Coordination Between Interconnection and Grid Planning

i2X Webinar 3

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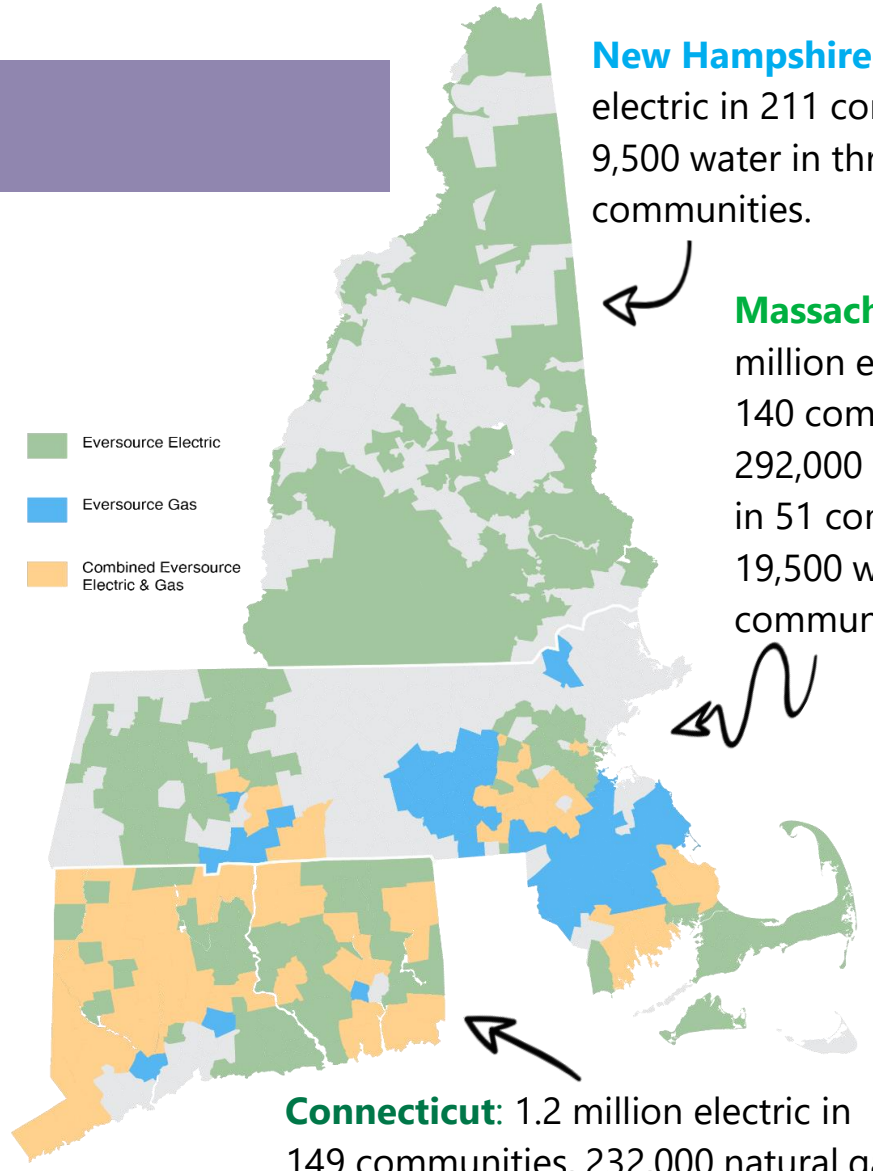
EVERSOURCE

Eversource – Who We Are

We're New England's largest energy delivery company with **4 million customers** across 525 communities in Connecticut, Massachusetts and New Hampshire.

Eversource aims to be **carbon neutral by 2030**, and the benefits of our regional clean energy initiatives will more than offset Eversource's greenhouse gas emissions.



New Hampshire: 510,000 electric in 211 communities, 9,500 water in three communities.

