



California Public Utilities Commission

Report to the Governor and the Legislature

California Smart Grid - 2012

May 2013



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Overview

This is the California Public Utilities Commission's (CPUC) third annual report to the Governor and the Legislature, pursuant to Public Utilities Code Section 8367 (SB 17, Authored by Senator Padilla).

As ordered by the Legislature, the CPUC and the state's Investor Owned Utilities (IOUs) have made significant progress on the path toward modernizing the state's electric grid. Smart Grid activities are part of the ongoing process of grid modernization, accelerated due to the advancements in information processing and hardware technologies. Smart Grid development is being driven by: a need to reduce the impacts of energy use on consumers' bills; the increasing impacts of distributed and intermittent generation resources on the distribution grid; and the impact of electricity production and use on the environment. The resulting modern, technologically superior electric grid that produces greater resiliency, environmental benefits, and customer value, as an aggregate, is known as the Smart Grid.

Pursuant to Public Utilities Code Section 8367, this annual report provides an overview of the CPUC's recommendations for a Smart Grid, the plans and deployment of Smart Grid technologies by the state's IOUs, and the costs and benefits to ratepayers. This report will detail the following:

- Privacy and Security of Electric Usage Data
- Giving Consumers Control
- Utility Smart Grid deployment plans and status
- National developments
- Federal stimulus funding for Smart Grid projects
- The CPUC's plan for 2013

Smart Grid Progress:

- Improving customer access to energy use information and options to lower electricity bills.
- Improving customer data privacy protections.
- Increased efficiency of grid operations and ability to deploy demand response, distributed generation, renewables and storage.
- Improved reporting on grid reliability and smart grid metrics.
- New jobs and economic benefits from creation of new markets and empowerment of new market players.

The Evolution of California's Smarter Grid

In some respects California's electric grid is operated in the same way that it has been for decades. However, since the Smart Grid legislation was passed in 2008, significant progress has been made to take advantage of innovative technologies, accommodate new supply resources, and meet consumer demands.

The creation of a smarter grid results in a safer, more reliable, efficient, affordable, and interoperable system. This is a “system of systems” which is hugely complex and multi-faceted, covering everything from customer data access to cybersecurity and substation automation. The CPUC and the IOUs have confronted this enormous task by developing Smart Grid Deployment Plans, which outline the steps that need to be taken by 2020 in order to make significant progress.

California’s Accomplishments to Date:

- Further development of customer privacy policies in Phase II of the privacy proceeding.
- Home Area Network (HAN) enablement decision issued.
- Smart Grid Metrics decision issued and the Technical Working Group for Smart Grid Goals convened.
- Smart Meter Deployment nearly completed statewide. (approx. 10 million)
- Customers and mobile app developers have access to energy usage data through energy data download (Green Button).

These plans are already becoming reality through pilots, demonstrations, and full-scale deployment of some technologies. The solutions that have already been implemented, such as smart meters, grid sensors, and optimization tools are already providing measurable benefits of over \$120 million a year, as well as supporting the California job market and green economy. Although the majority of the investment in Smart Grid by the utilities has been in smart meter deployment, which has been ongoing since 2006,

it is clear that the benefits will become even more significant as the deployment of Smart Grid features becomes more pervasive.

California is pioneering a broad range of grid modernization projects, as described above. The CPUC is continuing in its national leadership role in further defining and enhancing California’s policies and practices related to Smart Grid implementation.

Under CPUC supervision, IOUs have begun the transformation of the electric grid into a safer, more reliable and more efficient system that optimizes ratepayer value and cost-effectively implements state energy policy. This transformation is being accomplished through strategic planning and projects for grid modernization that are ensuring that California’s utility customers realize the benefits of a Smart Grid.

The Smart Grid Deployment Plans were organized into several areas or domains in which the activities are occurring:

- Customer Engagement/Empowerment
- Distribution Automation/Reliability
- Transmission Automation/Reliability

- Asset Management & Operational Efficiency
- Security (Physical and Cyber)
- Integrated and Cross-cutting Systems

The CPUC, along with the California Energy Commission and the IOUs have also been actively engaged in defining research and development activities related to smart grid, and lowering the environmental impact of the electricity supply more broadly. Two initiatives, the Electric Program Investment Charge (EPIC) and the 21st Century Energy Systems (CES-21) are funding Research Development and Demonstration (RD&D), and Technology Demonstration and Deployment (TD&D) that have a major focus on Smart Grid technology.

