ARGUS NORTH AMERICAN ELECTRICITY IMPLIED VOLATILITY FORWARD CURVES

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The most up-to-date Argus North American Electricity Implied Volatility Forward Curves methodology is available on www.argusmedia.com
Introduction

Argus Media is a price reporting organization recognized throughout the world for its impartial, reliable and accurate coverage of key energy commodity markets. Argus price indices are used extensively in natural gas and electricity markets in Europe and globally for crude oil, refined products, coal and environmental markets such as emissions credits.

Argus North American Electricity Implied Volatility Forward Curves “Argus Electricity Volatilities” represent the market’s current volatility valuation for call, put and straddle options, on a monthly basis. Implied volatility is a measure of variation in price derived from observed option prices for a specific forward contract time period. Argus Electricity Volatilities are derived from market option prices and differ from historical volatility curves, which are calculated from the historical market prices of the underlying commodity.

Argus Volatility Curves provide an assessment of implied volatilities at major natural electricity locations and/or hubs across North America, including those markets and/or tenors where minimal liquidity exists on a given trading day.

Argus Electricity Volatilities are an essential tool for valuing option premiums. Argus Electricity Volatilities can also be used in mark-to-market accounting, and numerous analytical applications such as value-at-risk, potential future exposure, deal valuation, regression analysis, scenario analyses, etc.

Argus Electricity Volatilities include daily assessments for 19 electricity trading locations, providing monthly granularity for time periods extending a minimum of two years forward. Argus provides implied volatilities at current market prices using “At the Money” (ATM) strike prices for all 19 electricity locations assessed. The strike price is the price at which a specific derivative contract can be bought or sold, also known as the exercise price. A call option strike price is the price at which a derivative can be bought, while a put option strike price is the price at which the derivative can be sold. In addition, Argus Electricity Volatilities reflect market value as of 2:30pm EST, consistent with NYMEX natural gas futures’ primary trading session, providing consistency and corresponding with the CME closing prices for any given trading day.

Argus gathers information on forward option markets from numerous sources, including brokers, traders and through the mid- and back offices of energy companies. Argus uses electricity option transactions, bids and offers, option spreads, straddle options, collars and other financial data to derive its final implied volatility forward curve assessment.

Market information is cross-checked and validated to ensure accuracy of the data. Information that Argus cannot validate may be excluded from the assessment process. Transactions done after 2:30pm EST are not considered for that trading day’s forward curve assessments.

Methodology

Argus Electricity Volatilities are derived from market option prices observed for a specific forward contract time period. Argus calculates implied volatilities using a calendar (365 days) time to maturity for all options observed.

Argus produces electricity implied volatility forward curves on every trading day in which the CME's Henry Hub Natural Gas Futures market is open for trading during normal business hours. Argus Electricity Volatilities are not published on CME holidays.

Code of Conduct and Compliance

Argus operates a rigorous and transparent controls framework to govern its price reporting activities. This is underpinned by its global compliance policy (www.argusmedia.com) and which includes an ethics policy and a business continuity plan. This strict ethics policy can be found on Argus’ website at www.argusmedia.com. Included in this policy are restrictions against Argus employees trading in any energy commodities, including the equities of energy industry participants, and guidelines for the acceptance of gifts from non-Argus individuals and entities. Argus also has strict policies regarding the archiving of email and instant messenger communications, maintenance and archiving of notes and for the archiving of spreadsheets and deal lists used in the price index formation process.

The company’s Global Compliance Officer oversees the compliance framework, including a rolling program of internal audits to ensure compliance with stated methodologies and policies.
executed transaction may be ignored if it falls outside the prevailing bid/offer range. In the event there is only a bid or offer available, the transaction price must be lower than the offer price and/or greater than the bid price. In situations where both a bid and offer are available, but no transactions, Argus determines value as being at the midpoint of the bid/offer spread, assuming the bid offer spread is not wider than what Argus determines is a normal bid/offer spread for a particular market location and term. If the bid/offer spread is considered to be wider than is normally the case, Argus will value the curve within the bid/offer spread but will not necessarily value the curve at the midpoint.

