Deriving wholesale market revenue opportunities and maximizing customer utility bill savings with behind-the-meter distributed energy resources (DER) – demonstration pilot

2019 Getting to Zero Forum

Overview

About CSE

3 things about California

CSE’s distributed energy resources (DER) demonstration project
About CSE

501(c)(3) nonprofit organization
Offering clean energy program administration and technical advisory services.

Headquarters: San Diego, CA
Regional offices: Boston, Brooklyn, Stony Brook, Oakland, Sacramento and Los Angeles

185+ dedicated, mission-driven employees
Managing ~50 projects and programs
National programs | Statewide incentive projects | Region-specific solutions

3 things about California
(1) Solar Drives California’s Grid

(2) Wholesale Market Volatility Increasing
(3) Changing Electric Utility Bill [Retail Tariff]

CSE’s DER-to-wholesale market demonstration project
Project Partners & Structure

Why Hotels and Schools

California: Service industry economy

Schools
- Typically located in residential grid circuits
- Ample space [solar + storage]
- Community visibility

Hotels
- Mimic residential electricity demand profile
- Unique business and customer challenges
Project Goals

• Bypassing electric utility demand response programs, show how behind-the-meter DER can participate in California’s wholesale electricity market

• Establish a market participation blueprint for interested technology vendors and customers

• Shed light on current constraints and tensions that lie between customers’ retail utility bill savings versus wholesale market revenue opportunities.

• Identify and recommend policy, program and market improvements.

Tesla Batteries at Chino Hills Schools

<table>
<thead>
<tr>
<th>Resource Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities</td>
</tr>
<tr>
<td>Capacity</td>
</tr>
<tr>
<td>Energy</td>
</tr>
<tr>
<td>Duration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Market Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Ahead Energy</td>
</tr>
<tr>
<td>Real-Time Energy</td>
</tr>
<tr>
<td>Spinning Reserve</td>
</tr>
<tr>
<td>Frequency Regulation (simulated)</td>
</tr>
</tbody>
</table>
Conectric Networks IoT at Hilton Hotels in San Diego

**Resource Attributes**
- Facilities: 2 mid-sized hotels
- Capacity: 160 - 215 kW
- Energy: 640 - 1,300 kWh
- Duration: 2 - 6 hours

**Market Services**
- Day Ahead Energy
- Real-Time Energy
- Frequency Regulation (simulated)
Operational Strategies

Tesla’s Battery Packs at Schools

- Avoid utility bill demand charges
- Decrease electric grid use during higher-rate evening time-of-use block (i.e., 5:00 – 9:00pm)
- Perform demand response and spinning reserve when market prices exceed price-optimization thresholds

Conectric’s IoT in Hotels

- Avoid utility bill demand charges
- Shift loads away from higher-rate evening time-of-use block (i.e., 5:00 – 9:00pm)
- Perform demand response by pre-cooling common areas, vacant rooms, and shift the timing and frequency of certain pumping and air-circulation equipment.
Tesla’s School Batteries
Potential Wholesale Market Revenues

Conectric’s Hilton Hotels
Potential Wholesale Market Revenues
Project Learnings and Insights

**Tesla’s Battery Packs at Schools**
- This project is one of the first behind-the-meter, non-utility program registered resources performing a demand response reliability (ancillary) service in California’s wholesale market
  - Registering and testing with the CAISO is a time-consuming and complex process (Though for good reason)
  - De-risking potential market non-performance (i.e., penalties) across two firms (Tesla and Olivine) required significant legal effort
- No wholesale compensation is available for battery-to-grid export
  - The batteries require enough on-site load off-take the battery discharge
  - Limiting the potential ‘value stack’ of on-site battery storage

---

**Conectric’s IoT in Hotels**
- Wireless sensor, electric metering and control (IoT) devices are (relatively) cheap
- For a resource that is this small, wholesale market revenues are an order of magnitude smaller than retail utility bill savings, i.e., demand charge reduction and shifting away from high TOU periods
- Energy data science specialists are hard to come by (eh hem, Silicon Valley tech peeps!)
Project Learnings and Insights

Across Both Portfolios

• Mitigating the non-[peak] coincident customer demand charge may run counter to timing of grid balancing and decarbonization needs
• Process improvements are needed for customer-utility authorization for third-party access to customer utility meter data
One simple mission —

DECARBONIZE.

Our vision is a future with sustainable, equitable and resilient transportation, buildings and communities.