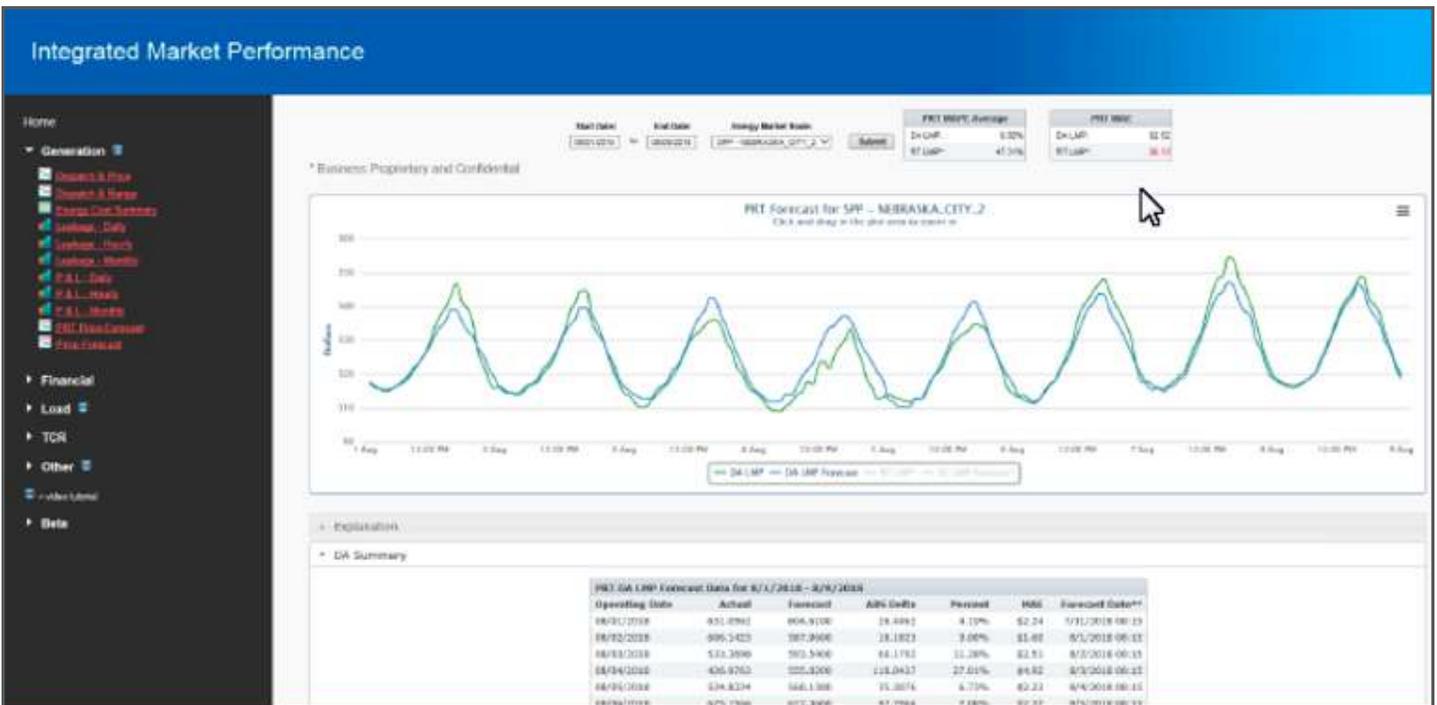




IMPROVE OPERATIONAL DECISIONS WITH PRT'S PRICE FORECASTS



How Nebraska Public Power District Makes Informed Trading Decisions with PRT Load and Price Forecasts

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Case Study

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Intro:

With the advent of deregulated markets, one of the greatest challenges utilities, municipalities, retail or electric providers face today is the ability to model forward-looking power demand, predict accurate forecasts of the expected load ahead of time, and forecast locational marginal prices (LMPs) for next day trading. Bringing estimates closer in line with reality saves time and money. In this case study, we show how PRT forecasting data is delivering for Nebraska Public Power District (NPPD), Nebraska's largest electric utility.

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Background

Nebraska Public Power District (NPPD):

Nebraska Public Power District (NPPD) is Nebraska's largest electric utility, with a chartered territory that includes all or parts of 91 Nebraska counties. NPPD operates as both a retail and wholesale provider with an estimated 600,000 people in Nebraska depending on it for electricity.

NPPD is a member of the Southwest Power Pool (SPP), a regional transmission organization that oversees the bulk electric grid and wholesale power market in the central United States on behalf of a diverse group of utilities and transmission companies in 14 states. SPP's Integrated Marketplace coordinates next-day generation across Nebraska to maximize cost-effectiveness and improve the regional balancing of electricity supply and demand.

