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Silicon Valley Power/City of Santa Clara

Update to the 2014 Adopted Energy Storage Targets & Policies

PLEASE INDICATE WHAT, IF ANY, ENERGY STORAGE TARGETS YOUR UTILITY ADOPTED IN 2014 TO BE ACHIEVED BY DECEMBER 31, 2016.

State Law (Assembly Bill 2514) requires publicly owned utilities to evaluate the use of energy storage as an element of power supply plans by adopting an Energy Storage Procurement Plan. Prior to the City of Santa Clara's adoption of its plan on August 19, 2014, Silicon Valley Power (SVP), the City of Santa Clara's electric utility, reviewed various technologies and their relative cost effectiveness in the current marketplace. This review found that storage technologies were not cost effective in 2014 with the exception of large pumped hydro storage, which is very sensitive to particular geographic locations. To satisfy SVP's obligations under state law, the City Council approved the following energy storage procurement targets in August 2014:

Category	**Amount (kW) / Reason**
Transmission	None – not cost effective
Distribution	None – not cost effective
Customer	30 kW – Green Charge Networks at Tasman Parking Structure

OVERVIEW OF ENERGY STORAGE PORTFOLIO

Please describe current or planned energy storage projects, including pilots and RD&D projects, if any, in your utility's resource portfolio:

- *Project description*
- *Technology type*
- *Interconnection point*
    - *If customer-sited, indicate installed capacity by sector*
- *Ownership (i.e., utility, third-party, customer)*
- *Year installed (or planned to be installed)*

The project was installed in 2014, as projected, with contractor NRG eVgo (sub-contractors Clean Fuel Connections and REJ Electric). The EV charger installed was the 1 x NRG eVGO L3 at a cost to SVP of $22,000 for 30 kW/30kWh capability. The purpose of the project was to be able to enable peak shaving for electric service. Concerns about this particular

installation include its high cell temperatures, setbacks with the contractor, and poor cellular reception at the location.

Being one of the first sold, the system was installed at the parking garage servicing the newly opened Levi's Stadium in Santa Clara, California. It was mounted inside the electrical room located at the lower level of the parking garage along with the 350kW PV inverter. The DCFC was originally planned to be located approximately 50 feet away from the electrical room. However, after going through the planning department, the DCFC had to be relocated so that it was accessible for both regular parking and handicapped parking. This increased the distance of the conduit by 100 feet and thus the conductors and conduit and eventually the overall project cost. The system is on the first level of the parking garage, right next to the east entrance.

With the electrical room being shared with the PV inverter, the room had a lot of heat, triggering high temperature warnings from inside the system and the batteries during commissioning. A temperature regulated exhaust fan was installed shortly after installation.

Another issue discovered soon after installation was a bad cellular signal. Being enclosed and surrounded by concrete and steel doors, the modem's reception was very poor. This prevented getting live updates and communicating with the system on a real time basis. Efforts were made to boost the signal, by relocating the modem and boosting the signal. Eventfully, none of these were needed as another contractor was able to increase cellular reception within the whole garage.

Currently, the DCFC and energy storage unit have been collecting data since its startup. The data is available on GCN's monitoring portal and readily available while the DCFC data is obtained via eVgo.

IF ENERGY STORAGE TARGETS WERE ADOPTED, PROVIDE AN UPDATE ON THE PROGRESS OF YOUR UTILITY TOWARDS MEETING THE ENERGY STORAGE TARGETS:

What procurement mechanisms were used?

SVP has a small energy storage project at its Tasman Drive Parking Structure through a California Energy Commission (CEC) grant designed to reduce customer-side peak demand charges from high energy electric vehicle (EV) fast charging. The 49 chargers include some battery storage to reduce electricity demand and charges. Other EV chargers in Santa Clara may be added with such storage capabilities in the future.

If energy storage targets were NOT adopted, please discuss any efforts your utility has undertaken to evaluate or otherwise consider energy storage technologies either RD&D or pilot projects. If your utility has since procured energy storage, even in the absence of a formal target, please describe these projects as well.

Not applicable

KEY FACTORS IMPACTING ENERGY STORAGE PROCUREMENT

Please describe your utility's reasoning for procuring, or not procuring, energy storage to date. In particular, discuss barriers to your utility procuring energy storage.

SVP has also been approached by many energy storage companies that are interested in testing and evaluating their technology in cooperation with the utility. These projects, as presented by vendors, provide an opportunity to study different energy storage projects, their impacts on the utility system and their cost effectiveness. SVP has and will continue to evaluate various technologies, particularly those that might include evaluation Vehicle-Grid-Interface (VGI) options using electric vehicle (EV) or solar PV batteries to support the distribution system. As these systems become more cost effective in the market, more customers will install them. Enhancing SVP's communication technology capabilities will allow the utility to coordinate these distributed systems into the management of the distribution system. As SVP does not know when these opportunities might arise or become cost-effecctive, they were not incorporated into the 2014 energy storage procurement target.

