



2025 **LMP** Energy Price Analysis

LandGate

LandGate is the leading provider of data solutions for site selection, origination, development, financing, and market analysis of US renewable energy and infrastructure projects: solar, data centers, EV's, energy storage, wind, carbon, and CCS.

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Understanding Wholesale & Retail Energy Pricing

Electricity pricing is fundamental to the operation of energy markets, determining how energy is bought and sold across the grid. Two primary systems—zonal and nodal pricing—shape the way electricity prices are calculated, alongside retail pricing, which impacts end consumers.

Zonal Pricing

Zonal pricing divides the electricity grid into large geographical zones, assigning a single average price to electricity within each zone. This approach simplifies pricing for market participants but comes with limitations. By averaging costs across a zone, it often fails to reflect the true cost of delivering electricity to specific locations within that zone. This can result in inefficiencies, such as underinvestment in areas with high congestion or overinvestment in areas where the average price masks low demand or minimal grid constraints.

Zonal pricing is commonly used in regions with less complex grid structures. While its simplicity is advantageous for some markets, its lack of granularity can hinder efficient decision-making in areas where transmission constraints and local demand vary significantly.

Nodal Pricing

Nodal pricing, in contrast, assigns a unique price to electricity at each node—a specific connection point on the grid. This method considers local demand, generation costs, and transmission constraints, making it more accurate than zonal pricing. By reflecting the actual cost of delivering electricity to individual locations, nodal pricing provides stronger price signals that incentivize efficient grid operation and investment.

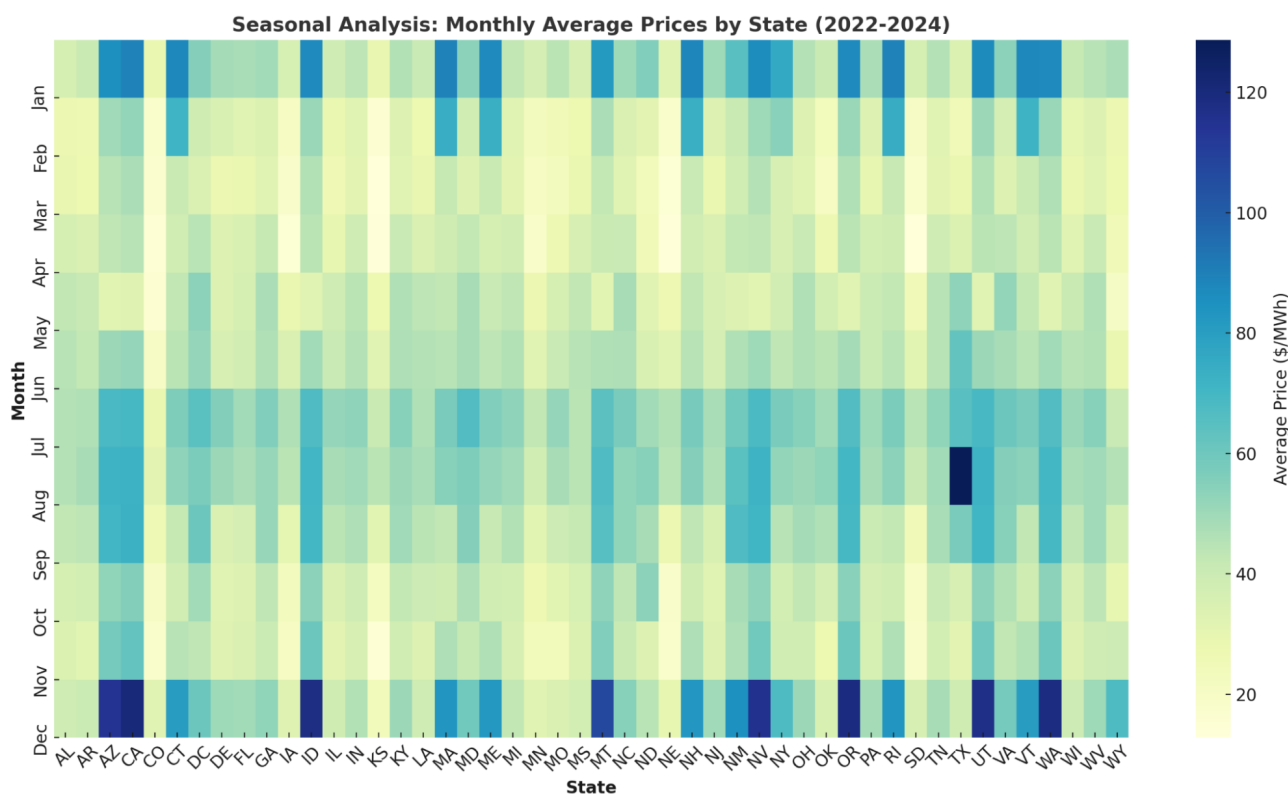
A specialized form of nodal pricing, Locational Marginal Pricing (LMP), calculates electricity prices at each node based on the incremental cost of serving an additional unit of load. LMP is widely regarded as the most efficient pricing mechanism for deregulated electricity markets, as it accounts for real-time grid conditions and promotes resource optimization.

