

# Energy Storage and PSC 119



# **Next Steps - from previous presentation**

**Continue updating ES-DER glossary**

**Develop scoping document of ES-DER interconnection technical requirements**

**Involve stakeholder committee**

**Produce first draft of ES-DER interconnection technical requirements**

**Update draft(s) and circulate (recursive action)**

**Cross-reference latest draft with PSC 119**

**Seek peer review of draft from PSCW (engineer: Lipinski, et al)**

**Finalize draft and update / augment PSC119**

**Seek WIDRC consensus vote on final draft**

# Glossary Additions and Changes

**Back-up Power (customer-sited)** — Electric energy or capacity supplied by a DG facility with energy storage (customer) to replace energy ordinarily generated by an electric provider during an unscheduled outage of the distribution system.

**Back-up Power (electric provider)** - Electric energy or capacity supplied by an electric provider to replace energy ordinarily generated by DG facility equipment during an unscheduled outage of the distribution system.

**Capacity (energy storage)** - The capacity of a storage system is defined as the amount of energy that it can deliver in discharge. Energy storage capacity is typically specified in amp-hours or in watt-hours.

**Charge/Discharge Cycle** - The operational profile of an energy storage device that defines how much of the time it must be used to store electrical energy versus how much time it is available to supply electrical energy or other services. This could also be referred to as the “duty cycle”.

**Demand Response** - the change in the power consumption of an electric consumer to better match the demand for power with the supply.

**Energy Storage (ES)** - Energy storage of electricity that is interconnected to the electric distribution, transmission or electric user site to supply electric capacity. **Electrical energy storage includes electrochemical technologies (e.g., batteries and fuel cell storage systems) and electromechanical technologies (e.g., flywheels and compressed air energy storage).**

**Power Quality (electric)** - A measure of the electric system’s ability to deliver energy that is steady and within a prescribed voltage level, frequency, and waveform. This would lead to the ability to power equipment that is suitable to the proper operation of that equipment.

# Scope

*Scope does not address the following:*

- **cost-effectiveness of energy storage**
- **market price impacts of storage deployment**
- **asset utilization impacts for generators and transmission system**
- **grid reliability**
- **greenhouse gas impacts of storage deployment**
- **buyback rates**

# Introduction

The major objective of this document is to provide guidance about the requirements for interconnecting energy storage, **associated with a DG facility**, to the distribution system. The guidelines are intended for retail electric customers, independent power producers (IPPs), independently owned generators or any other parties interested in operating an energy storage system, **associated with a DG facility of 15 MW or less**, in parallel with an electric distribution system in Wisconsin.

This document provides guidance in including energy storage in the rules codified by Chapter 119 of the Wisconsin Administrative Code – “Rules for Interconnecting Distributed Generation Facilities.”

The Chapter 119 rules already define an application process, an application form, an interconnection agreement, requirements for grounding, metering, use of certified or non certified equipment, safety equipment, power quality and testing, and compliance with applicable national, state, and local codes. This guidance document suggests how these rules will be changed, supplemented and modified for energy storage.

These energy storage changes, supplements and modifications to PSC 119 will, in general, only apply to units interconnected after the issuance of a commission (PSCW) opinion and order for these changes.

A detailed common set of definitions is provided in a glossary appendix.

