October 8, 2024

EVERSOURCE

ESIG Technical Workshop

Integrated System Planning

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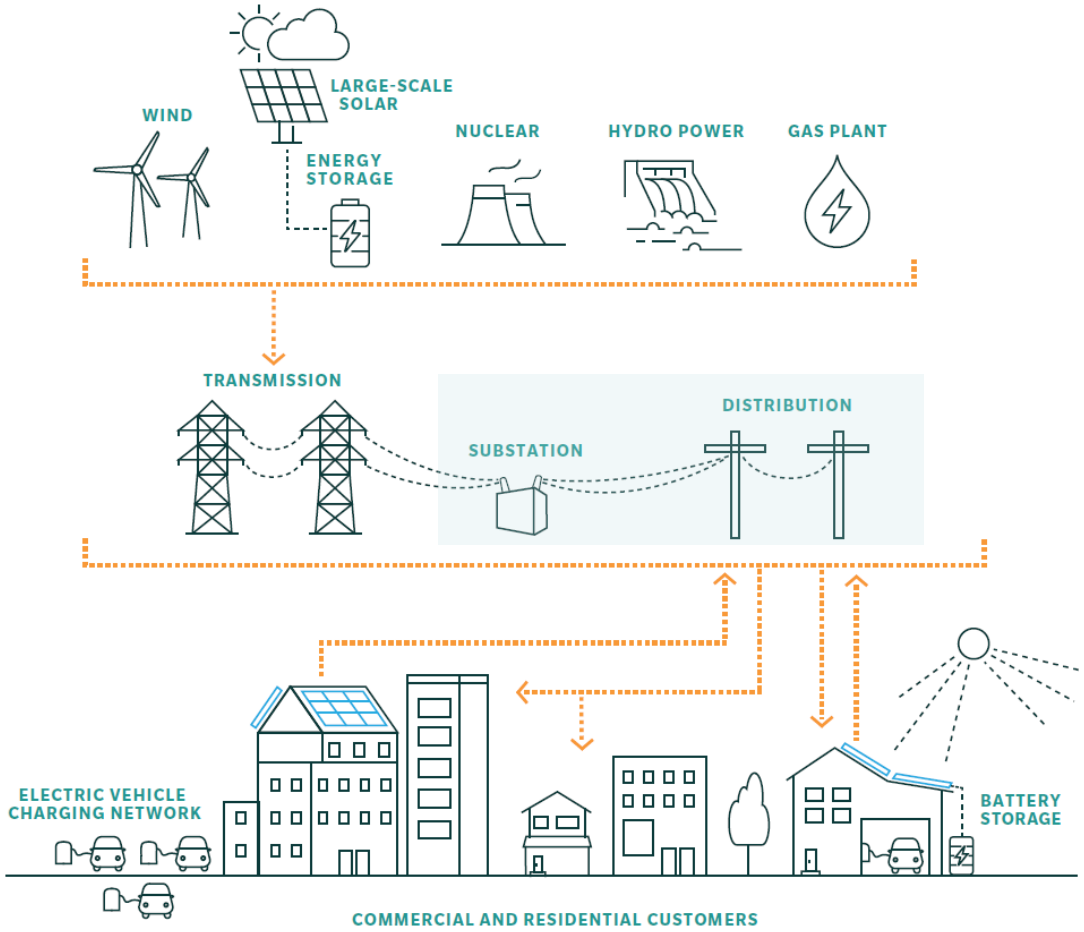
The Electric Grid

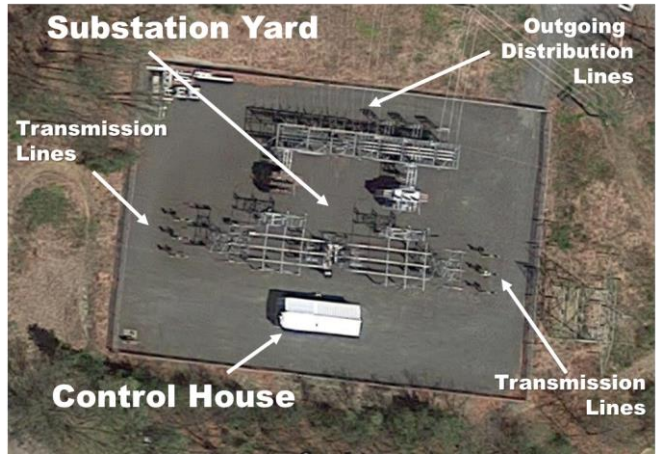
- Utility scale generation is interconnected across New England and even across the country by way of high-voltage transmission lines
- All of these lines networked together create a type of superhighway that moves electricity from the power plants to electric substations and local distribution systems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



The distribution system is the backbone of a reliable Electric Power System (EPS) … serving as an interface between the transmission system and customers

See Bates Page 02023

Bulk Distribution Substation Layout



Bulk substations are key components of the electric power system and essential elements in meeting residential and business customers' demand for energy

See Bates Pages 02028-02030

Why do we plan?

