

Initial Analysis for Constructing Gas & Electric Price Forecasts

PRESENTED BY

Sam Newell

Jamie Read

Walter Graf

PRESENTED TO

PJM MIC Special Session

THE **Brattle** GROUP



Statements of principle

- 1. Should only rely on prices with sufficient liquidity** in relevant forward timeframe
 - In steady state, delivery period is about 3.5-4.5 years after parameters are set
 - We consider related products together with their product family (DA peak, DA off peak, RT peak, RT off peak for a given location)
 - We take any open interest (cumulative open positions in relevant products) for a gas or electric hub to be indicative of “sufficient liquidity”
- 2. Should make use of forwards as much as possible**, but only where there is corresponding electric and gas forwards
 - If unmatched gas & electric forwards, this risks introducing discrepancy between gas and electricity basis differentials, with effects on dispatch and E&AS revenues
- 3. Should map each PJM zone to the gas & electric hubs** with the highest observed historical price correlation

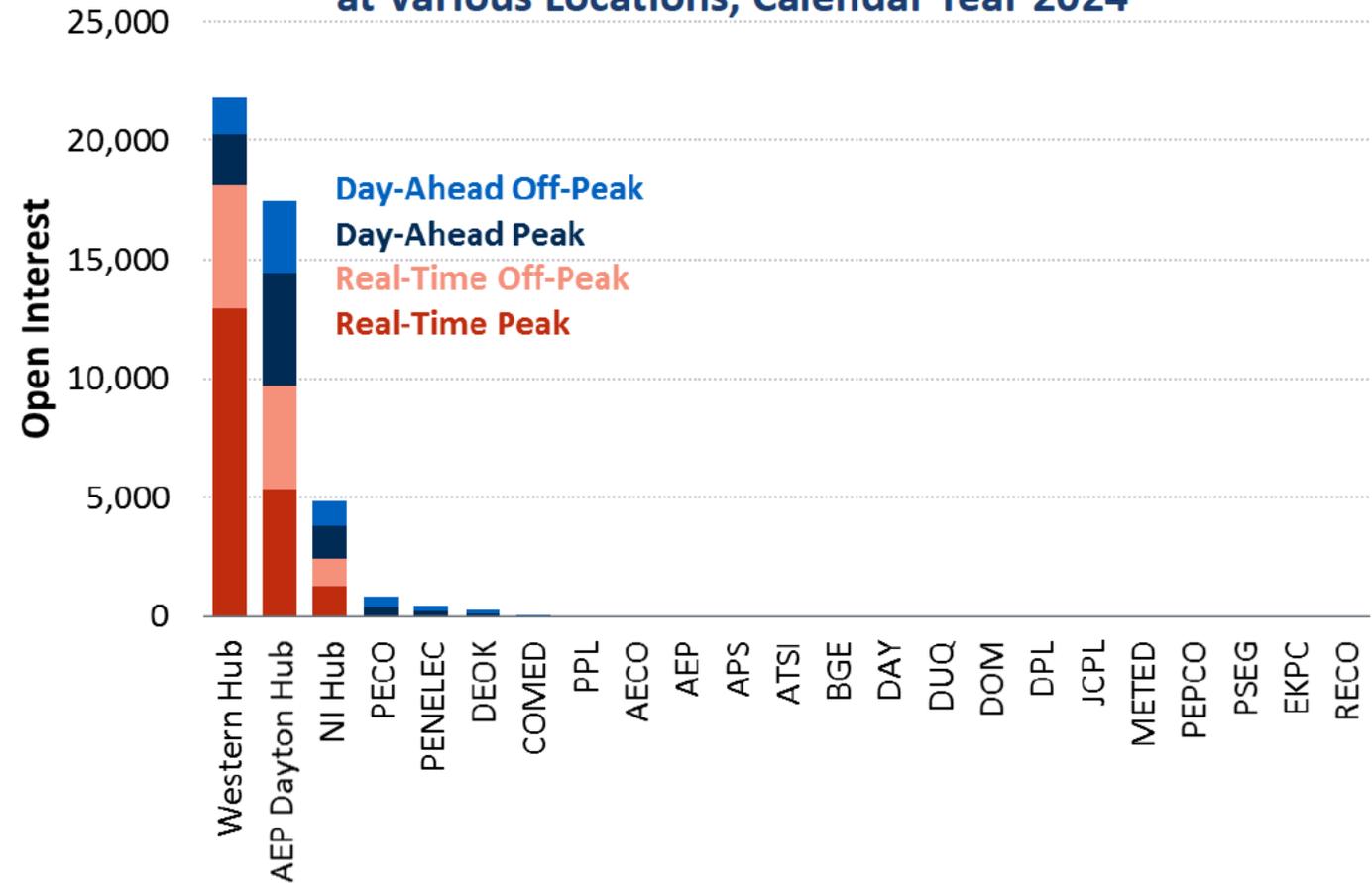
INITIAL ANALYSIS

Forecast electricity prices at hubs

We recommend using forward prices for 3 PJM hubs: Western Hub, AEP Dayton, N. Illinois

