

California Public Utilities Commission

Report to the Governor & the Legislature on Smart Grid Plans and Recommendations

Submitted
December 2010

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EXECUTIVE SUMMARY

This is the California Public Utilities Commission's ("Commission") first annual report to the Governor and the Legislature, pursuant to Public Utilities (PU) Code Section 8367 (SB 17, Authored by Senator Padilla), on the Commission's recommendations for a smart grid, the plans and deployment of smart grid technologies by the state's electrical corporations, and the costs and benefits to ratepayers.

The Commission initiated an Order Instituting Rulemaking ("Rulemaking") in December 2008 to consider whether and how to set policies to guide and encourage the investor owned utilities to modernize the electric grid. Subsequent to commencing this proceeding, new legislation at both the federal and state level has affected policies concerning a Smart Grid system and the management of the proceeding.

California continues to be one of the leading States driving Smart Grid policies. As discussed in greater detail in the following sections, legislation from both the federal and state levels has brought not only needed leadership but has also shed a brighter light on the reasons behind building a Smart Grid. Consequently, significant sectors inside California, such as venture capital, technology companies, and other business and customer interest groups are becoming increasingly aware that improving the operation of the grid is as important as building the interstate highway system or the development of the internet. As technology advances, innovation and new products will allow customers to take greater control over their usage and lower their bills. This will also allow for greater and more efficient use of resources, reducing the electricity lost due to transmission over long distances, increasing the localized use of new types of generation and electricity storage, and allowing for a smooth transition to electric vehicles.

California's early efforts to modernize the electricity grid have not been without a certain level of controversy. However, Policymakers are learning from early efforts and are actively working with stakeholders to communicate the wide array of benefits to deployment of advanced technologies across the electricity grid. California's deliberate and strategic planning for a Smart Grid system will ensure that California's utility customers realize the economic, environmental, reliability, and public health and safety benefits of Smart Grid investments.

COMMISSION ACTIVITIES AND RECOMMENDATIONS ON ADVANCEMENT OF A SMARTER GRID

In December 2008, the Commission initiated a Rulemaking (R.08-12-009) to consider setting policies, standards and protocols to guide the development of a smart grid and facilitate integration of new technologies such as distributed generation, storage, demand-side technologies and electric vehicles. The Rulemaking further noted that as a consequence of amendments to the Public Utilities Regulatory Policies Act (PURPA) contained in the Energy Independence and Security Act of 2007 (EISA), PURPA § 111(d)(16) now requires states to consider imposing certain requirements and authorizing certain expenditures pertaining to the Smart Grid.¹

In October 2009, the Governor signed into law Senate Bill (SB) 17 (Authored by Senator Padilla). The passage of SB 17 imposed additional statutory requirements on both the Commission and the electrical utilities that the Commission regulates pertaining to the Smart Grid.

SB 17, Sec. 8360, defines the characteristics of a Smart Grid as:

- (a) Increased use of cost-effective digital information and control technology to improve reliability, security, and efficiency of the electric grid.
- (b) Dynamic optimization of grid operations and resources, including appropriate consideration for asset management and utilization of related grid operations and resources, with cost-effective full cyber-security.

¹ The Recovery Act at Division A, Title IV, Sec. 408 redesignated PURPA § 111(d)(16) as § 111(d)(18).

- (c) Deployment and integration of cost-effective distributed resources and generation, including renewable resources.
- (d) Development and incorporation of cost-effective demand response, demand-side resources, and energy-efficient resources.
- (e) Deployment of cost-effective smart technologies, including real time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices for metering, communications concerning grid operations and status, and distribution automation.
- (f) Integration of cost-effective smart appliances and consumer devices.
- (g) Deployment and integration of cost-effective advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air-conditioning.
- (h) Provide consumers with timely information and control options.
- (i) Develop standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.
- (j) Identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services.

