INNOVATIONS @ ENERGY

01 Market Update

01 Recent Tech Releases

02 **Feature Story**
Role of Derivatives in Deepening the Power Market

MARKET UPDATE

IEX technology team's vision is to create a customer-centric energy marketplace through efficient and state of the art technology solutions. In our journey towards this vision, we recently launched Green Term Ahead Market which allows buyers and sellers to trade green power along with the fulfilment of RPO obligations. It provides market-based support for renewable energy to achieve the ambitious target of 175 GW of renewables by 2022. While in the REC framework only green attributes are traded on power exchange and bought by entities to fulfil their RPO obligations, in G-TAM, the physical delivery of green power will take place and the RPO obligations would be fulfilled simultaneously. The market has received encouraging response from all stakeholders and has cumulatively traded 459 MU comprising 404 MU under Solar and 55 MU under Non-Solar segments within 102 days since commencement of trading on 21 August'20. G-TAM is a good alternative for RE100 companies to explore and commit to their sustainability goals.

We are witnessing good traction in the market and will further strengthen our offering with the recently launched daily and weekly contracts. Real-Time Market continues to do well and has traded more than 5 BU. More customers are now using RTM through our API framework as we continue to onboard more and more members. We are also streamlining client onboarding and data access process by providing a web based interface in next couple of months. We envision all our systems to be a web-based platform in an incremental manner.

RECENT TECH RELEASES

TWS User Privilege

With TWS User Privilege, bids for portfolios entered by any user are visible to all the mapped users with the members. The Respective changes have also been incorporated in Bid Books, Trade Books, Portfolio schedule report, etc. These changes have been done for all segments i.e. DAM, TAM-EC, RTM (including API) and G-TAM.

Green-Term Ahead Market

Green-Term Ahead Market Intra-Day and Day Ahead Contingency contracts were successfully launched in Sep-2020. All contracts of G-TAM are nationalised contracts and available with Solar and Non-solar attributes. The matching mechanism is continuous trading for Green-Intraday, Green-DAC and Green-Daily contracts, whereas double-sided open auction process for Green-Weekly. Trading and Settlement timelines are in line with the existing Term-Ahead Market segment.

E-Invoicing

This is a regulatory requirement and applicable for companies with turnover of more than 100 Cr. With this change, the members can generate E-invoice at their end and upload their corresponding responses to the exchange. This is cross-verified with Government Portal before initiating pay-out.

ROLE OF DERIVATIVES IN DEEPENING THE POWER MARKET

Introduction

World over, Power Market plays a crucial role in providing a platform for competitive sourcing of electricity as well supporting the overall transition of the energy sector from the perspective of 4Ds: De-carbonisation, Digitalisation, De-centralisation, and Democratisation. A well developed, liquid and competitive power market helps renewable generators to sell power in the market at competitive rates, which in turn fuels further investment & de-carbonisation. Also, the digitalisation and technology transforming the power sector value chain supports participation of market factors on real-time basis. Even de-centralisation and democratisation of the sector is supported by Power Exchanges in terms of offering a platform for aggregation and arbitrage opportunities for distributed energy resources.

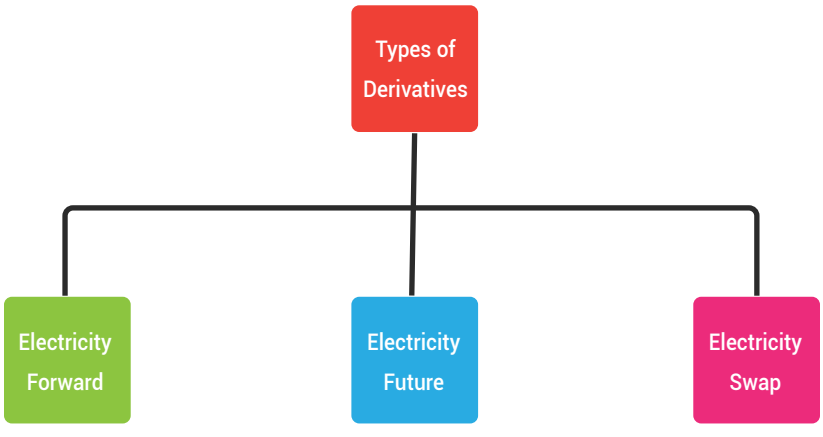
In India, although Power Exchanges have been successful & competitive option for market participants, the overall share of Exchange traded electricity hovers around 4-5% of the total consumption vis-à-vis the corresponding share of more than 50% in European and other developed economies.

Through various policy & regulatory initiatives, there is a clear focus to improve the share of market traded electricity in India. As per the recent agreement between CERC & SEBI, Non-Transferable Specific Delivery contracts shall be within the purview of CERC & financial and derivative contracts shall be traded on commodity exchanges within the purview of SEBI, thus paving the path forward for the introduction of electricity derivative contracts.

Understanding Electricity Derivatives

Electricity spot prices in the emerging power markets, such as in India, are generally volatile, due to smaller market size (4%), various dynamic factors such as weather conditions, change in fuel supply positions, variation in RE generation, transmission congestion and other physical attributes of electricity production and distribution. As India transitions from an emerging power market to a thriving power market, there is a need for hedging instruments that reduces price risk exposures for market participants such as generators, buyers and load serving entities. These hedging 'instruments' which are used by market participants to hedge their price risks through certain contract types are called Derivatives. For example, these derivative contracts linked with spot electricity prices help market participants to hedge from price risk variations and the buyer can pay a fixed price irrespective of variation in spot electricity prices with variations being absorbed by derivatives.

The plainest forms of electricity derivatives are forwards, futures, and swaps. Being traded either on the exchanges or over the counters, these power contracts play the primary roles in offering future price discovery and price certainty to generators, Discoms and other buyers.



Electricity Forwards

Electricity Forward contracts represent the obligation to buy or sell a fixed amount of electricity at a pre-specified contract price, known as the forward price, at a certain time in the future (called maturity or expiration time). In other words, electricity forwards are custom-tailored supply contracts between a buyer and a seller, where the buyer is obligated to take power and the seller is obligated to supply. The payoff of a forward contract promising to deliver one unit of electricity at price F at a future time T is:

Payoff of a Forward Contract = (ST - F); where ST is the electricity spot price at time T. Although the payoff function appears to be the same as for any financial forwards, electricity forwards differ from other financial and commodity forward contracts in that the underlying electricity is a different commodity at different times. The settlement price ST is usually calculated based on the average price of electricity over the delivery period at the maturity day "T".

Electricity Futures

Electricity Futures are contracts for the delivery of a certain quantity of electricity at a specified price and a specified time in the future, sellers can sell a proportion of their production in the future market, while consumers can buy a specific amount of the power they need.

Electricity futures contracts, like other financial futures contracts, are highly standardised in contract specifications in terms of trading locations, transaction requirements and settlement procedures. The most notable difference between the specifications of electricity futures and those of forwards is the quantity of power to be delivered. The delivery quantity specified in electricity futures contracts is often significantly smaller than that in forward contracts.

Electricity futures are exclusively traded on the organised exchanges, while electricity forwards are usually traded over the counter in the form of bilateral transactions. This fact makes the electricity futures prices more reflective of higher market consensus and transparency than the forward prices. Most electricity futures contracts are settled by financial payments rather than physical delivery, which lower the transaction costs. In addition, credit risks and monitoring costs in trading futures are much lower than those in trading forwards since exchanges implement strict margin requirements to ensure the financial performance of all trading parties. The fact that the gains and losses of Electricity Futures are paid out daily, as opposed to being cumulated and paid out in a lump sum at maturity time, as in trading forwards, also reduces the credit risks in futures trading. Overall, as compared to Electricity Forwards, the advantages of Electricity Futures lie in market consensus, price transparency, trading liquidity, and reduced transaction and monitoring costs while the limitations stem from the various basis risks associated with the rigidity in futures specification and the limited transaction quantities specified in the contracts.

Electricity Swap

Electricity Swaps are financial contracts that enable their holders to pay a fixed price for underlying electricity, regardless of the floating electricity price, or vice versa, over the contracted time.
They are typically established for a fixed quantity of power referenced to a variable spot price at either a generator's or a consumer's location. Electricity Swaps are widely used in providing short-to-medium term price certainty for up to a couple of years. They can be viewed as a strip of electricity forwards with multiple settlement dates and identical forward prices for
each settlement.

Electricity locational basis swaps are also commonly used to lock-in a fixed price at a geographic location that is different from the delivery point of a futures contract. That is,
a holder of an electricity locational basis swap agrees to either pay or receive the difference between a specified futures contract price and another locational spot price of interest for a fixed constant cash flow at the time of the transaction. These swaps are effective financial instruments for hedging the risk-based on the price difference between power prices at
two different physical locations.

Settlement of Derivatives

Settlement of Electricity Forwards

No settlement is performed during the trading period. The mark-to-market gains or losses are accumulated throughout the trading period. The settlement will finally take place when the contracts reach their due dates. Forwards contracts also use the system price as the reference price. Futures and forwards enable the market participants to hedge against the system price risk. Furthermore, futures and forwards are open to speculators who want to "make a bet" on the price of electricity derivatives, making electricity transactions the same as other financial commodities transactions.

Generators such as Independent Power Producers (IPPs) are the natural sellers of electricity forwards while utility companies are often the buyers. The maturity of an electricity forward contract can range from hours to years although contracts with maturity beyond two years are generally less liquid. Some electricity forwards are purely financial contracts, which are settled through financial payments based on a certain market price index at maturity, while the rest are physical contracts as they are settled through physical delivery of underlying electricity. Examples of financially settled electricity forwards include the Contract for Differences in the United Kingdom and Australian power markets. Electricity forwards with short maturity like 1 hour or 1 day are often physical contracts, traded in the physical electricity markets such as the PJM power pool market and the energy balancing market operated by CAISO in US. The contracts with a maturity of weeks or months can be either physical contracts or financial contracts and they are globally; they are mostly traded through brokers or directly among market participants (traded in the OTC markets).

Settlement of Electricity Futures

The settlement of Electricity Futures involves two steps: a daily mark-to-market settlement during the trading period and a settlement with reference to system prices (Power Exchange spot market) during the delivery period. In the trading period, Electricity Futures are subject to daily settlement with reference to the day-to-day changes in the closing price of the Electricity Futures. At the maturity of the contract, the delivery period starts, and a cash settlement takes place covering the difference between the final closing price of the Electricity Futures contract and the system price during the delivery period.

The figure below shows the settlement of the Electricity Futures contract. Supposing a Electricity Futures contract was signed at a predetermined price of 185 EUR/MWh. The price of assets continued to rise during the trading period and reached 223 EUR/MWh as the final closing price. The mark-to-market gain is 38 EUR/MWh accumulated by the daily settlement. During the delivery period, additional revenue at the price of 2 EUR/MWh (225 EUR/MWh -223 EUR/MWh = 2 EUR/MWh) was gained as a difference between the final closing price and system price. Therefore, the Electricity Futures contractor purchases electricity at a price of 225 EUR/MWh in the spot market, and gain a profit at a price of 40 EUR/MWh through the contract, resulting in the actual purchase price of 185 EUR/MWh, equivalent to the contract price. Such mechanism can be widely used by Discoms to meet the supply obligations at a competitive rate from the market without being exposed to price risk variations, therefore, facilitating the deepening of the power market in India.

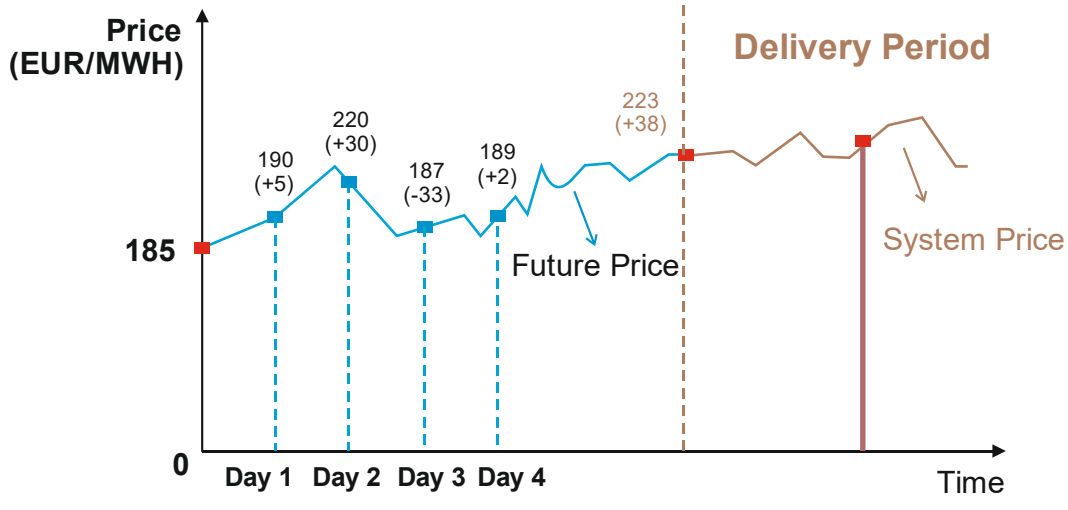


Fig. Settlement of Futures Contracts in Electricity trading

Derivatives in Electricity – Global References

In the European market, derivatives for electricity have highly evolved and have been playing a crucial role for more than 20 power markets across Europe. Some of the electricity futures markets in Europe are Belgian Power Futures, Czech Power Futures, Dutch Power Futures, French Power Futures, German Intraday Cap Futures, Italian Power Options, UK Power Futures, etc.

Most of these future markets are traded on European Energy Exchange (EEX) group with standard contracts for base load, peak & off-peak load for long term maturity (Month, Quarter & Year) and short-term maturity (Day, Week & Weekend).

EEX in cooperation with EPEX SPOT also offers a Physical Fulfilment Service (offered in more than 8 Power Future markets across Europe) to enter bids in the corresponding EPEX SPOT day-ahead auction according to the participants' respective position in an EEX power futures product.

There are financial derivatives products for hedging against the transmission congestion and association price risks:

In an electricity market such as the PJM that employs locational market price (LMP), a point-to-point Financial Transmission Right (FTR) is specified over any two locations in the power transmission grid.

FTRs allow market participants to offset potential losses (hedge) related to the price risk of delivering energy to the grid. FTRs are a financial contract entitling the FTR holder to a stream of revenues (or charges) based on the day-ahead hourly congestion price difference across an energy path. FTRs are a method to bypass congestion charges associated with PJM's LMP, which gives market participants the ability to attain better certainty in delivering power across the grid. An FTR entitles its holder to receive compensation (or pay) for transmission congestion charges that arise when the grid is congested. The congestion charge/payment (or payoff) associated with one unit of FTR is equal to the difference between the two locational prices. PJM also operates a market for FTR to help market participants hedge price risk.

The Nordic transmission grid was divided into several congestion zones. Each zone is an independent bidding zone and calculates its own zonal price. A system price in the Nordic market is calculated neglecting congestion. Futures, forwards, and Contracts for Difference (CFDs) are designed in Nord Pool financial market to hedge against the price risk.

Benefits realised from Electricity Derivatives in European Market

Higher efficiency in price discovery & lower growth in tariffs (e.g. real rate of growth in power tariffs declined by 4-6 % since derivatives launch in countries including Italy, Netherlands, and Spain).

Significant reduction of price volatility in spot markets (e.g. base and peak spot prices in France saw volatility reducing from 36-87% and 50-155% to 25% and 40%, respectively.

Benefits to Sellers: Price certainty and better price signals for investment decisions.

Government/Regulatory bodies: Higher transparency in power pricing, especially as OTC trades come online; higher efficiency of spot markets with prices trending towards marginal costs of generation.

EXCHANGE	PRODUCT	COUNTRY	TYPE	SETTLEMENT
EEX Group	Futures Options	Germany, Austria, France, Italy, Spain, Netherland, Belgium & other EU nations	Base load, peak load, off-peak load	Day ahead spot market of Epexspot
NASDAQ OMX Commodities Exchange	Futures	UK, Scandinavia, and Baltic nations	Base load & peak load	Day ahead spot market of Nordpool Spot
PJM/NYMEX	Forward & Futures	Respective ISOs and TSOs	Peak load & off-peak load	Respective spot prices
ICE Futures US	Futures	Respective ISOs and TSOs	Peak load & off-peak load	Respective spot prices

In developed Power Markets, the Power Derivatives have been quite successful. For example, in EEX group 3793 BU of power derivatives were traded in 2019.

Need for Derivatives in Electricity for Spot Market & Exchange Traded Power

The introduction of electricity derivative contracts in India is expected to play a crucial role in deepening the market traded electricity as various contracts to hedge the price risks can be explored by the buyers and sellers. The following points summarise the need for derivative contracts in overall market design:

Renewable-led variation in supply position may further increase the variability of supply and increased share of variable RE generation (with target of 450 GW of RE by 2030) can further result in increased volatility in spot market. Hence, various market-based mechanisms such as forward physical, future physical and future contracts shall help market participants to hedge the price risk, which is crucial to increase participation in the spot market.

In India, almost 89% of the power generated is tied up under long-term PPA of 25 years, which are rigid in nature and obligation to pay fixed cost restricts Discoms to explore cheaper power available in the market. In recent times, it has been observed that Discoms are now moving towards Short-term and Medium-term PPA options. In light of transition from Long-term rigid PPA contracts to more flexible short -term PPAs, the market design should support development of Capacity market for addition of new generation capacity and electricity derivatives shall help in giving firm and better price signals to market actors.

Going forward, for long-term capacity addition, an efficient and most accurate market price signals shall be crucial to give better signals for capacity addition. In temporary factor leading to volatility in the market prices for various reasons, such as variability in generation from RE, transmission congestion in few blocks, etc. may give inaccurate signals, which may further affect the capacity addition in the sector, thereby leading to sub-optimal utilisation of assets and missing money problem. The derivatives coupled with market products shall further reflect true cost of electricity to meet the demand. The role of power market goes much beyond price discovery and encompasses price signal for capacity addition as well as risk mitigation platform to exude confidence among the market actors.

The exchange-based markets currently thrive on the residual transmission capability that is left over after being allocated to long, medium, and bilateral short-term electricity markets. Transmission corridor allocation leads to uncertainty in physical delivery of traded power at MCP and market splitting increases the price of the area in congestion, therefore increasing the price. Hence, the derivative products, which hedges the price risk due to congestion would ensure delivery of traded electricity at the agreed price. Along with mechanism such as Financial transmission rights implementation of locational marginal pricing for transmission pricing shall further increase liquidity in power market and will lead to maximisation of social welfare.

Thus, Electricity derivatives can be used by Discoms, large C&I consumers, Generators for effective price risk management, which can be combined for several months to form a close match with the long-term load or generation profile. Also, for merchant generating stations in India, such instruments shall provide longer term visibility of guaranteed price, which shall help them to better formulate longer term fuel sourcing strategy. Thus, stable price visibility for buyers and sellers encourages reliability of trade and supports the deepening of Power Market.

Further, MCX has announced to launch Electricity derivatives products linked to IEX spot electricity prices. This shall lay the groundwork for a vibrant electricity derivatives market in the country and shall provide an effective risk management to market participants and will help the entire value-chain of the Power Sector in terms of optimum capacity addition, most efficient price discovery at Exchanges and stability in market prices, thereby providing a much needed impetus to deepening of Power Market in India.

CONNECT WITH US

@IndianEnergyExchange

buysmart@iexindia.com

IEX App on

Indian Energy Exchange Limited

Plot No. C-001/A/1, 9th Floor, Max Towers, Sec - 16B, Noida,

Gautam Buddha Nagar, Uttar Pradesh, 201301 | CIN: L74999DL2007PLC277039

Phone: +91-11-43004000 | Fax: +91-11-43004015

Email: contact@iexindia.com | www.iexindia.com