

Localised Solutions

Developing power exchanges suited to the Indian market

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During the early days of globalisation, major global corporations believed that the road to growth and higher profitability lay in tapping new markets with the same products and services that had been perfected in the developed markets. From car manufacturers to pizza delivery chains, most entities tried to centralise their design, development and production process and use economies of scale to increase profitability.

However, these companies soon realised the futility of trying to adopt a "one size fits all" solution. Today, we can see the results: a large burger chain makes burgers especially for India; cars are being designed and developed specifically for Indian roads, conditions and customer tastes; sachets of shampoo are sold even in remote Indian villages; and major multinational banks are creating local solutions. Thus, the focus is on "glocalisation", that is, thinking global and acting local. Power Exchange India Limited (PXIL) believes that a similar approach needs to be adopted while evolving solutions (products as well as services) for the Indian power market.

By establishing power exchanges, regulators and policy makers in India have taken an important step towards the development of a competitive market. Power exchanges bring in transparency in power trading by eliminating information asymmetry and provide a free, fair and transparent market where a large number of participants can interact through appropriate products and services, at prices determined by both long-term and short-term demand-supply considerations.

Power exchanges in India currently provide a day-ahead product, and are on the threshold of providing longer-tenure products. For the products to have the desired impact on the shaping of the power market, it is essential that they are evolved keeping in mind factors like the needs of the participants, the level of their understanding, the level of development of the Indian power market, demography, distribution of resources, local market regulations, etc.

How is the Indian power market different?

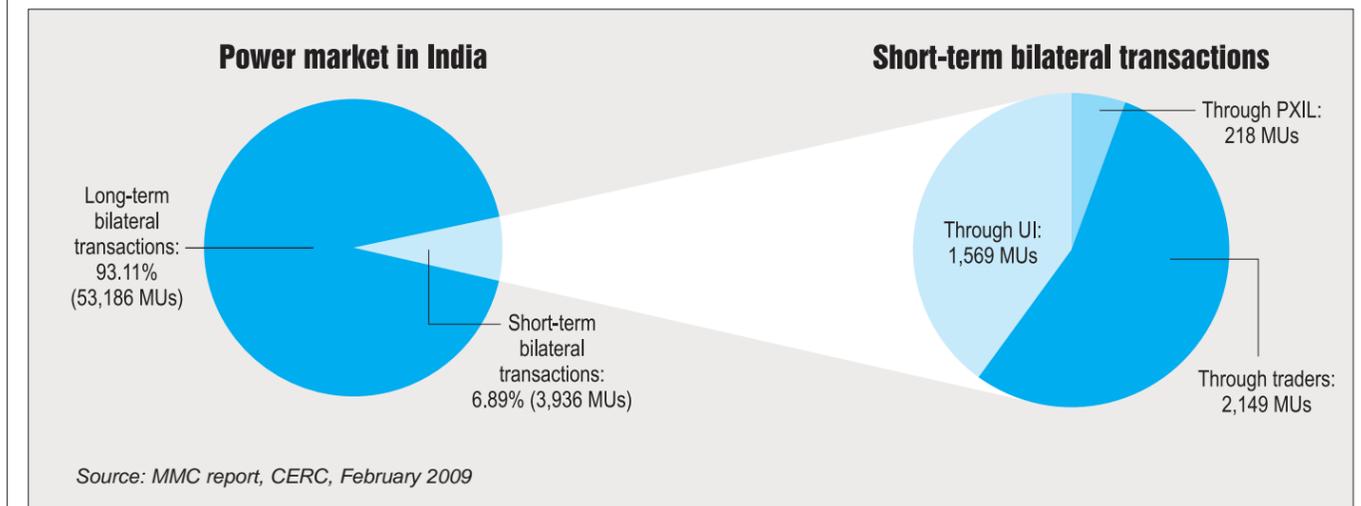
The electricity value chain of generation-transmission-distribution-system operators-consumers-regulators is the

same across the world. However, the course of development adopted by individual markets is significantly different in terms of the policy and regulatory environment, transmission pricing, loss allocation methods, generation cost recovery principles, and the generation mix itself. In addition, power remains an extremely politically sensitive commodity in most countries, a fact that can place its own pressures on the course and nature of market development.