Further, SB 17 states:

§ 8362(a) By July 1, 2010, the commission, in consultation with the Energy Commission, the ISO, and other key stakeholders shall determine the requirements for a smart grid deployment plan consistent with Section 8360 and federal law, including the provisions of Title XIII (commencing with Section 1301) of the Energy Independence and Security Act of 2007 (Public Law 110-140). The commission shall institute a rulemaking or expand the scope of an existing rulemaking to adopt standards and protocols to ensure functionality and interoperability developed by public and private entities, including, but not limited to, the National Institute of Standards and Technology, Gridwise Architecture Council, the International Electrical and Electronics Engineers, and the National Electric Reliability Organization recognized by the Federal Energy Regulatory Commission. An adopted smart grid deployment plan may provide for deployment of cost-effective smart grid products, technologies, and services by entities other than electrical corporations. The smart grid technologies and services shall improve overall efficiency, reliability, and cost-effectiveness of electrical system operations, planning, and maintenance.

SB 17 also requires the filing of a Smart Grid deployment plan:

§ 8364(a) By July 1, 2011, each electrical corporation shall develop and submit a smart grid deployment plan to the commission for approval.

Thus, § 8364(a) requires that the utilities develop and submit Smart Grid deployment plans to the Commission by July 1, 2011 for Commission approval.

Commission Supports California’s Utilities Receiving Approximately \$ 118 million in Recovery Act Funding for Smart Grid

After the issuance of the Rulemaking, Congress passed the Recovery Act which appropriated \$4.5 billion “to modernize the electric grid” through activities including the Smart Grid programs authorized by EISA.² The Smart Grid funding provided by the Recovery Act created an opportunity for California to expand and accelerate its activities to modernize the state’s electric infrastructure at a significantly lower cost to ratepayers. The Recovery Act directed the Department of Energy (DOE) to create a competitive process to distribute the funds to projects that met the DOE requirements. DOE created an application process whereby utilities, or other groups, could apply for a portion of the available funds allocated to DOE for this program. As part of the application process, DOE required that projects that had ensured 50% funding would receive greater consideration and if approved the Recovery Act would fund the remaining 50%. In order to allow California’s utilities to submit a competitive application to DOE, in September 2009 (D.09-09-029) the Commission approved processes and policies to align the timeline of the Commission’s review of investor-owned utility Smart Grid projects with the DOE’s rapid timeline for reviewing and granting awards for projects.

On November 24, 2009, DOE announced that California would receive approximately \$186 million in Federal Stimulus funding for eight Smart Grid and Energy Storage demonstration projects. Four investor-owned utility projects were submitted for funding consideration for this round of awards and three were selected. Overall, California received 30 percent of the \$620 million that DOE awarded for Smart Grid and Storage Demonstrations.

² The Recovery Act, Section 2, Division A, Title IV, Energy and Water Development states: “For an additional amount for ‘Electricity Delivery and Energy Reliability,’ \$4,500,000,000: Provided, That funds shall be available for expenses necessary for electricity delivery and energy reliability activities to modernize the electric grid, to include demand responsive equipment, enhance security and reliability of the energy infrastructure, energy storage research, development, demonstration and deployment, and facilitate recovery from disruptions to the energy supply, and for implementation of programs authorized under title XIII of the Energy Independence and Security Act of 2007 (EISA) (42 U.S.C. 17381 et seq.) ... ”

California's Investor Owned Utilities' Smart Grid Demonstration Projects selected:³

- Southern California Edison, Irvine Smart Grid Demonstration (\$40 million): Integrated, scalable end-to-end Smart Grid system from transmission to consumer applications.
- Waukesha Electric Systems (in conjunction with Southern California Edison), Fault Current Limiting Superconducting Transformer (\$11 million): New transformer technology that can reduce losses and improve reliability.

California's Investor Owned Utilities' Energy Storage Demonstration Projects selected:⁴

- PG&E Underground Compressed Air Energy Storage (\$25 million): 300 megawatt plant in Kern County.
- Southern California Edison Tehachapi Wind Energy Storage Project (\$25 million): 8 megawatt utility-scale lithium ion battery technology.