**Illiquid Electricity Forward Markets**

In the absence of any market information for a particular location and/or term on a given day, Argus will seek to establish if the location typically trades on a spread basis to another, more liquid, electricity market. At times, Argus may use proprietary curve valuation models that utilize advanced statistical analyses to formulate implied volatility curves in cases in which no market information is available for a particular market location and/or term. Argus constantly reviews markets, liquidity and trading patterns to ensure its forward curve valuations are in line with energy market information needs.

**Definition of Forward Implied Volatility Contracts**

**Monthly**

Monthly electricity contracts are for the contracted volume of electricity divided by the number of days in a given month. This daily required volume of electricity is then delivered rateably over a 24 hour delivery schedule for every day during the contracted delivery month.
Trading Locations for Argus North American Electricity Forward Price Curves

East Markets:

NYISO Zone A
Other IDs: Zone A
Details: New York ISO Zone-A hub consists of four sub-regions where power is delivered into western NY state.
Grid operator: New York ISO
Market structure: Nodal LMP
Product(s) assessed: Financial swap settled against NYISO day-ahead market clearing price.
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: Hours ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

NYISO Zone G
Other IDs: Zone G, Hudson Valley
Details: New York ISO Zone-G hub consists of four sub-regions where power is delivered into New York’s lower Hudson Valley.
Grid operator: New York ISO
Market structure: Nodal LMP
Product(s) assessed: Financial swap settled against NYISO day-ahead market clearing price.
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: Hours ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

NYISO Zone J
Other IDs: Zone J, NYC
Details: New York ISO Zone-J hub consists of four sub-regions where power is delivered into New York City.
Grid operator: New York ISO
Market structure: Nodal LMP
Product(s) assessed: Financial swap settled against NYISO day-ahead market clearing price.
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: Hours ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

PJM East Hub
Other IDs: East Hub, PJM East
Details: The PJM East Hub comprises the basket of nodes east of PJM West Hub
Grid operator: PJM Interconnection
Market structure: Nodal LMP
Product(s) assessed: Financial day-ahead power, financially settled against PJM’s East Hub day-ahead LMP
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

PJM PEPCO Zone
Other IDs: PEPCO
Details: PJM PEPCO Zone located within PJM’s East Hub territory
Grid operator: PJM Interconnection
Market structure: Nodal LMP
Product(s) assessed: Financial day-ahead power, financially settled against PJM’s PEPCO Zone day-ahead LMP
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

PJM PSEG Zone
Other IDs: PSEG
Details: PJM PSEG Zone located within PJM’s East Hub territory
Grid operator: PJM Interconnection
Market structure: Nodal LMP
Product(s) assessed: Financial day-ahead power, financially settled against PJM’s PSEG Zone day-ahead LMP
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

PJM JCPL Zone
Other IDs: JCPL, Jersey City Power & Light
Details: PJM JCPL Zone located within PJM’s East Hub territory
Grid operator: PJM Interconnection
Market structure: Nodal LMP
Product(s) assessed: Financial day-ahead power, financially settled against PJM’s JCPL Zone day-ahead LMP
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

PJM West Hub
Other IDs: PJM Western Hub, PJM-W, West Hub
Details: The PJM Western hub pricing point comprises a basket of 115 nodes stretching from Erie, Pennsylvania, to Washington, D.C.
Grid operator: PJM Interconnection
Market structure: Nodal LMP
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays
PJM PPL Zone
Other IDs: PPL
Details: PJM PPL Zone located within PJM’s East Hub territory
Grid operator: PJM Interconnection
Market structure: Nodal LMP
Product(s) assessed: Financial day-ahead power, financially settled against PJM’s PPL Zone day-ahead LMP
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

ISO-NE Mass Hub
Other IDs: Mass Hub, NEPOOL, Massachusetts Hub, ISO New England Internal Hub, Internal Hub
Details: The NE Pool hub pricing point comprises about 30 nodes located in central Massachusetts that represent much of the bilateral power trading that occurs within the six-state New England region.
Grid operator: ISO New England
Market structure: Nodal LMP
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

Central Markets:

MISO Indiana Hub
Other IDs: Indiana, Indiana Hub
Details: Indiana pricing hub comprises 182 nodes and replaced the former Cienergy hub.
Grid operator: Midwest Independent System Operator (MISO)
Market structure: Nodal LMP
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

