

**Quadrennial Energy Review
Second Installment
Department of Energy
Stakeholder Meeting No. 6
Generating and Delivering Electricity to Meet GHG Targets**

May 10, 2016

**Written Comments of the
Sacramento Municipal Utility District**

The Sacramento Municipal Utility District (SMUD) appreciates the opportunity to provide its written comments in connection with the May 10, 2016 Stakeholder Meeting addressing “Generating and Delivering Electricity to Meet GHG Targets.” These comments along with SMUD’s participation in the second installment of the Quadrennial Energy Review (QER) are intended to assist the Department of Energy (DOE) in developing national energy policy affecting SMUD’s customers.

SUMMARY

SMUD is a political subdivision of the state of California formed pursuant to the Municipal Utility District Act (California Public Utility Code §811501 *et seq.*) to acquire, generate, transmit, and distribute electric energy. SMUD currently serves 1.4 million residents in its 900 square miles service area, which includes most of Sacramento County (including the City of Sacramento) and a portion of Placer County.

Our utility has developed an integrated generation portfolio that includes renewable energy sources such as hydro, photovoltaic, and wind, as well as natural gas-fired combined cycle and cogeneration plants. In a typical year, this portfolio provides about one-half of the power demand of SMUD’s customer-owners. Other power is provided for through long- and short-term power contracts for both renewable energy and natural gas-fired generation. At present, about half of SMUD’s retail electricity sold comes from GHG-free resources.

SMUD’s Resource Planning objectives include maintaining affordable power and continuing local and regional environmental leadership toward a low-carbon future, and providing reliable, clean and high quality energy for its customers.

SMUD’s planning process remains flexible and adaptable to changing SMUD customer needs as well as state and federal regulations. For example, we recently shifted some of our renewable procurement focus away from biogas and towards solar resources. This was a necessary adaptation recognizing reductions in solar prices and state policy concerns regarding biogas.

As our utility transitions away from carbon-emitting resources, integration of variable renewable energy sources will create significant challenges, requiring some combination of flexible supplies, responsive demands and energy storage. The long-term planning strategy addresses this need to support the transition toward the low-carbon future while maintaining reliable,

affordable clean power. Toward this end, we are engaged in a comprehensive examination of distributed energy resources, including local solar, energy efficiency opportunities, demand response (DR) and pricing initiatives, electric vehicle developments, and consideration of a variety of storage options. Our examination is informed by significant R&D efforts on clean resource opportunities, including distributed storage pilot projects funded in part by DOE.

SMUD's resource planning process is an important planning framework for us to ensure that our long-term resource needs are met in a way that is consistent with state carbon policy. California has adopted long-term carbon reduction goals that will reduce emissions by 80% below 1990 levels. Legislation for renewable portfolio standard (RPS) requirements of 50% by 2030 was adopted in 2015, (not counting large-hydro). In this context, SMUD along with the other 4 large utilities in California funded modeling by Environment + Energy Economics (E3) to examine the impacts of a 50% RPS on the electricity system in 2030¹. The report found that there would be substantial amounts of over-generation of solar energy, primarily during spring and fall days, totaling as much as 23% of the hours of the year. These findings indicate the need for flexible generation, DR, and energy storage to accommodate more variable generation without curtailing its output.

With these goals, the amount of renewable energy added in SMUD's service area, and the Western electric grid as a whole, will increase substantially. The majority of this energy is expected to come in the form of wind and solar energy, both intermittent and non-dispatchable resources. As more intermittent energy sources are added to the grid, additional forms of flexible generation will be needed to smoothly integrate the intermittent contribution. Currently, the majority of flexible generation, providing fast start-up capability, rapid ramping and regulation services, comes from hydro resources and gas-fired generation. As more renewable energy comes on-line and gas-fired generation declines, a resource to replace the integration services of gas-fired generation appears will be necessary to meet renewable and sustainable energy goals.

UPPER AMERICAN RIVER PROJECT

With an installed capacity of 688 MW, the Upper American River Project (UARP) is an important component in SMUD's integrated generation portfolio. The UARP provides low-cost power, operational flexibility, and overall system reliability to SMUD's customer-owners. Additionally, the UARP's storage capability, coupled with its operational flexibility, provides a much-needed level of protection to SMUD's customer-owners from unexpected increases in the price of electricity on the open market.