- Need to plan ahead 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 procurement and siting/permitting delays

Bottoms-Up Integrated T&D Planning

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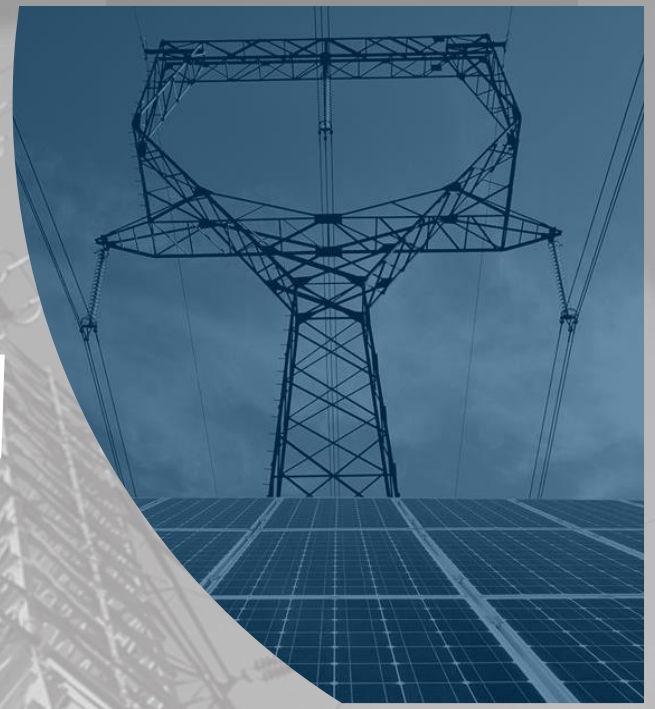
Identify new or expand existing D Stations
Establish incremental DER and Firm Capacity Enabled

