



Energy Storage System Application Guidelines

Xcel Energy- Wisconsin

January 18th, 2019



Agenda

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

Xcel Energy Overview

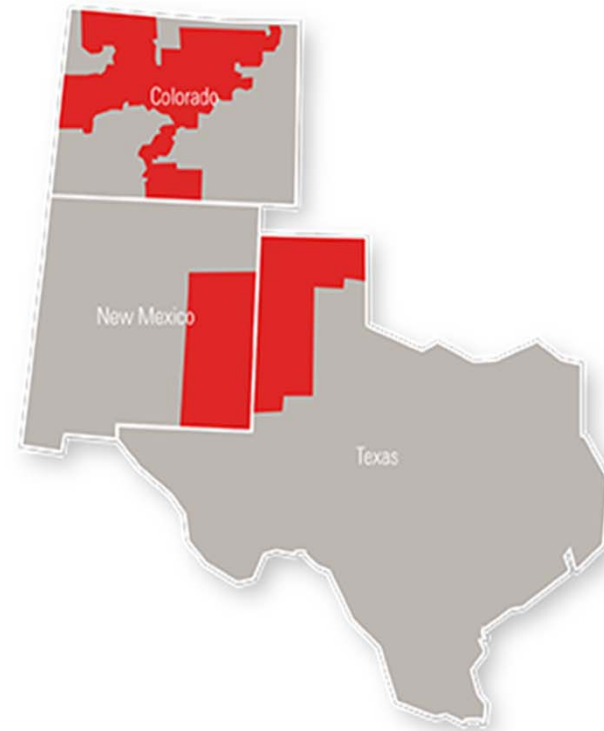


Serving eight states

- 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

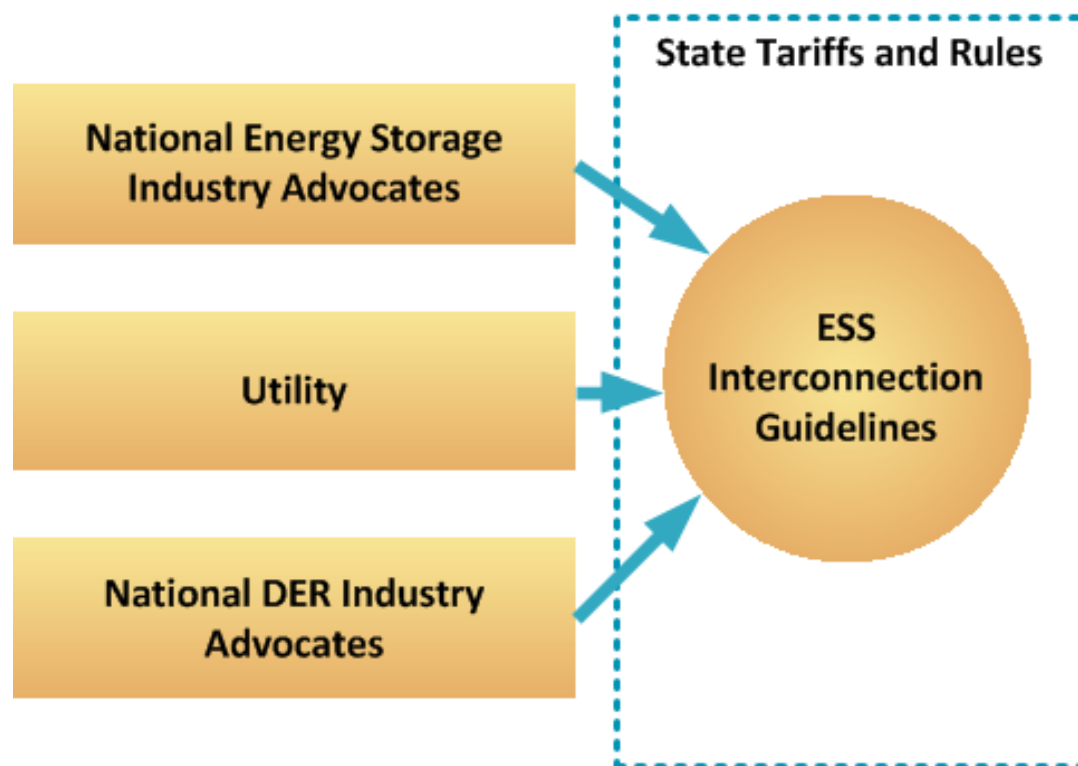
Considerations:

- 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:

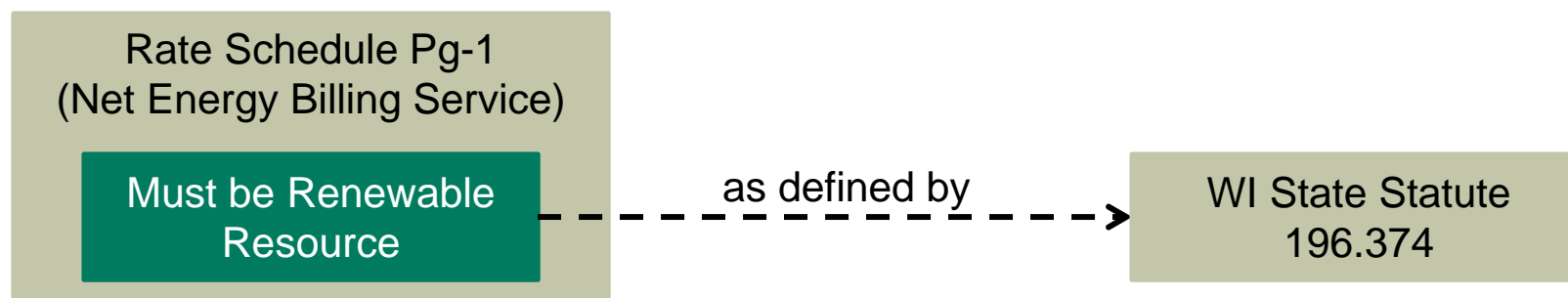
- Load Visibility
- NEM Integrity
- Review of control modes/functions

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



Configuration [^]	AC Coupled Battery						DC Coupled Battery	
	1A	1B	1C	2A	2B	2C	3A	3B
	Standby Energy Storage Only	Energy Storage Operation in Parallel without Generation	Energy Storage Operation in Parallel with Self-Generation	Standby Energy Storage with NEM Eligible Renewable Generation	Parallel Energy Storage Charged 100% by NEM Eligible Renewable Generation	Parallel Energy Storage Operation Subject to Non-Export	Hybrid Inverter with a Second Load Meter ^{***}	Hybrid Inverter with a Transfer Switch
Interconnection Type	Customers without Generation or Storage in Parallel with Self-Generation			Net Energy Metering (NEM) and Solar*Rewards for qualifying facilities				
Pair with Renewable Energy	Yes or No			Yes				
Parallel Operation Allowed	No	Yes		No	Yes		Yes	
Interconnection Review Required	No ^{^^} ^{^^^}	Yes		No ^{^^} ^{^^^}	Yes		Yes for Parallel Operation. Otherwise No	
Battery Charging	Utility or Self-Generation			Utility or Generation	100% Renewable Generation	Utility or Generation	100% Renewable Generation if Exporting	
Battery Discharging	Standby System ^{^^^}	Non-Export*		Standby System ^{^^^}	Export of 100% Renewable Generation Only, Otherwise Non-Export*	Non-Export*	Export of 100% Renewable Generation Only, Otherwise Non-Export*	
Telemetry and Control	Determined by total Distributed Energy Resources (DER) as addressed in PUC Rules, Interconnection Requirements							
Production Meter	No			Solar*Rewards and any DER > 40 kW			Solar*Rewards and any DER > 40 kW	
Agreements	Attestation of Conformance to NEC Article 702 ^{^^^}	Interconnection Agreement (IA), Attestation, Operation Mode to be Identified in IA ^{**}		Attestation of Conformance to NEC Article 702 ^{^^^}	Interconnection Agreement, Attestation, Operation Mode to be Identified in IA ^{**}		Interconnection Agreement, Attestation, Operation Mode to be Identified in IA ^{**}	