The UARP is the only hydroelectric project owned by SMUD. The 688 MW hydro system plays a significant role in energy management, contributing value in three primary areas: (1) operational flexibility, (2) economic power generation, and (3) overall system reliability.

¹ 'Investigating a Higher Renewables Portfolio Standard in California' January 2014, Energy + Environmental Economics https://ethree.com/documents/E3_Final_RPS_Report_2014_01_06_with_appendices.pdf

One of the primary aspects of operational flexibility lies in the ability of the UARP to store water on a seasonal basis. The project's combined 400,000 ac-ft gross capacity enables SMUD to manage the water, within physical, safety and regulatory constraints, to generate electricity when power is most valued throughout the year.

Generally, power is most valued when a deficit exists for electricity supply in the western United States (west of the Rocky Mountains), and particularly in northern California. An imbalance between energy supply and demand is driven by a number of factors, including but not limited to: (1) high daily temperature, (2) low precipitation and snowmelt in the Pacific Northwest and/or California, (3) an unexpected generating plant and/or transmission outage, and (4) constrained natural gas supplies. For example, on a hot summer day, when customer demand for electricity is high, SMUD will generally release water from storage to generate electricity at near full capacity. This operation occurs most often during peak load hours of the day such as the later afternoon and early evening. Alternatively, when local demand for power is low or when the western power supply is abundant, water is held in the storage reservoirs, and the UARP generates at reduced capacity for shorter periods of time.

The UARP is also operated to ensure reliability of the electric generation and transmission systems within SMUD's service area and in northern California. The UARP is operated in a manner to instantaneously provide electricity during emergency and other limited (e.g., peak load) situations, and to provide regulation services to the California Independent System Operator (CAISO). The Project is also capable of providing "black start" power to help in quickly putting base-load generation plants back on line in the event of a system-wide blackout. This helps to ensure integrated system reliability in California and other western states.

STATEWIDE GHG POLICY CONTEXT AND THE 50% RPS STUDY

California has adopted long-term carbon reduction goals through Executive Order and legislative action to address climate change. In 2005, the Governor established an 80% carbon reduction below 1990 levels by the year 2050, and in 2006, the state legislature passed landmark legislation to reduce statewide emissions back to 1990 levels by the year 2020. These overarching policies are being accomplished in the state through a variety of specific policies including renewable energy, rooftop solar, zero-emissions vehicles, low carbon fuels, cap and trade, energy efficiency and other efforts. One of the biggest drivers for the electricity sector is the RPS, which reached 20% in 2010, will reach 33% by 2020, and 50% by 2030.

The E3 study previously mentioned examined seasonal operational impacts of high penetrations of renewables, focused in particular on scenarios with significant amounts of solar generation. More than any other resource, solar generation has become a preferred renewable resource based on its now low cost and relatively easy accessibility throughout the state. The scenarios examined indicated that even with the contracts in place to meet the 33% RPS by 2020, overgeneration situations were going to be increasingly likely, and that by 2030, at a 50% RPS, overgeneration could occur as frequently as 23% of the hours of the year in certain scenarios. Such outcomes could have profound implications for asset owners, market participants, and our customers.

Energy storage combined with dispatchable or controllable loads such as water heaters and/or EV's could provide an opportunity for a lower societal cost of renewables integration as distributed storage costs are reduced. In this context, storage for both bulk as well as distribution systems presents an increased opportunity to capture value and enhance reliability.

Currently, the California Independent System Operator is overseeing regional modeling efforts as the result of entering into a memorandum of understanding (MOU) with PacifiCorp in April of 2015 to merge the entire PacifiCorp system into the CAISO balancing authority area footprint. Given the multi-state expansion implicated by the MOU,² the State of California enacted SB 350,³ which, besides increasing to a 50% RPS by 2030 and adopting other key environmental goals, requires that studies be conducted on the impact of regional integration on multiple aspects of the economy and environment, including:

- The creation and retention of jobs and other benefits to the California economy
- Environmental impact in California and elsewhere
- Impacts on disadvantaged communities
- *Emissions of greenhouse gases and other air pollutants*
- Reliability and integration of renewable resources

Preliminary study results are proposed to be published later this month or in early June and submitted to the Governor. Any requisite CAISO governance changes required to allow the regional integration to proceed must be enacted by statute.

