5: Impacts to Smart Customer, Market, and Utility by Project Category

Project Category	Smart Customer	Smart Market	Smart Utility
1. **Customer Empowerment / Engagement**	Smart Meters, Green Button and related web-based and mobile apps empower SDG&E's customers by giving them a means to conveniently access their usage data and also give them greater control over how and when they use energy. Because these are standards-based, open access initiatives, they also enable new applications and information services that provide greater value to customers.	Projects such as Green Button Connect My Data and Smart Pricing Program contribute to the development of a Smart Market by providing a platform for third parties to develop new products and services, encouraging changes in customer behavior through new pricing and rate models. Connected to the Sun opens access to solar generation to all customers, even those lacking capital or property to install their own.	Smart Meters, Demand Response programs, and DER- and PEV-related projects are helping to create a Smart Utility by supporting the reliable and cost-effective integration of widespread intermittent renewable generators and plug-in electric vehicles, as well as new time of use rates that send more accurate price signals to customers.
2. **Distribution Automation & Reliability**	These projects contribute to the Smart Customer through Smart Community Programs and the Borrego Springs Microgrid that advance	Projects in this category help drive a Smart Market through development and deployment of technologies that will enable high penetrations of	Projects such as Advanced Energy Storage, SCADA Expansion, and SCADA Capacitors enable the Smart Utility by empowering distribution system

Project Category	Smart Customer	Smart Market	Smart Utility
	community awareness of Smart Grid technologies and benefits so that customers understand the role of these investments in improving distribution system reliability and power quality.	renewable distributed generation and plug-in electric vehicles, and utility-integrated microgrids that will provide new options for differentiated reliability services in the future.	operators with energy storage options that expand capacity as well as improved reliability through better failure detection and prediction, improved power control and faster isolation of faulted electric distribution circuits for faster load restoration.
3. **Transmission Automation & Reliability**	Projects in this category contribute to the goals for the Smart Customer by integrating large-scale centralized renewables while maintaining reliable services to customers and helping to avoid large-scale outages that economically impact customers.	Projects such as Phasor Measurement Units (PMUs) and SCADA Expansion will help build a Smart Market by using sensing and control technologies to improve wide area situational awareness, leading to more efficient market operations and maintaining reliability while integrating large-scale intermittent renewable generation sources.	Projects such as PMUs contribute towards the objectives of the Smart Utility by using innovative approaches to maximize network capacity, while others include advanced materials, sensors, and control systems that will help maintain or improve reliability.
4. **Asset Management, Safety, and Operational Efficiency**	These projects help to create the Smart Customer by making improvements and advances to systems	Projects in this category such as the Flexible Demand Initiative contribute to the Smart Market by integrating	The Smart Utility will be realized in part through projects such as CBM, GIS, OMS/DMS, and Smart Isolation and

Project Category	Smart Customer	Smart Market	Smart Utility
	that will optimize investments, system efficiency, and public safety. Projects such as the Solar to EV initiative include advanced technology integration and outreach efforts that will reach large numbers of customers.	technologies and services that benefit the grid while creating opportunities for innovative new business models.	Reclosing, which proactively manage asset health, improve situational awareness, maximize operational and system efficiency, while protecting worker and public safety.
5. **Security**	SDG&E's Customer Privacy Program will help create the Smart Customer by ensuring that the ever-increasing amount of data collected for and about customers is appropriately managed and protected while being made available to third parties after customer authorization.	A Smart Market must guarantee the availability of systems, confidentiality of information, and integrity of data and transactions, all of which depend on a robust risk-based security program.	Projects in this category help to create the Smart Utility by ensuring that systems, assets, and customers are protected from physical and cyber security issues that could affect reliability or customers' trust in the system.

Project Category	Smart Customer	Smart Market	Smart Utility
6. **Integrated & Cross-cutting Systems**	Projects in this category ensure Smart Customers are be served by a Smart Utility workforce that understands their preferences and needs for more tailored energy services.	Enabled in part by RD&D and integrated system testing efforts in this project area, the Smart Market will develop with assurance that interoperable systems will support market and transaction integrity.	Projects in this area will ensure robust and secure communications are widely available and enable cost-effective implementation of sensor and control capabilities that provide a variety of benefits. Workforce development initiatives will ensure that skills of existing employees evolve, and future hires have the blend of skills needed for the Smart Utility.

2.5 CUSTOMER ROADMAP

2.5.1 INTRODUCTION / BACKGROUND

On March 2, 2012 an ALJ Ruling was issued in the Smart Grid proceeding adding a "Staff Comments & Recommendations" report[48] ("Staff Report") to the proceeding's record. The Staff Report was issued to summarize the Energy Division staff's ("Staff") recommendations following the filing of the Smart Grid Deployment Plans by SDG&E, PG&E and SCE as well as well to summarize Staff's reactions and summary of the Smart Grid workshops conducted at the Commission from January 30 – February 2, 2012.

In summary, the Staff agreed that the SGDPs were in compliance with the requirements set forth in D.10-06-047 (decision that provided the requirements for the SGDPs), and the Staff recommended

[48] http://docs.cpuc.ca.gov/efile/RULINGS/160729.pdf

approving the plans with no revisions[49]. However, the Staff noted that "…all three utilities failed to develop an actual roadmap/plan that included a detailed strategy and timeline to outreach to customers"[50] and that "CPUC Staff would like to see additional detail on how the utilities link their vision with day to day operations for marketing, education, and outreach to customers."[51] In the report, Staff included a template for a "Customer Outreach Project Timeline" and SDG&E's Customer Roadmap / Customer Engagement Plan is provided below in three groups and utilizes that template.

2.5.2 CUSTOMER OUTREACH & ENGAGMENT PLANS

This annual Smart Grid update report contains an updated SDG&E Smart Grid project list with 63 projects included. In terms of its customer outreach and engagement effort, SDG&E organizes these projects into three groups, and therefore three customer roadmaps (or customer engagement plans) are included the tables below. These tables follow the format provided by the CPUC in the Staff Report provided on March 1, 2012.

The first project group contains SDG&E's customer empowerment / engagement projects or other projects that have a direct customer outreach component. That is, these projects directly result in communications with customers or provide tools or programs for customers and therefore have, as a critical and necessary element, customer engagement or communication organic to the effort (see Table 2-6).

The second project group contains projects that are not squarely focused at the customer, but rather on the grid side of the meter and that will be evident to customers generally because of their physical presence within the community. These projects also bring with them customer concerns that based on recent experience can be reasonably expected to develop. For example, these may include health concerns (such as radio frequency – RF), community development concerns (sometimes referred to as 'not in my backyard' or NIMBY concerns), and environmental concerns (such as noise or appearance) (see Table 2-10).

The third project group contains projects that, like group two, are not squarely focused at the customer but rather on the grid side of the meter, but in this case will largely be transparent to the customer. These projects may include the installation of equipment that is not imposing or that may be located in the substation and that in general customers simply will not see. That said, these projects are still a vital part of the Smart Grid, and customers will need to have a high level idea what issues they are designed to address and have confidence that investments in these projects are wise for system reliability and power quality purposes (as two examples)(see Table 2-14).