On October 27, 2009, DOE announced that California would receive approximately \$203 million in Federal Stimulus funding for six Smart Grid Investment Grant projects. Two investor-owned utility projects were submitted for funding consideration for this round of awards and one was selected. Overall, California received 17 percent of the \$3.4 billion that DOE awarded for Smart Grid Investment Grant projects.

California's Investor Owned Utilities' Investment Project Selected:⁵

SDG&E advanced wireless communication system (\$28 million): Implement an advanced wireless communications system to provide connection for 1,400,000 smart meters, enable dynamic pricing, and examples of smart equipment that will allow increased monitoring, communication, and control over the electrical system.

³ Other Demonstration Projects located in California that received Recovery Act funding include: Los Angeles Department of Water and Power, Smart Grid Regional Demonstration (\$60 million): Demonstrations in partnership with local research institutions.

⁴ Other Energy Storage Demonstration Projects located in California that received Recovery Act funding include: Primus Power, Wind Firming Energy Farm (\$14 million): 25 megawatt storage for Modesto Irrigation District; Seco Inc., Solid State Batteries (\$6 million): 25 kWh prototype advanced lithium ion battery system; Amber Kinetics, Flywheel Demonstration (\$4 million): Demonstrate innovative flywheel technologies.

⁵ Other Investment Projects located in California that received Recovery Act funding include: Sacramento Municipal Utility District (\$127.5 million): Install a comprehensive regional smart grid system from transmission to the customer; Burbank Water (\$20 million): Deploy multiple integrated smart grid technologies, including 51,000 electric smart meters and a connected smart meter network for water usage, Customer Smart Choice, Energy Demand Management programs, and enhanced grid security systems; City of Glendale Water & Power (\$20 million): Install 84,000 smart meters and a meter control system; City of Anaheim (\$5.9 million): Upgrade and enhance the city's smart grid network and demand response systems; and, Modesto Irrigation District (\$1.5 million): Install 4,000 smart meters, enhance the electricity distribution system.

Commission Issues Decision in Response to EISA 2007

In December 2009, the Commission issued a decision in response to the requirement contained in EISA 2007 directing states to consider certain amendments to PURPA.⁶ EISA directed state commissions to consider five tasks:

- Each State shall consider requiring that, prior to undertaking investments in non-advanced grid technologies, an electric utility of the State demonstrate to the State that the electric utility considered an investment in a qualified smart grid system based on appropriate factors;
- Each State shall consider authorizing each electric utility of the State to recover from ratepayers any capital, operating expenditure, or other costs of the electric utility relating to the deployment of a qualified smart grid system;
- Each State shall consider authorizing any electric utility or other party of the State to deploy a qualified smart grid system to recover in a timely manner the remaining book-value costs of any equipment rendered obsolete by the deployment of the qualified smart grid system based on the remaining depreciable life of the obsolete equipment;
- All electricity purchasers shall be provided direct access, in written or electronic machine-readable form as appropriate, to information from their electricity provider, including prices, usage, intervals and projections, and sources; and,
- Purchasers shall be able to access their own information at any time through the Internet and on other means of communication elected by that utility for Smart Grid applications. Other interested persons shall be able to access information not specific to any purchaser through the Internet. Information specific to any purchaser shall be provided solely to that purchaser.

The Commission declined to adopt the proposed requirements, deciding that prior Commission action sufficiently satisfied the proposed requirements. The Commission, however, did set three policy objectives in the area of customer and third party access to information and prices:

- Provide retail and wholesale prices to customers by the end of 2010;
- Allow authorized third parties to access customer data by the end of 2010; and

⁶ D.09-12-046.

- Provide those customers with an advanced meter, access to their usage in near real time by the end of 2011.

