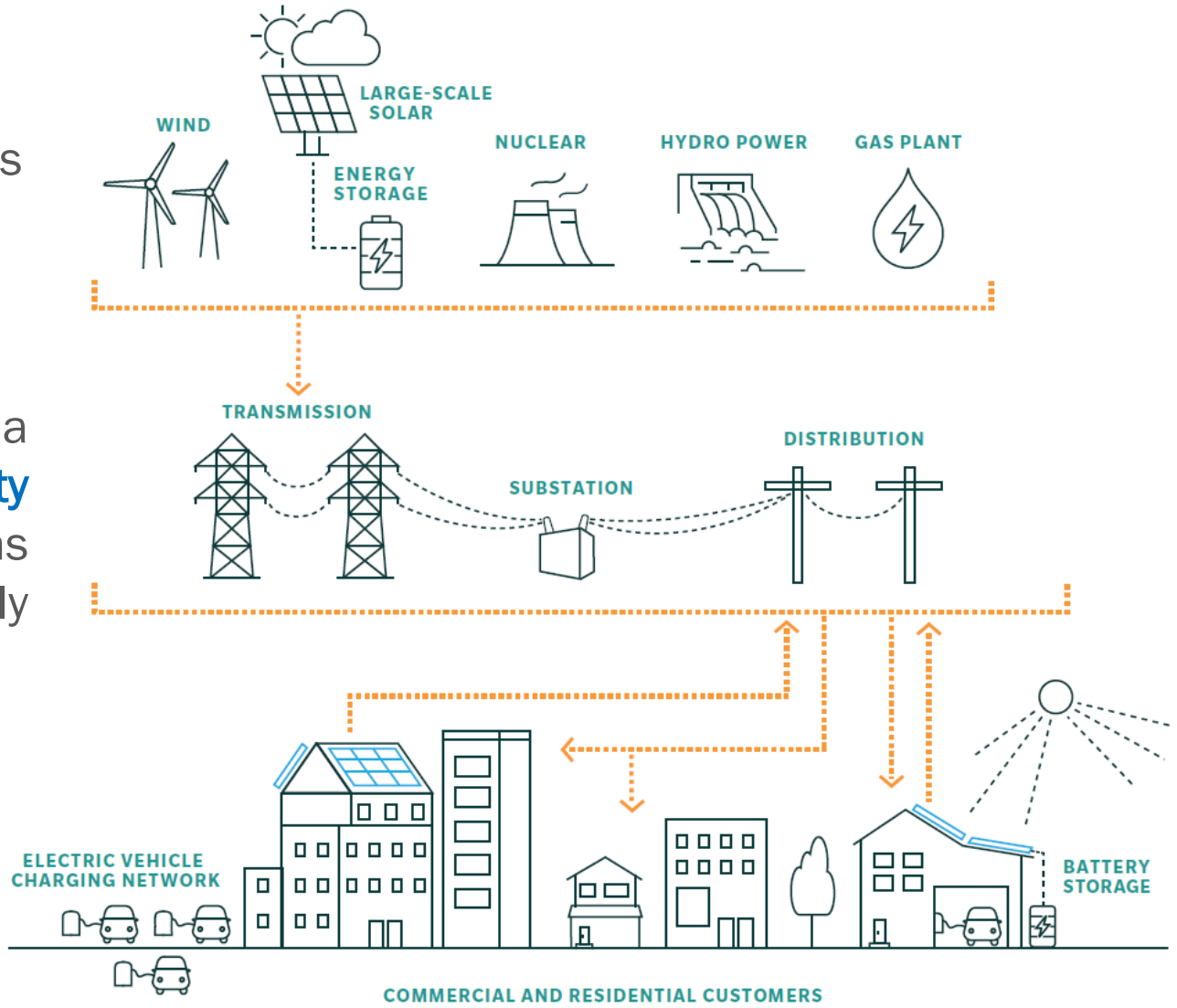
Grid Modernization Advisory Council Meeting 05/11/2023