[49] "Staff Comments & Recommendations" report (http://docs.cpuc.ca.gov/EFILE/RULINGS/160730.htm) at p. 1 and p. 13
[50] Ibid, p. 2
[51] Ibid, p. 10

Table 2-6: Customer Engagement - Project Group Description & Target Audience – Project Group One

SDG&E Smart Grid Projects, Group One - Customer Empowerment/Engagement or other projects with direct customer outreach.	
Projects Included	*connected….. to the sun*, Green Button Connect My Data, Green Button Download My Data, Smart Grid Demand Response Programs, Electric Vehicle (Clean Transportation) Education and Outreach, HAN Projects, Smart Meters, Smart Pricing Program (Dynamic Pricing), Vehicle to Home (V2H) Pilot, Vehicle to Grid (V2G) Pilot, PEV Rate Experiment (Study), Customer Privacy Program, Solar to EV Project, Smart Community Programs, Smart Grid Enabled Energy Efficiency, EV Demand Response (Grid to Vehicle (G2V)) Enterprise Projects: Digital Roadmap, Enterprise Notification System, Community & Stakeholder Engagement, Mobile Command Centers
Description of Project Grouping[52]	These SDG&E Smart Grid projects collectively represent SDG&E's Smart Grid-related customer empowerment and engagement effort as well as other customer outreach efforts. These projects will: - Enable customers to have an unprecedented understanding of their energy usage. - Provide customers greater pricing plan options that better meet their needs - including time-variant and 'green' rates - and the information and tools they need to make informed choices among those offerings. - Ensure that the 'home area network' (HAN) capabilities in Smart Meters continue to be tested and developed. - Provide incentives and capabilities for customers, if they choose to participate, to vary their load in response to price or other signals (demand response). - Give customers the information they need as they contemplate and purchase plug-in electric vehicles (PEVs). - Provide energy usage information directly to customers or their designated third parties, empowering innovation and valued energy related services to customers. - Ensure, if and when current CPUC policy changes, that PEV charging is readily available to those customers who

[52] Individual project descriptions can be found in section 2.3.3 of this report.

	need it. - Ensure that customer privacy is fully integrated into the way SDG&E does business and that customer privacy controls are in place and working. Collectively, these are the projects that "...will create a utility foundation for an innovative, connected and sustainable energy future." Through these projects, SDG&E will "work with customers and service providers to increase customer engagement with and adoption of new energy management technologies and behaviors. From a "Smart Customer" perspective, this will give consumers the opportunity to capture the benefits of a wide range of existing and emerging energy technologies and associated energy management products and services."[53] These are the projects that allow customers to "... be aware, informed and knowledgeable about their energy choices, and have the tools to act upon those choices."[54] As stated in its *Smart Grid Deployment Plan*[55], "SDG&E recognizes that engaging with and proactively reaching out to customers is critical to the success of its Smart Meter deployment and Smart Grid utilization efficiency." These projects continue that journey.
Target Audience	Primarily residential and small commercial customers (< 20kW peak load), but in some cases medium and even large commercial customers as well. Additionally, target audiences include SDG&E employees, policy makers (legislators and staff, CPUC and staff, CARB, CEC), communities and local stakeholders, and in the case of electric vehicle related messages also includes car dealers and manufacturers (OEMs or original equipment manufacturers) as well as fleet and workplace charging providers among others.

[53] A.11-06-006, p.21
[54] ibid, p.22
[55] ibid, p.22

Table 2-7: Customer Engagement Roadblocks – Project Group One

	2012	2013	2014	2015
Current Roadblocks	1 – Most customers are not aware of how much energy they use, when they use it, or how much it costs. 2 – Most customers are not financially rewarded for shifting their energy use to off peak periods – especially on 'critical' days. 3 - Energy usage is a low engagement activity / purchase. That is, many customers would rather not spend time thinking about their energy usage or what it costs. 4 - Some customers, although environmentally conscious and inclined to install PV, are not able to install such a system due to some constraint (such as living in an apartment, or not having a suitable roof orientation or other limitation). 5 – Some customers desire other	15 – Most customers are not aware of new rate choices / customers need tools to conduct a meaningful analysis of new rate choices. 16 - Customer 'HANs' may be more about security and entertainment, not energy usage. 17 – Some customers are becoming more concerned with privacy as it relates to the operations of the electric and gas utility (collection / sharing of usage and other data).	18 – Some small commercial customers (<20kW peak load) are not aware that they are defaulting to time-of-use pricing / are not aware how this will impact their bill / are not aware of rate choices available. 19 - SDG&E expects the rate of growth / adoption of PEVs in its service territory to increase dramatically during this period, and that customers who purchase PEVs will not contact the utility to inform them of such purchases in many cases.	

	2012	2013	2014	2015
Current Roadblocks, continued	'information services' providers (i.e.: presentation of usage / cost information) besides the utility. 6 - Customers don't know what new energy saving technologies is available. 7 - SDG&E's understanding of its customers is less than optimal and this makes communicating with them in a consistently engaging way challenging. 8 - Point of PEV purchase opportunities with OEM and dealerships tend to preclude messaging about low cost electric fuel benefits and importance of planning charging needs with utility. 9 - Limited EV customer notification to utility regarding purchase of EV limits opportunity to educate customers about EV rate and EVSE options. 10 - General level of knowledge of			

	2012	2013	2014	2015
	benefits of EVs in customer population is limited.			
	11 - Potential PEV owners are concerned about range and where they will charge. Additionally, customers are not aware of the environmental or societal benefits of PEVs or the metering, rates or other programs associated with PEVs.			
	12 – Customer's service expectations continue to increase and are being compared against other industries and businesses level of convenience/service – for example, customers can deposit a check into their bank account via their smart phone while at home.			
	13 – Customers may "opt out"[56] of Smart Meters in growing numbers. 14 – Customers who might benefit are not aware of 'Reduce Your Use Days' / awareness levels of 'Reduce Your Use Days' needs to be increased.			

[56] D.12-04-019 provides SDG&E with direction regarding customer's ability and choices to opt out of Smart Meters. Fees for opting out are $75 up front / $10 per month thereafter ($10 up front / $5 per month thereafter for customers enrolled in CARE).

Table 2-8: Customer Engagement Timeline & Strategy – Project Group One

	2012	2013	2014	2015
Timeline & Strategy to overcome roadblocks **NOTE: numbering of these 'strategies to overcome' corresponds to the 'roadblock' numbering above; that is, strategy number 1 is meant to address roadblock number one, and so on.**	1, 2, 3 & 8 - Offer the right information to the right customer through the right channel at the right time to enable customers to adopt smart energy solutions and make informed energy management decisions.			
	1 - Complete the Smart Meter deployment / Drive customer enrollment in My Account and encourage customers to engage with the new Energy Management Tool. Act as a trusted energy advisor by promoting programs (and pricing options as they come available) that meet each customer's needs. Additionally, the Green Button – implemented in late December 2011 – is providing customers and application developers with unprecedented access to energy usage information. 2 – Implementation of 'Reduce Your Use' / financial incentives of $.75 (no technology) or $1.25 (technology) per kWh on event days for savings below individually calculated customer reference level during the 11 a.m. – 6	16 – SDG&E's HAN projects seek to ensure that energy usage information is available in the premise on a near-real time basis supporting smart appliances and other in-home devices and although energy usage information may not be the main driver for customers installing wireless networks in their home, will allow energy usage information to be available over the air and therefore 'part of the mix' as customer in-home wireless networks develop. 17 – SDG&E's Customer Privacy Program is resulting in a renewed focus on the issue of privacy and has resulted in SDG&E partnering with the Information and Privacy Commissioner of Ontario Canada (Dr. Ann Cavoukian), one of the leading Smart Grid privacy advocates in the world today; SDG&E's customer	18 – As part of SDG&E's Smart Pricing Program, a comprehensive multi-channel communication, outreach and education effort to the small business community will take place to ensure these customers are prepared for the rate transition to time-of-day pricing. In addition, a new tool will be made available to allow customers to conduct a rate comparison analysis to help them understand which pricing plan will best fit their needs. Additionally, relevant EE/DR programs and other technology solutions (such as programmable communicating thermostats) will be offered as solutions to support customers opting in or transitioning to time variant rates. Customers will be	

