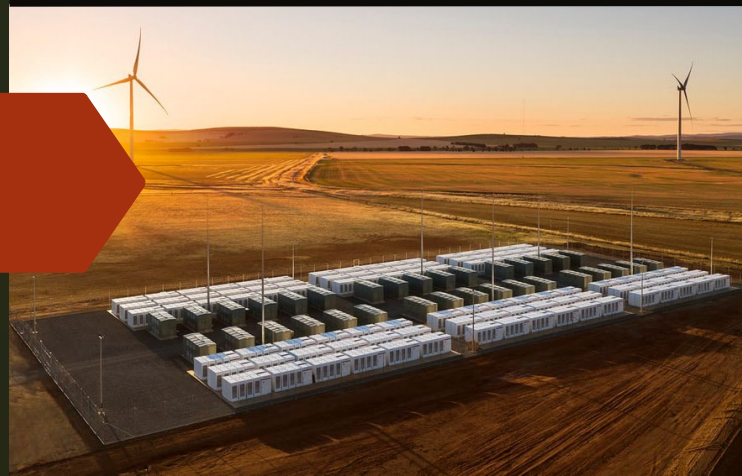
Massachusetts Technical Standards Review Group (TSRG)

Quarterly Meeting- June 30th, 2025



Agenda

- Meter Socket Adapters Discussion (Guest Speakers) (~40 min)
- Metering Update (Eversource) (~15 min)
- FERC 2222 (~30 min)
- TSRG Sub-Committee Updates (~15 min)
  - Flexible Interconnections
  - DER Equipment Replacement
- Tariff Revision Process update (~30 min)
  - IIRG process update and procedural schedule
  - IIRG ESS Subgroup
- Group Study Status Update (~20 min)
  - Eversource
  - National Grid
- Queue Management/Study Philosophy Change Applicability (ESS) (~5 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 September 18th, 1PM-4PM
    - Thursday December 11th 1PM-4PM
  - Send topics for future meetings to:
    - Shakir Iqbal (shakir.Iqbal@eversource.com)
    - Tony Morreale (tmorreale@ligconsultants.com)

METER SOCKET ADAPTERS

A COST-SAVING TECHNOLOGY FOR CLEAN ENERGY DEPLOYMENT

MASSACHUSETTS TECHNICAL STANDARDS REVIEW GROUP

MEETING #46 | JUNE 30, 2025

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Statutory Requirements

- MSAs included in omnibus energy bill, "An Act Promoting a Clean Energy Grid, Advancing Equity and Protecting Ratepayers," signed into law in 2024
- MA utilities required to create process to qualify MSAs and publish results w/in 60 days of new product request
- The law describes minimal product technical standards and allows different entities to install

Section 151

(a) For the purposes of this section, "meter socket adapter" shall mean an electronic device that is installed between a residential electric meter and the meter socket, for the purpose of facilitating the deployment of customer-owned or customer-leased technology.

(b) An electric company shall authorize the installation and operation of a meter socket adapter, whether the meter socket is owned by a residential customer or by a third-party, if the meter socket adapter:

(i) is qualified to be connected to the supply side of the service disconnect pursuant to the applicable provisions of the National Electric Code;

(ii) is approved or listed by a nationally recognized testing laboratory and is rated appropriately for the meter socket into which it is intended to be installed;

(iii) is certified to meet all applicable standards, as determined by a nationally recognized testing laboratory approved by the department; and

(iv) does not prevent access to the sealed meter socket compartment or the pull section of the service section of the electric meter or switchboard, as applicable.

(c) A manufacturer of a meter socket adapter, a third-party, a residential customer or an electric company shall all be allowed to install, maintain or service a meter socket adapter or associated equipment.

(d) An electric company shall approve or disapprove a request for approval of a specific model of meter socket adapter for installation in its service area not later than 60 days after a manufacturer, a third-party or a residential customer submits a request for approval of the specific model of meter socket adapter. An electric company shall provide public notice of all decisions approving a meter socket adapter, including by posting the information on the company's website. Should an electric company disapprove a specific model of meter socket adapter, the electric company shall provide an explanation to the requesting vendor providing the reasons the application was denied.

