# Massachusetts Technical Standards Review Group (TSRG)

**Quarterly Meeting- September 18th, 2025**

# Agenda

- Interconnection Treatment by Bi-Directional EV Chargers (Guest Speakers) (~30 min)
- Fermata Energy Bi-Directional Chargers Update (~5 min)
- Shared Transformer Screening- Resonant Energy (~20 min)
- TSRG Sub-Committee Updates (~20 min)
  - Flexible Interconnections
  - DER Equipment Replacement
  - Meter Socket Adapters
- Tariff Revision Process update (~20 min)
  - IIRG process update and procedural schedule
    - IIRG ESS Subgroup
    - IIRG Flex IX Sub-Group
- Group Study Status Update (~15 min)
  - Eversource
  - National Grid
  - Unitil
- OPESS Tariff Update (~5 min)
- National Grid DLS Update (~30 min)
- Technical Standards Update from EDCs (~10 min)
- Common Technical Standards Document (~10 min)
- Close Out & Final Discussion (~5min)
  - Next scheduled quarterly meeting dates
    - Thursday December 11th 1PM-4PM
  - Send topics for future meetings to:
    - Shakir Iqbal (shakir.Iqbal@eversource.com)
    - Tony Morreale (tmorreale@ligconsultants.com)

# Interconnection Treatment by Bidirectional EV Function

MATSRG Working Group

September 18, 2025

Carter Wood

Electrification Policy SME

# Agenda

01 Home Integration System Overview

02 Ford's Market Experience

03 Interconnection with Parallel Operation

04 Collaboration to Solve Roadblocks

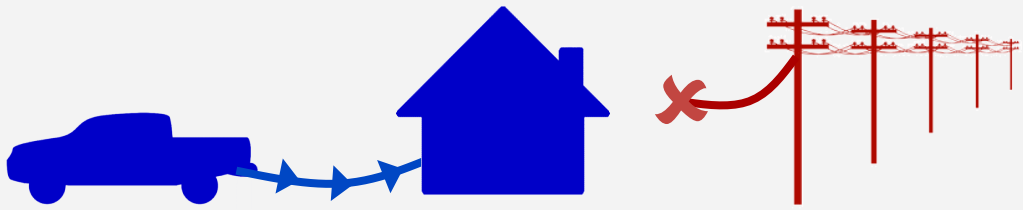
# How Can We Work Together on Interconnection Issues for Bidirectional Vehicles?

# Value Beyond Mobility

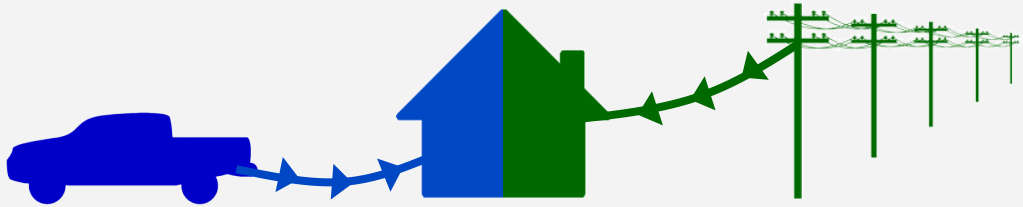
At Ford, we believe EVs should be part of the solution.

# From Backup Power to V2G.

**Backup Power (Islanded)**



**Vehicle-to-Home (V2H) Grid-Connected, Non-Export**



**Vehicle-to-Grid (V2G) Grid-Connected, Export**

## Requirements

**Only allowed to operate when disconnected from the grid. Operates like a traditional gas/diesel generator.**

**Vehicle energy discharged must match home load. Requires utility non-export interconnection permission to operate (PTO) in parallel to grid.**

**Requires utility interconnection permission to operate (PTO) and export into the grid.**

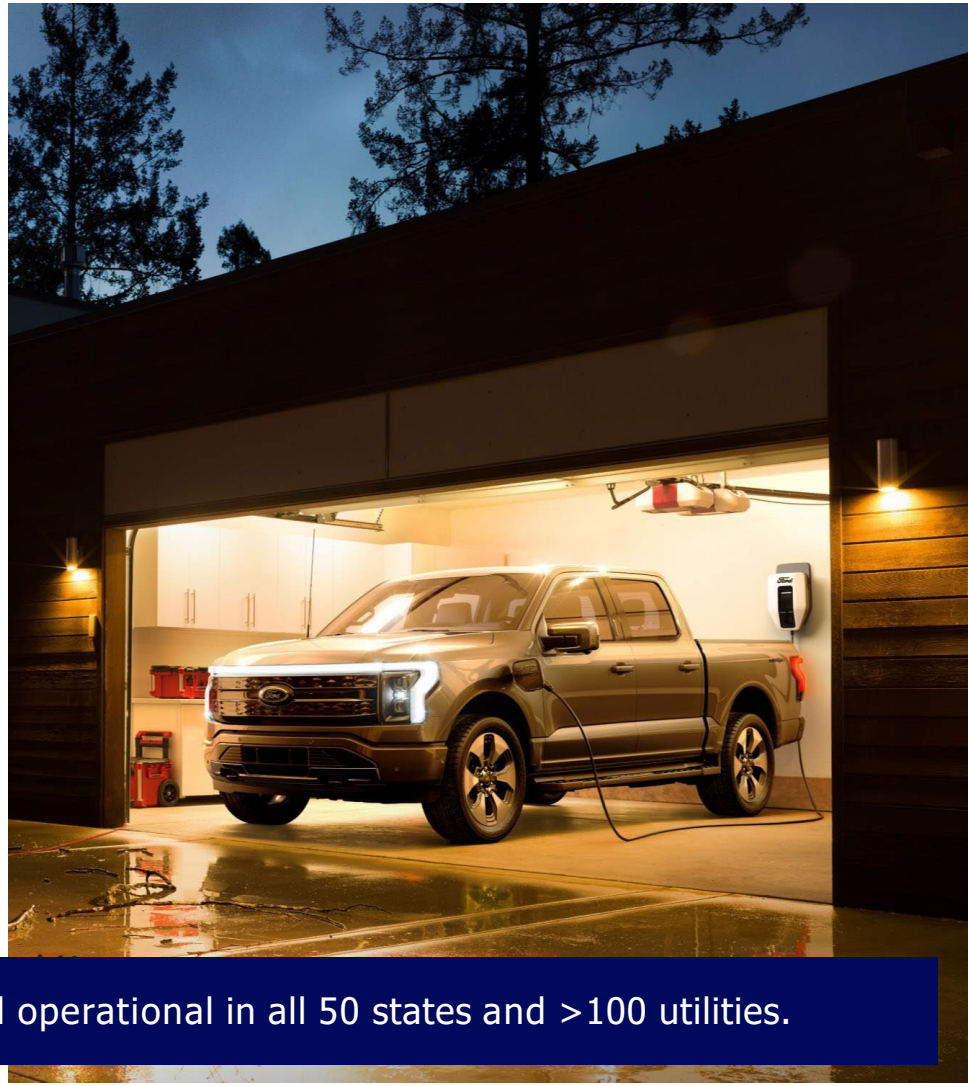
Bidirectional functionality comes in multiple forms.

# Ford's Bidirectional (V2X) System

## Key Components.

- Ford F-150 Lightning – **1st retail-production electric truck with bidirectional capabilities!**
- Ford's V2X System includes 3 main components:
  - 1) Ford F-150 Lightning
  - 2) Ford Charge Station Pro (EVSE)
  - 3) Ford/Sunrun Home Integration System (HIS)
    - Includes Microgrid Interconnection Device (MID), inverter and dark-start battery

+



Ford's System has already been rolled out and operational in all 50 states and >100 utilities.

