

Use of Normals in Load Forecasting at National Grid



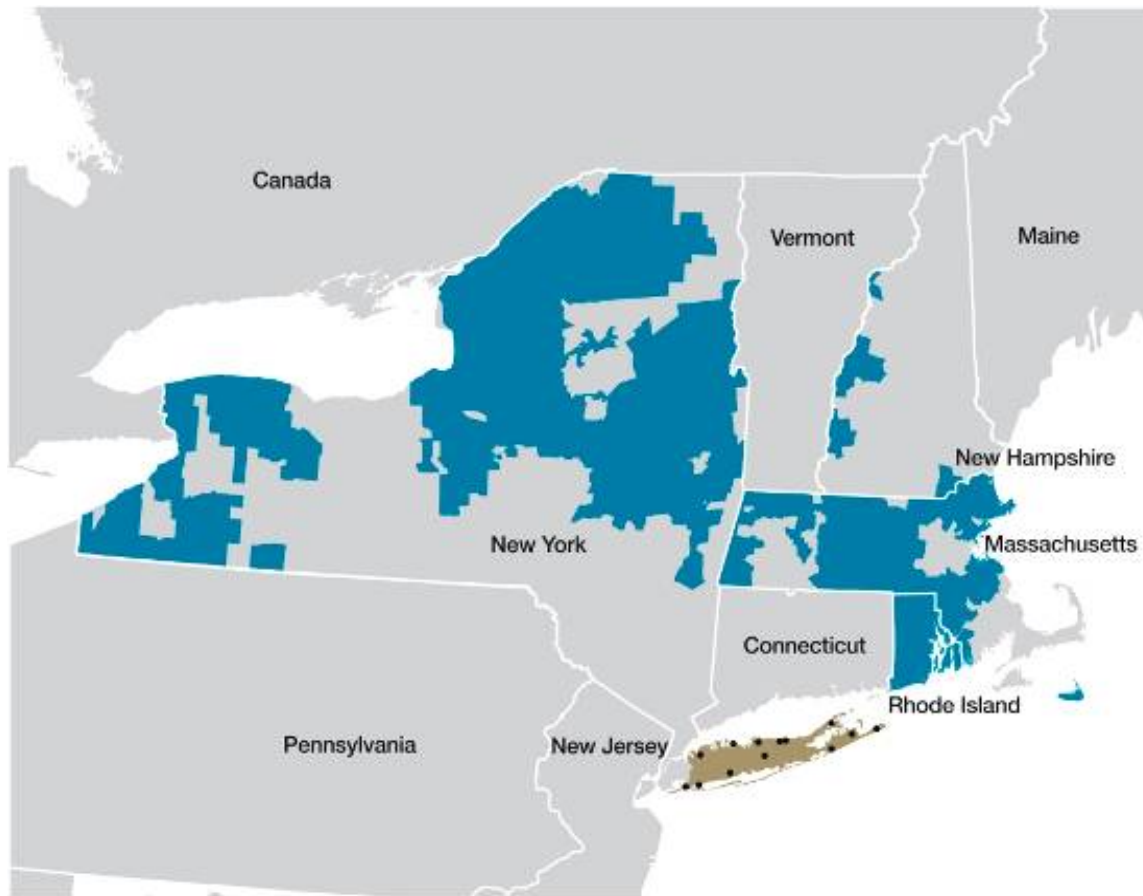
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National Grid is an international electricity and gas company

- Based in the UK and northeastern US
- One of the world's largest investor-owned utilities
- 19 million customers
- 28,000 employees, 63% in the US, 37% in the UK
- UK business consists mainly of regulated gas distribution, gas transmission and electric transmission
- US business consists mainly of regulated gas distribution and electric distribution and transmission



US Electric Footprint



- Electric distribution service area
- Long Island Power Authority service area
- Generation

- 3.4 million electric distribution customers in Upstate NY, Massachusetts, Rhode Island and New Hampshire.
- Five electric distribution companies.
- We also manage the Long Island Power Authority and own 4,000 MW designated for LIPA customers

US Gas Distribution Service Area



■ Gas distribution service area

- 3.5 million gas customers in Upstate New York, New York City, Long Island, Massachusetts, Rhode Island and New Hampshire.
- Eight gas distribution companies