Operational Characteristic Questionnaire

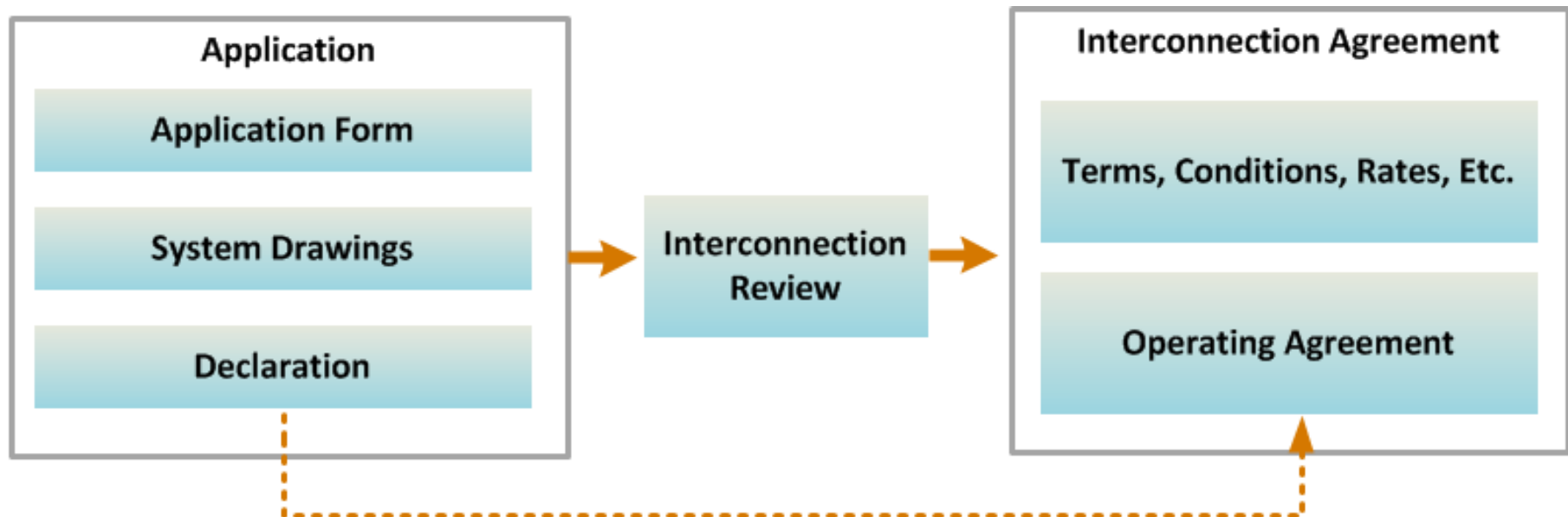
1. Does energy storage export energy to the grid?
2. What source or sources charge the energy storage (i.e. utility, PV, diesel, etc.)?
3. Is a Renewable Resource part of the interconnection?
 - a) Is the storage 100 % charged by a Renewable Resource?
4. Does the energy storage parallel with the grid 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

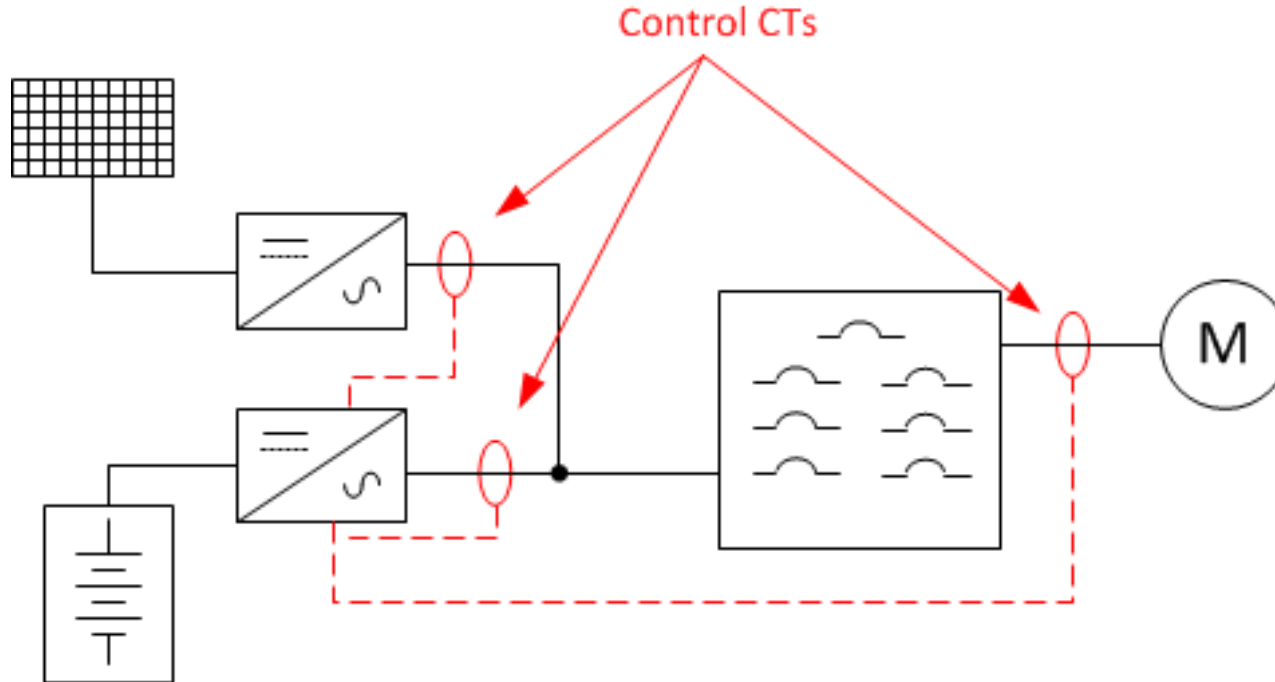
- Operating Agreement will be attached to Interconnection Agreement
- Informed by Declaration Form



Self-supply and NEM Export

One-line Example*

Illustrate how the system can monitor source of energy and export magnitudes



*One-line is for conceptual purposes only. Does not include all information required for one-line review. Please refer to "Document

Wisconsin ESS Guidelines

- Available on company website

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

Questions?



Thank you

Alan Urban – DER Integration Engineer

Alan.M.Urban@xcelenergy.com