



Deepening India's Short-Term Power Market

New Financial Products Will Boost Trading of Renewable Energy

Executive Summary

Long-term contracts between energy providers and distribution companies (discoms) have traditionally prevailed over other options for the buying and selling of conventional power in India, and they continue to do so with the growth in 25-year solar power purchase agreements (PPAs).

However, this model has locked the state-owned discoms into buying expensive power from highly polluting and inefficient thermal power plants, to manage their peak as well as base-load requirements. Meanwhile there is cheap electricity, in the form of renewables, available in the market.

The recent introduction of new financial products to the short-term market can help developers and discoms to hedge risk without having to sign long-term PPAs to secure financial closure of projects.

By trading in the short-term market, developers can diversify risk and earn more revenues during higher value, peak-demand hours, while the discoms can buy electricity at competitive prices and with greater transparency. The short-term market also allows the discoms to balance supply with demand at all time intervals.

The short-term market can help developers and discoms to hedge risk without having to sign long-term PPAs to close projects.

In this briefing note, IEEFA highlights that the short-term market has yet to reach its full potential. So far participation has been limited. Short-term electricity transactions as a share of overall electricity generation have remained at around 10% for the past decade. And to date, participation of renewable energy (RE) in the short-term market has been minimal (less than 1%).

But the recent rollout of new market mechanisms on the Indian Energy Exchange platform will boost the short-term trading of RE.

The real-time market (RTM) enables consumers, including discoms, to match supply and demand by buying power just an hour before delivery. And renewable energy generators benefit from selling their unanticipated surpluses.

The newly launched Green Term-Ahead Market (GTAM) offers consumers a sustainable option, contributes to efforts to achieve the government's RE goal and facilitates the integration of RE in India's electricity market.

In IEEFA's view India's electricity market should transition to a national pool real-time market and at the same time optimise the huge investment in the national generation fleet. Increased competition and transparency would drive down the average cost of supply, forcing outdated, inefficient and polluting plants to close and reducing overcapacity in the thermal power sector.

A shift to real-time electricity pricing for large consumers (monthly consumption greater than 1 MWh) would benefit the market and the development of grid-connected behind-the-meter solar and storage in the commercial and industrial sectors.

The right price signals will also encourage large consumers to shift consumption from peak to off-peak periods and to use low-cost RE when available.

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India should deepen its short-term market further, to deliver more liquidity and efficient price discovery – both of which have been constrained by transmission capacity being allocated to bilateral contracts with the remainder made available for trading at the power exchange.

To help address this issue, IEEFA suggests introducing a market for transmission capacity rights. Allocation of financial transmission rights (FTR) between market participants could be instrumental in addressing the issue of back-down of power due to the non-availability of a transmission corridor.

Introduction To the Short-Term Market

The enactment of the Electricity Act 2003 laid down the provision for promoting of competition in the Indian power market.

Historically, long-term power contracts have dominated the Indian electricity sector and continue to do so with the growth of 25-year solar power purchase agreements (PPAs). With the massive deflationary effect of solar power, these long-term contracts have driven inefficiency and imposed an ongoing burden of costly power, undermining India's ability to retire expensive, polluting end-of-life coal-fired power plants. The distribution companies (discoms) in India are struggling with huge financial losses, with accumulated losses amounting to Rs4,88,686 crore (US\$67bn) and total outstanding debt of Rs478,000 crore (US\$66bn) in FY2018/19.¹

¹ PFC. Report on Performance of State Power Utilities 2018-2019.

Our recent IEEFA report² found that the discoms are saddled with huge losses on account of PPAs with costly and inefficient thermal power plants. The discoms are burdened with fixed-charge payments, even if they do not procure power from such assets.

In order to ease their financial burden, the discoms need to be unshackled from expensive long-term PPAs with old, inefficient plants. India is transitioning towards development of financial products in the electricity market that developers could utilise to hedge the risk without requiring the signing of long-term PPAs for the financial closure of projects.

The short-term market has evolved over the years with the introduction of a variety of products in the market, thereby increasing liquidity and efficient discovery of prices. By selling in the short-term market, developers can diversify the risk and also earn more revenues by selling during higher value peak demand hours. On the other hand, the short-term power market will also enable discoms to procure electricity in a transparent, cost-competitive manner. Further, it will help discoms to match demand and supply at all time intervals which provides flexibility and accrual of savings.