Clearly the modeling of such a complex, multi-state integration with varying environmental standards (most far less stringent than California and now Oregon) and regulatory regimes is fraught with difficulty and in some respects extremely speculative. Nevertheless, if the integration proceeds, it will no doubt be transformative to the Western region due to the standards that might be imposed by a centralized market and dispatch, particularly with respect to addressing GHG emissions across a single market footprint.

SMUD'S DISTRIBUTED STORAGE RESEARCH

Distributed energy storage holds promise as a mitigation strategy for dealing with intermittency of PV and wind. It can also help deal with increased loading of distribution system from EV charging. For example, storage can be sited with commercial, public opportunity charging systems. If EV charging is needed during peak load periods for the utility, the storage can be dispatched to offset the EV charging load and thus lessen stress on the distribution system. Further, it can help customers manage costs and improve their reliability. Customers can use the storage to better manage super peak energy costs or demand charges by using off-peak stored energy to offset energy and demand during super peak periods. Storage can also be used by customers to serve their load during utility outages, like an uninterruptible power supply. And, it can help SMUD and SMUD customers reduce peak load. Off-peak stored power can be used during utility peak periods when the distribution system is stressed and energy losses are highest.

² PacifiCorp comprises the states of Oregon, Washington, California, Utah, Wyoming and Idaho.

³ "The Clean Energy and Pollution Reduction Act of 2015," was signed into law by Governor Jerry Brown on October 7, 2015 (Chapter 547).

SMUD has developed a portfolio of storage research and demonstration projects to better understand the different technologies, how well they perform, how durable they are, and how those technologies interact within our system. These projects are also helping our utility understand how to integrate, view, and manage storage in our system operations. From the customer perspective, some of these projects are helping SMUD and SMUD customers understand how storage can benefit them, i.e., reduce energy and demand costs and improve reliability.

SMUD's distributed storage projects are helping SMUD and SMUD's customers understand the value that storage can provide to managing energy costs, improving grid operations and integrating intermittent renewable power. SMUD has assessed distribution substation/feeder scale storage to help firm intermittent megawatt class PV projects, firming commercial customer sized PV plants, and helping firm customer-sited PV and reduce their energy costs. These research projects have revealed the challenges of communicating with and controlling these storage systems. For example, at the Anatolia demonstration site, the customer broadband communication with the Residential Energy Storage was much less reliable and more problematic than the wireless communication solution used for the Community Energy Storage. SMUD has ongoing research to leverage SMUD's Smart Grid investment in automated metering infrastructure (AMI), its Distribution Automation networks, and Demand Response Management System to communicate and control distributed storage devices that can help address this.

CONSIDERATIONS FOR FEDERAL POLICYMAKERS

SMUD takes the issue of climate change seriously. For the past two decades, our utility has actively implemented efforts to reduce our GHG emissions. We are on track to meet an interim goal equivalent to 30% below our 1990 GHG emissions by 2020, while planning for resources necessary to meet our 2050 goal of 90% reduction below our 1990 emissions. These emission reductions were accomplished through aggressive investments in energy efficiency and significant and steady additions of renewable energy. Our renewable energy content is now about 26% of our retail energy demand (not counting large hydropower) and resources in the pipeline should increase that percentage in the coming years. SMUD's remaining energy resources includes low-cost, zero-GHG emitting large hydro generation described above and modern and efficient combined cycle and cogeneration natural gas facilities. We plan to continue investing in efficiency with our customers, and our relatively recent smart grid transformation will allow us to supplement these efforts. We are encouraged by and plan to continue investing in the electrification of transportation to help achieve broader GHG reductions.

The efforts SMUD has undertaken to reduce our GHG emissions have real financial costs to our customers, and we encourage the DOE and the Administration not to discount such costs to consumers and businesses as you consider climate policy. Our experience is that having the flexibility and a relatively long time horizon to accomplish our goals have allowed us to keep these costs lower than would be expected. Our long-term carbon goals have caused us to begin planning for significant future changes to our operations and resource needs to meet the levels of reductions required by those goals.

