SolarCity "Living Pilot" Proposal

SolarCity is pleased to provide this proposal to manage load growth in the Johanna and Santiago areas of SCE's service territory consistent with the objectives of SCE's "Living Pilot". Using proven technology and preferred resources, customer-side solutions can be effectively deployed on a scale that is capable of managing expected load increases at a lower cost than conventional generation and T&D investments. Using SDG&E's Pio Pico plant as a proxy, were SCE to deploy a 250 MW conventional facility, the costs would be on the order of $1.3 billion, or approximately $210/kW/year.[1] In contrast, we believe achieving the same goal under our proposed pilot would incur less than $75/kW/year. Additionally, unlike conventional assets, which take a long time to complete and provide no intermediate benefit, customer-side solutions, by virtue of their distributed nature, can be deployed in a steady incremental manner, providing immediate benefits that more closely track existing need.

At the core of SolarCity's proposal is a suite of immediately actionable technologies and strategies including roof-top PV, customer-side stationary battery storage, energy efficiency (EE), and air conditioning load management. These solutions can individually and collectively provide substantial reductions in a customer's contribution to peak load and manage load growth consistent with the objectives of the pilot. Below we map each solution to the attributes identified by SCE in its Living Pilot presentation.

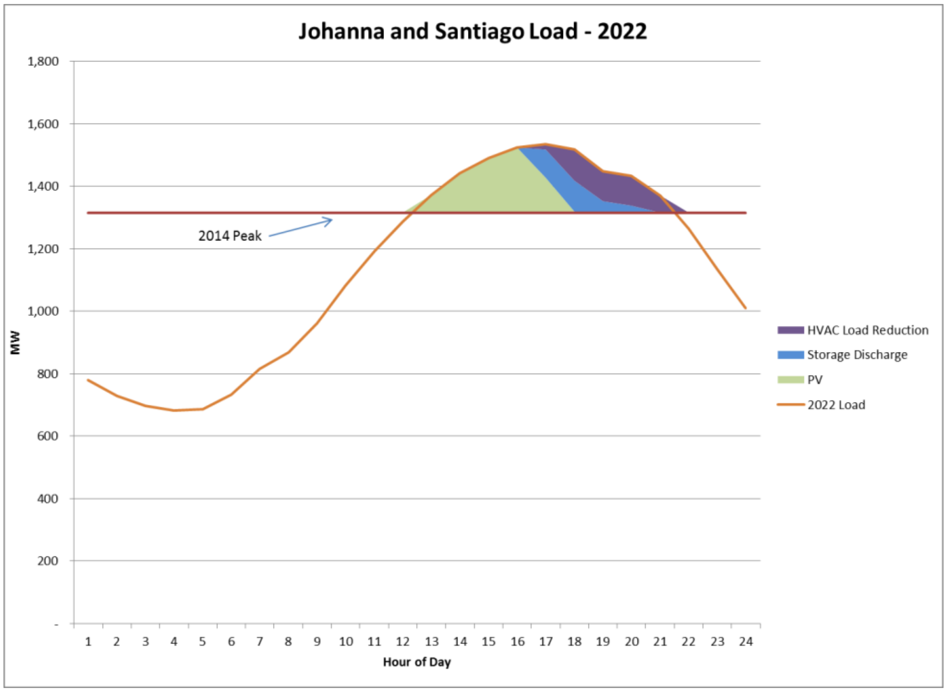
Pilot Proposal Solutions	Attribute Class Addressed*
Pre-cooling and Energy Efficiency – Using the thermal mass of a building to store cool air conditioned in advance of the peak period, thereby reducing air conditioning loads during peak hours. Pre-cooling can be paired with EE measures to further improve building thermal properties and to replace inefficient AC units.	**A, D.1-D.3**
Roof-Top Solar – photovoltaic systems deployed on customer rooftops throughout the pilot region, sized to offset a portion of onsite loads. Smart-inverters can be deployed to enable systems to provide voltage support. Day ahead forecasting will assist in real time capacity planning	**B**
AC-Cycling – Turning customers' air conditioners on and off over a relatively short period to reduce individual and collective energy consumption during peak periods. Again can be paired with EE measures.	**C, D.1-D.3**
Lithium-Ion Battery Storage – Co-located lithium-ion storage systems, over which the utility or ISO has either direct or indirect control, can be used to reduce on-peak consumption by shifting either off-peak grid energy or solar production to cover on-site loads during peak periods or, if desired by the utility, discharged onto the grid. Storage systems can also be used to address system ramping and provide reactive power.	**C, D.1-D.3**

* A = Firm Load Reduction; B = Customer Side Intermittent Generation;
C = Real Time Demand Reduction; D.1-D.3 = Scheduled Load Reductions (low to high use)

[1] In a customer mailer SDG&E indicated that the 305 MW Pio Pico plant will cost $1.6 billion. Pro-rating this to 250 MW yields a cost of $1.3 billion. Assuming a 25 year life, this results in a cost of $210/kw/year. See https://www.sdge.com/sites/default/files/documents/920709556/PioPico.pdf

In addition to supporting the narrow objective of mitigating load growth, this proposal provides a platform to assess integration and grid-management approaches (e.g. voltage support, reactive power, etc.) through, for example, the deployment and utilization of smart inverters as well as day-ahead and hour-ahead forecasting to provide greater visibility into customer-side solar output.

Below, we illustrate the individual and combined impacts of each of the load management strategies identified above on system peak demand such that peak load is maintained at 2014 levels.



