SMUD Value of Solar + Storage Technical Working Group: Notes from Meeting #3

These notes summarize the action items, meeting highlights, and attendees to the November 21st meeting of SMUD’s Value of Solar + Storage Technical Working Group. Gridworks served as facilitator and prepared these notes.

Action Items:
- Provide a presentation on current NEM policies for other utilities
- CESA: coordinate with facilitator on how to introduce latest methods on valuing contribution to peak of solar + storage resources
- CalSSA: coordinate with facilitator on defining desired solar + storage scenarios, as detailed

Background:
SMUD's Value of Solar + Storage Technical Working Group aims to engage the solar industry, stakeholders and the community to provide input on the components of a study on the value of solar and solar-plus-storage. SMUD will host this engagement between October 2019 through January 2020.

This meeting included the participants listed below and was hosted at SMUD’s headquarters.

Meeting Highlights:
- To begin the meeting the facilitator provided a brief recap of the Working Group’s November 7 meeting. Meeting minutes from that meeting were approved.
- Rick Codina (SMUD Customer) provided a presentation, “The Value of Energy and Capacity from Rooftop Solar” available here: The Value of Energy and Capacity from Rooftop Solar. Insights from Codina’s presentation include:
  - Recognizing the difference between rooftop solar generation that is consumed onsite (“self supply”) and generation which is exported and consumed offsite (“exports”).
    - Codina suggests a “no trespassing” rule for self supplied energy in which the customer reserves the right to avoid retail charges for that energy.
    - Codina suggests SMUD is under no obligation to pay for exports, but believes fair compensation for that energy based on its value to other customers is desirable.
Codina uses a “top down method" to estimate the current value of rooftop solar is $0.062/kWh, a figure arrived at by averaging customer retail rates and subtracting fixed costs that, in his estimation, are not avoided by rooftop solar.

Codina suggests the following guidance for evaluating the value of energy and capacity:

- The value of energy and capacity should be the marginal cost of providing that resource from the alternative resource (“marginal resource”).
- The marginal resource needs to be estimated on an hourly basis for 20-30 years using a production cost modeling analysis. Key factors in that analysis include estimated fuel costs, efficiency (heat rate) of the available generation units, and “adders,” which may impact the modeling outcome based a range factors (identified in slide 9).
- To determine the net present value, the long-term marginal costs need to be discounted using an appropriate discount rate.

Codina suggests the marginal resource will be SMUD’s natural gas generation, accounting for factors specified on slide 15 of his presentation.

With regards to the value of rooftop solar as generation capacity, Codina suggests the value of marginal generation capacity of rooftop PV should not be considered to the value of SMUD’s thermal plants, since they will not be retired during the evaluation period. Moreover, these plants must still operate for reliability particularly in the peak period when PV generation is unavailable.

Participant input on Codina’s presentation led to the following insights:

- The value of solar as a generation capacity resource may be impacted if the marginal resource has to be operated differently, with increased ramping needs.
- There is a relationship between the value of energy and capacity. The two should be considered together.

Scott Murtishaw (CalSSA) provided a presentation, “Energy and Capacity Value of Solar (& Storage) available here: Energy and Capacity Value of Solar (& Storage). Insights from Mr. Murtishaw’s presentation include:

- Murtishaw echoed Codina’s suggestion to focus on the marginal cost. He added that the marginal unit is “usually the last (and most expensive) plant dispatched to provide power at any moment.”
- Murtishaw suggests the wholesale price of energy provides an appropriate proxy for marginal cost/value of energy. The average wholesale price is published by the California Public Utilities Commission, a data set that could be referenced to support SMUD’s value of solar study.
- With regards to the value of rooftop solar as generation capacity, Murtishaw notes this determination depends on growth of peak load, plant
retirements, portfolio requirements and whether the rooftop solar (& storage) resources matches peak load.

- On Slide 10, Murtishaw suggests rooftop solar does reduce peak load and estimates distributed resources can contribute between 20 and 45% of their rated nameplate capacity to peak, depending on:
  - whether the resource is solar only or solar + storage
  - whether the resource is a on a Time of Day rate with peak rates from 5pm to 8pm or 5pm to 9pm.

- On Slide 11, Murtishaw shows the results of a 2015 meta analysis performed by Synapse Energy which assesses the cost of “renewable integration” are determined as a percent of renewable penetration. Mr. Murtishaw concludes the costs of renewable integration are relatively minor based on this collection of studies.

- Participant input on Murtishaw’s presentation led to the following insights:
  - The CPUC is for all of California and SMUD believes a more local value such as NP-15 or Energy Imbalance Market for the SMUD node will be a more accurate price comparison for marginal cost/value of energy.
  - Solar and Solar+Storage systems can be designed to increase their contribution to meeting peak demand.
  - SMUD has an obligation to provide capacity and energy 24/7/365. Estimation of the rooftop solar contribution to meeting that obligation need to account for the likelihood that they are available when needed.
  - Methods of estimating rooftop solar’s contribution to peak may need to reevaluated if/when California experienced a winter peak, a potential result of electrifying space and water heating.

  - Smutny-Jones provided perspective on where energy generated by customer sited generators fits into the larger, California utility regulatory environment.
  - With regard to the value of energy, he emphasized his perspective that rooftop solar provides only energy value and should be compared to other sources of energy, some of which are renewable energy.
  - Smutny-Jones recommended SMUD’s Value of Solar study rely on Lazard’s annual report on the levelized cost of energy from various sources.
With regards to the value of capacity from rooftop solar, Smutny-Jones noted the use of Effective Load Carrying Capacity methodologies used to determine how much a solar resource contributes to peak demand. He concludes the contribution is greater than zero.