Massachusetts: 1.4 million electric in 140 communities, 292,000 natural gas in 51 communities, 19,500 water in five communities.

Connecticut: 1.2 million electric in 149 communities, 232,000 natural gas in 71 communities, 198,000 water in 51 communities.

T&D Planning – Integrated Bottoms–Up Approach

Distribution Net Load Forecasting

Identify new or expand existing Distribution Stations

Establish incremental DER and Firm Capacity Enabled

Transmission Net Load Forecasting + New Generators - Retirements

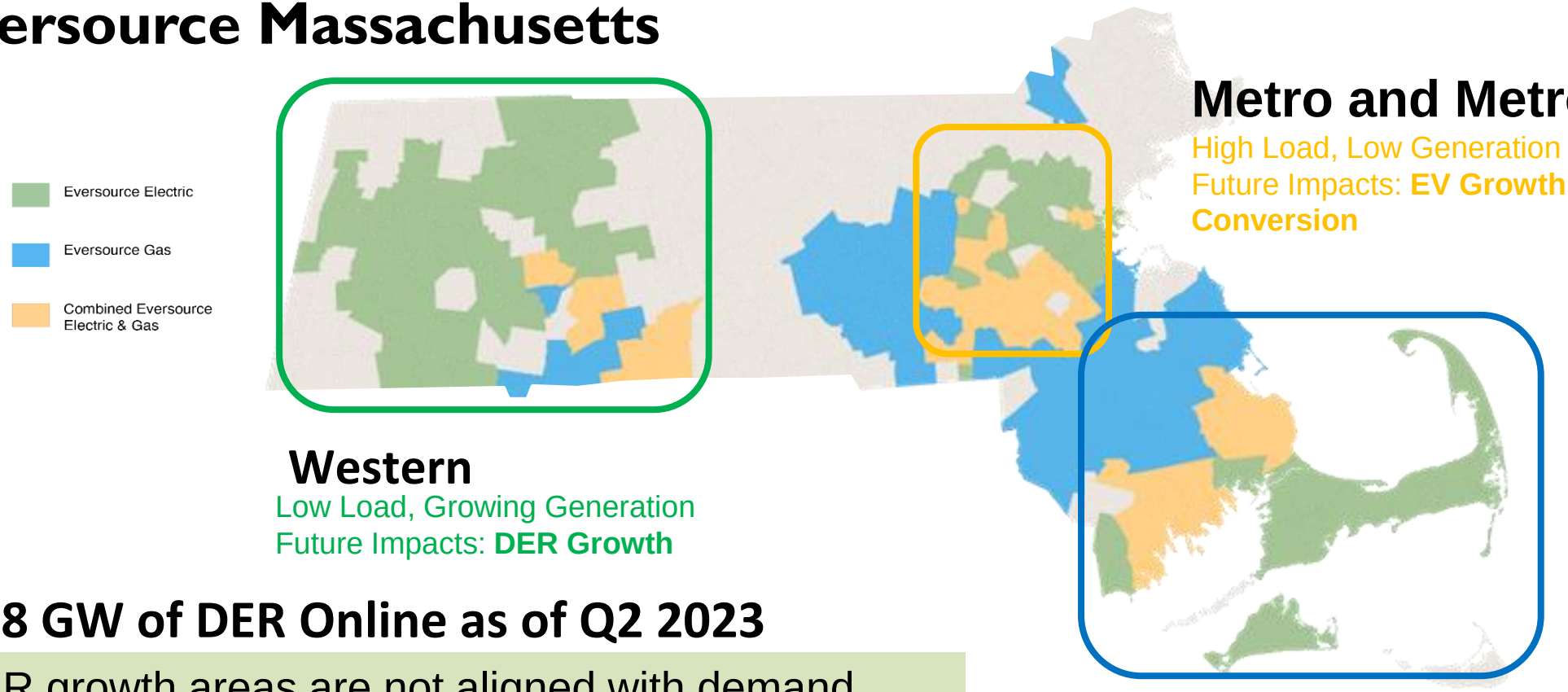
Identify new Transmission Solutions

Identify Distribution Constraints

Identify Transmission Constraints

Integrated Planning Implementation

Eversource Massachusetts



Western
Low Load, Growing Generation
Future Impacts: **DER Growth**

Metro and Metro-West
High Load, Low Generation
Future Impacts: **EV Growth and Sector Conversion**