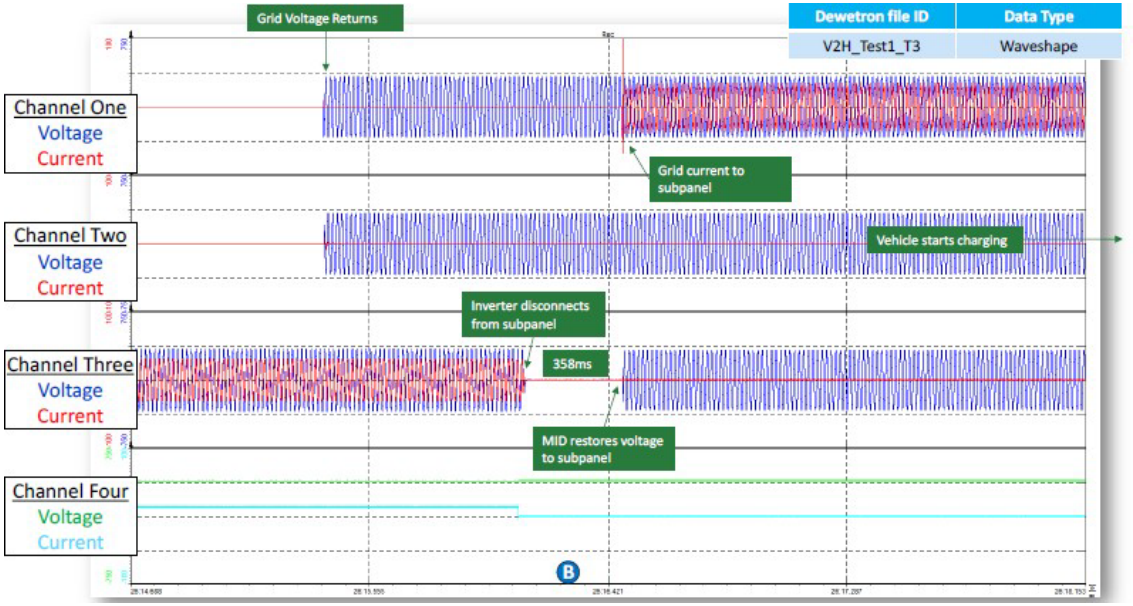
# EPRI Lab Assessment

## Independent Validation: Proving the Safety of Ford's Bidirectional Systems

- "When the grid is out, the Main panel output goes to zero … then waits for the DC power flow to come in before putting out AC power to the Backup panel. Similarly, when the grid power is restored, the current from [the] vehicle goes to zero and the main panel output is restored to the original loads."

- "It can be observed from Figure 11 that when the grid power comes back, the inverter disconnects from subpanel and stops its output, and then the Microgrid Interconnect Device restores grid power to the sub-panel."

- Free link to full study: https://www.epri.com/research/products/000000003002029045



# Michigan Public Service Commission (MPSC) Declaratory Filing

## Purpose and Goals

1) Be a proactive partner and work collaboratively with regulators and utilities
2) Stakeholder engagement with key parties: DTE, Consumers, MEGA utilities, co-ops, Commission staff, MEIBC and VGIC
3) 41-page filing including testimony from Ford expert witnesses

**REQUEST FOR DECLARATORY RULING**

Pursuant to Section 63 of the Michigan Administrative Procedures Act, 1969 PA 306, MCL 24.263, and Michigan Public Service Commission ("the Commission") Rule 448 (R 792.10448), Ford Motor Company ("Ford" or "the Company") requests a declaratory ruling interpreting Michigan's Interconnection and Distributed Generation Standards ("MIXDG"), R 460.901a *et seq.* as inapplicable to systems with backup power capabilities, such as the Ford Home Backup Power ("HBP") System ("System"), and thus finding that Systems with HBP capabilities do not require interconnection authorization from the electric utility.

MPSC
MICHIGAN PUBLIC SERVICE COMMISSION

Gretchen Whitmer, Governor
Dan Scripps, Chair
Katherine Peretick, Commissioner
Alessandra Carreon, Commissioner

**NEWS RELEASE**

X/Twitter: @MichiganPSC
www.michigan.gov/mpsc

**FOR IMMEDIATE RELEASE** March 13, 2025
**News media contact:** Matt Helms 517-284-8300
**Customer Assistance:** 800-292-9555

**MPSC takes action to strengthen power grid and maximize customer value from distributed energy resources**

*Orders across a range of proceedings highlight efforts to modernize Michigan's regulatory framework*

# Interconnection Rules: Stationary Storage Focus

- Interconnection tariff applies to any “power-generating Facility”
- Facility is “a source of electricity **owned and/or operated** by the Interconnecting Customer”
- For backup power – exclusions if “If the Facility will always be isolated from the Company’s EPS”
- How does this apply if a customer has features or system capabilities they never intend to use?
  - We want to reduce potential workload on interconnection engineers
  - This affects the vast majority of future EV customers.

# Clarifying Definitional Ambiguities for EVs

- Revise definitions to ensure bidirectional charging systems can connect and serve customers in “load-only mode”
  - Proposed language: “An electric vehicle with an un-activated feature that allows the EV to be a source of electricity during parallel operation is not considered to be a Facility requiring interconnection until and unless a Customer takes an action to activate such a feature.”
  - Feature enablement is controlled by Ford-installed and Ford-controlled software in the vehicle, charger, and Integration System
  - When customers do decide to upgrade to parallel operation, rules should ensure a smooth transition to interconnection and a new classification of grid integration

# Edge Concerns for Bidirectional Vehicle Interconnection

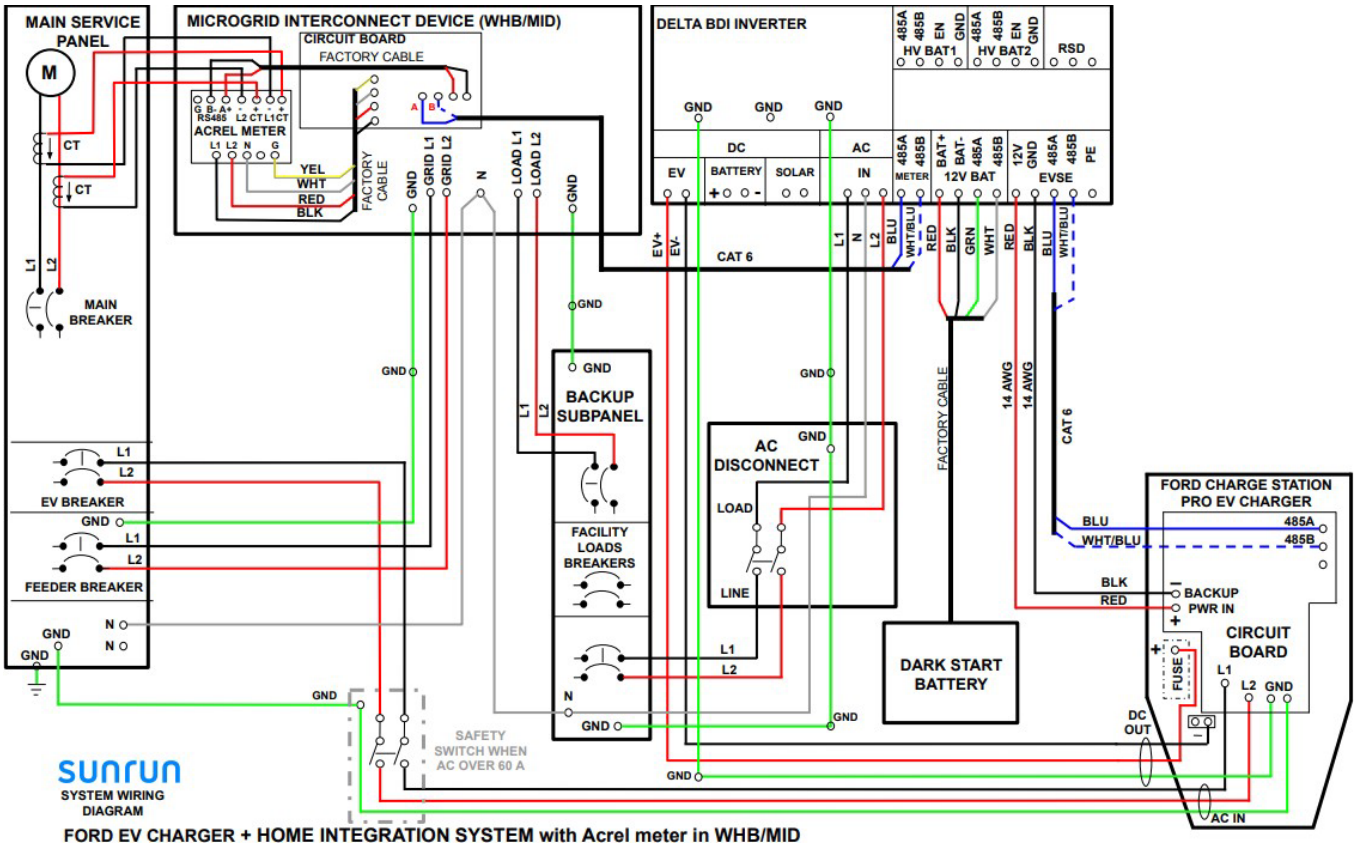
1. Nameplate capacity defined by storage capacity rather than inverter size
   - Vehicle batteries are an order of magnitude larger than most stationary storage
   - Limited from the start by customer usage and battery health parameters
2. Need to future-proof interconnection rules for evolving EV capabilities
3. Lower economic barriers by leveraging onboard EV telematics in place of a separate meter for bidirectional programs and billing
   - How can we avoid NGOMs for customers with NEM?