Retail Pricing

Retail pricing represents the cost that end-use customers—including residential, commercial, and industrial consumers—pay for electricity. Retail prices encompass wholesale electricity costs, such as LMP in nodal markets, as well as transmission and distribution fees, taxes, and regulatory charges. These prices vary significantly based on location, consumption patterns, and the chosen electricity supplier.

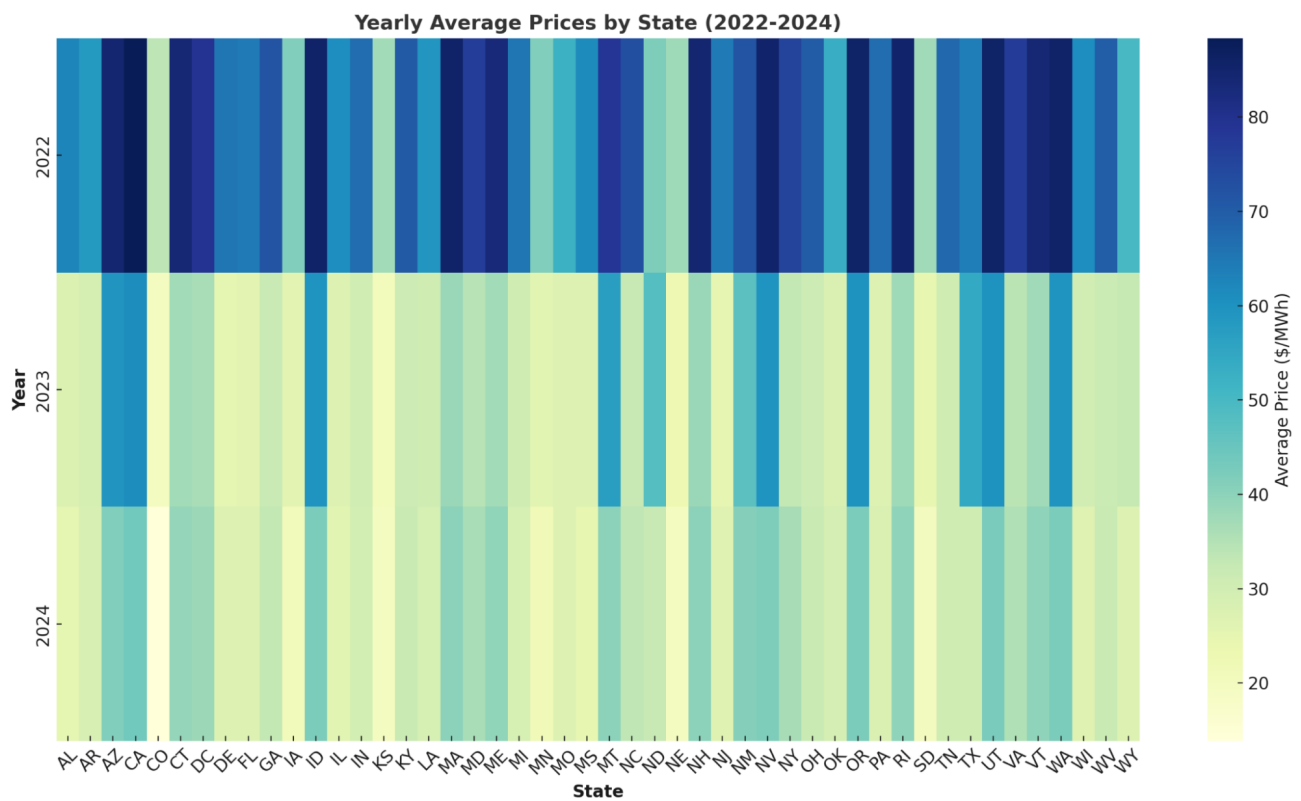
Retail customers generally benefit from stable and predictable pricing structures, often shielded from the volatility of wholesale markets. However, retail prices can still be influenced by the efficiency of the wholesale pricing system—zonal or nodal—underpinning the electricity market.