Identify new
Transmission Solutions



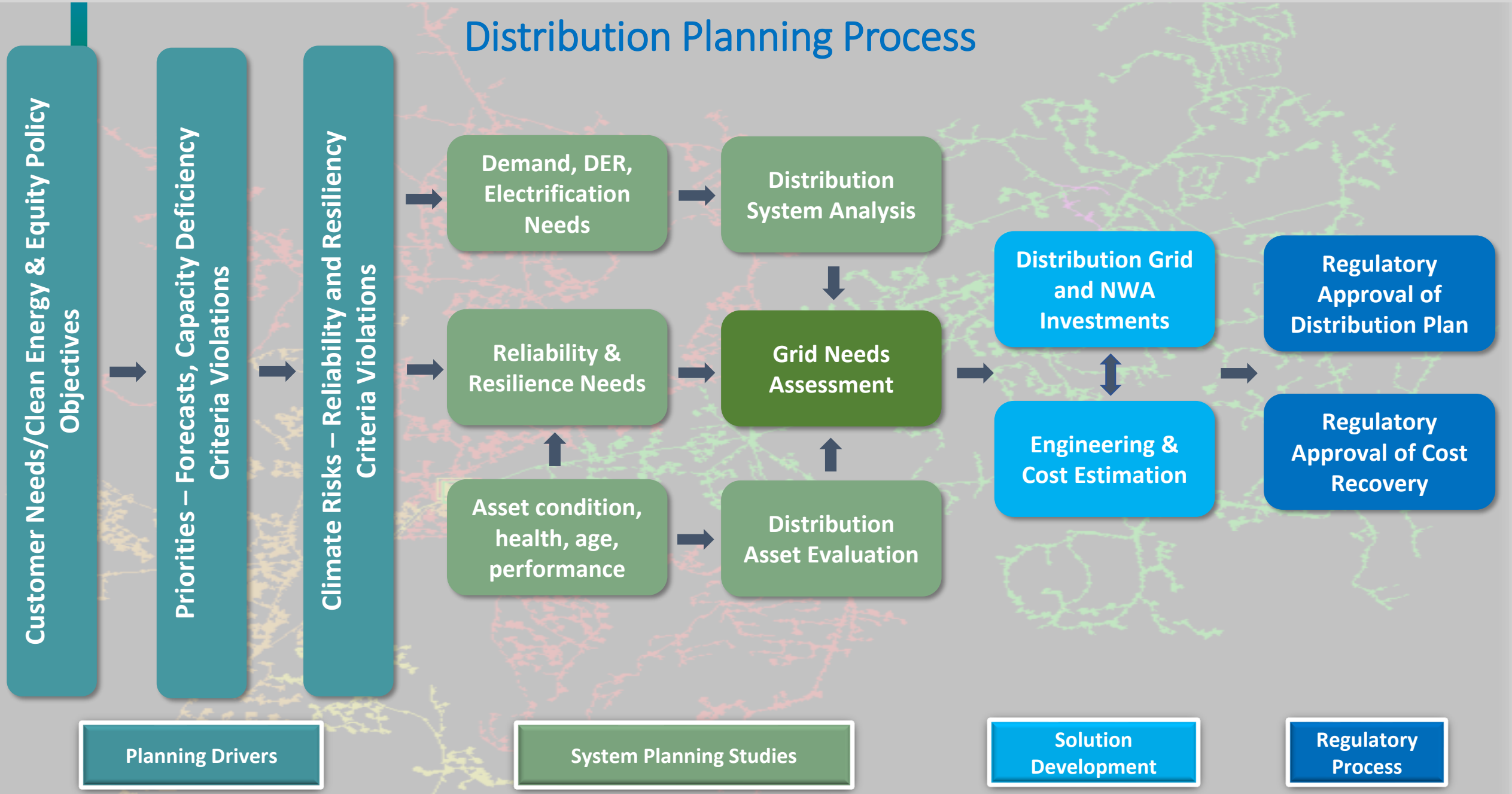
Identify Distribution Constraints

Identify Transmission Constraints

Distribution Net
Load Forecasting

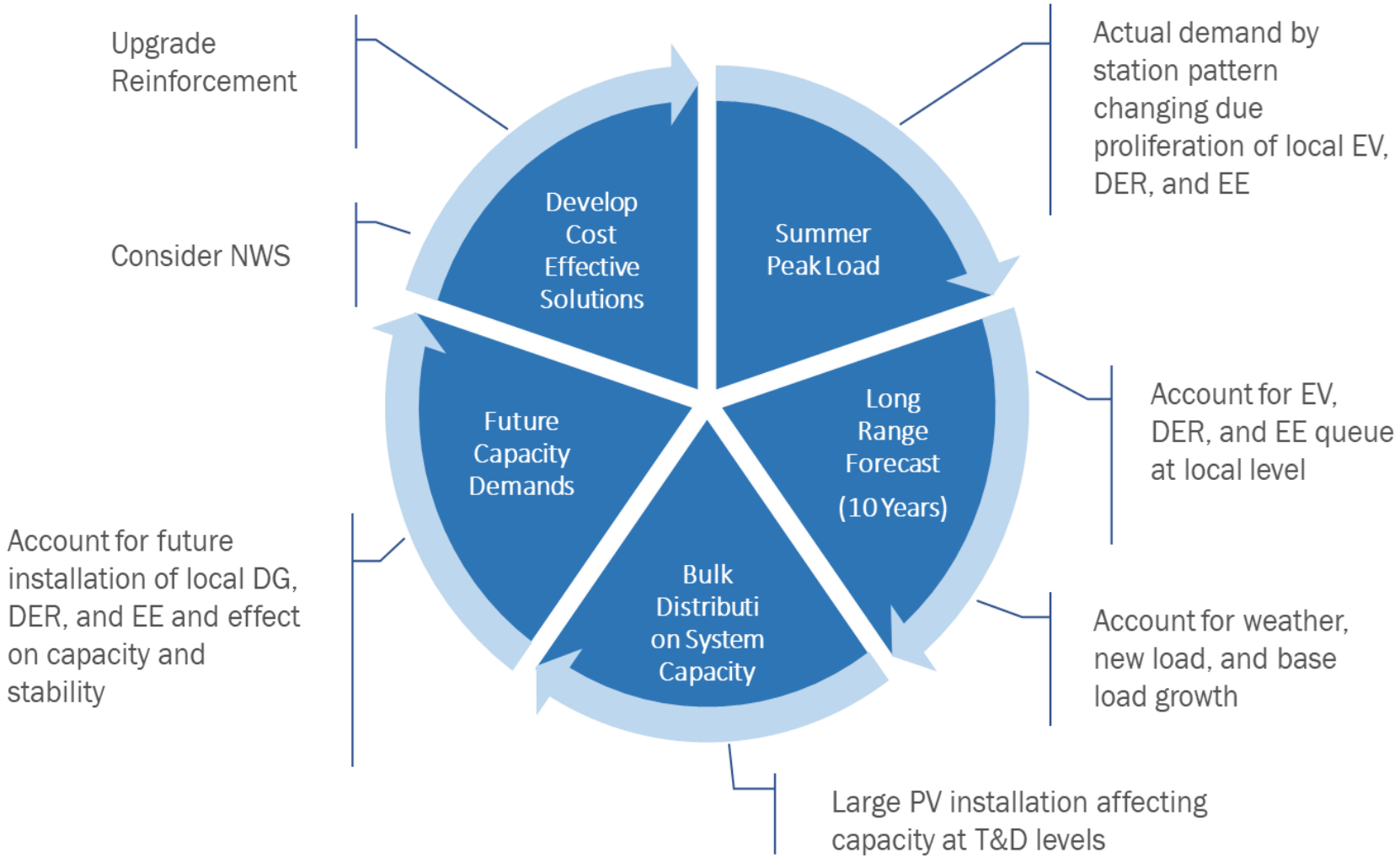
Transmission Net Load
Forecasting + New Generators
- Retirements

Distribution Planning Process



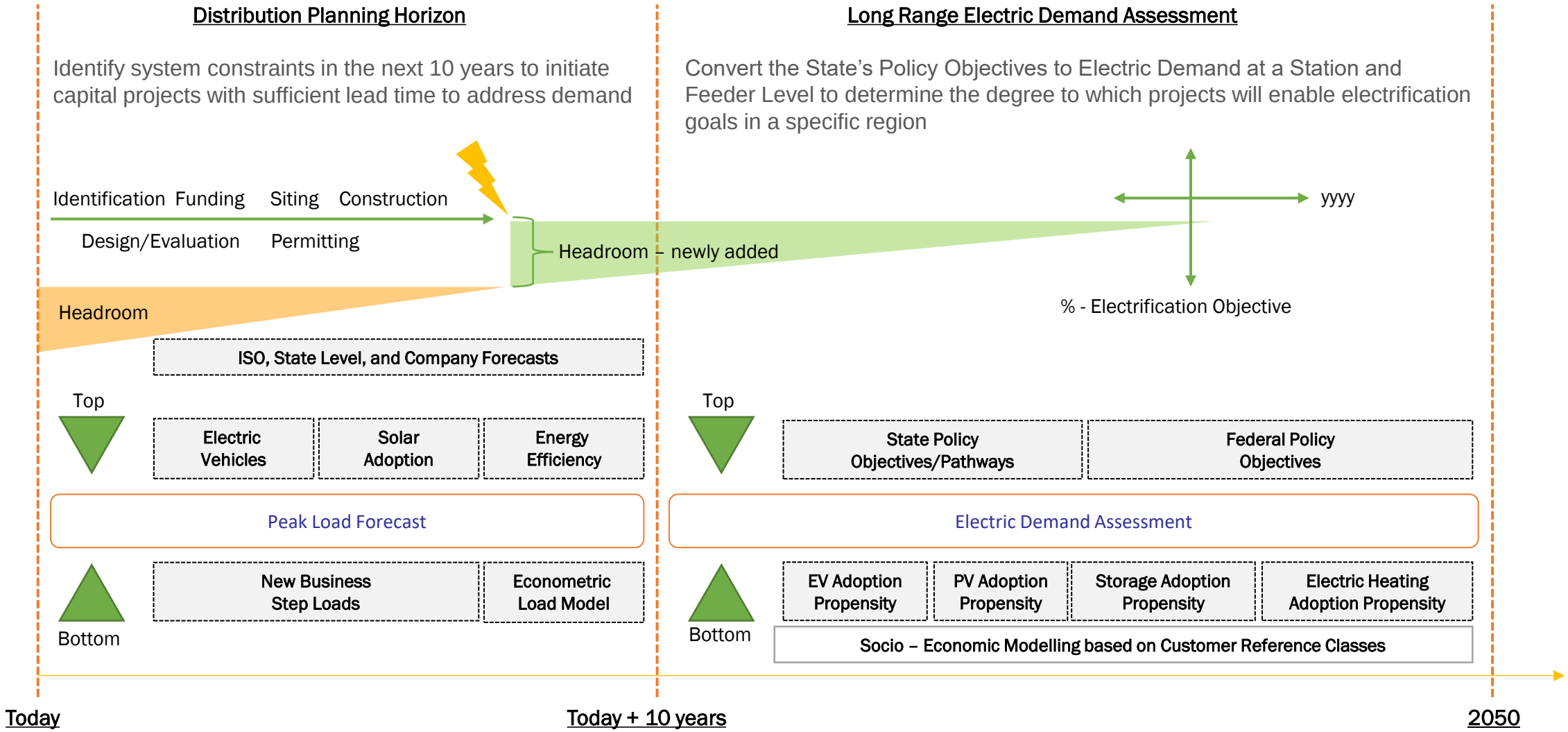
Annual Distribution Planning Cycle

BEGINS WITH FORECASTING THE NET LOAD ON THE SYSTEM



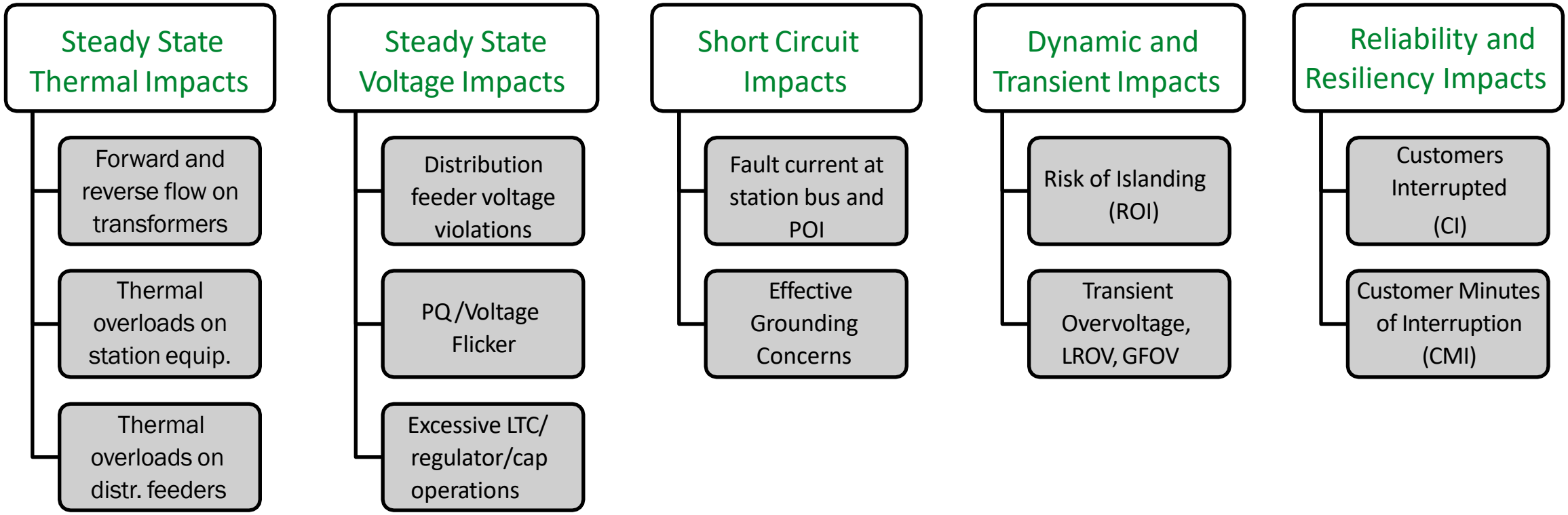
Overall Guiding Principle:
Enable disciplined, cost-effective build-out, reinforcement and replacement of equipment and facilities to meet future demand with acceptable system performance

Forecasting Timelines



Tools & Methods for Distribution Performance Evaluation

Advanced tools and processes are used to assess impacts and plan the system to safely, reliably provide service for both electric load and DER installations.

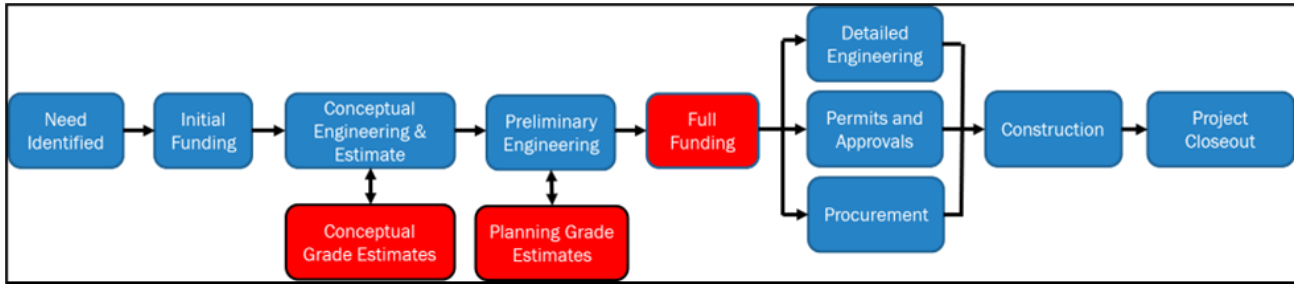


Distribution Solution Development

- **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.

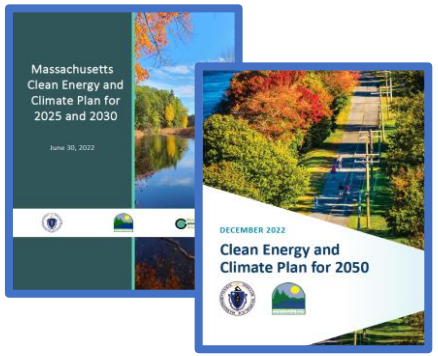


- **Regulatory Review/Approval** – may be required for complex solutions

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

ESMP Overview

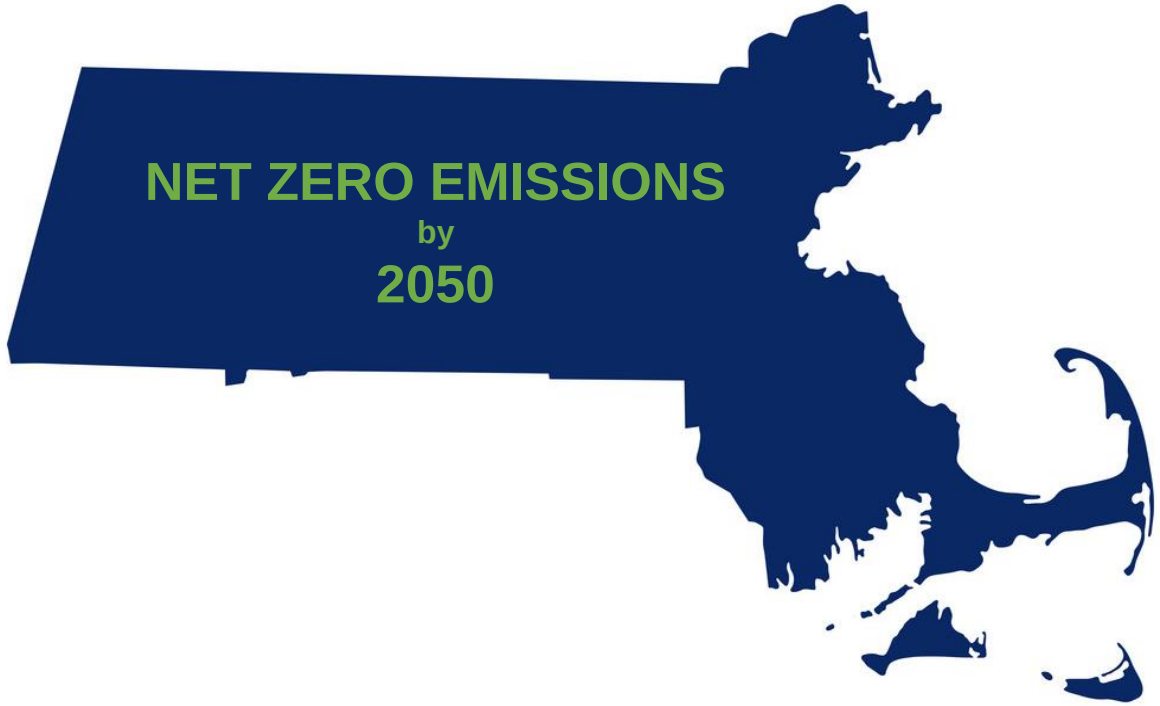
Massachusetts' Clean Energy Goals



MA LAW REQUIRES REDUCING GREENHOUSE GAS (GHG) EMISSIONS

- **33%** GHG reduction by **2025**
- **50%** GHG reduction by **2030**
- **75%** GHG reduction by **2040**