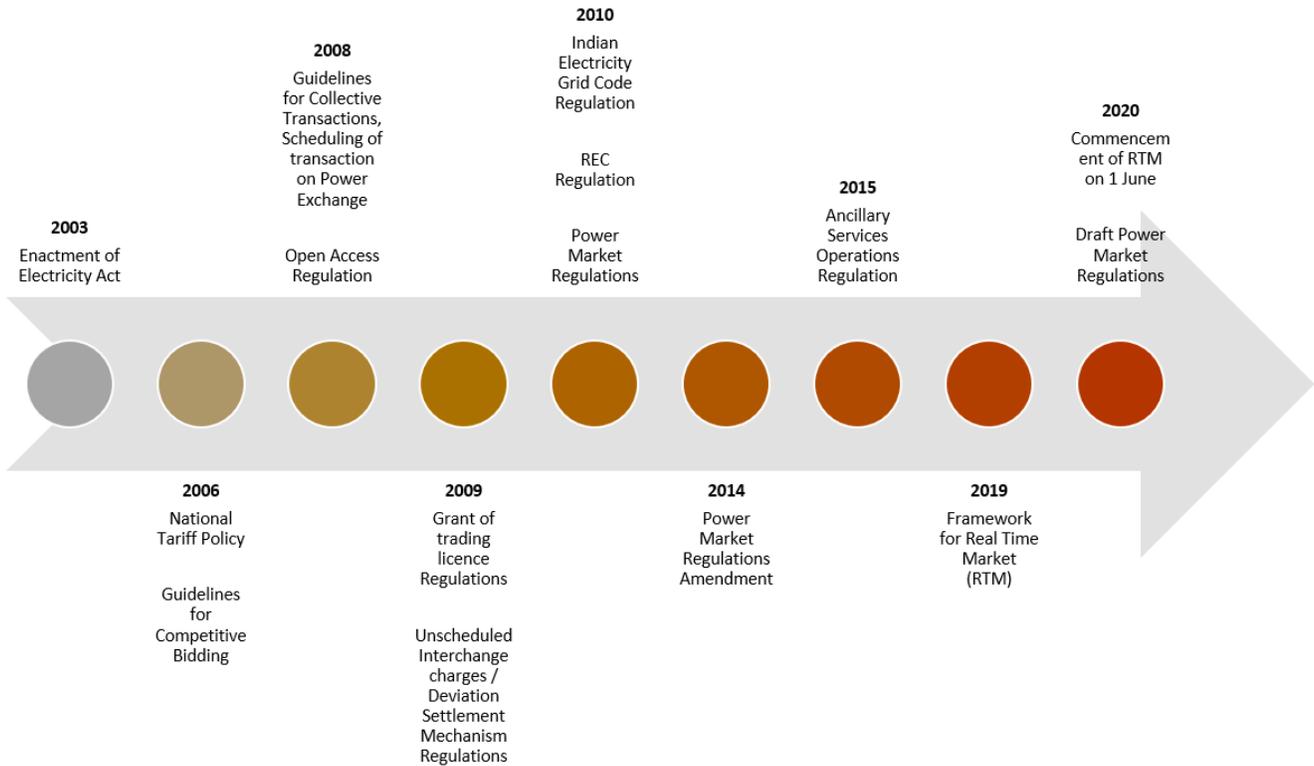
Analysis of the Short-Term Market

The Central Electricity Regulatory Commission (CERC) issued various policy guidelines and regulations over the years that paved the way for a paradigm shift in the power sector. Key regulations for operationalising and deepening of power markets in India are presented in Figure 1.

There are various market segments through which buyers and sellers can trade power in the short-term market. A snapshot of market segments in the short-term market is shown in Figure 2.

