ABT to deregulated power market

A White Paper

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Introduction

In one of our previous articles on ABT, we have already made a passing remark as to how ABT is expected to be the distant ancestor of a self-regulating free market power regime. In this article we will try to look a bit more closely at this anticipated evolutionary process. We will try to speculate on the landscape, milestones and possible pitfalls in this long journey of the Indian power sector. Of our three articles on ABT, this is the most speculative and subjective one and hence the most interesting one to write. For the same reason, however, we would want you to read it with a sufficient mix of caution and skepticism thrown in.

ABT (Availability Based Tariff) is a new tariff structure recommended by CERC (Central Electricity Regulatory Commission). The main objective of the recommendations is to introduce a tariff regime that will promote responsibility and accountability in power generation and consumption so that overall quality of power in India is improved. The ABT act envisages a phased implementation and the process is already underway. For information on ABT the user is referred to a quick introduction to ABT (http://www.kalkitech.com/downindex/IntroductionToABT.pdf). The complete text of the ABT act can also be had from the CERC website.

Self-regulating power market

Going by the commonly accepted definition of market, a power market would indicate an entity (or arrangement) where power generators will offer their distribution capacity or actual energy and interested consumers (such as distribution companies) would purchase them. The energy charges payable to the generators will depend on the demand-supply characteristics of the market. By the term “self-regulating” we imply that no external influence (such as directives from a regulating agency) shall be responsible for the power tariffs in the market and it will be determined purely on the demand-supply ratio. This is in contrast to the current scene in Indian (and most other) power sectors where government regulatory agencies are responsible for setting the rules of the game and the applicable tariffs. In fact, presently most of the generating companies and distribution companies are public sector units controlled by the government thereby curtailing the notion of a market system considerably.

However, the economics of a general market cannot be directly imported to the power sector due to the peculiarities of the commodity involved viz. electricity. For one, electricity cannot be stored for consumption and need to be generated synchronously with consumption and then transferred over conducting medium. This means that the production system needs to be ramped up and down closely in pursuit of the market demand. The implication is that your generation capacity needs to exceed the instantaneous maximum demand and your transmission bandwidth also needs to support the same. This “real time” nature makes demand forecasting a messy job as far electricity is concerned. For example, you may be able to predict that X tons of wheat is required for the next month based on past consumption data and other relevant information. This prediction will be more or less accurate if you have got your statistics right. But it is not possible to predict exactly how many tons of wheat will be consumed on a particular day at a particular time. And in the case of wheat, it is not necessary to do so. But in a typical power market, you are required to predict the demand for each five minute interval (at least).

Another differentiating fact for electricity is that it is not a stand alone commodity. Along with electric power other resources also need to be supplied such as reactive power, stand-by (spinning and non-spinning reserves) etc. which are commonly termed as ancillary services. In general practice terms for ancillary services are negotiated separately and in many instances actual power and ancillary services may be provided by different entities. This further complicates the process of modeling the electricity market.

A third crucial aspect is the consumer perception of electricity as a commodity. It requires extensive infrastructure to deliver electricity to a consumer. As a result, it is not possible for a consumer to choose from an array of vendors (for small-medium consumers, it is often not

possible to have a choice of vendor at all). Further electricity is considered as a near-essential commodity for all and a must-have for critical institutions such as hospital. As a result of this subjecting electricity to a complete market oriented system susceptible to uncertainties of price and availability is a concern for most societies.

Due to the points enumerated above a completely free power market is yet to take shape (or even successfully conceived). What has been implemented in several advanced economies is a restricted power market. The restriction is implemented by means of a central coordinating agency (called an Independent System Operator – ISO) who regulates the market and ensures that the social objectives are met within the parameters of the system. Thus ensuring adequate and reliable supply of electricity to all consumers, preventing undue manipulation of the market by participating entities for profiteering etc. are the objectives of this entity. To facilitate the meeting of these objectives, in many cases all the transmission facilities are managed by this coordinating entity while it owns no generation or distribution mechanism. Selling and buying of power happens through bilateral agreements (between a generator-consumer pair) as well as in a power market. In may instances, the power market is run by the ISO while it may also be run by a separate independent agency. The ISO typically operates as a no-profit organization and is run by representatives from a regulating agency. All the stakeholders (such as generators and consumers) are also allowed representation in the ISO though mostly without decision making authority and only as recommending participants.