DISTRIBUTION PLANNING OVERVIEW

The Electric Grid

- Utility scale generation is interconnected across New England and even across the country by way of **high-voltage transmission lines**
- All of these lines networked together create a type of **superhighway that moves electricity** from the power plants to electric substations and local distribution systems, which ultimately deliver it to homes and businesses
- The combination of these components is what we call **the US electric grid**



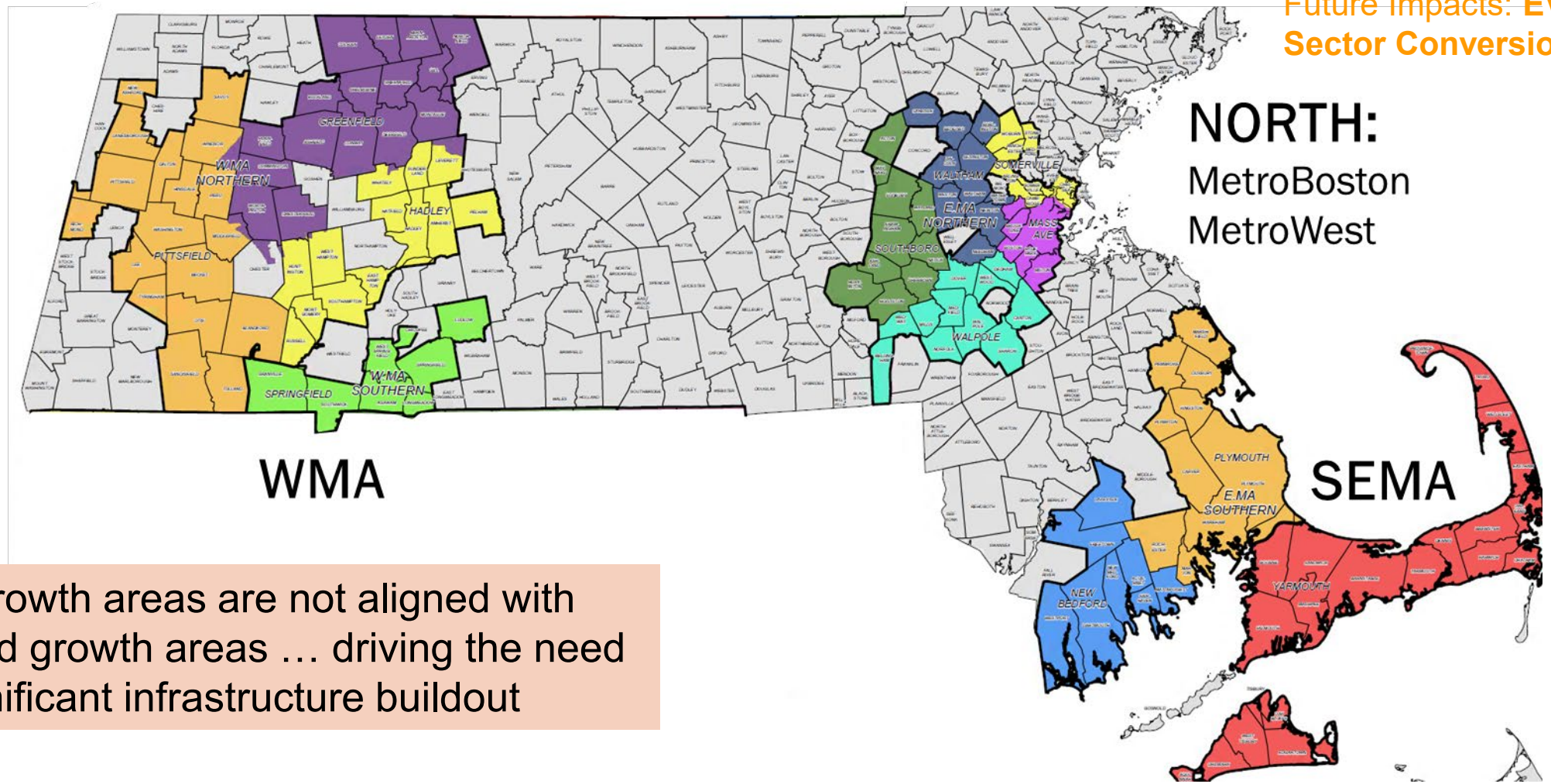
Challenges facing the grid in the Next 20 Years - Require granular, high-fidelity analytics and tools

