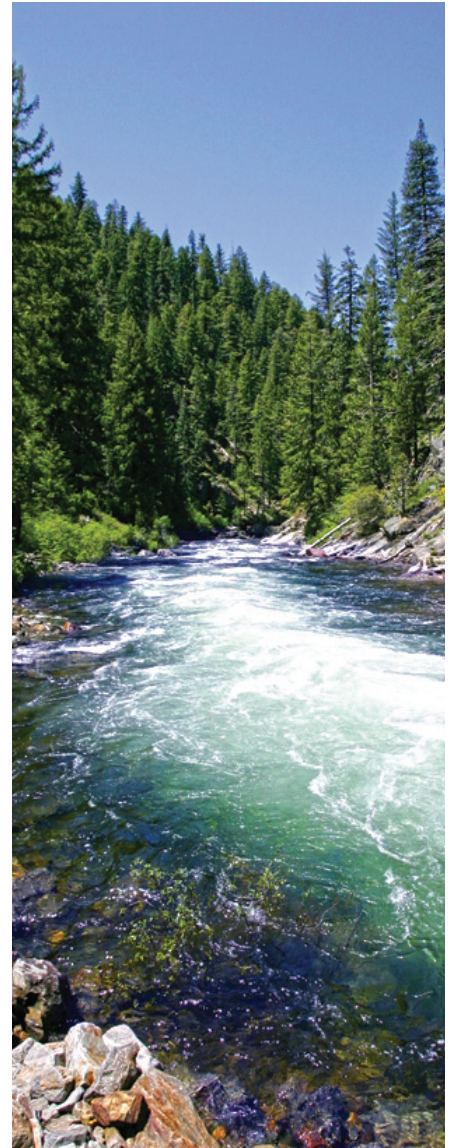




Status Report on Renewable Energy at SMUD

Powering forward.
Together.



SMUD[®]

Sacramento Municipal Utility District

Introduction:

The Sacramento Municipal Utility District (SMUD) is a community-owned utility serving about 1.6 million people in Sacramento County and a small part of Placer County.

SMUD has a sustainable power supply goal of reducing greenhouse gases emissions from generation of electricity to 10% of its 1990 level by 2050. As part of this umbrella policy, SMUD is committed to increasing renewable energy supply to meet its load. SMUD met California's Renewables Portfolio Standard (RPS) target of 20% for the period of 2011 through 2013 (Compliance Period 1); will meet its Compliance Period 2 (2014 – 2016) target and the 2016 target of 25%; and is on track to meet the Compliance Period 3 target and the 2020 target of 33%. SMUD will meet its 2016 target using 2016 generation and surplus renewable generation from previous years. The RPS regulations allow renewable energy procured above the compliance period targets to be "banked" and used to cover any deficits in future compliance periods. SMUD's voluntary green pricing program is expected to account for roughly 4% of SMUD's annual load.

Overall, SMUD's 2016 power mix is expected to be 22.7%. SMUD's power mix only includes 2016 generation, and the portion of our voluntary green pricing program not served by unbundled renewable energy credits (RECs).

Background on SMUD's Greenergy®, SolarShares and RPS Programs:

In order to grow renewable energy supplies for its customers, SMUD voluntarily created three separate programs: a Green Pricing Program called "Greenergy", SolarShares and an RPS Program.

In 1997, SMUD began Greenergy which allows participating customers to select renewable energy supply for 100% or 50%

of their electricity for a simple monthly fee of \$6 or \$3, respectively, in addition to their regular electricity bill. Commercial Greenergy customers pay 1¢/kWh for 100% renewables and 0.5¢/kWh for 50% renewable energy. Greenergy commercial customers can also purchase 1 MWh blocks for \$10 each.

In 2016, 72,524 customers participated in the Greenergy program (including commercial customers), an increase on the



¹ Senate Bill X2-1

² Final accounting of WREGIS RECs is expected to be completed in June 2017.

³ All resources in SMUD's Greenergy program meet the Center for Resource Solutions' (CRS) Green-e renewable energy program certification requirements.

⁴ SMUD 2016 power mix is based on the Power Source Disclosure reporting, which will be finalized in May 2017, and the Power Content Label which will be available by October 2017.

number of participants from 71,893 customers participating over 2015.

In July 2008, SMUD created a pilot residential Solar Shares program focused on expanding access to the benefits of local solar generation to all residential customers, not just those that had suitable siting conditions for rooftop solar. This program was the first program of its kind in California and the largest in the nation at this time. The program made possible for everyone to get solar power from a locally-based "solar farm". This 1MW Solar Shares system is located in Sacramento County with the capacity to serve between 800 and 1,000 customers. Therefore, for a fixed monthly price- ranging from less than \$5 a month up to about \$30 a month without spending thousands of dollars on a rooftop solar system.

SMUD is expected to launch a new Solar Shares program in 2019, this new program will not only allow for

residential customers to take advantage of the program benefits, but will also reach out to commercial customers to be able to participate.

