Introduction to Availability Based Tariff

A White Paper

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Kalki Communication Technologies Private Limited
#147, 2nd Floor, 5th Main Road
Sector 7, HSR Layout
Bangalore 560034
Karnataka
INDIA

Phone: 080-5721263/4
Fax: 080-5725473
E-mail: info@kalkitech.com
Web: http://www.kalkitech.com

Introduction

Power generation and distribution in India started towards the end of the nineteenth century. However, it was only after our independence in 1947 that the power sector got the required momentum and power generation was identified as a key area for our development. With sustained efforts over the decades, the power generation scenario in India presents a rich and composite mixture of hydro, nuclear, thermal, wind and solar generation. Our installed capacity across the nation well exceeds 100,000 MW, a major share of which is derived from thermal sources (coal/lignite, gas, diesel). Though rich and diverse, the thrust on the power generation sector so far has been on capacity addition and our power sector has not really kept pace with the emerging technologies on the power management front, especially in leveraging the tremendous potential unleashed by information technology (IT). Power generation in India has been largely state owned and like so many other public enterprises donned a traditional outlook and lagged in extracting the benefits offered by digitization and automation owing mainly to a lack of economy centric approach.

How well we can manage this vast infrastructure and how close it can keep pace with our increasing energy demands will be a crucial deciding factor in achieving our dream of an annual double digit growth. And in the wake of opportunities thrown up by liberalization and deregulations, the state machinery started mooting on introducing these effects to the power sector also. ABT (Availability Based Tariff) along with the Electricity Act of 2003 is perhaps the most significant and definitive step taken in the Indian power sector so far to bring more efficiency and focus to this vital infrastructure. The fact that the ABT regime was introduced to replace the Electricity Supplies Act of 1948 would perhaps be an indicator of how overdue reforms were. This document is an attempt to introduce the significant clauses and implications of ABT in a concise manner.

Salient clauses of ABT

ABT concerns itself with the tariff structure for bulk power and is aimed at bringing about more responsibility and accountability in power generation and consumption through a scheme of incentives and disincentives. As per the notification, ABT is applicable to only central generating stations having more than one SEB/State/Union Territory as its beneficiary. Through this scheme, the CERC (Central Electricity Regulatory Commission) looks forward to improve the quality of power and curtail the following disruptive trends in power sector:

i) Unacceptably rapid and high frequency deviations (from 50 Hz) causing damage and disruption to large scale industrial consumers
ii) Frequent grid disturbances resulting in generators tripping, power outages and power grid disintegration

This objective is to be brought about by encouraging generators to produce more during peak load hours and curtail generation adequately during off-peak hours on one hand and discouraging consumers from overdrawing on the other hand. The new tariff regime aims at inducing this discipline at the generation and consumption end through adequate monetary incentives.

The most significant aspect of ABT is the splitting of the existing monolithic energy charge structure into three components viz. capacity charges (fixed), energy charges (variable) and UI (unscheduled interchange) charges. It is the last component that is expected to bring about the desired grid discipline. Splitting of the tariff into fixed and variable cost components is meant to act as an incentive for power trading which shall (ideally) conclude in a self-regulating power market regime. It is also expected to promote the concept of ELD (Economic Load Dispatch) among power generators. Let us now look at these tariff components in a bit more detail:

Capacity charges: Fixed charges are payable to the generating station, by the intended beneficiaries of the generation facility (state governments of the region in most cases). In the

present tariff regime, capacity charges are payable against the (deemed) PLF (Plant Load Factor) of the station. Full fixed charges are payable at achieving a PLF of 68.49%, and incentive is payable for each unit of electricity generated above this PLF. Under the ABT regime, fixed charges are payable against the availability[i] (declared capacity) of the generating facility. Fixed charges excluding ROE is payable on a prorated basis for 0-30% availability. Prorated ROE is payable from 30-70% availability. Incentive is payable to the generating station for availability beyond 70%. The incentive is pegged at 0.4% of equity for each percent increase in availability in the 70-85% range. Thereafter, the incentive falls to 0.3%. This decrease in incentive after 85% is aimed at discouraging the generating facility from overloading the units at the cost of maintenance and equipment life. ABT also contains provision for penalizing the generating utility for over/under declaration of the availability. Fixed charges are payable by the beneficiaries in proportion to the allocated capacity and does **not** depend on the actual consumption.

Variable charges: Under the present tariff regime, there is no bifurcation between fixed and variable charges. Both are bundled together and payable in proportion to the actual energy drawn by the consumer. As we have seen already, under ABT fixed charges vary with the allocated capacity and has nothing to do with actual energy consumed. In contrast, variable charges are to be paid against the actual energy consumed. This splitting is expected to promote power trading.