The Indian power markets differ significantly from the fully developed markets in the following ways:

Absence of a multi buyer-multi seller model

Two key provisions introduced by the Electricity Act, 2003 – the multi buyer-multi seller model as well as open access – are yet to be realised in a meaningful way. The act had prescribed compulsory unbundling of the state electricity boards (SEBs) as the stepping stone to creating a multi buyer-multi seller electricity market. However, six years after the act came into force, all utilities have not unbundled. Moreover, the ones that have unbundled continue to carry out their power procurement functions in a



unified way, thus compelling the sellers in their control areas to sell electricity to the state power procurement centres.

Similarly, it was hoped that with the advent of open access, a multitude of buyers and sellers would enter the market to procure power or sell surpluses. However, with open access being denied in most states, the participants in power exchanges are limited to a handful of utilities or a few captive generators which have managed to obtain open access. On the buyers' side, open access consumers are completely absent from the exchanges as of now. Compared to the paltry 20-odd serious players on the Indian exchanges, most developed markets in Europe have a large number of participants, with some of the successful ones having more than 100-200 participants in day-ahead trading.

Structure of the sector Policy and regulation

In most countries that have successful power exchanges, the electricity sector is under the purview of a single central government. However, in India, power is in the concurrent list and both central and state governments can make regulations on the subject. Accordingly, the Electricity Act, 2003 recognises both central and state governments as the "appropriate government" in their respective areas of responsibilities.

Moreover, the act defines the roles and

responsibilities of the Central Electricity Regulatory Commission (CERC) and the state electricity regulatory commissions (SERCs) as the "appropriate commission" in their respective areas. Historically too, the power sector in India has been divided into independent control areas managed by specific state utilities.

On the other hand, power exchanges were successfully introduced in European markets where homogenous, single control areas were under a single system operator. Even in the case of the Nord Pool power exchange, the exchange-driven market was first developed just in Norway and, over time, coupled one by one with the other Nordic countries. The product design principles could therefore presume universal access to markets for all participants, unlike the Indian markets where the lack of open access has to be taken into account while designing the contract structure.

There is an increasing focus on glocalisation, or thinking global, acting local. A similar approach needs to be adopted while evolving solutions for the Indian power market.

The structure of the market in India, together with the governing legislation and regulations, poses peculiar problems in creating and designing products for a national electricity market.

Transmission-related issues

Single versus multiple control areas

The Nordic markets developed as single, unconstrained control areas in the initial years, with transmission systems following point-of-connection tariffs with losses socialised on a MW usage basis all over the system. The markets in the different countries were coupled in a phased manner over a few years to form the larger Nordic market. Indian power exchanges, in contrast, operate across a number of control areas, as a result of which there can be multiple transmission constraints on a single contract.

Pricing and loss allocation mechanisms

In contrast to the point-of-connection tariff in most homogenous markets in Europe, the transmission pricing system in India varies across different market segments. The "contract path" method is used in the short-term bilateral market and the "postage stamp" method used for longer term transactions. However, since both these methods are not conducive to creating a national market via a power exchange, a form of the point-of-connection tariff on a MW usage basis was conceptualised while introducing exchange-traded collective transactions. This method could be adopted and sus-

tained as the day-ahead market (DAM) was not expected to assume significant volumes under the current market conditions and have a major impact on the transmission pricing system as a whole.

Expectedly, when it came to products with longer tenures, the exchanges needed to comply strictly with the current short-term open access regime. This, in effect, means that exchange-discovered short-term transactions, comprising week-ahead, month-ahead and three month-ahead contracts, need to conclude point-to-point contracts, which thereafter need to be validated by the system operator.