	2012	2013	2014	2015
Timeline & Strategy to overcome roadblocks, continued	p.m. period. Additionally, implementation of time varying rates as proposed in SDG&E's Dynamic Pricing Application (A.10-07-009) as modified in the Joint Party Settlement Agreement, filed on June 20, 2011. 3 – SDG&E is working to find new and better ways to engage customers with their energy usage such as: (1) social gaming (SD Energy Challenge); (2) personalized energy reports; and (3) Energy usage/tier notification (that will be piloted at the end of 2012). In addition, a customer preference center will allow customers to select their preferred channel of communication for energy related information. 4 – To address customers who want to install a solar system, but cannot due to circumstances / or customers who want a 'green rate' option, SDG&E filed A.12-01-008 "Connected to the Sun" that includes 'Share the Sun' and 'SunRate' provisions. Additionally,	privacy program continues to grow and evolve as privacy principles like Privacy By Design (PbD) and Fair Information Practice Principles (FIPP) are woven into systems and processes, from the design stage forward.	provided up to two years of bill protection to allow them try these new pricing options risk free. 8, 19 – Work with car manufacturers and dealers to develop improved contractual opt-in language within the PEV purchase process that allows for direct communication between the utility and the new PEV owner post-purchase regarding such issues as rate choices and charging options.	

	2012	2013	2014	2015
Timeline & Strategy to overcome roadblocks, continued	solar calculator functionality has been implemented within the My Account / My Energy portal to allow customers to analyze the potential impact to their electricity bill of installing a solar system. 5 – To address customers choice in third-party energy information services providers (and innovation in this market space), SDG&E is implementing its 'Green Button Connect My Data' project during Q3 2012. Additionally, SDG&E is working to transform its Customer Contact Center by training employees to become Energy Service Specialists (ESS's) instead of transaction focused customer service representatives. 6 – SDG&E's Energy Innovation Center (EIC) had its grand opening on January 18, 2012 and is a showcase facility that includes a 'smart home' area that highlights new energy efficiency and other energy related technologies.			

	2012	2013	2014	2015
Timeline & Strategy to overcome roadblocks, continued	7 – SDG&E's customer segmentation work – undertaken as part of the Smart Pricing Program project - will allow its customer contact center personnel (as well as other SDG&E employees) to understand what segment customers fall into and therefore what program offers and messages may resonate more effectively. Additionally, the Customer Analytics System (CAS) project will allow an improved understanding of SDG&E's customers. 10, 11 – SDG&E's EV Outreach project is designed to improve the EV level of knowledge in the community, among other goals.			
	12 – Continue to make improvements to self-service channels as well as offer additional services enabling SDG&E to be a catalyst for innovation and to become the customer's choice for trusted energy solutions which enrich customers' lifestyles and their businesses. Examples include the transformation of SDG&E's Customer Contact Center toward becoming trusted energy advisors (Energy Service Specialists / chat capabilities / as well as other services such as SDG&E's 'Mover Services' project).			

	2012	2013	2014	2015
Timeline & Strategy to overcome roadblocks, continued	13 – Continue to explain the benefits of having a Smart Meter (such as the ability to see when electricity is used on an hourly basis / applications that are being developed in conjunction with Green Button and Green Button Connect my Data, and ability to take part in Reduce Your Use Day rewards). 14 – Utilize mass media and individual's preferred channel to communicate when 'Reduce Your Use Days' are called. Weave 'Reduce Your Use Day' messages into a wide range of company communications to raise customer awareness levels. Encourage customers to enroll in 'My Account' and to sign up for notifications via text, e-mail or other preferred channels. 8, 9, 16, 19 - Work with car manufacturers and car dealerships to encourage customer communication with the utility early in the PEV purchase process. Additionally, continue to grow multiple methods of identifying and communicating with EV customers, among these: DMV bill SB859, load detection analysis, CVRP/ARB partnership, mass communications, OEM communications, community and car related events/seminars.			
	11 – Although IOUs are currently prohibited from owning PEV charging equipment[57] SDG&E is afforded a path to EVSE ownership should SDG&E's GRC request for such equipment be approved. Accordingly, SDG&E may have the ability to plan for locating charging infrastructure and is already conducting outreach to alleviate PEV customer range anxiety.			
	17 – Communicate with customers about SDG&E's privacy program including policies and practices			

[57] D.11-07-029, p. 49

	2012	2013	2014	2015
	related to the collection and sharing of customer information. Include a link on the SDG&E website to the customer privacy notice and privacy policies; include the link to the privacy notice on all electronic correspondence with customers.			
		15, 18 – Communicate new rate options to customers via their preferred channel (CCM project will enable this capability) and provide customers with the tools they need to analyze which rate is best for them (Smart Pricing Program will provide these tools). For Small Commercial - customers aren't aware that they are defaulting to TOU (and how this will impact their bill). In addition, small business customers in particular are not able to deal with time-of-use pricing generally in many cases due to the nature of their business.		

Table 2-9: Customer Engagement Messages – Project Group One

	2012	2013	2014	2015
Sample Message(s) / Message Source(s)	1 - My Account: There's more to My Account than paying your bill. With the new online energy management tool you can: See an overview of your energy use, get current bill and a	11 - Earn LCFS (low carbon fuel standard) credits to increase the value of the electricity used for your EV & help CA reduce its carbon footprint	10, 11 - Save even more with low EV electric fuel rates, and incentives for additional load management program options.	

	2012	2013	2014	2015
Message source is the utility unless specified otherwise **NOTE: Numbering of these Sample Messages corresponds to the roadblock and strategy numbering above; that is, messages labeled**	forecasted bill for the month, review your hourly, weekly or monthly energy use, analyze your bill to see why it changes, learn about energy-saving actions specific to your home, and more … 1 - Green Button: Now you can download your electricity use data with the simple click of a button. Through the "Green Button" you can quickly and easily download your electricity usage data through our secure My Account website. By using the Green Button, you can download up to 13 months of your personal electricity usage data and share it with developers and third parties who can help you understand your energy use. 2, 14 - Reduce Your Use: Save energy between 11 a.m. and 6 p.m. on Reduce Your Use days and you'll be rewarded with a credit on your SDG&E bill. Set up an alert and we'll let you know when to expect a	(GHG – greenhouse gas).		

	2012	2013	2014	2015
with a number one are meant to address strategies and roadblocks labeled with a number one, and so on. **Sample Message(s),**	Reduce Your Use day. 3 – "Join the San Diego Energy Challenge. Win prizes for you and your school." "The more you play, the more chances you and your school will have of winning." 6 - San Diego Gas & Electric (SDG&E) introduced its new Energy Innovation Center (the Center), a showcase facility where residential and business customers can learn about energy efficiency, alternative fuel transportation, Smart Grid, and clean generation. 8, 9 - "Call SDG&E First" - Support the adoption of plug-in electric vehicles while ensuring safe, reliable and efficient load integration with the grid. 10, 11, 15 - Ensure you are receiving the lowest cost electricity (fuel) possible when charging – charge your car during off peak hours.			

