

**Suggestions from
Independent Power Producers
Association of India (IPPAI)
to
Ministry of Power (MoP)
on
20 Year (2016-2036) Perspective
Transmission Plan Report
June 2016**

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Table of Contents

1.	Executive Summary	1
2.	Context – The present picture and the trends for the future	3
3.	Suggestions to the Ministry of Power (MoP), Central Electricity Authority (CEA)	5
4.	Way Forward	7
5.	Additional Chapter on Energy Storage	13
6.	About IPPAI	16



Executive Summary

At 302 GW¹, India today is the 5th largest electricity market globally, a quantum leap from 10th position a decade ago. The growth in demand for power has outpaced the supply of power, led by rapid urbanization and industrialization in the country.

In light of the growing needs for power sector reforms, the Electricity Act 2003 (The “Act”) was conceived more than a decade ago. The Act laid down the provisions for enabling a competitive market and providing opportunities to the private sector to participate in the development of the power market. In order to address the shortage in supply scenario, the Act delicensed power generation. Buoyed by favourable legislation and various incentives, the private sector made massive investments in power generation.

India is endowed with diverse fuel resources which are concentrated in pockets at different locations. This led to a skewed development of power generation capacities around the country. We have domestic coal based generation in Chhattisgarh, Orissa and Jharkhand in the eastern part of the country; vast hydro power potential in the north and north-eastern part of the country and wind based generation potential along the coastal belt of Tamil Nadu, Maharashtra and Gujarat.

We have load centers spread across the country. In addition, the market is moving from long term to short term with such diverse distribution of generation and load centers that there is a need for considerable transmission capacity inter-connecting the entire country at a national level, to move from the traditional “generation to load” to “load to load” and meet the aspirations of distribution companies (discoms) and consumers to procure electricity from the short term power market.

Transmission infrastructure is the backbone for the operation of a competitive electricity market. The objectives of Electricity Act, 2003 such as taking measures necessary for development of the electricity industry, promoting competition therein, and protecting interest of consumers and supply of electricity to all areas, require existence of a policy framework conducive to development of a robust Inter-State Transmission System (ISTS) and Intra-State Transmission System. It would be possible to achieve the ultimate objective of a competitive power market through a plug and play grid and an enabling regulatory and policy framework.

Development of the transmission system must match with the generating capacity on one side and growing demand on the other with flexibility for generators to switch from one drawing entity (Discom or Consumer) to another and vice versa for the drawing entity to switch from one generator to another. With Open Access in transmission, the role of transmission has changed from an infrastructure provider to an enabler in the operation of a competitive power market.

While there has been a marked increase in the growth of the central sector transmission system and transformation capacity during the previous (11th) and the current (12th) five year plans, transmission congestion in some parts of the grid as evident in the last few years, underlines the need for emphasis on the development of adequate transmission system, especially at the intra-state level and its coordinated planning and development with the inter-state transmission system.

India is one of the few countries where the Transmission Sector has been opened up for private participation and has attracted significant interest from private players. The private developers however, face a number of challenges in implementing transmission projects awarded under the competitive bidding route, which include:

- ▶ Delays in securing clearances under Section 164 and Section 68 of Electricity Act 2003;
- ▶ Delays in securing transmission license from the Appropriate Commission;
- ▶ Delays and cost escalation in securing Right of Way (ROW) clearance;
- ▶ Delays in acquiring forest land due to differing dispensations for Central Transmission Utility (CTU) vis-a-vis private developers;

¹ Total Installed Generation Capacity as of April 30 2016 (Source: CEA Executive Summary, April 2016)

- ▶ Fixed tariff quoted for 35 years creates challenges due to long gestation period of the transmission projects leading to cost and time overruns.

In contrast, the Central Transmission Utility (CTU) under cost plus regime does not face most of these challenges as:

- ▶ It has automatic clearance under Section 164 and Section 68 of the Electricity Act 2003 being deemed as a 'central project';
- ▶ It is a deemed licensee;
- ▶ It has the power to pay double compensation for the forest land and acquire it without any procedural issues, being deemed a 'central project';
- ▶ The tariff determination for projects executed by the CTU is under cost plus regime which allows any cost escalation to be passed through the tariffs although there is a sunset clause which mandates competitive bidding for all future projects.

Going forward, demand could further increase with increasing industrialization. If India's transmission capacity is not augmented in a timely manner, the grid congestion problem is expected to further aggravate in certain areas.

The policy makers may take necessary steps to ensure competition in the transmission sector, including PSUs. As a first step in this direction, the Central Government may begin by adopting the concept and putting in place the right policy and regulatory framework for pursuing the implementation of a National Power Beltway (NPB).

