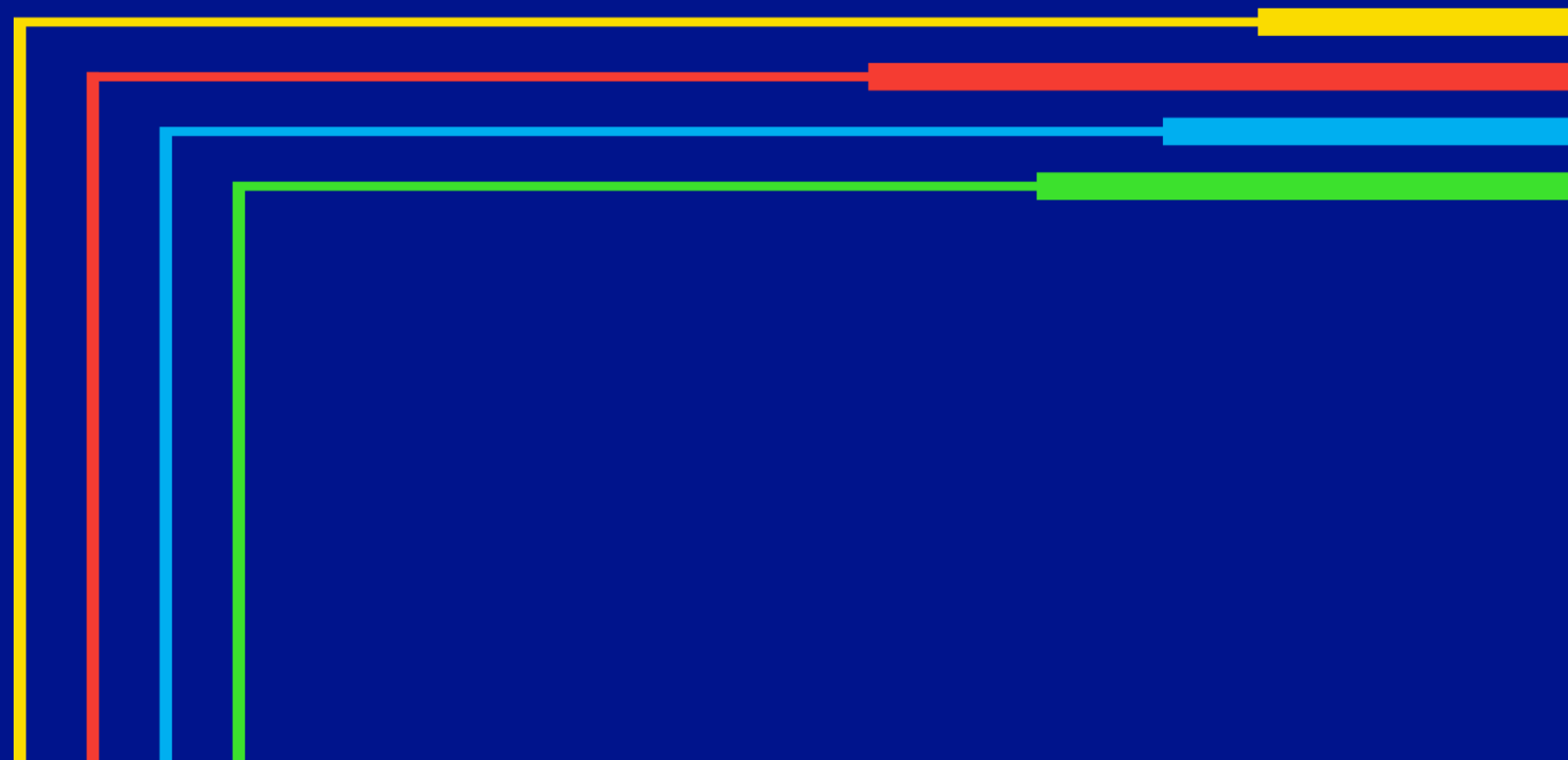
Distribution Planning Overview

May 11th , 2023



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