(e) The department may adopt rules and regulations as necessary to implement the provisions of this section.

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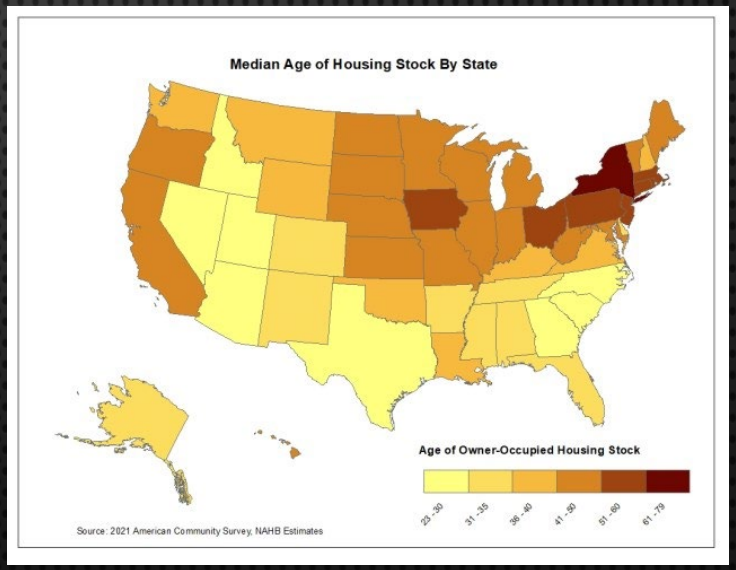
DER Installation Challenges → MSA Benefits

- DER installations commonly trigger main service panel ("MSP") replacements
- Exterior "taps" are often extremely difficult to install or impractical.
- Complex interior conduit + wiring adds time + cost to installations, especially for back-up power configurations.

However, MSAs can:

- Eliminate MSP replacements when it's otherwise unnecessary
- Simplify solar, storage, and other DER installations by avoiding complex rewiring



Older housing stock, like much of Massachusetts, is more susceptible to unexpected cost increases at installation

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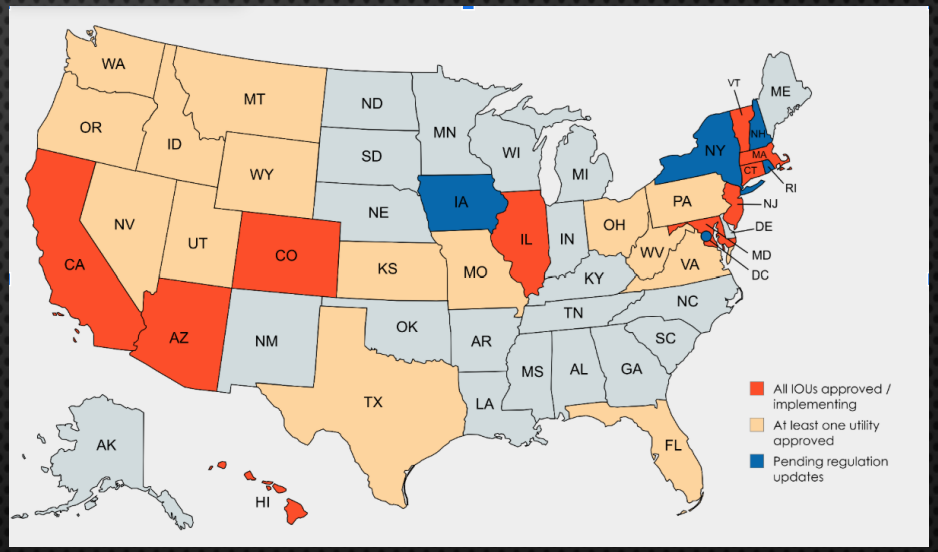
Widespread Adoption

- MSAs are increasingly being relied upon to suppress costs associated with DER adoption.
- Roughly one-third of US households live in a utility territory where MSAs are approved.
- Electrically, MSAs are no different than line-side taps to connect DERs.



