Alliance for an Energy Efficient Economy

Comments and Suggestions on

Draft Power Market Regulations 2020

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Background

On 18th of July 2020, the Central Electricity Regulation Commission invited comments on the Draft Central Electricity Regulatory Commission (Power Market) Regulations, 2020. The proposed regulation will supersede the existing Central Electricity Regulatory Commission (Power Market) Regulations, 2010, and its subsequent amendments in 2014 and 2019. The proposed regulatory changes in the draft regulations arise from increasing flexibility needs of the electricity grid due to the increasing penetration of renewable energy.

The high penetration of renewable energy has resulted in a fundamental change in managing the electricity grid. The Electric power system is identified with the characteristic of supply-demand balance in balance in real time. Demand levels also can change quite rapidly and unexpectedly, and resulting mismatches in supply and demand can threaten the integrity of the grid. Typically supply side is scheduled to meet the changing demand. However, with the addition of variable generation from renewable energy in the grid, there is a paradigm shift in the grid operation. To enable a high amount of variable generation, the erstwhile power generators who were inflexible are forced to prioritise and value flexibility.

India's power sector is characterised by long term power procurement contracts between generators which offered very less flexibility. The long-term contracts, constituting 90% of share of power procurement portfolio of the electricity distribution companies (DISCOMs) are entered through Power Purchase Agreements (PPAs) for a duration up to 25 years. Currently, the country is transitioning into short-term contracts, and real time market providing much needed flexibility. Recently, the government has permitted trading of derivatives in the power market, allowing futures contracts and the ability to use it as a new hedging tool to mitigate price volatility and risks.

As the greening of electricity generation is a global phenomenon, the need of flexibility is a hot topic of discussion among policymakers and regulators. The global consensus is that as the power sector is transitioning away from the traditional technology-specific contracting approaches towards a market mechanism, assuring resource-neutrality is quintessential to support decarbonisation. There is a space to adopt an innovative market design that would allow all resources not constrained by technology to participate and ultimately to ensure the delivery of cleaner energy at lower prices. Energy efficiency is one of the cheapest resources that is available to the policymakers.

Expanding the role of Energy Efficiency in Managing Demand Flexibly

The involvement of energy efficiency in the current market mechanism in India is limited to trading of energy savings certificates in the exchange under the ambit of the Performance Achieve and Trade Scheme. Though Energy Efficiency is not formally acknowledged as a resource in India, the Indian Power sector has tapped into energy efficiency for several decades and many developed countries have recognised energy efficiency (negawatts) as a resource to both green the grid and introduce greater flexibility on par with storage. The benefits of energy efficiency measures are also well documented, leading to savings in energy demand and avoiding emissions. The power sector is in a period of fundamental change with decarbonisation, and this presents an opportunity to improve the market design and better incorporate energy efficiency into the market place.

In India, Demand Side Management (DSM) is the umbrella term covering of initiatives undertaken to bring about a desired change in consumer demand and/or demand profile maintaining. This includes both energy efficiency and Demand Response (DR) measures that can support load shifting, peak clipping, valley filling and strategic conservation programs. The current definition is such that even enhancing the service provided to the consumer in terms of quality, reliability and cost of service is also a DSM activity. In the changing world with the increased deployment of renewables, and widespread adoption of smart technologies, the role of DSM has expanded. Future DSM (DSM 2.0) opportunities will include utilizing new, integrated technologies to optimize the grid planning and operation time while keeping costs low for customers.

The fundamental difference between the benefits offered by traditional DSM and DSM 2.0 is based on the increasing need of flexibility in the grid. Traditional DSM activities in India focused on energy savings through more efficient equipment or achieving load reduction during peak demand. In DSM 2.0 the design needs to be such that with supporting technologies programs are designed to add value to the grid. This would include proactively shifting load during specific times of the day, controlling customer load in targeted locations experiencing congestion, and giving the utility the flexibility to control customer load as needed. For the evolving grid to benefit from the demand side resources, the basic requirement is that DSM 2.0 is ingrained in the new electricity market design.

