GOVERNMENT OF INDIA
MINISTRY OF POWER

UK Government

FICCI

Synthesis paper

# National Workshop Series on 'Electricity Markets of the Future'



December 2018



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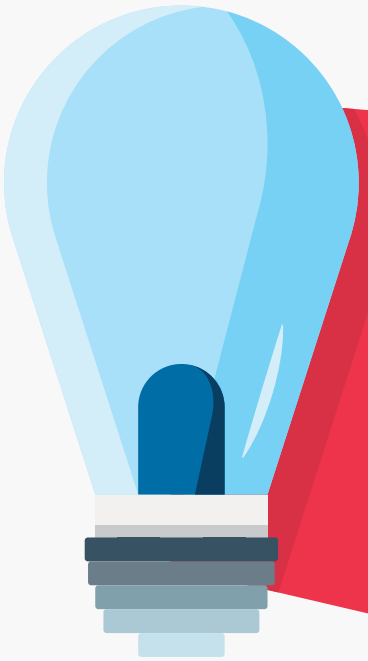
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This discussion summary is being prepared for the workshop series being organised by FICCI and is supported by Government of UK as initiative partner.

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# 1 Background

The national workshop series on "Electricity Markets of the Future" has been held under the Technical Assistance titled "Supporting Structural Reforms in the Indian Power Sector" or Power Sector Reforms (PSR) programme supported by the UK Government in collaboration with the Ministry of Power. The objective of this workshop series is to assess the power sector challenges that can be addressed through markets and thereafter evolve the broad market design in consultation with key stakeholders. The broad outcomes of the workshops are highlighted as below:



**1**

**Component Workshop 1:**
It indicated a set of challenges that were impeding the growth of the sector and markets in India.

**7th February, 2017**

**2**

**Component Workshop 2:**
It witnessed lively exchanges among the participants, brought out the possibilities and also the challenges in the way to deeper markets.

**12th June, 2018**

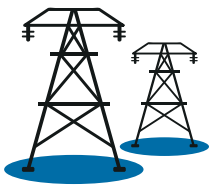
**3**

**Component Workshop 3:**
The concluding workshop of this series led to firming up of priorities, amenable changes and action areas to chart out the course for deeper power markets.

**30th October, 2018**

For wider stakeholder alignment for success, consultation was also sought with Distribution Companies (Discoms) and State Load Dispatch Centres (SLDCs) from 14 states, regulators, and other market players through an extensive 3–day workshop before the concluding workshop on 30th October.

This paper is a synthesis of discussions, findings, recommendations and actions that have emerged from the series of workshops.



# 2 Role of markets and current challenges

The larger roles of markets (including capacity, energy and balancing markets) and key challenges that elicit adequate policy response are indicated as below:

### Providing signals for capacity addition

One of the primary roles of markets is indicate generation and transmission capacity addition. The signals are in terms of capacity, prices, location and timing etc. for investments in future infrastructure to meet expected electricity demand. Surplus generation capacity, stranded assets, sub-optimal utilisation of assets and inefficient prices indicate that markets are not working effectively.

### Reliable, secure and efficient system operations

While the permissible variation in grid frequency has been tightened over the years, it is still above the international benchmarks. LSEs relying on Deviation Settlement Mechanism (DSM) to meet peak loads further endanger the national grid and distorts transparent price discovery. Current issues and increasing penetration of Renewable Energy (RE) demand more stringent measures for grid discipline and design changes for ensuring grid reliability. Higher levels of automation and integration of smart-technologies further necessitate extremely tight grid security to mitigate cyber-threats.

### Vibrant and flexible platform for energy trading

Insufficient liquidity, lack of flexible trading arrangements (physical and financial products) and legacy Power Purchase Agreements (PPAs) are some of the reasons that inhibit development of deeper markets and fine-tuning of contracts. The market inefficiencies are manifested in form of pockets of surplus and deficits despite a synchronous grid, anomalous surge in exchange prices during peak seasons, load shedding or deliberate over-drawal of power by Discoms and loading of fixed cost of underutilised capacities on Discoms, etc.