In order to address the changing market mind set, there is a need to design and develop a grid which addresses the changing needs of the consumers and generators as well as acts as a market enabler for growth of power demand and generation. This report highlights the need for such implementation and allow transmission segment of the Indian power sector to move from "Market Product" to "Market Enabler".

Context – The present picture and the trends for the future

The present transmission planning process

The planning of transmission system for new Inter-State Generation Stations (ISGS) seeking Long-Term Access (LTA) is carried out based on the quantum of power, point of injection, point of drawl, time frame requirement of power transfer etc.

Transmission schemes are also implemented as grid strengthening schemes, based on the projected likely future power scenarios and operational feedback. The transmission system so planned has transmission margins which inherently get created on account of the following:

- ▶ planning for peak power transfer,
- ▶ requirement to meet specified reliability criteria (N-1/N-1-1 etc),
- ▶ adoption of higher capacity or higher voltage transmission line,
- ▶ Right of Way (ROW) for future generation potential or power transfer requirements,
- ▶ the lumpy nature of transmission elements,
- ▶ the transmission capacities are created in steps, and
- ▶ Actual operational condition from time to time.

The transmission margins are utilized for power transfer under Medium Term Open Access (MTOA) and Short Term Open Access (STOA).

Issues in the present planning process

Regarding creation of adequate transmission system:

Central Electricity Regulatory Commission (CERC) regulations allow system strengthening (fresh investment) on the basis of application for LTA. No system strengthening can be done for giving Connectivity, MTOA or STOA.

The investment of the transmission system is therefore made on the assurance of payment of transmission charges for a longer period by the LTA users.

The existing philosophy is based on the premise that long term Power Purchase Agreements (PPAs) are predominant. Short term market, seeking MTOA/STOA, shall be catered through available margins.

Need for a new approach

- ▶ A way out has to be found as the long term Power Purchase Agreements (PPA) may not materialize at the time of planning for transmission to a significant extent. The existing transmission service products need to be reviewed alongside the approach to planning so as to provide flexibility to buyers and sellers. New transmission systems would have to be developed to cater to the need for short / medium term market, including power exchanges (PX). However, any fresh investment should be supported by a commitment to pay for it. States such as Punjab, Tamil Nadu, Gujarat, and Uttar Pradesh etc. who are availing far more import capacity through ISTS than their LTA capacity should proportionally share the Point of Connection (PoC) charges at the point of drawal.

- ▶ We have to recognize the fact that short / medium term market can no longer be restricted to “spare margins” on the lines, which was the basic premise of the first Open Access regulations introduced in 2004 when long term PPAs were predominant. As of now, fresh investments in transmission is permitted only for providing long term access. It needs to be recognized that in the current scenario, if short term / medium / PX transactions are curtailed, it results in significant bottling up of generation and distress to distribution companies (discoms).

▶ **It is required that:**

- The Independent Power Producers (IPPs) / generators should be given comfort to sell their powers under long / medium / short-term time frame with lesser congestion events.
- The transmission system is built with due commitment from its users i.e. the (i) injectors (generators, captive plants and surplus State utilities) and (ii) drawing entities (State utilities and bulk consumers).
- The stranded transmission assets do not get created.
- Sharing of transmission charges become fairer and equitable with a commitment from all stake holders i.e. STOA/MTOA customers, injecting entities and LTA costumers.

System strengthening for additional drawl and additional injection could be done without knowing the contracted source of purchase or sale because power in a meshed network would be transferred by displacement. In other words, the generator and the states / consumer could be given General Network Access (GNA) to ISTS for the agreed quantum of power (MW). While granting GNA, the generation and load scenarios and other assumptions would be declared by the Central Transmission Utility (CTU). A GNA agreement could become the driver for investment.

The new approach should therefore involve introduction of General Network Access (GNA) mechanism in Inter-State Transmission System for transmission system development and hassle free access to the transmission system by the Generators.

Suggestions from IPPAI on Perspective Transmission Plan (2016-2036) based on stakeholder meeting called by the Ministry of Power (MoP) on 4th May 2016

Key policy changes which can pave way for a robust capacity creation in the transmission segment of the Indian power sector, based on experiences gained so far, have been highlighted below.