UI charges: In the present regime, there is no penalty for deviation from the generating/drawal schedule by an entity. The ABT regime stipulates that UI (Unscheduled Interchange) charges are payable under the following conditions:

a) A generator generates more/less than the schedule causing grid frequency to deviate upwards/downwards
b) A beneficiary draws more/less than the schedule causing grid frequency to deviate downwards/upwards

The penalty imposed varies with the grid condition at the time of the indiscipline and the magnitude increases with the severity of the frequency deviation caused.

Apart from this tariff structure, ABT provides for

a) Implementation in a phased manner
b) Generation and drawal schedules to be managed in 15 minute blocks (96 blocks per day)
c) Mechanism for communication and co-ordination of the schedules and how rescheduling is to be done in case of a generator/beneficiary being unable to meet the schedule
d) Role of regional load dispatch centers (RLDC) in managing and coordinating the schedule and managing the schedule in the event of grid disturbances
e) Methodology for calculating the capabilities for different types of power stations (such as hydro, thermal, nuclear) and for demonstrating the same
f) Details on metering, accounting, billing and payment of energy charges under the ABT regime
g) How disputes arising under ABT shall be resolved

Benefits professed by ABT

By ushering in the Availability Based Tariff, the CERC looks to bring forth the following positive changes in the Indian power sector:

1. Enhanced grid discipline that will pave the way for higher quality power with more reliability and availability. Grid disturbances and frequency fluctuations as occur in our power system today are serious problems and would be considered unacceptable in any advanced economy. The system of incentives and disincentives allow for penalization of the party responsible for any disruption. This will serve all participating bodies in a power grid to be self-disciplined ensuring quality power supply for all consumers.

2. A more economically viable power scenario that alleviates some of nagging problems of the power sector such as outdated technology, poor management and maintenance, cross subsidization, over staffing, poor accounting practices etc. In breaking the tariff into fixed and variable components and making the fixed charges depend on the declared availability of a plant (subject to demonstration), there is a lot of reason for generators to bring in efficiency. The current diktat at most of the public sector generating station is "to produce as much as you can". Under the influence of ABT, this will change to produce only as much is needed i.e. supply will need to closely follow the projected demand schedule. Also there is a lot of reason for the generators to usher in the latest technology to ensure that the power generation is predicable, controllable and can be monitored easily. At the consumption end also there is scope for technology investment now in terms of load forecasting and monitoring.
3. Promote competition, efficiency and economy leading to power trading which shall ultimately pave way (step-by-step) for a self-regulating power market. The variable cost component for the energy consumed is the first step for facilitating trading of power. Also, since the fixed charges are now payable based on declared availability rather than actual power consumed, there is a lot of reason for beneficiaries to trade in capacity as well. And this kind of trading will automatically induce competition and efficiency into the power scenario. In fact it is hoped that ABT will prove to be the first step for Indian power industry towards a completely market oriented regime which is self-regulating and does not need the tariffs or other parameters to be regulated externally. Adequate transmission capacity (so that there is no bottleneck in terms of purchase or delivery) is the most important infrastructure requirement to support such a market regime.
4. Introduce and encourage MOD (Merit Order Dispatch) in the Indian power scene. In the current scenario, the generators tend to produce as much as they can irrespective of the demand side of the power equation. Under ABT, generators will need to ramp up and ramp down generation based on the declared generation schedule given by the RLDC (Regional Load Dispatch Center). Thus when the plant (or a cluster of generating stations owned by a single entity) will need to use the power generation combination that will incur the least cost for all loads below the maximum load. This exactly is the formulation of the MOD, which is an optimization problem. MOD is used by modern power plants to save millions of dollars in generating cost every year. Thus introduction of MOD is expected to benefit the power industry greatly.

Concerns on ABT

While ABT is acknowledged to be a welcome measure to tackle the major problems in our power scenario and is expected to be the welcome step towards a self-regulating market, there are a lot of concerns that need to be addressed by this new system. We will, in this document, concern ourselves only with issues of a technical nature and not with those having political or statutory implications (such as whether a particular clause of ABT is within the jurisdiction of CERC). For information regarding these and detailed information on the clauses of ABT, the reader is referred to the full text of the ABT notification. Some of the important technical concerns to be addressed by ABT are:

a) What happens to the schedule and UI charges in instances of the grid disruption beyond the control of generator or consumer? ABT delegates the responsibility of resolving such instances to the RLDC. However more clarity needs to be brought forth on this issue as this point can potentially cause a lot of contention regarding the UI charges.
b) A fundamental concern on ABT is whether it is the right measure to be introduced. While the spirit and intention of the act is widely appreciated, there is serious concern that it introduces elaborate and complicated procedures that shall give rise to a lot of contentions between involved parties on their interpretation. Some of these aspects include the declaration and demonstration of availability by a generating station, computation of variable and UI charges, rescheduling of generation and consumption etc.

