# A journey towards "One Nation- One Grid -One price"

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Initially India was demarcated into five regions namely Northern, Eastern, Western, North Eastern and Southern region as depicted in Figure 1 below:

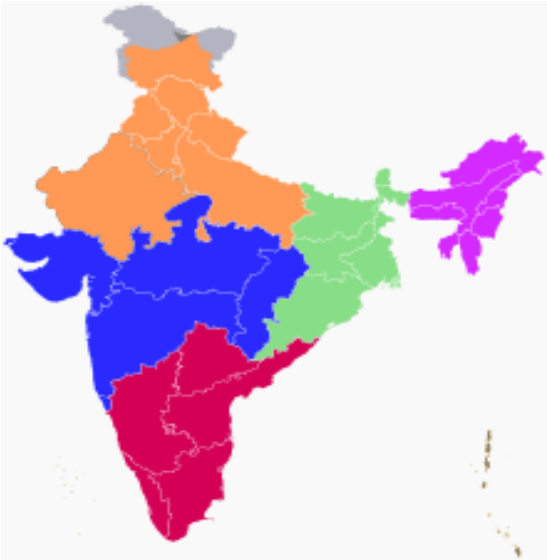

*Figure -1: Five regions in India*

Chronology of synchronization of grid in India is as below:

- In October 1991 North Eastern and Eastern grids were connected through 220 kV D/C Line connecting Birpara and Salakati.
- In March 2003 WR and ER-NER were interconnected through 400 kV D/C line connecting Rourkela and Raipur.
- In August 2006, after connecting Muzaffarpur and Gorakhpur by 400 kV D/C line, North grid was connected to ER-NER-WR grid constituting NEW grid/Central grid, thereby 4 regional grids Northern, Eastern, Western and North Eastern grids were synchronously connected forming central grid operating at one frequency.
- On 31st December 2013, with the commissioning of 765 kV Raichur- Solapur transmission line, isolated Southern Region was connected to rest of the grid i.e. Central Grid in Synchronous mode thereby achieving 'ONE NATION-ONE GRID-ONE FREQUENCY'.