Seasonal Pricing by State



Peaks in pricing can be seen during winter months like December and January for several states, driven by heightened demand for heating. Similarly, many states experience increased pricing in summer months like July and August, reflecting higher energy consumption for cooling.

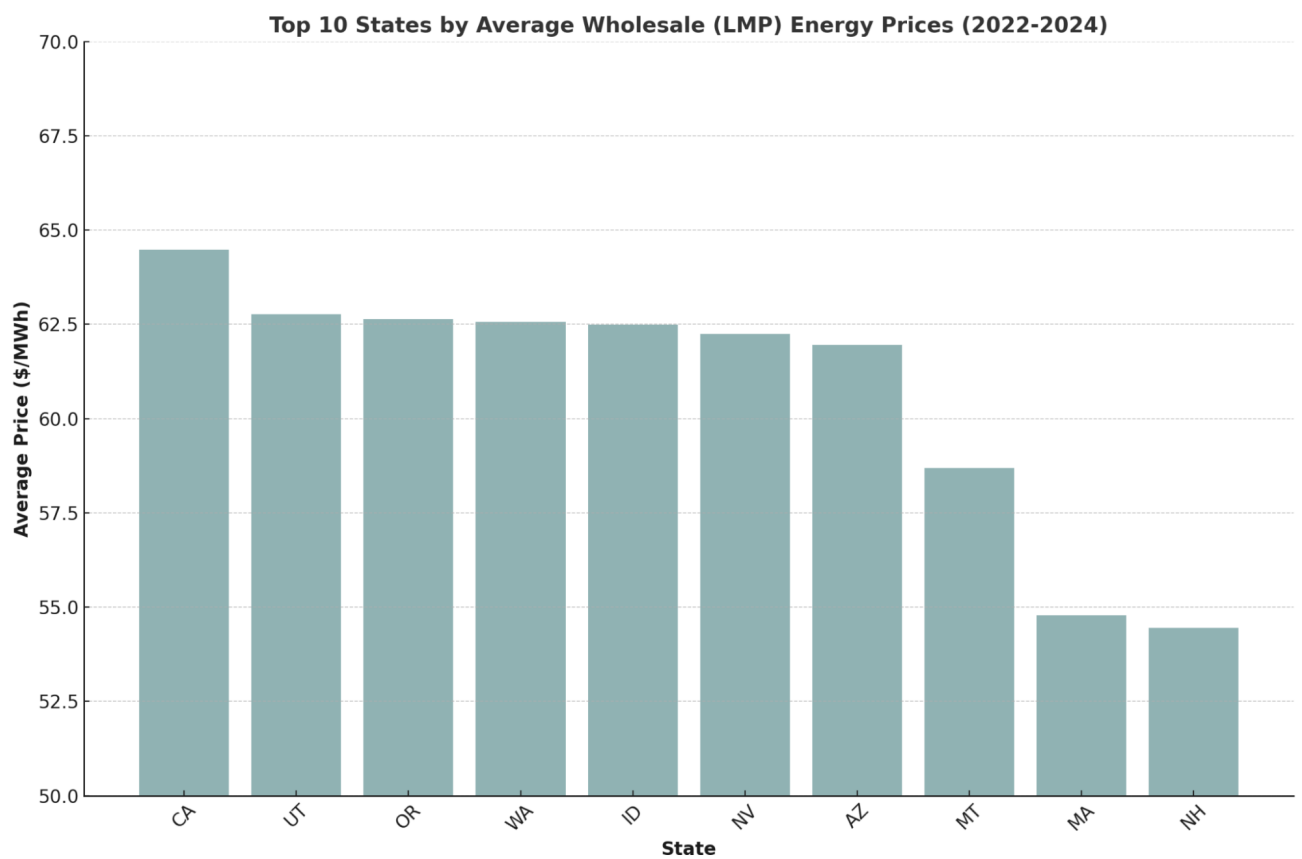
The dips observed in spring and fall months (e.g., May and October) highlight periods of mild temperatures, where energy demand for both heating and cooling is typically lower, resulting in reduced average prices. These seasonal fluctuations are driven by regional weather patterns and energy consumption trends, with states in colder climates (like New York or Maine) showing higher winter peaks, while southern and western states (like Texas and Arizona) see summer-driven increases.