Privacy and Security of Electric Usage Data

The CPUC has acknowledged the value of customer energy data, as well as the need to secure it as evidenced by the privacy and security rules adopted in 2011. The CPUC continued this work in 2012 through the Phase II Privacy proceeding. This proceeding extended the privacy rules to Community Choice Aggregators and Electric Service Providers, as well as to gas customers.

Another major initiative begun in 2012 by the CPUC is the consideration of creating an Energy Data Center, proposed in a CPUC white paper¹. This proposal aims to allow the research community, as well as other interested parties, to access the “Big Data” being generated by the Smart Meters, while at the same time protecting customer confidentiality of this data. This proceeding is continuing in 2013, with the objective of getting the full value from the massive amounts of data generated by the Smart Meter infrastructure, without in any way compromising the privacy of California’s energy consumers.

Giving Consumers Control

Ensuring customer energy data security and privacy is a critical element of customer enablement. However, in order for customers to directly realize the benefits of Smart Grid technologies, they need to have access to the Home

“I, like many electricity customers, am eager to set up my own home area network. The marketplace is innovating and the customer will benefit now that we’ve laid the foundation with Smart Meters. Our decision [on HAN strategy] today is an important step in that direction.”

- **CPUC President Michael R. Peevey**

¹ <http://www.cpuc.ca.gov/NR/rdonlyres/8B005D2C-9698-4F16-BB2B-D07E707DA676/0/EnergyDataCenterFinal.pdf>

Area Network (HAN) capability that is integrated into the Smart Meters in California.

To this end, the CPUC in 2012 directed the utilities to activate HAN capabilities. The HAN activation is a key step forward in allowing customers to get real-time usage information from their Smart Meters² and engage in demand response activities.

HAN capabilities will enable customers to realize tangible benefits from the installation of Smart Meters. These benefits include giving customers and any authorized third-parties additional opportunities to respond to prices or event signals in real-time and participate in other demand response products. Allowing customers to set preferences around their usage patterns will give them the ability to further control their electricity bills.

The Green Button Initiative, initially proposed by the White House, presented a vision of enabling customers to have total access to their energy use data and share with authorized third party. The first phase of this initiative makes energy usage data available to customers in a downloadable format. This data was envisioned to be easily used by the customer to determine ways to reduce their energy use, as well as to enable the customer to share it with third party providers of solar PV systems, efficiency audits, and the like.

Customer Energy Web Portal Usage

Number and percentage of (enrolled) customers using [the] web-based portal to access energy usage information . . . or who have authorized the utility to provide a third-party with energy usage data.

IOU	Number	Percentage
PG&E	1,472,776	86%
SCE	232,199	8%
SDG&E	17,649	1.3%

The first step in the innovative Green Button program has been largely implemented by the three IOUs, as reported in their 2012 Smart Grid Annual Reports, and is a significant success factor in enabling customers to take greater control of their energy use. The second step in the Green Button Initiative is to allow authorized third parties to directly access customer usage information from the utility.

The IOUs filed applications to implement this step, and those applications are currently pending before the CPUC.

² Currently, this information will be limited to kWh usage, but in the future may include other information collected by the meter including voltage and current readings.

Smart Grid Metrics, Goals and Deployment Status

Measuring progress of Smart Grid deployment and quantifying realized benefits is a great challenge and an area where the CPUC provided definition in 2012. There was an effort to develop a set of metrics through a collaborative process between the parties and the CPUC Staff. This collaborative effort resulted in a decision defining 19 consensus metrics³ for Smart Grid development. These metrics are reported by the utilities in their annual Smart Grid Deployment status reports. Last year was the first year in which the utilities submitted annual reports and presented their data for each of the metrics. All statistics reported are as of June 30, 2012.

The initial metrics effort focused on identifying metrics that were based on readily available information related to utility operations and customer participation. The CPUC continues to work to identify how best to measure the delivery of the benefits of the Smart Grid to California ratepayers.

The CPUC continues to build upon the work already done through defining metrics to develop additional mechanisms for tracking Smart Grid progress. For instance, the CPUC established a working group of industry experts to investigate a possibility of setting specific targets or goals that smart grid should enable to achieve. This work will continue in 2013, along with continuing CPUC efforts to refine and improve the relevant metrics.