There are active and passive methods for demand to participate in energy markets:

- **Price-responsive load:** Customers tend to consume less energy when the price is high, but without submitting formal bids or offers in the wholesale market. This can be achieved with passive consumer participation in markets. But these responses are not visible to the grid operator, their activity can only be estimated. They cannot contribute to the flexibility needs of the grid either.
- **Dispatchable load:** Customers load can be dispatched by the system operator. They actively participate in the market and submit bids in the markets by themselves or via proxy. Customers that participate on the supply side of the market and "sell back" energy by submitting formal offers. These resources can be dispatched by the system operator to serve the energy or ancillary needs. Thus, demand side flexibility can be explored as an economical option for supporting grid operation.

The principle of allowing demand participation in the market is built around two core ideas. The first is that all carbon-free energy resources should be allowed to compete with other resources for identifying the least-cost solutions. The second is smart product design, where the marketable product is designed reflecting its capacity to complement existing products in electricity markets. The ultimate goal is to allow the market mechanism to find the most efficient and combination of technologies to meet changing system needs while decarbonizing the grid. These system needs can be catered at the most competitive rates through markets for energy, capacity, and ancillary services. Together, with empowering the consumers to participate in the supply side of market, it is possible to ensure that both system reliability and decarbonization targets are achieved at the lowest possible cost. Supply offers could be submitted by any resources that do not directly emit carbon and thus helps displace emissions, and hence DSM 2.0 fits the bill. The market would clear only the lowest-cost offers to meet system needs, and establish a competitive clearing price.

Given that the transition of the power sector is also evident in a smarter electricity distribution, there is a need to examine if the draft regulations can encourage the market participation of demand side resources. Though traditionally the electricity markets are centred on supply side reserves, with the advent of smart technology and increasing variable generation, global markets have allowed market participation of demand side resources. Demand Response (DR) in particular is an option, often

identified as the cheapest source of flexibility, to accommodate significant growth of renewables and avoid curtailment. Demand Response could single-handedly be the key to avail the best possible benefits from DSM 2.0. Market design and regulation is identified as a key barrier that is currently restricting the system operator to tap into this economical, wide spread resource.

Market Entry for Demand Response

DR has found successful implementation as a tool for peak management globally. In India also, there has been a few pilot projects focused on demand response. In its new avatar, DR needs to be tapped into as the most widely available flexibility option when compared with other options including flexible generation and storage. Incentive-based demand response can be used to optimise system operation through the provision by the demand side of reserves and balancing by allowing demand aggregators to bid negawatts into the power exchange – something that is currently not possible. If guaranteed, the network and market operators can treat demand as negative generation (negawatts), which can also bring flexibility into the grid.

Demand Response is not only about reducing energy usage. If applied correctly, DR can lead to a number of direct and indirect benefits – at consumer, discom and system level. The direct benefits include lowering of costs of electricity and improvement in system reliability. DR will result in environmental savings, including lower green-house gas emissions from the electricity sector and support higher penetration of renewable energy. The role of DR in the high renewable energy electricity system is in its synergy with the other resources, and assistance in matching demand with generation and optimising the use of the electricity system. Distributed demand participation will be important in managing overall system balance and security in the future grid. Demand can be an active participant in all end-use sectors provided that the right technology and incentives are in place. A large number of appliances, either domestic or commercial, can also be used to provide demand-side flexibility if the right infrastructure such as smart meters, sensors and controllers are in place.

Enabling DR as an entirely new category in the power market allows results in lower wholesale market prices and thereby minimising the need to use the most costly-to-run power plants. In fact, international studies have shown that the cost of meeting 1% of peak load may result in 10-20% of the total cost incurred by the system, leading to regulators and system operators to allow Demand Response into the market. This will bring the prices down for all wholesale electricity purchasers and thereby all market participants can benefit. Over the longer term, guaranteed DR can lower aggregate system capacity requirement. Apart from the energy only market DR can add value to capacity, balancing and ancillary services market. The first step to this is adding a definition of DR, thereby removing the first hurdle for market entry. Demand response, defined broadly should refer to active participation by customers in electricity markets, responding to prices as they change over time.