It may be required to evolve the current proposals to a more simplified and transparent system over a period of time.

c) Acceptable availability may vary depending on the energy source of the generating station. And in some cases, such as hydro and wind stations the availability may not be accurately predictable except in the very short term. This will pose problems in calculation of fixed charges based on availability
d) Plants commissioned in different times tend to use vastly varying technology and thus tend to differ a lot in efficiency and cost of production. Since revenue for the generator vary significantly with efficient and controlled operation, old (though fully functional) plants may be at a disadvantage. The investment required to bring them to par with their modern counterparts may not be justified by the professed returns. On the other hand if CERC relents to discriminate between plants based on this factor, it will just add to the opacity of the proposed system
e) Another significant concern on ABT is the possibility of gaming (deliberate manipulation of availability, daily demand and capacity schedules etc.) by the involved parties to derive undue benefit from the UI charges. ABT system introduces clauses meant to discourage gaming through severe penalties. Whether this will prove a sufficient enough deterrent and whether the checks and balances prove adequate to detect gaming need to be ascertained
f) Another interesting concern is the CERC diktat that any revision in schedule by the RLDC will deemed to be effective irrespective of the successful communication of the same to concerned parties. As has already been pointed out, most of the concerned parties being PSUs lagging on the technology front are yet to have fool-proof or redundant communication infrastructure in place. Thus rescheduling may fail to reach concerned parties in a timely manner and if somebody is caught unawares on the wrong side of the UI charges, they are not going to be pleased about ABT.

Implications for different industry players

Put succinctly ABT requires all the actors in the great power drama to get their technology act right. There is no room for laxity on control or efficiency fronts. The technology dependency is going to be more on the generation side.

Capital cost of the generating facility being redeemable only against declared availability and successful demonstration of the same will require the generators to really have a tight rein on their complete infrastructure. All the generators will now need to set a target of 85% availability to ensure that complete capital costs, ROE and incentives are available to them. And the provision for surprise audit to demonstrate the availability will need to them to monitor all the equipments and ensure adequate and timely maintenance of their overall infrastructure. This will usher a modern outlook and calls for the latest and best technology in performance calculations, efficiency and IT.

Variable costs and UI charges will require the generators to closely match their output with the demand curve and the ability to take corrective actions in the shortest possible time. ABT also calls for elaborate computation of the payable tariffs and close monitoring of the cost of production. Ushering in of MOD is going to be a positive development for all generators enabling them to make huge savings on cost. All these factors will involve a good amount of technology investment but will set the right background for an efficient power structure and the right launching pad for a market oriented approach. This will naturally result in higher reliability and increased customer confidence giving the right impetus for more industrialization and enhancing our development process.

At the consumption end also there is going to be the need to forecast demands as accurately as is possible and to follow the strictest possible grid discipline. This again will prove vastly beneficial to the power industry as a whole.

Conclusion

All the apprehensions regarding the new system not withstanding, ABT is still a welcome and necessary development. Next step is for the concerned authorities to ensure the necessary infrastructure to remove all the bottlenecks on the transmission side. Once this id done, the path should be clear to a completely market driven scenario with much better systems and infrastructure in place. The culminating point shall be an elaborate and efficient system with much more reliance on distributed power systems as well. This will iron out any monopoly tendencies in the system delivering maximum benefits to the consumers. This will also prove beneficial to the environment since “green power” norms are much more effectively implemented in a distributed and deregulated power scenario.

[i] ABT notification defines availability for any specific time-period as the ratio of the average send-out capability (SOC) for all time blocks of the time-period to the rated SOC. Thus availability can be expressed using the formula:

$$Availability = \left\{ \sum_{i=1}^{n} \frac{SOC_i}{\left(1 - AUX/100\right)} + CL \right\} \times \frac{100}{h \times IC}$$

where

IC – Installed capacity of station in MW
SOC_i – Send out capability in i^{th} time block
n – number of time blocks in the durations
AUX – Normative auxiliary consumption for the plant as a percentage of gross consumption
H – Number of hours in the duration
CL – Gross MWH of capacity units kept closed on account of the generation scheduling order