California is at the forefront of policymaking efforts to reduce GHG emissions. California's GHG regulatory regime contains a number of key design elements to help minimize impacts on customers and business which we believe are instructive for federal GHG policymaking. Specifically, California has:

- Adopted a cap-and-trade structure that recognizes utilities as key actors in helping the state reduce emissions, provides appropriate carbon price signals, raises revenue specifically for carbon reduction investments, and minimizes cost impacts on the retail customer. The program preserves local flexibility, while providing clear guidance for resource planning over appropriate time horizons;
- A renewable portfolio standard aimed at sharply reducing the GHG emissions from electricity services in the state.
- Adopted leading standards for energy use in new homes and buildings, aiming to produce zero-net energy new homes and buildings in the next two decades;
- Required significant investment in energy efficiency programs by utilities and other participants, aiming to achieve all cost-effective energy savings;
- Adopted a "low-carbon-fuel-standard" to reduce the carbon-content in transportation fuels used in the state, gradually over time; and
- Adopted protocols for increasing vehicle efficiency – now largely mirrored at the national level – as well as protocols for land-use development aimed at reducing the need for vehicle travel on our overburdened roads.

All of these efforts in California are part of a broad policy to reduce the state's GHG emissions to levels last seen in 1990 by the end of this decade, and 40% below these levels by 2030.

As the Administration undertakes federal policy design to address climate change, we believe observing several key principles will be important to accomplish policy goals. In particular, flexible rules are needed that recognize the long-term nature and large capital requirements for resource investments in the electric industry. A first priority should be to minimize cost impacts to consumers and businesses. Emphasis on regional flexibility, with local decision-making and accountability will allow the most appropriate, cost-effective solutions to emerge based on the diversity of resources and tools available in each region. There should be flexibility to use any real emissions reduction tools available including not just onsite reductions but offsite renewable energy, energy efficiency, offsets, and available reductions made in other sectors.

The release last year of the U.S. Environmental Protection Agency's Clean Power Plan demonstrated regulatory flexibility essential to balancing the goals of carbon reduction with regional decision-making and accountability. For example, EPA adopted the recommendations of utilities such as SMUD that includes allowing up to two additional years to submit state implementation plans, introducing a mechanism to reward "early action" taken in 2020 and

2021, and allowing states to earn emissions allowances or emission reduction credits (ERCs) depending on whether they select a mass-based or rate-based plan for early investments in renewable and energy efficiency programs implemented in low-income communities. Additionally, in response to reliability concerns, the Plan includes a “safe harbor” for power plants that must run to meet reliability standards and if needed, states are allowed to amend compliance plans to account for the need to keep a plant open longer than anticipated.

Federal climate policy should encourage locally appropriate solutions and compatibility with market tools already being developed in regions across the country. Programs that depend upon meeting overarching goals with flexibility at the local and regional level will work most efficiently and more effectively than piecemeal and potentially inconsistent and/or duplicative regulations. To the extent that programs are aimed at specific subparts of the problem, federal-state coordination is paramount to avoid unnecessary costs and allow differing solutions where these make sense. The intra-agency coordination we observed between FERC and EPA in addressing reliability issues within the Clean Power Plan is the type coordination that should be fostered between federal and state agencies toward this end. Implementation details matter, and there are real costs resulting from administratively complex rules and reporting obligations.

As DOE and the Administration consider GHG reduction options, a key opportunity lies in reducing societal energy needs through energy efficiency or energy conservation. The dollars saved through energy efficiency represent dollars that will not need to be spent to meet future energy demand. Enabling states to adopt policies to promote regionally appropriate energy technologies is worth considering. Similarly, federal actions should not preempt or complicate existing state or regional emissions reduction programs which provide compatible alternatives. In addition, the electrification of the transportation sector represents an important opportunity for the Administration as part of its GHG reduction efforts given growing consumer demand for low-carbon emitting transport.

CONCLUSION

SMUD continues to strategically deploy its R&D and ongoing IRP resource planning to meet the demands of power generation and delivery in a carbon-constrained world. We encourage federal policymakers to ensure utilities such as SMUD and states such as California have the regulatory flexibility to find cost-effective, innovative, and environmentally sound solutions to the energy needs of consumers. SMUD greatly appreciates DOE’s invitation to contribute to this second installment of the Quadrennial Energy Review and welcomes the opportunity to provide further input in the QER process.