### Utility efficiency and improved consumer services

Deep wholesale markets efficiently interlinked with retail markets (through dynamic tariffs, retail market competition etc.) ensure that the upstream efficiencies are passed on to end consumers, making power more affordable. Competition also gives consumer 'choice', freer access to power markets and enables improvement in services. However, current market structure does not facilitate competition, efficiency and innovation in retail segment, failing which both consumers and utilities are struggling. Completion of household electrification will necessitate design and operational changes to ensure consumers are served 24x7 without affecting utility finances.

Stakeholders were consulted to capture their views on current market design and challenges, imperatives to prepare for integration of RE and other technologies, enablers for future market design and priorities. Basis these discussions, the recommendations are summarised as below:

# 3 Priorities and actions for evolution of future markets

The workshops brought sharply to the fore that **unless urgent measures are initiated, there is a looming risk of lack of reliable capacity to service the growing demand in the coming years.** Markets could serve as an alternative mechanism to both support existing capacities and create new pipelines of capacity instead of long term contracts. However, even if the technical abilities exist to implement more advanced market designs that could include Ancillary Services markets, Real Time Markets and Capacity Markets that allow for a wider range of physical and financial trading products, the readiness of the Discoms and also their operating realities limit the possibilities of a rapid transition to deep markets in a short period. Equally challenging are the non-existent fuel markets, and without fuel market reforms a rapid move to deeper power markets would be impracticable. **Hence there is a need to consider measures for competition for the market**[1] (in the form of auctions) ahead of competition in the market (through deeper power markets).



The workshop participants concurred that **irrespective of the specific design, products and development trajectory of the wholesale power markets there is an urgent need to get some building blocks for power sector and market operations in place (detailed below).**

Stakeholders further concurred on the **need to use the instruments of policy more effectively. In this process attention is required on positive bias that has crept in towards the public sector in various segments of sector value chain. While expedient at times it can ultimately undermine investor confidence and reverse the path of reforms** that has been charted out since the 1990s.

Finally, **clear consensus emerged that markets must evolve (incrementally) to meet the larger objectives of System Reliability, Resource Adequacy and Economy. The changes need not be transformational, rather a diverse mix of measures to move in the direction of deeper markets.** Such key elements and actions identified in the concluding workshop are discussed as below.

[1] Workshop participants voiced serious concerns on the proposed move back to cost plus capacity development since there is a real risk of overpriced capacity and emergence of a discriminatory regime that favours the public sector and permanently damages private sector appetite in conventional generation.

**Issues/ Recommendations**

1

- **Better planning and forecasting is essential -** This has been the Achilles heel of the sector both at the central and state level where techniques are weak and at times (especially at the State level) are absent. While in a deregulated system the planning will be indicative in nature, it should be sufficiently robust to anticipate load growth at the various nodes in the system and match it with likely generation. Compliance on other hygiene factors including on metering, scheduling, etc. need to be ensured.
- **Data disclosure regime must be strengthened -** Data availability and accuracy is key for improved planning and forecasting. This needs strengthening across the board. As witnessed through the introduction of the DEEP[2] portal, Vidyut Pravah and other platforms, open disclosure of information on accessible platforms hugely enhances transparency and engenders innovation. Such facilitation helps remove administrative and non-tariff barriers impeding market access, as is the case with open access for prospective buyers of power.

**Priorities and Actions**

### Robust central level planning

- The planning process should generate a number of alternate scenarios and distil the outcomes to identify necessary planning and implementation actions including for system augmentation at various levels.
- There should be capacity addition signals (location, type and technology etc.) for the market to deliver on.
- Notwithstanding the planning roles of various state level entities mandated in the Electricity Act, comprehensive national planning for electricity system need to be ideally carried out by a central agency. Proposals/ plans for setting up generation should disclosed for incorporation in long term planning.
- Distributed Energy Resources (DERs) are playing an increasingly important role in "central" network planning. Enhancements at the distribution level (including DERs) need to "iteratively" interact with the "central planning process" so that such planning encompasses and also utilise the resources present in a "localised" area to defer/obviate the "costlier" resource creation at other places in the network. This approach will greatly enhance pick-up of batteries and other storage options, whose costs are likely to decline over next 4-5 years.

### Enforcement of Universal Supply Obligation (USO)

- Legislation ought to indicate that USO encompass the obligation for 24x7 supply to consumers. Enforcement of USO will ensure that Discoms plan ahead and ensure capacity adequacy, instead of resorting to load-curtailment.
- This forms a basic premise for expansion of customer service and reliability of market signals to the users of the system including generators and customers.

### Capacity adequacy statements to support USO fulfilment

- Regulations must provide for submission of Capacity Adequacy statements by Discoms, for medium-long term, say 7 years. Data disclosure from Discoms in form of these statements will

[2] Discovery of Efficient Electricity Price (DEEP) portal for e-bidding

Priorities and Actions

help predict the system demand more accurately, provide inputs for national level planning and nudge Discoms to use the available market mechanisms for short term procurement.

- Regulators need to ensure prudent and periodic evaluation of these statements.

### Robust data regime

- Granular data from time block –wise load flows, efficiency and reliability parameters to long term forecasts and capacity addition plans must be made accessible in form of an open registry to central planning agencies, policy makers and other market participants for informed decision making.
- Regulations must clearly mandate data disclosure scope, set accountability and enforce compliance by respective entities. Platform for submission of data and standardised formats must be used.

2 Issues/ Recommendations

- **Need for stronger presence of buyers in Short Term (Day-Ahead) market -** Fundamentally, short term market cannot be deepened without the increased participation of buyers and suppliers. Increased participation is requisite for improving the demand and supply and reducing price volatility. Within the available platforms there is wide disparity in the participation and utilisation of the market among the Discoms. While some states use the markets very effectively for financial gains, there are other large states that have been staying away from markets.

Priorities and Actions

### Inducing participation of Discoms

- Introduction of Real Time Markets, the broad contours of which have been discussed by Central Electricity Regulatory Commission (CERC) in a paper published in July, 2018[3].
- Stronger regulations/ stringent penalties for discouraging use of DSM to meet temporal and seasonal load variations.
- Gate closure/ right to recall norms to be reviewed and altered as required to ensure reliability of market operations.

### Inducing participation of Generation Companies (Gencos)

- State and central Gencos must be allowed to offload their surplus capacity in short term market to improve liquidity, enabled through RTM.
- Improved load forecasting and scheduling will also help improve the Un-requisitioned Surplus (URS) available to participate in market. However, it is also essential that adequate safeguards are there to ensure larger players (buyers or sellers) do not exercise market power.

[3] http://www.cercind.gov.in/2018/draft_reg/RTM.pdf

**Issues/ Recommendations 3**

- **Continuous institutional capacity creation is key to sustainable reforms -** For efficient sector operations it is essential to ensure that the players are adequately equipped to deal with the opportunities and the operational aspects of the markets, including real time trading. Especially at the state level, the capacity building initiatives need to be ramped up with the SLDCs and Discoms. Specific provisions could be considered in policy along with corresponding funding and institutional arrangements for capacity building.

**Priorities and Actions**

### Targeted programmes at central and state level

- All market stakeholders, including regulators and planners must build capacities to keep pace with external changes and actively contribute to market evolution.
- Comprehensive national level programme need to be evolved in line with strategic direction for continuous upgrade of skills employed from planning to operations.
- For secure sector and market operations the key actors need to be trained adequately where necessary required to go through a certification process.
- Further, tools for forecasting, optimisation and trade visualisation/enablement need to be propagated rapidly to all load serving entities

**Issues/ Recommendations 4**

- **Flexible contracting mechanisms for risk mitigation -** Long term PPAs in the form of bilateral contracts constitute the bulk of the power market and contribute to its rigidity. They also bind Discoms to power purchase obligations with inefficient costs in the face of demand uncertainties or inadequacies of forecasts. There is a need to break away from the convention and limit PPAs to shorter duration of forecastable period of demand projections for serving the quantum of base loads, leaving peak load requirements to be met through short term contracts and seasonal variations through market operations via exchange-traded products.

**Priorities and Actions**

### Innovation in contracting models and introduction of financial products

- While PPAs may not be amenable to restructuring, these can be supplemented with standardised financial contracts[4] which ensure security of supply for Discoms, yet hedge the price risks and induce economic procurement in short term market, supporting deeper markets.

[4] Developed on the lines of Contract for Differences. CERC is understood to be working on such a model.

**Priorities and Actions**

- Instruments such as Contract for Differences (CfD) would greatly help in managing risks and/or dealing with the variability of market prices and can be introduced in the next 1-2 years (an illustration of the CfD mechanism is provided in Annexure A).
- Additionally, shorter and innovative contracting models suited for the market need to be developed and adopted for future use. Planning for introduction of other financial products such as derivatives can be undertaken now to prepare for launch once the market is mature enough few years hence.

**Issues/ Recommendations 5**

- **Capacity auction mechanisms to be developed before moving towards an advanced capacity market model -** There is consensus that at this stage, we need to put a simpler mechanisms in place to ensure resource adequacy. Due to current capacity surplus, the long term capacity creation plans have largely stalled, barring that in RE sector.

**Priorities and Actions**

### Capacity auction platform

- Similar to DEEP (meant for shorter term procurement) there is need to evaluate creation of a dedicated auction platform for long term contracting periodically, rather than sporadically. Load serving entities and generators can chisel their contracts through this platform. Basis the experience, we could move towards more advanced capacity market models.

**Issues/ Recommendations 6**

- **Opening up fuel linkages critical for market deepening-** Having an administered arrangement to regulate the fuel supply will be counter-productive to power market development aiming to free up capacities to meet demand along with the variations. Large privately owned capacity with potential to provide the required liquidity and competition in short term market is stranded due to lack of fuel availability. The situation creates dichotomy in market where on one hand spot prices are peaking at INR 18/ kWh, while gigawatts of capacity is underutilised due to artificial limitations imposed by fuel supply agreements/linkages.

**Priorities and Actions**

### Fuel planning and liberalisation policies

- Conducive policies are needed to free up coal linkages for utilisation by the stranded capacity, at least on short term basis, moving on to more liberalisation in coal mining to harness efficiency upstream of power sector value chain.
- Better fuel planning and storage is also essential, and in this regard the implementation and enforcement of fuel storage norms specified is necessary.

Issues/ Recommendations 7

- **Real Time Market (RTM) and Ancillary Service (AS) essential for improved reliability and control-** A further volume growth in the Short Term markets including the Day-Ahead Market can only happen when the markets offer a wider set of avenues to chisel the positions of the participants in accordance to the changing needs after the Day-Ahead Market (DAM). There is strong consensus that RTM is necessary to improve grid reliability, particularly in view of increasing share of intermittent and variable RE.

Priorities and Actions

### Introduction of RTM and Expansion of AS

- Market players cannot be allowed to fall back on load shedding at will for meeting intra-day load variations. Beyond reliability aspects, utilising expensive power available through DSM is not economically efficient and burdens end consumers. Real Time Market on the lines of the concept envisaged by CERC need to be introduced.
- Similarly Ancillary Services, currently in nascent stage should be gradually expanded to include fast responding, reliable and economical technologies, aggregators and service providers to improve the grid resilience. Regulations need to be developed by CERC for introduction of other sources and technologies and incentives should be available to enable participation.

Issues/ Recommendations 8

- **Retail market reforms should not be lost sight of -** The significance of improving retail market efficiencies is amply clear and reforms are much needed. Coupling of retail and wholesale market is imperative to pass on the economic benefits in latter to end consumers. Considering the federal structure and embedded political economy in distribution segment, transition to retail competition is bound to be complex.

Priorities and Actions

### Inducing Discom participation on short term markets

- As an immediate measure, stakeholder/ expert views converge on improving efficiencies by improving the operational practices of Discoms and enabling their active participation in wholesale markets. Aforementioned actions for inducing Discom participation need to be followed.

### Stepping up governance

- Prior to carriage and content segregation, competition in retail could be infused through other forms, including fair and consistent open access policies/regulation and their application.

**Priorities and Actions**

- At all levels including in the utilities, regulatory bodies and also for open access there is a need to review the governance arrangements and enforce policy adaptation to ensure fairness and timely warnings on challenges faced in implementation of the laws and the market construct.
- The importance of institutional oversight and surveillance for efficient market functioning cannot be over-emphasised to pre-empt non-competitive behavior and abuse of dominant position.

**Issues/ Recommendations 9**

- **Transmission planning and access is a pre-requisite.** Both intermittency of renewable energy generation and demand uncertainties have reduced the dependence on long term contracts, which lock in transmission capacities and lead to lack of margins for the short term and day-ahead / intra-day markets. While examining a new market design, which will allow dynamic balancing of supply and demand, an alternative approach to transmission planning and access would be necessary to provide for flexible corridor allocation and trading of transmission capacities to avoid over-building of the transmission network.

**Priorities and Actions**

### Move towards General Network Access (GNA)

- Transmission is a common carrier for all market participants. Accelerated implementation of GNA regulations will further help congestion management, and economic utilisation of networks, leading to benefits for end consumers.
- Ease of transmission access to Independent Power Producers (IPPs) will further aid deepening of markets. Further, in view of evolving regulations and nature of system utilisation, states should also plan for future transmission import and export capacity. A short account of GNA is provided in Annexure B.

**Issues/ Recommendations 10**

- **RE can play more active role in markets-** Future market designs should look at incorporating RE to enable it play a bigger role as a market maker, rather than a must-run generator.

**Priorities and Actions**

### RE project structuring

- Better structuring of RE projects could alleviate risks perceived by developers and financiers to further bring down electricity prices. Green contracts could also play a key role in meeting the Renewable Purchase Obligation (RPO) for Discoms.

**Issues/ Recommendations 11**

- **Decentralised resources could be an alternative to retail market competition-** Decentralised resources connected to the low voltage networks and behind the meter create de-facto competition in retail segment. Technologies such as solar rooftop are already becoming competitive with grid based electricity and increasingly substituting the latter.

**Priorities and Actions**

**Introduction of aggregators and intermediaries**

- Introduction of aggregators could play a vital role in operational control and coordination with system operators. They can also provide a gamut of services ranging from balancing reserves to load curtailment and demand response, aiding grid reliability.

**Issues/ Recommendations 12**

- **DERs have immense potential in grid reliability improvement-** DERs enabled by Technology could be the backbone for secure, efficient and reliable system and market operations.

**Priorities and Actions**

**Evaluation and testing of new technologies**

- Focus is needed on evaluating the technological imperatives to develop a resilient power system.
- Upcoming DER technologies, Internet of Things (IoT) and Information and Communication Technology (ICT) must be evaluated and piloted.

**Issues/ Recommendations 13**

- **Continued engagement and communication** with stakeholders

**Priorities and Actions**

- Ongoing dialogue is needed for awareness creation, consensus development, issue resolution and capacity building is required and for this

**Issues/ Recommendations 14**

- **Adoption of learnings from states-** Certain states like Gujarat, Rajasthan, Telangana, etc. have made very substantial progress in implementation of robust processes for market operations and associated activities including resource forecasting, scheduling and intra-state Availability Based Tariff (ABT) implementation.

**Priorities and Actions**

**Standardisation of good practices**

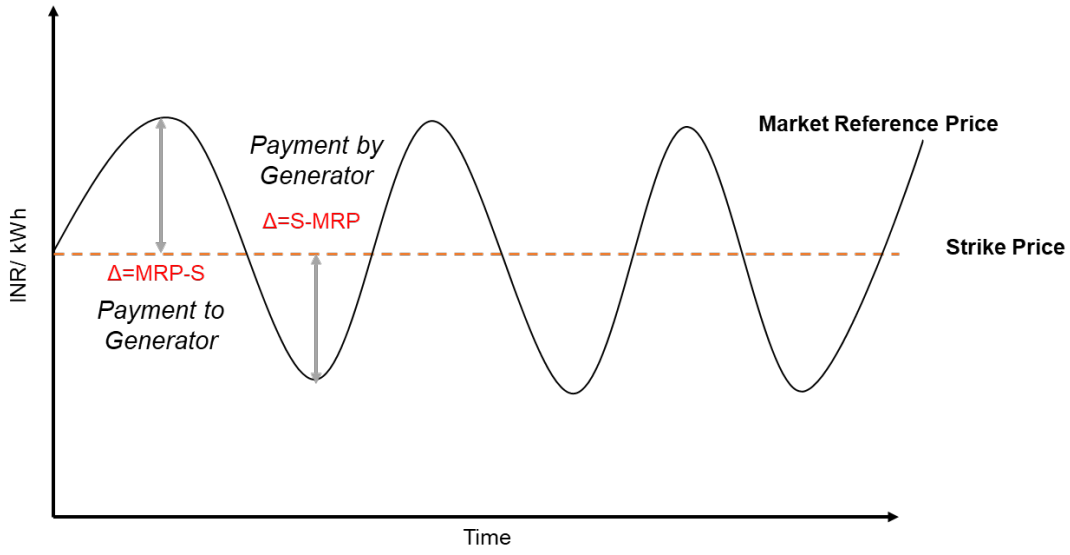
- Experiences of these states need to be studied, identified good practices need to be harmonised and converted into Standard Operating Procedures (SoP) for the various stakeholders.

Going forward the workshop agreed that a blueprint for market reforms needs to be evolved reflecting the above and including a timeline for the activities (including the building blocks). The task will be to examine the options of market design under bilateral and Over-the-Counter (OTC) products on the one hand and exchange-traded products on the other, with scope for including both delivery-based and derivative contracts as constituents. Based on the chosen path, an operating framework and implementation plan will be necessary to define the changes in policies, regulations, codes, industry agreements and institutional arrangements. With the emanating clarity on the possible action agenda it is essential to place the actions in a "time-bind" to define the sequence and priorities of actions for ushering in the markets of the Future.

# Annexure A How CfD works?

Contracts for Difference (CfDs) are contracts agreed between generators and a government counterparty, meant to mitigate price for targeted generators and stabilise their revenues for the duration of the contract, through a pre-agreed guaranteed 'Strike Price'. The counterparty is primarily responsible for making payments to CfD generators and for maintaining and updating the CfD itself. This process works alongside standard interaction between the generator and the market, with generators selling their electricity into the market as before but with the CfD functioning alongside.

Payments are primarily dependent on both the amount of electricity supplied and the difference between the Market Reference Price (MRP) and the predetermined Strike Price (SP). In context of India, the MRP could be the Day-Ahead Market Price discovered on power exchange. In case the MRP is above the SP, the counterparty pays the differential (MRP- SP) to the generators. Conversely, if the MRP is lower than SP, the generator pays the differential (SP-MRP) to the counterparty as highlighted in figure below.




The mechanism ensures that generator always gets a fixed price (SP or Strike Price), mitigating its price risk. The market benefits as the participation of generators create liquidity, discovery of true prices and hence increased market efficiency.

# Annexure B General Network Access

The Central Electricity Regulatory Commission (CERC) has come out with the draft regulations[5] on General Network Access (GNA) in November 2017, with an objective to achieve synchronisation between transmission (a licensed activity) and an open market (including delicensed generation). GNA regulations are expected to ensure adequacy in the planning and development of the Inter-State Transmission System (ISTS).

GNA is the ability in MW to draw or supply from a given point/zone of connection (PoC) to any ISTS point as assessed by the Central Transmission Utility (CTU) through system studies. Since a strong all India mesh grid was expected to emerge by end of 12th Plan i.e. 2016-17, it should be possible to do planning with fair degree of certainty without prior knowledge of pairs of injection and drawal. System strengthening for additional drawal and additional injection could be done without knowing the contracted source of purchase or sale because power in a meshed network would be transferred by displacement. In other words, the generator and the States/Consumer could be given General Network Access (GNA) to ISTS for the agreed quantum of power (MW). A GNA agreement could become the driver for investment. The new approach should therefore involve introduction of General Network Access (GNA) mechanism in Inter-State Transmission System for transmission system development and hassle free access to the transmission system by the Generators.

Benefits of GNA are as below:

- New transmission corridors could be planned based on GNA requirement, which would help in a great way to remove congestion in transmission corridors.
- Generators shall not be liable to pay notional point of drawal charges.
- Generators shall not have to declare target beneficiaries.
- Generators shall have access to ISTS grid with flexibility for point of drawal subject to conditions laid down at the time of grant of GNA.
- Drawing Utilities shall also access to ISTS to the extent of their GNA and get the system created for power transfer over ISTS from anywhere in the grid.
- This will give them flexibility to purchase power through long / medium / short term transactions/agreements depending upon their need and economic considerations and without any transmission restrictions.

[5] http://www.cercind.gov.in/2017/draft_reg/D_GNA.pdf