	2012	2013	2014	2015
continued	10, 11 - Support energy independence and reduce petroleum imports; Plug-in electric vehicles help achieve these goals. 10, 11 - Assist California in meeting its goals to reduce 13 million tons of greenhouse gasses by 2020 – 39% come from transportation. 12 - Pay online with My Account. Use My Account to pay your bill and more. – • Control when and how your bill gets paid. • Link additional accounts to manage multiple bills at the same time • Schedule service appointments for your appliances The easy, secure way to manage your account. 13 - Smart Meters will help you save energy and money. Smart Meters allow for two-way communication between you and SDG&E. The meters record your energy use information daily, then that data is sent to our data center for billing and customer			
Sample				

	2012	2013	2014	2015
Message(s), continued	service. This new technology will also help you make smart choices to save energy and money on your SDG&E bill. 17 - SDG&E believes privacy is a fundamental right of every customer. SDG&E has a strong commitment to protecting customer data and we take the issue of customer privacy very seriously. We are committed to doing our part to advocate for privacy on behalf of our customers and our community.			

Table 2-10: Customer Engagement - Project Group Description & Target Audience – Project Group Two

SDG&E Smart Grid Projects, Group Two - Grid-centric or cross-cutting projects that are evident to customers / that have more obvious customer impacts or concerns	
Projects included	Advanced Energy Storage - Distribution, Second Use of EV/PEV Batteries in Stationary Applications, Borrego Springs Microgrid, Flexible Demand Initiative (FDI), SDG&E Grid Communication Systems (SGCS), Low Power Wide Area Communications Network, SCADA Expansion (Distribution), SCADA Expansion (Transmission), SCADA Capacitors, Smart Transformers, Solar Energy Project, Microgrid Community Hardening.

SDG&E Smart Grid Projects, Group Two - Grid-centric or cross-cutting projects that are evident to customers / that have more obvious customer impacts or concerns	
Description of Project grouping[58]	These projects are 'grid-centric' (in that they are generally focused on the utility side of the meter and not squarely at the customer), but are anticipated to be more evident to customers than other grid-centric projects. For example, a community storage (Advanced Energy Storage – Distribution) system might consist of a large piece of equipment – perhaps just smaller than a compact automobile – placed in the utility right-of-way that many customers are likely to notice. These projects generally address reliability and / or power quality concerns and due to their size or operational characteristics may garner concern from customers.
Target Audience	Primarily residential and small commercial customers (< 20kW peak load), but in some cases medium and even large commercial customers as well. Additionally, target audiences include SDG&E employees, policy makers (legislators and staff, CPUC and staff, CARB, CEC), communities, and other stakeholders.

Table 2-11: Customer Engagement Roadblocks – Project Group Two

	2012	**2013**	**2014**	**2015**
Current Roadblocks	1 – Community opposition to development (sometimes referred to as NIMBY or "not in my backyard") concerns 2 – Health concerns (i.e.: Radio Frequency or RF concerns, etc.) 3 – Environmental concerns (i.e.: appearance or sounds made by running equipment or other environmental concerns such as chemicals used in equipment, etc.)			

[58] Individual project descriptions can be found in section 2.3.3 of this report.

	2012	2013	2014	2015
	4 – Rate / cost concerns (these projects represent a significant investment for customers and the customers may not understand the reason these investments are necessary, why they have been proposed and / or approved).			

Table 2-12: Customer Engagement Timeline & Strategy – Project Group Two

	2012	2013	2014	2015
Timeline & Strategy to overcome roadblocks	**NOTE: numbering of these 'strategies to overcome' corresponds to the 'roadblock' numbering above; that is, strategy number 1 is meant to address roadblock number one, and so on** 1 – Community outreach – look at addressing community specific needs; look at the concerns from the customer's perspective and address them individually where possible; be as transparent as possible regarding project scheduling or construction (leverage Sunrise Powerlink and Smart Meter lessons learned as much as possible) 2 – Ensure that the facts are included the outreach effort so customers understand the accepted scientific conclusions of the health risks of various technologies. Offer choice where ever and whenever possible (i.e.: Smart Meter Opt-out) 3 – For appearance related concerns, utilize visual mitigation such as color, berms, walls, etc… blending into the environment as much as possible; for environmental impact of construction, ensure complete understanding of the rules (i.e.: complete an Environmental Impact Report (EIR) as necessary, understand the California Environmental Quality Act (CEQA) requirements and follow them, etc.); mitigate through real estate offset purchases as applicable and necessary (leverage Sunrise Powerlink lessons learned as much as possible) 4 – Ensure that the overall business case for Smart Grid is communicated in the appropriate level of detail. In SDG&E's case, as shown in A.11-06-006 (*SDG&E's Smart Grid Deployment Plan*, filed June 6, 2012), costs were quantified as $3.5-$3.6 billion, and benefits as $3.8-$7.1 billion.			

Table 2-13: Customer Engagement Messages – Project Group Two

	2012	2013	2014	2015
Sample Message(s) / Message Source(s) **Message source is the utility unless specified otherwise**	2 – Radio Frequency, or RF, emissions are a form of electromagnetic energy used for many purposes, including radio and television broadcast, cellular telephones, and communications for police and fire departments. Many devices use some form of RF signals for communications, including such common items as garage door openers, baby monitors, cordless phones and even the radio. Like many business, we have equipment that use RF communications. 4 – Advanced Energy Storage systems connect to the electric grid to alternately store and release electric energy in a programmed manner to smooth power flow, stabilize voltage, and improve local reliability. 4 – During a power outage, AES systems have the potential to allow for continual power while separated from the grid. 4 – Our investment in Smart Grid technology is an investment in the future – a future designed to provide customers with more choices, more control and greater convenience.			

Table 2-14: Customer Engagement - Project Group Description & Target Audience – Project Group Three

SDG&E Smart Grid Projects, Group Three - Grid-centric or Cross Cutting Projects that are less evident to customers / that are more or less system upgrades or technical enhancements and/or that are reliability related	
Projects included	Advanced Ground Fault Detection, Advanced Distribution Management System (ADMS), Advanced Weather Station Integration & Forecasting, ARC Detection – Distribution, ARC Detection – Transmission, Condition-Based Maintenance (CBM) – Substation Transformers, Condition-Based Maintenance (CBM) – Gas Breakers, Geospatial Information System (GIS), Micropile Foundations, Outage Management System / Distribution Management System (OMS / DMS), Plug-in Electric Vehicle Infrastructure Upgrades , Dynamic Reactive Support Project – Ocotillo Sol, Dynamic Line Ratings – Distribution, Dynamic Line Ratings – Transmission, Dynamic Voltage Control, Phasor Measurement Units (PMU) Distribution, PMUs - Transmission, Wireless Faulted Circuit Indicators, Cyber Security Projects, Smart Isolation & Reclosing, Automated Fault Location, Composite Core Conductor, Integrated Test Facility, Smart Grid RD&D, Smart Grid 2.0 Engineering & Architecture, Substation Physical Security Hardening. Enterprise Projects: Early Fire Detection System, Smart Substations, Mobile Off-Grid Communications Systems, Workforce Development, Data Management & Analytics.
Description of Project grouping[59]	These projects are grid-centric (in that they are generally focused on the utility side of the meter and not squarely at the customer), but are anticipated to be less evident to customers than other grid-centric projects from group TWO above. These projects are generally to address reliability and/or power quality issues, or to provide efficiencies, or are technical improvements being made to the electrical system that are generally transparent to customers.
Target Audience	Primarily residential and small commercial customers (< 20kW peak load), but in some cases medium and even large commercial customers as well. Additionally, target audiences include SDG&E employees, policy makers (legislators and staff, CPUC and staff, CARB, CEC), communities and local stakeholders.