These two features of the Indian electricity markets place unique constraints on the principles guiding product design. Following a contract path method for pricing in the short-term market, electricity transactions once matched cannot be transferred or sold to any other entity, and need to be performed specifically by the parties to the contract, unless mutually cancelled. This is also necessitated by the fact that multiple transmission constraints can occur on a single contract.

This suggests that in order to be successful in India, power exchanges need to discover point-to-point bilateral contracts valid across multiple control areas. This constraint generally rules out the possibility of designing and operating transferable contracts which can continuously change hands between market participants. Hence, this may lead to a loss of liquidity in the market in the short run. However, power markets in India are still at an early stage of development and, eventually, should be able to accommodate more advanced methods of trading.

Development of the power market

Level of participation

The failure to fully unbundle and the non-availability of open access limit the number of participants in the power exchanges to only a few. Most of the existing participants are government-owned utilities or their successor enti-

ties. A few power trading companies including PTC India are also active in the market. This is in sharp contrast to the developed markets which either operate as compulsory pools or have liberalised to an extent where every eligible player is active in the market.

Preparedness of the participating entities

Of the few utilities that are active on Indian exchanges, many continue to participate via traders and are thus not fully conversant with how exchanges operate. Some, though active, are yet to adapt to the electronic mode of operation and are more comfortable with physical means of communication and placing of orders.

Also, the operating staff at most utilities are still getting familiar with the products offered by the exchanges. The utilities' internal decision making and payment processes for managing power procurement are yet to be aligned with the daily payment schedules of the exchanges.

Policy and regulatory evolution

The exchanges currently operate on the basis of specific operating orders; broader market-defining regulations delineating the role of each participant in the power market value chain are yet to be developed. Further, power trading as an activity is relatively new and the country is yet to fully develop a regulatory framework for it. There are a number of issues which have already emerged in this area, such as the level of trading margins, capital requirements, norms for cross-border trade, etc. These issues are at various stages of resolution.

Indian power markets are different from other power markets. In India, product design, auction methodologies as well as the pace of phasing in products should be tailored to the policy and regulatory structure.

The exchanges and regulators need to work together to gradually introduce a bouquet of products which is in line with the expectations and capabilities of the eligible participants. Most regulators initially allow the introduction of existing bilateral products in exchanges. Once these products are stabilised, they gradually allow for product innovations to bring in the required efficiency and vibrancy in the markets. Regulators in power markets also routinely consider the nature of auction methodologies which the exchange can adopt.

Low level of liquidity in a deficit market

The electricity market in India, being in the early stages of liberalisation, has very low volumes of freely tradable power which can flow to the exchanges. Moreover, the market is not only deficit at the moment, it is projected to be so for many years.

Liquidity

The Indian power market has had all generation capacity tied up with long-term power purchase agreements (PPAs), with little or no surpluses available for trading. While PPAs are still used even in the advanced markets, project developers usually seek to tie up long-term contracts only to the extent of the debt service coverage required by the lenders. This makes a relatively large share of generation available for short-term trading. In addition, PPAs can be freely down-sold by consumers, who are also large participants in the exchange markets.

Deficit market

In sharp contrast to the Nordic and other developed markets, the Indian power markets are in a continuous state of deficit. In the developed markets, with sufficient generation surpluses available at various price points, the participants do not face any quantity risk and only need to manage the price risk. This has enabled the markets to be structured into a vibrant DAM where physical quantity is sold and a futures market is created where only the price risk is managed by the participants.

However, in a deficit market, the participants have to manage both price and quantity risks. It thus becomes imperative to initially introduce only long-term physical contracts which provide assurance on both the price and quantity fronts. Deficit markets would find it difficult to trade through futures contracts which can be infinitely traded, as the physical market may not be able to provide the required quantities that come up for delivery on the maturity of these contracts.