The depiction of the same is shown below in figure 2

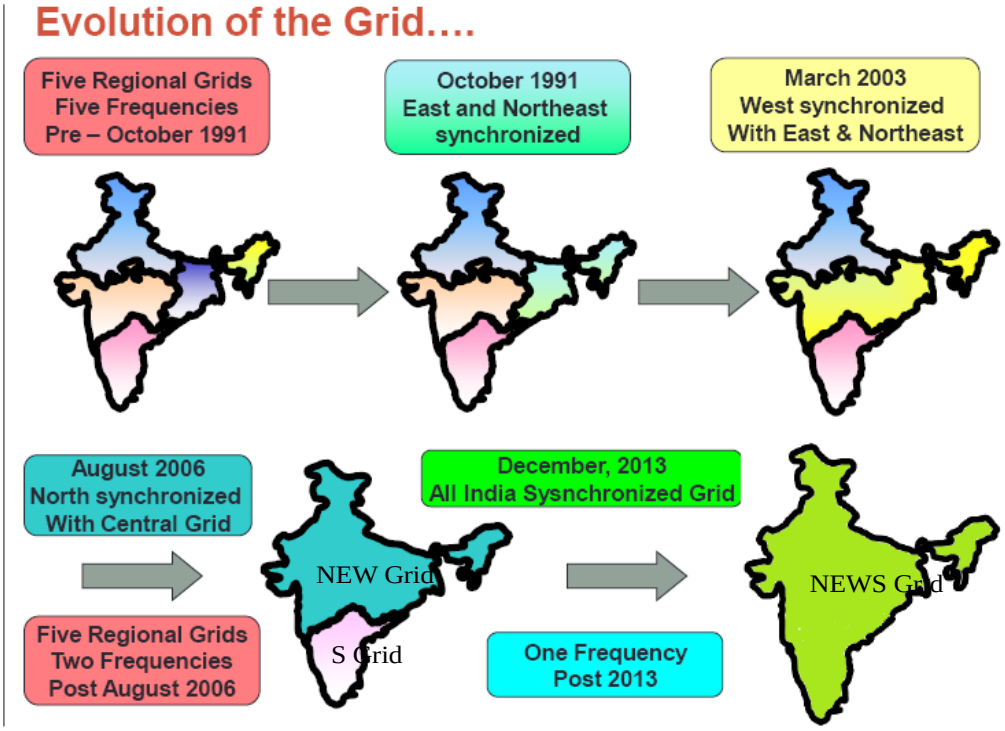


*Figure- 2: Synchronization of regional grid*

This interconnection makes the national grid the biggest synchronized grid in the world with more than 228 GW installed capacity. So, focus moved from regional self-sufficiency to a national basis, the inter-regional links were planned with power generation projects so as beneficiaries of these projects weren't bound by regions. This synchronization has come as a major relief to the power deficit states of Tamil Nadu, Karnataka, Kerala and Andhra Pradesh. This synchronization of SR grid with rest of the country has not only improved the power transfer among the regions, but also minimized fluctuation in frequency. This success shall pave the way for interconnecting other countries and formation of a SAARC Grid.

Benefits of “One Nation – One Grid – One Frequency” are summarized below:

- It reduces pressure on already scarce natural resources, by transferring power from resource-centric regions to load-centric regions.

- Facilitate power trading across regions, thus, establishing a vibrant electricity market.
- Increases grid reliability and stability due to synchronization of large rotating inertial masses.
- Energy deficit at national level improved continuously from 8.7% in FY 2012-13 to 0.4% in FY 2020-21. Similarly, Peak Demand deficit improved from 9.0% in FY 2012-13 to 0.4% in FY 2020-21.

It is noteworthy to mention that earlier power was deficit commodity but in present scenario power has become surplus commodity, therefore, now it is necessary to evolve the mechanism for the optimization of cost of power, thereby enabling the uniformity of cost of power to the states by realizing “One Nation – One Grid –One Tariff”.

Parliament standing committee also made extensive deliberation with all the stakeholders including CERC and SERCs in order to explore the feasibility and implementation of uniform Tariff across the country. Consequently, Ministry of Power (MoP), Govt. of India issued a discussion paper called Market Based Economic Dispatch (MBED). The objective of discussion paper is to create merit order at national level by suitably scheduling and dispatch of all contracts among beneficiary and generators.

MBED envisages ex-bus uniformity of generation cost based on variable cost of the plant only. However, in order to get near uniform retail tariff across various states, it is very much important to obtain uniform overall landed cost of power at state periphery including interstate transmission charges and losses.

**Uniformity of Retail Tariff for sale:**

Broad components of the retail tariff to consumer comprises as depicted in figure 3 below:

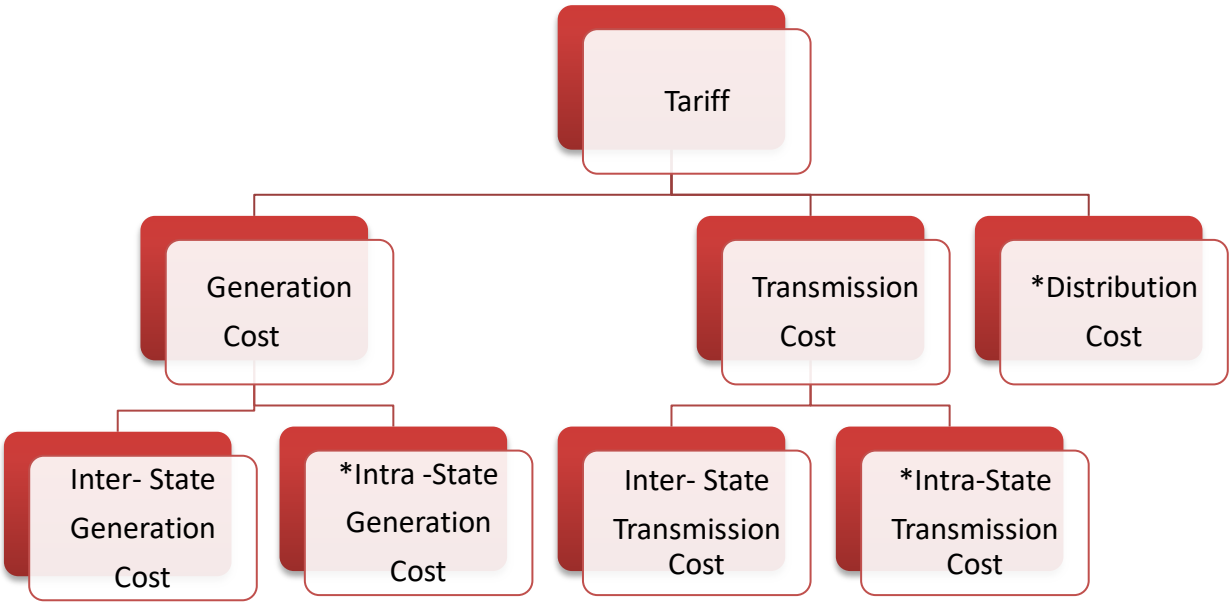


*Figure -3*

***Note:*** *asterisk mark components are dealt by the respective states since same is in concurrent list*

From the above, it is evident that Intra-state generation cost, Intra-state transmission cost and distribution cost are state specific subject and comes under concurrent list of the constitution. So, scope for uniformity in power procurement cost exists for the remaining two components i.e. inter-state generation cost and inter-state transmission cost. As major component affecting retail tariff is power purchase cost (inter-state generation cost + inter-state transmission charges and losses) normally lies in the range of 70% to 80 % of Average Cost of Supply (ACoS) for most of the state.

In view of foregoing discussion it is to note that this paper emphasizes on dispatch of merit order on basis of variable cost of the inter-state generation and corresponding inter-state transmission charges and losses so as landed cost at state periphery is uniform.

However, it is to mention that most of the long term PPA signed between discoms and generators are having two part tariff comprises of Fixed Cost (FC) component and Variable Cost (VC) component. Variable cost optimization at ex-bus have been covered under MBED discussion paper, but effect of FC which is a major component of power procurement cost, varies from PPA to PPA and also depends upon useful life of the generating stations has not been elaborated in obtaining uniform power procurement

cost across the states. So, after adding FC component to the landed cost of the power (i.e. variable cost of interstate generation and interstate transmission charges and losses), it is very likely that overall cost of power to the discoms at state periphery may vary owing to the differential cost of FC component.

Even after factoring above mentioned components for achieving uniformity of power purchase cost at state periphery, making retail tariff uniform for all the states may not be feasible for the various reasons as given below:

- State specific policy,
- Geographical area,
- Population,
- Consumer mix etc.

Therefore, If as a first step landed cost of power including Inter-State transmission charges and losses could be same for all states then it would provide more realistic opportunity to the utilities to move towards 'near uniform Tariff' as variation in the tariff will be restricted to only to 20% to 30% (i.e. Intra-state generation cost, Intra-state transmission cost & distribution cost) of ACoS. These variation can further be minimized after interaction among all the states to move "**near uniform tariff**"

As an illustration, it can be observed that, presently national average power purchase cost (APPC) and average power purchase cost of eastern region states have wide variation as enumerated in table below:

| FY | APPC (Rs./kWh) | | | | |
|---|---|---|---|---|---|
| | **National** | **Bihar** | **Orissa** | **Jharkhand** | **West Bengal** |
| 2017-18 | 3.48 | **3.84** | 2.73 | 3.98 | 3.59 |
| 2018-19 | 3.53 | **3.51** | 2.77 | 3.56 | 3.59 |
| 2019-20 | 3.60 | **4.12** | 2.77 | 3.90 | 3.55 |
| 2021-22 | 3.85 | **4.26** | 2.46 | 4.04 | 3.55 |

*Source: Various orders of CERC*

From above table it is observed that:

- APPC of Bihar is more than other constituents in the same region.
- APPC of Bihar is more than National APPC.

- In case of Orrisa, APPC is lower owing to its own large quantity of Intra-State Hydro generation. Other states APPC needs to be analyzed further.
- Above APPC is aggregate of Inter-State generation and Intra-State generation cost which needs to be segregated to determine the Inter-State APPC only.

**Way Forward:**

- As a first step ex-bus power purchase cost for interstate generation may be made uniform across the state as proposed in MBED.
- Interstate transmission charges should also be made uniform based on unit handled (Rs./kWh) which is the simplest way, although it may not be in spirit of Tariff Policy, which states that transmission pricing should be based upon distance, direction and quantum of power.
- Making interstate generation cost and interstate transmission cost uniform for all states, 70% to 80% component of ACoS will be made uniform. However as discussed in foregoing para, issue pertaining to fixed cost (FC) under bilateral contract may be dealt as follow:
  - Scrape all existing PPA, which is not feasible in current scenario.
  - As majority of the long term PPA are likely to be expire in approximately 10 years, allow the existing PPA to operate till its expiry of the contract.
  - After expiry of contract no such long term bilateral PPA should be allowed and all transaction should be done through exchange.
- Now, only 20% to 30% components of ACoS (intra-state generation cost, intra-state transmission cost and distribution cost) require to be optimized further so that near uniform tariff across county can be achieved.

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