The higher electricity prices observed in 2022 were primarily due to elevated natural gas prices and other market dynamics. The subsequent decline in prices during 2023 and 2024 can be attributed to the reduction in natural gas costs and other stabilizing factors in the energy market.

Wholesale vs. Retail Electricity Pricing

Understanding the distinction between wholesale and retail electricity pricing is crucial for comprehending how energy markets function and how prices are determined for end consumers.



Wholesale Electricity Pricing

Wholesale electricity prices are the rates at which electricity is bought and sold between generators and retailers before reaching the end consumer. These prices are typically determined through competitive markets and can fluctuate based on several factors:



Supply & Demand

Wholesale prices are highly sensitive to changes in electricity supply and demand. For instance, during periods of high demand or limited supply, prices can surge. Conversely, an oversupply can lead to lower prices.



Fuel Costs

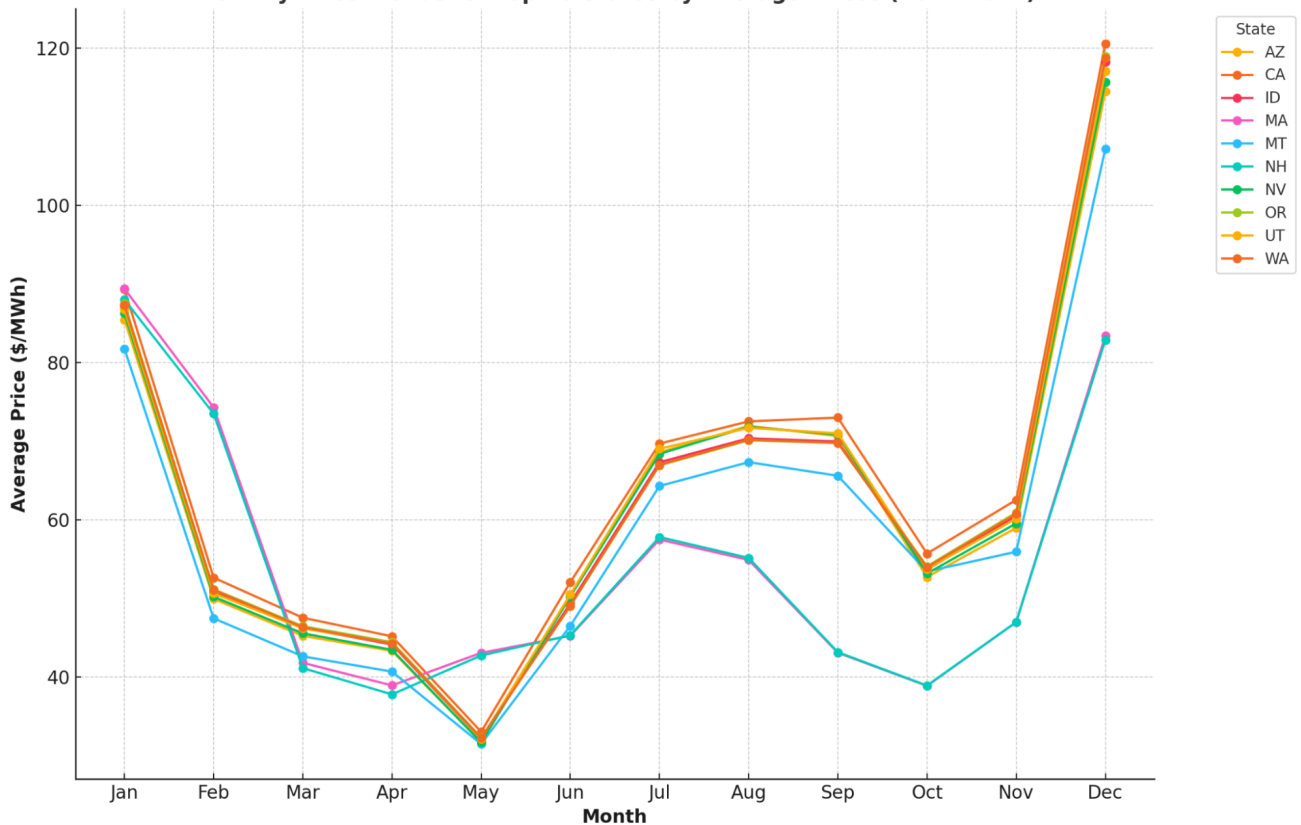
The cost of fuels used in electricity generation, such as natural gas or coal, directly impacts wholesale electricity prices. An increase in fuel costs can lead to higher wholesale electricity prices.