SVP has met with the following vendors promoting technologies in Santa Clara since the procurement targets were approved in 2014:

- STEM – potential Microgrid opportunities with commercial customers

- Pintail Power – CAES – Nondisclosure Agreement (NDA) has been signed. We have met numerous times to discuss opportunities and possible project potential with their proprietary CAES energy storage technology
- PowerSecure – The chosen vendor of Santa Clara University. SVP is working with then on the potential R&D project described at the end of this document.
- Aligned Energy w/Power Secure – Large scale battery storage with data centers. A new build data center (potential 18MW to 30MW) is being designed and built in Santa Clara. The customer initiated a conversation regarding battery storage potential at the site. This project will take 18 to 24 months, depending on substation build. If the project progresses, the customer will reinitiate talks about a possible battery storage partnership.
- Calpine – We met many times and spent significant amounts of time trying to develop a case for a 3MW Utility Scale R&D battery storage project
- Sonnen – residential storage solution with PV
- SunVerge – residential storage solution with PV
- SolarCity – residential storage solution with PV
- D-Statom – Company with a focus on distribution side, frequency regulation, integration of localized PV storage and management. They could not produce a business case at this time. SVP has a uniquely designed distribution system that at the present loading does not currently need the solution that was proposed.
- Freewire Technologies – proposed meeting postponed for a mobile battery storage used with EV charging. Tentative meeting rescheduled in 2017.
- Apparent Energy –DER aggregator using software to maximize DG resources, including storage, for CAISO market participation. At this time, they could not make a business case in SVP territory. As DG resources potentially grow and as the CAISO markets evolve, there could be potential.
- Envision Solar – Delivered an EV solar Battery charging station for SVP as a trial technology for a couple of days. Project potential if costs come down.
- Tesla - Met with Tesla to evaluate the large commercial developments held by the Irvine Company. The Irvine Company and Tesla wanted to replicate the Southern California Business Model for energy storage they have implemented over the years. After analyzing the utility rates, energy mix and CAISO business model for SVP, the Irvine Company and Tesla have determined that the only advantage of energy storage at that time in Santa Clara would be for the arbitrage of peak demand. This did not provide a reasonable rate of return vs. life expectancy of the equipment.

PLEASE DISCUSS PLANNED OR POTENTIAL ENERGY STORAGE PROJECTS, INCLUDING RD&D AND PILOT PROGRAMS, YOUR UTILITY MAY PURSUE GOING FORWARD.

Pursuant to Section 2836(b) of the Public Utilities Code, POUs are required, by or before October 1, 2017, to reevaluate adoption of energy storage procurement targets, if any, to be achieved by December 31, 2020. Please provide an update on your utility's re-evaluation process of energy storage technologies (i.e., the NCPA/SCPPA joint contract with DNV GL to provide an updated evaluation of energy storage technologies).

Due to the increasing numbers of requests for meeting by energy storage vendors, SVP put forward an internal strategy regarding demonstration and implementation plan. This implementation plan includes a three pronged effort to study and demonstrate energy storage in a variety of situations in the utility system:

1. ***Continue to research the potential of participating in a developing multi-party research project on different energy storage technologies on the northern edge of town.***

   SVP first met with Calpine to discuss potential energy storage opportunities with the Transmission Agency of Northern California (TANC). After extensive review of member load patterns and rates, it was determined by all parties that a transmission level battery storage project by a partnership between TANC and Calpine at a substation location would not be cost-effective under any scenario. After that decision was reached, SVP and Calpine began looking at the potential for installing a battery energy storage R&D project in Santa Clara for distribution and/or transmission benefits. After nondisclosure agreements were agreed to and signed, three different locations and potential project types/ownership models were reviewed extensively for nearly a year. Calpine and SVP project management and engineering staff walked each site and reviewed the technological and economic issues for an energy storage project at each location.

   After extensive engineering review, distribution opportunities and locations were pulled from consideration. They were too costly to implement without any significant benefit to either SVP or Calpine. Two major barriers for distribution level energy storage in Santa Clara are the facts that SVP's infrastructure is not in need of major upgrades for capacity issues in any location (thus not allowing storage to avoid or put off infrastructure costs) and that the current model for charging transmission access charges by the CAISO create significant financial barriers to storage technology. This second is caused by the fact that batteries lose energy during each conversion. The CAISO charges for all energy transmitted into SVP's service territory, thus the energy lost for each conversation by the batteries is charged TAC, which is now over $20 per MWH for both low and high voltage costs.

A transmission level location was reviewed at the northern edge of SVP's service territory. However, CAISO and PG&E requirements for installing any energy storage project are extensive and would require, at a minimum, 18 to 24 months for completion with expensive engineering requirements. Equipment costs for both the battery storage and equipment for connection to the transmission system were extremely costly and would take another year or more for lead time and then delivery and installation. Conversely, potential energy arbitrage and ancillary service financial benefits from the project were deemed to be low.