SMUD established its RPS goals in 2001. A year later, the State of California established an RPS Program. Currently, the RPS legislation requires Publicly Owned Utilities (POUs), such as SMUD, meet 33% of retail sales with electricity from an eligible renewable energy resource by December 31, 2020, and 50% by December 31, 2030. Before this requirement, RPS statutes did not obligate POUs to have defined percentage goals and deadlines, nor did state laws require POUs to satisfy state eligibility rules for renewable energy resources to count toward their RPS goals. Nonetheless, SMUD met and actually exceeded state requirement of 20% of retail sales with renewable energy by 2010.

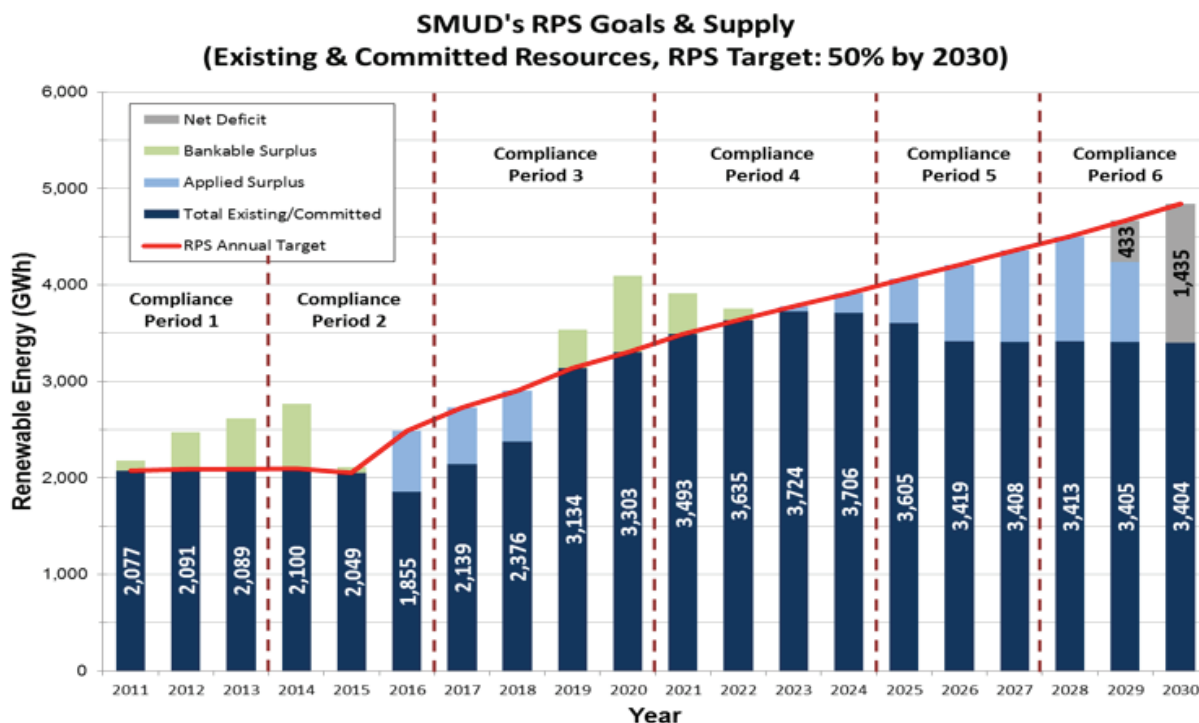
SMUD issued Requests for Offers (RFO) and accepted unsolicited proposals for

renewable projects to meet its RPS goal. Around the 2009 timeframe, SMUD signed contracts for substantial baseload generation, specifically geothermal and biomethane injection into the natural gas pipeline resulting from an increased amount of unsolicited offers. These new contracts helped place SMUD ahead of its renewables goals through 2015, when utilizing banked surplus procurement (see chart on the next page).

SMUD's current and projected renewable energy supply is reflected in the chart below. The renewable energy supply growth chart shows the supply targets, actual supply and projections based on existing PPAs and SMUD-owned renewable generation. Also reflected is SMUD's renewable energy deficit projected to 2030 as a result of increasing retail sales and the expiration of existing PPAs. The graph also shows applied surplus procurement from previous years to cover deficits starting in 2016 (blue bar).