- Retirement of traditional generation and expansion of inverter-based technology including significant growth in offshore wind and DER
  - Transitioned from static analysis at hourly intervals to transient analysis down to 1/1000 sec
  - Transitioned from studying the system at a specific hour (peak load analysis) to studying all hours of the year (8760 analysis)
- Load growth driven by policy directives and new sectors, including heating and transportation electrification, as the industry shifts away from fossil fuels
  - Advanced forecasting tools and Integrated planning needed to evaluate long-term capacity/reliability needs
- Increasing negative impacts of climate change on the electric power system
  - New resiliency plans, including climate adaptation/mitigation strategies, needed to harden OH and coastal areas and reduce customer impacts

Massachusetts Planning Challenges

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

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



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

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

Approach to Bottoms-Up Integrated T&D Planning

Distribution Net Load Forecasting

Identify new or expand existing Distribution Stations

Establish incremental DER and Firm Capacity Enabled

Identify Distribution Constraints

Transmission Net Load Forecasting + New Generators - Retirements

Identify Transmission Constraints

Identify new Transmission Solutions

Why do we Plan

- Need to plan because it takes time to build capacity

T&D Level	Lead Time*
Transmission	10+ years
Bulk Substation	5+ years
Primary Feeder	2-4 years
Primary Lateral	1-3 years
Secondary/Services	2-12 months

Effective planning accounts for lead time to deploy T&D assets in developing reasonable alternatives

* includes time to perform field audits, pole staking, environmental evaluation, etc. as well as siting/permitting delays

