



January 6, 2017

Mr. Robert Weisenmiller
Chairman
California Energy Commission
1516 9th Street
Sacramento, California 95814

RE: Publicly Owned Utilities and Energy Storage

Dear Chairman Weisenmiller:

The California Municipal Utilities Association (CMUA), the Northern California Power Agency (NCPA), and the Southern California Public Power Authority (SCPPA) are pleased to submit this letter, which provides context regarding publicly owned utilities' (POUs) energy storage projects. This letter complements the individual reports that have been or will be submitted by POUs in compliance with Assembly Bill 2514 (Skinner, 2010), as amended by Assembly Bill 2227 (Bradford, 2013), which require a POU, by January 1, 2017, to update the California Energy Commission (CEC) on the energy storage procurement targets and policies adopted by the POU local governing board in 2014.¹

The letter is also intended to support the CEC in preparing the required summary of the POU reports to be included in the 2017 Integrated Energy Policy Report.² In Appendix F of the *2015 Integrated Energy Policy Report*³ (2015 IEPR), the CEC reported on the energy storage procurement targets adopted by public power. While Appendix F accurately summarizes public power's compliance with AB 2514 statutory requirements, it does not reflect the individual and collective investments of POUs into energy storage resources. This incomplete assessment of POU energy storage activities could lead policymakers, stakeholders, and the public to draw

¹ Cal. Public Utilities Code §9506(b).

² Cal. Public Utilities Code §9506(e).

³ California Energy Commission. 2015. *2015 Integrated Energy Policy Report*. Publication Number: CEC-100-2015-001-CMF.

erroneous conclusions about public power's prior and ongoing investments in energy storage. In particular, the decision of a local governing board to not adopt procurement targets does NOT mean the POU is not exploring energy storage projects or making energy storage investments.

The primary purpose of this joint letter is to provide an overview of previous, current, and prospective efforts of public power to support and procure energy storage resources.

I. OVERVIEW

Public power reaffirms its support for the California's 2030 goal of reducing greenhouse gas emissions to 40% below 1990 levels and remains committed to pursuing a range of resource solutions, including energy storage, to reduce the electricity sector's GHG footprint. As POU's proceed with resource plans consistent with the state's climate change policies, the following are the primary areas of interest regarding energy storage:

- (1) ***Research, Development, and Demonstration (RD&D) & Pilot Programs:*** Public power will continue, as it has for years, to invest in energy storage RD&D and pilot projects to better understand the wide range of energy storage technologies and their varying real-world applications.
- (2) ***Renewable & Storage Procurement:*** In procuring and/or integrating utility-scale and community-level renewable resources, POU's will consider the costs and benefits of including energy storage to provide energy services that would otherwise need to be secured to integrate intermittent renewable generation resources.
- (3) ***Infrastructure Replacement & Modernization:*** As existing resources are retired (such as the once-through cooling power plants) and upgrades are made to the grid (such as the installation of advanced meters, communication technology, and other Smart Grid infrastructure), POU's will evaluate proposed energy storage solutions in response to competitive solicitations for resources and/or services.
- (4) ***Market Conditions:*** Public power will factor in how major policy changes, such as California ISO regionalization, could either hamper or improve the competitiveness of energy storage technologies in future resource planning efforts.

These four interest areas are grounded in the underlying principle that utility resource procurement and planning shall be comprehensive, and lead to cost-effective, reliable, and feasible results. Depending on utility-specific factors, including customer base, service territory,

and existing resource mix, the current and future opportunity for storage to provide grid and customer services varies greatly among California's utilities.

As a matter of review, according to data published by the U.S. Energy Information Agency⁴:

- Retail sales from the three largest investor owned utilities in California was roughly 164,000,000 MWh or 73% of utility retail sales.
- Retail sales from 39 POU's in California was roughly 61,500,000 MWh, or 27% of utility retail sales:
 - Los Angeles Department of Water and Power (LADWP) and Sacramento Municipal Utility District (SMUD) combined (~34,000,000 MWh) to represent over 55% of POU retail sales and 15% of total utility retail sales.
 - In contrast, the 20 smallest POU's total only 2,350,000 MWh, which is less than 4% of the total POU retail sales, and only 1% of the total retail sales in California.