- (a) Time taken from concept to commissioning, which is currently 5 to 6 years, is much longer than global standards, and must be optimized. The process needs to be more efficient and the process for award of projects needs to be streamlined. At the same time, incentives must be given to a developer for faster project execution. To ensure faster execution, it is recommended that provision for early commissioning incentives be made in the Standard Bidding Documents (SBDs).
- (b) The level of innovation and technology in the industry must be upgraded considerably, thereby upgrading quality, speed, health and safety standards. Currently, no guidelines on the use of technology are mandated and the focus is on lowest price for transmission projects through tariff-based competitive bidding (TBCB). This does not help incentivise developers to innovate and suggest new ways of working as they will be at a disadvantage compared to a cheaper alternative. It is recommended that policies be realigned to focus on output parameters rather than input factors in order to extract maximum results from projects. When new transmission systems are conceptualised by CTU and various standing committees, they must exhaust all possibilities to optimise existing transmission corridors by deploying best available technologies, before embarking on creating green-field lines and substations which occupy scarce agricultural and forest land.
- (c) Qualification requirements must be critically evaluated and reformed so as to screen out inexperienced players from the bidding process. Due to inadequate pre-bid due diligence by inexperienced players, projects have been awarded at unviable prices. When the developers later realize the actual costs, projects are often stalled. Qualification requirements must be tailored to attract only serious participants, which can be achieved by placing higher emphasis on prior transmission experience. In addition, for projects that have already been awarded, it is recommended that concessionaire should be allowed to completely exit the project at any point in time (before/after COD) by selling equity to an equally qualified substitute concessionaire. Post-commissioning, the projects may even be sold to financial investors who are willing to provide adequate Operation & Maintenance (O&M) undertaking through third parties.
- (d) Another crucial factor is clearance process and redressal mechanisms. Current clearance and redressal policies have not been able to get private players to actively participate in the power transmission sector. Dealing with the judiciary system in India makes the process time consuming and deters private players from participating. Considering the number of risks assumed by a developer during project execution, robust redressal mechanisms should be available to developers in case of unforeseen events. It is recommended that a material adverse effect clause be inserted allowing parties to seek relief, as opposed to electing to terminate the agreement.
- (e) In order to promote greater private participation in the power transmission sector, it is important that private players be given a level playing field along with state owned players such as Power Grid. Power Grid currently plays a dual role - transmission planning (as CTU) and execution of inter-state transmission projects - and is thereby privy to commercially sensitive information. In the course of discharging its duties, as a CTU & as a member of Empowered Committee (EC), Power Grid is privy to certain material non-public & cost-sensitive information – apart from having rights to influence decision making in EC. It is therefore recommended that CTU be hived off from Power Grid & in order to ensure fairness in the bidding process,

an independent and impartial Empowered Committee without any representation from Power Grid should decide whether projects should be done by tariff based bidding or under the cost-plus route. State entities and private players should be treated at par with similar norms & processes for securing forest clearance.

Immediate policy action is required from the Ministry of Power (MoP) and Central Electricity Authority (CEA) for reinvigorating the transmission sector. There is an urgent need to synchronise the policy framework with a new reality of wider participation by private players under competitive bidding regime.

Meeting Challenges in Transmission Sector

In order to meet the growing power demand of various regions, power transfer capacity of the grid is being enhanced continuously. This expansion poses few challenges that need to be met through planning and adoption of new technologies. Following are some of the challenges:

- **Right Of Way (ROW):** It is the most notable challenge that the transmission sector is facing today. The need is to develop high intensity transmission corridor (MW per meter ROW) in an environment friendly manner.
- **Flexibility in Line Loading and Regulation of Power:** Due to wide variation in demand on a daily as well as seasonal basis, there is increased need to regulate power flow on the transmission network for grid security and optimization.
- **Improvement of Operational Efficiency:** Power system is required to be operated at the rated capacity with security, reliability and high availability. This can only be achieved through reliability based on-line condition monitoring, repair and maintenance in advance and making forced outage as zero.

Way Forward

Challenge: Existing regulations of Central Electricity Regulatory Commission (CERC) do not allow plug and play feature to operate seamlessly

- The current CERC regulations require generators to identify the target region and a long term consumer with duly executed power purchase agreement before using the grid through long term access:
 - ▶ The generator needs to identify the target region where it intends to sell the power before securing long term access to the grid,
 - ▶ The generator also needs to execute a long term Power Purchase Agreement (PPA) to transmit power by using the long term access.
- At present, generators with long term access to a target region are unable to sell power in the absence of a long term PPA. At the same time, states are currently not executing any long term power procurement contracts and are banking on the short term power market to fulfil their immediate needs.
- With the shift from long term power market to short term power market, the power generators want to secure dedicated transmission bandwidth for a long term and use this dedicated bandwidth to sell power in short / medium term based on the market demands.
- The uncertainties around fuel availability / project clearances / land acquisition, at times delays the commissioning of power plants. A generator whose plant is delayed / scrapped should have the flexibility to assign its transmission rights to another generator thereby utilizing the transmission system in an economical fashion.