States where utilities have approved MSAs

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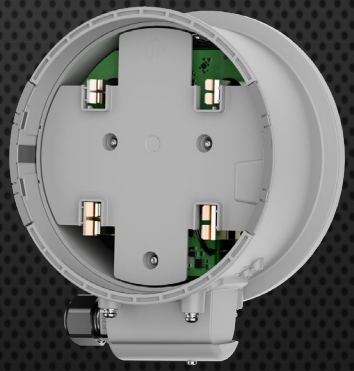
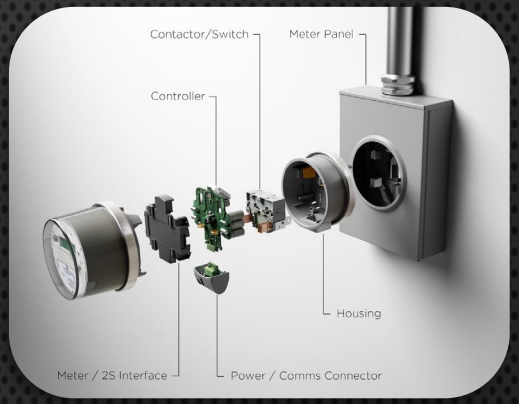
How MSAs Work

- **MSAs are conductors in plastic casing that interface between the utility service and the utility meter and can provide several features + functions:**
  - **Additional supply-side connection / Point of Interconnection to streamline additional load and / or generating DERs**
  - **Microgrid interconnect device ("MID") to streamline isolation of home loads / DERs in providing back-up power / resilience**
  - **Additional sources of metering, grid service controls, and grid-edge monitoring data**





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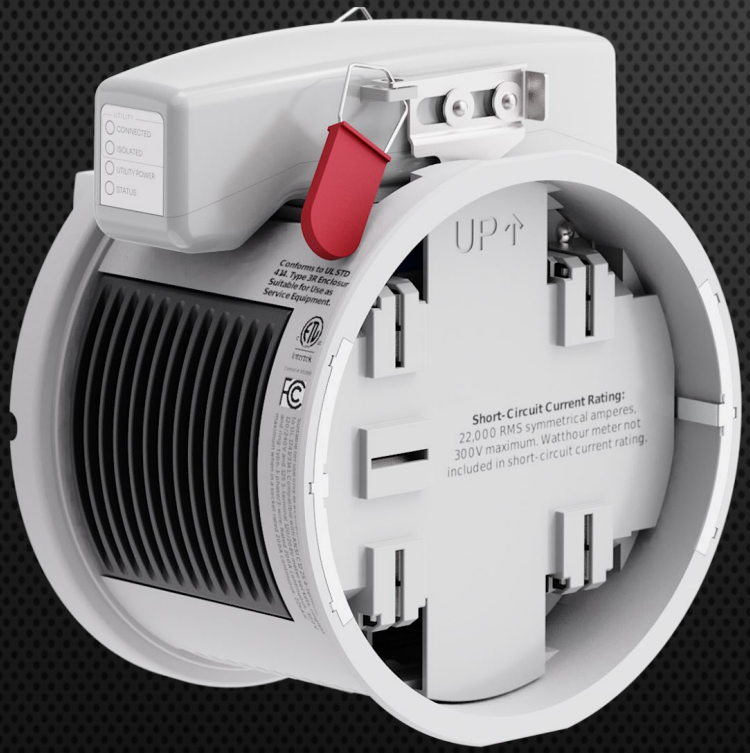
Codes and Standards – Product / Use Case specific

- MSAs are certified for safety compliance to relevant UL standards by Nationally Recognized Testing Laboratories (NRTLs). The exact test program depends on the product use case, but relevant standards include:
  - UL 414 (meter sockets),
  - UL 2735 (utility meters),
  - UL 916 (energy management), and
  - UL 1741 (inverters, converters, charge controllers, and interconnection system equipment)
- Can be safely installed by qualified contractors / electricians.
- NEC compliance is also part of the NRTL effort.