Definition of Demand Response

"*Changes in electric usage by demand-side resources from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized"*

As early as 2000s, DR based programs are allowed participation in International Energy Markets. DR programs are used to reduce load during shortages or high energy prices in Texas, New England, Singapore, Alberta and Ontario markets. California Public Utilities Commission (CPUC) piloted Demand Response Auction Mechanism (DRAM) in 2015-2019. International markets have enabled

utilisation of demand side flexibility in their energy markets, as the share of renewable generation is increasing. Texas, Singapore, Alberta and Ontario have allowed DR participation in the ancillary services market as well. The New York Independent System Operator (NYISO) has a Day Ahead DR Programme. In the Australian New Energy Market DR participation is allowed in energy, ancillary and capacity markets.

Ontario has seen considerable discussion on ensuring greater participation incentives to demand response in the energy market. The market operated by Independent Energy System Operator (IESO), in Ontario is an ideal case study to examine market participation of DR. Dispatchable loads, which submit bids into the energy market, have been active in the IESO wholesale market since 2002. DR resources were also enabled through various programs administered by the IESO. In 2013, the IESO started demand response programs with the goal of integrating existing contracts into a market-based Demand Response Auction (DRA). The DRA has been the sole means of managing demand response contracts in the IESO service area since 2018. The DRA is an annual process in which participants compete for demand response capacity obligations for delivery in two seasonal commitment periods. Participants who clear the auction receive payments for making capacity available in the energy market either as a Dispatchable Load or as an Hourly Demand Response resource. However, there is no singular approach for compensation of participants. There are multiple methods in practice, including avoided cost (Alberta), Locational Marginal Prices (U.S), value sharing (Singapore), and purchase and buyback (Australia).

Demand response participation creates savings due to deferrals of otherwise necessary capacity, transmission, and distribution investments. It is true that maximum DR participation is experienced in capacity markets and globally, demand response resources there earn the vast majority of their revenues from capacity. However, there are added benefits for the energy market and ancillary services markets with dispatchability. If capacity providers agree to be dispatchable, they improve the reliability at the lowest cost. In jurisdictions without capacity markets, DR provides ancillary services and emergency reserves. Capacity markets and flexibility markets are more suited for DR aggregation, as highlighted in Table 1.

Table 1: Benefits from DR in Market (adapted from European Commission's study on Demand Response)

Market Segment	**Energy**	**Capacity**	**Balancing**
Benefit	Economic and efficient dispatch	Long term system adequacy	Short term system adequacy
Role of demand response	Bids to reduce demand, which in simple terms can reduce wholesale spot prices	Longer term offering of capacity	Short term offering of reserve capacity and balancing energy from fast response demand units
Potential of DR	Low to medium	Medium to high	High
Market instruments	Forward, day ahead, intra-day markets	Capacity markets	Day ahead, intra-day markets, balancing markets, ancillary services

DR can participate in capacity, energy and ancillary service markets in the supply or demand side. In energy and ancillary markets, DR can also act as an emergency resource mechanism or a balancing mechanism. In India, currently, the real time energy market mechanism has been introduced as a mechanism to handle the intra-day changes in demand, and a guaranteed DR can easily fit the bill. If

DR participates on the supply side, it enables the system operators to "dispatch" load reductions or increases when supplies are limited or in excess. Traditionally DR was only a reserve for load reduction, however, with increasing penetration of renewables, load increases can avoid curtailment of renewables in times of excess generation. As demand resources are treated and paid as supply, a flourishing industry of specialized third parties called demand aggregators who act as proxies for consumers.

Demand Aggregation

India is recently taken progressive strides in the introduction of real time markets to manage real time energy imbalances. In terms of the service it provides to the system, with the help of technological advances, DR can also substitute for services which are traditionally provided by power generation plants and compete with storage technologies. Fast Acting DR can assist in correcting short term imbalances during emergency effectively and economically, and it is a right fit with the requirements of the newly introduced real time market.

Definition of demand aggregator

"Demand Aggregators are agents working on their behalf of consumers, and participate and provide demand side resources on the energy, balancing, ancillary and/or capacity markets."