The lack of liquidity as well as continuing deficits have also set the stage for possible volatilities as well as distorted price signals in the exchanges. The regulators and exchanges should act together to develop the right kind of products as well as trading methodologies that suit the needs of the markets. Physical power markets generally use auction methods which are more suitable for trading in limited supply commodities, unlike the securities markets which are capable of using continuous trading methods.

While the lack of liquidity places a severe constraint on the functioning of the exchanges in the short run, it does, at the same time, provide a window of opportunity to develop and test product innovations in a relatively shallow and less impactful market. As a result, valuable lessons can be learnt well in time for the arrival of larger, untied capacities in the market.

Market coupling

Market coupling is an important reason for the success of the Nord Pool. Norway, Denmark, Finland and Sweden have a different resource mix for generation of electricity; for example, while Norway's power generation portfolio is dominated by hydro, in Denmark, wind accounts for a major share of generation. Both hydro and wind-based generation have seasonal natures and hence, when coupled, these countries are better able to satisfy their electricity requirements over the year. This provides a fundamental drive for seeking efficiencies in the overall

market through the power exchange.

The generation pattern in India is very different as compared to France, Denmark or Norway. Moreover, even at the policy level, the Indian market is not designed for market coupling, which seeks an overall resource balance. The exchanges thus need to operate in the absence of this underlying driver in the power market, which does, to an extent, limit their role to mere marketplaces that help create a confluence between demand and supply.

More mature markets prescribe mandatory flows to exchanges. For example, the mandatory flow of cross-border electricity through the power exchange not only provides additional liquidity to the Nord Pool, but also ensures that the exchange remains on top of the trading market value chain by facilitating all flows between different control areas. In India, however, the exchanges need to compete with traders in the short-term market.

Localised solution

Longer term products by PXIL

To sum up, the Indian electricity markets pose unique challenges in market as well as product design on the following fronts:

- The markets are deficit and have low liquidity. The products and trading methods need to keep price volatility in check and an open auction methodology is perhaps more apt in the context.
- The utilities have a low level of preparedness to operate on electronic exchanges. As a result, only very simple and familiar products with a low level of complexity must initially be introduced on Indian exchanges.
- The power procurement and payment processes of utilities are currently capable of handling only bilateral trading. The auction methodologies thus need to provide enough decision-making time to the participating utilities. This would also allow for documenting of decisions for subsequent audit scrutiny.
- Transmission pricing and loss allocation rules necessitate creation of point-to-point contracts via exchanges. These

contracts need to be specifically performed by the initial parties, thereby ruling out the possibility of employing continuous trading methodologies.

- A national market operating across India is similar to market coupling across the whole of Europe. The contract structures for the Indian markets thus need to be able to function across multiple control areas.

The Indian power markets are substantially different from power markets elsewhere in the world. PXIL believes that in India, designing of products, auction methodologies as well as the pace of phasing in products should not only be tailored to the policy and regulatory structure but should also be in line with the capability and understanding of the participants in the market.

Therefore, while PXIL decided to enter the market with a day-ahead trading product fashioned on the methodology used by the Nord Pool, for longer term products having weekly and monthly durations, it consciously moved away from the methods used at the Nord Pool or by other developed power markets. PXIL firmly believes that the Indian power markets are not ready for the level of complexity or the trading methodologies that these products employ.

PXIL has developed its trading system, matching algorithms and other related infrastructure in-house after a major local consultative process involving all stakeholders. The auction methodology offers market participants products they are familiar with, in a standardised, risk-free and exchange-led environment. The locally developed in-house proprietary software ensures that the auction and trading methodologies can be improved to match the changing commercial and regulatory requirements of the Indian power markets. While developing these systems has required tremendous research and developmental effort in the short run, it has, however, enabled PXIL to stay true to its commitment of developing a power market suitable for India. ■