The relative size of the utility is integral to energy storage procurement decisions because economy of scale plays a key factor in the feasibility and cost-effectiveness analysis of energy storage technologies. With this background in mind, the following sections of this letter will explore and highlight public power activity in the different energy storage interest areas.

II. RESEARCH, DEVELOPMENT, AND DEMONSTRATION (RD&D) & PILOT PROGRAMS

As California adjusts its focus on energy policies beyond 2020 to 2030, POU's support further research, development, and demonstration (RD&D) of energy storage technologies to expand the energy storage market and improve competitiveness. Larger POU's have been engaged in energy storage RD&D for years, including but not limited to the following highlights:

- Los Angeles Department of Water and Power (LADWP)
 - LADWP has promoted thermal energy storage (TES) technology since the early 1990s and paid incentives for the installation of TES.
 - In August 2016, LADWP issued a solicitation for a pilot test plant to evaluate the performance of a 100 kW lithium-ion battery system and 100 kW flow battery.
 - In November 2016, after thorough testing and review, LADWP approved the SolarMax FLEX Energy Storage System (lithium-ion battery) for installation by customers, which may be of particular interest to customers with solar PV arrays.

⁴ 2015 data from forms EIA-861- schedules 4A & 4D and EIA-861S; <http://www.eia.gov/electricity/data.cfm#sales>.

- LADWP is involved in energy storage studies and projects using various technologies and use cases, including lithium-ion, flow batteries, compressed air, thermal energy storage at levels of the power system, including generation, transmission, distribution, and behind the meter.
- Sacramento Municipal Utility District (SMUD)
 - Since 2008, SMUD has conducted research into thermal, mechanical and electrical energy storage technologies, including lithium-ion batteries, sodium nickel chloride batteries, compressed air energy storage, and zinc bromide flow batteries, ranging in project size from 5 kW to 135 MW.
 - As part of its energy storage demonstration program, SMUD installed a large lithium-ion battery system to augment a 3 MW solar PV plant within its service territory to evaluate the system's ability to mitigate PV variability, ramp rates, and voltage issues.

For most POU's, administering their own RD&D program is not feasible and would exceed their limited resources or detract funding from other efforts such as energy efficiency. However, NCPA and SCPPA both support their members with joint RD&D efforts:

- Demonstration of Energy & Efficiency Developments (DEED) Program
 - The DEED Program is the primary RD&D program funded exclusively by and for public power utilities in the United States. Established in 1980, DEED is administered by the American Public Power Association (APPA) and available to more than 2,000 public power organizations. NCPA and SCPPA hold a membership in the APPA DEED program on behalf of their respective members, as well as a number of individual POU's. As participants in the DEED program, POU's are eligible for funding for RD&D projects and can access a database of previous projects findings and results, which includes 19 energy storage projects.
- Ice Bear Thermal Energy Storage (TES) RD&D Program
 - Redding Electric Utility has been investing in TES systems since 2005 and has installed 3.5 MW of TES in their service territory.
 - SCPPA entered into an agreement with Ice Energy to purchase up to 53 MW of peak load shifting (PLS) capacity with the installation of Ice Bear Thermal Energy Storage (TES) equipment on behalf of SCPPA's 12 members as well as other POU's in the region. To date, seven SCPPA members and two other POU's have participated in the program to install more than 4 MW of TES.
 - NCPA recently executed a Shared Services Agreement with SCPPA that will allow NCPA members to participate in a number of existing SCPPA agreements, including the Ice Energy contract, and vice versa.

- Joint Reevaluation of Energy Storage Technologies
 - NCPA and SCPPA jointly contracted for a reevaluation of energy storage technologies to support member utilities’ update of determinations regarding 2020 energy storage procurement targets, as required by statute. DNV GL was selected for the project, which is scheduled to be completed in early January 2017.

