Distribution Planning with a Feeder-Level Forecast

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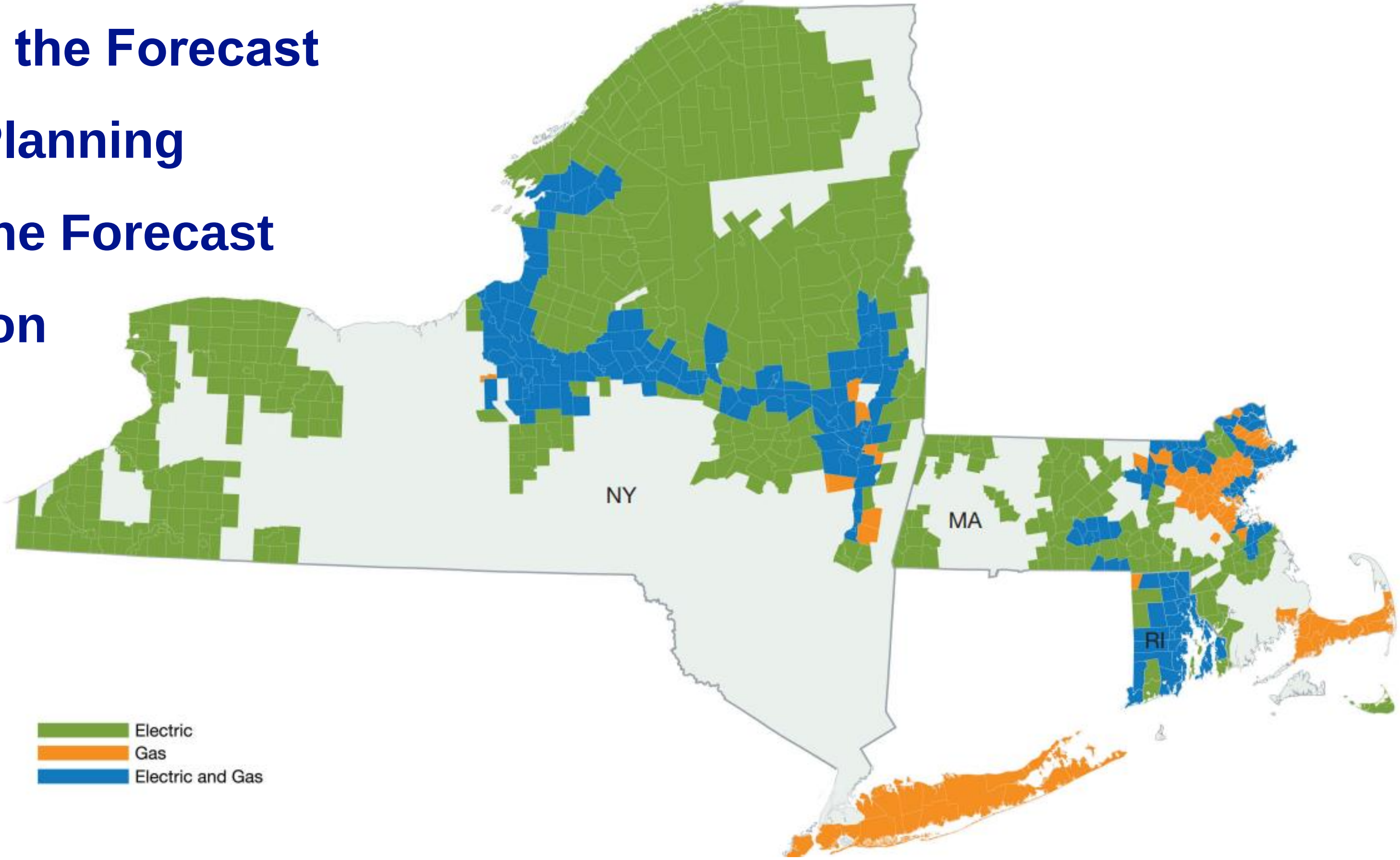