South-Eastern
High Generation, Seasonal Low Load
Future Impacts: **Offshore Wind and DER**

~1.8 GW of DER Online as of Q2 2023

DER growth areas are not aligned with demand growth areas … driving the need for significant infrastructure buildout

High DER Penetration Areas South–Eastern and Western MA

- Standard cost causation approach has resulted in solutions and costs that prohibit new DER facilities from interconnecting in already saturated areas
- Department of Public Utilities (D.P.U) stablished a new provisional program framework for planning and funding upgrades to the Electric Power System (EPS)
- New Capital Investment Project (CIP) framework allowed utilities to study and find holistic solutions for interconnecting new DER facilities as a group
- Innovative approach for funding essential EPS upgrades

Provisional Program for Interconnecting DER – Capital Investment Project (CIP)

First in nation approach to cost sharing for upgrades that benefit both Distribution Customers and DER Customers.

Establishes a fixed cost per kW fee for 20 years

Upgrades establishes future capacity short term solutions

Eliminates "free riders" from having others pay for upgrades through the cost causation principle

System Impact Study – Integrated Planning Solutions

- Distribution Planning engineers identified saturated area
- Substations and associated circuits were assigned a study group
- DER planning engineers developed comprehensive distribution solutions for 7 affected groups
- Transmission planning engineers used the comprehensive solution as starting point to determine transmission level reinforcements

Group	# Substations	Existing DER (MW)	Study DER (MW)	Additional Enabled DG (MW)
Plainfield-Blandford	1	38	13	29
Plymouth	7	237	123	279
Cape	8	149	71	274
Marion-Fairhaven	4	69	49	102
Dartmouth-Westport	2	72	16	55
Total	22	565	272	739

https://www.mass.gov/guides/provisional-system-planning-program-guide

Transmission Affected System Operator (ASO) Study

- Steady-state analysis to assess thermal overloads and voltage limit violations resulting from the DER interconnections,
- Stability analysis to verify acceptable model performance and, to identify any violations of stability acceptability criteria following system disturbances resulting from the interconnection,
- Short-circuit analyses to assess if circuit breaker short-circuit capability limits are exceeded as a result of the interconnection;
- PSCAD EMT evaluation to verify acceptable control stability and interactions between inverter-based technologies connected to Distribution and Transmission, and acceptable DER ride-through capabilities;
- Determine any system upgrades that are required to eliminate any thermal or voltage violation, system dynamic and transient stability, and degradation to transfer capability.

Eversource's standards, study process, project and centralized model management ensure most cost-effective solutions in T & D planning.

Key Factors to Address the Challenges in Long–Term T&D Planning

- Load growth forecasting including load patterns and locations
- Granular, high-fidelity analysis tools to model and simulate different scenarios, including load and generation variations
- Resilience plan to mitigate the vulnerability of the system to extreme weather events and adapt the climate change
- Clear study process, including cost-benefit analysis with the involvement of all stakeholders

Summary

- Policy is accelerating growth in clean energy and electric demand
- Eversource is addressing these challenges by:
  - Collaboration with stakeholders and regulators
  - Integrated Planning
  - Enhance analytics and modeling tools
- These strategies have already been implemented in Massachusetts
  - First in nation approach to cost sharing
  - Large DER group study
- Integrated planning strategy ensures most cost-effective holistic solution that aligns with policy goals

Thank You – Questions?