Solution: Introduction of General Network Access (GNA) regime to augment existing CERC regulations for access to the transmission grid:

GNA would be a framework for providing long term access and usage of the national grid, which will replace the CERC regulations of Long term Connectivity (2009) and Long term Open Access (2004) and allow plug and play flexibility to the generators and consumers:

- Under GNA, anybody can get access to the National Grid by paying the GNA charges without any Power Purchase Agreement or identification of target regions/beneficiaries prior to securing access to the grid.
- Under the proposed framework:
 - ▶ Generators would need to specify the maximum capacity they want to inject into the grid (irrespective of short / medium / long term or if there is a PPA or not)
 - ▶ States need to specify their maximum power injection/drawl requirements,
 - ▶ GNA customer will be liable to pay either PoC injection or drawl charges, depending on whether it is a generator or a load / discom,
 - ▶ The generator starts paying the GNA injection charges from the declared contracted date.
- Entities availing GNA shall have to commit to pay such PoC charges (injection or drawl) for 25 years as may be prescribed by the CERC.
- All the existing LTA would be fully or partially convertible into GNA.

- Under the GNA concept as suggested by the Central Electricity Authority (CEA), the generators and loads will not be tied to each other.
- The generators have to acquire the right to inject a fixed quantum of power at the point of injection and discoms / open access consumers have to acquire the rights to import / export a certain capacity of power via the injection / drawl point.
- Under the proposed framework, a generator whose power plant is delayed can assign his transmission rights to inject the fixed quantum of power at the point of injection to another user without altering the direction of flow. **This will allow economical use of the available transmission capacity.**

- ▶ Transmission System to be developed to meet market requirement instead of point to point
- ▶ Current provision of Connectivity for generators leads to congestion as system augmentation cannot be undertaken in absence of financial commitment
- ▶ New Investments for additional drawl beyond long term commitments by the States without matching obligation to pay, leading to distorted allocation of transmission charges

- ▶ Under GNA anybody can get access to the national grid by paying the GNA charges
- ▶ Under the new framework:
 - Generators would need to specify the maximum capacity they want to inject into the grid
 - States need to specify their maximum power injection / drawl requirements
 - Existing Long Term Access would be partially / fully converted to GNA

- ▶ **Broad GNA pricing principles**
 - GNA consumer pays PoC injection / drawl charges
 - Premium for drawl / injection beyond the contracted GNA limit (subject to availability)
 - Generators / consumers will pay GNA charges from the contracted date

The GNA framework is still in its early stages and rationalization of the GNA needs to be done from point of view of generators and consumers.

On the consumer end, as the power market matures, the consumers are demanding more flexibility:

- ▶ Flexibility to choose and change their source of power at short notice without getting tied up with a single source of power for a long period.
- ▶ Flexibility to vary their demand upon short notice.
- ▶ In order to achieve the needs of the consumers, the country needs a high capacity transmission system, interconnecting the entire country and which can offer “plug and play” flexibility to the consumers and generating stations.
- ▶ The Central Transmission Utility (CTU) has made a significant contribution in this direction and is also initiating development of high capacity corridors. But still, there is a long way to go in meeting the aspirations of the new developing market.
- ▶ Such a transmission system would lead to the development of a short term power market, on the lines of the Nordic power market, where decisions on power purchase and sale could be made in real time.
- ▶ A solution to address the changing needs of the consumers and other players in the power sector, is the development of a “National Power Beltway” (NPB), with a capacity to transmit close to 300 GW of power across the country, to be developed over a 10-15 years time period.
- ▶ The National Power Beltway (NPB) can form the backbone of a plug-and-play transmission system. It can connect not only all of India but also facilitate energy exchange from Tajikistan to Singapore and connect the fuel resource rich Middle-East countries. This will increase the prospects for India to emerge as a key strategic player for countries in Central Asia, Middle-East and South and South-East Asia.

A grid for the consumer

Network centric to consumer centric transmission planning:

- The traditional approach of transmission planning has been to connect a generation source (generator) to the consumers (load center), which binds the consumer and generator on a long term basis.
- Although such an approach is desirable by grid planners because of its ease in terms of planning and operations, it tends to restrict consumers’ choice of power, diminishes competition and increases need for regulated intervention in the market to avoid reliability problems.
- It is necessary for the grid planners to understand the consumers’ needs and market trends and allow them the choice and flexibility as depicted below:
 - ▶ Consumers today want the flexibility to procure power from any generating station at any location within the country and at any point of time to meet their requirement; also enabled under the Electricity Act 2003 through Open Access;
 - ▶ Consumers desire the ability to make real time decisions on changing their source of power supply in the interest of better price, quality of supply and service;
 - ▶ Generators too desire the flexibility to change their consumer for various reasons. However due to lack of transmission capacity this is not always possible since there is no transmission planning at present to build capacity to move from “load to load”;

- ▶ Open access customers are looking for the flexibility to acquire and trade transmission capacities as and when required to meet the short term market needs. There is a need for development of a transmission derivative trading policy and regulation to meet the growing needs of this new market.

