SMUD Value of Solar + Storage Technical Working Group: Notes from Meeting #4

These notes summarize the action items, meeting highlights, and attendees to the December 12 meeting of SMUD’s Value of Solar + Storage Technical Working Group. Gridworks served as facilitator and prepared these notes.

Action Items:

- Working Group participants should provide any final edits on the Meeting 3 Meeting minutes by COB Friday, December 13
- Working Group participants who have input on SMUD’s Request for Qualifications for potential Value of Solar + Storage study consultants should reach out to Eric Poff.
- Collect and reference data and analysis from Luis Amezcua on the benefits of reduced land use resulting from distributed generation.
- Eric Poff and Stephen Campbell are collaborating on a list of Non-Energy Benefits and identifying who benefits from this list in a matrix. Eric and Stephen plan on bringing this completed matrix back to the TWG at Meeting #6

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:

- Eric Poff shared SMUD’s plans for issuing a Request for Qualifications, a first step in engaging a third-party contractor to complete a Value of Solar + Storage study. SMUD’s plans are explained in this presentation.
  - TWG participants who have input on the RFQ should reach out to Eric Poff.
- Gridworks requested feedback or corrections on the meeting minutes from November 21st. The following additions to the minutes were submitted to the facilitator. They have been paraphrased by the facilitator.
○ John Briggs: The consultant should determine whether a cross subsidy between non-participating and participating ratepayers is created by SMUD’s Net Metering policy. This analysis should account for two factors:
  ■ SMUD’s IRP and potential capital investments therein
  ■ The impact of any identified cross subsidies across income strata

○ David Wright: SMUD can provide the best benefit to its customers by working to put solar on all reasonably eligible roofs/spaces and use storage (both stationary and V2G) to hold and feed the power back when market rates are advantageous. These two recommendations will be added with a note they are “non-consensus” recommendations.

● Dr. Elena Krieger (SMUD Customer) provided a presentation, “DER Non-energy Benefits” available here: https://www.smud.org/-/media/Documents/Rate-Information/NEM-2/121219-PSE-Healthy-Energy-Krieger-2019-SMUD.ashx. Dr. Krieger’s analyses can also be interacted with at https://www.psehealthyenergy.org/california-power-map/. Insights from Krieger’s presentation include:
  ○ Dr. Krieger’s analysis concludes adoption of solar by low income customers has been low historically but has been improving in recent years.
  ○ Dr. Krieger’s analysis concludes rooftop solar and solar + storage can provide environmental benefits, including reductions in greenhouse gas emissions, criteria pollutants. These benefits include reduction in asthma, birth defects, cancer, and other harmful conditions through reductions in pollutants (e.g., PM 2.5, ozone, NOx, SOx).
    ■ Dr. Krieger identified the following factors which have the greatest impact on whether and to what extent such benefits accrue:
      ● Which marginal generator is displaced? Is the solar + storage meeting needs or dispatching to the grid in a time and place the results in displacement of a conventional generator or not?
      ● Did the distributed resource result in more ramping of conventional generators?
      ● Are the financial incentives to discharge storage aligned with the period of greatest emission intensity for the alternative power supply (e.g., peak demand)?
      ● What is the population density near the displaced power plants?
      ● Does storage get charged by onsite solar or by grid power? If so, what is the emission intensity of the grid power used?
      ● Whether the generator is cogeneration that creates steam for an industrial process?
    ■ Dr. Krieger concludes resilience offered through solar + storage deployments offers the participating customer additional benefits, including servicing medical equipment and supporting food storage.
Participant input on Krieger’s presentation led to the following insights:

- Storage can contribute to more solar integration, along with increased demand flexibility and regional grid operations and markets.
- If solar + storage is displacing the adoption of a diesel back up generator, additional benefits may accrue; however, data and analysis evaluating the effectiveness of this potential displacement is still a work in progress.
- Storage which responds to a timely dispatch signal can have a larger environmental value than storage that does not. It was noted that SMUD control of storage will be crucial for realizing the potential economic and environmental benefits of energy storage. SMUD’s energy storage programs currently aim to control 51% of the stored energy (kWh) of behind the meter batteries systems on their grid. The remaining 49% is available to the customer to meet their individual needs, typically economic dispatch or home resiliency.
- Virtual Power Plants located near conventional generators can impact whether that generator runs, but does not guarantee it; the current design of power markets make it possible that a generator runs, even if local load is served by distributed generation.