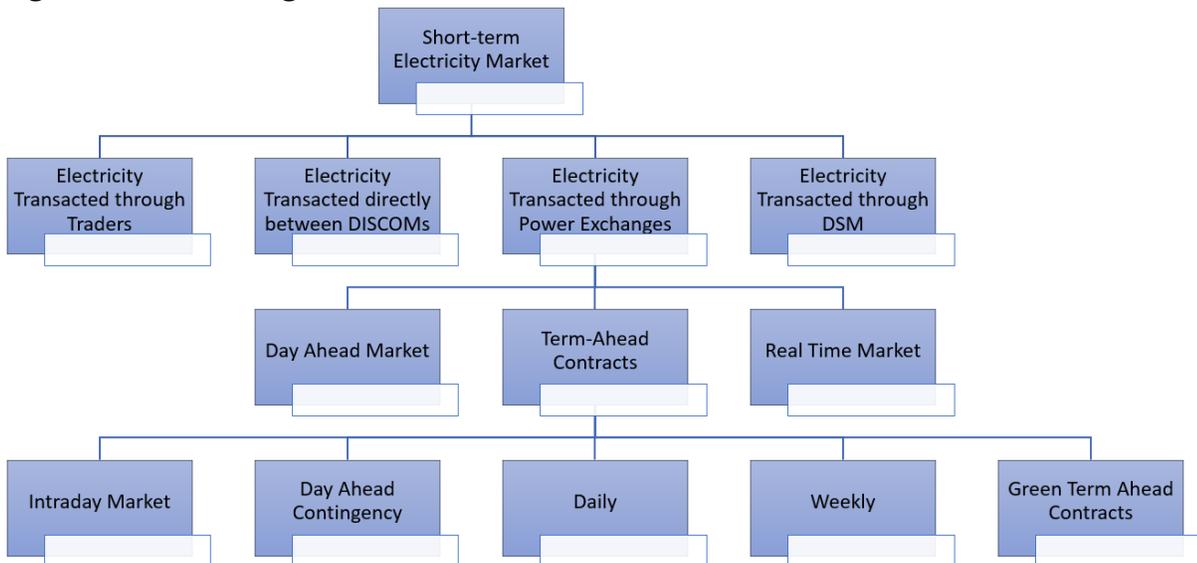
² IEEFA. The Curious Case of India's Discoms. August, 2020.

Figure 1: Transition Towards a Competitive Market Structure



Source: IEEFA

Figure 2: Market Segments of the Short-Term Market



Source: IEEFA

The table below shows the volume of electricity transacted in the short-term market, including electricity traded through:

- Trading licensees (traders) under bilateral transactions;
- Direct transactions of electricity between discoms;
- Power exchange transactions;
- Deviation settlement mechanism (DSM).

Table 1: Volume of Short-Term Transactions of Electricity Relative To Total Electricity Generation, 2009-10 to 2019-20

Year	Volume of Short-term Transactions of Electricity (BU)	Total Electricity Generation (BU)	Volume of Short-term Transactions of Electricity as % of Total Electricity Generation
2009-10	65.9	768.43	9%
2010-11	81.56	811.14	10%
2011-12	94.51	876.89	11%
2012-13	98.94	912.06	11%
2013-14	104.64	967.15	11%
2014-15	98.99	1048.67	9%
2015-16	115.23	1107.82	10%
2016-17	119.23	1157.94	10%
2017-18	127.62	1202.97	11%
2018-19	145.2	1245.32	12%
2019-20	137.16	1248.17	11%

Source: CERC Annual Report on Short-term Power Market 2018-19, CERC Monthly Market Monitoring Reports 2019-20

The volume of electricity transacted in the short-term market has increased at a Compound Annual Growth Rate (CAGR) of 8% during fiscal year (FY) 2009/10 to FY2019/20. The volume of short-term transactions of electricity as a percentage of total electricity generation is averaging around 10.4% and has increased at a CAGR of 2.5% during the same period.