III. RENEWABLE & STORAGE PROCUREMENT

One of the main services many energy storage technologies can provide is integration of renewable energy resources. The value proposition for energy storage is therefore affected by the portfolio of overall energy supply and intermittent renewable generation in particular. We expect the attractiveness of energy storage may change as utilities strive to meet the 50% by 2030 Renewables Portfolio Standard (RPS) requirement, while also decarbonizing the non-renewable portion of their resource mix in furtherance of the 2030 GHG reduction target. However, many POUs are fully resourced through the next few years, which limits the opportunities for new resources, such as energy storage, to be procured. Also, many POUs have diverse portfolios that are less reliant upon intermittent resources, particularly solar, to meet RPS obligations. For example:

- The City of Palo Alto Utilities is slated to meet 50% of customer demand from RPS-eligible renewable resources and 50% from large hydropower in 2017, with the carbon content of occasional grid purchases offset by tradable RECs.
- Alameda Municipal Power is set to provide to its customers nearly 100% energy from large hydropower and RPS-eligible renewable energy resources – mainly geothermal, small hydropower, and landfill gas – by the end of 2018.

Looking beyond 2020, some POUs now include energy storage components in procurement solicitations for RPS-eligible renewable energy:

- On an ongoing basis since 2014, SCPPA administers a “rolling RFP” to solicit proposals for RPS-eligible renewable energy projects and energy storage.
- In 2016, NCPA partnered with SCPPA on pursuing a project through a rolling RFP to provide RPS-eligible solar power to participating NCPA and SCPPA members. The project includes the potential to install energy storage to complement the solar generation.

Public power is well-positioned to meet the 33% by 2020 RPS program requirements. POU, in general, are less reliant on solar generation than the IOUs to meet their RPS requirements. Instead, wind, biomass & waste, geothermal, and small hydro provide much of the RPS-eligible energy to POU. Large hydropower also plays a critical role in many POU resource mixes as a clean and flexible energy resource that, while not RPS-eligible, may in certain instances help integrate intermittent renewable resources. As such, the opportunities for POU energy storage procurement by 2021 are limited as many POU simply do not have sufficient need for the services that energy storage can provide regarding renewable resource integration.

IV. INFRASTRUCTURE REPLACEMENT & MODERNIZATION

Public power has tracked the results of recent Southern California Edison (SCE) and San Diego Gas & Electric (SDG&E) solicitations, including Local Capacity Reliability RFOs, the Aliso Canyon Energy Storage RFO, and Preferred Resources Pilot to help identify cost-effective and feasible energy storage options for our customers. While these solicitations have been in part a response to the ongoing limited operation of Aliso Canyon and the early retirement of San Onofre Nuclear Generating Station and other coastal power plants, the solicitations have also been guided by policies of the California Public Utilities Commission directing IOUs to procure energy storage resources.

The energy storage projects that have been selected by IOUs resulted from the unique operational and policy conditions of these solicitations; in most cases, POU conditions do not directly mirror those of IOUs. However, despite this misalignment with solving POU service needs, the IOU energy storage solicitations are a useful resource for public power to reference when designing their own future solicitations and provide real-world examples for how energy storage can provide utility services in the wake of prolonged or permanent losses of grid infrastructure.

For example, the now-prolonged limited operation of the Aliso Canyon natural gas storage facility has certainly impacted operational consideration of the electricity grid in Southern California. Aliso Canyon serves 17 natural gas-fueled power plants in Southern California. The unanticipated loss of that core resource has created heightened demand for energy services that did not previously exist for utilities that serve customers in the area.

In May, as a response to the limited operation of Aliso Canyon, SCPPA issued a Request For Information (RFI) regarding potential programs, measures, and/or technologies to help reduce peak electric demand; increase local distributed generation capacity; and/or improve energy efficiency for customers, during the summer months of June 1, 2016 – October 31, 2016, and/or winter months November 1, 2016 – March 31, 2017. Eight of the 17 responses included an

energy storage component; however, none of the responses provided a cost-effective and/or feasible solution that resulted in a contract with SCPPA or any of SCPPA's member utilities.

One of the main drivers of POU consideration of energy storage is the early retirement and/or repowering of coastal natural gas power plants pursuant to the State Water Resources Control Board once-through cooling (OTC) regulation. The OTC regulation impacts 19 power plants, including three power plants in the LADWP balancing authority area that represent over 2,100 MW of capacity. In compliance with the regulation, LADWP is repowering their facilities to completely eliminate the use of ocean water for cooling and to provide additional operational flexibility to respond to grid conditions driven by increasing amounts of intermittent renewable generation. At the same time, LADWP – and a number of other SCPPA members - are also working to support a rising number of solar PV and electric vehicle charging station installations. As POUs look to replace aging power plants and accommodate the growth of distributed energy resources, energy storage is being considered as a potential solution to future needs:

- LADWP is completing a Distributed Energy Resources Integration Study to understand the combined grid reliability and safety impacts of multiple DER technologies, including Solar PV, Energy Storage, Electric Vehicle Charging Station, Demand Response, Energy Efficiency, etc.
- LADWP is also evaluating interconnection processes to incorporate energy storage with solar PV and EV agreements and processes.
- The City of Palo Alto is considering a pilot program to site energy storage systems at customer premises, for both residential and commercial applications, and provide incentives to customers as part of the City's current Demand Response program.