# General Requirements

~~Applicant Responsibilities~~

~~Designated Point of Contact~~

~~Definition of DG Facility Size Categories~~

~~Application Process for Interconnecting DG Facilities~~

~~Application Process Flow Chart for Interconnecting DG Facilities~~

~~Agreements~~

~~Insurance~~

~~Modifications to DG Facilities~~

~~Fees and Distribution System Costs~~

~~Easements and Rights-of-Way~~

~~Disconnection~~

~~DG Facility Operations Manual~~

~~DG Facility Maintenance Records~~

~~Interconnection to a Transmission System~~

~~One-line Schematic Diagram~~

~~Control Schematics~~

~~Site Plan~~

~~Procedure for Appealing to the Commission~~

# Design Requirements

General Design Requirements

DG Facility Equipment Protection

Equipment Circuit Breakers

~~Interconnection Disconnect Switch~~

Labeling Requirements

Revenue Metering Requirements

~~Grounding~~

Operating Limits

~~Power Factor~~

~~Power Quality~~

~~Synchronizing DG Facilities~~

~~Automatic Interrupting Device~~

Minimum Protection Function Requirements for Non-Certified DG Facilities

Test Switches

~~Dedicated Transformer~~

Spot Networks

Telemetry / SCADA

# Equipment Certification

Certified Paralleling Equipment

~~Non-Certified Paralleling Equipment~~

## Commissioning Tests

~~Anti-islanding Test~~

~~Commissioning Tests for Paralleling Equipment in Categories 2–4~~

Additional Tests

# Appendix Listing

**Appendix I Glossary**

**Appendix II Protection System Functions**

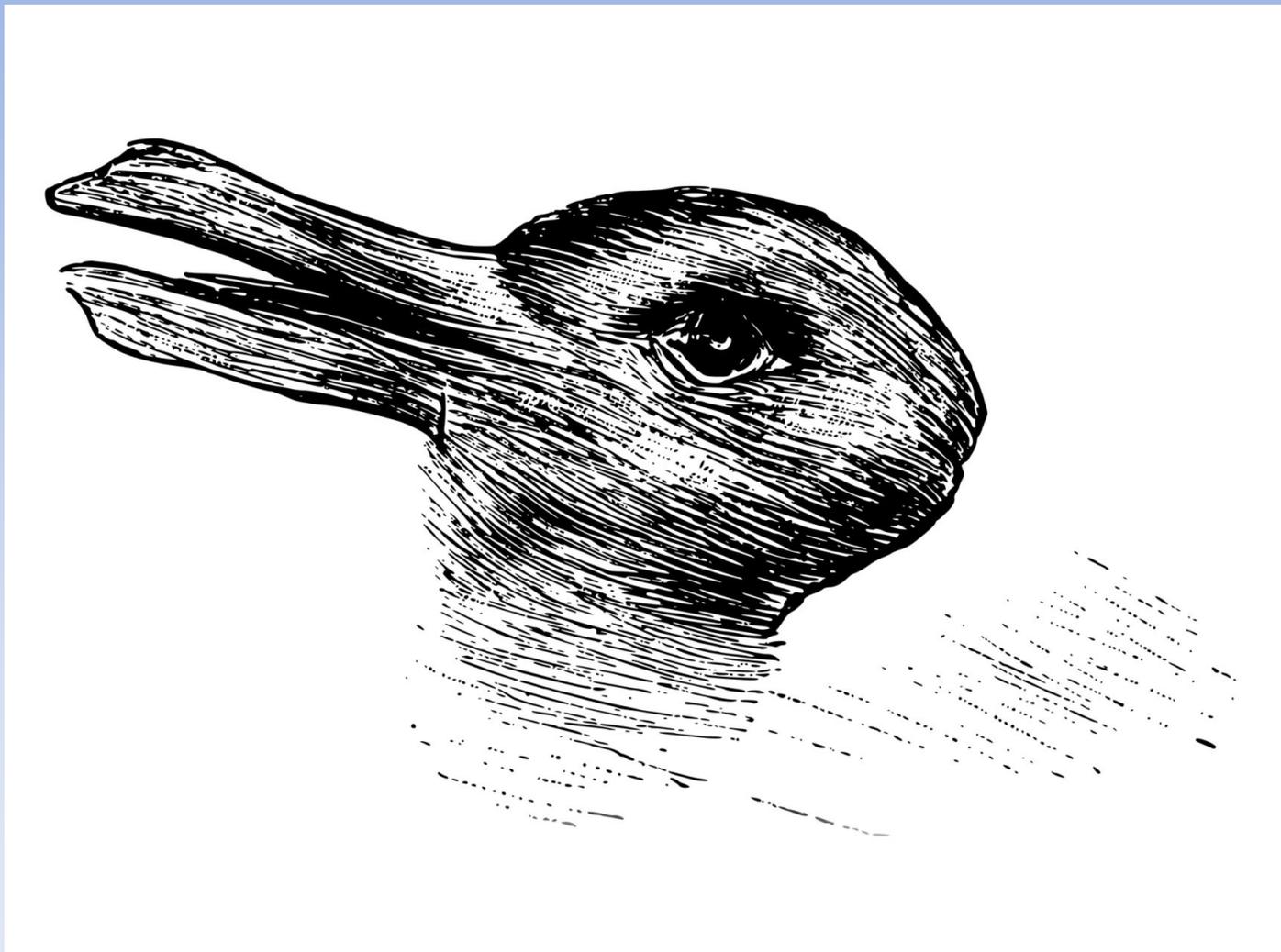
**Appendix III Operating Limits, Power Quality, and Standards Summary**

**Appendix IV Codes and Standards**

**Appendix V Sample One-Line Diagram (Category 1: 20 kW or less)**

**Appendix VI Sample One-Line Diagram (Categories 2-4: Greater than 20 kW to 15 MW)**

# Questions ?



# Issues

**How to assure the source of battery charging?**

**How to prevent export and/or paralleling when not allowed?**

**Should inadvertent or momentary export be allowed?**

**How to assure that only renewable generation is used for NEM**

**Systems combining energy storage and DG may not both simultaneously discharge to the electric distribution system UNLESS the operational rating of the transformer (serving the customer) is not exceed.**

**A second AC disconnect means may be required to be installed in proximity to the energy storage system if the main disconnect is not within sight.**

**Telemetry is required for dispatchable storage systems.**

# Non-Export Mitigation

## Operational Mode Programming

The energy storage inverter's software programming will control the appropriate charging, discharge, and bypass of the energy storage system.

For energy storage which parallels with the grid, the inverter software programming must be inaccessible to the customer so only the inverter manufacturer or installer can change to an operating mode.

Another means of achieving this may provided as part of the Interconnection Agreement and Interconnection Application.

## Protection Functions (relays)

ANSI Type 32 Directional Power Relay Function, reverse power relay, monitors the direction of power from ac generators.

If current flow from the generator becomes reversed and exceeds the adjustable setting, the relay will trip.

# Energy Storage System Standards

## **Inverter:**

UL 1741 SA, P1547.8x's electrical interconnection standards for electric storage and hybrid generation/storage

## **Batteries:**

UL 1973, UL 1642

# Developing a Guidance Document for Wisconsin

- Instead of reinventing the “wheel”, why not utilize Xcel Energy energy storage interconnection configurations as a starting point in writing a consensus-based guidance.
- Xcel Energy defined 8 configurations.
- These are currently being utilized in Xcel’s Wisconsin service territory.