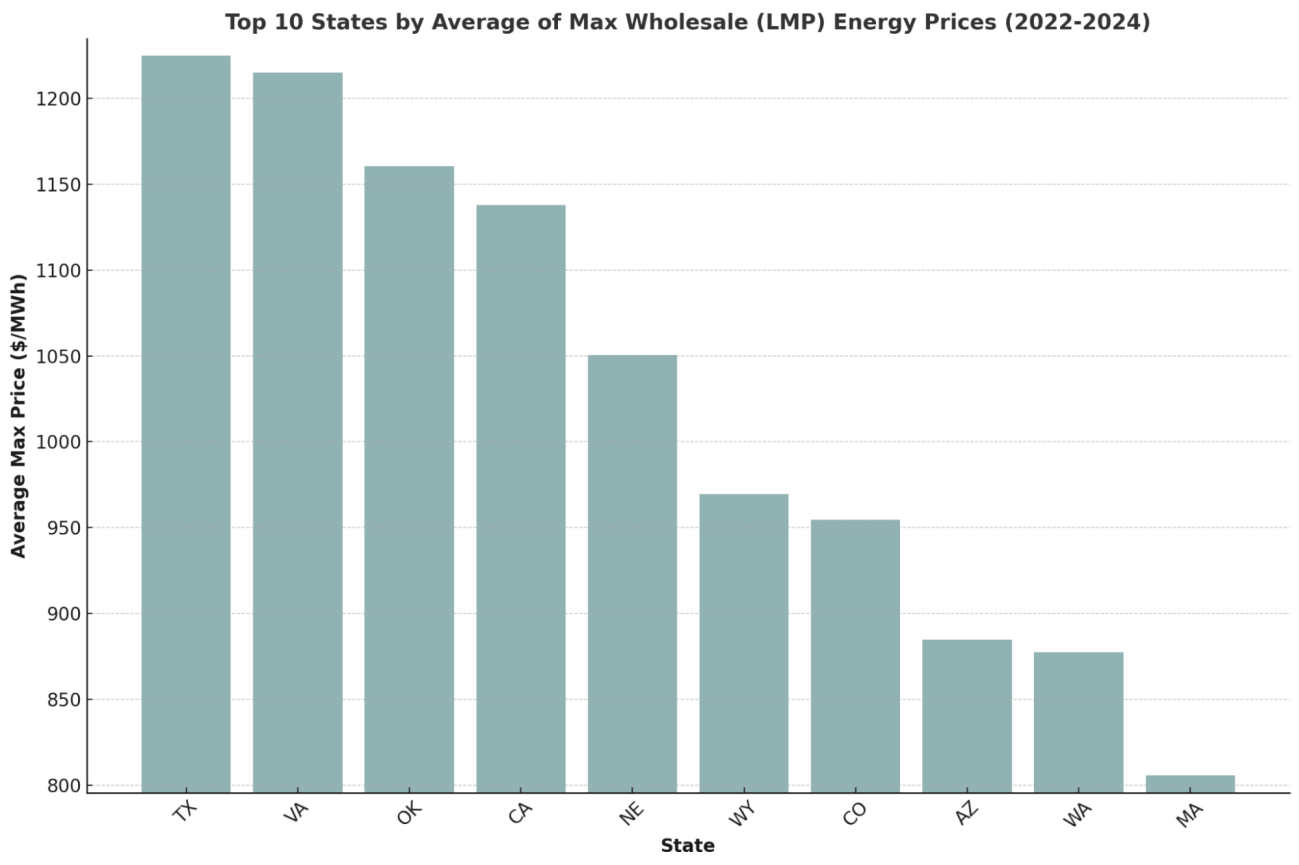
Transmission Constraints

Limitations in the transmission network can cause price variations across different locations, especially in nodal pricing systems where prices are set at specific grid points.

Monthly Price Trends for Top 10 States by Average Prices (2022-2024)



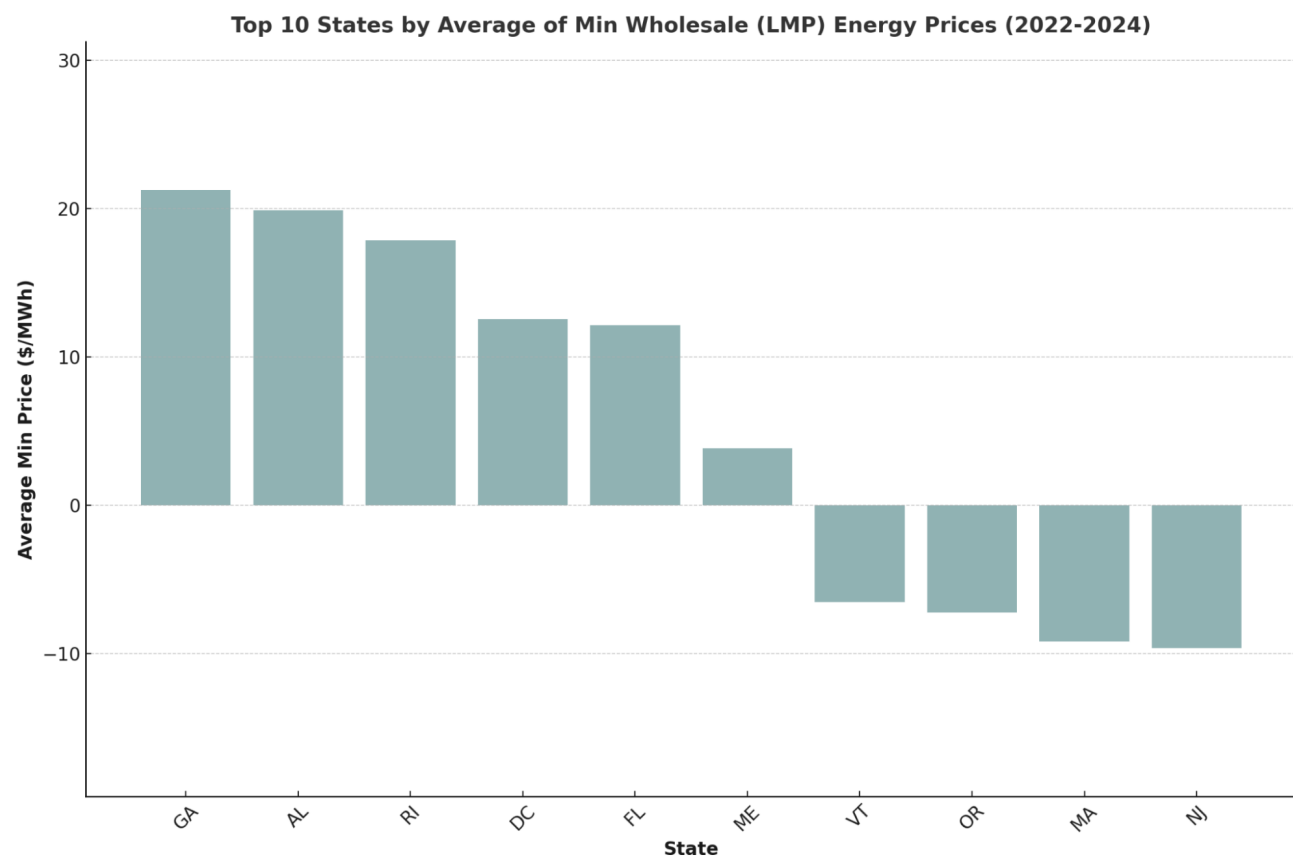
Max vs Min Pricing by State



Significant disparities arise between maximum and average pricing over time. States like Texas (TX), Virginia (VA), and Oklahoma (OK) exhibit the highest max prices, indicating substantial volatility in energy markets during specific periods. These max prices often occur during peak demand events, such as extreme weather conditions or unexpected supply shortages, which can drive LMP pricing far above the state averages.

LMP volatility highlights the importance of granular energy data. Max prices far exceeding averages reflect market responses to supply-demand imbalances, grid constraints, and fuel price spikes. LandGate’s advanced analytics provide critical insights into these dynamics, enabling stakeholders to predict high-price scenarios, optimize energy investments, and capitalize on opportunities tied to land-based renewable energy projects.





There are instances where certain states, such as Texas (TX), Oklahoma (OK), and Kansas (KS), have experienced negative LMP pricing. Negative LMPs occur when electricity supply surpasses demand to the extent that producers are willing to pay consumers to take excess energy off the grid. This situation often arises in regions with substantial renewable energy generation, like wind or solar, which continue producing power even when demand is low.

Factors contributing to negative LMPs include the inflexibility of certain power plants to reduce output, transmission constraints preventing the export of surplus energy, and the variability of renewable energy sources. For instance, during periods of high wind generation at night when demand is low, the excess supply can drive prices below zero. Understanding these dynamics is crucial for stakeholders in the energy market, as negative pricing impacts revenue streams and investment decisions.



Retail Electricity Pricing

Retail electricity prices are the rates charged to end consumers for their electricity usage. These prices encompass several components beyond the wholesale cost of electricity:



Transmission & Distribution Costs

Expenses related to delivering electricity from power plants to consumers, including maintenance of power lines and infrastructure.



Administrative & Operational Costs

Costs associated with billing, customer service, and other operational activities of the utility or retail provider.



Taxes & Regulatory Fees

Government-imposed taxes and fees that support energy programs, infrastructure development, and other regulatory requirements.