V. MARKET CONDITIONS

Policy priorities are evolving, which creates a great deal of uncertainty regarding the business case for energy storage.

At the wholesale level, Governor Brown has championed the regionalization of the California ISO markets to include other Western states. One of the main arguments for regionalization, as outlined by the study conducted by the California ISO as directed by SB 350,⁵ is optimization of renewable resources. In particular, the California ISO studies argue that a regional market would

⁵ *Senate Bill 350 Study: The Impacts of a Regional ISO-Operated Power Market on California*. July 8, 2016. Prepared for California ISO by The Brattle Group, Energy and Environmental Economics, Inc., Berkeley Economic Advising & Research, LLC, and Aspen Environmental Group.

help reduce anticipated curtailment of renewable resources through increased access to latent flexible capacity across a broad, diverse region and increased ability to export surplus renewable energy.

One of the main services energy storage can offer is the improved operation and integration of renewable energy resources. As argued by the California ISO analysis, expanded grid operations are supposed to accomplish the same thing. Therefore, the nature and extent of regional grid operations may be a critical factor when assessing long term viability of energy storage as a cost effective option for renewable integration. When considering long term investments by our customer-owners that may span decades, it is our responsibility to assess these variable market conditions. If California ISO regionalization moves forward, it could result in stranded assets similar to what may be being experienced with respect to the existing thermal fleet.

At the opposite end of the spectrum, the continued growth of customer-sited solar generation coupled with time-of-use rates and a shift of peak load to non-solar generating hours, could create a scenario in which behind-the-meter and distribution-level energy storage installations are competitive resource solutions. However, that would require the differential between super peak and off peak pricing to be much more significant than current TOU rate structures, as well as dramatic reductions in battery costs.

In addition, energy efficiency, energy conservation, demand response, and a suite of other energy management options may be more attractive to customers and building owners looking to manage their energy usage. From the utilities' perspective, the state has established cost-effective, reliable, and feasible energy efficiency and demand reduction as the preferred resource for utilities to acquire first.⁶ Senate Bill 350 (De Leon, 2015) reinforced the Legislature's commitment to energy efficiency by codifying Governor Brown's goal to achieve a cumulative doubling of statewide energy efficiency savings in electricity and natural gas final end uses of retail customers by January 1, 2030.⁷ As POUs solicit energy services at the retail level, energy storage faces both market and policy competition from other distributed energy resources.

VI. CONCLUSION

Public power has long pursued energy storage solutions to energy resource needs. From utility scale solutions, such as LADWP's 1,255 MW pumped storage facility at Castaic Lake, to customer-sited resources, such as Glendale Water & Power's installation of 1.5 MW thermal energy storage units at 76 locations.

⁶ Cal. Public Utilities Code §9615

⁷ Cal. Public Resources Code §25310(c)(1)

POUs remain committed to further RD&D and pilot projects to identify cost-effective, reliable, and feasible energy storage technologies. Future solicitations for renewable generation resources, and potentially other utility services, present opportunities for energy storage technologies to be incorporated into broader procurement activities. Replacement of aging and retired infrastructure may also create future opportunities for energy storage to compete with a growing number of low-carbon and clean energy resources to provide utilities with needed energy services. Shaping the energy storage market, though, will be broader policy decisions, such as regionalization of the California ISO markets and implementation of the SB 350 RPS and energy efficiency provisions, which may or may not create market conditions that do not necessarily support public power investments in energy storage technologies.

On behalf of the California POUs, we thank you for this opportunity to highlight the activities of public power related to prior, current, and prospective energy storage projects. We look forward to meeting with CEC staff to further discuss the most recent AB 2514 filings and future energy storage considerations.

Respectfully submitted,



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