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Probabilistic Applications in ISO-NE Operations

Probabilistic Forecasting Applications Panel – ESIG Summer Workshops

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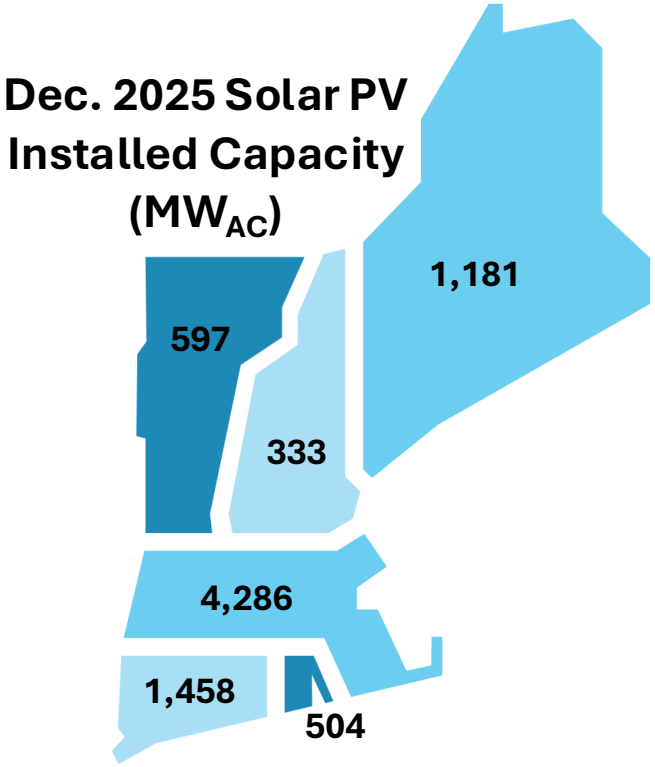
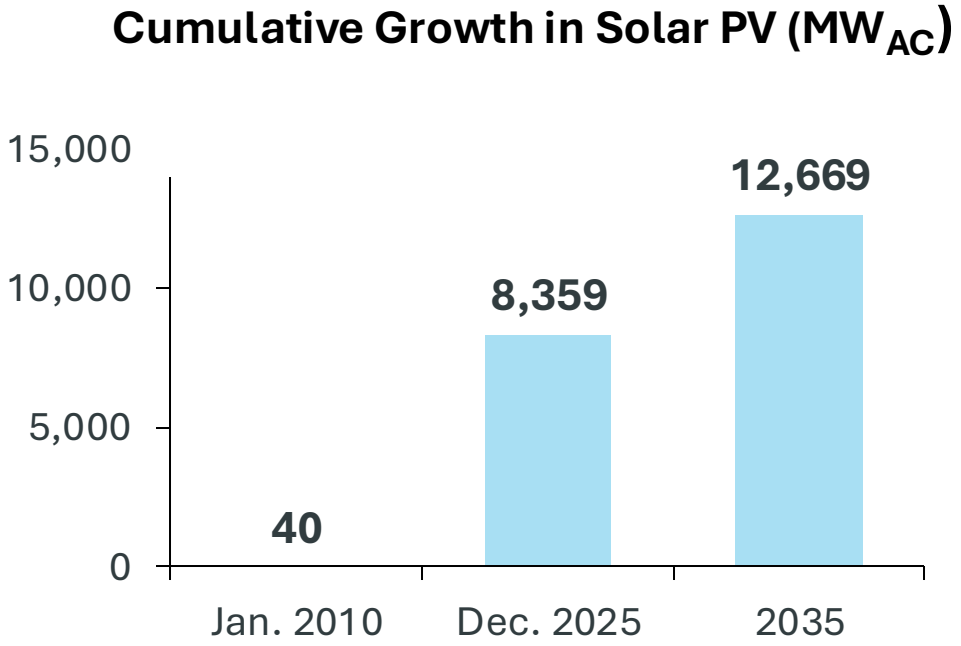
ISO-NE PUBLIC

ISO-NE Load & Renewables

- Highest “Recent” Peak Load
  - 26,024 MW (6/24/2025)
- Lowest Mid-Day Minimum Load
  - 5,318 MW (4/20/2025)
- Renewables
  - ~8,500 MW Behind-the-meter PV
    - Acts as “load reducers”
  - ~1,000 MW Front-of-meter PV
  - ~2,400 MW Wind