- **4,400** MW of solar capacity by **2025**
- **8,300** MW of solar capacity by **2030**
- **27** GW of solar capacity by **2040**

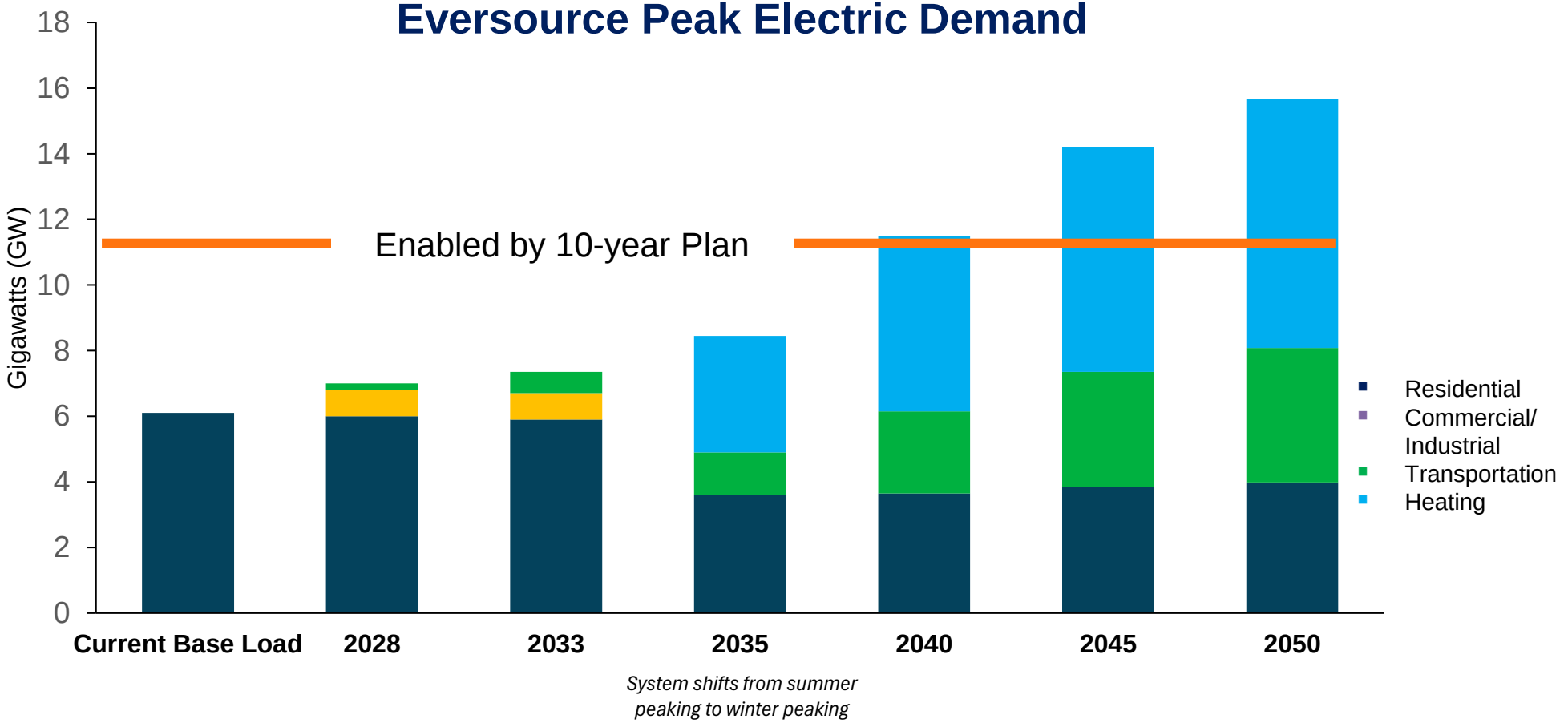


2022 Climate Bill requires Electric Distribution Companies develop **Electric-Sector Modernization Plans (ESMP)** to proactively upgrade distribution and where applicable transmission systems to meet the state's climate goals