National Grid’s Feeder Level Forecast - Overview

Bottom-Up and Top-Down Approach

Hourly Data (8760) through 2050

90/10 Weather Scenario

Base, Low, and High Scenario for Each DER

Included DER Scenarios and Probabilities

DER type	Low(L)	Base(B)	High(H)
Energy Efficiency (EE)	15%	80%	5%
Solar (PV)	20%	75%	5%
Electric Vehicles (EV)	20%	70%	10%
Energy Storage (ES)	10%	80%	10%
Electric Heat Pumps (HP)	10%	85%	5%

DER Adoption Scenarios	Probability
Base Case: EE(B) + Solar(B) + EV(B) + ES(B) + HP(B)	28.56%
EE(B)+PV(B)+EV(L)+ES(B)+HP(B)	8.16% ↓
EE(B)+PV(L)+EV(B)+ES(B)+HP(B)	7.62% ↑
EE(L)+PV(B)+EV(B)+ES(B)+HP(B)	5.36% ↓
EE(B)+PV(B)+EV(H)+ES(B)+HP(B)	4.08% ↑
EE(B)+PV(B)+EV(B)+ES(H)+HP(B)	3.57% ↓
EE(B)+PV(B)+EV(B)+ES(L)+HP(B)	3.57% ↑
EE(B)+PV(B)+EV(B)+ES(B)+HP(L)	3.36% ↓
EE(B)+PV(L)+EV(L)+ES(B)+HP(B)	2.18%
EE(B)+PV(L)+EV(L)+ES(B)+HP(B)	2.18%
EE(B)+PV(H)+EV(B)+ES(B)+HP(B)	1.90%
EE(H)+PV(B)+EV(B)+ES(B)+HP(B)	1.79%
EE(B)+PV(B)+EV(B)+ES(B)+HP(H)	1.68%
EE(L)+PV(B)+EV(L)+ES(B)+HP(B)	1.53%
EE(L)+PV(B)+EV(L)+ES(B)+HP(B)	1.53%
EE(L)+PV(L)+EV(B)+ES(B)+HP(B)	1.43%
EE(B)+PV(B)+EV(L)+ES(L)+HP(B)	1.02%
EE(B)+PV(B)+EV(L)+ES(L)+HP(L)	0.96%
EE(B)+PV(B)+EV(L)+ES(B)+HP(L)	0.96%
EE(B)+PV(L)+EV(B)+ES(L)+HP(B)	0.95%
EE(B)+PV(L)+EV(B)+ES(B)+HP(L)	0.90%
EE(B)+PV(L)+EV(B)+ES(B)+HP(L)	0.90%
EE(L)+PV(B)+EV(B)+ES(L)+HP(B)	0.66%
EE(L)+PV(B)+EV(B)+ES(B)+HP(L)	0.63%
EE(B)+PV(B)+EV(H)+ES(H)+HP(B)	0.51%
EE(B)+PV(B)+EV(B)+ES(L)+HP(L)	0.42%

Distribution Planning "Inputs" into the Feeder Level Forecast

Historical Loads	Types of Distributed Energy Resources (DERs)	Variations of Scenarios
Summer Peak Winter Peak Minimums	Electric Vehicles Distributed Generation Electric Heat Energy Efficiency Battery Energy Storage Systems (BESS)	High, Base, Low Fossil Free Vision Full Electrification

Forecast Delivery to Distribution Planning

A Set of Files for Each Feeder

- Hourly Data Until 2050
- Summary Data (Peaks and Minimums)