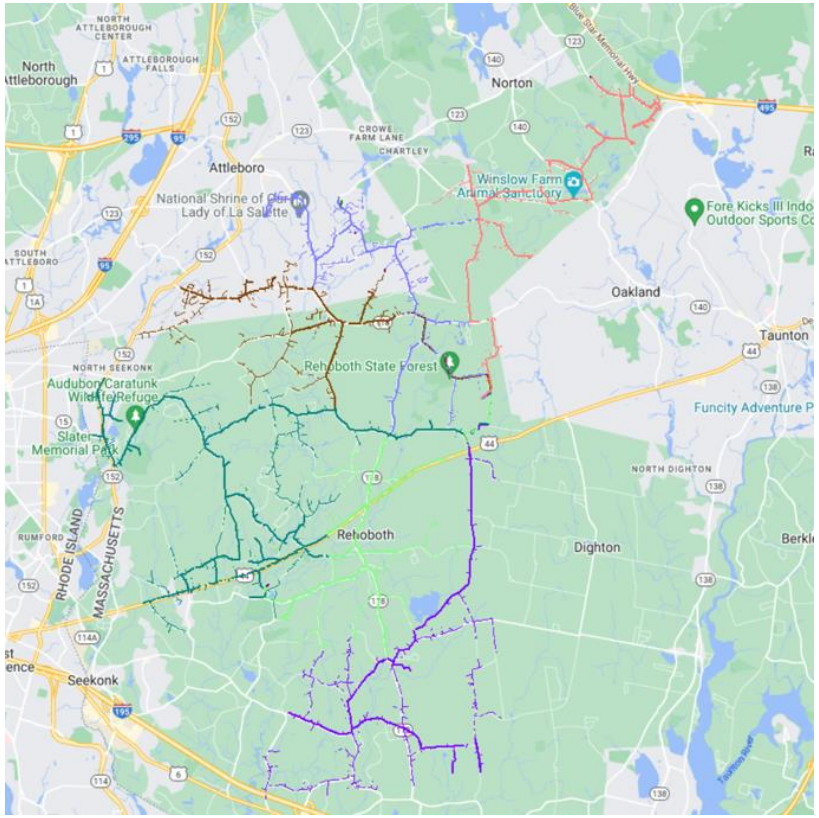
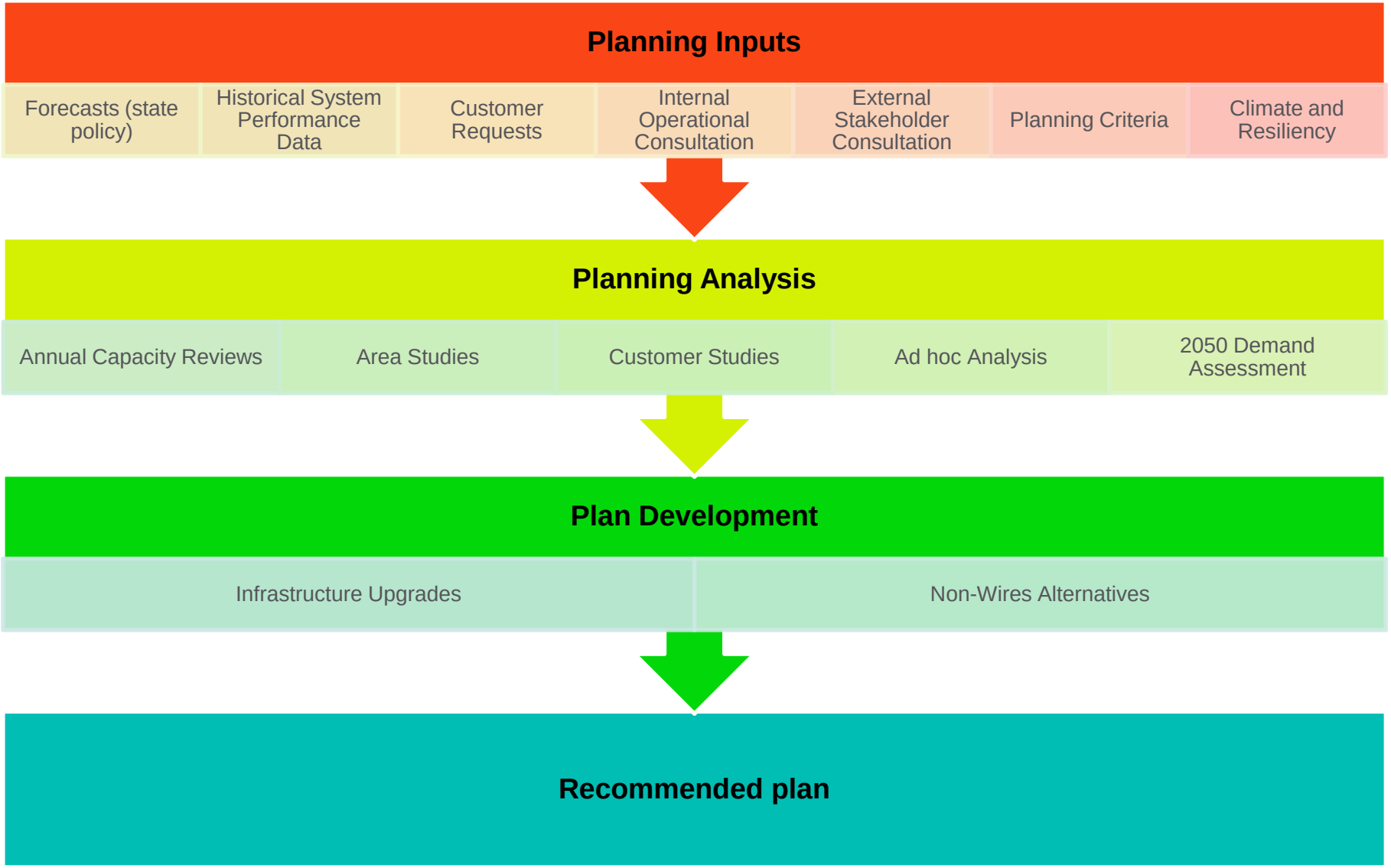
Distribution Planning Criteria