Strong Growth in Solar Resources Forecasted



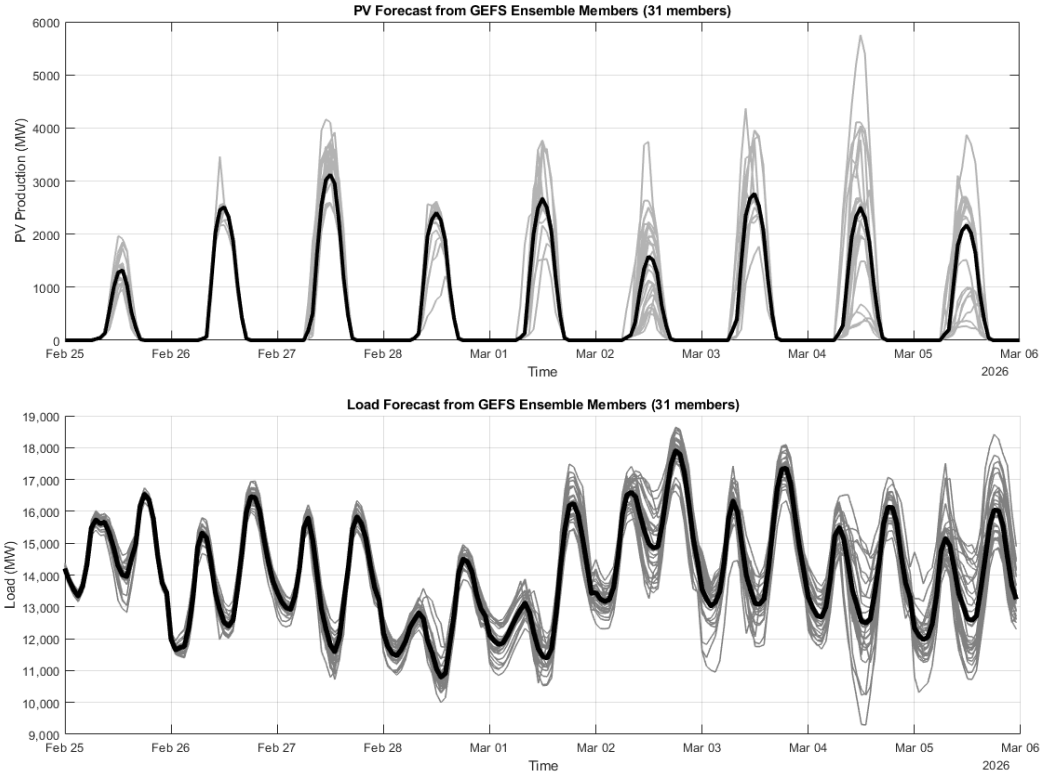


History and Future of Forecasts in ISO-NE Operations

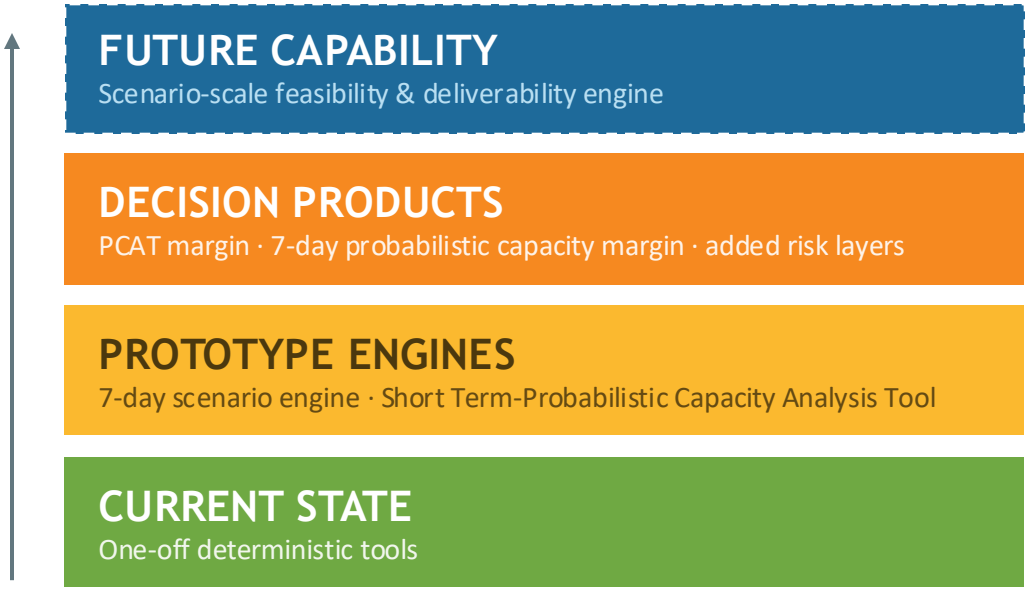
- 20+ years of deterministic forecasting
  - Will continue to be used and improved
- ~1 year into probabilistic forecasting
  - Initial areas of exploration
    - Various methods focused on Load, Solar, and Wind
  - Transitioning towards weather-driven analysis
    - Enables more “realistic” scenarios to feed analysis
  - Decision-focused framework

Concept – NWP Ensemble Members Generate Realistic Scenarios

- Download GEFS members
- Retrieve New England weather
- Run weather through PV Forecast model(s)
- Run PV and weather through Load Forecast model(s)



Probabilistic Analysis Framework



Where things stand

- The 7-day load, wind & solar scenario engine already exists and is being refined.
- That scenario engine is the primary input to ST-PCAT — the 7-day probabilistic capacity product we are starting to design.

COLOR = MATURITY: In hand · Building · Open Design · Future

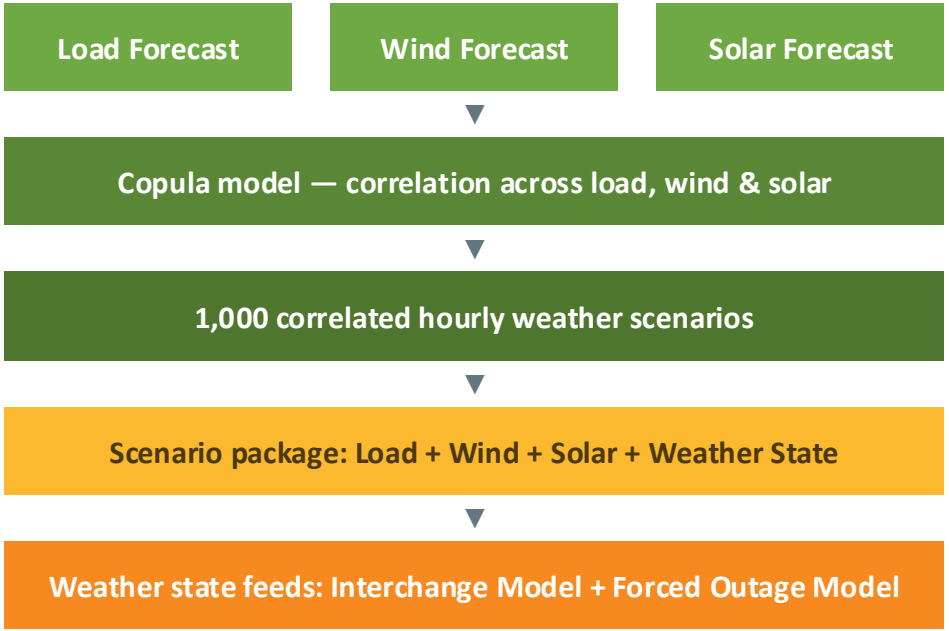
Probabilistic Capacity Analysis Buildout

FOUNDATION — IN HAND	BUILDING + OPEN DESIGN	FUTURE RISK LAYERS
Load Distributions	7-day Capacity Margin	Gas-At-Risk Modeling
Wind Scenarios	Interchange Model	Energy Security Risk
Solar Scenarios	Forced Outage Model	Battery SOC Risk
Copula Correlation	Improved Generation Capability Model	Fuel Constraints
Scenario Traceability	Validation Framework	Regional Risk

We are not building a single hard-coded tool. We are building a framework that can mature into a broader operational risk modeling capability — new risk layers plug in as they become identifiable and quantifiable.

In hand Building Open Design Future

Probabilistic Scenario Engine



Why this matters

We are not independently sampling load, wind, solar, interchange, and outages.

Each scenario is internally consistent, and the full set of 1,000 represents the probability distribution for that hour.

Interchange and forced-outage risk are modeled from the same weather and system state, because both depend on it.

Output: an hourly package of 1,000 representative, internally consistent sets of weather and system conditions — the primary input to ST-PCAT.

In hand Building Open Design Future

Future Use Cases

- Outage Coordination
  - Outage requests studied against increased risk of system & local capacity and energy deficiencies
- Localized High Voltage Mitigation
  - Currently modeled as a function of load & can trigger unit commitment for additional reactive support
- Dynamic Regulation & Reserve Optimization
  - Dynamically adjusted real-time regulation and reserve requirements based on level of system uncertainty

About the Presenter

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