# Limit Engineering Resource Requirements

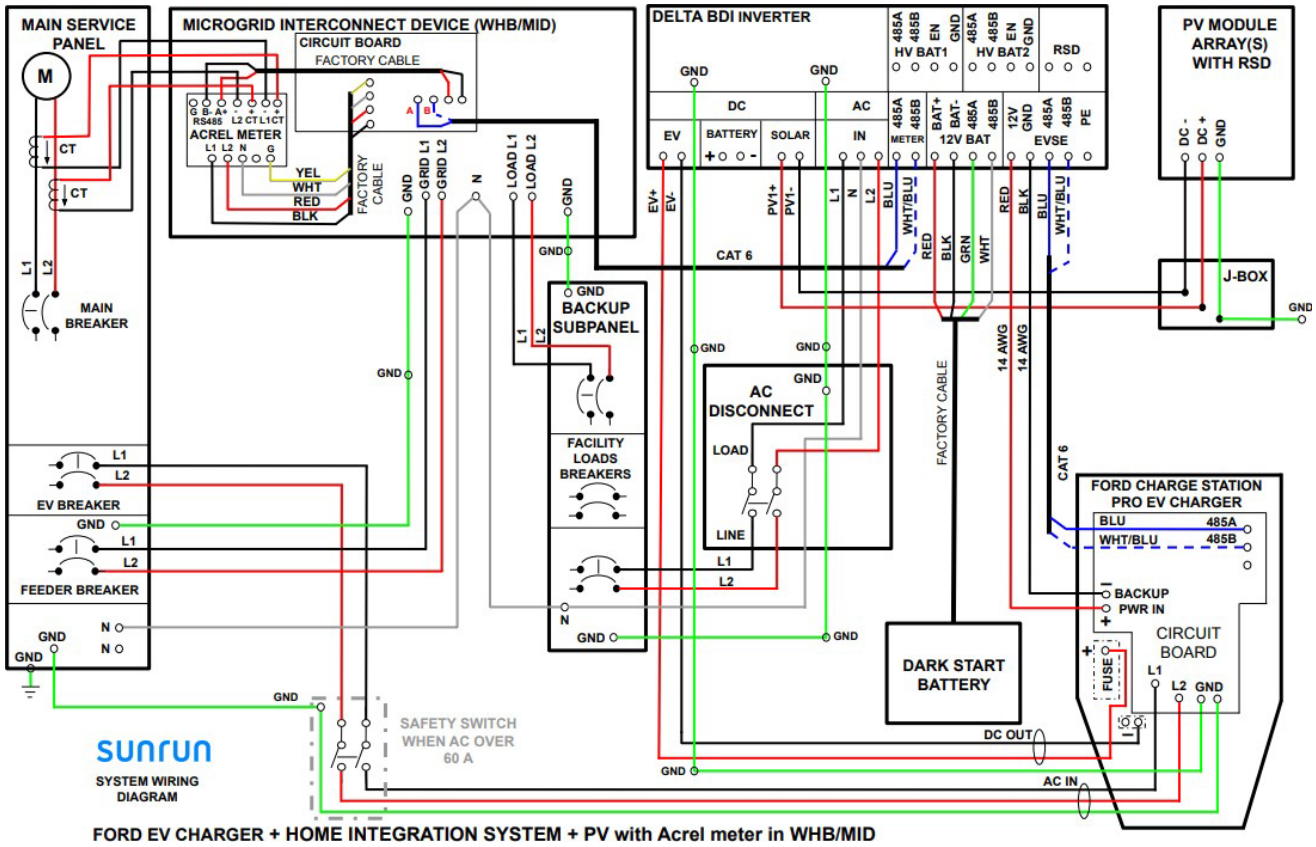
1. Bin customers at inverter capacity rather than battery size to limit engineering review burden
   - September 9th FERC decision ruled in favor of the inverter as "nameplate capacity"
2. Proactively adapt rules as bidirectional systems are rolled out in stages
   - Future chargers and vehicles will be equipped with more embedded capabilities
   - Avoid utilities being a DMV
3. Leverage EV telematics for efficient program management
   - EV telematics currently accepted and used for managed charging by CA IOUs (e.g. PG&E Charge Manager, etc.)
   - Need long-term solutions for mass adoption

Let’s Work Together to Future-Proof Bidirectional Vehicle Interconnection

# Charger + Home Integration System



# Charger + Home Integration System + PV




FORD EV CHARGER + HOME INTEGRATION SYSTEM + PV with Acrel meter in WHB/MID

# Long-term telematics-based **customer billing**

**Proposed elements for long-term telematics standard for rates and billing:**

1. **Accuracy standard:** Use the NIST Handbook 44 1% lab / 2% field accuracy.
2. **Under-reporting accuracy:** EV on-board metering will never be exactly the same as the measurement at the utility meter due to losses (EVSE loss, home wiring loss, etc.)

   **Key recommendation:** Can utilize a scaling factor that accounts for losses (e.g., calculated from EPRI NY testing data).

   A. **Data reading accuracy:** Accuracy of the EV on-board metering at the measurement point.

   **Key recommendation:** On-board meter accuracy, meter precision, and data reporting to improve to achieve the desired NIST Handbook 44 1% lab / 2% field accuracy standard

# Long-term telematics-based **customer billing**

## Proposed elements for long-term telematics standard for rates and billing:

**3. Geotagging/geofencing:** How can the OEM/telematics provider/utility determine whether the customer is charging at "home base" or elsewhere, and bill the customer accordingly?

- **Key recommendation:** Leverage Low Carbon Fuel Standard geotagging methodology, where charging within 110 meters of a home is attributed to that home account, and any charging within 220 meters of a non-residential site is associated with that non-residential site.

# Nameplate Capacity Case - US D.C. Court of Appeals
# September 9, 2025 - Solar Energy Industries Association v. FERC

The core of the dispute revolved around Broadview Solar, a facility comprising a 160 megawatt (MW) DC solar array, a 50 MW DC battery storage system, and inverters capable of sending a maximum of 80 MW of AC power to the electrical grid. Under PURPA, a "small power production facility" must have a "power production capacity" of no more than 80 MW to be eligible for certain regulatory advantages, including mandatory power purchase agreements with utilities.

