

## **Scope of Work for Independent Consultant on PJM Load Forecasting Methodology 5/7/10**

### **Purpose for Proposal**

On March 8, 2010 a group of stakeholders requested, by letter, that the PJM Interconnection (PJM) “retain an independent consultant to review its peak load forecasting methodology and make recommendations.” The stated goal of the stakeholders is to “ensure that the load forecast is as accurate as possible and is adapted as necessary for changing circumstances.”

### **Background:**

PJM developed an internal load forecasting function beginning in 2004, and released its first independent load forecast in 2006. The PJM load forecast model is an econometric model that produces estimates of non-coincident and coincident peak loads and net energy for load, for each PJM zone, locational deliverability area (LDA) and the RTO. It uses local economic activity, weather, and day-type variables as explanatory variables/drivers. Weather data and economic data and forecasts are procured from outside vendors. The model features a Monte Carlo simulation of historical weather patterns and regional diversities to develop a distribution of forecasts that are then used to produce monthly and seasonal forecasts across a range of weather conditions.

Internal uses of the load forecast are: the Regional Transmission Expansion Plan (RTEP), which identifies needed system upgrades; the Reliability Pricing Model (RPM), the forward capacity market; load deliverability (CETO/CETL) studies, which identify transmission constraints in PJM; and the installed reserve margin study, which determines the reserves required to maintain 1-in-10 reliability. Additionally, PJM supplies its load forecasts to the North American Electric Reliability Corporation (NERC), SERC Reliability Corporation (SERC) and ReliabilityFirst Corporation (RFC), for use in regional reliability assessments.

Subsequent to the release of the first load forecast in 2006, PJM experienced an unrestricted all-time peak load of 145,951 MW on August 2, 2006, exceeding the forecasted peak load by over 12,000 MW. PJM retained independent consultant The Brattle Group (TBG) to assess the load forecast model and make recommendations. TBG concluded that “the model is doing a good job of forecasting peak demand and the main source of error is weather.” TBG also made recommendations for enhancements to the model. A number of TBG’s recommendations have been implemented (along with others that have been vetted through PJM’s Load Analysis Subcommittee).

As PJM developed the 2009 load forecast in fall 2008, the U.S. economy was in recession and the economic forecasts that drive the load forecasts were being revised downward significantly. Some PJM stakeholders expressed concern that the PJM model

was too dependent on the economic forecast of one vendor whose forecast could be erroneous, that the model was unable to respond to slowing load growth, and that recent industry developments that impact load growth are not fully reflected in the PJM model. This led PJM to conduct a special stakeholder process throughout 2009, which included sessions on the details of the model and review of all stakeholder concerns. Ultimately, the process resulted in one proposed revision: to supplement the existing forecast based on GMP data from a single vendor with an alternative forecast based on consensus US GDP data from the Blue Chip Economic Indicators publication. The proposal was rejected by a vote of the PJM Planning Committee on September 16, 2009.

### **Scope of Work:**

PJM solicits analysis to address the following issues. All recommendations must be reasonably achievable, cost effective and compatible with PJM's planning policies. To the extent possible, all recommendations should be backed up with demonstrated benefits:

#### **Phase I – This portion of the scope of work must be completed by September 2010 in order to be implemented for the 2011 PJM Load Forecast Report:**

- **Economics:** PJM currently uses point estimates of economic variables from one provider (Gross Metropolitan Product from Moody's Economy.com). This puts significant weight on that one input (economics is the only true growth driver). The quality of the load forecast is directly tied to the quality of the economic forecast. **Is there a more appropriate way to incorporate economic activity into the model?** Consideration should be given to:
  - Use of economic variables in place of or in addition to Gross Metropolitan Product;
  - A method to select the most accurate economic forecaster;
  - Producing separate load forecasts using economic inputs from multiple providers (with a method to select a final forecast);
  - A method to produce a blended economic forecast from multiple providers;
  - A method to produce a true consensus economic forecast;
  - A method to adjust the economic forecasts by the average error of the individual economic forecaster.

#### **Phase II – This portion of the scope of work will ideally be completed by September 2010 in order to be implemented for the 2011 PJM Load Forecast Report, but is lower in priority than Phase I:**

- **Weather:** PJM currently models weather uncertainty through a Monte Carlo simulation that provides load estimates over a wide range of weather conditions.

Scenarios are produced using all weather observations from January 1974 onward. **Is there a more appropriate way to treat weather uncertainty or to determine 50/50 and 90/10 load levels?**

**Phase III – This portion of the scope of work must be completed by September 2011 in order to be implemented for the 2012 PJM Load Forecast Report:**

- **Price:** The model does not include a price term for either peak load or net energy for load. **Can the load forecast model be improved by the addition of a price variable?** Consideration should be given to:
  - Addressing this issue separately for peak load and net energy for load;
  - A method to acquire historical price data;
  - A method to forecast forward prices.
- **Demand Side Response:** In addition to the unrestricted peak forecasts, PJM uses adjustments to the load forecasts to derive the final peak loads that are used in system planning studies and RPM. These adjustments capture the impact on future load growth of Load Management, Energy Efficiency and Price Responsive Demand (assuming PRD is implemented in future RPM auctions):
  - PJM currently uses the amounts of DR, EE and PRD cleared in RPM auctions. PJM believes, at this time, that using only impacts of resources committed through the auction process is appropriate. **Is there a more appropriate way to incorporate future demand side response activity into the model? How should federal and state mandates to reduce future load be addressed?** Consideration should be given to:
    - The ability to model demand side response as opposed to separately developing adjustments to the forecast;
    - The possibility of double-counting of energy efficiency gains already embedded in the load data;
    - The possibility that mandated load reductions may not materialize or be fleeting.
- **Revisit Previous Recommendations:** The Brattle Group investigated the PJM load forecast model in 2006 and made a number of recommendations. Some were adopted and others were not. **Revisit the Brattle Group's 2006 recommendations and determine if any of the recommendations not adopted should be pursued.**
- **Documentation and Validation of the Forecast:** Stakeholders desire to have confidence that PJM's forecasts project as accurately as possible. **Can this confidence be strengthened by further validation and documentation of the forecasts?** Consideration should be given to:
  - Further discussion of recent trends and key drivers of the forecast;
  - Additional sensitivity analyses and scenarios;
  - Backcast analyses;

- Comparisons to other forecasts for the RTO region, such as those prepared by electric distribution companies or the Energy Information Administration; and comparisons to forecasts for adjacent regions.
  - New ways of communicating the forecast internally and externally to various stakeholder groups.
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- **Process for Preparing and Approving the Load Forecast:** PJM currently produces annual forecast updates, with model estimation starting in late summer, initial stakeholder review in early December, and final publication at year end. **Make recommendations regarding the annual process for preparation, review and approval of the load forecast.** Consideration should be given to comparing PJM's process to the processes followed by other ISOs/RTOs.

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