The Commission directed that further investigation was required in order to create rules surrounding customer access, privacy and security before authorizing third party access.

Commission Provides Guidance to Investor Owned Utility's Smart Grid Deployment Plans

In June 2010,⁷ pursuant to SB 17, the Commission issued a decision delineating requirements for a Smart Grid deployment plan. The decision provided Pacific Gas and Electric Company ("PG&E"), San Diego Gas & Electric Company ("SDG&E"), and Southern California Edison Company ("SCE") with the guidance needed to file Smart Grid Deployment Plans by July 1, 2011. The decision required that the Smart Grid Deployment Plans present a vision of the Smart Grid consistent with legislative initiatives. The vision must address how the plans will enable customers to capture the benefits of a wide range of energy technologies and energy management products and services that may, or may not, be provided by the utility, while protecting customers' privacy. The vision must also discuss how the Smart Grid will help the utility meet environmental policies already adopted by statute or Commission action, and promote innovation and competition among companies developing new products and services.

This decision required that utilities follow a common outline in preparing their Smart Grid Deployment Plans. The outline consists of eight topics as follows:

1. Smart Grid Vision Statement;
2. Deployment Baseline;
3. Smart Grid Strategy;
4. Grid Security and Cyber-Security Strategy;
5. Smart Grid Roadmap;
6. Cost Estimates;
7. Benefits Estimates; and
8. Metrics.

⁷ D.10-06-047

The June decision also required that the Smart Grid Deployment Plans provide a deployment baseline so that the Commission can better understand the character of the California grid today and articulate a strategy for achieving the adopted goals. Each utility must address grid security and cyber-security issues in their Smart Grid Deployment Plans to ensure that these issues are considered explicitly at the planning stage. Additionally, consistent with the intent of SB 17, the June decision linked California's concerns for grid security with the security guidelines identified as under development by the National Institute of Standards and Technology. Finally, the decision also adopted security strategy requirements and principles to guide the development of Smart Grid Deployment Plans to ensure alignment with national efforts.

Commission and Stakeholders Develop Metrics to Measure Smart Grid Progress

Performance metrics allow the Commission, other parties and the public to measure, compare and contrast the adherence of SCE, PG&E and SDG&E to statutes and policies created by the Commission. Essentially, the goal of adopting metrics is to measure progress. It is expected that a decision by the first quarter of 2011 will adopt a set of metrics that should be included in the utilities' Smart Grid deployment plans due July 1, 2011. Additionally, the utilities are required to report on performance relative to the metrics as part of their annual reports, to be filed pursuant to the timetable adopted by the Commission.

Commission Is Developing Rules to Ensure Protection of Customer Data

The goal of this decision is to set the guidelines needed to implement customer and authorized third party access to price and consumption data. The decision is expected to resolve the policy objectives for the provision of retail and wholesale price information, access to usage data through an agreement with a third party, and access to usage information on a near real-time basis for customers with advanced meters.

In September 2010, the Governor signed SB 1476 (Authored by Senator Padilla) which instituted certain privacy protections upon utilities to protect customer's energy consumption data. Fundamentally, SB 1476 directs electric and gas utilities to provide a certain level of

privacy protection for customer's usage data, including provision of data to an authorized third party or utility contractor.

As directed by the Commission's December 2009 decision on EISA requirements, a process was initiated to create a record that will permit the adoption of privacy and security protections, and ensure that consumer privacy is adequately addressed. In order to assist the Commission in the creation of those rules, the Commission requested PG&E, SCE, and SDG&E to file comments that answer the following questions:

- What customer energy usage data does the utility expect to generate or currently generates (including the frequency with which such data will be generated)? Does the utility provide customers with access to that data today? If not, when is the target date for providing such access? With whom do you propose to share that data? How do you currently use such data (including the relevance of such data to the intended uses), and how long will the data be maintained?
- What are the current privacy protections and data exchange rules that apply to this data? What privacy protections and data exchange rules does the utility propose that the Commission adopt?
- Does the utility currently provide usage data to third parties? If so, what are the consumer protections and security provisions that apply to that information?
- What policies does the utility follow in responding to requests or demands for disclosure of such data from law enforcement, other government agencies, and civil litigants, including what policies will the utility follow in providing consumers with notice when a request or demand is received?
- Does the utility provide the customer with access to pricing data associated with their usage? If so, what does the utility communicate and when and how is the price communicated? What price information does the utility believe would be most useful to a customer?