The court's reasoning emphasized several key points:

**Holistic Facility View:** The statute refers to the "facility" as a whole, meaning all its components (solar array, battery, and inverters) working together, rather than just the capacity of a single subcomponent like the solar panels.

**Grid-Usable Power:** The focus is on the amount of electricity that is usable by the grid, which is AC power. The DC power generated by the solar panels or stored in the battery is not directly grid-usable until converted to AC.

**Consistent FERC Precedent:** FERC has consistently applied a "send-out" approach since 1981, defining power production capacity as the maximum output a facility can safely and reliably send to the interconnected utility.

**Battery's Role:** While the battery enhances the facility's capacity factor by allowing power to be delivered more consistently, it does not increase the instantaneous maximum AC power that can be sent to the grid, which remains limited by the inverters to 80 MW.

Therefore, because Broadview's inverters physically limit its output to the grid to 80 MW AC, the court affirmed FERC's decision that the facility qualifies as a "small power production facility" under PURPA.

# Fermata Energy Bi-Directional Chargers Update

# Shared Transformer Screening

Resonant Energy

# FLEXIBLE INTERCONNECTIONS

## MARK BENTSON



TSRG Sub-Group Update

# Flexible Interconnections Sub-Group Update

## Mission Statement:

Center discussion on the use of technology, improved methods, and products that can enable dynamic management of DER assets on the grid.

As a SubGroup, our primary aim is to define and review Flexible Connections across industry. The goal being to enable DER projects in appropriate areas to interconnect to avoid significant distribution system upgrades, while reducing costs and timeframes associated with the standard interconnection process. This includes defining policy on how curtailment will work for DERs. Success may allow for faster and cheaper integration of DERs by increasing the hosting capacity of existing grid infrastructure and/or increased penetration of DERs to the grid.

## Expected Group Output:

Deliverables and actionable next steps to be escalated/reported to the TSRG on the following:

- **Utility Controlled, Flexible Connections –** Use Cases, Thermal Constraints, Foundational technologies, scheduling, economics & markets, curtailment, studies, scaling.
- **Dynamic "Local" Control –** Enabling inverter functionality, Smart Inverter controls & Power Control systems, managing assets via Grid Services.

Bring/communicate any non-technical standard issues or topics to additional groups/DPU.

**Team**

| First Name | Last Name | Company |
|---|---|---|
| Gerry | Bingham | DOER |
| Russ | Aney | Parallel Products |
| Nachum | Sadan | GridEdge Networks |
| Doug | Pope | Pope Energy |
| Greg | Hunt | ZeroPoint Energy |
| Richard | Labrecque | Agilitas |
| Mrinmayee | Kale | NewLeaf Energy |
| John | Mosher | Solect Energy |
| Prasanth | Gopalakrishnan | Applied Systems Engineering Inc. |
| | | |

| First Name | Last Name | Company |
|---|---|---|
| Daniel | McDonough | National Grid |
| Michael | Porcaro | National Grid |
| Justin | Woodard | National Grid |
| Mark | Bentson | Eversource |
| Shakir | Iqbal | Eversource |
| Ryan | West | Eversource |
| Michael | Taniwha | Eversource |
| Jeannie | Amber | Eversource |
| Paul | Krell | Unitil |
| John | Bonazoli | Unitil |
| | | |

**Summary of Major Accomplishments & Upcoming Activities**

**Completed Activities:**

| DATE | DESCRIPTION OF ACTIVITY |
|---|---|
| 12/11/2023 | Kick off meeting with SMEs |
| 1/22/2024 | Review Flexibility SubGroup Charter, Defining Flexible Interconnections, Developer Feedback on Reporting |
| 3/7/2024 | Confirmed working definition and listed out scope |
| 4/12/2024 | Alignment on Initial Constraint Criterion (Thermal) and Initial Foundational Technologies (software, hardware/equipment, communication protocols - DNP3/IEEE 2030.5) |
| 5/21/2024 | Transmission system capabilities, impacts, & benefits and how this impacts our Flex Connect discussions moving forward. Thermal Constraints Data / Reporting for Viable Circuits – Preliminary List for early scaling. |
| 6/18/2024 | Initial IIRG – Flex Connect / DERMS language and deliverable list established for UL 3141, Failsafe items, & Data points |
| 7/22/2024 | UL 3141 "Outline of Investigation for Power Control Systems" criteria for equipment standardization – Review of scope, requirements, testing & optional testing. Out for industry review and comment. |
| 9/30/24 | Group alignment on carrying over existing IEEE 1547 subgroup scope. As we can move these to Flex Connect, then we can close the 1547 group. – Communications Protocols (DNP3, 2030.5, SunSpec Modbus), Customer Comms, & Grid Support functions |
| 10/21/24 | Introduction to defining fail safe mode operation/countermeasures: Communications Failures & Data Points (DNP3) |
| 11/25/24 | Advanced/Smart Inverter Functionality Presentation: Brian Lydic (IREC), Nachum Sadan (GridEdge Networks), and Jeffrey Albus (Eos Energy Enterprises) |
| 1/21/25 | Eversource presentation / Q&A of their recent Flexible Interconnection activities |
| 2/19/25 | Established Curtailment Catch-All Doc – Work to define "Curtailment"?, Defining policy on how curtailment will work for DERs, Industry thoughts on ways of curtailing, Feasibility analysis and curtailment studies, collaborative discussion between Utility and Industry |
| 3/19/25 | Refined Curtailment Catch-All Doc – Discussed %s in curtailment estimates, CIP areas, Hosting Capacity Fee, and potential use-cases not limited to 1) Full flexibility with estimated figures 2) "Hybrid" Model that ensures a confirmed amount of capacity in addition to flex capacity where available & not to exceed nameplate 3) Firm with schedule and adherence to schedule |
| 5/29/25 | Continued discussion on the Curtailment Catch-All Doc Flex connect schedules and implementation |
| 6/18/25 | How we study, what it means for customers 8760 models in connection with studies Different types of DE profiles, flex connect schedules and implementation |
| 7/31/25 | 8760 models in connection with studies Software packages; excel, Cyme, Synergi, Windmill, PSSE Data cleaning; net load vs gross load |
| 8/27/25 | When to offer flex connection in the process, which feeders/stations are most suitable for flex connect Thermal and voltage limits Use cases; PV only, PV + ESS, ESS Only |
| Upcoming Activities: | |
| | Establish deliverable document with scope list, decisions/outcomes, and highlighted differences of any EDCs / group members. Continue discussion on studies and 8760 modeling |

# DER EQUIPMENT REPLACEMENT

## JOHN BONAZOLI



TSRG Sub-Group Update

# In-Service DER Equipment Replacement Subgroup

## Mission:

To develop a comprehensive procedure to administer the replacement of in-service DER equipment.

