

Transparency in Power System Operation in India

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In the physical sciences a *transparent* object is one that can be seen through. *Transparency*, as used in Humanities is the opposite of *privacy* and it implies openness and accountability. In addition to transparency, the successful operation of any social system demands that the inputs required for prudent decision making as well as the rules of the game are a '*common knowledge*'. '*Common knowledge*' by definition is "*a fact known to everybody and known to everybody that it is known to everybody ad infinitum...*" In this context it would be worthwhile to discuss the operation of the power system which represents the ultimate in '*just-in-time*' manufacturing.

Reliable operation of such a sophisticated system requires a '*fool-proof*' system for investor confidence and consumer satisfaction. Power supply and demand in a power system has to be balanced at every instant for the stability of the interconnected network and it can be achieved only through extensive offline and real time coordination between the various stakeholders. In view of the above, the operating philosophies and the rules of the game in power system have been clearly laid down in the form of Indian Electricity Grid Code. A scientific and robust commercial settlement system in the form of Availability Based Tariff Scheme has been put in place after elaborate debate and consultation with the stakeholders in the Indian Power System. '*Transparency*' and '*common knowledge*' are the pillars of this scheme.

Under the ABT regime elaborate planning is carried out in consultation with all the stakeholders. The interstate generating stations as well as the load serving utilities exchange the information related to their committed injection and off take from the interstate grid through a transparent internet based system. In order to enhance the power system visibility and improve the quality of supervision in real time power system operation in the country, the grid control rooms at the regional and state level have been equipped with a data acquisition and communication system. During real-time the vital operating variables such as generation, consumption, grid frequency, bus voltages and transmission line loading and are available at all coordinating centres.

The utilities have the freedom and choice to deviate from their declared commitments and these deviations are settled as contracts arranged in an infinitesimally short time interval. The UI rate used for settlement of contracts is a Regulator defined frequency-actuated commercial signal available at any wall socket and hence a '*common knowledge*'. Every utility responds to this signal in real time and adjusts its generation/ demand and a new equilibrium is achieved. What results is a Nash equilibrium at which every player emerges a winner by having maximized his pay-off.

After the fact, a consolidated energy account of the last seven days is made available through the internet for scrutiny and cross verification by all the participants. Errors and omissions if any are promptly corrected and a revised account is released. After having satisfied themselves the players make payments to the UI pool account which is further disbursed to those who have to receive it. It is also pertinent to note that in spite of the absence of any enforceable payment security

mechanism, the level of default in the UI pool has remained marginal, primarily due to peer pressure and regulatory intervention. The state utilities often utilise this mechanism to buy and sell power as it provides a convenient way to overcome the administrative hurdles.

In addition to the long-term open access in transmission system as explained above, the short-term open access contracts are also being facilitated in a fair and equitable manner, which is resulting in inter-regional and intra- regional trading of power among utilities. The information related to the Available Transfer Capability (ATC) and the real time flows on the interregional links is available on the website of respective Regional Load Despatch Centres.

Thus the frequency-linked component of ABT popularly known as the Unscheduled Interchange (UI) mechanism has established a simple, decentralized but highly scientific and robust framework of dispute-free commercial settlement system for interstate and interregional long-term and short-term power contracts in the country. The mechanism, tailor made for the Indian conditions, has brought in accountability and seriousness in grid operation in the country. The voluntary participation of utilities in this self-healing, self-dealing balancing mechanism has dramatically enhanced the security and reliability of the integrated electricity grid. The command and control regime has been abandoned and the utilities now have freedom and choice for purchasing and selling electricity leading to a remarkable improvement in the overall economy and efficiency in power system operation. In the whole process the spot price for settlement of imbalances gets *"collectively controlled"* and *"democratically stabilized"*. The UI mechanism is the *'provider of last resort'* and has contributed enormously in *'social welfare maximization'*. It is fair, equitable and rigging proof mechanism. It has thus facilitated the development of a workably competitive and vibrant regional power market in the country.

Apart from the commercial data various technical reports of varying periodicity as well as the special energy meter data used in the settlement system are available on the website of respective Regional Load Despatch Centres in a 'user friendly' manner. In addition to the above, all the data related to the real time operation and the major decisions taken by the grid operators are placed before the stakeholders in the regional power committee every month for discussion and review.

The regional grids are thus being managed in an increasingly transparent and democratic manner, which has also facilitated amicable resolution of day-to-day problems associated with the complex task of grid operation. Better frequency and voltage profile in the grid has ensured better equipment performance, reduction in system losses and brought about an improvement in the quality of power to the end consumer. Over the years all the above mentioned initiatives coupled with the co-operation of all the players in the grid has resulted in drastic reduction in grid disturbances and enhancement in the security, reliability and economy of Indian power system and it has set the stage for a vibrant power market in the country.