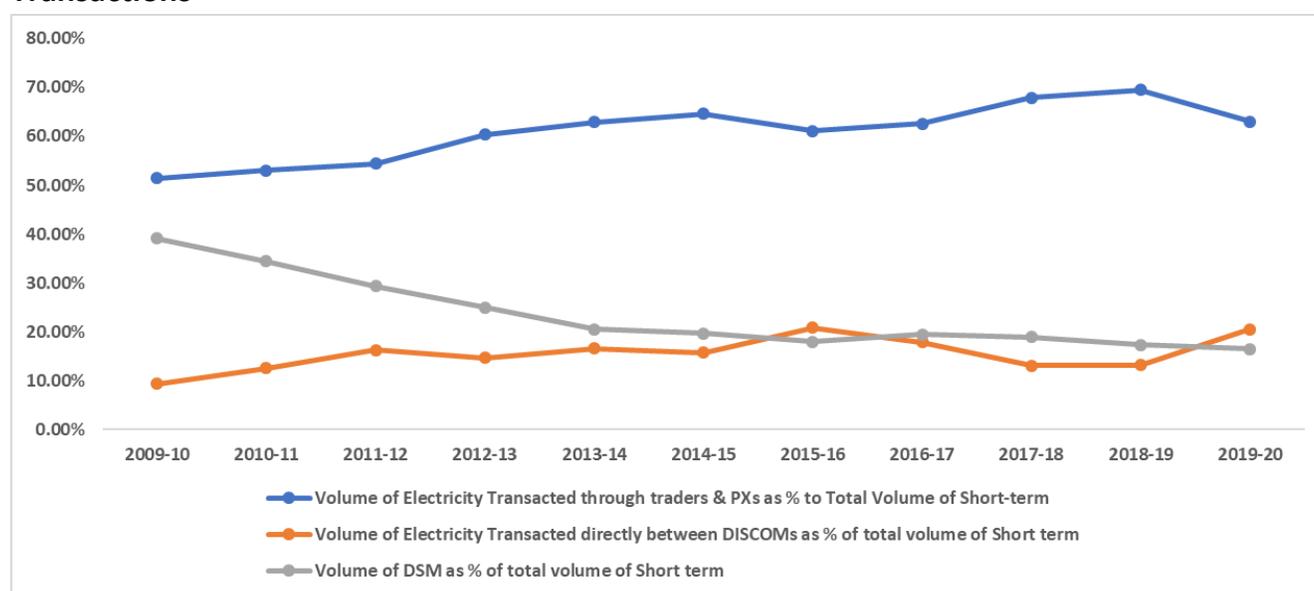
An analysis of bifurcation of short-term transactions reveals that the volume of electricity transacted through traders and power exchanges as a percentage of the total volume of short-term transactions increased from 51% to 63%. The volume of electricity transacted directly between discoms as a percentage of the total volume of short-term transactions increased from 9% to 20% during FY2009/10 to FY2019/20. On the other hand, the volume of DSM as a percentage of the total volume of short-term transactions declined from 39% to 16% during the same period.

Table 2: Electricity Transacted Through Traders, Power Exchanges and DSM as a Percentage of Total Short-Term Transactions

Year	Volume of Electricity Transacted through Traders & Power Exchanges (BUs)	Volume of Electricity Transacted directly between DISCOMs (BUs)	Volume of Electricity Transacted through DSM (BU)	Total Short-term Transactions of Electricity (BU)	Volume of Electricity Transacted through traders & PXs as % to Total Volume of Short-term	Volume of Electricity Transacted directly between DISCOMs as % of total volume of Short term	Volume of DSM as % of total volume of Short term
2009-10	33.91	6.19	25.81	65.9	51.46%	9.39%	39.17%
2010-11	43.22	10.25	28.08	81.56	52.99%	12.57%	34.43%
2011-12	51.38	15.37	27.76	94.51	54.36%	16.26%	29.37%
2012-13	59.66	14.52	24.76	98.94	60.30%	14.68%	25.03%
2013-14	65.78	17.38	21.47	104.64	62.86%	16.61%	20.52%
2014-15	63.96	15.58	19.45	98.99	64.61%	15.74%	19.65%
2015-16	70.43	24.04	20.75	115.23	61.12%	20.86%	18.01%
2016-17	74.63	21.38	23.22	119.23	62.59%	17.93%	19.47%
2017-18	86.64	16.77	24.21	127.62	67.89%	13.14%	18.97%
2018-19	100.84	19.23	25.13	145.2	69.45%	13.24%	17.31%
2019-20	86.40	28.17	22.59	137.16	62.99%	20.54%	16.47%