[59] Individual project descriptions can be found in section 2.3.3 of this report.

Table 2-15: Customer Engagement Roadblocks – Project Group Three

	2012	2013	2014	2015
Current Roadblocks	1 – Most customers are not aware why these projects need to be implemented / what issues these projects are designed to address. In short: why are these projects needed? 2 – Rate / cost concerns: Most customers are not aware that these projects are the most cost effective approach for addressing the issues (issues being reliability and power quality, for example).			

Table 2-16: Customer Engagement Timeline & Strategy – Project Group Three

	2012	2013	2014	2015
Timeline & Strategy to overcome roadblocks	**NOTE: numbering of these 'strategies to overcome' corresponds to the 'roadblock' numbering above; that is, strategy number 1 is meant to address roadblock number one, and so on.** 1 – Explain to customers (and other stakeholders) why these projects are needed in understandable language. For example, some of these projects are necessary to maintaining reliability and power quality in the face of challenges of the system such as high concentrations of roof-top solar systems and growing numbers of plug-in electric vehicles. 2 - Ensure that the overall 'business case' for Smart Grid is communicated in the appropriate level of detail. In SDG&E's case, as shown in A.11-06-006 (*SDG&E's Smart Grid Deployment Plan*, filed June 6, 2012), costs were quantified as $3.5-$3.6 billion, and benefits as $3.8-$7.1 billion.			

Table 2-17: Customer Engagement Messages – Project Group Three

	2012	2013	2014	2015
Sample Message(s) / Message Source(s) **Message source is the utility unless specified otherwise**	**NOTE: Numbering of these Sample Messages corresponds to the roadblock and strategy numbering above; that is, messages labeled with a number one are meant to address strategies and roadblocks labeled with a number one and so on.** 1 – Why do we need a Smart Grid? Electric system design has served us well; however, it needs upgrading to take advantage of the latest technology breakthroughs. The system was not designed to accommodate a high penetration of intermittent generation like wind and solar that only provides energy when Mother Nature allows. 1 – Conventional generation like natural gas fired power plants can be throttled up or down to match demand. This is not the case with intermittent energy sources like wind and solar. Additionally, plug-in electric vehicles represent a new significant load on the grid, and the growing number of roof-top solar systems result in the flow of power in the opposite direction from what the system was originally designed to support. Renewable resources are only available when the sun shines or the wind blows. Moving clouds and changing wind speed can cause reliability issues, but we want our power to be reliable every minute of every day. This challenge requires new technology such as remote sensors and energy storage that provide the flexibility to integrate large amounts of renewable energy seamlessly onto the grid. SDG&E's *Smart Grid Deployment Plan* calls for an investment of $3.5 - $3.6 billion from 2006 through 2020, which will result in between $3.8 and $7.1 billion in related benefits and newfound efficiencies.			

	2012	2013	2014	2015
	1 - Incorporating technology into the electric system is necessary to meet these new complex challenges successfully and will allow SDG&E to provide the power quality and reliability that is necessary and fundamental for supporting a modern society. 1 - Implementation of Smart Grid will help maintain electrical system reliability and make the system more secure. 1 - Our Smart Grid initiative is another effort in the greening of SDG&E. It calls for the adoption of a broad range interconnected, inter-operable technologies – including distributed generation, energy storage, wireless sensor networks, software and computing – that can give customers the ability to reduce costs, improve efficiency and reliability, and enhance the environment that we live in. 1 - SDG&E is on the forefront of developing clean energy and technological innovations that empower our customers and have a positive impact on the environment. 1 - Our efforts to strengthen our system are making a difference and SDG&E's electric reliability has been steadily improving. In 1998, a typical customer experienced about one power outage a year. We've cut that number in half: today a typical customer experiences about one power outage every other year. Outage duration is improving as well: in 1998, on average, an outage lasted an hour and a half. Today it's down to about an hour. 1 - As our system continues to grow, we also must invest in system upgrades to make sure we can continue to deliver safe, reliable energy and meet customers' increased demands. That requires new or expanded substations, infrastructure		

	2012	2013	2014	2015
	to support electric vehicles, equipment to manage the intermittency of solar and wind power to prevent equipment damage, etc. 2 – What are the benefits of implementing a Smart Grid? The Smart Grid empowers customers by creating the foundation necessary for a number of new technology-driven energy alternatives, emission reductions, efficiency improvements, a shift to a lower emitting fuel for transportation, and encourages more energy efficiency by providing real-time energy usage data to customers. Research shows that when customers know how much energy they're using, if they are engaged, they will reduce their use by 5 to 10 %. Additionally, the Smart Grid facilitates integration of the vast amount of renewable energy that is currently being mandated and that is already in the pipeline for development. In summary, SDG&E's Smart Grid Deployment plan calls for an investment of $3.5 - $3.6 billion from 2006 through 2020. This investment will result in between $3.8 and $7.1 billion in related benefits and newfound efficiencies. 2 - Our investment in Smart Grid technology is an investment in the future – a future designed to provide customers with more choices, more control and greater convenience.			

2.6 KEY RISKS BY CATEGORY

The following table discusses key Smart Grid risk categories and their likelihood, potential impact, and actions taken by SDG&E to reduce or mitigate risks in these areas.

Table 2-18: Risk Assessment Information by Category

Key Risk Category	Likelihood / Probability	Impact / Consequences	Actions Taken
1. Reliability	High Many factors, including the intermittency of renewable generation sources, changes in load patterns, breaches of system security, and other impacts of new technologies have the potential to negatively affect system and local distribution reliability.	High Particularly where intermittent distributed renewables, electric vehicles, and other new technologies are concentrated into "clusters" the impacts of intermittent supply or demand can be significant.	Many Smart Grid projects undertaken by SDG&E are designed to maintain or improve overall and distribution system reliability, including projects in each of the six program areas addressed in this *Annual Report*.
2. Rates	High The probability that current retail rate designs will trigger significant consequences to the deployment of renewables and require Smart Grid technologies is high.	High Current electric rate policies, such as AB1X and Net Energy Metering statutes provide unsustainable and inaccurate pricing signals to customers. AB1X forces increases in fixed system costs to be allocated only into tiers 3 and 4, because of statutory protections that cap increases to tier 1 and 2 rates. Compounding	SDG&E is advocating for changes in Net Energy Metering and other residential rate structures that would more equitably allocate the costs for electric reliability services provided by the utility.