One Column for Every DER and Scenario

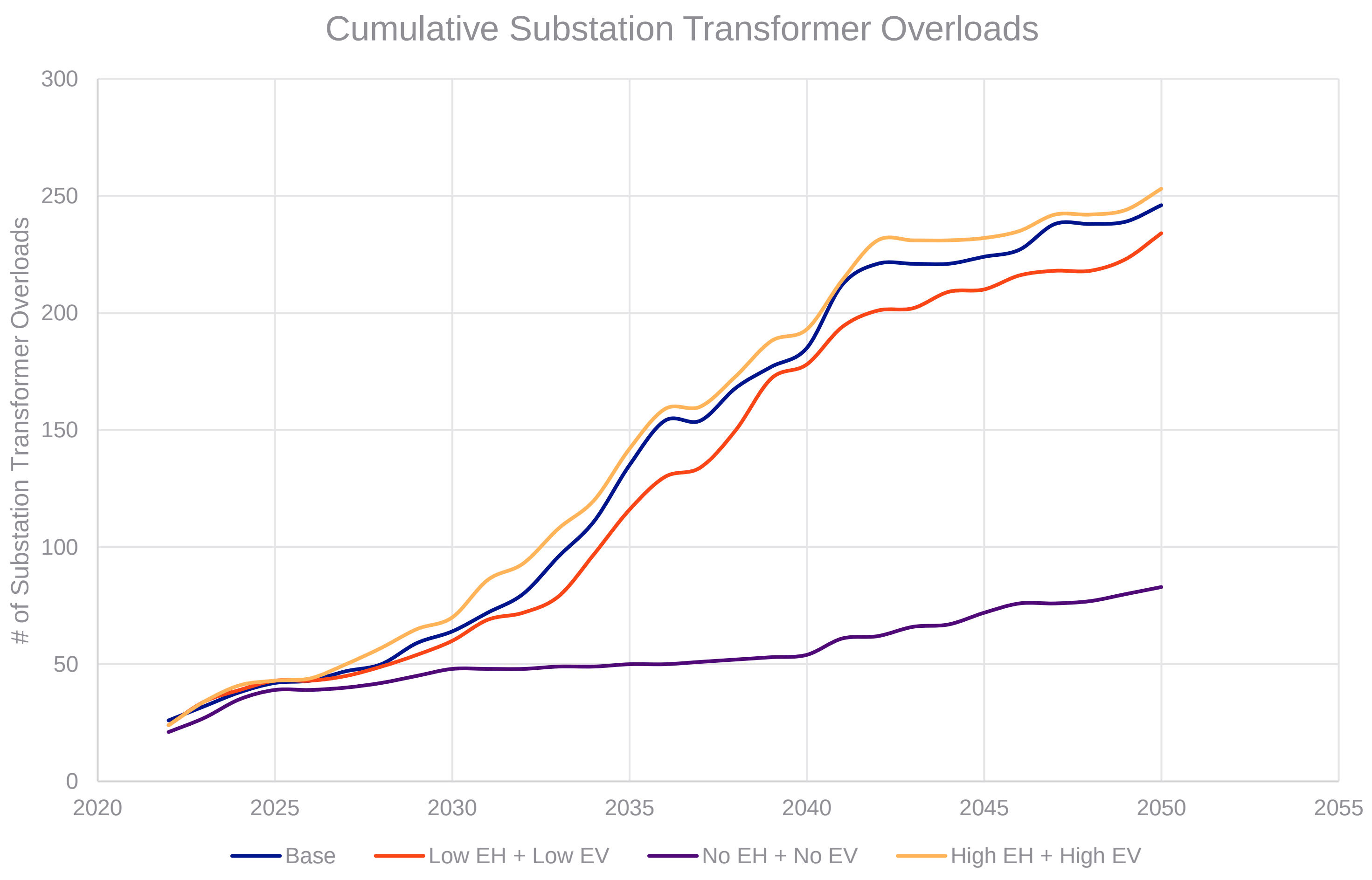
- Example: 3 Columns for EV Scenarios (Base, Low, High)