## Expected Group Output:

The recommended procedure from this group will be presented to the TSRG and the IIRG for potential inclusion of interconnection tariff changes.

| Team | | | |
|---|---|---|---|
| Fist Name | Last Name | Affiliation | Role |
| Muhammad | Khan | Eversource | EDC Member |
| Shakir | Iqbal | Eversource | EDC Member |
| Ruvini | Kankanamalge | National Grid | EDC Member |
| Nathan | Walsh | National Grid | EDC Member |
| Jeremy | Kites | Unitil | EDC Member |
| Gerry | Bingham | MA DOER | Gov. Member |
| Courtney | Feeley Karp | MA DOER | Gov. Member |
| Nat | Haslett | revision | Guest |
| Tim | Snyder | ACT | Industry Member |
| Sam | Feigenbaum | Kearsage Energy | Industry Member |
| Andrew | Hickok | Solect Energy | Industry Member |
| John | Mosher | Solect Energy | Industry Member |
| John | Bonazoli | Unitil | Lead |

| Summary of Major Accomplishments & Upcoming Activities | |
|---|---|
| **Completed Activities:** | |
| DATE | DESCRIPTION OF ACTIVITY |
| 6/10/2025 | Kick-off meeting with full subgroup with industry and government reps. |
| 8/12/2025 | Created Matrix of equipment replacement categories and requirements |
| 8/26/2025 | Decision: separate requirements for systems under Simplified process |
| **Upcoming Activities/ Topics:** | |
| | Bi-weekly meetings of subgroup and EDC only meetings every other week. |
| Oct. 24, 2025 | Goal: Present recommended procedure to IIRG |

# METER SOCKET ADAPTERS (MSA)

## MIKE PORCARO



TSRG Sub-Group Update

# Meter Socket Adapter Sub-Group Update

## Mission Statement:

Ensuring safe, reliable and standardized implementation of meter socket adapters technology across the Utility network through technical expertise, stakeholder collaboration and foster regulatory compliance per Chapter 231 Section 151 of the MA State Law & applicable safety standards.

## Expected Group Output:

The goal of this subgroup is to ensure compliance with the MA State Law per Chapter 231 Section 151 by incorporating Meter Socket Adapters (MSA) for the Simplified Applicants and by ensuring that all safety & operational procedures of the EDCs are addressed. For clarifying purposes, it should be noted that this subgroup will not create guidelines for MSAs that do not support Distributed Generation such as EV Chargers.

| Team | | |
|---|---|---|
| First Name | Last Name | Company/Affiliation |
| Michael | Porcaro | National Grid |
| Shakir | Iqbal | Eversource |
| Patrick | Fam | Eversource |
| John | Bonazoli | Unitil |
| Brian | Canfield | National Grid |
| William | Nieman | National Grid |
| Gerry | Bingham | DOER |
| Courtney | Feeley-Karp | DOER |
| Carson | Bullock | DOER |
| Jonathan | Knauer | Connect DER |
| K | Munro | Connect DER |
| Tirzah | Shakespeare | Connect DER |
| Marc | Monbouquette | Enphase Energy |
| Marko | Rosenfeldt | Enphase Energy |
| Nathan | Charles | Enphase Energy |
| Beau | Millett | Tesla |
| Dominic | Gatti | Tesla |
| N | Caner | Tesla |
| Russ | Aney | Parallel Products |

| Summary of Major Accomplishments & Upcoming Activities | |
|---|---|
| **Completed Activities:** | |
| DATE | DESCRIPTION OF ACTIVITY |
| 8/11/25 | Kick off – Group expectation setting, mission statement and outcome development |
| 9/11/25 | Manufacturer presentation on product details including installation, equipment accuracy, included protections, etc |
| | |
| Upcoming Activities: | |
| 10/13/25 | Review of draft list of use restrictions<br>Discussion on next steps toward 3 main goals established in first group meeting:<br>1. Process for evaluating devices<br>2. Updates to utility field procedures<br>3. Installation practices and agreements |

# IIRG GROUP UPDATE

## KATE TOHME/BRETT JACOBSON



IIRG Group

# ESS SUB-GROUP UPDATE

## MIKE PORCARO



IIRG Sub-Group

# IIRG Energy Storage Sub-Group Update

## Mission Statement:

Scope of the IIRG Energy Storage Sub-Group is limited to energy storage topics related to interconnection and processes overseen by the DPU. Topics discussed by the group may tangentially relate to other elements, however each substantive topic must be centrally focused on its relation to energy storage.

## Expected Group Output:

Recommendations from the group shall focus on process recommendations to the DPU for processes under their purview. Technical topics may come up in natural course and will be discussed to the extent practical. This sub-group will develop recommendations on technical topics when appropriate, however detailed discussion and decisions on technical topics will be deferred to the Technical Standards Review Group (TSRG).

| Team | | |
|---|---|---|
| First Name | Last Name | Company/Affiliation |
| Michael | Porcaro | National Grid |
| Greg | Hunt | Zero Point Energy |
| John | Mosher | Agilitas Energy |
| Nathan | Walsh | National Grid |
| Shakir | Iqbal | Eversource |
| Mark | Bentson | Eversource |
| Jeremy | Kites | Unitil |
| John | Bonazoli | Unitil |
| Natalie | Treat | ACT |
| Sarah | Bresolin | ENGIE North America Inc. |
| Silas | Bauer | Seal Rock Energy |
| Mrinmayee | Kale | New Leaf Energy |
| Chris | Modlish | AGO |
| Tom | Ferguson | MA DOER |
| Ryan | McGlothlin | Silo Electric |

| Summary of Major Accomplishments & Upcoming Activities | |
|---|---|
| **Completed Activities:** | |
| DATE | DESCRIPTION OF ACTIVITY |
| 6/16/25 | Substantive Topic summaries<br>Topic 01: ESS Metering – Delineation of charging load vs station service load and associated PCC meter arrangement implications<br>Topic 02: Open Loop Response Time – Requirements on OLRT performance and testing |
| | Due to ongoing efforts related to ESS in other forums, and group member availability challenges in the summer, the group decided to pause for July and August, picking up again in September |
| | |
| Upcoming Activities: | |
| 9/23/25 | Review efforts progressing in other forums related to ESS.<br>Prioritize a list of substantive topics for the sub-group to address. |

# FLEX INTERCONNECTIONS SUB-GROUP UPDATE



## MIKE PORCARO

IIRG Sub-Group

# IIRG Flexible Connections Sub-Group Update

## Mission Statement:

Develop a comprehensive & standardized set of flexible interconnection options for DERs and EVs in an iterative manner based on system, customer and market needs

## Expected Group Output:

Recommendations from the group shall focus on process recommendations to the DPU for processes under their purview. Technical topics may come up in natural course and will be discussed to the extent practical. This sub-group will develop recommendations on technical topics when appropriate, however detailed discussion and decisions on technical topics will be deferred to the Technical Standards Review Group (TSRG).

| Team | | |
|---|---|---|
| First Name | Last Name | Company/Affiliation |
| Michael | Porcaro | National Grid |
| Sean | Burke | Bluewave |
| Chris | Modlish | AGO |
| Nikhil | Balakumar | AGO (Facilitator) |
| Kayla | Burns | AGO |
| Carson | Bullock | DOER |
| Gerry | Bingham | DOER |
| Courtney | Feely-Karp | DOER |
| Kate | Tohme | New Leaf Energy |
| Joshua | Briggs | Lodestar Energy |
| Daniel | Passarello | Nexamp |
| Brian | Lydic | IREC |
| Brett | Jacobson | Eversource |
| Michael | Taniwha | Eversource |
| Mark | Bentson | Eversource |
| Jill | Duplessis | Eversource |
| Michael | Porcaro | National Grid |
| Sean | Burke | Bluewave |

| Summary of Major Accomplishments & Upcoming Activities | |
|---|---|
| **Completed Activities:** | |
| DATE | DESCRIPTION OF ACTIVITY |
| 9/17/25 | Kick off – Group expectation setting, mission statement and outcome development. Seeking to define:<br>• Flexible Interconnection program offerings<br>• Clear definitions of terms and program constructs<br>• Resulting advisory and/or filing to DPU as required by outcomes |
| | |
| Upcoming Activities: | |
| | • Bi-weekly meetings with in-person workshops as needed - Timelines are being developed currently. |

# GROUP STUDY STATUS UPDATES

# Group Study Status Update

- The EDCs have provided the below links for Group Study status updates
- Status is updated monthly
- Intended to be generally informative on Group Study timeline expectations
- Included here for reference and general discussion, however Group specific questions may need to be deferred to a separate Group specific forum