Key Risk Category	Likelihood / Probability	Impact / Consequences	Actions Taken
		this effect are increases in fixed system costs, such as those required to reliably integrate distributed generation sources (particularly PV) realized in projects such as energy storage and dynamic voltage control systems. NEM customers are the triggers of some of these cost increases, but those costs are allocated to other tier 3 and 4 customers who do not have DG systems, further increasing the upward pressure on their retail rates.	
3. Security	High No networked system can be perfectly secure, thus the probability that some security-related issue will affect the operation of the system is high.	High Security-related threats to Smart Grid systems have the potential impact the reliability of the transmission and/or distribution networks, and could affect worker and public safety.	 SDG&E has a robust and comprehensive risk-based security program that addresses and mitigates these risks, employing defense-in-depth and other strategies.
4. Safety	Medium While the Smart Grid has the potential to introduce new safety	High The consequences of safety risks that are realized can	 SDG&E works to continually improve its safety standards,

Key Risk Category	Likelihood / Probability	Impact / Consequences	Actions Taken
	risks, the well-established safety culture of the utility and robust processes that help maintain workforce and public safety diminish the probability that new safety risks will be realized.	be devastating.	education and awareness, and has a number of Smart Grid and other projects that contribute to maintaining or improving safety of its workforce and the public.
5. Technology	High Smart Grid deployment involves a great deal of new or emerging technologies, many of which lack consistent, interoperable industry standards. It is highly probable that a lack of or inconsistency in standards will impact deployments.	Medium Many other major technology deployments have been similarly affected in the past. Mitigation efforts can keep these risks from having high impacts on Smart Grid deployments.	SDG&E participates in the development of key technical standards, and focuses on those standards that are implemented at "key interfaces" – that is, the points of integration between systems where interoperability matters most.

2.7 SECURITY RISK AND PRIVACY THREAT ASSESSMENT UPDATES

In its *SGDP*, SDG&E discussed its vision for physical and cyber security as well as its strategy for achieving its security goals. Its vision for the security of Smart Grid stated "that by 2020 all Smart Grid participants, from customers to service providers, to regulators, to utilities, must be able to rely on the availability of the system; trust the integrity of the information produced by the system; and be confident that sensitive information is secure from unauthorized access or disclosure. SDG&E's Smart Grid must be resistant to physical and cyber security threats, as well as resilient to attack and natural disasters. It must be aligned with industry standards and best practices. Because resources are finite, it must be built on a security program that uses well-established risk management methodologies to maximize its security investments."

SDG&E stated that "in order to realize its security vision, SDG&E will act on a strategy which can be summarized based on five components:

- Adhere to Security Principles
- Broaden Awareness (to Employees, Third Parties and Customers)
- Converge Security Governance
- Disaggregate Security Controls
- Comply with Federal Critical Infrastructure Protection Standards and Requirements"

This section will discuss the current threat landscape and the progress SDG&E has made so far to achieving its security vision and then offer its conclusions.

2.7.1 THREAT LANDSCAPE

Cyber security threats continue to evolve. Malware, especially targeted malware by highly skilled and well-funded threat agents, continues to be a significant threat to utilities that manage critical infrastructure. Stuxnet, and variants like Flame, Duqu and others, have demonstrated how sophisticated and extremely difficult malware can be to detect while providing potential attackers more command-and-control capabilities than ever before. Control systems continue to be difficult to protect with traditional cyber security controls, such as firewalls and anti-virus software. Control system communication protocols remain insecure and, while efforts to improve them are being discussed, they remain a vulnerability waiting to be exploited. Advanced Persistent Threats are becoming more sophisticated, better coordinated and, according to the Department of Homeland Security, critical infrastructure is a primary target of such organizations regardless of their motives, whether political, economic or intelligence-driven.

On the legislative front, Congress has been trying to pass a cybersecurity bill without success and the White House is considering an executive order to accomplish its cyber security objectives. Such legislation may improve SDG&E's cyber security posture, or could end up requiring utilities to manage

extraneous security controls that cost money to operate but do little to reduce the utility's overall security and privacy risk.

2.7.2 SMART GRID SECURITY PROGRESS

SDG&E has been working diligently to act on its security strategy. Its areas of effort can be categorized into Risk Assessment and Engineering, Compliance, Operations, Research and Privacy-related activities.

2.7.2.1 RISK ASSESSMENT AND ENGINEERING

SDG&E's strategy is to apply a "secure by design" approach to Smart Grid projects from their conception to implementation. A trained Information Security Engineer is assigned to every Smart Grid-related project and a dedicated Security Engineering Principal oversees and leads the overall effort. SDG&E's Information Security department has developed a Smart Grid Risk Assessment Methodology and new Smart Grid security requirements based on NISTIR 7628. These engineers are working with the Security Architecture team to develop security patterns for Smart Grid architecture based on this new risk assessment methodology.

Security engineers have been actively performing security testing on Smart Grid devices and working with the manufacturers of these products to remediate discovered vulnerabilities. SDG&E is constructing an integrated Smart Grid testing facility that will allow third parties to test their products in an environment that better mimics the production environment. Additionally, strong relationships have been developed with outside testing experts, including security testing companies, research institutes and government agencies, including the Department of Homeland Security, in order to enhance security testing capabilities.

From an enterprise perspective, the Information Security department is developing standards for a secure software development lifecycle. This new standard will positively impact the software development lifecycle of all Smart Grid projects by ensuring software internally developed or customized for Smart Grid is built to the same set of security standards.

2.7.2.2 COMPLIANCE

Compliance, and transparency of compliance activities, is recognized internally at SDG&E as an important part of its Information Security program. Meeting legal, regulatory, and company requirements should be a by-product of good security and privacy programs. SDG&E has been working to deploy a Governance, Risk, Compliance Management (GRCM) solution that enhances the ability to track information assets and map them to security controls. This will allow operational personnel to more quickly identify potential security issues and allow company leaders more accurate and timely security posture information when making business decisions. Early phases of this project will incorporate security operations activities, such as vulnerability management and incident response, into a dashboard-style executive view as well as technical reports for control owners.

2.7.2.3 OPERATIONS

As the Smart Grid matures, perhaps the largest security-related investment will be in the infrastructure required to centrally govern security controls and safeguard a broad set of assets deployed in a large geographic area. Some of the activities underway to prepare for this paradigm include the following:

SDG&E is improving its enterprise logging capabilities to support large scale event logging across multiple platforms and devices that transmit more log data than ever. It is continuously improving its Security Event and Information Management systems to find patterns of malicious or unauthorized behavior among a greater array of systems. Automation of internal vulnerability management systems using the aforementioned GRCM solution and vulnerability tracking tools is enhancing the management Smart Grid related vulnerabilities, and from a physical security perspective, deployment of physical security controls improves intrusion detection in the field environment.

In its *SGDP*, SDG&E discussed the need to unify shared security capabilities, especially between its physical and cyber security organizations, but also between its information and operational technologies teams. SDG&E has completed a physical threat assessment of its grid communications system and is using that data as part of its cyber security risk assessment. The Information Security department is now included in SDG&E's Emergency Operations Center in cyber security tabletop exercises.

SDG&E recognized in its *SGDP* the need to be more proactive about raising security awareness among its employees, and also its partners, vendors and customers. To that end, SDG&E has developed a security presence on its external website (at http://sdge.com/security) for the purpose of providing relevant security content and is preparing to pilot a community-centric security awareness capability in the form of a security awareness presentation on social media for one of its satellite communications partners. Equally important, it is raising awareness with third-party Smart Grid device makers on security vulnerabilities with a focus on mitigation, remediation, and prevention.