- *Results to date:* Even though both parties were very interested in the project, after extensive review, this project had to be shelved due to low benefits and high costs. This project could potentially test the provision of ancillary services through ES into the CAISO market. Significant amounts of work was done on developing a timeline and budget for the project during 2016, but this effort ended in little to no progress.

2. Issue a Request for Information (RFI) for potential providers to provide proposals to SVP on ways to implement programs in town.

This RFI would request proposal for systems of up to 1 MW capacity and would include a summary of the value proposition to SVP, types of customers who would participate, whether third party partners would be included, a demonstration plan with quantification of costs, siting, vendors, cost-effectiveness, sources of funding, technology/solution description, performance characteristics, measurement and verification of installed systems, interconnection requirements, integration and operation specifications, software/analytics requirements, safety/permitting issues, environmental concerns, plans to scale, and other relevant information. Such an RFI was originally proposed to be issued in the summer of 2016. Results of this RFI could potentially point out cost-effective and beneficial locations of and uses for energy storage that have not yet been identified. Any chosen proposals would be budgeted and implemented beginning in the following fiscal year.

- *Results to date:* an RFI was created in the summer of 2016 but not released. SVP decided instead to join the combined efforts of the Northern California Power Agency (NCPA) and the Southern California Public Power Authority (SCPPA) to evaluate energy storage technologies through the contract with DNV GL. The Kick off meeting with DNV GL was held on November 3, 2016. Once completed and based on the results of this evaluation study, SVP will update its energy storage procurement adoption targets and will again review the possibility of issuing an RFI for potential partners.

3. ***Develop a demonstration program of energy technology on the customer-side with a large customer.***

It is presumed that costs for the implementation of the proposed system will be split between SVP, the customer and potential third parties. After preliminary approval by the customer, an overall program design will be developed. The next step will be the determination of the site and technology for the project. An engineering consultant will need to be hired to work through integration and interconnection difficulties. Installation is expected in the 18 months following approval of the project by the customer. Depending on the results of such a demonstration program, it could potentially be expanded to other customers.

- *Results to date:* SVP staff researched the best large customer for such a demonstration project. The customer's staff were originally quite excited about the potential project. After several meetings with this customer and its engineering consulting agency, the customer decided that it needed a significant amount of funding from the utility and that its staff were currently too busy to develop such a program, particularly with its current construction priorities. SVP also found problems both in budgeting the costs for such an R&D program at this time and in staffing the engineering, so talks were pushed to 2017 to further develop a project.

Proposal for the Garage of the Future

Summary: At a parking facility structure an educational facility, develop a grid integration demonstration. In this demonstration project, distributed PV generation will be integrated with on-site battery energy storage, which is also charged and discharged from electric and plug-in hybrid electric vehicles. Utility staff and students and representatives from the customer location will monitor the systems on a joint basis—testing different operating conditions, energy arbitrage and ancillary services opportunities, charge/discharge scenarios and control mechanisms.
Customer will provide location, PV distributed generation, EVs for charging and cost of control systems. SVP will pay for capital and operating costs of the batteries and internal staff time.

Type of Customer: Educational

Utility Goals to be met:

1. Education utility staff members on the interaction of storage with utility grid and distributed energy/PV on the SVP system.
2. Promote environmentally preferred supply technologies.

3. Enhance future workforce potential by providing training on electricity technologies.
4. Meet state policy goals.

Specifications: Battery storage system at 100 kW

Costs: (Costs were based on TID's lithium iron analysis study; 2014) U:\Energy Storage\EnergyStorage\Utility ProcurementPlans\2014-10-28_Turlock_Irrigation_District_Energy_Storage_Study.pdf)

Capital Cost	$ 1,800.00	kw
Fixed O&M Cost	$ 10.00	kw/yr
Variable O&M Cost	$ 0.30	MWh
Project Life	20	years
Battery Replacement Cost	$ 244.00	kWh
Battery Replacement Year of Occurrence	11	
Roundtrip Efficiency	83%	
Debt Interest Rate (20 Year Term)	4%	
O&M Escalation Rate	2%	years
Annual Hours Operation (50%)	4380	

- Annual Cost is $14,772 the first year, increasing to $20,881 the last year, including 2% annual O&M escalation and replacement of batteries at year 11.

- NPV--$282,043

Time-line: Assume begin implementation in 2017 with an estimated 20 year life.

- April 24, 2016 – Met with Santa Clara University (SCU) to discuss a pilot Microgrid and Energy Storage Pilot
- May 10, 2016 – Continued discussion with SCU and the chosen vendor, Power Secure. Site was selected, but the funding to be determined. SCU needs to complete the solar installation on the garage and secure a funding source. SVP is to determine contribution amount based on what SCU secured.
- July 6, 2016 – Followed up with SCU regarding pilot. Talks were pushed to early 2017 due to staffing limitations and construction priorities at SCU.