Source: CERC Annual Report on Short-term Power Market 2018-19, CERC Monthly Market Monitoring Reports 2019-20

Figure 3: Electricity Transacted Through Traders and Power Exchanges, Directly Between Discoms and DSM as a Percentage of Total Short-Term Transactions



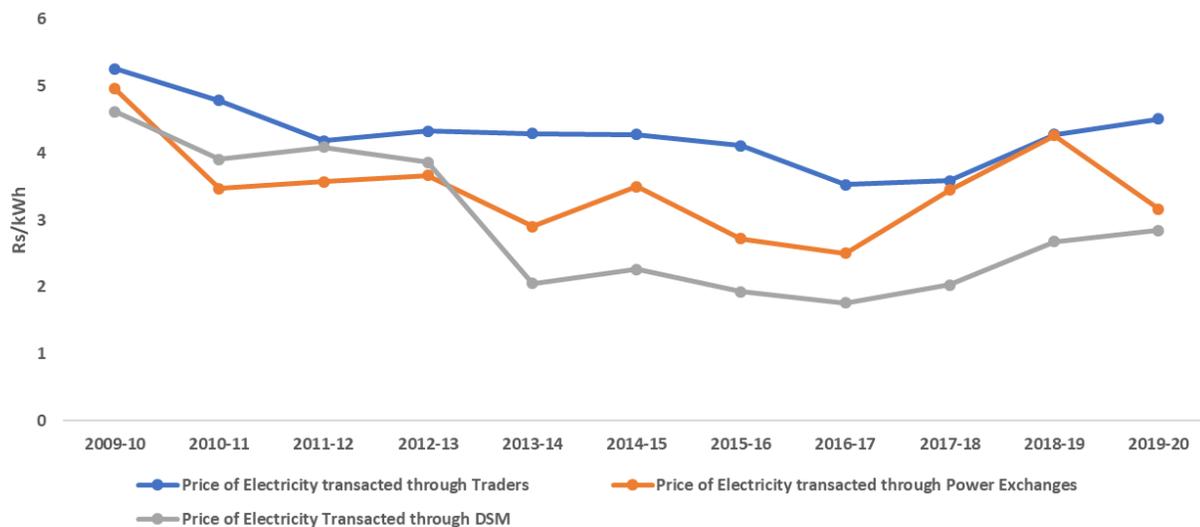
Source: CERC Annual Report on Short-term Power Market 2018-19, CERC Monthly Market Monitoring Reports 2019-20

The share of electricity transactions in the DSM market is declining, especially after the July 2012 power blackout which was due to overdrawing by a few states, to the extent of compromising the system. The regulator tightened the norms for utilities and power generators to trade electricity under such a mechanism and use it for last-minute balancing rather than as a platform for trading of power.

The addition of huge capacity has led to an increase in supply of electricity. This has, in turn, led to an increase in volume of various products in the short-term market and a declining trend in prices to FY2016/17.

However, in FY2017/18 prices started rising again owing to an increase in peak demand along with lower generation.³ Further, thermal generators faced coal shortages, which led to an increase in e-auction rates. There was an increase in imported coal prices too,⁴ thereby leading to a rise in the market clearing price in the short-term market.

Figure 4: Price of Electricity Transacted Through Traders, Power Exchanges and DSM



	Traders	Power Exchanges	DSM
Min	3.53	2.5	1.76
Max	5.26	4.96	4.62
Average	4.29	3.47	2.91