Industry Structure / Regulatory Background

- Electric generation divested in all jurisdictions since the late 1990s
- Electric and gas distribution rates decoupled in all jurisdictions except New Hampshire
 - Electric rates set to recover approved revenue requirement
 - Gas rates set to recover approved revenue/customer; some customers excluded
- Electric transmission rates decoupled or fully reconciling everywhere but New Hampshire
- Fully reconciling default service commodity rates in all jurisdictions
- Capex trackers in Massachusetts and Rhode Island for distribution system upgrades (electric and gas)

Primary Load Forecasts, Uses and Weather Assumptions*

<u>Forecast</u>	<u>Main Uses</u>	<u>Weather Assumptions</u>
5-year monthly kWh and Btu distribution deliveries by Company and class of service	Rate setting, financial planning, electric procurement, DSM budgeting	Normal weather
Long-term (10-year to 25-year) seasonal peak MW demands, by Company and power supply area	Electric distribution and transmission planning	Three weather scenarios: normal, 1/10 and 1/20
5-year design year, design day and design hour gas volumes (Btu)	Gas supply planning (procurement) and distribution system planning	1/40 weather
Day-ahead hourly MW and Btu demands	Daily energy management	NWS hourly forecast

* Traditional load forecasts based on aggregate data. In addition, National Grid is collecting parcel-level data to forecast individual customer electric and gas demands for marketing, targeted DSM and SmartGrid.

Weather Concepts Used

Forecast

Weather Concept

5-year monthly kWh and Btu forecasts

HDD and CDD weighted over the monthly billing period (HDD only for gas)

Long-term seasonal peak MW demands

Peak day temperature for winter and average of peak-day temperature and dew point (THI or “Temperature Humidity Index”) for summer

5-year design year, design day and design hour gas volumes (Btu)

Weighted average of temperature and wind speed (EDD or “Effective Degree Days”)

Day-ahead hourly MW and Btu

Hourly EDD

Weather Stations

<u>Forecast</u>	<u>Service Area</u>	<u>Weather Stations</u>
5-year monthly kWh and Btu distribution deliveries	Massachusetts Rhode Island New Hampshire Upstate NY Downstate NY	Boston, Worcester, Nantucket Providence Concord Albany, Syracuse, Buffalo Central Park
Long-term (10-year to 25-year) seasonal peak MW demands	Same as above	Same as above, aligned to individual load areas
5-year design year, design day and design hour gas volumes (Btu)	Same as above	Same as above
Day-ahead hourly MW and Btu	Same as above	Same as above plus 11 second order stations

Normal Weather Definitions

	<u>Electric</u>	<u>Gas</u>
New York	Latest 10-year historical average of monthly CDD and HDD per NY PSC Order in last rate case	30-year historical average of monthly HDD established in last gas rate case
Mass	Latest 10-year historical average of monthly CDD and HDD for consistency with NY (no regulatory requirement)	20-year historical average of monthly HDD established in last rate case and approved by the MA-DPU
Rhode Island	Same as above	10-year historical average of monthly HDD established in last gas rate case and approved by the RI PUC
NH	Same as above	20-year historical average of monthly HDD established in last gas rate case approved by NH PUC

Observations / Conclusions*

- While NOAA's 30-year normals have been used in the past, subjective definitions have been used more often
 - Current normal weather definitions driven largely by precedents from past regulatory proceedings
 - Extreme weather scenarios for electric system planning are basically subjective
 - Extreme weather scenarios for gas system planning based on cost/benefit analyses accepted by regulators, but still have subjective element
- Stakeholders often look to load forecasters for guidance
- Stakeholders and load forecasters tend not to be meteorologists
 - Many seem to intuitively believe that weather normals should be updated annually, using the latest actual weather
 - Some have argued for different definitions of normal weather to suit their needs
 - Others feel a weather forecast should be used, perhaps because of a volcano or El Nino
- Calls for normal or extreme weather assumptions that reflect climate change are constant
- The preference is to use the most accurate weather assumption possible

* All opinions expressed here are the author's only and not necessarily those of National Grid.