- The Distribution Planning Criteria defines acceptable operating parameters which are applied to the analysis of historical data with forecasting information to prepare recommendations for National Grid to provide safe, reliable, and efficient electric service.
- Planning criteria is applied in all distribution planning studies and analyses
- Planning criteria is reviewed every two years and updated as necessary
- Sets thresholds and limits intended to identify system needs and initiate investments to address these issues under Normal and Contingency (N-1) conditions
  - Asset condition
  - Thermal loading
  - Voltage
  - Non Wires Alternative Criteria
  - Fault Duty, Protection & Arc flash
  - Reliability
  - Resilience
  - Reactive Power
  - Load Balancing
  - Hosting Capacity
- Electrification is changing customer expectations which is driving changes to the company's planning criteria



Distribution Planning Process



Transformation of Distribution Planning

Emerging Needs

- Electrification
- Increased customer reliance on electricity
- Large Spot Loads
  - Distributed Generation (DG) saturation and increased number of Energy Storage System (ESS) applications
  - Large commercial customers
- System Resiliency and Climate Change
- Providing the most value to customers while maintaining a safe and reliable system

Emerging Technologies

- Distributed Energy Resources
- Distribution Automation (FLISR)
- Volt/Var Optimization
- Advanced Distribution Monitoring
- Time of use rates
- Distributed Energy Resource Management System
- GridEdge computing, Digital Twins