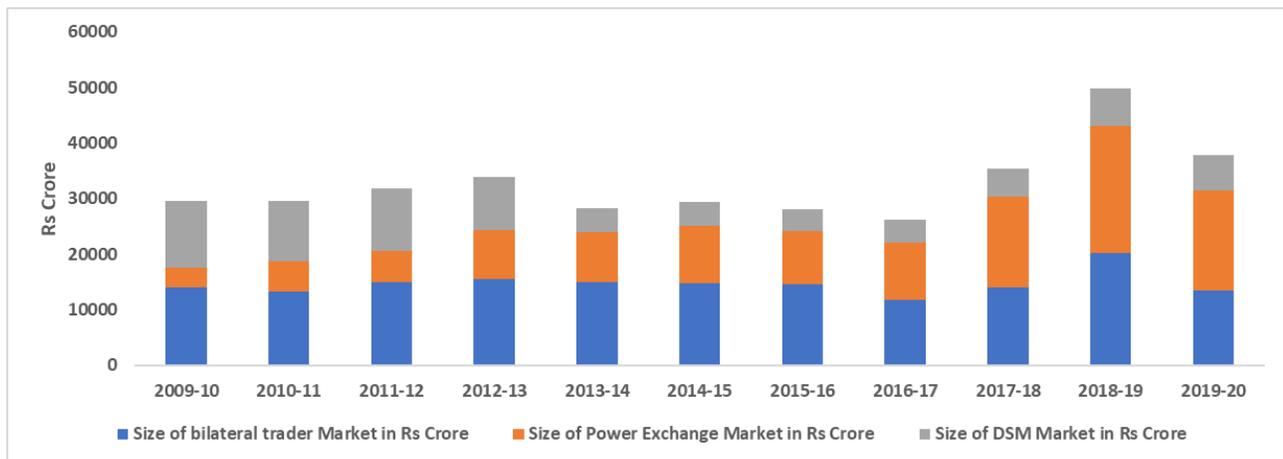
Source: CERC Annual Report on Short-Term Power Market 2018-19, CERC Monthly Market Monitoring Reports 2019/20

The size of the bilateral, power exchange and DSM market increased from Rs29,542 crore (US\$4.1bn) in FY2009/10 to Rs37,809 crore (US\$5.2bn) in FY2019/20, increasing at a CAGR of 2.5%. Variation in volume and price affected the size of bilateral, power exchange and DSM market.

³ Indian Infrastructure. Trading Trends. October 2018.

⁴ Business Standard. Power Demand Drives 19% Volume Growth at Indian Energy Exchange. 26 November, 2018.

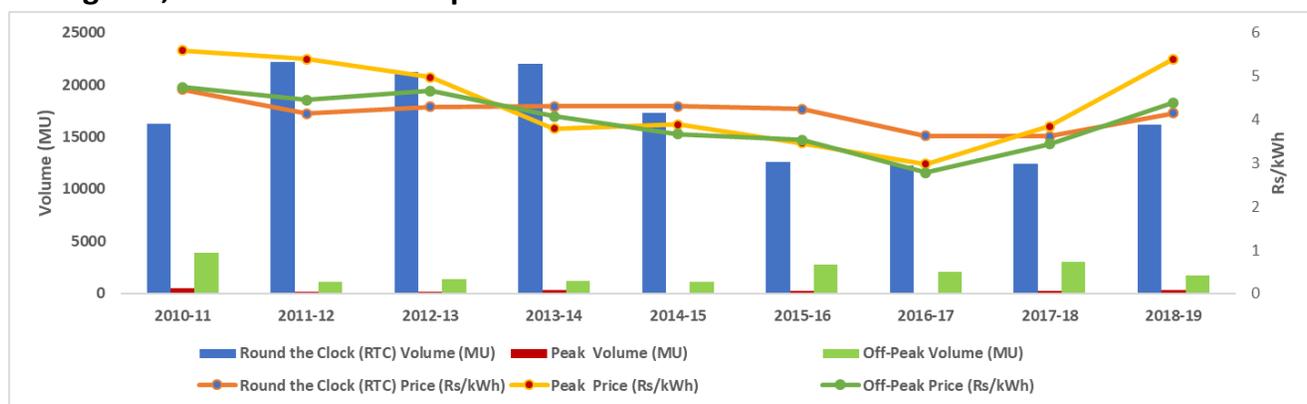
Figure 5: Size of Short-Term Power Market



Source: CERC Annual Report on Short-Term Power Market 2018-19, CERC Monthly Market Monitoring Reports 2019-20

The trends in the price of electricity transacted by traders during round-the-clock (RTC), peak and off-peak periods are shown in Figure 6 below. The price of electricity during peak periods was higher than the price during RTC and off-peak periods. During FY2013/14 to FY2016/17, peak prices were lower than RTC, making RTC products more attractive than those supplying power during peak hours.

