MN Energy Storage Use Case Analysis: Peaker Substitution

September 15, 2017
Potential Peaker Plant Additions in Minnesota

Reference:
- MISO MTEP17 Futures Siting, Planning Advisory Committee Meeting, 10-19-2016
Potential Supply-Side Capacity Resource Options (partial list)

- Natural Gas Combustion Turbine
  
  Credit: Duke Energy

- Energy Storage System*
  
  Credit: Doosan GridTech

- Solar + Storage System*
  
  Credit: Solar City

*Can be large-scale or distributed
“...the all-in cost for the solar-plus-storage project is ‘significantly less than $0.045/kWh over 20 years,’ said Carmine Tilghman, senior director for energy supply at TEP. And, at under 3¢/kWh, he says he believes the solar portion of the PPA is ‘the lowest price recorded in the U.S.’”
Steps in the Analysis

1. Calculate the net cost of:
   - 100 MW, 4-hr energy storage system.
   - 100 MW, 3-hr energy storage plus 50 MW solar PV system.
2. Calculate net cost of a natural gas Combustion Turbine (CT).
3. Compare the net cost of the two alternatives.
   - Difference = potential benefit to electric customers.
   - Similar to Total Resource/Societal Cost Test.
4. Quantify impact on CO$_2$ emissions.
Cost & Benefit Categories

**Cost categories:**
- Capital Costs
- O&M Costs
- Fuel or charging costs (incl. losses)
- Tax and Insurance

**Primary Benefit Categories:**
- Capacity (presumed equivalent for both resource types)\(^1\)
- Ancillary services revenue
- Energy sales revenue
- Avoided environmental costs (solar only)

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### Potential Benefits (or Costs) of ESS

- Other benefit categories not quantified (not in scope):
  - Avoided startup and no-load costs
  - T&D deferral
  - Voltage Support

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\([1]:\) For S+ESS, equivalent CT capacity estimated to be 90% of nameplate.
Net Cost Comparison
Lifetime CO₂ Emissions Comparison
Thank You!


Ed Burgess  
Senior Manager  
Strategen Consulting, LLC

Email: eburgess@strategen.com  
Phone: 941-266-0017