  - Amezcua suggests benefits of distributed generation include utilization of the built environment, water use reduction, fossil fuel and GHG emissions reduction, reliability, and resiliency.
    - Specifics on land use: DER on roofs and parking lots uses built environment before open greenspace. One MW of solar uses about four to five acres of land; California has nine GW of distributed generation, which could account for close to 40,000 acres saved
      - Where DER avoid the need to build transmission, these land use benefits may be greater.
    - Specifics on water use reduction: many conventional power plants rely on water for cooling, including “Once Through Cooling” technologies being phased out in California to minimize impact on marine ecosystems. DER can reduce reliance on water cooling.
  - For SMUD, Amezcua suggests:
    - Through targeted incentives, more value can be added from rooftop solar by increased adoption in DACs and congested areas
    - As climate change becomes more apparent, rooftop solar gives customers a chance to engage with carbon emission reduction
- Participant input on Amezcua’s presentation led to the following insights:
  - Distributed generation provides a benefit of reduced obligations under the renewable portfolio standard.
  - Utility scale solar, which offers an alternative to distributed generation, can rely on transmission upgrades needed to deliver the generation to customers. Costs avoided by relying on distributed generation where new transmission would otherwise be needed should be considered as benefits.
  - The upstream material costs of various energy solutions could also be accounted for.

- Steve Campbell (Grid Alternatives) provided a presentation, “Societal Benefits Presentation to SMUD NEM Working Group,” available here: https://www.smud.org/-/media/Documents/Rate-Information/NEM-2/121219-Societal-Benefits-Presentation-to-SMUD-NEM-Working-Group_v4.ashx. Insights gained from Campbell’s presentation include:
  - Campbell described Non-energy benefits (or co-benefits) as stuck in a state of “quantitative purgatory,” recommending
    - “To reduce energy burdens for low-income customers, SMUD should include NEBs into internal cost-effective tests and the VoS Study to reverse historical under-investment in low-income and Environmental and Social Justice Communities.”
  - On Slide 9, Campbell lists the Non-Energy Benefits SMUD’s Value of Solar + Storage study should account for. These benefits emerged by the California legislature’s recent consideration of AB 961.
  - Campbell suggests a recent evaluation of the California Public Utilities Commission’s Single-Family Affordable Home (SASH) program be used as a reference in SMUD’s Value of Solar + Storage study. Highlight benefits which are incremental to presentations provided by Dr. Krieger and Amezcua include:
    - Economic Benefit (Direct and Indirect Employment)
    - Reduced shutoffs, including corresponding reductions in homelessness
    - Energy burden reduction, including corresponding reductions in missed workdays
    - Benefits to the utility, such as reduced bill support for low income customers and carrying costs
    - Benefits to the participant, such as annual cost savings, which average $877/year.
  - Campbell echoes Dr. Krieger and Amezcua’s suggestion that increased resilience in the face of wildfire risk power shut offs may provide additional benefit to low income customers, but notes the extent of this risk in SMUD’s territory may be low.
Participant input on Campbell’s presentation led to the following insights:

- There is a tension in weighing benefits which are quantifiable and those which are not. Participants in the working group agree the benefits identified by Campbell’s presentation exist, but do not agree on whether asking customers to pay for those benefits through their SMUD rates is appropriate.
- SMUD will seek an independent, third-party consultant with experience in the best methods for quantifying non-energy benefits.


- Millers suggests the localized visibility of rooftop solar can raise awareness of renewable energy and prompt otherwise disengaged customers to consider the sources of their energy and how they use it, a benefit. Miller acknowledges quantifying these benefits is challenging; therefore, this benefit should be considered a qualitative addition to the value of solar, acknowledged but not determinative.
- Using data from the Solar Foundation on the number of jobs created in Sacramento serving the solar industry and average earnings of those workers, Miller and Rich suggest solar jobs add $321 million annually to the Sacramento economy.
- Miller and Rich suggest the Value of Solar + Storage study account for the benefits to the local economy from rooftop solar and compare those benefits to alternative strategies (e.g., utility scale solar)
- Participant input on Miller and Rich’s presentation led to the following insights:
  - Sacramento jobs include some manufacturing.
  - Whether existing solar workers are trained and approved to provide storage installations was uncertain, pending ongoing policy making.
  - SMUD finds $786 million in local economic benefit is derived from having lower rates than neighboring utilities. These benefits might be reduced if SMUD rates increased.
  - SMUD is independent from the city of Sacramento. Whether benefits which accrue to the City or community should be financed through SMUD customers is an ongoing, challenging issue.

Patrick Durham, Rene Toledo, and Eric Rivero-Montes (SMUD) provided a presentation, “Valuation of NEM Solar: Environmental Considerations,” available
here: https://www.smud.org/-/media/Documents/Rate-Information/NEM-2/121219-NEM---Environmental-Presentation_2019-12-12_Final.ashx. Key insights from the presentation include:

- The Cap-and-Trade Program allows for quantifiable financial benefits for the reduction of Greenhouse Gas (GHG) emissions. Any monetization of allowances must be used to comply with Assembly Bill 32 (AB32) objectives.
  - SMUD’s IRP projects decreased emissions. Excess allowances should provide monetizable benefits for SMUD customers, some of which are attributable to NEM solar.
- SMUD’s IRP also projects declines in NOx, which will result in societal benefits.
  - Where Environmental Costs like NOx compliance are incurred on a “pay ahead” basis (e.g., Emission Reduction Credits), costs may be sunk and unavoidable.
- SMUD has identified various variable environmental costs that may be impacted by reduced reliance on its conventional generators. Some of these environmental cost decrease with decreased demand, but some of them are associated with increased cycling which may actually increase environmental costs.
- In sum, SMUD recommends the Value of Solar + Storage study examine both of the following benefits and costs:

### Closing – Environmental Benefits Perspectives

<table>
<thead>
<tr>
<th>GHG Emission Reductions</th>
<th>Benefit: Decreased GHG allowances required per decreased thermal power plant generation</th>
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<tbody>
<tr>
<td>Variable Operating Cost Reductions</td>
<td>Benefit: Decreased thermal power plant generation will decrease variable operating costs (i.e., water, waste, etc.)</td>
</tr>
<tr>
<td>Cost: Increased power plant standby/station power costs and higher operation and maintenance (O&amp;M) costs due to cycling</td>
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<tr>
<td>Criteria Emission Reductions</td>
<td>Benefit: Overall decreased emissions contribute to societal benefits</td>
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<tr>
<td>Neutral: Assigned criteria pollutant ERCs are sunk cost (no financial impact)</td>
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Consolidated Recommendations

● The Working Group agreed to SMUD’s recommendations from Slide 37 with the following specifications and caveats:
  ○ David Wright: the full costs of GHG impacts are not reflected in the GHG allowance price. The consultant should not be constrained to such a conclusion. Costs of carbon sequestration, as has been piloted by SMUD, may offer an alternative proxy for the full costs of GHG emissions.
    ■ These recommendations from 350 Sacramento did not reach consensus by the Technical Working Group.
  ○ Lauren Randall (Sunrun): variable operating costs identified by SMUD are acceptable, but may be mitigated through timely storage application and operation. Sunrun requests that the CalSSA proposed storage scenarios analysis (identified in meeting #3) be used when assessing the potential for mitigating those costs.
    ■ The TWG reached consensus on this during Meeting #3.