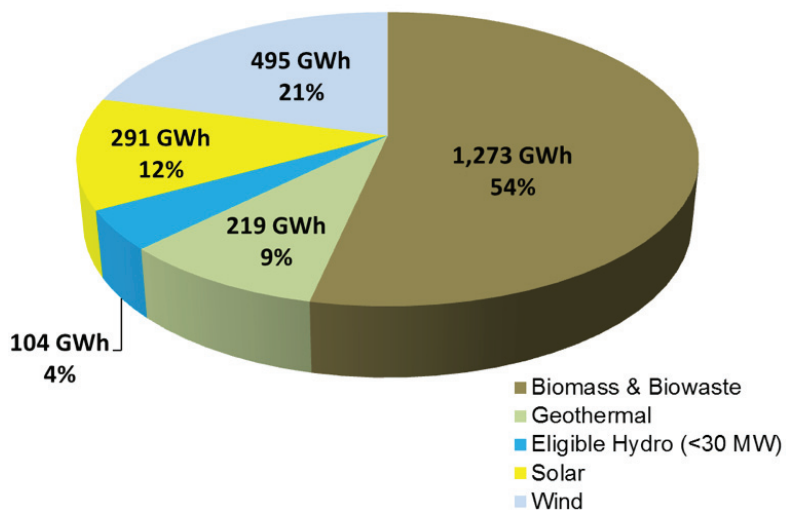


SMUD's Renewable Energy Goal and Supply Status



SMUD's Total 2016 Renewables Supply

The pie chart below shows SMUD's 2016 renewable energy supply by type of renewable energy resource. It shows a good balance between a baseload renewable energy supply (biomass) and intermittent renewables (wind, small hydro, and solar). SMUD added geothermal to its mix of baseload renewables supply in 2014.



Issues Preventing Growth in Renewable Energy:

SMUD has seen many issues preventing the growth of renewable energy. These include transmission constraints, permitting and integration issues.

Transmission. There are plenty of renewable energy resources in the West, but transmission is not available to access these resources.

While there has been some progress on transmission construction beginning in Southern California, there has been very little progress expanding transmission access to renewable energy resources in Northern California. The SMUD service territory encompasses 900 square miles, all of Sacramento County and a small portion of Placer County. SMUD initially relied on renewable energy imported from the rest of CA and neighboring states for much of its renewable supply. In 2009, SMUD's renewable supply consists of roughly

50% imported renewable energy.

In 2016, imported renewable energy is estimated to be 28% of our renewable supply. SMUD is mitigating its transmission issues but transmission is still a concern for future renewable resource needs in general for all of California's major utilities. New transmission takes many years to plan, permit and build.

Permitting. Permitting of renewable generation and transmission projects often is a slow, complicated process that may involve many regulatory agencies, each with different procedures, mitigation requirements and permitting schedules. Permitting

schedules sometimes are unpredictable particularly if negative responses from impacted communities occur.

Integration of Variable Renewable Generation. As the SMUD continues to grow its renewable supply, especially from variable (or intermittent) renewable resources, Impacts to grid reliability may become an issue. Other utilities, particularly in Hawaii, are already experiencing negative impacts. SMUD staff have conducted studies and implemented projects to identify possible mitigation measures to ensure continued reliable service to our customers.



Meeting Goals and Mandates:

SMUD has several activities underway to help us achieve our goals.

In addition to SMUD's goal of reducing greenhouse gases emissions from electricity generation to 10% of its 1990 level by 2050 and RPS goal of 50% by 2030, SMUD Board of Directors adopted an Energy Efficiency goal equal to 15% of retail load by 2023. Staff is developing Strategic Plans to enable us to meet these goals. Meanwhile, SMUD will continue to issue Renewable Energy Request for Offers as determined necessary, accept unsolicited proposals and actively discuss and help develop renewable energy projects with independent power producers and others.

SMUD is also supporting local development of distributed generation renewable energy projects. For example, SMUD has partnered with developers and dairy owners to build five dairy digesters in our service territory. These projects make up roughly about 4% out of the 54% Biomass & Biowaste shown in the 2016 Renewable Supply pie chart. Furthermore, these projects not only offer numerous benefits to the dairy farms where they are installed but



they also bring substantive benefits to the environment. Some of those benefits include reducing the greenhouse gas emissions by capturing and destroying methane. This is important because methane is 21 times more potent than Carbon Dioxide (CO₂) in causing climate change.

SMUD has done studies to look at promising next generation technologies for possible investment in research and development and we have been actively evaluating advanced technology projects.

In addition, to achieve a 50 % by 2030 goal in a cost effective manner, renewable technologies emerging from R&D need to be demonstrated and brought to commercialization. The next generation of renewable energy technologies (e.g. biomass gasification, in-conduit small, hydroelectric, distributed wind etc.) has potential, and many of these technologies can be built near load centers and thus are not as dependent on transmission construction. With industry partners, SMUD has also received grants from funding programs such as the California



Energy Commission, California Public Utilities Commission and the Department of Energy, to develop, demonstrate or deploy innovative renewable energy and distributed storage to help address the variable generation of some renewable energy technologies within our service territory.

Currently, SMUD owns and operates renewable energy facilities such as the Solano Wind Facility and the Upper American River Project (UARP), which consists of large and small hydro facilities. To better make use of our existing facilities, SMUD is investigating ways to increase renewable electricity generation by modifying or expanding these facilities. SMUD plans to complete Solano Wind Phase 4 development activities which will add about 64 MW of additional capacity. Staff is also evaluating and modifying the UARP power systems for efficiency improvements that can lead to increased generation.

Conclusion:

SMUD is committed to utilizing renewable energy to meet its load and help reduce its impact to the environment. We have met our goals and expect to achieve 50 % renewable supply to our customers by 2030. SMUD is developing strategies and activities to assist us in meeting our 2020 RPS short term goal of 33% and a long term 2050 goal of providing a sustainable power supply for the Sacramento region with only 10% of CO₂ emissions compared to the 1990 level.