Figure 6: Volume and Price of Electricity Transacted Through Traders during RTC, Peak and Off-Peak period



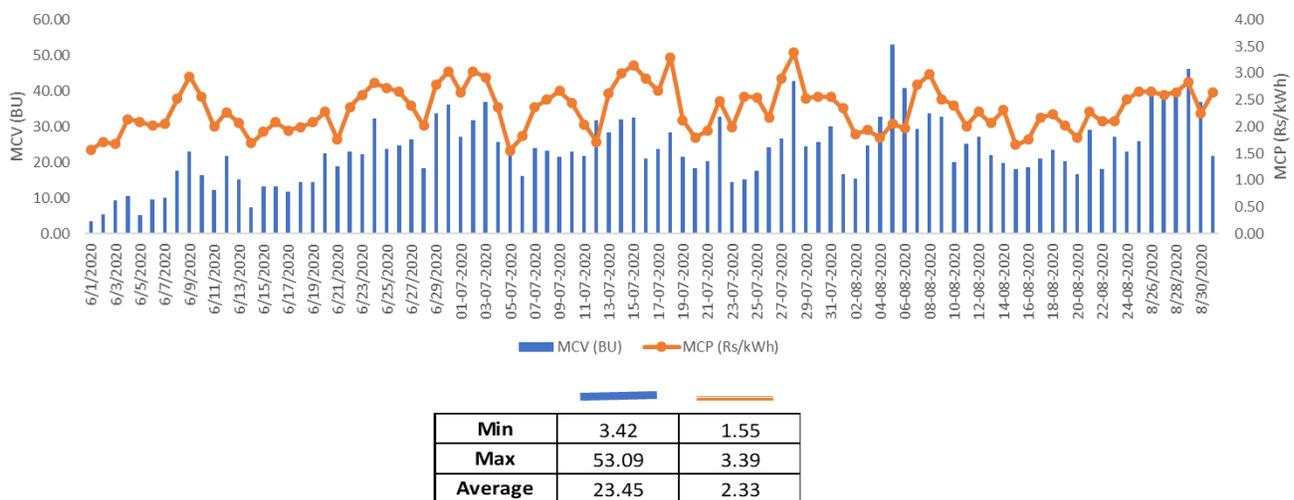
Source: CERC Annual Report on Short-term Power Market 2018-19, CERC Monthly Market Monitoring Reports 2019-20

New Products in the Short-Term Market

In June 2020, Indian Energy Exchange launched another product on its platform: the real-time electricity market (RTM). The RTM enables consumers, including discoms and captive users, to buy power on exchanges just an hour before delivery.⁵

Data reveals that volume in the RTM is picking up from 3.42BUs on 1 June 2020 to as high as 53BUs on 5 August 2020. The price ranges from Rs1.55/kWh to Rs3.39/kWh.

Figure 7: Volume and Prices in RTM



Source: IEX Market Snapshot

Note: MCV stands for Market Clearing Volume; MCP for Market Clearing Price

The participation of renewable energy (RE) in the short-term market has been limited (less than 1%). However, the introduction of the RTM has benefited renewable energy generators, by allowing them to sell their unanticipated surpluses and earn additional revenues.

Further, on 21 August 2020 a new product – the Green Term-Ahead Market (GTAM) – launched and power exchanges commenced trading. The introduction of green markets on the exchange platform is a significant milestone which will enable consumers to make a sustainable choice, help government to achieve its renewable energy goal and enable integration of renewable energy in the most flexible and efficient way.

The energy markets are deepening with the introduction of competitive pricing-based market products. With better forecasting techniques, more players will trade renewable energy in this market. And given its falling cost, renewable energy will compete with conventional sources of electricity generation. This will help to build a sustainable and profitable economy.

⁵ ET EnergyWorld. [Indian Energy Exchange Launches Real-Time Electricity Market](#). 1 June, 2020.

Another milestone was achieved when government allowed electricity to be traded as other commodities with forward contracts and derivatives on exchanges.⁶ Delivery-based long-term contracts are likely to be traded on power exchanges under CERC's jurisdiction, and the derivative contracts are likely to be traded on commodity exchanges under Securities and Exchange Board of India (SEBI). This will pave the way for the introduction of long duration, delivery-based contracts on the power exchanges and allow discoms to lower their power purchase costs and hedge their risk.

Next Steps

The true potential of the short-term power markets in India has yet to be fully exploited. The volume of short-term transactions of electricity as a percentage of total electricity generation is still hovering around 10%. With the increasing complexity of global electricity markets and the progressive moves towards a smart national grid, credible, liquid time-of-day price discovery is likely to be an important enabling development.

The true potential of the short-term power market has yet to be fully exploited.

The discoms have entered into costly long-term PPAs not only to meet their base load power requirement but also peak demand, while there is cheap electricity available in the power market. The discoms are burdened with huge financial losses as they have to pay the capacity charge for the volume, even off-peak and even if the power is not despatched and consumed during those hours.

IEEFA notes that the Indian electricity sector needs system-wide reform to improve the financial health of the distribution utilities. This will enable them to transition to the real-time market to meet energy demand, particularly peaking power to balance very low-cost but intermittent renewable energy. Discoms will require cash flow support to be able to participate in the markets. Hence, government, via Power Finance Corporation, might consider providing working capital loans to enable discoms to participate.

Discoms need to further improve internal capability and deploy analytical tools for projection and forecasting to take advantage of market developments and innovations such as RTM. Further, there is a need for capacity building to enable the discoms to use such analytical tools for portfolio optimisation and to accelerate the lowering of aggregate power purchase costs.

The CERC has been instrumental in supporting the short-term power market by coming up with policy guidelines and regulations that have led to introduction of new products and availability of open access for trading of power etc.

⁶ ET Energyworld. [Govt Allows Electricity Derivatives, Forward Contracts](#). 15 July, 2020.

The introduction of new products like RTM and GTAM have facilitated better integration of renewable energy and sale of surplus power by RE generators.

However, there is a need to deepen the short-term market by increasing liquidity and efficiency. IEEFA notes that the short-term market can drive the overall system costs down by increasing competition and transparency.

Move To a National Pool Real-Time Market

India's electricity market should gradually move to a national pool real-time market and optimise generation nationally. This would allow optimisation of the huge investment in the national generation fleet and drive the average cost of supply down, forcing the least efficient and most outdated facilities to close and reducing the overcapacity clearly evident in the thermal power sector.

Competition based on short-run marginal costs will result in use of the cheapest electricity possible. As renewable energy has zero marginal cost, this would ensure despatch and use of renewable energy at the maximum.

The launch of a RTM and forward and derivative contracts trading platforms for electricity transactions are a step in the right direction. The CERC introduced the concept of Market Coupling Operator (MCO) in its draft Power Market Regulations, 2020. The MCO can play the role of aggregator and price discovery at the national level, thereby optimising the generation.

Move To Real-Time Electricity Pricing for Large Consumers

The market can benefit by enabling large consumers (monthly consumption greater than 1 MWh) to participate in the real-time market and the development of grid-connected behind-the-meter solar and storage in the commercial and industrial sectors. The right price signals will incentivise them to alter their demand and encourage energy efficiency and conservation, optimising capital investment across the national grid. Further, it will allow consumers to benefit from the smart meter rollout and shift their consumption from peak to off-peak periods and utilise low cost renewable energy when it is available. This will help ease the burden of supply of costly power by discoms during peak periods.

Implement Financial Transmission Rights

The short-term market thrives on the residual transmission capability that is left over after being allocated to long- and medium-term electricity markets. Within the short-term market, transmission capacity is allocated to bilateral contracts and then remaining capacity is available for power trade at the exchange. This constrains the ability of the short-term market to deliver liquidity and efficiency to the sector.

There is a need to create a market for transmission rights. Allocation of transmission capacity based on "value" that users attach to a scarce resource could be instrumental in addressing the issue of back-down of power because of the non-availability of transmission corridor. IEEFA notes that Financial Transmission Rights (FTRs) should be implemented for allocation of transmission rights between the various consumers.

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

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Vibhuti Garg is an IEEFA energy economist who undertakes research promoting sustainable development through influencing policy intervention on energy pricing, subsidy reforms and deployment of clean energy.

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