NE Distributed Energy Resources Benchmarking

DER Activity

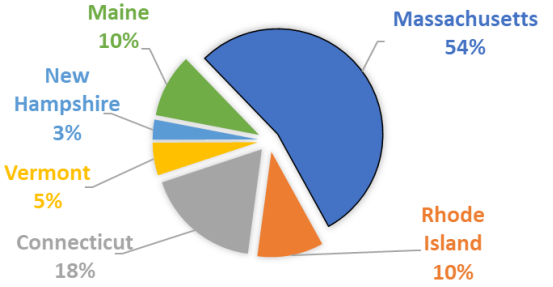
- National Grid connected 2GW of DG in MA service territory to date over 82,000 applications
- Currently there is 1.9GW of applications pending in queue

Energy Storage System (ESS) Applications

- Received >2.3GW of applications and ~1.5GW active in queue, majority in 2022
- Currently 711MW of applications in study

Source: State data from US Energy Information Administration and US CensusBureau

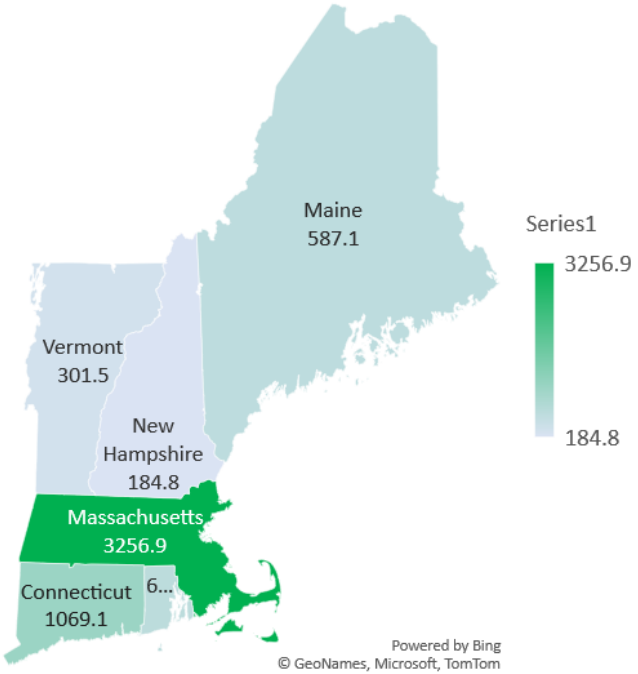
New England: State Shares of Solar Installed



Top States for Solar per Sq-Mi

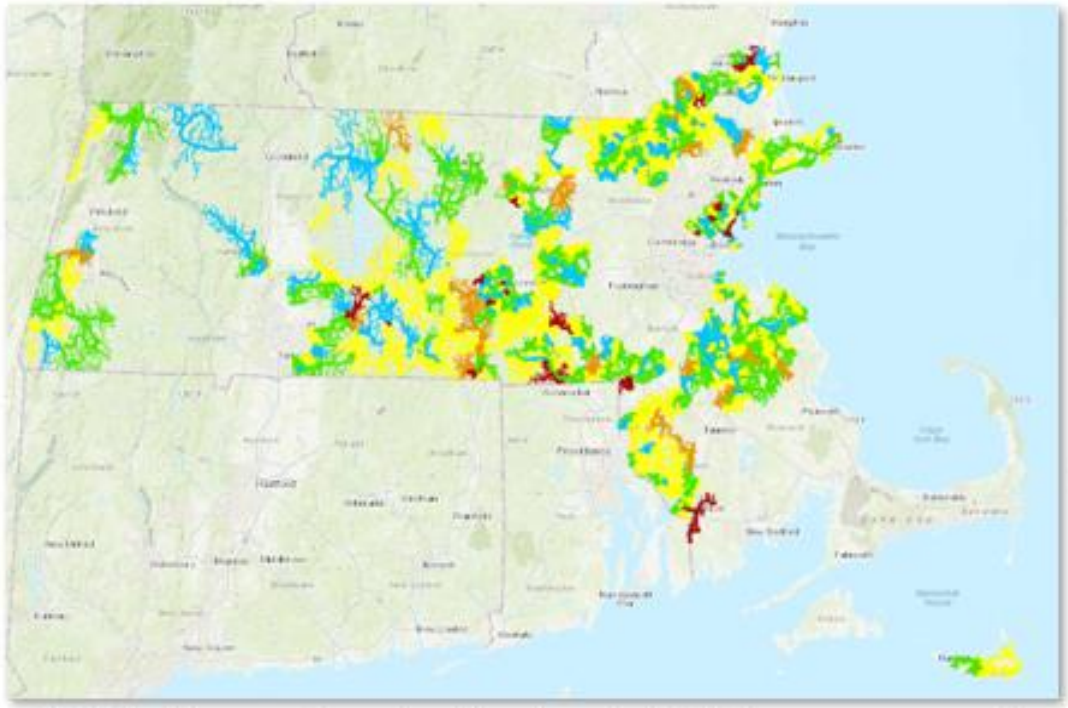
Rank	State
1	Rhode Island
2	New Jersey
3	***Massachusetts***
4	Connecticut
5	California