Transmission to move from “Market Product” to “Market Enabler”

The transmission system planners in the country have to move from:

- ▶ Planning transmission systems in response to demand **to** Carry out proactive transmission planning, where the transmission system will lead to growth in generation capacities and demand.
- ▶ Although developing countries have moved to enabling transmission to lead generation and load, our current approach in transmission planning, follows generation and load. This has been possible as the entire sector was in the central and state government hands earlier. However, the result has been unsatisfactory and till date there is a huge loss to the power sector and the national economy due to transmission congestion and stranded power capacity.
- ▶ This along with the fact that generation has been delicensed under the Electricity Act 2003, has led to new challenges for the traditional transmission planner as both load and generation have spread across the country. Often information about capacity addition in generation and transmission does not reach the central planner. This has led to stranded capacities from time to time including captive power. A case in point is a captive power plant which has a mismatch of the host project getting delayed resulting in availability of surplus power which he wishes to schedule or in case where the captive power plant itself is having an outage resulting in a demand for import of power by the host project.
- ▶ The present scheme gives connectivity to the generator and the host but does not guarantee scheduling or import of power as there is no provision for contingency for transmission capacities for such projects. This has resulted in huge stranded capacities in terms of power availability on the one hand and black outs and brown outs on the other, across the country. The cost of this to the power consumer and the national economy is incalculable.
- ▶ This has led to a situation where power is being exchanged either bilaterally or through power exchanges based on the reserve capacity of the existing long term transmission capacity built so far.
- ▶ As the country focuses on driving investments in renewable energy, a large quantum of existing renewable capacities are stranded due to lack of transmission corridors.
- ▶ There is no provision in the current regulations which encourage transmission to lead the development of load.
- ▶ There is a need for transmission planning to address these issues and **ensure that transmission moves to becoming a market enabler.**

National Power Beltway (NPB):

The National Power Beltway (NPB) shall be planned and implemented progressively as building blocks in different time frame, depending upon the GNA requirement being sought by import / export applicants. Along with the implementation of the building blocks, following associated studies need to be carried out:

- ▶ Technical feasibility study;
- ▶ Financial feasibility study;
- ▶ Assessing the legal framework; and
- ▶ Designing the regulatory framework.

Designing the commercial framework based on requirements and planning:

- ▶ Phasing of transmission line construction to optimize the total lifetime cost of transmission capacity.

Assessing the social benefits of the project:

- ▶ Impact on regional disparity across states,
- ▶ Impact on primary job creations and improvement in the quality of life of the general public,
- ▶ Multiplier effect on economy.

Development of robust Intra-state transmission system crucial for NPB's success

- ▶ The National Power Beltway (NPB) will form the backbone of the transmission system in the country while the associated sub-systems in the states will play a crucial role in the success of the National Power Beltway.
- ▶ It is imperative that the associated sub-systems, which ensure last mile connectivity to the users of the transmission network, are built in a timely and economical fashion with adequate capacity.
- ▶ For the purpose, the state owned utilities are required to :
 - Provide accurate forecast in respect of their import / export requirement for a long term period, and
 - Finance the sub-systems associated with the National Power Beltway.

Inability of the state owned utilities to accurately forecast their import / export requirement in the long term:

- ▶ States are responsible for providing long term forecasts of demand and supply projections to ensure the development of the associated sub-systems of the National Power Beltway with adequate capacity.
- ▶ However, there is a lack of adequate capability with State Transmission Utilities (STUs) in terms of manpower, skill sets and systems to accurately forecast demand and supply over a long term period in addition to the inability of the discoms to provide accurate long term requirements due to the trend to move from long term to short term.
- ▶ Inaccuracies in demand-supply forecasts vis-a-vis actual turn out leads to sub-optimal planning of the supporting transmission system and this has at times led to unexpected congestion in the transmission networks.
- ▶ Therefore, the planning and execution of the associated state transmission system to the National Power Beltway should not be assigned to the STUs. Therefore, it may be desirable for the central planner to assess the load requirements in consultation with the concerned STU.

Inability of the state transmission utilities to finance the sub-systems associated with the National Power Beltway:

- ▶ At the state level, vast majority (apart from a few states where PPP has been implemented) of the intra-state investments are carried out by STUs with insignificant participation from the private sector.
- ▶ STUs find it very difficult to raise funds and most STUs do not have the capability to raise cheap funds from national / international markets due to low net worth / poor balance sheets to support the huge investment for the associated sub systems of National Power Beltway.
- ▶ Some of the STUs are not claiming or being allowed any ROE; therefore, forever depending on the state budget to fund the equity portion of their investment requirements. The State budgets are already strained and left with a very little scope to support the huge investment for the associated sub systems of National Power Beltway.
- ▶ CEA may extend assistance to states for planning and load forecasting, if desired.
- ▶ Funds required for sub-system development may be given by Central Government as soft loan and / or grant.

