

INNOVATIONS @ **ENERGY**



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Achieving Renewable Aspirations: The CfD Model

RECENT TECH DEVELOPMENTS @ IEX

IEX Technology Team is executing the vision of a customer-centric energy marketplace through efficient and state-of-the-art technologies. While last year, we focused on expanding our product portfolio with Green and Real-time Market, this year, we are reinventing our platform by introducing the state-of-the-art customer-centric technologies. A few developments are:

- We have started experimenting with Microsoft Container Orchestration, a distributed systems platform for packaging, deploying, and managing stateful distributed applications at scale. It is the next generation platform used by Microsoft to manage enterprise class Tier-1 Azure cloud.
- We are actively using an end-to-end, open-source testing tool framework 'Cyprus' for creating a regression suite, which is a great tool for writing faster and reliable test suites as it is executed directly inside the browser. Once covered comprehensively, this will significantly reduce our testing effort and improve our time to market for new web products.
- We have been investing significantly in comprehensive monitoring and have started using open-source tools like Prometheus, Grafana and ELK stack. All these tools provide a real-time early warning notifications in case of a failure and further improve our exchange uptime.

IEX now has the requisite tools and platforms and a strong experience to move its Exchange Technology to a world-class platform.



ACHIEVING RENEWABLE ASPIRATIONS: THE CFD MODEL

Overview

The government of India has set up an ambitious target to set up 175 GW of installed generation capacity from Renewable Energy Sources by 2022, and to further scale it up to 450 GW by 2030. Currently, renewable energy capacity in India is added mainly through competitive bid route, with SECI being the nodal agency, and the developer and beneficiaries enter long-term PPA of 25 years. In the recent years, issues related to forced curtailment of renewable energy, payment disputes and long-term PPA being re-negotiated have seen an increasing trend.

In USA's CAISO market, renewable energy trades and competes with thermal energy and this has resulted in increased green component in the spot market. In line with global trends, innovative market models are crucial to address these disputes and to accelerate the capacity addition of renewable energy sources.

What is Contract for Difference?

As a general principle, under the market-based, Contract for Difference (CfD) mechanism for renewable energy, the power is traded and scheduled at Power Exchange at market prices. However, the revenue to the generator is guaranteed through a 'Contract for Difference'.

The price guaranteed to renewable energy generator called as 'strike price' is determined through the auction and generator executes a PPA at strike price. If the discovered market price is more than the strike price, the generator pays the difference to the pool and if the market discovered price is less than the strike price, the pool pays the difference to the generator. The pool is maintained by the government entity with good credit rating to give comfort to the renewable energy developers.

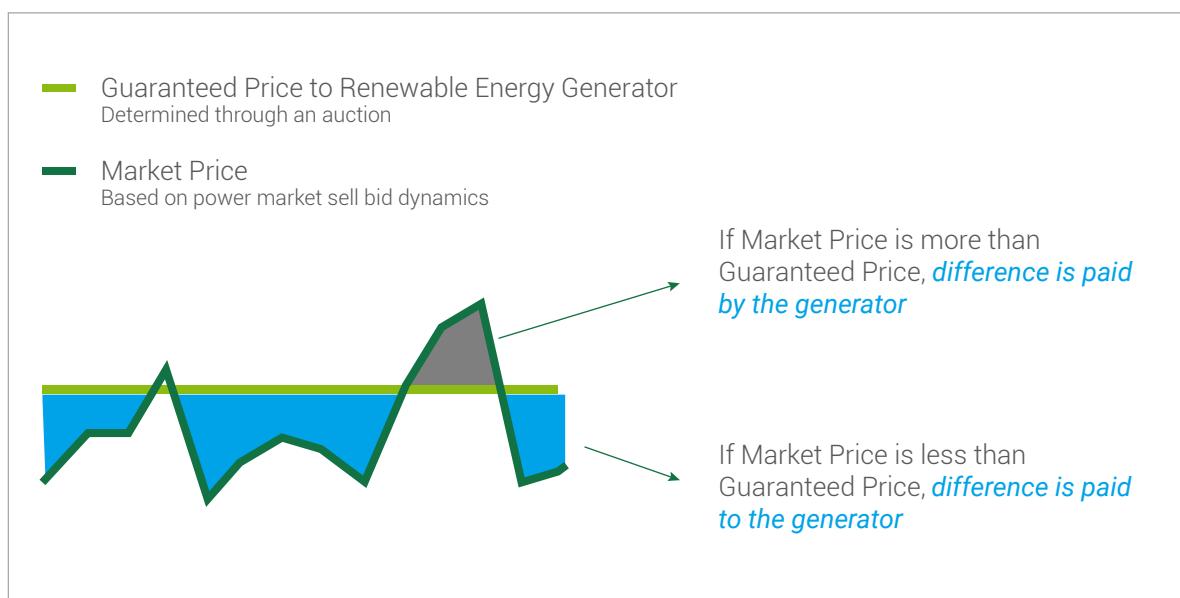


Fig: Basic Contract for Difference Mechanism

In India, this nearly 88% of the power generation comes from long-term PPA, so customisation of CfD model is needed to align it with the existing market and facilitate smooth integration of renewable energy. Some of the suggested market-based CfD models, which can be implemented in India are:

International Experience

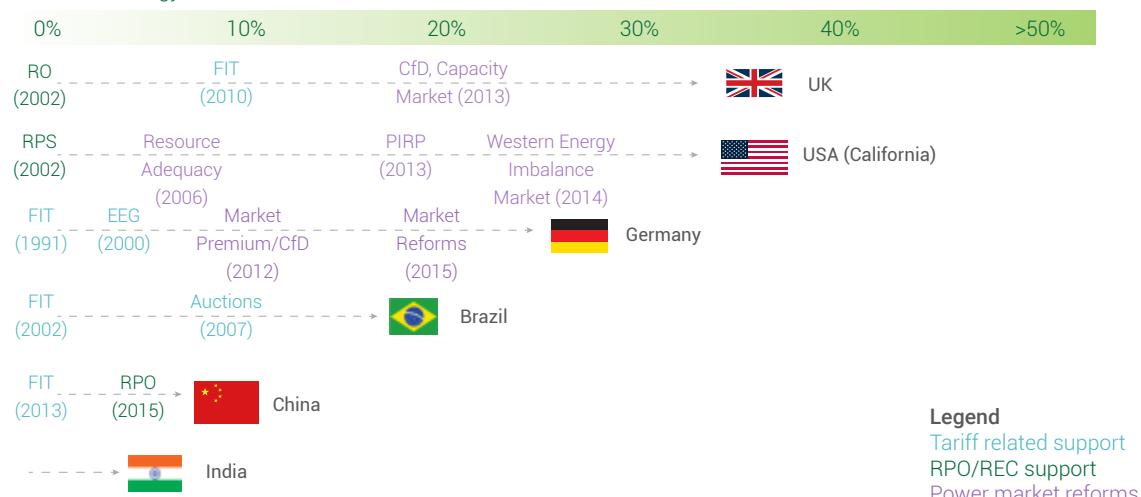
The experience of the advanced economies shows that establishing an efficient, transparent and liquid market is crucial for accelerated development of renewable energy. Countries such as UK, USA (California), Germany, etc. were able to increase their renewable energy penetration to more than 20% by shifting away from regulatory incentives/subsidies to implementing market-based reforms CfD to facilitate renewable energy integration into the grid.

In UK, three rounds of auction have been held under CfD mechanism. In the first auction held in 2015, 1.9 GW of renewable energy capacity was added. In the second auction in 2017, 3.3 GW of renewable energy capacity was added, with prices 50% lower than the levels of 2015. The latest round held in 2019, 6 GW of renewable energy projects were added with 30% lower tariffs than previous auction held in 2017.

Currently, the CfD model has been adopted by UK, Germany, Australia, France, Italy, Portugal, Sweden, Spain and Switzerland.

Renewable Energy Journey of India vs Other Countries

Renewable Energy* Share in Generation



*Excluding Hydropower

Fig: Global Comparison: Trend of Growth of Renewable Energy in Generation Mix



Bilateral CfD

In Bilateral CfD model, auction is conducted through nodal agencies for development of specific renewable energy projects. The generator enters into PPA with the nodal agency at auction discovered tariff (strike price) and nodal agency executes back to back power supply agreement with the beneficiaries. The sell and scheduling of renewable energy generator shall be through power exchange. If the discovered market price (MCP) is more than the strike price, the generator pays the difference to the utility and if the market discovered price is less than the strike price, the utility pays the difference to the generator. The tenure of the PPA under CfD may be decided by the government as appropriate.

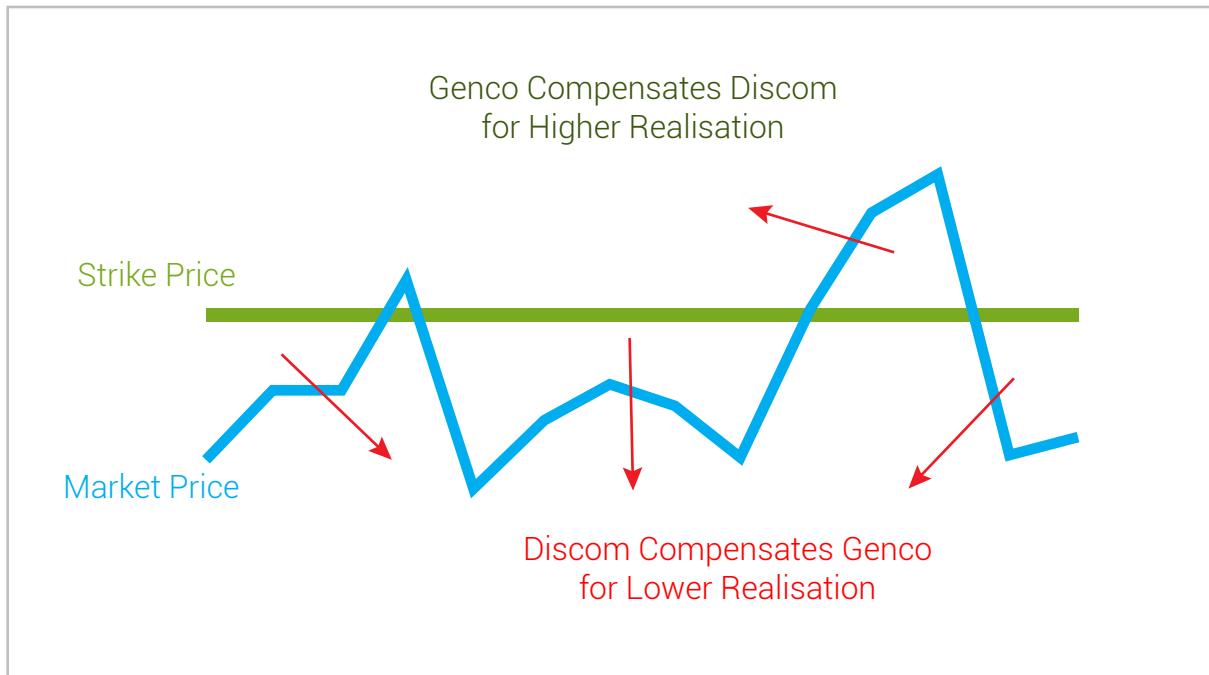
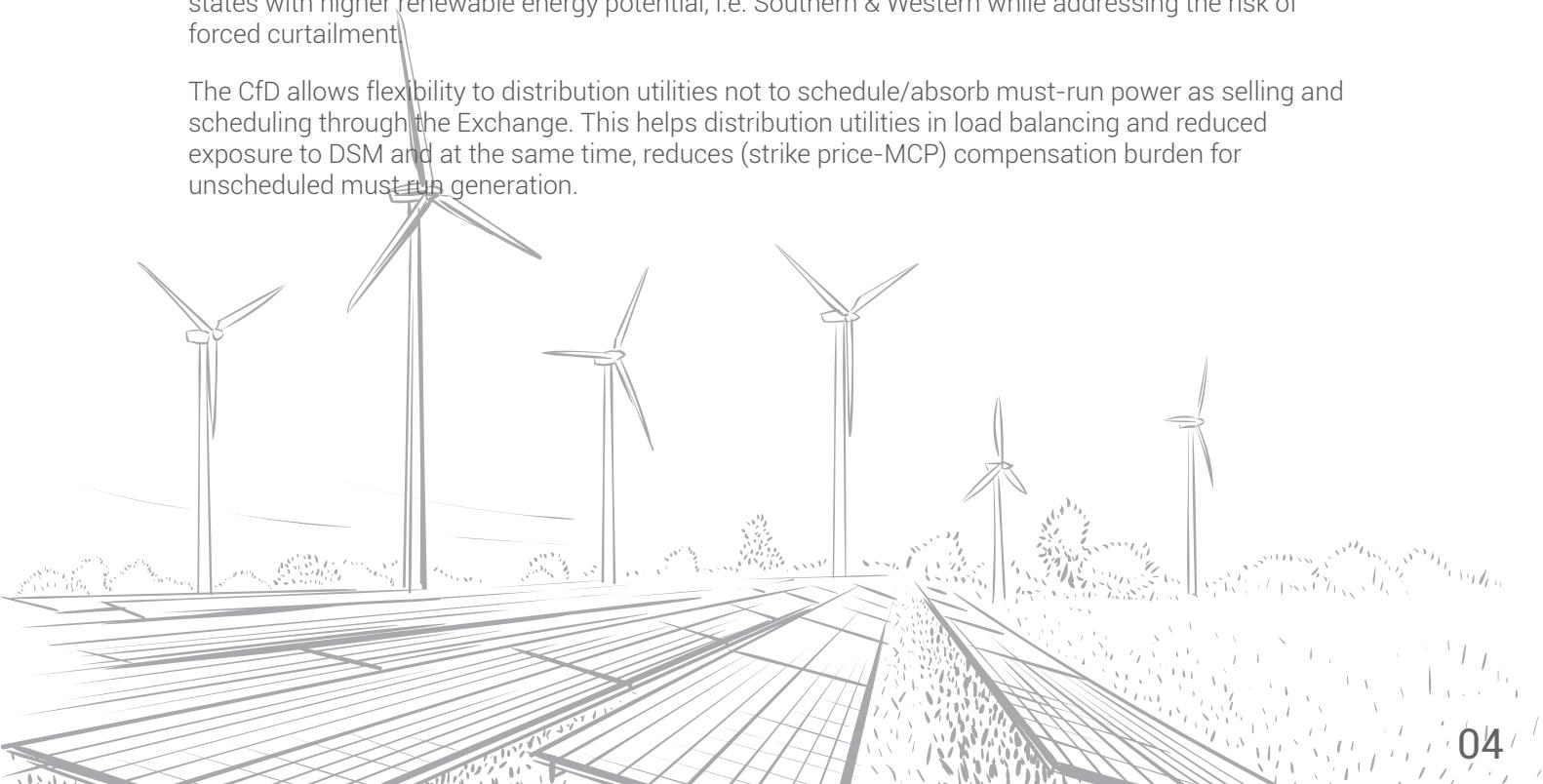


Fig: Bilateral CfD Mechanism

Bilateral CfD model aims to protect the developer's investment risk by assuring a guaranteed price and scheduling through Exchange ensures timely payment to generators, thereby, improving their cash flows and reducing requirement for working capital, which ultimately reduces the cost of generation. It is pertinent to note that Southern & Western States will be renewable energy rich states and the renewable energy generation will surpass their RPO targets. Therefore, it becomes relevant to empower inter-state exchange to facilitate competitive and efficient integration of renewable energy. Thus, the Bilateral CfD can play an instrumental role in facilitating rational investment of renewable energy in states with higher renewable energy potential, i.e. Southern & Western while addressing the risk of forced curtailment.

The CfD allows flexibility to distribution utilities not to schedule/absorb must-run power as selling and scheduling through the Exchange. This helps distribution utilities in load balancing and reduced exposure to DSM and at the same time, reduces (strike price-MCP) compensation burden for unscheduled must run generation.



Guaranteed Floor Price based CfD

Another version of CfD is 'Guaranteed Floor Price based CfD'. In this model, guaranteed floor price is declared for renewable energy projects by government through nodal agencies. PPA is executed with the generator at the guaranteed price and renewable energy power is scheduled and traded through the Exchange. The sharing of upside gains between generating and distribution utility can be graded and slab based, and downside risk can be fully borne by the utilities. The tenure of the PPA under CfD may be decided by the government as appropriate.

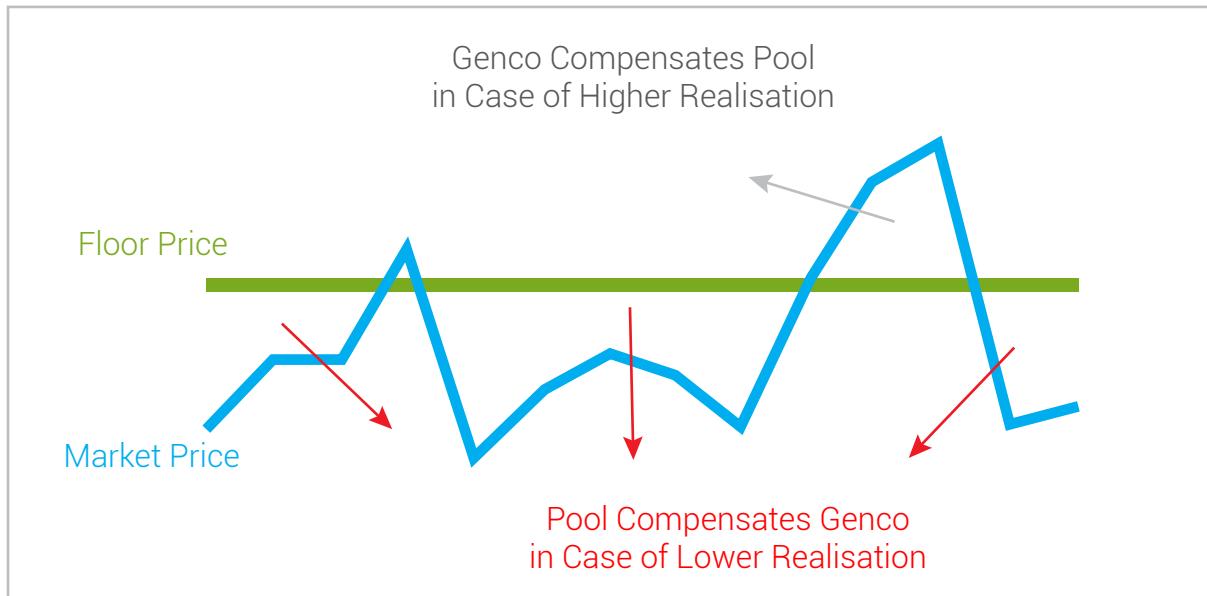


Fig: Guaranteed Floor Price based CfD Mechanism

Pool Based CfD

Bilateral CfD and guaranteed floor price based CfD should be initial models to develop green market and instil confidence among renewable energy developers and lenders. Once enough liquidity has been built up, the market can graduate towards pool based CfD.

In this model, the nodal agency holds auctions for setting up renewable energy capacities as per requirements of the states. The generators execute power purchase agreements with SECI at discovered auction price and the distribution utilities. Execute power purchase agreements with SECI at 'pool price', which is a dynamic price. It is expected that pool price will have a decreasing trend with addition of cheaper renewable energy capacity. In this model, distribution utilities pays/receives difference between Auction Price and Market Price into a central pool and similarly, difference between Auction Price and Market Price is paid to/by generators from/to the pool.

The pool can be managed by government entity with good credit rating. Apart from distribution utilities, the CfD mechanism can be offered to commercial and industrial buyers. The tenure of the power purchase agreements can be decided by the government as appropriate.

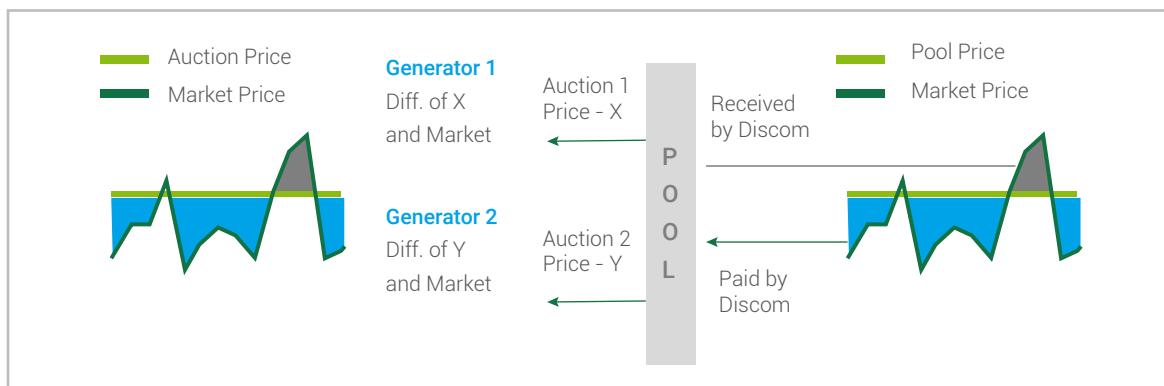


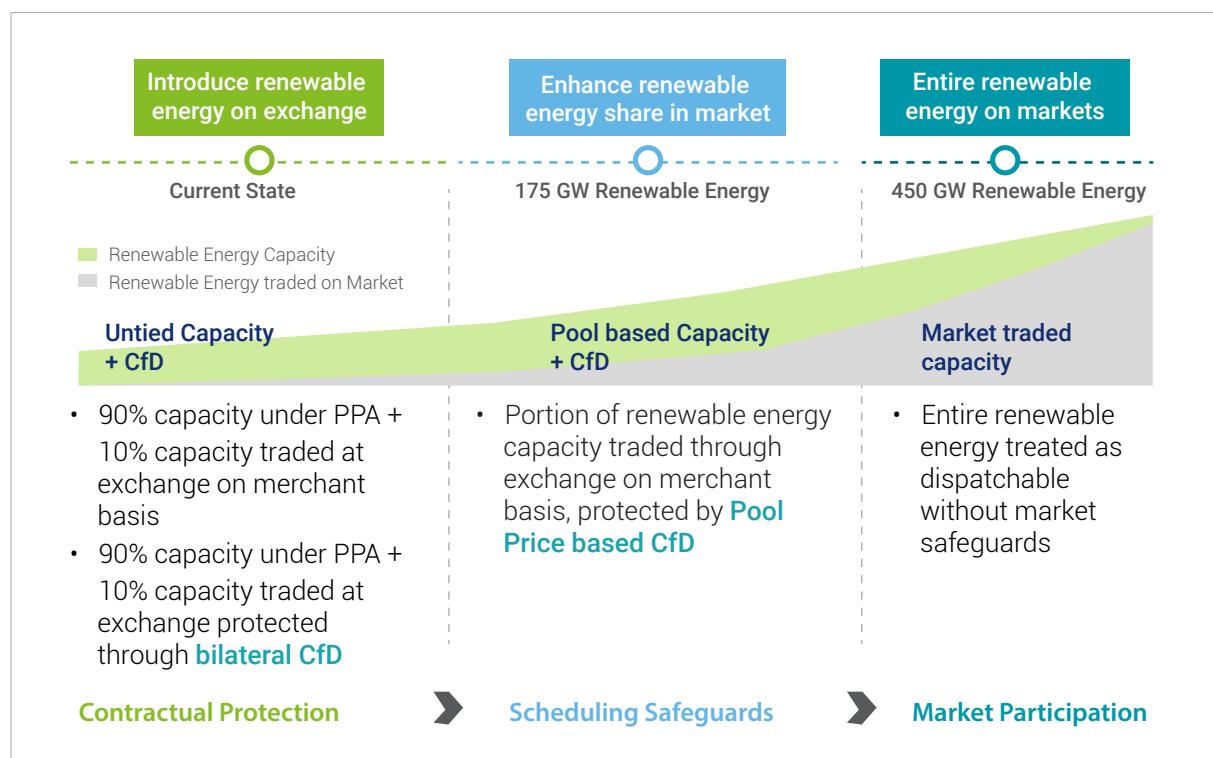
Fig: Pool based CfD Mechanism

This model is best suited to facilitate gradual integration of newer technologies, such as battery storage system, pumped hydro storage, offshore winds, etc. without giving a tariff shock to consumers and spreading the impact of costlier technologies over larger consumer pool.

Merchant Renewable Energy

Once renewable energy market develops and matures, it becomes instrumental to give market signal for new investment and developers start investing even outside long-term PPA or with partial untied capacity.

Along with bilateral CfD, certain capacity of the plant can be kept merchant and the remaining post can be under long-term PPA. In next 10 years, a trajectory must be developed to make a transition from 100% PPA model in 2020 to 100% merchant/market-based model by 2030, in line with global markets/advanced economies.



10% capacity traded at Exchange on merchant basis

Advantages of CfD Model

- **Grid Balancing:** Aggregation of diverse sources of generation, centralised despatch, efficient load management by distribution utilities, transfer of surplus renewable energy generation from renewable energy rich to deficit states increases, which will enhance grid balancing, thereby ensuring grid security.
- **Payment Security:** Any trade scheduled in the market is backed up by advanced payment, resolving the payment security concerns of the generators and the working capital requirement.
- **Efficient Scheduling:** Centralised pooling of renewable energy at power exchange decreases the aggregate forecasting errors and improves the firmness of renewable energy. This helps distribution utilities to efficiently manage its load and reduces the burden of flexibilisation of thermal stations.
- **Competitive Prices:** Market enabled model will help in discovering competitive price of power, based on marginal cost of each generation sources and provide long-term/short-term price signals for future capacity addition.

Regulatory Enablers

- As renewable energy generators will be competing in Day-ahead Market on the Power Exchanges, no revision in day-ahead schedule will be allowed. Since, no revision in day-ahead schedule is allowed in DAM on Power Exchange, the deviation charges for renewable energy under DSM regulation being calculated at fixed rate (PPA floor price in this case) may be extended from 15% to 20% for schedule of power under CfD mechanism, till the time forecasting of renewable energy becomes efficient.
- To allow renewable energy generators selling power under CfD route, apart from relaxed tolerance limit under DSM, the renewable energy generators may be allowed to fulfil its obligation (shortfall in generation) through Real-time Market mechanism as an additional option to manage its deviation from its day-ahead schedule.
- Distribution utilities/commercial and industrial consumer or SECI signing contract with generators will own green attributes of renewable energy power.
- As PPA through competitive bidding route (Sec 63, EA 2003) will be executed to facilitate utilities to meet their RPO, the waiver of transmission charges need to be retained for renewable energy under all models in CfD mechanism as well.



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