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The Forecasting Challenge:

As a key player in the electricity wholesale market, NPPD requires accurate forecasts on locational marginal prices (LMPs) and loads for next day trading.

As electricity is a commodity that cannot be easily stored, generation should ideally match consumption at any given time. Therefore, the cost of generating electricity—predicted by locational marginal prices—has a direct relationship to load.

Accurate load forecasts and LMPs therefore enables NPPD to optimize the amount of electricity it buys and the generation nodes it calls upon, so that fuel and maintenance costs are covered and a positive financial outcome occurs.

“ *When it comes to local forecasting, the smallest gains can have a huge financial impact – just half a percent improvement in forecasting can make the difference of up to a million dollars. We recently set a goal to refine our forecasting error to under 5%, which is pretty aggressive because the general industry average is less than 10%. With PRT's help, we achieved this.*

Kirk, Energy Supply Specialist at NPPD

Prior to engaging with PRT, NPPD used one forecasting service. If there were out of tolerance forecasts with this provider, confidence fell. It was against this backdrop that NPPD came to PRT.

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The Solution:

NPPD incorporated PRT forecasting data for both LMP and load into their own integrated market web page. Different generational nodes could then be assessed and load then submitted into SPP's Integrated Marketplace.

Figure 1, for example, provides the August 2018 outlook for the Nebraska City 2 node/generator in the SPP market based on PRT forecasting.

In this example, PRT data is compared against actual prices (based on NPPD's preferred dollar averages), with mean absolute percentage error (MAPE) averages calculated. The result shows that the forecasts are "on average" within \$2. Based on these numbers, NPPD will determine whether participation shares for this node will be profitable or not and whether it will be prudent to buy megawatts (MW) for the unit.

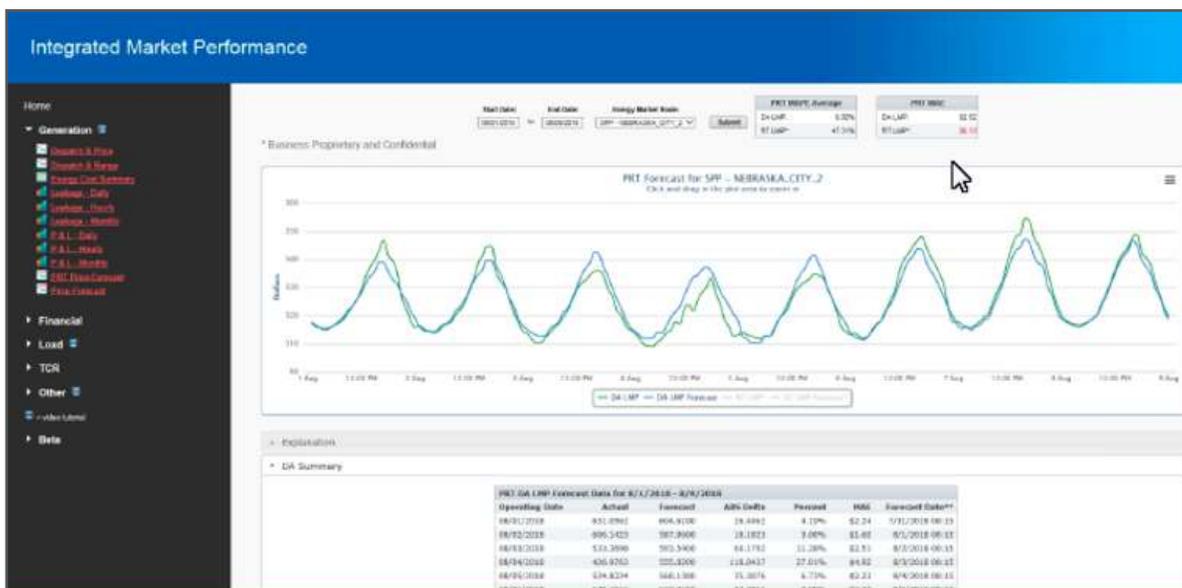


Figure 1

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PRT data and the hourly forecasts it calculates can also be used to guide the fuel required to run particular units. In the case of figure 2 – hourly forecasts from a BPS natural gas unit generated through PRT – NPPD will take the LMP forecasts, put them into a calculator along with the unit price, and determine how much gas needs to be burned. In this way, such data can play a key role in calculating NPPD’s breakeven figure and how much fuel and maintenance costs will be.