- **Eversource**

  - https://www.eversource.com/content/residential/about/doing-business-with-us/interconnections/massachusetts/distribution-group-studies

  - The Company has filed the following Group Study CIPs in June 2025:
    - Southwick-Granville Group Study CIP
    - New Bedford Group Study CIP
    - Dalton-Hinsdale Group Study CIP
    - Gill-Montague Group Study CIP

- **National Grid**

  - https://gridforce.my.site.com/s/article/MA-Distribution-Group-Study-Documents

- **Unitil**

# OPERATIONAL PARAMETERS FOR ENERGY STORAGE SYSTEMS (OPESS) TARIFF UPDATE

# DISPATCH LIMITING SCHEDULE UPDATE



National Grid
Emily Slack

# Dispatch Limiting Schedule Investigation

nationalgrid

# NG Dispatch Limiting Schedule (DLS) Investigation

## National Grid's Current Dispatch Limiting Schedule:

- Two seasonally varying time blocks, allowing **either charge or discharge within available capacity**

Table 5.1.5-1: National Grid BESS Import/Export Schedule

| BESS Season/Operation | Charging (Import) Hours | Discharging (Export) Hours |
|---|---|---|
| Spring (03/01-05/14) | 11PM-5PM | 5PM-11PM |
| Summer (05/15-09/14) | 11PM-3PM | 3PM-11PM |
| Fall (09/15-11/30) | 11PM-4PM | 4PM-11PM |
| Winter (12/01-02/28) | 11PM-3PM | 3PM-11PM |

- Available capacity identified to avoid **all identified thermal overloads**
- Curtailment in **increments of 100 kW**

The DLS construct is designed to limit the impact of ESS to the EPS's ability to safely and reliably accommodate end use load. Any grid services offerings would be incremental to this baseline construct.

# NG Dispatch Limiting Schedule (DLS) Investigation

**Purpose: explore the implications of adopting a modified DLS with the following characteristics:**

- Four seasonally varying time blocks, each allowing both **charge and discharge within available capacity**

| | | | | |
|---|---|---|---|---|
| **Discharge Limit Schedule (DLS)** | **07:00 - 12:00** | **12:00 - 15:00** | **15:00 - 19:00** | **19:00 - 07:00** |
| **Charge Limit Schedule (CLS)** | **06:00 - 11:00** | **11:00 - 15:00** | **15:00 - 22:00** | **22:00 - 06:00** |

- Available capacity identified to avoid **thermal overload of the substation transformer**
- Curtailment in defined intervals (**25% nameplate** or comparable)

# Timeline

| Month(s) | Action |
|---|---|
| June | Develop alternative DLS and supporting deliverables with the above characteristics |
| July-September | Develop illustrative examples of the outcome of analysis in National Grid territory |
| September | Present alternative DLS and illustrative examples at September TSRG, and receive feedback on preferred approach |
| October | Internal review and determination of any changes that will be made |
| November-December | Prepare implementation materials as required |
| Early 2026 | Implement DLS decision |

# Example Development

**National Grid selected 6 examples from among ESS studies conducted across its service territory:**

- **2 examples from BSN (North Shore, Merrimack Valley)**
- **2 examples from BSW[1] (Central, Western)**
- **2 examples from BSS (South Shore, Southeast)**

[1] the appendix provides a 7th example from BSW, not included in summary slide

# Summary of Results

| | Current DLS | Alternative DLS | |
|---|---|---|---|
| 1 | **0 charge all seasons**<br>No additional system modifications | **Curtailed charge 2 seasons**<br>**0 charge 2 seasons**<br>New feeder required | *Feeders more constrained than transformer* |
| 2 | **0 charge all seasons**<br>No additional system modifications | **0 charge all seasons**<br>No additional system modifications | |
| 3 | **Curtailed charge 1 season**<br>No additional system modifications | **Uncurtailed charge all seasons**<br>New feeder and transformer required | *Feeders more constrained than transformer* |
| 4 | **Curtailed charge 1 season**<br>No additional system modifications | **Uncurtailed charge all seasons**<br>Full substation rebuild required | *Feeders more constrained than transformer* |
| 5 | **0 charge all seasons**<br>No additional system modifications | **Curtailed charge 2 seasons**<br>**0 charge 2 seasons**<br>New feeder required | *Feeders more constrained than transformer* |
| 6 | **0 charge all seasons**<br>No additional system modifications | **Curtailed charge 2 seasons**<br>**0 charge 2 seasons**<br>New feeder required | *Feeders more constrained than transformer* |

**Bold text** denotes capacity available under a DLS, communicated at Preliminary Assessment

Non-bold text denotes system modifications required *when operating under the DLS*, communicated at SIS completion

# Observations

- **Alternative DLS offers more capacity allocation to ESS**
  - More viable for ESS to operate without substation modifications
  - Less capacity for end use, particularly in overnight hours targeted by EV (including managed charging) and EH
- **Illustrative examples show that often, issue is capacity constrained systems aggravated by ESS charging rather than the DLS construct itself**
  - 4 examples have at least one season with no charging capacity under either DLS construct)
  - Capacity constraints at feeder level not addressed by alternative DLS
- **Operational (not scheduled) flexibility ultimately allows the greatest potential for ESS in a capacity-constrained system**

# Illustrative Examples

nationalgrid

# Example 1: (2) 4.992 MW ESS's

## Current DLS

### Preliminary Assessment

Thermal upgrades for nameplate:

- Upgrade Substation or New Substation
- New Feeder

DLS to avoid thermal substation/feeder upgrades:

| Season | Charge | Discharge |
|---|---|---|
| Spring | 0 MW | -9.984 MW |
| Summer | 0 MW | -9.500 MW |
| Fall | 0 MW | -9.984 MW |
| Winter | 0 MW | -9.984 MW |

### Final SIS

Thermal upgrades required when adopting DLS above:

- None.

## Alternative DLS

### Preliminary Assessment

Thermal substation upgrades for nameplate:

- Upgrade Substation or New Substation

DLS to avoid thermal substation upgrades:

| Season | CLS-1 06-11:00 | CLS-2 11-15:00 | CLS-3 15-22:00 | CLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | 0.00 | 5.00 | 7.50 | 5.00 |
| Summer | 5.00 | 5.00 | 7.50 | 10.00 |
| Fall | 0.00 | 0.00 | 0.00 | 0.00 |
| Winter | 0.00 | 0.00 | 0.00 | 0.00 |

| Season | DLS-1 07-12:00 | DLS-2 12-15:00 | DLS-3 15-19:00 | DLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | -9.984 | -9.984 | -9.984 | -9.984 |
| Summer | -9.984 | -9.984 | -9.984 | -9.984 |
| Fall | -9.984 | -9.984 | -9.984 | -9.984 |
| Winter | -9.984 | -9.984 | -9.984 | -9.984 |

### Final SIS when adopting DLS

Thermal upgrades required when adopting DLS above:

- Station: No work is required because spare feeder position is available along with protection relays.
- Feeder: New feeder with 0.2 miles underground cable, 0.4 miles of overhead construction, and 0.04 miles of civil work

# Example 2: 5 MW ESS W/ 2 MW Max Charge

## Current DLS

### Preliminary Assessment

Thermal upgrades for nameplate:

- New Transformer and Metal-Clad Switchgear
- New Feeder Position

DLS to avoid thermal substation/feeder upgrades:

| Season | Charge | Discharge |
|---|---|---|
| Spring | 0 MW | - 5 MW |
| Summer | 0 MW | - 5 MW |
| Fall | 0 MW | - 5 MW |
| Winter | 0 MW | - 5 MW |

### Final SIS

Thermal upgrades required when adopting DLS above:

- None

## Alternative DLS

### Preliminary Assessment

Thermal substation upgrades for nameplate:

- New Transformer and Metal-Clad Switchgear

DLS to avoid thermal substation upgrades:

| Season | CLS-1 06-11:00 | CLS-2 11-15:00 | CLS-3 15-22:00 | CLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | 0 | 0 | 0 | 0 |
| Summer | 0 | 0 | 0 | 0 |
| Fall | 0 | 0 | 0 | 0 |
| Winter | 0 | 0 | 0 | 0 |

| Season | DLS-1 07-12:00 | DLS-2 12-15:00 | DLS-3 15-19:00 | DLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | -5 | -5 | -5 | -5 |
| Summer | -5 | -5 | -5 | -5 |
| Fall | -5 | -5 | -5 | -5 |
| Winter | -5 | -5 | -5 | -5 |

### Final SIS when adopting DLS

Thermal upgrades required when adopting DLS above:

- None

# Example 3: Two 5 MW ESS

## Current DLS

### Preliminary Assessment

Thermal upgrades for nameplate:

- New feeder position: 4th substation feeder
- New transformer: (second) transformer triggered by installation of 4th feeder
- Install 600 feet of UG and 500 feet of OH line extension for new feeder.