Additional Chapter on Energy Storage

Renewable energy (RE) resources are of strategic importance to India – they constitute a vital national resource which will allow sustainable development while ensuring a cleaner environment, energy independence, and a stronger economy. Theoretically, India's renewable energy resource base is very large, with many proven and commercially viable technologies.

Although renewable energy resources exist, their lack of scheduling/high intermittency will ultimately (with rapid deployment) result in a stage where the grid will not be able to absorb any more RE power. One of the most effective solutions to address the lack of scheduling/high intermittency while allowing scale up of these technologies is the use of energy storage technologies.

The factors which influence the development of the energy storage technologies in India are:

- a. **Renewable Energy Integration:** One of the main drivers of energy storage in India is increasing the share of grid connected renewable energy resources. With the government's intention to adopt environment friendly renewable energy projects across the country, **Energy Storage** projects are required to be given a special status as they provide a mechanism to convert infirm power to firm power in 15 minutes time blocks and to ensure scheduling of renewable power in both intra & inter-state transactions. Further, we need to have a special mechanism and status to be given to energy storage projects whereby they are treated neither as a consumer nor as a generator from the point of view of inward and outward wheeling, transmission losses or charges since the transformative losses in such projects are extremely high. In fact, the only logical way that the renewable energy projects can take off on the scale that has been envisaged by the government will be through the energy storage mechanism. In the absence of the same, it will not be possible for stranded capacities and renewable energy projects to be able to compete with thermal/hydro power and will face resistance to be purchased by distribution companies (discoms) in the long run.
- b. **Demand-Supply Gap:** India being a power deficit country experiences both energy deficit and peak deficit. Energy storage can play a huge role in meeting the demand and supply gap as during peak periods when electricity consumption is higher than average, storage could complement the base-load power plants (such as coal-fired and nuclear). During the off-peak period when less electricity is consumed, types of generation that are costly can be stopped. This is a chance for owners of Electrical Energy Storage System (EESS) to store energy. From the utilities' viewpoint there is a huge potential to reduce total generation costs by eliminating the costlier methods, through storage of electricity generated by low-cost power plants during the night being reinserted into the power grid during peak periods. With high PV and wind penetration in some regions, cost-free surplus energy is sometimes available. This surplus can be stored in EESS and used to reduce generation costs.

Conversely, from the consumers' point of view, EESS can lower electricity costs since it can store electricity bought at low off-peak prices and they can use it during peak periods in place of expensive power. Consumers who charge batteries during off-peak hours may also sell the electricity to utilities or to other consumers during peak hours.

- c. **Micro-grids:** Micro-grids will play an important role in solving energy problems in India. Micro-grid can operate in parallel or in island mode to utility power grid. They can meet the growing demand of a particular set of consumers whether grid connected or operating in islanded mode. Micro-grids along with storage will allow for fast installation of electricity supply without the need for expensive transmission infrastructure investments and the lengthy development approval and construction process.

Consumer or Producer?

In the present context, the worldwide debate on energy storage devices is on whether they are to be treated as generators or consumers. It should be appropriate to point out, based on the existing technology that energy storage devices lose heavily on both inward transmission by way of losses and charges as well as on outward transmission losses and charges, besides the technical loss of almost 20-30% in conversion from AC to DC and from DC to AC as there is no clarity on how to treat energy storage devices: **are they consumers or generators?**

It is therefore critical that the Electricity Act 2003 (through suitable amendments) clearly mention the need to give **priority to energy storage schemes** by incentivizing them so that they do not end up being penalized twice which would jeopardize their viability. It is also suggested that since the country has seasonal peaks where it is not able to harness the full potential of power due to lack of existing storage capacity, it may be appropriate to create a mechanism which encourages this by offering to purchase credits by issuance of special certificates which are interchangeable with existing Renewable Energy Certificates (RECs), as has been done in the case of renewable energy.

The following areas need more elaborate research when many drivers such as decline in renewable energy costs, inflation in fossil fuel costs, drop in storage costs and acceleration of smart grid implementation, come together to help accelerate adoption of storage technologies. These require policy development both at central & state levels, taking into account financing of projects and incentives for deployment.

A detailed assessment of storage technologies, which is based on direct discussions with technology suppliers, feedback from users or demonstration sites around the globe and experts from well-known global Research & Development (R&D) programs is required, to understand current and expected future price-performance of technologies. This assessment will be useful for developing India's own energy storage technology development strategy.

- ▶ Development of simulation, analytical and control tools to design, schedule, dispatch and earn revenue from energy storage devices, specific to Indian context. Some important types of tools / models are:
 - Long term resource portfolio planning
 - Production simulation (generation, transmission)
 - Load flow analysis (near term grid stability)
 - Dynamic simulation (short term grid variability and load balancing)
 - Technical screening of storage solution (technologies and services)
 - Cost and value analysis tools (life cycle analysis of ESS solutions)
- ▶ Modeling of 20-30 percent Renewable Energy use scenarios, related impact on the grid and the requirement of energy storage. This will facilitate preparation of a strategic roadmap for energy storage in India.

