Energy and Capacity Value of Solar (& Storage)

SMUD NEM Working Group
November 21, 2019

Scott Murtishaw
Senior Advisor

CALIFORNIA SOLAR STORAGE ASSOCIATION
smart local energy
Operating Margin vs Build Margin Effects

• New renewable and efficiency resources do not offset generation from an average of the existing portfolio

• Resources that are inflexible (nuclear), have a fixed output potential (hydro), or variable and low-cost (existing) are rarely curtailed

• Operating Margin: reduction in output from marginal existing resources
  • Usually the last (and most expensive) plant dispatched to provide power at any moment

• Build Margin: effect of new resources on deferring or avoiding the need for new power plants
Operating Margin Example

Energy production from a flexible power plant decreases during solar energy production.

Source: SMUD
Build Margin Concepts

• Key question: do additional DERs affect decisions about new generation capacity in the future

• Is new generation needed? By when? What kind?

• Depends on load growth, plant retirements, portfolio requirements

• Ability to avoid growth-driven capacity depends on renewable resource’s match to peak loads

• Renewable Portfolio Standard requirements may necessitate new capacity even if no load growth
Build Margin Examples

• Load growth triggers the need for new capacity
  • If DER output can match the need, DERs may avoid
  • With RPS in effect, part of the new capacity will be renewable

• Retirement of existing plant triggers need
  • DERs may avoid only new fossil-fired capacity

• Utility is committed to developing a certain amount of new renewables, regardless of RPS minimum requirements
  • No Build Margin effect, DERs operating margin effect continues indefinitely
Capacity Value: Primarily Driven by Peak Load Requirements
Example of Capacity Value of NEM Solar
Capacity Value of NEM Solar + Storage, 5 – 8 Peak TOU Rate
Capacity Value of NEM Solar + Storage, 5 – 9 Peak TOU Rate
## Effective Capacity of 1500 MW Solar on SMUD Peak Day

<table>
<thead>
<tr>
<th></th>
<th>Solar Only</th>
<th>S + S, 5-8 TOU</th>
<th>S+S, 5-9 TOU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Peak Load</td>
<td>2,649</td>
<td>2,498</td>
<td>2,276</td>
</tr>
<tr>
<td>Effective Capacity</td>
<td>295</td>
<td>446</td>
<td>668</td>
</tr>
<tr>
<td>Effective Capacity, % of Solar</td>
<td>20%</td>
<td>30%</td>
<td>45%</td>
</tr>
<tr>
<td>Peak Hour</td>
<td>7 - 8 pm</td>
<td>8 - 9 pm</td>
<td>2 - 3 pm</td>
</tr>
</tbody>
</table>
Solar Integration Costs