Installed MW per state as of Dec 2022

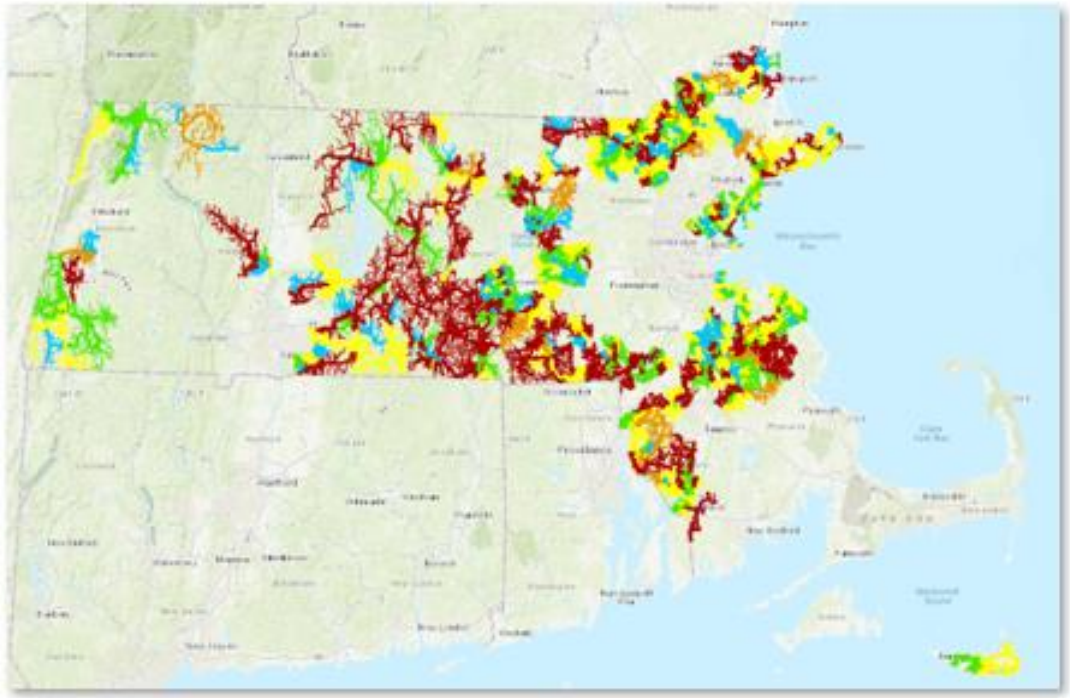


System Loading Level Challenge

Including all the storage currently in our interconnection queue would overload 15% of our distribution feeders or 25% of the total customers served