In the spirit of information sharing, SDG&E communicates regularly with utility peers to discuss security awareness and training activities and share ideas to manage these capabilities in cost-effective ways. It also participates in national and local cyber security exercises in order to test its incident response processes, share ideas on how to improve them and develop important inter-personal relationships with incident responders in other organizations, public and private, in order to be better prepared for future incidents.

2.7.2.4 RESEARCHING AND LOOKING AHEAD

SDG&E recognizes that it has accomplished a lot in the past year, but still has a long way to go to realize its security vision, which spans over 10 years. Some of the things SDG&E is investigating for long term needs include the following:

As part of its risk-based model for managing security, SDG&E continues to develop its threat intelligence capabilities to more accurately assess threats that pose the highest risk to SDG&E and its customers.

Large scale information integrity and non-repudiation services will become critically important as more and more devices are connected into Smart Grid infrastructure. SDG&E is developing Smart Grid identity services for the purpose of allowing devices onto the Smart Grid, identifying unauthorized devices, securing command and control communications, and to identify when devices are tampered with.

For the purposes of cyber threat detection and alerting and response capabilities, SDG&E is developing solutions for field security gateways that will help push more security control functions closer to the network edge, where devices reside. This will provide greater visibility into activities occurring in the field and reduce latency with security controls. SDG&E is evaluating several technologies for obtaining greater visibility into cyber threat activity within its grid communication system, and is also exploring event and incident visualization technologies that will make finding patterns of unauthorized behavior easier to identify and allow operational staff to respond more effectively.

SDG&E maintains the philosophy that an efficient Smart Grid architecture allows an opportunity to uncover security threats based on quickly identifying unauthorized changes to a system, such as when malicious software attempts to write itself onto a control system. Therefore, SDG&E is enhancing its system configuration management capabilities and looking at GRCM as an additional tool for configuration management.

2.7.2.5 PRIVACY

SDG&E recognizes the importance of gaining customer confidence in a successful Smart Grid deployment. Therefore, SDG&E has declared its aspiration to become an industry leader when it comes to customer privacy. To that end, SDG&E has already begun the following activities.

In March 2012, SDG&E announced the publication of a joint white paper with the Privacy by Design organization from Ontario, Canada. This white paper (at http://sdge.com/privacypaper) outlines SDG&E's commitment to aspire to the Privacy By Design principles as outlined in its *Smart Grid Deployment Plan*, and documents the integration of its principles into the project lifecycle.

SDG&E has formed an internal SDG&E Privacy Committee of company subject matter experts, from customer operations teams, to information security, to legal for the purposes of developing a formal privacy program, including the selection of a recognized or tailored privacy framework, identifying and implementing essential privacy controls, standardizing information sharing procedures, and managing privacy risks. This body also monitors local, state and Federal legislative bodies and regulatory agencies for security and privacy-related changes in laws and regulation in order to incorporate these changes

into SDG&E's security and privacy programs. Further, SDG&E has hired a dedicated Privacy Manager to formalize the privacy program and manage day-to-day privacy activities.

Because many third parties have demonstrated a strong desire to be given access to the information that Smart Grid will produce about SDG&E customers, SDG&E is working to standardize its processes for sharing – or not sharing – customer information with third parties company-wide.

Finally, SDG&E has deployed privacy training to employees that handle customer information in some of the company's most critical customer information repositories.

2.7.3 CONCLUSION

Security and privacy remain high priorities for SDG&E as it begins to realize its Smart Grid vision. SDG&E continues to execute the strategy laid out in its *Smart Grid Deployment Plan* and to foster relationships with security and privacy partners to help it further improve its security and privacy posture. SDG&E welcomes input on how it can continue to serve its customers by providing the security and privacy they expect in a cost-efficient manner.

2.8 COMPLIANCE WITH NERC SECURITY RULES AND OTHER SECURITY GUIDELINES

SDG&E is a NERC registered Transmission Owner and Transmission Operator. NERC's Critical Infrastructure Protection Reliability Standards (often referred to as Cyber Security) are applicable to those entities that are registered Transmission Owners (TO) and Transmission Operators (TOP). The NERC Critical Infrastructure Protection Reliability Standards have been mandatory and enforceable since June of 2009, and SDG&E has certified its TO and TOP annual compliance each year since June of 2009.

SDG&E is implementing what it currently calls its "Smart Grid Risk Assessment Methodology" (SGRAM), which classifies risk for Smart Grid projects and technologies based on the recommendations in the National Institute of Standards and Technology (NIST) Interagency Report (IR) 7628. The SGRAM applies a consistent, risk-based methodology to identify those systems or devices with the potential to affect public or worker safety, to disrupt services to customers, or to impact utility operations, so that standards-based security controls, testing regimes, and ongoing security monitoring capabilities are applied appropriately.

3 SMART GRID METRICS

In SDG&E's reporting of metrics in the following section, "Reporting Period" is defined as the period from July 1, 2011 through June 30, 2012. Metrics are reported per the definitions in D-12-04-025, retrievable at http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/164808.htm.

A. Customer / AMI Metrics

1. Number of advanced meter malfunctions where customer electric service is disrupted, and the percentage this number represents of the total of installed advanced meters.

Metric	Units	Reporting Period Value
Number of meters	Meters	26
Percentage of meters	%	.002%

Because of the exclusions noted in the definitions, this response is limited to the number of times a service switch within disconnect-equipped meter hardware fails which results in service interruption.

SDG&E experienced 25 mis-operations of the service switch resulting in customer electric service disruption due to backup battery corrosion and one additional disconnect operation due to control circuit component failure in the 2011/2012 reporting time period. This represents .002% of the total number of installed advanced meters.

2. Load impact in MW of peak load reduction from the summer peak and from winter peak due to Smart Grid-enabled, utility-administered demand response (DR) programs (in total and by customer class).

Metric	Units	Reporting Period Value
Residential	MW	19
C&I < 500 kW	MW	10
C&I > 500 kW	MW	9
Other	MW	4
Total		42
Load Impact of Peak Load Reduction from the winter peak:		
Residential	MW	n/a
C&I < 500 kW	MW	n/a

Metric	Units	Reporting Period Value
C&I > 500 kW	MW	n/a
Other	MW	n/a
Total		n/a

Note*: Some SDG&E DR programs are available in the winter months, but SDG&E did not call an event during the winter of 2011-12. Therefore, there is no load reduction "from the winter peak" to report.*

3. Percentage of demand response enabled by AutoDR (Automated Demand Response) in each individual DR impact program.

Metric	Units	Reporting Period Value
Percentage of demand response enabled by AutoDR – Capacity	%	6%
Percentage of demand response enabled by AutoDR – Critical Peak	%	3%

4. The number and percentage of utility-owned advanced meters with consumer devices with Home Area Network (HAN) or comparable consumer energy monitoring or measurement devices registered with the utility (by customer class, CARE status and climate zone).

Metric	Units	Reporting Period Value
By Customer Class		**1,167 / .085%**
Residential	# / %	1,008 / .073%
C&I < 500 kW	# / %	159 / .012%
C&I > 500 kW	# / %	0
Other	# / %	0
Total by Customer Class		**1,167 / .085%**
CARE	# / %	350 / .025%

Metric	Units	Reporting Period Value
Non-CARE	# / %	817 / .059%
Total by CARE/non-CARE		**1,167 / .085%**
Coastal	# / %	563 / .041%
Inland	# / %	582 / .042%
Mountain	# / %	20 / .001%
Desert	# / %	2 / .000%
Total by Climate Zone		**1,167 / .085%**

5. Number and percentage of customers that are on a time-variant or dynamic pricing tariff (by type of tariff, by customer class, by CARE status, and by climate zone).