Although energy storage has a number of advantages, the key challenge still lies in the high cost as well as relative sub-optimal performance of these solutions. Most decentralized applications use batteries which suffer from low life, low depth of discharge, high failure rates, etc., while on the large-connected side; the solutions are not economically feasible.

There is a need to introduce new technologies to demonstrate and validate better local application and performance. At the same time, there is also a need to develop business models and structures for these solutions, where the application(s) already exist. Therefore, new energy storage technologies need to be evaluated, and business models need to be developed and tested to ramp up addition of renewable energy in India.

With many storage technologies available at capital cost levels of less than USD 500 per kWh (less than USD 0.10 per kWh/discharge cycle (electrical storage)), there is tremendous potential for larger adoption of energy storage

technologies in India, provided focused support is available through appropriate policies, programs, incentives infrastructure, etc. To design these enabling and supportive policies and programs, a better understanding of the value of storage solutions across various end use applications, their scale-up potential, status of technology development trends, is needed to facilitate market deployment.

Policy development:

Initially policies are needed to maximize the participation of storage in different potential revenue streams and making them 'monetizable'. Market rules need to be developed so that public support needed to make storage viable comes down rapidly.

Some of the important policy areas are:

- ▶ Policies supporting such energy storage projects,
- ▶ Participation of distributed energy storage systems (DESS) in grids both as 'loads' and 'generators' (bi-directional use).
- ▶ Rules for providing multiple services using the same storage capacity as generators / load.
- ▶ Energy Market related Policies,
 - Rules for participation of storage service providers in the energy markets; Energy (reserve) capacity, ancillary services. Payment mechanism for the same.
 - Dynamic pricing for peak loads; peak load management using storage.
 - Policies to encourage utilities and transmission companies to use storage or procure resources from storage service providers. Procurement obligations (e.g. in California).
- ▶ Fiscal benefits and incentives to implementers of storage solutions:
 - Capital subsidies,
 - Custom duties,
 - Value added tax (VAT),
 - Income tax,
 - VGF/shared investments (PPP) for demo project,
 - Technical Assistance for demo project,
 - Funding from National Clean Environment Fund (NCEF)

IPPAI believes that if policies & regulations for Renewable Purchase Obligations (RPOs), Open Access, Power Quality and Reliability, Grid Integration, Ancillary Services and Forecasting and Scheduling of renewables are implemented strictly along with necessary amendments to the Electricity Act (2003), it will accelerate adoption of storage technologies.

About Us

Since its inception in 1994, **Independent Power Producers Association of India (IPPAI)**, as an aggregator of ideas, believes that change must be engineered through models steeped in innovation and in conformity with regulations. Over the years, we have become a well-informed, interactive institution bringing together important players such as cross-party members of Parliament, government officials, bureaucrats, regulators, financial institutions, independent power developers, international and national companies, industry and cerebral thinkers from civil society. As an established forum, IPPAI is a catalyst of positive transformation for policy in the Indian power and allied sectors.

IPPAI Annual Events

IPPAI has, over the last two decades, conducted over a hundred workshops, round table meetings, energy summits and international conferences on a wide range of subjects such as financing, regulation, policy initiatives, and environmental and consumer concerns by NGOs.

These initiatives have yielded a wealth of data and information on how to tackle issues and bottlenecks pertaining to a wide range of critical policy matters across the Indian power and allied sectors. The recommendations that stem from these initiatives are forwarded to the concerned policymakers for their consideration and necessary action.

In the last decade alone we have conducted over 85 state-specific, national and international conferences on relevant issues such as:

- ✓ Public good v/s private profit - A regulatory dialogue in association with FERC, US (an Indo-US regulatory workshop)
- ✓ Impact of the denial of open access on the power sector
- ✓ The challenge of terrorism to India's infrastructure and economy
- ✓ Policy incentives for Independent Power Producers (IPPs) and investors for wind and biomass power generation
- ✓ Powering North-Eastern India: Attracting investments for development of the power sector
- ✓ Economic impact of judicial decisions
- ✓ Regular state-specific conferences and seminars across India like Maharashtra, Tamil Nadu, Delhi, Haryana, Punjab, Gujarat, Rajasthan, Odisha, Bihar, Uttar Pradesh, Karnataka, Jharkhand, Chhattisgarh, Andhra Pradesh, etc.