Field Procedures and Safety

- Initial installation is quite simple:
  - The meter puller is attached, and the meter is pulled from the base
  - The meter is connected to the MSA and secured using a meter sealing ring
  - The meter and MSA are reinstalled in the socket and sealed
- Installers do this every day in multiple markets, receive training from manufacturers on procedures and how to identify appropriate field conditions for use.
- Utilities need to develop field procedures for workers who'll interact directly with devices, awareness training for others, and possibly update interconnection applications.
- Most utilities produce a technical bulletin that serves as the basis for internal communication to impacted groups, then hold in-person training during regular meetings.

ConnectDER Applications - PV, EV, ESS



ConnectDER has three product lines, each of which supports a different end-use application.

- Our IslandDER (pictured) facilitates whole-house and partial backup power behind the meter for a host of BESS providers.
- Our EV MSA serves as a power source for a L2 EVSE, and will pause charging if service ampacity is at risk of being exceeded.
- Our Solar MSA is a safe, reliable, and elegant alternative to supply side connections on PV systems up to 15kW.

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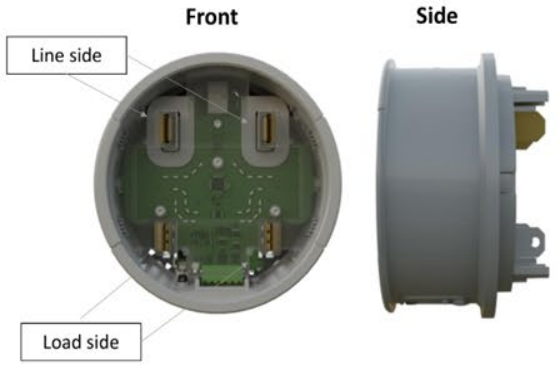
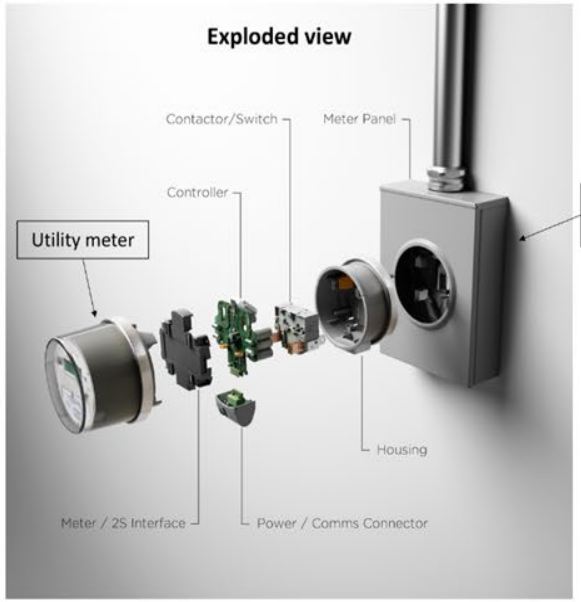
Tesla Backup Switch

Home Islanding Meter Collar

- A meter socket adapter which enables seamless grid connection control
- Backup Switch contains:
  - A contactor to connect/disconnect the home from the grid
  - Sensing equipment to operate the contactor and backup power sources
  - Intelligence and communication to ensure safe operation
- Installed as an **extension** of the customer's meter cabinet
- Enables install of clean, resilient solutions in **< 1 hour!**
- Install is **5 hours faster** compared with Gateway install
- **Biggest single-change potential for customer cost savings**





Enphase IQ Meter Collar

- Quick and easy whole-home backup
- No need for costly sub-panel labor in partial backup systems
- Integrated consumption CTs

Meter socket compatibility	CL 200 (base); Form 2S (meter)
Opening and closing of MID	Automatic with manual override support
Current Rating	Up to 200 A
Supply Voltage	120/240 V split-phase
Safety certification	UL 414
Safety compliance	UL 1741 SA/SB
Fault tolerance	Redundant power from grid and batteries
Communication protocol	Wired (4-wire Enphase CTRL cable)
Flexible cable entry	½" NPT junction box Reversible for left or right entry
LED status indicators	State of MID, grid power, and fault states
Compatibility	IQ Battery 10C with IQ Combiner 6C IQ Battery 5P with IQ System Controller 3M
Warranty	15-year limited warranty

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2025 Activities & Proposed TSRG Subgroup

- Our companies have contacted Eversource, Unitil, and National Grid re: MSA qualification following law passage.
- In response, utilities have stated that qualification processes don't exist and have pointed to MSA prohibitions in internal metering guidelines
- We were directed the TSRG to efficiently pursue a uniform implementation.

- We're requesting that the TSRG create a collaborative subgroup to advance MSA implementation in 2024 Mass. Acts Chapter 239, Section 151.
- Proposed Deliverables:
  - Revisions to Common Technical Guide, Utility-specific technical standards
  - Memo describing MSA subgroup work, areas of consensus / non-consensus, status of compliance w Section 151, and utility plans for MSA onboarding / installation processes

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Proposed Meeting Outline + Timeline

- July Kickoff Meeting
  - Agree on subgroup objectives, scoping questions, meeting cadence, deliverables.
  - Proposed date: July 15 (90 min)
- August Work Meeting 1
  - First meeting to dig into biggest issues, follow map established in kickoff meeting.
  - Proposed date: August 5 (2 hours)
- August Work Meeting 2
  - Continue work on most important issues, follow map established in kickoff meeting.
  - Proposed date: August 19 (2 hours)
- September Final Work Meeting
  - Intended to be the final working meeting, finalize redlines and discuss memo content.
  - Proposed date: September 2 (2 hours)
- September Contingent Meeting
  - Optional meeting to tie up any remaining loose ends, finalize language, discuss upcoming TSRG Meeting.
  - Proposed date: a few days before the Sept. TSRG meeting (45 min)
  - Put a shorter meeting on the calendar for just before the next TSRG Meeting to iron out final details

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METERING UPDATE

EVERSOURCE ENERGY

FERC 2222 Overview and Implications for Interconnection Process-

EDC's Joint Presentation

Agenda

What will this presentation cover and what to expect?

This presentation will briefly describe FERC 2222, its high-level requirements, efforts by EDCs and ISO-NE to develop an implementation plan to ensure compliance by November 1, 2026, and a discussion on the eligibility, safety, and reliability review process for DERs under DER aggregations.

In Scope Discussion

- Eligibility, safety, and reliability review proposal
- DER Interconnection Tariff considerations

Out of Scope Discussion

- DER participation models
- DER, metering, and locational requirements
- Operational coordination
- Metering and settlement

Primary Asks

- Discussion and alignment on EDC process to perform additional safety and reliability studies for DERs with unconstrained ISAs
- Discussion on DER Interconnection Tariff considerations

FERC 2222 Background

On September 17, 2020, FERC issued Order 2222 requiring ISO/RTO to allow DERs to participate in the wholesale market through via DER Aggregations (DERAs)

Tariff changes affecting energy and ancillary service market rule are **effective November 1, 2026,** where EDCs are expected to develop the following processes:

- Review **DER eligibility** to participate in a DERA
- Accommodate third-party DER/DERA meter readers to **facilitate Measurement & Verification and settlement**
- Assess the **safety and reliability** of DERAs and DERs on the distribution system

Key Compliance Directives

- Size and locational requirements
- DER participation models
- Metering and telemetry requirements
- Market rules for coordination between DERAs, EDCs, ISO-NE, and relevant electric retail regulatory authorities
- Information and data requirements
- DER/DERA registration, modifications, and eligibility reviews

DER Participation Models

ISO-NE's proposed models that allow for a mix of technology-neutral DERs that can form DERAs based on resource capabilities (demand reduction, energy injection, energy withdrawal, or regulation)[1]

Existing Models

- **(Modeled) Generator Asset**
- **Binary Storage Facility and Continuous Storage Facility.[2]** Used for dispatchable storage facilities that may be offer both load generation or as flexible load if storage is behind retail meters
- **Alternative Technology Regulation Resource.**

New Models

- **Settlement Only Distributed Energy Resource Aggregation.** Enables non-dispatchable resources to aggregate other with flexible loads to support diverse DERs within the same aggregation in the day-ahead energy market
- **Demand Response Distributed Energy Resource Aggregation.[3]** Enables demand response aggregations with other DER types for demand reduction, energy injection, and/or energy withdrawal

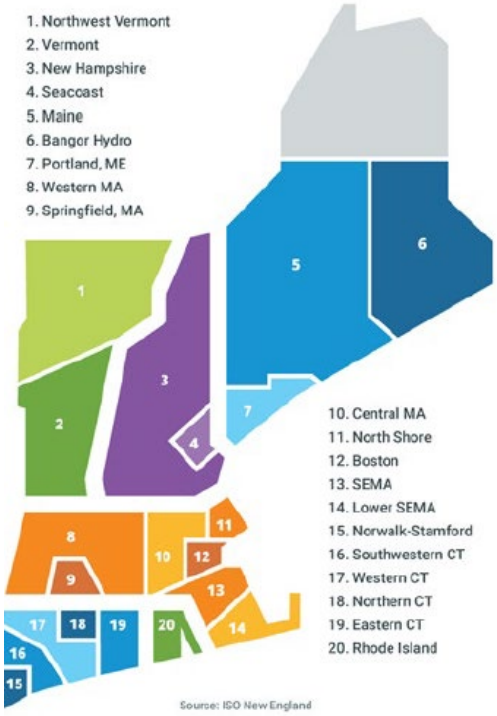
[1] Demand Reduction is reducing demand in response to dispatch, measured against a baseline (may include incremental injections); Energy Injection is injecting energy into the grid; Energy Withdrawal is withdrawing energy from the grid; Regulation is the ability to respond to dispatch to balance the grid every 4 seconds.
[2] These models can also be used by DERAs with flexible load and/or distributed generation even if there is no electric storage included.
[3] Allows for energy injection or withdrawal outside of dispatch to be compensated or billed at the Locational Marginal Price.

ISO-NE DER, Metering, and Locational Requirements

- **DER Size Requirements.** DERAs have a 100-kW minimum size requirement; there is no size minimum size requirement for DERs
  - DERs ≥ 5 MW can participate individually at a single node
  - Geographically limited aggregations of DERs ≥ 5 MW located at a single node can participate
- **Metering Requirements.** Meters are required to comply with OP-18 standards and must be located at the retail delivery point[1]
  - 1-hour revenue quality meter data is required (including AMI)[2]
- **Locational Requirements** include a multi-nodal approach using DRR aggregation zones as a single pNode
  - All DERs in a DERA must be the same aggregation zone and the same metering domain;
  - DER aggregators do not need to submit distribution factors since all DERs in a DERA are in the same pNode

ISO-NE hosts a series of workshops that serves as an open forum to learn about FERC 2222, discuss implementation challenges, and think through solutions for implementation; As such some processes are still in the preliminary

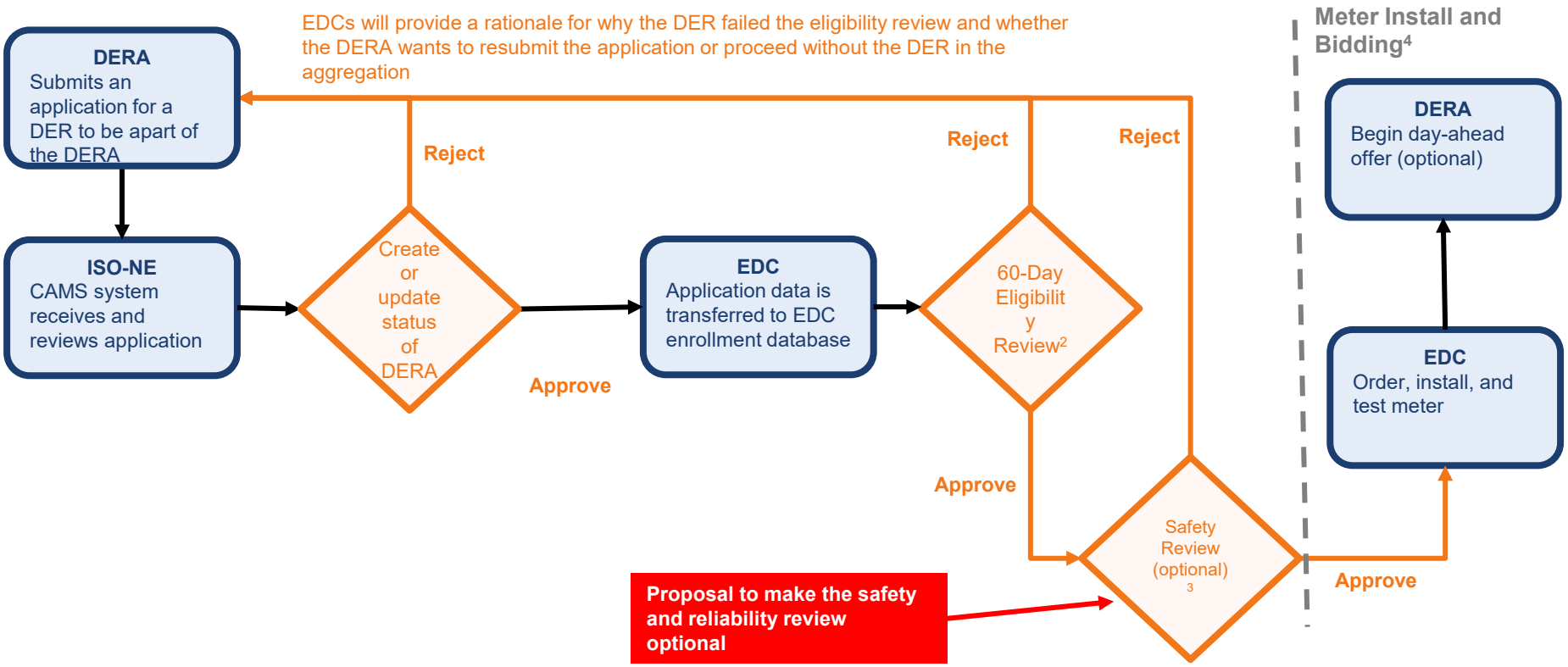
New England Aggregation Zone



Source: ISO-NE

[1] DER sub-metering is allowed if the host utility is able to accommodate metering configurations that address double counting (if applicable)
[2] ISO-NE could accommodate 5-minute interval data if EDC have the capability to submit data at that frequency.

Preliminary Simplified Registration Process[1]



[1] The registration process has been adapted from slide 14 from *FERC Order No. 2222: Metering and Settlements Workshop #2*, ISO-NE, February 14, 2025.
[2] The eligibility review process determines whether DERs within an aggregation meet the compliance standards for FERC 2222 participation within a 60-day review period. Typically, the safety and reliability review is conducted within the eligibility review process. However, For discussion purposes, the safety and reliability review is shown as a separate optional process given the 60-day review period can be paused if there are significant risk to the distribution system or additional studies are needed.
[3] The timeline for the safety and reliability review is still to be determined.
[4] The timeline for meter installs is still to be determined.

Eligibility, Safety, and Reliability Review Process

Currently, under the Eligibility Review Process, EDC will have up to 60 calendar day to confirm each constituent DER can participate in a DERA by conducting the following checks:

- **Double Counting Assets.** Confirm that each DER's metered net consumption or injection of energy will not be included in another Load Asset or Generator Asset
- **Dual Participation.** Confirm that no individual Distributed Energy Resource is participating in a retail program that prohibits it from providing the requested service in New England Markets
- **Metering Domain.** Confirm that all the Distributed Energy Resources are within the Host Utility's metering domain
- **Existing Interconnection Agreements.** Confirm the proposed DERA has appropriate interconnection and/or operating agreements in place with the Host Utility
  - Confirm that the net injection and consumption capability of the DERs participating in the DERA do not exceed the capabilities as authorized by any associated interconnection agreement

Safety and Reliability Review

Determine whether the proposed operation of any DER participating in a proposed DERA, or the DERA as a whole may pose significant risks or may require further study to evaluate the potential significance of the risks to the safe and reliable operation of the distribution system including:

- Overloads
- Voltage
- Stability
- Short Circuit Interrupting Capability

Further study includes a need for distribution system upgrades to avoid safety and reliability impacts and, if so, confirm that the DERA has self-certified that such upgrades have been completed or will be completed before the DER desired activation date

Summary

Given that DERs with an unconstrained Interconnection Service Agreement (ISA) have already gone through extensive study, EDCs will have the option to impose additional safety, and reliability checks for unconstrained DERs. However, DERs with constraints on their ISA will need to be restudied if they wish to operate with no constraints.

MA DER Interconnection Tariff Discussion

Additional consideration must be given to how FERC 2222 specific requirements will need to be implemented for restudies or additional system modifications.

Q&A and Discussion

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
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 Discuss different revenue markets for DER's and they how it could tie into the study process.

DER EQUIPMENT REPLACEMENT

JOHN BONAZOLI

TSRG Sub-Group Update

In-Service DER Equipment Change Procedure

Update June 30, 2025

The Massachusetts Technical Standards Review Group

In-Service DER Equipment Replacement Subgroup

Subgroup Membership

- EDC's
- Solect
- ACT
- Kearsarge Energy

Last Meeting

June 10, 2025

In-service Facility Revision Application Process

When in-service facility equipment is being changed out (e.g. due to age or repair)

- If Facility is off-line due to equipment failure, Customer to notify Company within 20 Business days.
- Application for equipment replacement is required
  - Specify existing and in-service equipment
  - Detail equipment to be changed
- No Pre-application required
- Company processes application and determines the scope of study required
  - Most analysis will be reduced scope
  - If changes are not Significant, study should be able to be isolated from group studies

Design and Operational Requirements

- All new equipment must meet present certification requirements
  - E.g. Inverters
    - IEEE 1547 Setting Requirements
    - UL 1741 SB
- Company reviews requirements in existing ISA
  - ISA amended per new equipment and requirements
- Requirement for Facility to meet updated EDC technical requirements would be evaluated on a case-by-case basis

Tariff Update

- Recommendation to update tariff to add revision requirements
  - List requirements of application
  - Deadlines of notifications

IIRG GROUP UPDATE

KATE TOHME/BRETT JACOBSON

IIRG Group

ESS SUB-GROUP UPDATE

MIKE PORCARO

IIRG Sub-Group

GROUP STUDY STATUS UPDATE

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
    - Southwick-Granville Group Study CIP would be filed with DPU in June 2025
    - New Bedford Group Study CIP would be filed with DPU in June 2025
    - Dalton-Hinsdale Group Study CIP would be filed with DPU in June 2025
    - Gill-Montague Group Study CIP would be filed with DPU in June 2025

- **National Grid**

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

Queue Management/Study Philosophy Change Applicability (ESS)

TECHNICAL STANDARDS UPDATE

EDC Technical Standards

- As needed, EDC Technical Standards may be updated

Eversource

- No new updates

National Grid

- NG to provide Updates

Unitil

- Unitil to provide Updates

TSRG COMMON TECHNICAL STANDARDS MANUAL UPDATE

https://www.mass.gov/doc/tsrg-common-guideline-2022-12-22/download

THANK YOU!

Next Quarterly Meeting:

Thursday September 18th 2025 1PM-4PM