A demand aggregator is a grouping of consumers in the power system to act as a single entity when engaging in power system markets or selling services to the operator. A demand aggregator helps in better integration of renewable energy resources by providing demand-side flexibility services to the grid. Demand-side flexibility is provided by aggregating demand-response resources or energy storage units to act to grid requirements. The benefits that an aggregator can provide include:

- **Load shifting:** Aggregators can enable real time shifting of commercial and industrial loads to provide demand-side management services to grid operators. This makes a business case for deferred investments in distribution and transmission grid infrastructure.
- **Balancing services:** Aggregators provide a range of ancillary services and thereby increase the system's flexibility to integrate more renewable resources. Aggregators can mitigate the "ramps" caused by solar going down in the evening and handle supply intermittency and variations. Both distribution and transmission grid operators benefit from valuable reserves.
- **Local flexibility:** Aggregators can provide flexibility at the distribution system operator level, if there is a regional markets for flexibility in place.

The role of aggregators can be vital to enable demand-side flexibility, especially from the residential sector since residential customers are typically small actors whose priority is to have a reliable and cheap service with the least possible effort. Aggregators would allow the participation of these customers in different services with no need for the consumer to monitor markets continuously. The regulatory framework should enable aggregators to participate in the wholesale electricity market and also in the ancillary services market.

For example, CPower is an example of a demand response aggregator in the US market that serves commercial and industrial consumers, so that they can provide demand-side flexibility to the grid by reducing demand. This aggregator thus acts as an intermediary between the consumer and the grid. When the grid is stressed, the aggregator sends a notification to shed load and the consumer gets paid

for the total energy that was not used. Additionally, CPower operates energy management software that allows the consumer to bid in the day-ahead and real-time markets.

In the United Kingdom (UK), Flexitricity is a demand response aggregator that serves industrial and commercial customers. This aggregator monitors electricity markets and consumer sites' capabilities continuously and seeks the most profitable revenue opportunities. It allows customers to participate in frequency response services, distribution management services and capacity markets.

The draft regulations define capacity contracts and ancillary contracts, and state that the regulations apply to any other contracts including the capacity and ancillary contracts. An important benefit of DR is therefore avoidance of capacity investment in peaking generation units. Demand response also provides short-term reliability benefits and help assist in local capacity constraints. Demand response offers a variety of financial benefits for electricity customers as well as system operators. To avail the value proposition from DR, and allow participation of small consumers aggregation of demand is essential. Power market is a conducive place for demand aggregation for DR, as by nature of design, Trader members also perform aggregation. It becomes vital to clarify the role of demand aggregators, and minimise the barriers for participation of smaller consumers.

The new draft regulation is introduced for power market, and this is a progressive step which will overhaul the complete power market in India. A new entity called market coupling operator has been introduced from all the power exchanges and matching them to discover a uniform market clearing price. Market coupling is a provision which is prevalent in European Energy Markets which ensures optimal utilisation of transmission corridors and surplus capacity. This regulation also defines grid connected entities as participants of the market, but to allow participation of smaller consumers in the market, and to derive value from the grid enabling aggregation and DR is essential. With small steps energy efficiency can be effectively utilised as a resource in the market.

The question of the hour then is, is the rime tight for India to tap into its demand side resources? Given the proliferation of advanced metering and communication in the grid, isn't it a 'leapfrog' opportunity to embrace DSM 2.0? In the background of the significance and the urgency for regulatory reforms to facilitate the decarbonisation of grid, can demand response be acknowledged as a market participant? The first step to pave a pathway to recognising into energy efficiency as a resource and enable participation of demand side resources in the energy market is to ask the right questions.

- What is the value proposition from Demand Response for flexibility in India?
- What amendment of regulatory structures is needed to facilitate Demand Response?
- What should be the regulatory definition of Demand Response?
- How can Demand Response be integrated into the market design to avail benefits?
- How can "EE as a Resource Provider" fit into the Market Participant definition?
- How can "Guaranteed DR reductions" be a part of Day Ahead Contract or Intraday contract?
- What are the barriers for demand side participation on the markets?
- What is the role of aggregators and how can aggregators function in the market?
- How should DR service providers be compensated ?
- How would the scheduling and delivery of DR will be done?