Metric	Units / Percentage	Reporting Period Value
By Type of Tariff		
Critical Peak Pricing (CPP)	# / %	1,187 / .09%
Time of Use (TOU)	# / %	24,160 / 2%
Enrolled in Peak Time Rebate[60] (PTR) Notifications	# / %	31,825 / 2.28%
Separately Metered Plug-in Electric Vehicle (PEV) Rates	# / %	401 / .029%
By Customer Class		
Residential	# / %	2,435 / .017%
C&I < 500 kW	# / %	23,506 / 1.68%
C&I > 500 kW	# / %	666 / .05%
Other	# / %	n/a

[60] SDG&E's PTR program is branded as "Reduce Your Use"

Metric	Units / Percentage	Reporting Period Value
By CARE Status		
CARE	# / %	141 / .01%
Non-CARE	# / %	26,466 / 1.896%
By Climate Zone		First percentage shown is as compared to all customers; second is as compared to all customers in that particular climate zone
Coastal	# / %	16,502 / 1.182% / 2.03%
Inland	# / %	9,621 / .689% / 1.62%
Mountain	# / %	379 / .027% / 2.2%
Desert	# / %	96 / .007% / 2.75%

6. **Number and percentage of escalated customer complaints related to (1) the accuracy, functioning, or installation of advanced meters or (2) the functioning of a utility-administered Home Area Network with registered consumer devices.**

Metric / Category of Complaints	Units	Reporting Period Value
AMI Meter complaints	#/% of all escalated complaints	1 / .097%
AMI Program complaints	#/% of all escalated complaints	115 / 11.143%
Device Registration (HAN)	#/% of all escalated complaints	0 / 0%
Communication Issues (HAN)	#/% of all escalated complaints	6 / .581%

Metric / Category of Complaints	Units	Reporting Period Value
HAN, other (primarily opting out of the various HAN pilots)	#/% of all escalated complaints	33 / 3.198%

7. The number and percentage of advanced meters replaced before the end of their expected useful life during the course of one year, reported annually, with an explanation for the replacement.

Metric	Units	Reporting Period Value
Replaced due to hardware/component failures:	# / %	3,012 / .218%
Replaced due to firmware related failures:	# / %	8,308 / .602%
Replaced due to environmental related failures:	# / %	76 / .006%
Replaced due to unknown or communication related failures:	# / %	1,271 / .092%

8. Number and percentage of advanced meters field tested at the request of customers pursuant to utility tariffs providing for such field tests, and the number of advanced meters tested measuring usage outside the Commission-mandated accuracy bands.

Metric	Units	Reporting Period Value
Number / percentage of advanced meters field tested (at the request of customers):	# / %	666 / .048%
Number / percentage of advanced meters field tested at the request of customers with results outside accuracy band:	# / %	3 / .0002%

9. Number and percentage of customers using a utility web-based portal to access energy usage information or to enroll in utility energy information programs or who have authorized the utility to provide a third-party with energy usage data.

Metric	Units	Reporting Period Value
Number/Percentage of customers	# / %	17,649 / 1.28%%

B. Plug-in Electric Vehicle Metrics

1. Number of customers enrolled in time-variant electric vehicles tariffs

Metric	Units	Reporting Period Value
Number of customers	Customers	701

C. Storage Metrics

1. MW and MWh per year of utility-owned or operated energy storage interconnected at the transmission or distribution system level. As measured at the storage device electricity output terminals.

Metric	Units	Reporting Period Value
Grid connected energy storage	MW	20MW
Grid connected energy storage	MWh	10,128 MWh 'in' 7,536 MWh 'out' (see Note 1)

Note 1 – The storage system referred to here is the Lake Hodges pumped storage facility and the first MWh figure shown is the amount of energy used to pump the water into the upper reservoir and the second MWh figure shown is the amount of energy produced when the water was released into the lower reservoir.

D. Grid Operations Metrics

1. **The system-wide total number of minutes per year of sustained outage per customer served as reflected by the System Average Interruption Duration Index (SAIDI), Major Events Included and Excluded for each year starting on July 1, 2011 through the latest year that this information is available.**

Metric	Units	Reporting Period Value
SAIDI - Major Events Included	SAIDI index	574.03
SAIDI - Major Events Excluded	SAIDI index	60.59

2. **How often the system-wide average customer was interrupted in the reporting year as reflected by the System Average Interruption Frequency Index (SAIFI), Major Events Included and Excluded for each year starting on July 1, 2011 through the latest year that this information is available.**

Metric	Units	Reporting Period Value
SAIFI - Major Events Included	SAIFI index	1.4583
SAIFI - Major Events Excluded	SAIFI index	0.4592

3. **The number of momentary outages per customer system-wide per year as reflected by the Momentary Average Interruption Frequency Index (MAIFI), Major Events Included and Excluded for each year starting on July 1, 2011 through the latest year that this information is available.**

Metric	Units	Reporting Period Value
MAIFI - Major Events Included	MAIFI index	0.2671
MAIFI - Major Events Excluded	MAIFI index	0.2668

4. **Number and percentage of customers per year and circuits per year experiencing greater than 12 sustained outages for each year starting on July 1, 2011 through the latest year that this information is available.**

SDG&E Customers / Circuits Experiencing >12 Sustained Outages		
Metric	**Units**	**Reporting Period Value**
Number of customers	Customers, # / %	369 / .03%

Number of circuits	Circuits, # / %	10 / 1%

5. System load factor and load factor by customer class for each year starting on July 1, 2011 through the latest year that this information is available.

Metric	Units	Reporting Period Value
System Load Factor	% load	54%
Load Factor - Residential	% load	53%
Load Factor - C&I < 500 kW	% load	48%
Load Factor - C&I > 500 kW	% load	79%
Load Factor - Other[61]	% load	44%

6. Number of and total nameplate capacity of customer-owned or operated, grid-connected distributed generation facilities.

Metric	Units	Reporting Period Value
Number of distributed generation facilities	Number of units / Capacity of units - MW	18,096 / 413.5MW

7. Total electricity deliveries from customer-owned or operated, grid-connected distributed generation facilities, reported by month and my ISO sub-Load Aggregation Point.

Metric	Units	Reporting Period Value
Total annual electricity deliveries from customer-owned	GWh	1,035.5 GWh[62]

8. Number and percentage of distribution circuits equipped with automation or remote control equipment, including Supervisory Control and Data Acquisition (SCADA) systems.

[61] Other is composed of small agriculture

[62] Sourced from CALIFORNIA ENERGY DEMAND 2012-2022 FINAL FORECAST, Volume 2: Electricity Demand by Utility Planning Area" CEC-200-2012-001-CMF-VII; the results shown and the average of the 2011 and 2012 values.

Metric	Units	Reporting Period Value
Number of circuits	Circuits	773
Percentage of circuits	%	77%

If the definition of “remote control equipment” is considered broadly, one interpretation of the term could match to the “turn on/turn off” functionality within SDG&E’s Smart Meters. In that more general case of “remote control”, 100% of SDG&E’s distribution circuits have Smart Meters, and therefore remote control capabilities.