PJM seeks an independent consultant to review its peak load forecasting model and associated non-modeled forecasts to evaluate the methods used and to make any recommendations. In particular, PJM is interested in recommendations that are likely to improve the accuracy, stability and transparency of PJM's load forecast model, and/or recommendations to reduce any bias of the model.

The independent consultant will review PJM's current forecasting approach and assist PJM with its transition to an hourly forecasting framework. Over the years, the PJM forecast has evolved to address the challenges of long-term forecasting across a geographically diverse region with demand driven by large variations in weather conditions and economic activity, as well significant improvements in end-use energy efficiency.

The next challenge is addressing the onset of new technologies that are reshaping system hourly loads, and as a result, the level and timing of coincident peak (CP) and non-coincident peak (NCP) demands across the PJM service area. The market penetration of solar, and expected impacts of electric vehicles, state electrification programs, home battery storage and a significant increase in data center loads, are complicating the load forecasting process.

General Topics To Review

- Hourly modeling frameworks
  - Reconstituted loads versus direct modeling
  - Integration with existing daily energy, CP and NCP models
  - Integration with new technology shapes and forecasts
  - Waterfall versus direct modeling approaches
- Technology market adoption data/forecasts and impact shapes
  - Technologies that should be included explicitly in the long-term forecast
  - Sources for market adoption data/forecasts
  - Sources for technology impact shapes
  - Linking solar photovoltaic generation impact shapes to weather simulation data
- Weather simulations and climate change
  - Existing PJM documentation on climate change
  - Candidate approaches for including climate change into the forecast

Specific Areas To Review

- **Hourly periodicity:** PJM's current model produces daily peak/energy values that are used to develop monthly and seasonal values. In 2022, PJM intends to transition to an hourly load forecast to accurately capture the influence of behind-the-meter solar generation and vehicle charging on the hourly load shape.
- **Forecast accuracy and/or bias reduction:** PJM currently uses an econometric model that produces a 15-year forecast of non-coincident and coincident monthly peak loads and net energy for load for each PJM transmission zone, locational deliverability area (LDA) and the RTO. This process includes the calibration of model drivers (i.e., sector models, non-weather-sensitive load and weather sensitivity). The model features a simulation of historical weather and solar patterns to develop a distribution of forecasts, from which the median value is selected as the 50/50 peak. The 90th percentile forecast, or "90/10" forecast, is also selected.

- **Sector models:** Recent changes to PJM's forecasting methodology included adding zonal residential, commercial and industrial sector models that underlie the heating, cooling and other indices used in the later-stage models.
- **Coincident peak forecast process:** PJM currently develops coincident peak forecasts for the LDAs and the RTO by modeling the contribution of the relevant PJM zones to the LDA/RTO load. The intent is to capture the appropriate amount of load diversity within the region.
- **Non-modeled forecast:** Aside from the modeled forecast, PJM currently develops forecasts for the load impact of distributed solar generation, plug-in electric vehicles and distributed battery storage. Each of these employ external forecasts, which PJM then translates into a PJM load forecast.
- **Forecast adjustments:** PJM's load forecast process allows for the Electric Distribution Companies of the various PJM transmission zones to apply for a load forecast adjustment in cases where the zone has experienced, or is anticipated to experience, a significant load change that may not be captured in the load forecast model. PJM may elect to apply a load forecast adjustment by either adjusting model inputs or by an explicit adjustment to the modeled forecast.
- **Energy efficiency:** The current load forecasting process incorporates anticipated energy efficiency improvements into the sector load models. This approach is designed to capture all energy efficiency improvements, including those resulting from policy actions not explicitly represented in the load model.
- **COVID-19 impacts:** Alternative approaches to modeling the impact of COVID-19 will be assessed.
- **Weather normalization of historical peak loads:** Historical weather-normalized peak loads, while only informational, are of interest because they remove weather effects and reveal underlying trends.