Implications of a power market

Thus it is quite easy to see that power markets are typically “engineered” markets and not “free” markets. Why then is it necessary to have such a market? Unfortunately, there is no unambiguous answer. Given the physics of power, perhaps the ideal system is a single generation-transmission-distribution-billing-collection agency. This unification of roles enables a lot of convenience in terms of managing unit commitment, merit order dispatch, congestion management, ancillary services etc. The problem is similar to one of the most debated issues faced by society viz. what is the best form of government? At a purely conceptual level it is quite tempting to accept a benevolent dictatorship or a Platonic educated-oligarchy as the best form. Why then is democracy preferred? For the simple reason that the conceptual level seldom translates into practice. A centralized system consisting chiefly of large generating capacities is posing environmental as well as reliability issues. And a monopoly nature inherent in such a mechanism does not turn out to be fair to all participants and stakeholders. The availability and economics of such a vital commodity as power tend to be dictated by political or other nefarious considerations. And at a much more fundamental level, it is sometimes quite impossible for a central agency (especially a PSU with its inherent handicaps) to run a vast and complicated power system efficiently and transparently. Decentralization, thus, needs to be ushered in and thence the market approach.

Most power markets operate along three lines: long term (year ahead, month ahead, week ahead), mid term (day ahead, hour ahead) and short term (intra hour market). Participants in the market such as generators and distributors typically take part in all three markets to ensure purchase/ selling of their power in the most economical fashion. There is a non-profit ISO which coordinates the power system and ensures reliability by responsibly managing the transmission system. The power market may or may not be run by this ISO. Of the three, short term power market is the most significant. This because long and mid term power purchase quite often happens through bilateral agreements. In such cases the price and other terms are part of a private contract and may not be made public. Long term contracts may also be made available by the ISO in a transparent manner paving way for market dynamics. The short term arrangements are typically handled in a pure market fashion. Ancillary services are typically bought and arranged by the ISO which then charges all the participants in an equitable fashion for the same.

Power price is typically set in the market through supply side bids. This means that each power supplier (generator) will submit bids into the market indicating their prices and ramp rates. (For

example, a generator may quote Rs.1300/- per MWh at an output rate less than 200MW, Rs.1600/- per MWh when the output is between 200MW and 420MW and Rs.2500/- when the generation capacity required is between 420MW and 500MW). Such bids will reflect the operating costs for the generator associated with different units. Demand side is typically not considered in determining the price of power in most markets. Market price of power is typically considered as the price paid against the highest successful bid. How each of the suppliers are paid for power supplied varies from market to market: in some, all will be paid the same price (which would be the market clearing price denoted above). In other markets, there may exist a pay-as-bid mechanism where different suppliers may get paid differently. Sometimes the long term and mid term power prices are set against the short term (or real time power price). Ancillary services (especially spinning and non-spinning reserves) may be priced against the real time prices.

Irrespective of the pricing model, it follows that price is normally set depending on applicable regulations of the market. And such regulations invariable allow the players to exploit loopholes gain undue benefit from the market. For example, a supplier of ancillary services has a lot of incentive to “fix” the real time price since he is going to get paid on the basis of that. Again where the real-time prices are fixed based on MCP (Market Clearing Price), suppliers can manipulate availability or demand to unethically bloat the MCP (this has actually happened in several markets). Where bilateral contract prices are also dependent on the real-time price, this incentive goes up much more. In pay-as-bid systems also such manipulations are possible by participants to gain undue advantage. In fact, in any of the four common auction methods (ascending bid auction, descending bid auction, highest price sealed price auction, Vickrey auction), given the restricted nature of power market, it is possible to manipulate the auction for participants to gain undue advantage. It is the crucial responsibility of the market coordinator to fine tune the market structure to discourage users from such manipulations. How successful such an attempt is what determines how efficient and beneficial the market is. And in most cases where power markets have failed, it was caused due to some unfair conduct by the participants exploiting vagueness or loopholes in the market regulations.