DLS to avoid thermal substation/feeder upgrades:
*Combined total for both 5MW ESS sites.*

| Season | Charge (MW) | Discharge (MW) |
|---|---|---|
| Spring | 0 | - 5.0 |
| Summer | 0.50 | 0 |
| Fall | 0 | - 3.5 |
| Winter | 0 | - 3.5 |

### Final SIS

Thermal upgrades required when adopting DLS above:

- None

## Alternative DLS

### Preliminary Assessment

Thermal substation upgrades for nameplate:

- None

DLS to avoid thermal substation upgrades:
*Combined total for both 5MW ESS sites.*

| Season | CLS-1 06-11:00 | CLS-2 11-15:00 | CLS-3 15-22:00 | CLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | 10 | 10 | 10 | 10 |
| Summer | 10 | 10 | 10 | 10 |
| Fall | 10 | 10 | 10 | 10 |
| Winter | 10 | 10 | 10 | 10 |

| Season | DLS-1 07-12:00 | DLS-2 12-15:00 | DLS-3 15-19:00 | DLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | - 10 | - 10 | - 10 | - 10 |
| Summer | - 10 | - 10 | - 10 | - 10 |
| Fall | - 10 | - 10 | - 10 | - 10 |
| Winter | - 10 | - 10 | - 10 | - 10 |

### Final SIS when adopting DLS

Thermal upgrades required when adopting DLS above:

- New feeder position: 4th substation feeder
- New transformer: (second) transformer triggered by installation of 4th feeder
- Install 600 feet of UG and 500 feet of OH line extension for new feeder.

# Example 4: One 5 MW ESS

## Current DLS

### Preliminary Assessment

Thermal upgrades for nameplate:

- Transformer upgrade and third feeder addition
- 6,000 feet of overhead line extension for new feeder.

DLS to avoid thermal substation/feeder upgrades:

| Season | Charge (MW) | Discharge (MW) |
|---|---|---|
| Spring | 0 | - 4.4 |
| Summer | 0 | - 2.0 |
| Fall | 0.40 | - 4.0 |
| Winter | 0 | - 5.0 |

### Final SIS

Thermal upgrades required when adopting DLS above:

- None

## Alternative DLS

### Preliminary Assessment

Thermal substation upgrades for nameplate:

- None

DLS to avoid thermal substation upgrades:

| Season | CLS-1 06-11:00 | CLS-2 11-15:00 | CLS-3 15-22:00 | CLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | 5 | 5 | 5 | 5 |
| Summer | 5 | 5 | 5 | 5 |
| Fall | 5 | 5 | 5 | 5 |
| Winter | 5 | 5 | 5 | 5 |

| Season | DLS-1 07-12:00 | DLS-2 12-15:00 | DLS-3 15-19:00 | DLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | - 5 | - 5 | - 5 | - 5 |
| Summer | - 5 | - 5 | - 5 | - 5 |
| Fall | - 5 | - 5 | - 5 | - 5 |
| Winter | - 5 | - 5 | - 5 | - 5 |

### Final SIS when adopting DLS

Thermal upgrades required when adopting DLS above:

- Substation Rebuild:
  - Triggered by need for transformer replacement and new feeder.
  - Due to small footprint of existing substation and surrounding wetlands a new greenfield substation is required.
- 6,000 feet of overhead line extension for new feeder.

# Example 5: 5 MW ESS

## Current DLS

### Preliminary Assessment

Thermal upgrades for nameplate:

- Upgrade two (2) substation transformers
- Install a new feeder

DLS to avoid thermal substation/feeder upgrades:

| Season | Charge | Discharge |
|---|---|---|
| Spring | 0 MW | 4.99 MW |
| Summer | 0 MW | 4.99 MW |
| Fall | 0 MW | 4.99 MW |
| Winter | 0 MW | 4.99 MW |

### Final SIS

Thermal upgrades required when adopting DLS above:

- None

## Alternative DLS

### Preliminary Assessment

Thermal substation upgrades for nameplate:

- Upgrade two (2) substation transformers

DLS to avoid thermal substation upgrades:

| Season | CLS-1<br>06-11:00 | CLS-2<br>11-15:00 | CLS-3<br>15-22:00 | CLS-4<br>22-06:00 |
|---|---|---|---|---|
| Spring | 0 | 0 | 0 | 1.25 |
| Summer | 0 | 0 | 0 | 0 |
| Fall | 0 | 1.25 | 0 | 3.75 |
| Winter | 0 | 0 | 0 | 0 |

| Season | DLS-1<br>07-12:00 | DLS-2<br>12-15:00 | DLS-3<br>15-19:00 | DLS-4<br>22-06:00 |
|---|---|---|---|---|
| Spring | -4.99 | -4.99 | -4.99 | -4.99 |
| Summer | -4.99 | -4.99 | -4.99 | -4.99 |
| Fall | -4.99 | -4.99 | -4.99 | -4.99 |
| Winter | -4.99 | -4.99 | -4.99 | -4.99 |

### Final SIS when adopting DLS

Thermal upgrades required when adopting DLS above:

- Install a new feeder with 750' underground section and 9300' of overhead section and area feeder reconfiguration.

# Example 6: 5 MW ESS

## Current DLS

### Preliminary Assessment

Thermal upgrades for nameplate:

- Install a new feeder position at nearby substation
- Install a new feeder double circuiting the existing feeder to serve the battery

DLS to avoid thermal substation/feeder upgrades:

| Season | Charge | Discharge |
|---|---|---|
| Spring | 0 MW | 4.99 MW |
| Summer | 0 MW | 4.99 MW |
| Fall | 0 MW | 4.99 MW |
| Winter | 0 MW | 4.99 MW |

### Final SIS

Thermal upgrades required when adopting DLS above:

- None

## Alternative DLS

### Preliminary Assessment

Thermal substation upgrades for nameplate:

- Install a new feeder position at nearby substation

DLS to avoid thermal substation upgrades:

| Season | CLS-1 06-11:00 | CLS-2 11-15:00 | CLS-3 15-22:00 | CLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | 0 | 0 | 0 | 1.25 |
| Summer | 0 | 0 | 0 | 0 |
| Fall | 0 | 2.5 | 0 | 5.00 |
| Winter | 0 | 0 | 0 | 0 |

| Season | DLS-1 07-12:00 | DLS-2 12-15:00 | DLS-3 15-19:00 | DLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | -4.99 | -4.99 | -4.99 | -4.99 |
| Summer | -4.99 | -4.99 | -4.99 | -4.99 |
| Fall | -4.99 | -4.99 | -4.99 | -4.99 |
| Winter | -4.99 | -4.99 | -4.99 | -4.99 |

### Final SIS when adopting DLS

Thermal upgrades required when adopting DLS above:

- Install a new feeder position at nearby substation
- Install a new feeder double circuiting the existing feeder to serve the battery.