- There is open interest 3.5-4.5 years forward to indicate sufficient liquidity
- We found almost no open interest for the other PJM hubs in the relevant forward timeframe

Open Interest for PJM Forward Products at Various Locations, Calendar Year 2024



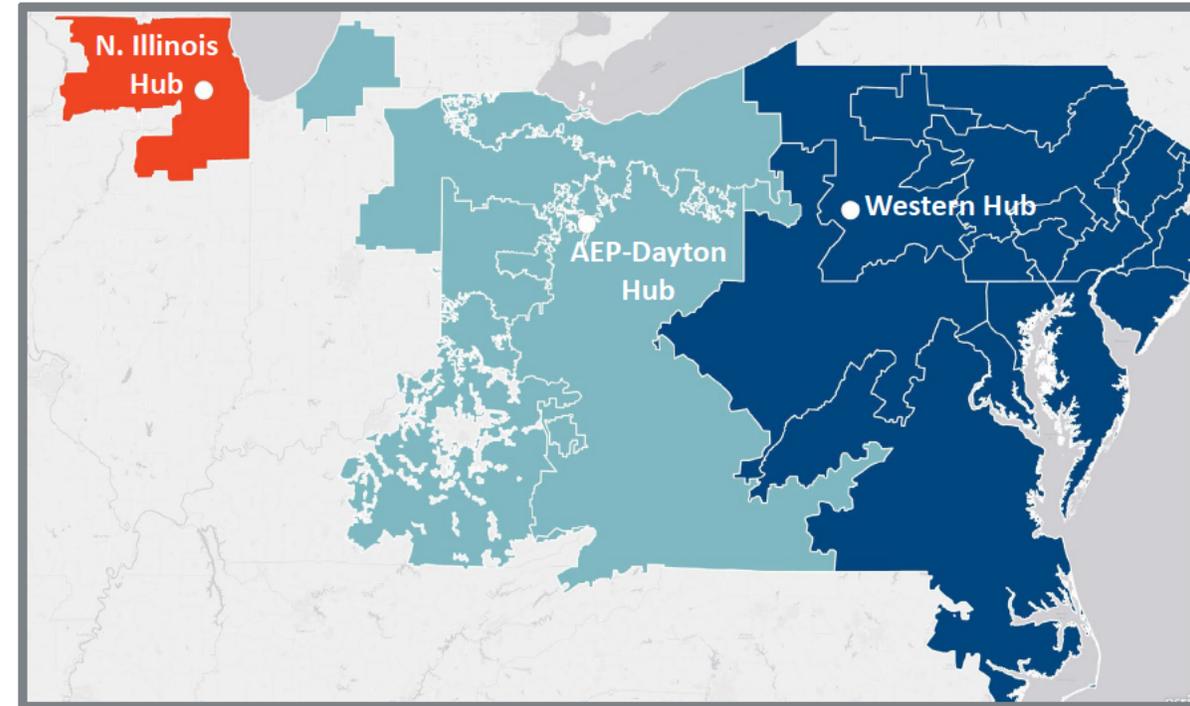
INITIAL ANALYSIS

Assign zones to electricity pricing hubs

To map each PJM zone to a pricing hub, we recommend choosing the hub with the highest observed historical price correlation

- We analyzed the correlation of historical prices between the three electricity hubs and twenty PJM zones, using monthly average peak and off-peak data 2015-2019
- Results of the analysis align with intuition: for each zone, the hub with highest price correlation is that which is geographically closest. Results are unchanged whether using on or off peak prices

Mapped Zones to Pricing Hubs



Historical LMP Correlation Analysis

	AECO	AEP	ATSI	BGE	COMED	DAY	DEOK	DOM	DPL	DUQ	EKPC	JCPL	METED	PECO	PENELEC	PEPCO	PPL	PSEG	RECO
Western Hub	0.96	0.96	0.93	0.96	0.85	0.91	0.86	0.99	0.95	0.83	0.94	0.96	0.96	0.96	0.99	0.99	0.96	0.96	0.96
N. Illinois Hub	0.83	0.89	0.86	0.82	1.00	0.87	0.80	0.82	0.84	0.79	0.91	0.82	0.84	0.82	0.87	0.82	0.82	0.81	0.81
AEP-Dayton Hub	0.86	1.00	0.98	0.88	0.90	0.99	0.95	0.93	0.86	0.94	0.99	0.85	0.87	0.86	0.93	0.90	0.86	0.84	0.85

Apply basis differential and forecast hourly prices

Two possible methods to forecast basis differential between zone and hub:

1. Calculate historical (2017-2019) price differential between each PJM zone and assigned hub to construct basis forecasts for each month, on & off peak, yielding 24 basis differentials for each zone. This is the “default” approach.
2. Use prices from long-term FTR auctions to impute implied congestion between hub and zone, likely shaping the (annual) prices using (monthly) historical patterns of congestion; calculate historical losses between hub and zone; add both to hub price as above. This is the “alternative” approach – we are still evaluating whether historical FTR data are reliable, unbiased predictors of congestion