Customer Distributed Generation

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

IOU	Number	Capacity (MW)
PG&E	43,786	811.7
SCE	10,426	202.2
SDG&E	18,096	413.5

Smart Grid Cybersecurity

The Smart Grid Deployment Plans were required to include an overview of utility practices to ensure that the grid and future Smart Grid investments include cybersecurity protections. The CPUC has weighed in

³ For a complete list of the 19 metrics, see Decision 12-04-025
http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/164808.PDF

on how cybersecurity considerations might figure in CPUC actions going forward. A policy white paper written by CPUC staff was published that received national attention from regulators, utilities and media.⁴ The potential role of the CPUC in ensuring cybersecurity in the Smart Grid is significant according to the staff whitepaper. Approximately 97% of all circuit miles and utility assets in the US are currently not subject to any type of cybersecurity requirements or standards. The CPUC paper discussed the role of compliance-type standards in ensuring the safety and reliability of the grid in the face of potential cyber-attackers. A major finding of the paper was that rather than simply adopting a strict regulatory regime, involvement of the regulator in risk management by the IOUs might be a more effective approach to ensuring effective use of ratepayer funds in securing the grid.

“California is a progressive state that is watched closely by others. What's more, commissions in Michigan, Pennsylvania and Texas are also developing cyber security policies. In other words, if you haven't yet heard from your PUC about the issue, you probably will soon. If I were you, I'd be getting ready right now. The [CPUC whitepaper] is a good starting point.”

- [Jesse Berst, SmartGridNews.com](http://SmartGridNews.com)

The paper recommends a variety of steps for the CPUC to investigate that has the potential for developing groundbreaking regulatory practices in the utility cybersecurity space. During early 2013, CPUC will host a Thought Leader forum presenting expert opinion on utility cybersecurity, and will consider further action on cybersecurity. Along these lines, the CPUC will establish a technical working group to examine and potentially recommend a set of cybersecurity metrics.

Going forward, the CPUC will work with the utilities to ensure that investments in cybersecurity are appropriately targeted and result in the highest ratepayer benefit.

California Leads Smart Grid National Developments

Nationally, grid modernization is proceeding apace, with California in many cases setting the trend for innovation. The American Recovery and Reinvestment Act (ARRA) funding that drove Smart Grid projects throughout country is showing promising results. Smart Meter deployment in the U.S., led by California utilities (approximately 97% deployed), has begun in over 70 projects across the country. Even smaller municipal utilities are now joining in the effort to deploy Smart Meters.

⁴ <http://www.cpuc.ca.gov/NR/rdonlyres/D77BA276-E88A-4C82-AFD2-FC3D3C76A9FC/0/TheEvolvingRoleofStateRegulationinCybersecurity9252012FINAL.pdf>

Advanced Metering Infrastructure (AMI) is seen as being fundamental to bringing the benefits of grid modernization to customers through improved grid operations and easier access to energy use data.

Development of advanced grid technologies is also coming into play in California and elsewhere. For example, microgrid development projects have been implemented in California such as Southern California Edison's (SCE) Irvine Smart Grid Demonstration project and San Diego Gas & Electric's (SDG&E) Beach Cities Microgrid project. Similar projects in Texas are pushing on developing new technologies for Smart Grid. One of the most innovative projects in the Smart Grid space is the Pecan Street Project, located in Austin, Texas. This project uses, among other things, microgrid technology to integrate renewables, storage and demand response to deliver "zero net carbon energy" at a community scale. Currently Smart Grid Information Clearinghouse lists over 170 Smart Grid projects that are in progress.⁵

Smart Grid Projects in California

SDG&E, SCE, and Pacific Gas and Electric Company (PG&E) have all filed their Smart Grid Deployment Status Reports for 2012. In this section, we list some of the activities as well as estimates on total costs and benefits for each utility⁶.

- **SDG&E**

Enabled by Smart Meters, the 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 days.

SDG&E continues to develop advanced capabilities to optimize asset performance. At the same time, an advanced, community-scale microgrid project now known as the Borrego Springs Microgrid has been launched. Major new Smart Grid hardware and software systems for outage management and distribution system management are nearing final implementation.

Ratepayer Benefits & Funding – Overall investments of approximately \$156 million and approximately \$40 million in benefits.

⁵ Smart Grid Clearinghouse, www.sgiclearinghouse.org/ProjectList

⁶ Data from Smart Grid Deployment Plan Updates, Filed October, 2012.
<http://www.cpuc.ca.gov/PUC/energy/smartgrid.htm>

- **SCE**

Customer empowerment projects provide customers with information regarding their energy usage. This information enables the capabilities of home area network (HAN) devices and facilitates dynamic pricing. These customer oriented projects aim to provide information accessibility in the manner desired by customers and third party service providers. SCE conducted various customer empowerment initiatives, including testing the functionality of smart meters and giving customers more choice in how they manage their energy during peak usage times.

Distribution automation and reliability (DAR) projects improve information and control capabilities for distribution systems. These projects focus on distribution system challenges posed by distributed energy resources and clustered electric vehicle charging.

DAR projects also mitigate outages by developing self-healing circuit technology. As part of DAR, SCE deployed assets for its Geographical Information System (GIS), which will provide a consolidated solution to manage safety, reliability, and compliance obligations.

“Smart Grid development must be seen in the context of California's goals to improve the resilience, safety and ratepayer value of its electric supply, and to lower its carbon impact. These progressive goals can unite all stakeholders in ongoing efforts to realize the potential of Smart Grid technology.”

- **CPUC Staff**

Ratepayer Benefits & Funding – Edison will have benefit assessments pending the completion of their rate case.

- **PG & E**

With backing from the White House, PG&E launched its Green Button initiative, which provides customers with access to standardized energy usage reports that they can share with energy service providers to help them find ways to reduce their energy consumption and save money. PG&E also completed implementation of the SmartMeter™ Operations Center (SMOC) project to test and implement telecommunication network operations management capabilities that can support PG&E's SmartMeter™ network. The goal is to handle growth in the number of deployed

meters, effectively monitor the increased amount of data communications from the meters, bring new SmartMeter™-related customer services online efficiently, and enable timely customer response as well as proactive reliability and availability management.

Ratepayer Benefits & Funding – PG&E stated that the operation benefits of the Smart Meter program were \$28.9 million in the year July 1, 2011, through June 30, 2012.

Looking Ahead to 2013 and Beyond

While the progress towards grid modernization made in 2012 has been substantial, many significant steps towards Smart Grid are yet to be made. The challenges that lie ahead include achieving significant demand reduction through widespread adoption of HAN-enabled appliances, increasing support for electric vehicles, interconnecting significant amounts of distributed and renewable generation, all while ensuring that reliability meets today's requirements and growing cybersecurity challenges are addressed. The CPUC will continue its leadership in Smart Grid topics and focus on ensuring that California benefits from grid modernization. The CPUC has several activities planned for 2013:

- Approve Smart Grid deployment plans for SDG&E, Edison, and PG&E.
- Continue consideration of smart grid goals and metrics.
- Continue oversight and support for implementation of the Green Button.
- The CPUC has ordered the creation of additional working groups that will develop goals or metrics on cybersecurity and environment. For example, a cybersecurity working group may develop a set of goals or metrics that can be used by the CPUC to monitor the effectiveness of utility cybersecurity practices, and potentially form the basis for any future CPUC action on developing cyber-security requirements. An environmental working group may develop goals or metrics that will be able to measure the environmental benefits associated with Smart Grid investments. If adopted, these working groups will provide input into the yearly review process.
- The CPUC will explore cybersecurity requirements applicable to the distribution grid and providing greater direction on cybersecurity policies to the utilities. The CPUC will also continue working with Federal agencies on their national cybersecurity initiatives to ensure that California and Federal efforts are coordinated.
- Continue work on dynamic pricing, automated demand response (AutoDR), HAN-related issues and other Smart Grid implementation issues such as communications standards and microgrid implementation.

Conclusion

Smart Grid implementation is at the forefront of energy policy and energy system development worldwide. California energy policies spearheaded by the CPUC on multiple fronts ensure that our State remains a leader in improving the power grid for all ratepayers and for the environment.

2013 promises to bring in more landmark actions in moving forward and transforming our grid into one that brings more reliability, more efficiency, more choice, and more for the energy dollar to all Californians.

Smart Grid Major Events