Additionally, the Commission requested third parties who are interested in securing customer data to answer the following questions:

- What home energy usage data do third parties currently obtain, expect to obtain, or will seek to obtain? How does the third party use or expect to use the data (including the relevance of the data for the expected uses)? To whom do third parties expect to disclose the data, and how long will the data be maintained? How does a third party

expect to obtain information, e.g., via the meter, a utility webpage or some other means?

- What policies do third parties follow when responding to requests or demands for disclosure of such data from law enforcement, other government agencies, and civil litigants, including what policies will the third party follow in providing consumers with notice when a request or demand is received?

The answers to these questions will provide a basis upon which the Commission can implement rules for providing customers access to their data, and also allow authorized third parties to access that customer data. Currently, SDG&E as part of a pilot program provides customers with access to usage data via an arrangement with Google. This arrangement may serve as a model for offering choice to customers and other third parties to be able to access a customer's usage data. The Commission is looking forward to establishing a complete record on privacy and access to third parties via a decision in first quarter of 2011.

Regarding access to electricity price information as a policy matter, the Commission in Decision (D.) 09-12-046 set a goal for utilities to provide customers with access to electricity price information. Similar to privacy and access issues, the Commission is in the process of establishing a record; in this process several parties noted that since residential prices vary with consumption, it is unclear what price to communicate to customers. Additionally, due to the unique electricity tiered rate structure for California's residential customers, sending a timely and useful price signal to residential customers may cause substantial confusion. For example, should the utility communicate a price to a customer which forecasts the monthly level of consumption, or should the price communicated simply vary depending on the aggregate consumption to date? In both cases, the sending of useful and actionable information will depend heavily upon a residential customer's relation to their tier, which varies throughout the month, and is likely to be very difficult for the utility to accurately project and may cause customer confusion. Consequently, the Commission has sought proposals for consideration, particularly from any utility who is currently providing price information to customers and from consumer groups, who represent the concerns of customers.

A decision is anticipated by the first quarter of 2011 setting the guidelines needed to implement access to price and consumption data. The decision should resolve the policy objectives for the

provision of retail and wholesale price information, access to usage data through an agreement with a third party, and access to usage information on a near real-time basis for customers with advanced meters.

Finally, the Commission is involved with the creation of national standards, and participated in many meetings held over the past year. The Commission is an active participant on issues ranging from customer access to cyber-security. As SB 17 directed the Commission to adopt standards, the Commission expects to maintain an active presence in this national effort to create consensus Smart Grid standards and to adopt them for California, where appropriate.

In summary, the Commission initiated a proceeding to move forward policies and guidelines that encourages utilities to create a smarter grid. Pursuant to SB 17, the Commission set the framework for utilities to file their Smart Grid deployment plans, and created the framework for utilities to be awarded funds from the \$4.5 billion allocated to Smart Grid related projects through the Recovery Act. California continues to be a leader on Smart Grid policies, and the Commission is at the forefront of that effort.

PLANS & DEPLOYMENT SCHEDULES OF UTILITIES

As a first step toward a smarter grid, the Commission, beginning in 2006, authorized the state's investor owned utilities (i.e., PG&E, SDG&E, and SCE) to replace conventional customer meters with advanced meters. Advanced meters serve as a fundamental building block of the Smart Grid by, amongst other things, providing customers with the ability to have greater control over their electricity usage. Additionally, advanced meters enable a utility to provide customers with detailed information about their energy usage at different times of the day, which in turn enables customers to manage their energy use more proactively.