Regardless of method, the next steps are the same:

- Add or subtract basis differential to the monthly peak and off-peak forward prices for the relevant zone
- Use historical price patterns to shape forecasted prices, using ratio of hourly price to monthly average on/off peak price in historical period, and applying to future prices
- This differs somewhat from PJM Manual 15 (section 12.5), which indicates hourly basis ratios should be calculated and averaged together to create monthly on/off peak basis ratios

INITIAL ANALYSIS

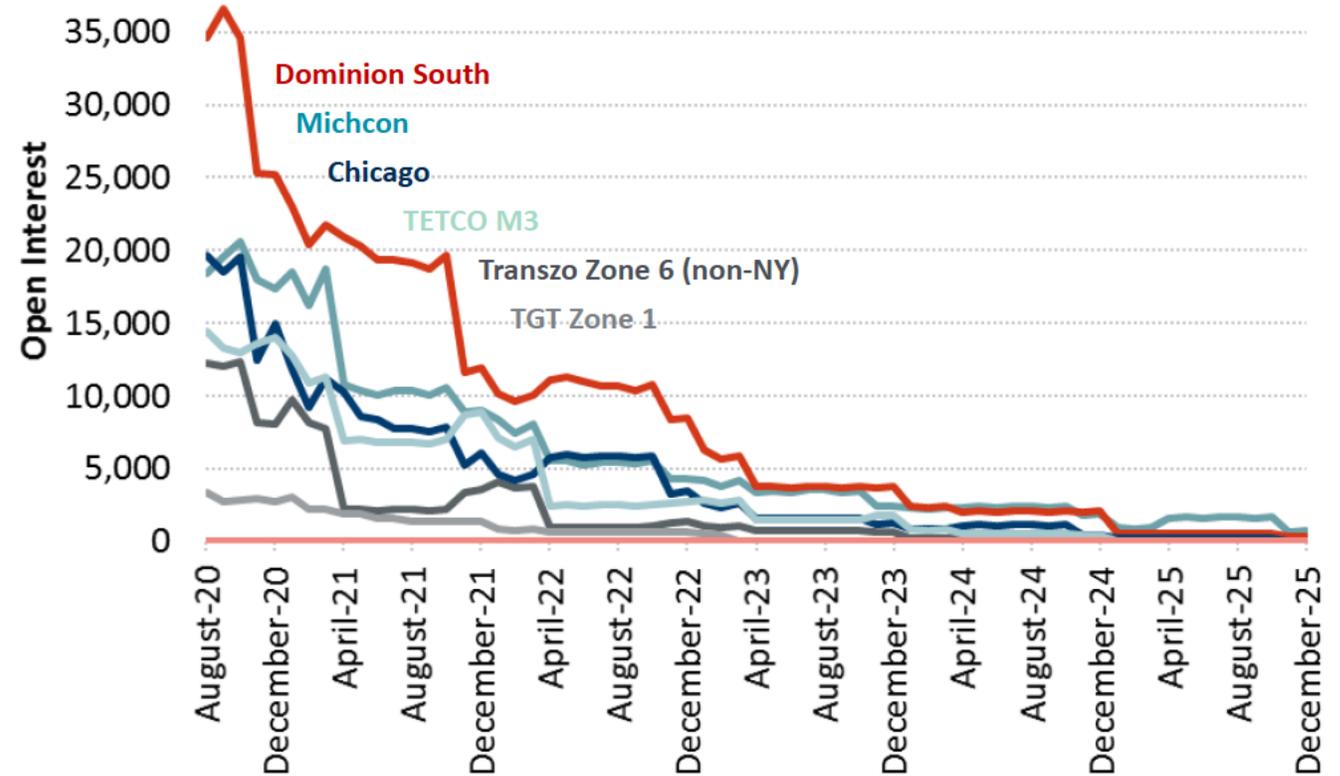
Gas price forecasts

For each zone, use prices from a corresponding gas hub with sufficient liquidity

- If electricity basis differentials constructed with historical, use only three gas hubs for consistency (Dominion South, Chicago, Michcon)
- If using FTRs to inform electric basis differentials, consider also using 2-3 other gas hubs with sufficient liquidity

Apply historical basis (2017-2019) to corresponding gas hub to construct gas price forecasts

Open Interest for Relevant Gas Futures on ICE



Example of principle 2

If unmatched gas & electric forwards, this risks introducing discrepancy between gas and electricity basis differentials, with effects on dispatch and E&AS revenues. Example:

Zone A

Gas price: \$2/MMBtu based on forwards for Zone A

Electricity price: \$50/MWh based on forwards for Zone A

Zone B

Gas price: \$1.90/MMBtu based on forwards for Zone B

Electricity price: \$55/MWh based on forwards for Zone A plus historical congestion & losses between Zones A and B

Issue: due to economics of a zone, the forecasted prices above may be fundamentally incompatible with each other