Asia Energy Security Summit (AESS): A two-day annual summit focussed on strategic thinking on energy security and security of energy assets and attended by the finest minds from leading Asian nations for promoting regional energy co-operation. The summit receives participation from ministers, regulators, experts and think tanks who discuss diverse issues such as fuel supply chain, emerging areas in coal, oil and gas, and nuclear and renewable energy. (www.asiaenergysecurity.com)

Regulators & Policymakers Retreat (RPR): Four-day annual conclave in Goa of regulators and policymakers across Asia and the West. Thought-leaders and experts discuss and brainstorm on issues in the energy and power sectors covering relevant policy and governance topics and regulatory issues and convergence opportunities across energy infrastructure sectors. (www.ippairetreat.com)

State-level Conferences: Conferences organized in association with state governments and state electricity regulatory commissions for the benefit of investors, power producers and consumers. Government (up to the level of chief ministers), and state and central regulators deliberate on issues related to the development of power generation, transmission and distribution with key stakeholders in an informal setting. Topics include promoting competition, actualizing consumer choice, incentivizing renewable energy and energy efficiency, and addressing land and fuel issues. We also promote solutions which are of key interest to our members. We engage in a constructive dialogue between government organizations and our members.

Industry-level Seminars: Seminars and workshops where industry experts discuss opportunities for industrial and commercial consumers to purchase cheaper power. We focus on all aspects of the power market like trading of power, open access, procurement of cheaper power, etc. We cover both technical and legal aspects of the power sector market. We interact and engage with our clients to know the challenges and problems they face in power-related areas. We have an in-house technical and legal expert team that helps in drafting recommendations in the interest of our members. These recommendations are forwarded to ministries and government organizations at both central and state levels.

IRPRI: The 'IPPAI Regulatory & Policy Research Institute' (IRPRI), has been established to share knowledge and experience about the workings of the Indian energy and infrastructure sector among policymakers, regulators, and other stakeholders in the power sector as it undergoes constant evolution.

As a thought leadership platform IRPRI focuses on capacity building to catalyse development in the energy and infrastructure sector through knowledge enhancement. This is done by collaborating with academicians, industry experts and economists and conducting various training programs, seminars and workshops. (www.irpri.org)

Impacting Policy

IPPAI's path breaking initiatives are filed as recommendations to key decision-makers. IPPAI has been involved in the preparation and implementation of the electricity regulatory movement right from the beginning. Some examples where we have been an integral part of key decision-making in the Indian power sector are:

- ✓ IPPAI hosted over 15 workshops across the country to debate over the contents of the Electricity Act 2003. IPPAI was closely involved with parliamentary agencies prior to the finalization of the Electricity Act.
- ✓ IPPAI organized a four-city tour on the amendments to the Electricity Act 2003. IPPAI, after carefully evaluating all aspects of the proposed changes and implications on all stakeholders, submitted its report to the Standing Committee on Energy (2014-15).
- ✓ We worked closely with the CEA in determining the 8th & 9th 5 year plans.
- ✓ We strategized with various state governments on investment opportunities and were members of state advisory committees like Haryana and Maharashtra.
- ✓ IPPAI Director General was also the convener of the transmission sub-group formed under the advisory group and a member of State Advisory Committee of Maharashtra 2013.

USP

The fast-paced developments in the sector have opened new opportunities, prospects and business models, and potential for future growth in the sector on a sustainable basis.

Our conferences, seminars and summits attract a high-calibre audience of key decision-makers and opinion-makers across businesses and government, providing excellent opportunities for networking and branding.

Due to its unique neutral disposition within the sector, IPPAI is able to interact with regulators from a position of strength. Such interactions enable IPPAI to provide cutting-edge information on developments in the market and the emerging situation, much before anyone else can.

IPPAI continuously organizes a series of pivotal initiatives that are engaging and revelatory due to the nature of the topics under discussion and the presence of distinguished speakers and key decision-makers who participate in our forums.

Landmark Publications

- ▶ Can the “UI” Power Pool Create Competition in the Indian Electricity Market? (updated by IPPAI in 2012), 2006
- ▶ Captive Power Series - Towards 24 x 7 Power for India, 2008
- ▶ Legal & Tax Summit 2009 In Power, Oil & Gas, 2009 Focus: Latest Regulatory, Legal & Fiscal Developments, 2009
- ▶ Incorporating: Security Overview & Managing Business Disruption, 2009
- ▶ Impact of the Denial of Open Access on the Power Sector, Solutions & the Way Forward, 2009
- ▶ Special Focus: Case Studies Where Open Access has been Denied, 2009
- ▶ The Politics & Economics of Climate Change, 2010
- ▶ Powering India, S.L. Rao, 2011
- ▶ Energy Handbook for Regulators & Policymakers, 2011
- ▶ Ancillary Services & Alternative Energy Options (The Need for Regulatory & Policy Framework), 2013
- ▶ Empowering North-East India: Decentralised, Distributed Generation – Latest Developments and Policy Initiatives, 2013
- ▶ State of the India Power Sector, 2013-2014 Initiatives, