Global Certificate Course in Electricity Price Forecasting

Regulatory Frameworks And Market Design

Ancillary Services
Related terms: frequency regulation, spinning reserve, voltage support
Ancillary services are the set of support functions that maintain grid reliability and quality after the energy market clears. They include frequency control, voltage control, and operating reserves. In electricity price forecasting, the cost of ancillary services can affect spot prices, especially during periods of high variability from renewable generation. Practical application: forecasting the price of balancing services to inform bidding strategies for generators. Challenges: limited transparency of ancillary service markets and the stochastic nature of demand for these services.

Capacity Mechanism
Related terms: capacity market, reliability obligation, capacity payment
A capacity mechanism is a policy tool that ensures sufficient generation capacity to meet peak demand. It typically involves payments to generators for maintaining available capacity, separate from energy market revenues. In price forecasting, capacity payments can influence the marginal cost of generation and thus spot prices. Practical application: modeling capacity auction outcomes to adjust price forecasts for periods of tight supply. Challenges: designing mechanisms that avoid overcompensation while providing security of supply.

Capacity Market
Related terms: capacity auction, reliability standard, forward capacity contract
The capacity market is a specific type of capacity mechanism where future capacity is procured through competitive auctions. Participants receive payments for committing to be available during peak periods. Forecasting the impact of capacity market outcomes helps predict long-term price trends. Practical application: incorporating cleared capacity prices into generation cost curves. Challenges: volatility in auction results and the interaction with energy market prices.

Congestion Management
Related terms: congestion rent, redispatch, market splitting
Congestion management refers to the set of actions taken to alleviate transmission constraints that prevent the optimal dispatch of electricity. Techniques include redispatch, counter-trading, and use of congestion rents. In forecasting, anticipated congestion can cause price spikes in constrained zones. Practical application: using network models to predict locational marginal price (LMP) differences. Challenges: limited real-time data on line flows and the complexity of cross-border congestion.

Demand Response

Related terms: load curtailment, price elasticity, ancillary service provider
Demand response (DR) programs incentivize consumers to adjust their electricity usage in response to price signals or grid needs. DR can flatten demand curves, reducing price volatility. Forecast models that incorporate DR participation can improve accuracy during peak events. Practical application: simulating DR activation based on price thresholds. Challenges: heterogeneous consumer behavior and limited participation data.

Energy Imbalance Market
Related terms: real-time market, balancing area, settlement price
An energy imbalance market (EIM) facilitates the real-time exchange of electricity among participating balancing authorities to correct short-term mismatches. Prices in the EIM reflect the cost of immediate generation or load adjustments. Incorporating EIM prices into forecasts helps capture intraday price dynamics. Practical application: using EIM price signals for short-term trading strategies. Challenges: differing market rules across jurisdictions and limited historical data.

Energy Market Coupling
Related terms: cross-border trade, market splitting, zonal pricing
Market coupling integrates separate electricity markets to enable efficient cross-border trade, often using coordinated auctions. It reduces price differentials and enhances liquidity. Forecasting in coupled markets requires understanding inter-regional price interactions. Practical application: modeling price spill-over effects between neighboring countries. Challenges: harmonizing market designs and handling transmission constraints.

Feed-in Tariff
Related terms: renewable subsidy, contract-for-difference, guaranteed price
A feed-in tariff (FIT) guarantees a fixed price for electricity generated from renewable sources over a contract period. FITs affect the generation mix, influencing market prices by displacing higher-cost generation. Forecast models must account for the expiration of FIT contracts. Practical application: adjusting supply curves when FIT-eligible plants retire. Challenges: policy changes and the transition to auction-based support schemes.

Forward Capacity Contract
Related terms: capacity obligation, firm capacity, capacity credit
Forward capacity contracts are bilateral agreements where a buyer secures a predetermined amount of generation capacity for future periods. They provide revenue certainty for generators and influence long-term price expectations. Practical application: incorporating contracted capacity into future supply forecasts. Challenges: credit risk and the interaction with regulated capacity markets.

Green Certificate
Related terms: renewable energy certificate, compliance obligation, market premium

Green certificates are tradable instruments that certify the generation of renewable electricity. Obligated entities must acquire a certain number of certificates, creating a secondary market that can affect renewable generation profitability and market prices. Practical application: modeling the impact of certificate price volatility on renewable bids. Challenges: varying certification schemes across regions.

Grid Code
Related terms: technical standards, system operation, compliance testing
The grid code sets technical and operational requirements for generators, transmission operators, and consumers to ensure safe and reliable system operation. Compliance influences generator availability and dispatch. In price forecasting, grid code changes can alter generation cost structures. Practical application: adjusting generation availability factors after code revisions. Challenges: interpreting complex technical provisions and forecasting their market impact.

Hedonic Pricing Model
Related terms: regression analysis, attribute valuation, price decomposition
A hedonic pricing model decomposes electricity price into constituent factors such as fuel cost, carbon price, and congestion. It is useful for isolating the effect of regulatory changes on price. Practical application: estimating the price impact of a new carbon tax. Challenges: multicollinearity among explanatory variables and data availability.

Independent System Operator
Related terms: regional transmission organization, market operator, reliability coordinator
An independent system operator (ISO) manages the transmission grid and runs electricity markets within a defined region, ensuring non-discriminatory access. ISO policies shape market design and price formation. Practical application: incorporating ISO market rules into forecasting algorithms. Challenges: differing ISO practices and regulatory oversight.

Inter-connector Capacity
Related terms: cross-border line, transfer capability, net transfer capacity
Inter-connector capacity denotes the maximum power that can be transferred between two market areas. Availability of inter-connectors influences price convergence and congestion. Forecasting must consider scheduled maintenance and forced outages of inter-connectors. Practical application: simulating price differentials under varying transfer capacities. Challenges: limited visibility of real-time capacity allocation.

LMP (Locational Marginal Price)
Related terms: congestion price, loss component, nodal pricing
LMP is the marginal cost of supplying the next increment of electricity at a specific location, reflecting energy, congestion, and loss components. It is the core price signal in many wholesale markets. Forecast models that predict LMPs provide granular price insights. Practical application: using LMP forecasts for optimal generation dispatch. Challenges: high spatial resolution data requirements and computational

intensity.

Market Splitting
Related terms: zonal pricing, transmission constraints, price zones
Market splitting divides a larger market into zones based on transmission constraints, allowing each zone to have its own marginal price. This design reduces the need for explicit congestion pricing. Forecasting must account for zone-specific supply-demand balances. Practical application: generating zone-level price forecasts for traders. Challenges: dynamic re-splitting and accurate zone definition.

Net Transfer Capacity (NTC)
Related terms: available transfer capability, allocated capacity, cross-border trade
NTC is the maximum exchange capacity between two control areas after accounting for security constraints. It determines how much power can be scheduled across borders. In price forecasting, changes in NTC can cause price swings in adjacent markets. Practical application: integrating NTC forecasts into cross-border price models. Challenges: frequent updates and coordination between system operators.

Negative Pricing
Related terms: price inversion, oversupply, renewable curtailment
Negative pricing occurs when market participants are willing to pay to off-load electricity, often due to excess renewable generation and inflexible demand. Forecasting negative price events is critical for storage and demand-side strategies. Practical application: predicting periods when battery arbitrage is profitable. Challenges: capturing rare events and policy-driven incentives.

Power Purchase Agreement (PPA)
Related terms: off-take contract, fixed-price contract, renewable offtake
A PPA is a long-term contract between a generator and a buyer that sets the price and quantity of electricity to be delivered. PPAs provide revenue certainty and affect market supply dynamics. Forecast models incorporate PPA volumes to adjust expected generation availability. Practical application: estimating the impact of a large corporate PPA on market prices. Challenges: contract clauses such as take-or-pay and price escalators.

Regulatory Asset Base (RAB)
Related terms: allowed revenue, cost-plus regulation, rate of return
RAB is the value of assets on which a regulated utility is permitted to earn a specified return. Changes in RAB affect the cost of capital and ultimately electricity tariffs. In price forecasting, RAB adjustments can signal future price trends. Practical application: modeling the effect of a RAB uplift on wholesale price expectations. Challenges: political influences and timing of regulatory reviews.

Renewable Portfolio Standard (RPS)
Related terms: renewable obligation, compliance certificate, renewable quota
An RPS mandates that a certain percentage of electricity sold by utilities must come from renewable

sources. This drives renewable investment and can shift the merit order, influencing market prices. Forecasting must consider RPS targets and compliance mechanisms. Practical application: projecting renewable generation growth under a tightening RPS. Challenges: varying state-level implementation and credit trading.

Residual Demand
Related terms: net demand, load after must-run, demand after renewables
Residual demand is the portion of electricity demand that must be met after accounting for must-run generation (e.g., nuclear) and renewable output. It is a key driver of price spikes during low-renewable periods. Practical application: forecasting residual demand to anticipate price peaks. Challenges: accurate renewable forecast integration and must-run unit availability.

Revenue Cap
Related terms: price cap, profitability limit, regulatory ceiling
A revenue cap limits the total earnings a regulated utility can collect, often to protect consumers. It influences investment incentives and can affect market supply. Forecast models need to reflect revenue cap policies when estimating future generation costs. Practical application: assessing the impact of a new revenue cap on wholesale price formation. Challenges: interaction with other price control mechanisms.

Scarcity Pricing
Related terms: price uplift, capacity scarcity, high-price interval
Scarcity pricing introduces additional price components when system capacity is tight, reflecting the high value of marginal generation. It enhances price signals for demand response and storage. Forecasting scarcity premiums improves short-term price accuracy during peak stress. Practical application: modeling scarcity price spikes for reliability-oriented trading. Challenges: determining the triggering thresholds and magnitude of scarcity premiums.

Security Constrained Economic Dispatch (SCED)
Related terms: optimal dispatch, transmission limits, unit commitment
SCED is the real-time optimization algorithm that determines the least-cost dispatch of generators while respecting transmission constraints and reliability limits. Its outcomes directly generate LMPs. Understanding SCED mechanics aids in interpreting price formation. Practical application: simulating SCED outcomes to test price forecast models. Challenges: high computational complexity and data granularity.

System Marginal Price (SMP)
Related terms: system price, pool price, uniform price
SMP is a single price applied to all participants in a pool market, reflecting the marginal cost of the most expensive dispatched unit. It differs from LMP in that it does not account for congestion. Forecasting SMP is essential for markets that use uniform pricing. Practical application: predicting SMP for contract settlement calculations. Challenges: capturing hidden congestion effects that may still affect SMP.

Transmission Tariff
Related terms: grid usage charge, transmission fee, cost allocation
A transmission tariff sets the charges for using the transmission network, covering operation, maintenance, and investment costs. Tariffs affect the overall cost of electricity and can influence bidding behavior. Forecast models may need to adjust price forecasts for tariff changes. Practical application: incorporating new tariff schedules into cost-of-generation calculations. Challenges: regulatory approval timelines and regional tariff heterogeneity.

Unbundling
Related terms: vertical separation, functional separation, market liberalisation
Unbundling separates generation, transmission, and distribution activities into distinct legal entities to promote competition. It reshapes market structures and can lead to new price formation mechanisms. Forecasting post-unbundling markets requires understanding new market rules. Practical application: modeling price impacts of a transmission operator becoming an independent entity. Challenges: transition periods and data continuity.

Virtual Power Plant (VPP)
Related terms: aggregated resources, demand response, distributed generation
A VPP aggregates diverse distributed energy resources (DERs) such as solar, storage, and flexible loads to act as a single market participant. VPPs can provide both energy and ancillary services, influencing price volatility. Forecast models that include VPP bidding behavior can improve accuracy. Practical application: simulating VPP market participation in congestion mitigation. Challenges: coordination latency and regulatory recognition of VPPs.

Wholesale Electricity Market
Related terms: day-ahead market, intraday market, balancing market
A wholesale electricity market is a platform where generators and large consumers trade electricity, typically through multiple time-frames (day-ahead, intraday, real-time). Market design determines price signals, settlement rules, and participant incentives. Understanding the market structure is foundational for any price forecast. Practical application: selecting the appropriate market segment for a given forecasting horizon. Challenges: overlapping market timelines and rule changes.

Yield Curve (Electricity)
Related terms: forward price curve, term structure, contract pricing
The electricity yield curve plots forward prices across delivery periods, reflecting expectations of future supply-demand balance, fuel costs, and policy impacts. Analysts use it to gauge market sentiment and to price derivatives. Practical application: fitting a smooth curve to observed forward contracts for scenario analysis. Challenges: sparse data for long-term horizons and structural breaks due to policy shifts.