The hourly load shape is based on the SDG&E-TAC region for the September 14th, 2012 CAISO peak. The load peak is based on the 2022 peak forecast for combined Santiago and Johanna substations (1531 MW). The hourly PV generation curve is the September 14th curve provided in the E3 Avoided Cost model.

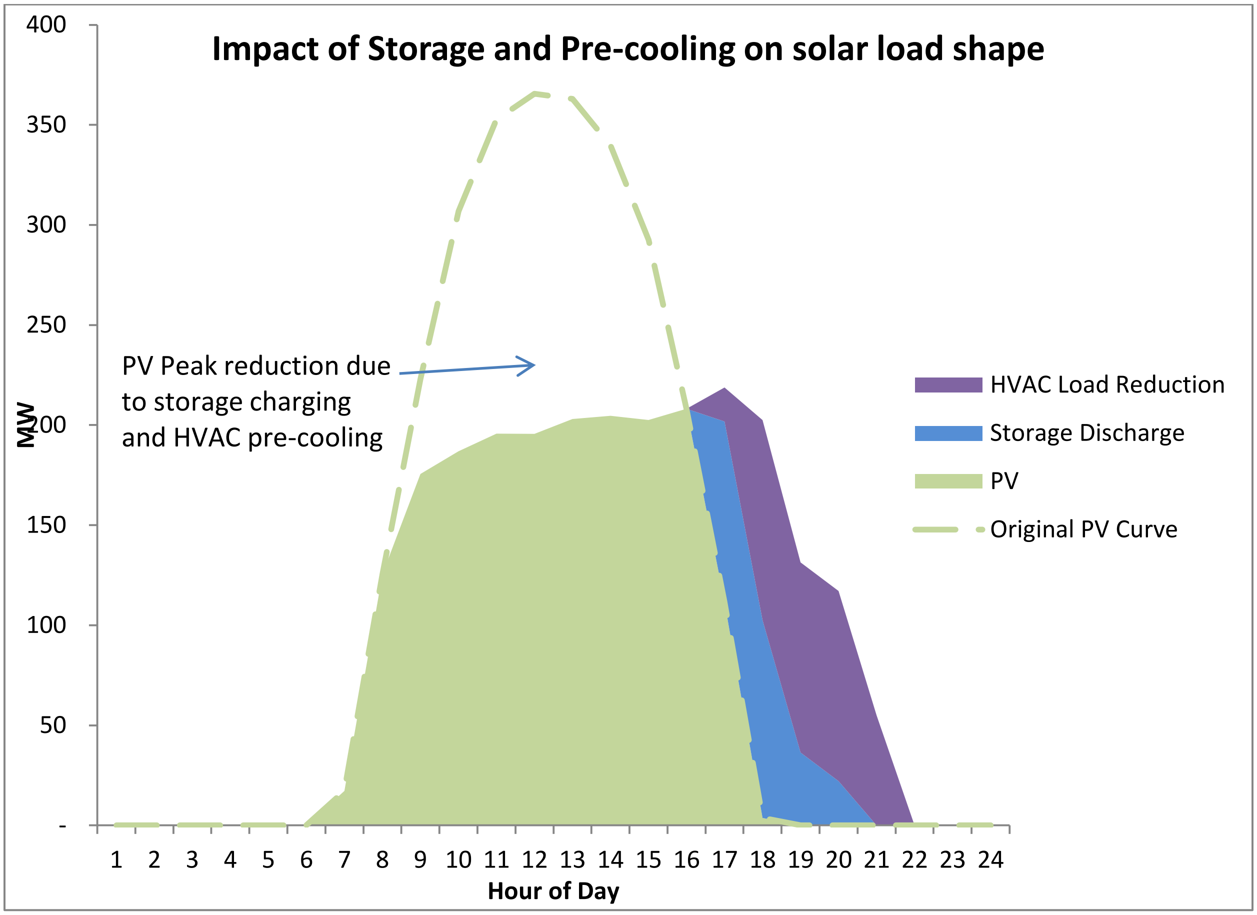
The graph assumes 10,000 households per year install an average of a 5 kW-AC PV system and a thermostat configured with a pre-cooling algorithm. Of the 10,000 households, 1 out of 3 households also install a 10 kWh battery.

Impact of Storage and Pre-Cooling on Aggregate Solar Load Shape

Below we provide an overview of some initial work SolarCity has undertaken to assess the potential peak demand reduction that could be achieved through pre-cooling and energy efficiency measures. The results compare the energy consumption associated with "typical" air-conditioning usage with the consumption associated with an efficient pre-cooling strategy. The data for this study, representing 1,283 households, was collected from energy evaluations conducted by SolarCity in the Johanna and Santiago load area. All data points were input into SolarCity's proprietary auditing software, Home

Performance Pro, which uses a DOE-2 EnergyPlus engine as a backbone to perform sub hourly energy simulations and predict energy usage.

For this study, the base case scenario assumes that the thermostat controlling the air conditioner is off all day and then is turned on from 5pm-9pm. The precooling scenario turns on the thermostat during the day to cool the house before the peak grid demand period. This allows the home to coast through the peak period and realize a reduction in electrical usage over the peak period.



Next Steps

To further flesh out this proposal, the Commission should convene a Pilot Working Group. This working group, consisting of, at a minimum, SCE, DER providers, ratepayer advocates, and Energy Division staff would be tasked with developing the pilot region incentive regime, the conditions and performance requirements participants and the utility would be subject to, as well as an evaluative framework to assess the efficacy of the program at reducing load growth consistent with the pilot's objectives. These various elements would subsequently be proposed as part of SCE's Pilot Application.