On the importance of PRT data, Kirk says, “As well as selling 100% of our MW to the market, we need to be profitable and will leave gas units offline if we can’t recover it in the market. If, however, we can calculate from PRT data that it costs \$20,000 to run and the price forecast says they will pay \$40,000, then we are in business.”

| Operating Date | LMP | LMP Forecast | MAE | Download Date |
|----------------------|-----|--------------|--------|---------------------|
| 8/8/2018 1:00:00 AM | | 19.69 | 1.2334 | 8/7/2018 8:15:17 AM |
| 8/8/2018 2:00:00 AM | | 18.54 | 0.9063 | 8/7/2018 8:15:17 AM |
| 8/8/2018 3:00:00 AM | | 18.31 | 1.5017 | 8/7/2018 8:15:17 AM |
| 8/8/2018 4:00:00 AM | | 17.11 | 0.7176 | 8/7/2018 8:15:17 AM |
| 8/8/2018 5:00:00 AM | | 17.21 | 0.1863 | 8/7/2018 8:15:17 AM |
| 8/8/2018 6:00:00 AM | | 19 | 0.9366 | 8/7/2018 8:15:17 AM |
| 8/8/2018 7:00:00 AM | | 19.68 | 0.1926 | 8/7/2018 8:15:17 AM |
| 8/8/2018 8:00:00 AM | | 22.39 | 1.5911 | 8/7/2018 8:15:17 AM |
| 8/8/2018 9:00:00 AM | | 25.57 | 1.8437 | 8/7/2018 8:15:17 AM |
| 8/8/2018 10:00:00 AM | | 28.85 | 0.3911 | 8/7/2018 8:15:17 AM |
| 8/8/2018 11:00:00 AM | | 32.25 | 0.2127 | 8/7/2018 8:15:17 AM |
| 8/8/2018 12:00:00 PM | | 36.08 | 1.2999 | 8/7/2018 8:15:17 AM |
| 8/8/2018 1:00:00 PM | | 39.46 | 0.517 | 8/7/2018 8:15:17 AM |
| 8/8/2018 2:00:00 PM | | 41.77 | 0.1299 | 8/7/2018 8:15:17 AM |
| 8/8/2018 3:00:00 PM | | 43.03 | 0.4861 | 8/7/2018 8:15:17 AM |
| 8/8/2018 4:00:00 PM | | 45.44 | 1.5493 | 8/7/2018 8:15:17 AM |
| 8/8/2018 5:00:00 PM | | 45.84 | 2.0902 | 8/7/2018 8:15:17 AM |
| 8/8/2018 6:00:00 PM | | 42.37 | 0.3742 | 8/7/2018 8:15:17 AM |
| 8/8/2018 7:00:00 PM | | 38.92 | 0.7017 | 8/7/2018 8:15:17 AM |
| 8/8/2018 8:00:00 PM | | 35.12 | 2.0159 | 8/7/2018 8:15:17 AM |
| 8/8/2018 9:00:00 PM | | 30.31 | 0.9147 | 8/7/2018 8:15:17 AM |
| 8/8/2018 10:00:00 PM | | 27.11 | 1.4924 | 8/7/2018 8:15:17 AM |
| 8/8/2018 11:00:00 PM | | 25.04 | 1.309 | 8/7/2018 8:15:17 AM |
| 8/9/2018 | | 22 | 1.3791 | 8/7/2018 8:15:17 AM |

Figure 2

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The Results:

The dual forecasting has led to improved performance for NPPD in their purchasing of MW for particular nodes/generators. It has also improved NPPD's ability to catch things early - if there is a line outage or dramatic weather changes, for example, with the forecasting particularly effective off-peak (between midnight and 6.00 am).

“ *It was particularly important to us to generate accurate forecasts at off-peak times when prices tend to be lower but margins minimal. This requires a tighter and detailed forecast to achieve a strong financial outcome which PRT delivered on.”*

Kirk, Energy Supply Specialist at NPPD

As a result of utilizing PRT data, the forecasting error targets have been met. NPPD has achieved forecasting errors of below 5% – substantially lower than the industry average of less than 10%.

Kirk concludes: “The way utilities, such as NPPD, use energy continues to change and evolve. PRT's ability to bring forecasts closer in line with reality is crucial to us - saving money and taking subjectivity away from crucial business decisions.”

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About PRT:

PRT is the leading provider of short-term power demand and price forecasts to the electric markets, with an operating history of more than 20 years. The company specializes in using machine learning technologies to predict how much energy will be needed in an electricity market or by a load-serving entity such as a utility, municipality, retail or electric provider.

PRT's online forecasting service provides real-time price forecasts for up to 15 days out for power markets in North America. Its online load forecast service delivers highly accurate electric load forecasts. Forecasts are generated according to different horizons and timespans, with the forecasting engine consisting of an ensemble of different intelligent system-based models. For load data, users can also view the references being used.

About Nebraska Public Power District:

Nebraska Public Power District (NPPD) is the largest electric utility in the state of Nebraska, serving all or parts of 91 (of 93) counties. Over 5,000 miles (8,000 km) of transmission lines make up the NPPD electrical grid system, which delivers power to about one million customers.

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