PJM NI Hub
Other IDs: NILL, Northern Illinois Hub
Details: The PJM Northern Illinois pricing hub comprises 232 nodes located in the Commonwealth Edison control area in northern Illinois.
Grid operator: PJM Interconnection
Market structure: Nodal LMP
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

PJM AD Hub
Other IDs: PJM AD, AEP Dayton, AD
Details: The PJM AEP Dayton pricing hub comprises 1,161 nodes found in the American Electric Power and Dayton Power and Light control areas in Ohio and Michigan.
Grid operator: PJM Interconnection
Market structure: Nodal LMP
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 8 through 23, Mon-Fri (excluding all NERC holidays)
Off-peak hours: ending 1 through 7 and 24, Mon-Fri, plus all hours of weekends and NERC holidays

ERCOT North Zone
Other IDs: North, NZ
Details: Represents transactions within ERCOT’s North Generation Zone.
Grid operator: Electric Reliability Council of Texas (ERCOT)
Market structure: Nodal LMP
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 7 through 22, Mon-Fri (excluding all NERC holidays)
Off-peak hours: Hours ending 1 through 6 and 23 through 24, Mon-Fri, plus all hours of weekends and NERC holidays

ERCOT South Zone
Other IDs: South, SZ
Details: Represents transactions within ERCOT’s South Generation Zone.
Grid operator: Electric Reliability Council of Texas (ERCOT)
Market structure: Nodal LMP
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 7 through 22, Mon-Fri (excluding all NERC holidays)
Off-peak hours: Hours ending 1 through 6 and 23 through 24, Mon-Fri, plus all hours of weekends and NERC holidays

West Markets:

WSPP Mid C
Other IDs: Mid C Mid-Columbia
Details: Mid-Columbia is a general reference to power trading at five hydroelectric dams along a 118-mile stretch of the Columbia River in the Pacific Northwest. The five dams are operated by the PUDs for Chelan, Douglas, and Grant counties in Washington state.
Grid operator: Various utilities in the region act as balancing authorities
Market structure: No organized market
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 7 through 22, Mon-Sat (excluding all NERC holidays)
Off-peak hours: Hours ending 1 through 6 and 23 through 24, Mon-Sat, plus all hours of Sundays and NERC holidays
WSPP NP15
Other IDs: NP 15, North of Path 15, North Path, NP
Details: The NP-15 hub pricing point comprises nodes within CAISO’s former northern congestion zone, the area north of the Path 15 AC transmission line.
Grid Operator: California Independent System Operator (CAISO)
Market structure: Nodal LMP
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 7 through 22, Mon-Sat (excluding all NERC holidays)
Off-peak hours: Hours ending 1 through 6 and 23 through 24, Mon-Sat, plus all hours of Sundays and NERC holidays

WSPP Palo Verde
Other IDs: Palo Verde, PV, Palo
Grid operator: Various utilities in the region act as balancing authorities
Market structure: No organized market
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 7 through 22, Mon-Sat (excluding all NERC holidays)
Off-peak hours: Hours ending 1 through 6 and 23 through 24, Mon-Sat, plus all hours of Sundays and NERC holidays

WSPP SP 15
Other IDs: SP 15, South-of-Path 15, South Path, SP
Details: The SP-15 hub pricing point comprises nodes within CAISO’s former southern congestion zone, the area south of the Path 15 AC transmission line.
Grid operator: Independent System Operator (CAISO)
Market structure: Nodal LMP
Product(s) assessed: Firm physical power with liquidated damages
Peak hours: Hours ending 7 through 22, Mon-Sat (excluding all NERC holidays)
Off-peak hours: Hours ending 1 through 6 and 23 through 24, Mon-Sat, plus all hours of Sundays and NERC holidays

Contact Information:

For methodological questions about Argus North American Electricity Implied Volatility Forward Curves, please contact Al Pollard, Vice-President of Risk Management Products, at 713-429-6338; al.pollard@argusmedia.com.

For questions about how you can begin receiving Argus North American Electricity Implied Volatility Forward Curves, please contact the Argus sales team at:
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