# Example 7: One 5 MW ESS

## Current DLS

### Preliminary Assessment

Thermal upgrades for nameplate:

- New feeder position with 1,700 feet of UG extension.

DLS to avoid thermal substation/feeder upgrades:

| Season | Charge (MW) | Discharge (MW) |
|---|---|---|
| Spring | 2.0 | - 5.0 |
| Summer | 0 | - 5.0 |
| Fall | 3.24 | - 5.0 |
| Winter | 0 | - 5.0 |

### Final SIS

Thermal upgrades required when adopting DLS above:

- None

## Alternative DLS

### Preliminary Assessment

Thermal substation upgrades for nameplate:

Thermal upgrades for nameplate:

- New feeder position with 1,700 feet of UG extension.

DLS to avoid thermal substation upgrades:

| Season | CLS-1 06-11:00 | CLS-2 11-15:00 | CLS-3 15-22:00 | CLS-4 22-06:00 |
|---|---|---|---|---|
| Spring | 5 | 5 | 5 | 5 |
| Summer | 5 | 5 | 5 | 5 |
| Fall | 5 | 5 | 5 | 5 |
| Winter | 5 | 5 | 5 | 5 |
| **Season** | **DLS-1 07-12:00** | **DLS-2 12-15:00** | **DLS-3 15-19:00** | **DLS-4 22-06:00** |
| Spring | - 5 | - 5 | - 5 | - 5 |
| Summer | - 5 | - 5 | - 5 | - 5 |
| Fall | - 5 | - 5 | - 5 | - 5 |
| Winter | - 5 | - 5 | - 5 | - 5 |

### Final SIS when adopting DLS

Thermal upgrades required when adopting DLS above:

- New feeder position 1,700 feet of UG extension

# TECHNICAL STANDARDS UPDATE

# EDC Technical Standards

- As needed, EDC Technical Standards may be updated

**National Grid**

- NG to provide Updates

**Unitil**

- Unitil to provide Updates

**Eversource**

- See Next Slide

# Eversource Technical Standard Update

- Relabeled the external Interconnection Standard Document to 'Technical Interconnection and Interoperability Requirements for DERs (TIIR)'
- Corrected the reference to each State Interconnection Rules and Standards, IEEE 1547 reference and ISO-NE SRD Document reference
- Added reference to DER Gateway requirement for both the Company and Customer owned in Section 2.6.1. indicating that such devices will be able to provide indication, telemetry and control aspect of the DER
- Updated Section 2.8 in reflecting the Recloser and a DER Gateway requirement for projects 500 kW and larger
- Updated language in Section 3.2 on the Rapid Voltage Change assessment for DERs to be compliant with IEEE 1547-2018 Clause 7.2.2.
- In Section 3.3 for Voltage Regulation and Power Factor, added a language on power factor assessment of 0.9 pF leading and lagging. Also included the reference of having DERs capability of operating under Volt/VAR mode for projects larger than 1 MW
- In Section 3.4 for Transformer Reverse Power Flow, added the clarifying language on the consideration of minimum forward load for the transformer thermal capacity evaluation

# Eversource Technical Standard Update

- In Section 3.10 for Design Changes, added a link to the Company's website on the Design Change process
- In Section 3.12, added more clarifying language on the ROI screenings and the need for EMT studies in ensuring compliance with IEEE 1547 Standard
- Added Section 3.13 on Transient Over-Voltage (TOV) and a need for the EMT study in validating the compliance with IEEE 1547 Standard
- Updated Section 4.10 on Grounding and Bonding to reflect Effective Grounding criteria to align with the Xo/X1 < 3 as discussed in the April TSRG Meeting
- Updated Section 5 on Spot & Area Networks to reflect minimum import protection that would trip the DER breaker and isolate from the EPS any time power import at POI drops below 10% of the Customer's minimum load or 10% of the Facility's gross name plate rating, whichever is greater.

# TSRG COMMON TECHNICAL STANDARDS MANUAL UPDATE

# Proposed Updates

- Updated Company links for their Technical Standards Reference in Section 3.1
- Updated Section 4.1 for Eversource on ROI Screening Process to indicate that the Company follows SANDIA ROI criteria & reference to EMT studies if required
- Updated Section 4.1 for National Grid on ROI Screens for different sizes of DERs and applicable SANDIA screens in relation to the percent of UL-1741-SB Certified Inverters on the feeder. Updated reference on the DTT requirement for non-certified DERs



- Updated Section 4.2 for Eversource indicating that Reclose Blocking is not used by Eversource
- Added a bullet in Section 4.3 for DTT Requirement indicating DERs which do not trip off within 2 seconds following the formation of an island
- Updated Section 5 on Feeder Limits for Eversource indicating no thermal violations should be incurred under all operating conditions. Added a reference to Distribution Planning Guide for feeder thermal loading limitations which are 90% for overhead and 80% for underground cables. These limits are applicable to all DER types. Added a reference to maintaining voltage criteria per ANSI Standards.

# Proposed Updates

- Updated Section 5.1 to replace the reference of 25% with a percentage of the max peak load. Added a reference for Eversource that when measurement data is not available, the minimum day-time load is calculated as 31% of the max peak load and min night-time load is defined as 18% of the max peak load.
- Updated Section 6.1 to add a reference for DER Gateway requirement for projects >= 500 kW Sites. Updated Tabe 1 for National Grid for RTU requirement for Non IPP Generating Capacity.
- Updated Section 6.3 on RMAC Communications for Eversource indicating Comms mediums such as Cellular, D-SCADA & Fiber
- Update to Table 2 in Section 7 for Protective Device Requirements in deleting the column for Area EPS Voltage Class
- Updated Section 8.3 to reflect PE Stamp on current As-Built Single Line Diagram and also As-Built Relay Settings
- Updated Section 8.4 on Testing Points to replace the reference of NPCC curve to ISO-NE Source Requirement Document (SRD) and added 79 and a 32 relay reference to the Testing Point list. A reference on the Volt/VAR curve validation and the SPOV set-point is also made in this section.

# Proposed Updates

- Updated Section 9 on Voltage Regulation & Power Factor to add a reference for Eversource indicating that the DER could be evaluated for power factor operation between 0.9 leading and lagging. Furthermore, projects larger than 1 MW could be required to operate under Volt/VAR mode
- Updated Section 12.2 Capacity Limit For Substation Reverse Power Flow to indicate that the minimum forward loading of the Transformer would be considered for Capacity limit assessment as oppose to transformer nameplate with no consideration to any forward load.
- In Section 13 for Network Interconnections, added a reference to Company's Technical Standards for any further interconnection requirements
- Updated the title for Section 14 to reflect Rapid Voltage Change (RVC) and added a Section for Eversource requiring DERs to be compliant with IEEE 1547-2018 Clause 7.2.2.
- Updated the title for Section 16.3 to state Limiting Import & Export & updated the reference to import limitation in this section
- In Section 16.4 for Charging Methods, updated the reference of MDPU 1320 which is National Grid's DER Tariff reference to Standards for Interconnection of Distributed Generation Tariff.
- Removing the Section 16.6.2 as there is no specific document on the study process on ESS from all EDCs.
- Added a new Section 18 on Transient Over-Voltage Assessment

# Proposal on updating Common Technical Standards Manual

- EDCs to submit the redlines to TSRG Members for their comments by Oct 24th
- TSRG Members to provide feedback by Nov 21st
- Final Comments to discuss in the December 11th TSRG meeting and seek voting on the edits



- EDCs are requesting to remove the 'Common Technical Guideline Matrix' file from the Website as the content of the topics from each Company is captured within the Common Technical Standards Manual along with a Revision History to document any changes or updates

# THANK YOU!



Next Quarterly Meeting:

**Thursday December 11th 2025 1PM-4PM**