Agenda

- Guidelines Development Process
- ESS Review Considerations
- Net Energy Metering (NEM) Integrity
- Application Process
- Declarations
- Operating Agreements
Xcel Energy Overview

Serving eight states
• 3.6 million electricity customers
• 2 million natural gas customers

Nationally Recognized Leader:
• Wind energy
• Energy efficiency
• Voluntary emissions reductions
• Pursuit of new technologies
Energy Storage System (ESS) Applications

ESS have unique aspects leading to a more complex review

Considerations:
- Storage is an energy source and load
- Net Energy Metering (NEM) Integrity

Issues that affect the above considerations:
- Multiple charge/discharge modes
- Software/firmware-based control schemes
- Lack of standards that regulate these issues
ESS Guidelines Development Process

Conceptual Agreement on:
- Load Visibility
- NEM Integrity
- Review of control modes/functions
ESS as a Source and Load

Potential System Impacts

- **As an Energy Source (even when non-exporting)**
  - Steady state voltage impacts
  - Voltage fluctuations
  - Equipment loading
  - Operational Awareness (“Hidden” loads)

- **As a Load**
  - Increased loading of equipment
Net Energy Metering (NEM) Integrity

- Non-renewable energy is excluded for compensation under Schedule Pg-1

So, when is the ESS qualified for Net Energy Billing?
- Must be 100% charged by an onsite Renewable Resource

- UL Certification is being modified to address the NEM integrity use case which may simplify reviews in the future
Application Process

Submit:

• Standard required documents (such as one-line, site plan, etc.)
• Standard Interconnection Application Form
  • List Configuration Type in the “Other Comments Section”
• Declaration Form stating the system will operate as defined by the selected configuration(s)
• ESS Operational Information Questionnaire
• Application fees are based on the aggregate DER nameplate ratings being applied for- no special fees for ESS review
### Possible Configurations

<table>
<thead>
<tr>
<th>Configuration^</th>
<th>AC Coupled Battery</th>
<th>DC Coupled Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1A</td>
<td>1B</td>
</tr>
<tr>
<td>Energy Storage Operation in Parallel without Generation</td>
<td>Energy Storage Operation with Self-Generation</td>
<td>Standby Energy Storage with NEM Eligible Renewable Generation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interconnection Type</th>
<th>Customers without Generation or Storage in Parallel with Self-Generation</th>
<th>Net Energy Metering (NEM) and Solar Rewards for qualifying facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair with Renewable Energy</td>
<td>Yes or No</td>
<td>Yes</td>
</tr>
<tr>
<td>Parallel Operation Allowed</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Interconnection Review Required</td>
<td>No^ ^ ^</td>
<td>Yes</td>
</tr>
<tr>
<td>Battery Charging</td>
<td>Utility or Self-Generation</td>
<td>Utility or Generation</td>
</tr>
<tr>
<td>Battery Discharging</td>
<td>Standby System^ ^</td>
<td>Non-Export*</td>
</tr>
<tr>
<td>Telemetry and Control</td>
<td>Determined by total Distributed Energy Resources (DER) as addressed in PUC Rules, Interconnection Requirements</td>
<td></td>
</tr>
<tr>
<td>Production Meter</td>
<td>No</td>
<td>Solar Rewards and any DER &gt; 40 kW</td>
</tr>
<tr>
<td>Agreements</td>
<td>Attestation of Conformance to NEC Article 702^ ^</td>
<td>Interconnection Agreement (IA), Attestation, Operation Mode to be Identified in IA**</td>
</tr>
</tbody>
</table>

^ Indicates possible configurations for AC Coupled Battery and DC Coupled Battery.
Operational Characteristic Questionnaire

1. Does energy storage export energy to the grid?
2. What source or sources charge the energy storage (i.e. utility, PV, diesel, etc.)?
3. Is a Renewable Resource part of the interconnection?
   a) Is the storage 100% charged by a Renewable Resource?
4. Does the energy storage parallel with the grid or is it a stand-alone system?
5. What is the process for changing operational modes of the energy storage?
   a) Are the modes of operation settings accessible to the end user?
6. For non-export, how does the system control output so that storage power is not exported to the grid under normal conditions?
Declaration Forms

• Declaration Form filed with initial application
• Declares system as operating in one or several modes only
• Simplifies review by limiting the scope of the review to Declared Functionality

• At any time, changing the ESS to a mode not declared requires notifying the utility and may result in a technical review to determine if new impacts are anticipated.
Operating Agreements

- Operating Agreement will be attached to Interconnection Agreement
- Informed by Declaration Form
Illustrate how the system can monitor source of energy and export magnitudes
Wisconsin ESS Guidelines

- Available on company website

https://www.xcelenergy.com/working_with_us/how_to_interconnect
Questions?

Thank you

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