Key Drivers of Net-Zero Goals

Electric vehicle adoption projected to add **1.3 GW of demand by 2035**

Zero-carbon heating projected to add **3.5 GW of demand by 2035**



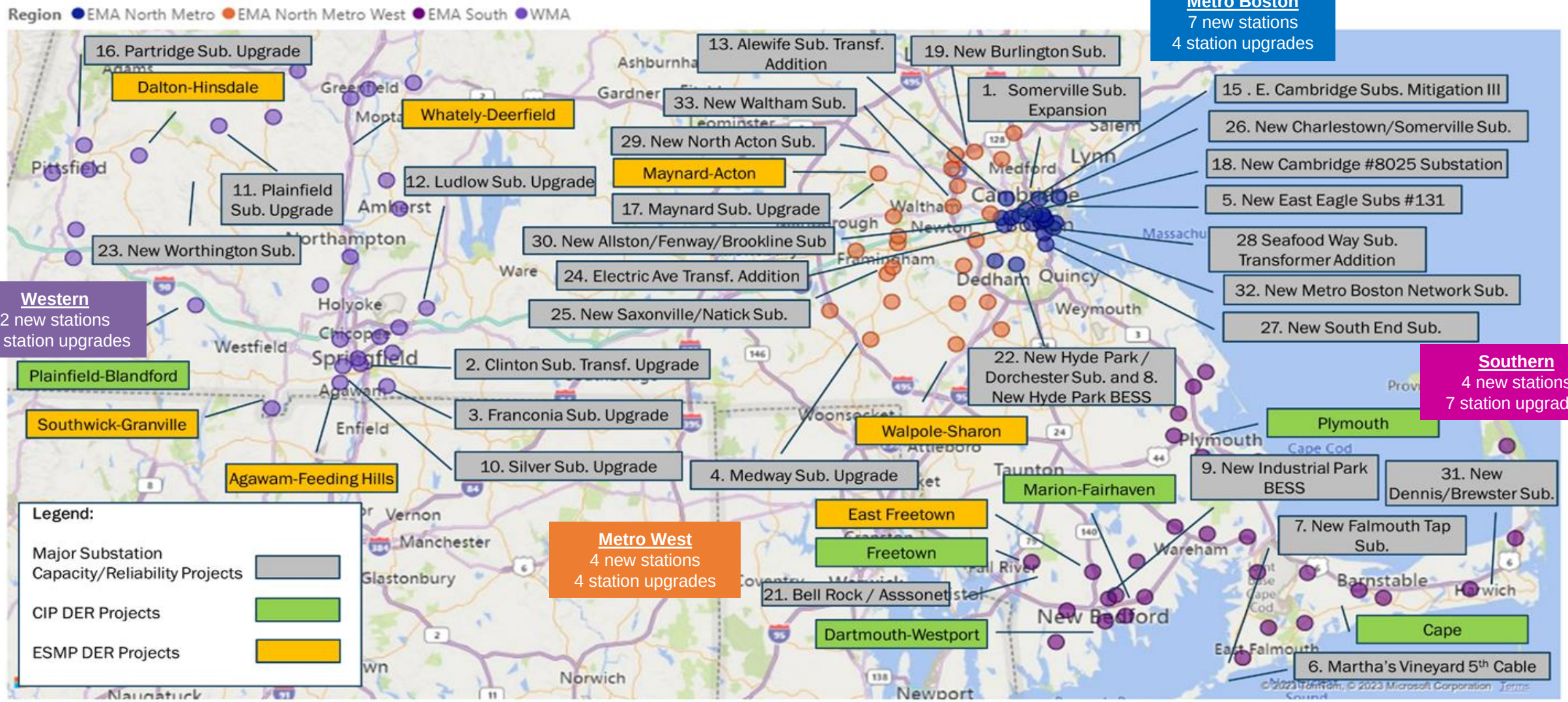
What is a Gigawatt?

It's the equivalent of 100 million LED bulbs!

Source: energy.gov

Major Capital Projects in our 10-Year ESMP

***Over the next 10 years**, we need **17 new substations clean energy hub substations** and **upgrades to 26 existing** to enable the clean energy future in Massachusetts*



Metro Boston
7 new stations
4 station upgrades

Western
2 new stations
11 station upgrades

Southern
4 new stations
7 station upgrades

Metro West
4 new stations
4 station upgrades

ESMP 10-Year Plan enables a clean energy future

By 2034, extensive upgrades to the Distribution System, including building 17 new clean energy hubs across the Commonwealth will enable:

Increases available electrification hosting capacity by 180% over the next decade

Supports the **adoption of 2.5 million electric vehicles statewide,** 60% of the state's 2050 goals

Allows for the **adoption of 1 million heat pumps,** 70% state's 2050 goal in the Company's service territory

Enables **5.8 GW of solar, exceeding the state's 2040 goals,** and reaching over 60% of the state's 2050 goals

Thank You!