Solar-Plus-Storage Fundamentals: Products and Services to Consider

Jeff Cook-Coyle
Director, Project Development
Interconnection Systems, Inc.
jeff@isi.consulting
970-744-9462

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About Interconnection Systems, Inc.

• Vertically Integrated Solar/Storage EPC
• Energy Storage Experience

<table>
<thead>
<tr>
<th>Utility</th>
<th>Capacity</th>
<th>Manufacturer</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Power (cooperative)</td>
<td>4.5 MW / 18 MWh</td>
<td>Tesla</td>
<td>2018</td>
</tr>
<tr>
<td>New Hampshire Electric Cooperative</td>
<td>2 MW / 4 MWh</td>
<td>Sungrow / Samsung</td>
<td>2020</td>
</tr>
<tr>
<td>Midwestern IOU</td>
<td>5 MW / 10 MWh</td>
<td>WEG / BYD</td>
<td>2021</td>
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</table>
What is a Battery Energy Storage System (BESS)?

1. Batteries
2. Inverters and the rest of the “Energy Storage System”
3. Optional Advanced Operating System
BESS System Components

- Batteries
- Inverter (PCS)
- HVAC and Fire Suppression

Image Courtesy Sungrow
BESS Main Components

1. PCS
2. Battery rack
3. LV panel
4. Local controller
5. HVAC
6. FSS

Images Courtesy: Sungrow
Standard Systems

Sungrow 1 MW / 4 MWh

Fluence “Edgestack”
Power and Energy Unknown

Tesla Megapack 0.7 MW / 3 MWH
Tesla Powerpack 50 kW / 232 kWh
Operating Systems

Advanced Operating Systems may add value

1. Will the system perform?
   - the same function
   - at the same time
   - every day

2. How much would you save (staff time and possible missed peaks) to automate peak prediction and battery operations?

3. Are you missing opportunities to tap multiple services?
Safety

• Fire Detection
  • Smoke, Heat

• Fire Suppression
  • Water shower and/or mist
  • Heptafluoropropane (HFC-227ea/FM200)

• “Deflagration”

• Passive Shutdown

• Key Standards:
  • NFPA 68 (includes deflagration vent specs)
  • UL9540A (in-depth protocol to document how system reacts to fire)

Image source: https://fluenceenergy.com/committed-to-safety/
### Examples

<table>
<thead>
<tr>
<th>Battery Manufacturers</th>
<th>BESS Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Panasonic</td>
<td>● Tesla</td>
</tr>
<tr>
<td>● Samsung</td>
<td>● Sungrow</td>
</tr>
<tr>
<td>● LG</td>
<td>● Fluence</td>
</tr>
<tr>
<td>● BYD</td>
<td>● WEG *</td>
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<thead>
<tr>
<th>Advanced O.S. Providers</th>
<th>Developers</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Enel X * DER.OS</td>
<td>● Today’s Power Inc.</td>
</tr>
<tr>
<td>● Engie * GridSynergy</td>
<td>● Strata Solar</td>
</tr>
<tr>
<td>● Stem * Athena</td>
<td>● NextEra Distributed</td>
</tr>
<tr>
<td>● Energy Toolbase Acumen</td>
<td>● Ormat / Viridity</td>
</tr>
<tr>
<td>● Fractal EMS</td>
<td>● Origis</td>
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