Profit Margins

Retailers include a margin to ensure profitability and cover business risks.

Key Differences

Understanding these differences is essential for energy developers and consumers alike, as they influence decisions related to energy production, investment, and consumption.



Price Stability

Wholesale prices are subject to frequent fluctuations due to market dynamics, whereas retail prices are often more stable, providing consumers with predictable billing.



Cost Composition

Retail prices include additional costs beyond the wholesale price, such as transmission, distribution, and administrative expenses, leading to higher rates for end consumers compared to wholesale prices.



Regulatory Oversight

Retail prices are often regulated to protect consumers from excessive rates, while wholesale prices are typically determined by market conditions.

Nodal Pricing vs. Zonal Pricing

Key Differences

The electricity grid relies on pricing mechanisms to manage the flow of energy efficiently and ensure fair costs for consumers. Zonal and nodal pricing systems represent two approaches to achieving this goal, each with its strengths and challenges.



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Practical Applications

In the United States, zonal pricing is used in regions with relatively straightforward grid operations, while nodal pricing has been adopted in major electricity markets like PJM Interconnection and ERCOT. The granularity and efficiency of nodal pricing make it ideal for markets with significant congestion and diverse grid dynamics, though its complexity requires robust tools for analysis and forecasting.

For energy developers, understanding these pricing mechanisms is critical. Nodal pricing, particularly LMP, offers actionable data for project siting, revenue forecasting, and strategic decision-making. Conversely, zonal pricing provides a more generalized view of market conditions, useful for broader assessments but less precise for pinpointing high-value opportunities.

LandGate's PowerTools platform equips developers with comprehensive LMP data, enabling them to navigate the complexities of nodal pricing and optimize their strategies in diverse market contexts. By leveraging advanced analytics, developers can identify lucrative opportunities and stay competitive in the evolving energy landscape.

To learn more about LandGate's tools, data, and modeling for the energy markets, book a demo with our dedicated energy team.

LandGate Corp.

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