With regards to the value of financial risk from fuel price hedging, Smutny-Jones suggests hedging against natural gas prices currently has low value because: 1) natural gas volatility is low; 2) increasing amount of mid-day energy is solar, with less gas used to generate; 3) gas consumed mid-day either meeting immediate load needs or needs to be operational at peak.

Participant input on Smutny-Jones’ presentation led to the following insights:

- The energy cost of utility scale renewable energy is lower than rooftop solar.
- The value to society of mitigating climate change, an existential threat, are not reflected in energy or capacity prices.
- The value of energy and capacity can vary from location to location.
- Smutny-Jones, who is a SMUD customer, stated that he doesn’t mind if his neighbor has solar, but he doesn’t want to pay for it.

- Key insights from Mr. Olson’s presentation include:
  - The need for SMUD to balance supply and demand every 4 seconds.
  - The wholesale power market is key to managing SMUD’s power portfolio.
    - SMUD participates in the Energy Imbalance Market, a real-time bulk power trading market across the western US.
  - SMUD suggests the net wholesale power market energy value is equal to the wholesale power market energy value minus any NEM integration costs.
  - SMUD suggests the net wholesale power market capacity value is equal to avoided resource adequacy value minus the cost of any needed intra-hour flexible capacity needed to integrate the NEM solar.
  - SMUD concludes that NEM solar reduces the utility’s exposure to fuel prices, but increase its exposure to electricity price volatility.
  - On Slide 31 SMUD describes their perspective on the impact of NEM solar on their investment cost, comparing the price of distributed solar compensated at the retail rate with the price of utility scale renewable energy. Utility scale solar costs SMUD less than rooftop solar given the current compensation practice to rooftop solar customers.
On Slides 37-39, SMUD suggests distributed solar integration can increase emissions when less efficient gas plants are relied on to respond to variations in solar production.

In conclusion, SMUD summarizes their recommendations as follows:

**Recommendations**

- Through discussion, participating stakeholders agreed to SMUD’s recommendations, with the following caveats:
  - The energy value of solar and solar plus storage is reflected in the wholesale energy price SMUD would pay otherwise (for example, utility solar market price). The price needs to be forecasted into the future and determined hourly as outlined in Mr. Codina’s presentation.
  - Rick Codina recommends running a production cost model with and without expected solar resources. The difference could be recognized as the impact of solar generation on fuel prices.
  - CalSSA and Sunrun suggest the renewable integration costs are likely to be minimal. However, they support analysis of these costs if the analysis can be performed at a reasonable cost.
  - John Briggs supports a SMUD specific assessment of renewable integration costs.

- CalSSA suggests the capacity value should be assessed using three different scenarios: solar (only), solar + storage responding to Time of Day rates, and solar + storage with utility controls and dynamic operations. CalSSA notes that under some configurations, solar + storage would not result in any intra-hour flexibility costs, but would instead be a benefit.

- Action Item: CalSSA will develop these scenarios in greater detail.
Regulation Down and Regulation Down prices in CAISO’s wholesale market may be an appropriate proxy for intra-hour flexibility costs.

- CESA suggests SMUD could leverage ongoing work being led by the CPUC and CAISO to develop new methods for determining the contribution of solar + storage to peak load if the results are ready in time for the Value of Solar Study.
  - SMUD observes that the CPUC is for all of California and SMUD believes a more local value would provide more accurate modeling comparisons for peak load contributions.
- John Briggs suggests methods used to determine the benefits and cost of capacity from behind the meter solar should account for the resource’s intermittency.
  - Action Item: Alex Morris from CESA will coordinate with the facilitator to introduce these materials.
- CalSSA challenges whether “NEM solar costs more than local, utility scale solar” is a related to financial risk and suggests if the value of solar is appropriately determined, this may not be true.
  - SMUD comments that when it enters power purchase agreements (PPAs) with utility scale solar the market risk is transferred to the 3rd party.
    Additional clarity/review may be needed on this comment.
- Lee Miller suggests that in determining the value of energy and capacity depends heavily on the accuracy of your forecast. The best available methods of forecasting should be assumed in determining the value.

Attendance (present, unless noted):

- Al Rich, ACR Solar
- Alcides Hernandez, Sacramento Municipal Utility District (SMUD)
- Ben Finkelor, University of California (UC) - Davis
- Damon Franz, Tesla
- Dan Noren, Canadian Solar (Not in attendance)
- Dave Rapson, UC Davis
- David Wright – 350 Sacramento (Not in attendance)
- Debra Warady, Sacramento Municipal Utility District (SMUD)
- Kim Bates, Sacramento Municipal Utility District (SMUD)
- Laurie Litman-- 350 Sacramento
- Eric Poff, Sacramento Municipal Utility District (SMUD)
- James Frasher, Sacramento Municipal Utility District (SMUD)
- Jan Smutny-Jones, Independent Energy Producers Association (IEPA)
- John Briggs (Customer)
- Jon Olson, Sacramento Municipal Utility District (SMUD)
- Justin Scott, Sacramento Municipal Utility District (SMUD)
- Patrick Mealoy (Customer)
• Rick Codina (Customer)
• Rosanna Herber, Board of Directors, Sacramento Municipal Utility District (SMUD)
• Joshua Brister, Sunrun
• Lee Miller (Customer)
• Luis Sanchez, Community Resource Project (Not in attendance)
• Obadiah Bartholomy, Sacramento Municipal Utility District (SMUD)
• Olof Bystrom, Sacramento Municipal Utility District (SMUD)
• Matthew Tisdale, Gridworks (Facilitator)
• Steve Campbell, GRID Alternatives
• Stephanie Bray, United Way
• Rachel Bird, Borrego Solar
• Scott Murtishaw, California Solar & Storage Association (CalSSA)