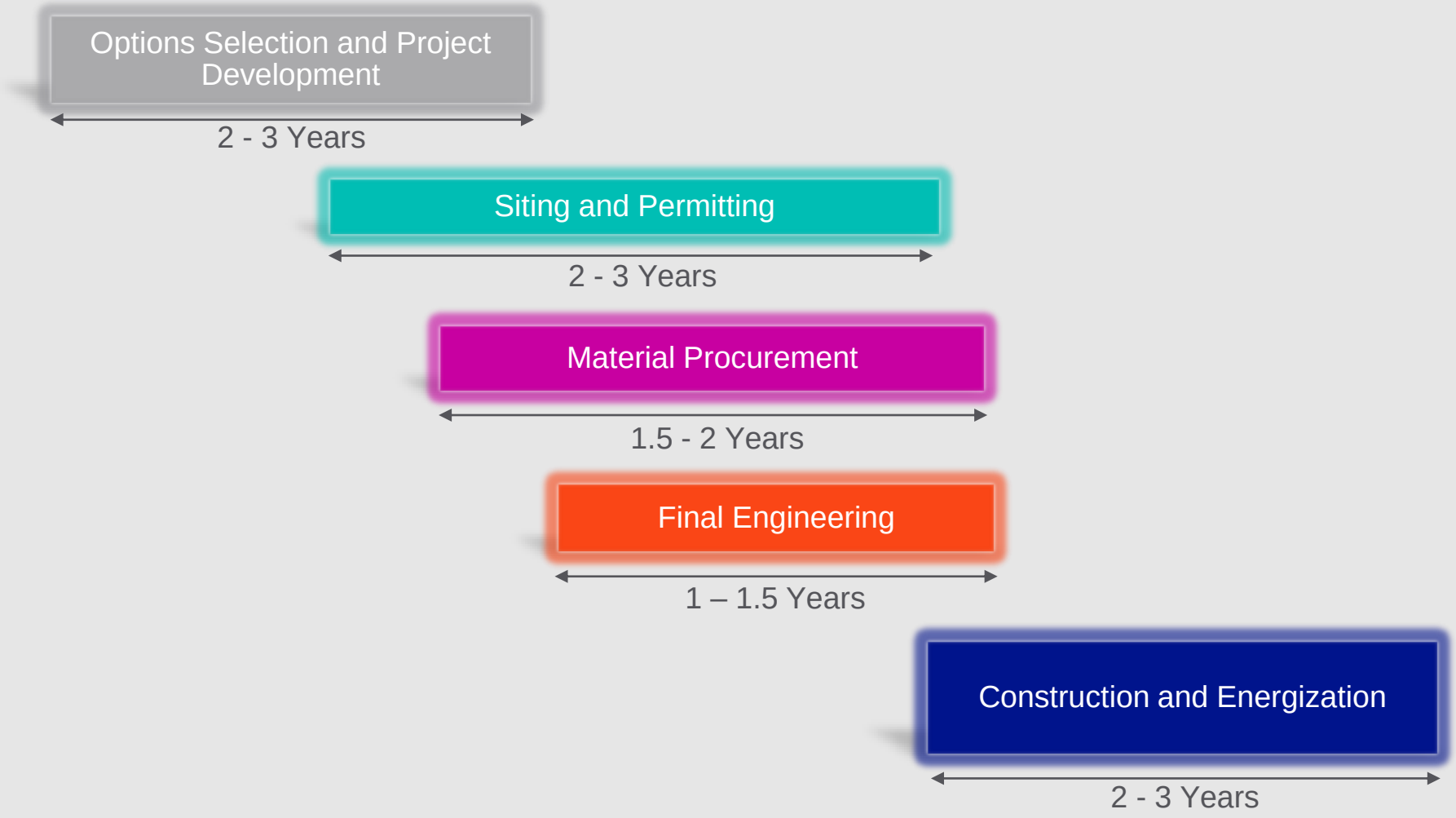
Distribution system loading levels



Distribution system loading levels
plus Battery Energy Storage Systems in queue

Heat map legend: <50% load | 50-70% load | 70-90% load | 90-95% load | >95% load

When need is determined, standard timeline from planning to energization for a major project, such as a new substation, is significant



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