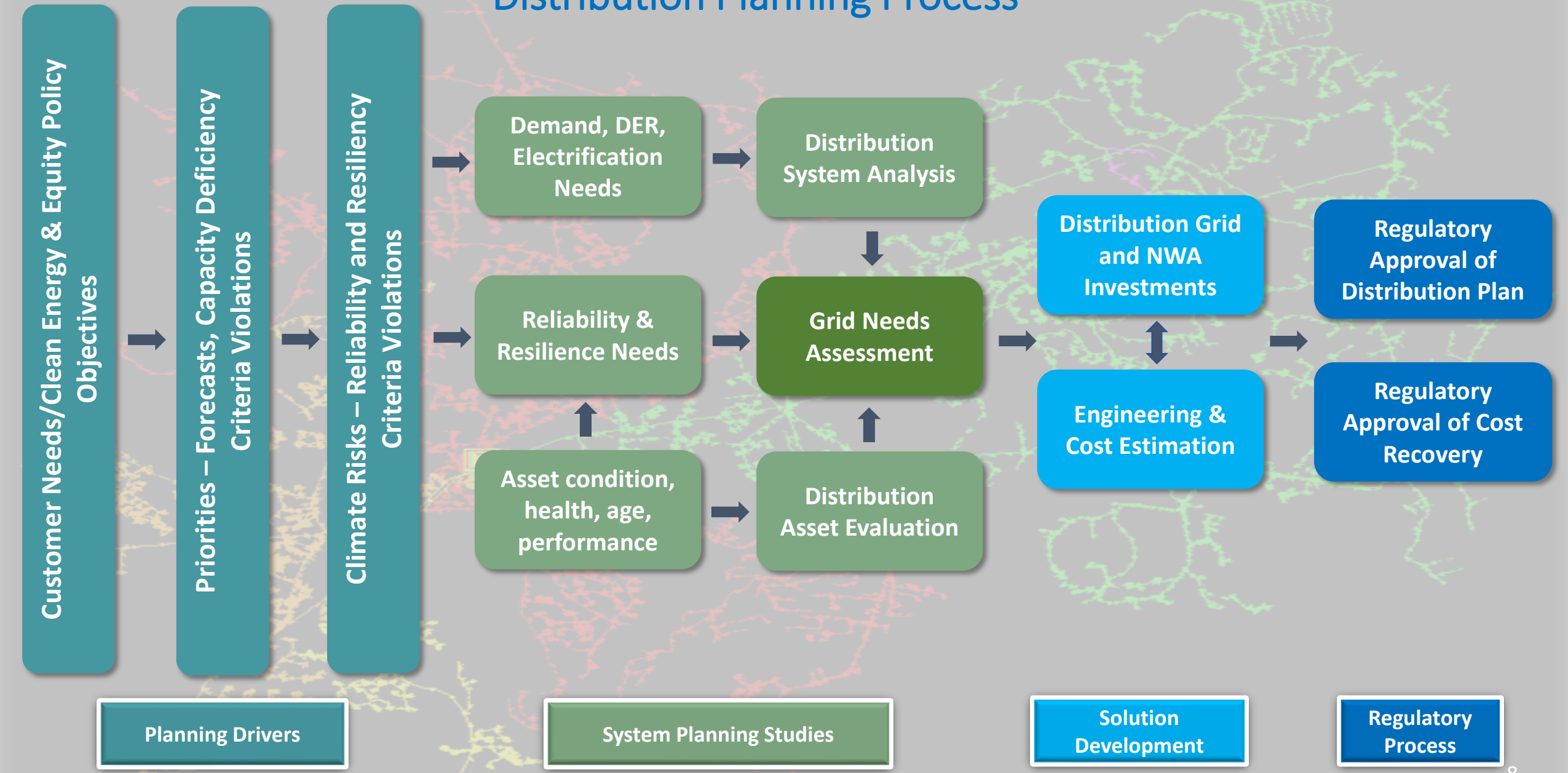
Goal of Distribution Planning

Provide orderly, economic expansion of equipment and facilities to meet future demand with acceptable system performance

- Ensure sufficient capacity to meet future demand and service needs
- Satisfy voltage and power quality requirements within applicable limits
- Provide adequate reliability and resiliency to disruptive events
- Serve all customers safely wherever they exist

… and do it all for the lowest reasonable cost

Distribution Planning Process



Distribution Solution Development

- **Data Analytics and Tools** – leverage traditional and non-traditional input (GIS, solar irradiance, socio-economics, travel patterns, parcel data, etc.) and cutting-edge tools to develop long-term view of system need

- **Solution Alternatives** – develop solutions with varying levels of complexity:
  - Balance loading across system
  - Replace/upgrade limiting equipment
  - Add new equipment or expand substation
  - Apply Non-Wires Alternatives
  - Develop new substation