There are other implications to a power market as well. Along with power, trade will be encouraged in other commodities as well. One of the important components here can be emission rights. Environmental norms are becoming more stringent every day and power generation (especially in fossil-fired power plants) is a pollution-intensive exercise. Under such international contracts as the Kyoto protocol, capacity for different emissions can be traded. For example an entity (an organization, body or even a nation) that has the rights to emit 1000 tons of NOx per year can trade part or whole of this capacity to another entity for monetary or other considerations. Such trades are already underway in European markets. Another important result of a power market is that end customer expectation regarding quality and availability will go up than when it is managed by public sector organizations. This customer expectation will also prove beneficial to the industry by compelling participants to set higher benchmarks for themselves.

Successive milestones

Energy being an essential commodity, a power market based on demand-supply dynamics will fail to take off in the absence of surplus generation capacity. So having adequate generation capacity is going to be the first step in moving towards a market regime. It may not be possible to account for this surplus capacity from large centrally operated power plants alone. Captive power plants will play a crucial role in meeting this objective. Thus the next important step is the successful integration of captive power plants to the national grid. A lot of positive measures in this direction are already provided in the Electricity Act of 2003. However the transmission infrastructure available across the country as well as with our neighbors needs to be enhanced to ensure that there are no transmission bottlenecks in this integration. Further, a market with scope for multiple generators to participate will materialize only in the presence of redundant transmission capacity.

Next step is to provide adequate economic incentives for different players to participate in power trading. Again such measures are already allowed for in the ABT and Electricity act. This includes incentives captive generators as well as removing a lot of regulatory hurdles for private and cooperative bodies in setting up power generation facilities. Once these steps are covered, we can have an atmosphere conducive for a self-regulating power market.

From here, the crucial step is setting up the market itself. As our earlier discussion indicates, there is no perfect model available to import even when we do not take into account factors unique to India. A completely successful and satisfactory power market is yet to emerge anywhere across the world. So it will more be a question of learning from other's mistakes. We will also need to adapt their good practices. The role of a central coordinating agency will be crucial in ensuring smooth operation of the market without failing any of the social and national objectives. One possibility is for the government to disinvest the generation capacity of PSUs and then for the PTC (Power Trading Corporation of India) with its Load Dispatch Centers to act as the central coordinating agency. This is however likely to raise a lot of opposition, not all of which will be invalid.

Bottlenecks

Thus after providing the conducive ambience for a power market, setting up of the actual market is going to be a major challenge. This challenge will first involve how to set the rules of the game and how to define the roles and responsibilities for the nodal coordinating agency. The onus is then on this agency to ensure the smooth operation of the market balancing the interests of different stakeholders. This agency will then also need to appropriately tone down its influence so that the market becomes more and more self-regulatory. The government (of India) will however need to divest all its generation facilities before setting up such a body to ensure that there is no conflict of interest in operating the market. If this is not done conclusively and transparently, it will act as a major deterrent for many players in entering the market. As already mentioned such a disinvestment itself is going to be a major concern with opposition to be anticipated from multiple quarters. Compared to others, divesting nuclear power plants may cause additional worries taking into account environmental as well proliferation problems.

Another problem that needs to be solved is the disparity between different types of generators that take part in the market. ABT (as the first step in this direction) itself is faced with this problem and is not able to address it completely satisfactory. For a market scenario, in the absence of external regulations such disparities can seriously hamper the success of the market since different generation facilities (like hydro, thermal, nuclear, non-polluting) will be bound by vastly different physical constraints in participating in the market. Many of the other issues enumerated by ABT (such as adequate metering infrastructure) will also manifest themselves as serious hurdles in the progress to a self-regulating market.

Conclusion

Thus we conclude that the path from ABT to a self-regulating power market is an arduous one. What is called for is a lot of perseverance and professionalism. It is quite easy to run into a crisis situation in this journey, as has quite often happened in other markets. So it is very critical for the regulatory authorities to have a clear vision of the goal and the will to see the path to its logical conclusion. If technology (say, studies on super conductivity making it possible to bring down transmission losses to negligible levels in real life situations) emerges to seriously alter the physics of power generation-transmission-distribution, such a journey will be fraught with interesting consequences.