Currently, advanced meters are being rolled out nationwide and internationally. It is estimated that over 70 million advanced meters are installed worldwide with over 250 million expected to be installed by 2015.⁸ In California, the Commission authorized Southern California Edison to install approximately 5.3 million new advanced meters, San Diego Gas and Electric Company

⁸ "Smart Meters" from Pike Research, November 2009.

(SDG&E) to install 1.4 million electric advanced meters and 900,000 natural gas meters, and Pacific Gas and Electric Company (PG&E) to install approximately 5 million electric meters and 4.2 million natural gas meters. As of the date of this report, PG&E has installed approximately 7.1 million meters, Southern California Edison has installed approximately 2 million meters, and San Diego Gas and Electric Co. has installed approximately 1.9 million meters. Full deployment of advanced meters across the three service territories is expected to be completed during 2012.

Early Controversy Related to Advanced Meter Deployment

In addition, there has also been concerns raised about the potential adverse health effects of advanced meters. In particular the EMF Safety Network filed an application with the Commission asking to reopen its review of Smart Meters, and require PG&E to demonstrate that their advanced meter program is consistent with delivery of safe, reliable gas and electric service at reasonable rates. The Commission denied EMF Safety Network's request based on the fact that the radio frequency (RF) emissions from advanced meters are 1/6000 of the Federal health standard and far below the RF emissions of many commonly used devices. This health standard is set by the Federal Communications Commission (FCC) based on guidance recommended by the U.S. Environmental Protection Agency. Importantly, the standard includes a conservative safety factor to account for uncertainty in emissions or exposure, for example.

California Council on Science and Technology (CCST) is currently reviewing available information regarding emission levels from advanced meters and whether these emissions pose any adverse health impacts on customers. The report is due in early 2011; however, the Center for Disease Control for the state of Maine has conducted its own review as has the Canadian health agency, Health Canada, and both have concluded that there are no adverse health impacts due to advanced meters.

Customer education and engagement must be one of the building blocks of a smart grid system. However, customers may not fully understand or appreciate the various benefits smart-meters provide in terms of enhancing their ability to better manage their energy use.

Nor do they necessarily understand the benefits of the new rate structures that smart meters enable. For example, dynamic pricing, including critical peak pricing and peak time rebates, will result in lower bills for many customers, particularly those whose usage is largely off-peak, or for those customers who are able to shift their usage in response to pricing information. A key part of the smart meter deployment, therefore, is educating customers on these various benefits and the role that smart meters play in allowing them to access those benefits.

CONCLUSION

California is aggressively pursuing modernization of the state's electric grid from one based on industrial age technology to one based on the technology of the information age: a Smart Grid. At the federal level, DOE has been charged with orchestrating the wholesale modernization of our nation's grid.

A Smart Grid will offer customers greater control over their utility bill through the availability of real-time information on rates and usage that will allow customers to decide when and how much energy to use. By providing customers with usage and price information (and eventually multiple tariff options), a customer will be able to understand how much and when a customer's pool pump, the multiple TVs, the freezer in the garage, and the chargers for the cell phone will cost. This will empower the customer to take a more active role on when to turn on the pool pump, or to turn the TV off when not watching it, or determine if that freezer in the garage is necessary. The customer will be able to decide what he or she needs ahead of getting a bill that is beyond their monthly budget, or to determine if there is a different rate option that would better meet their needs. It is therefore incumbent upon the Commission to continue to move forward and provide customers the choice in terms of rates that are better aligned with actual costs, and allow customers to choose amongst entities that are best able to help customers better manage their consumption. The customer needs to become a participant in the Smart Grid in order for the Smart Grid to become fully functional and beneficial. Therefore, customer awareness and acceptance are key aspects of a successful Smart Grid. The legislature, as well as the Governor and our local governments, can play a major role in promoting the transition to a Smart Grid.