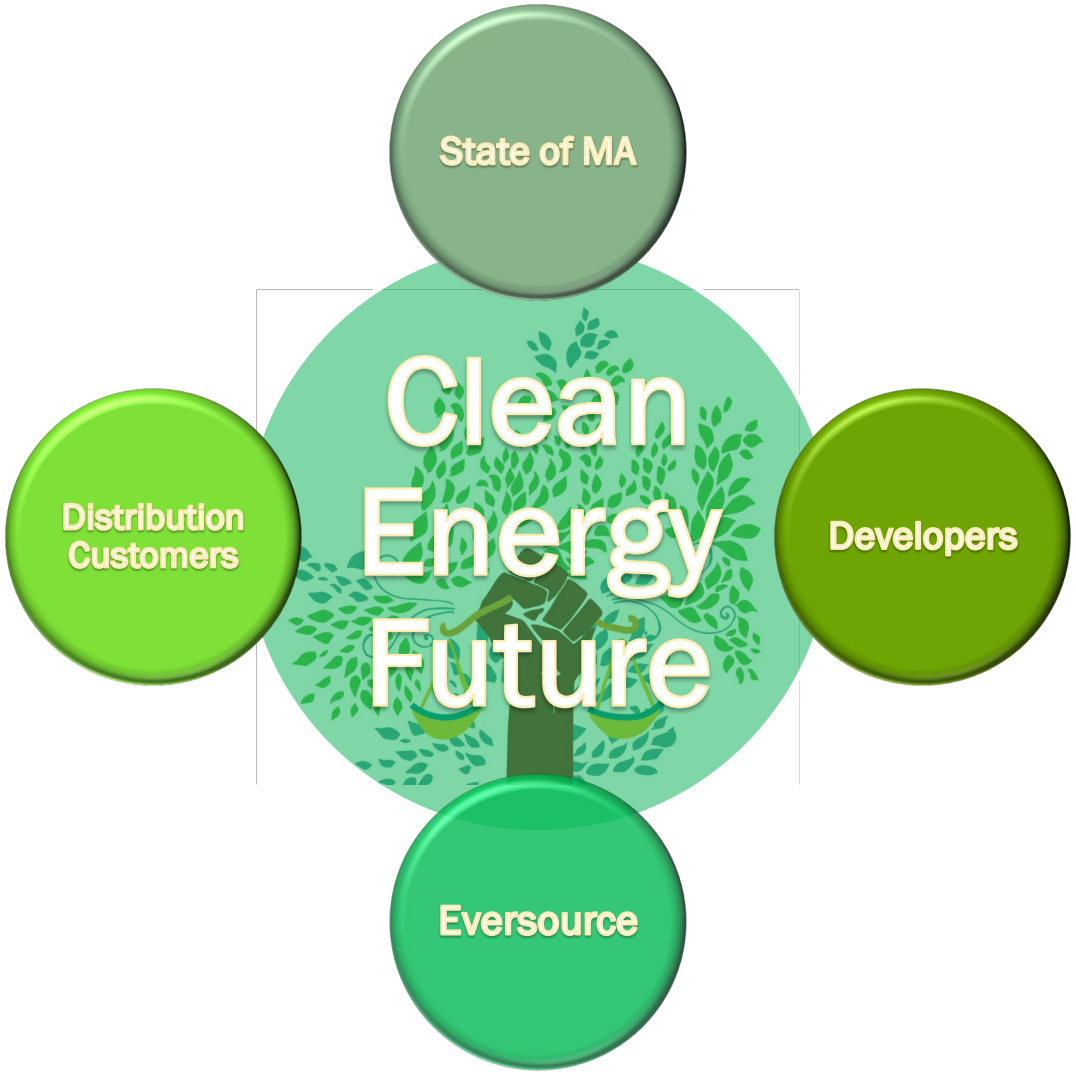
- **Solution Selection** – complex and iterative process involving several groups to select preferred solution in compliance with internal and external stakeholder requirements.

- **Regulatory Review/Approval** – may be required for complex solutions

The final distribution solution must meet the long-term energy need in a reliable manner with minimum impact on the environment at the lowest possible cost

A Clean Energy Future:

The Commonwealth of Massachusetts and Eversource are partners in the grid of the future



Collaborative engagement with stakeholders over several years develop suitable solutions

- Focusing on executing solutions across all levels of the grid from behind-the-meter **battery and solar** to large-scale **offshore wind**
- **Developing projects and solutions** in partnership with the Commonwealth, to enable a clean energy future
- Demonstrating **commitment to the community** and addressing the concerns of stakeholders with innovative solutions and mitigation measures

https://www.eversource.com/content/residential/about/transmission-distribution/projects/massachusetts-projects/greater-cambridge-energy-project

Thank You

QUESTIONS?

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