● Environmental Benefits:
  ○ The Working Group agrees with Dr. Krieger’s conclusion: “rooftop solar and solar + storage can provide environmental benefits, including reductions in greenhouse gas emissions, criteria pollutants. These benefits include reduction in asthma, birth defects, cancer, and other harmful conditions through reductions in pollutants (e.g., PM 2.5, ozone, NOx, SOx).”
    ■ The magnitude of the benefits depends on how well the solar + storage receives displaces the conventional alternative. Key factors impacting this question are delineated on page 2 of these notes.
    ■ This is aligned with what SMUD proposed Environmental Benefits from slide 37 from their presentation.
  ○ The Working Group agrees with the following parts Amezcua’s conclusion: “benefits of distributed generation include utilization of the built environment, water use reduction, fossil fuel and GHG emissions reduction,...”
    ■ While supportive of the value created through these benefits, the Working Group has not fully agreed on whether recovery of the costs of creating these benefits should be accomplished through SMUD rates.

● Societal Benefits:
  ○ The Working Group agrees with Campbell’s recommendation: “To reduce energy burdens for low-income customers. This should include the evaluation of non-adopter energy bill increases when considering including NEBs into internal cost-effective tests and the VoS Study to
reverse historical under-investment in low-income and Environmental and Social Justice Communities.”

- Eric Poff and Stephen Campbell are collaborating on this list of Non-Energy Benefits and identifying who benefits from this list in a matrix. Eric and Stephen plan on bringing this completed matrix back to the TWG at Meeting #6 to see if the TWG can reach consensus on the matrix of NEBs that should be included in the VOS study.

- John Briggs suggests care should be taken in determining the appropriate methodologies for determining these benefits and that the evaluation should be specific to SMUD territory.

- SMUD has also commented that these societal benefits may be achieved by other means such as building/vehicle electrification efforts at lower costs to SMUD’s customers with a larger societal benefit impact rather than rooftop solar installations. Community Working Groups will discuss these policy related questions and not the Value of Solar study.

- Resilience:
  - The Working Group acknowledges the potential resilience benefits of solar + storage applications; however, the value of resilience in SMUD’s territory appears lower than in neighboring territories where wildfire risk mitigation strategies are leading to power shutoffs.

- Recommendations of Ben Finkelor (UC Davis):
  - There are market transformation benefits
    - NEM incentivized an industry, but required early adopters to take on risk
    - Distinction between existing customers who took on risk to new customers who are not taking on the same risk
    - Find a way to incentivize existing customers to add storage
    - SMUD could also add value by leveraging electrification along with solar and storage
  - There is emotional and political value
    - Engaging customers with their bill through NEM changes the way they use energy
    - There is capital investment counted in IRP from customers with rooftop solar

- General observations from SMUD,
  - First, as we add a long and very detailed list of potential benefits to be quantified, we are potentially increasing the scope and cost of the study to be performed. This could potentially put our schedule at risk – we may be forced to choose between delaying
the NEM 2.0 launch in order to fully estimate all benefits and cutting the study scope to accommodate timing.

- Second, assuming we are able to attribute economic values associated with all the identified benefits, it is not clear that all those values should be compensated for in a revised NEM tariff. The level of compensation actually offered and the basis on which the compensation is updated may change over time as well as how a new NEM tariff supports low income/disadvantaged communities and other interests is a rate design issue that will have its own public process and that is likely to be at least as complex as our technical working group.

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 (Not in attendance)
- David Wright – 350 Sacramento
- Kim Bates, Sacramento Municipal Utility District (SMUD) (Not in attendance)
- 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)
- Justin Scott, Sacramento Municipal Utility District (SMUD)
- Patrick Mealoy (Customer) (Not in attendance)
- Rick Codina (Customer)
- Joshua Brister, Sunrun (Not in attendance)
- Lauren Randall, Sunrun
- Lee Miller (Customer)
- Luis Sanchez, Community Resource Project
- 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 (Not in attendance)
- Rachel Bird, Borrego Solar (Not in attendance)
- Scott Murtishaw, California Solar & Storage Association (CalSSA) (Not in attendance)
- Dr. Elena Krieger (PSE)
- Luis Amezcua (Sierra Club)