Portal for Planners to Retrieve the Filles

We Simplify for System Wide Analysis

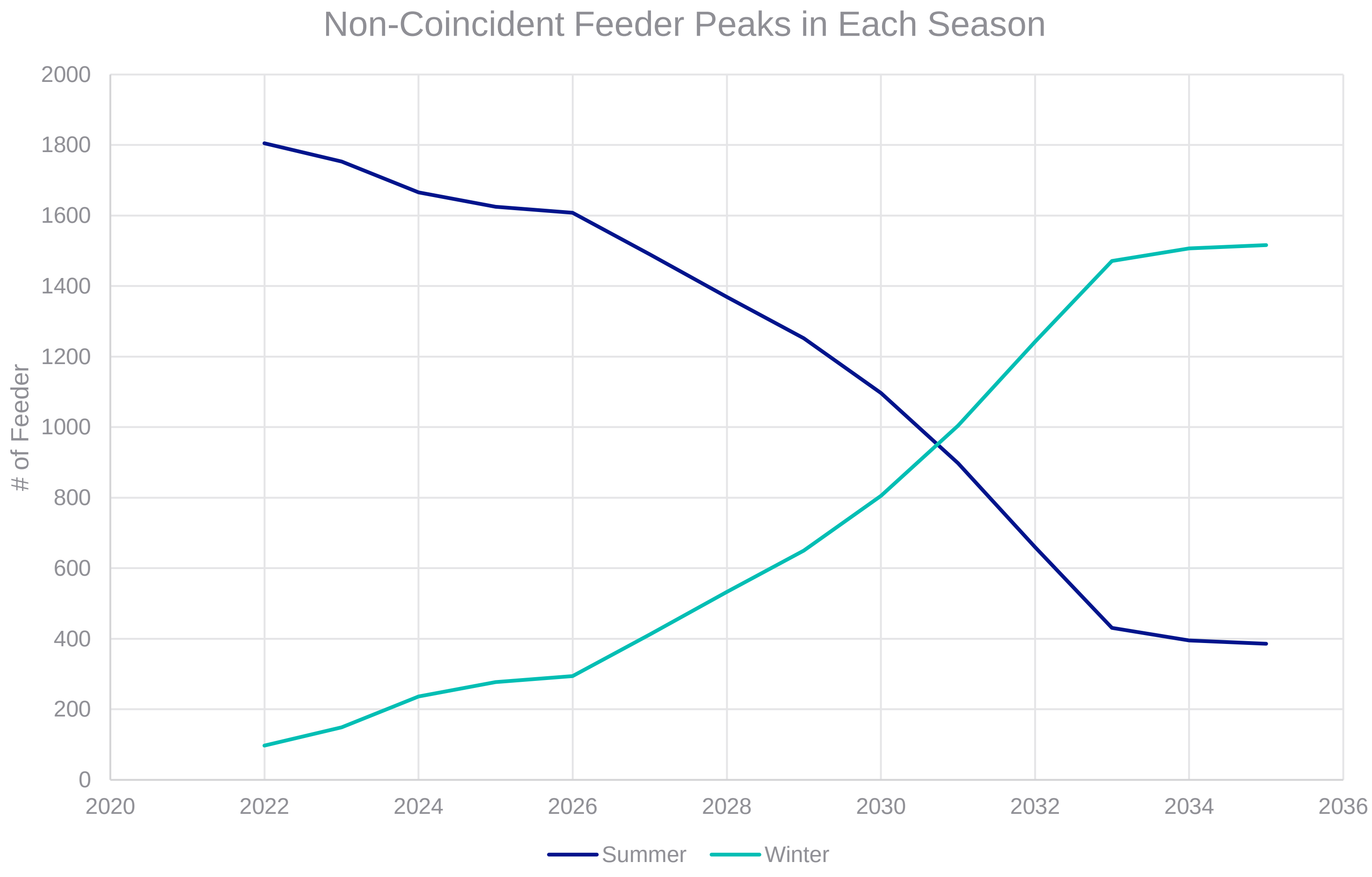
- Single Value for Every Feeder with Chosen Scenarios

EV Forecast – Scenario Comparison (2023 Forecast)



The higher scenario will result in increased criteria violations that are driving an increase to the number and average size of solutions.

The Switch to Winter Peaking



The peak in NY will shift from the summer to the winter due to the electrification of heat.

The peak hours will shift from early evening, to early morning.

Building the Trust of Planners in the Hourly Forecast

2018: Used the Trends	Increasing = Create a Project Decreasing = Monitor Prior to Creating a Project
2020: Used the Peaks of a Single Forecast	Create projects based on the yearly peak values in the forecast
2022: Used the Peaks of a Multiple Forecasts with Different Scenarios	Utilized different scenarios of the DERs depending on the local and overall probabilities of each scenario
2024: Improve utilization of the Hourly Data in the Forecast	Prioritize and design projects based on the frequency of peaks in the forecast

Example Project – Battery Energy Storage System (BESS)

Three key datapoints from the forecast to size a BESS:

- **Number of violations per year**
- **Length of time the violation occurs**
- **Magnitude of the violations**

A traditional, single-point forecast cannot provide this detail.

Thank You!

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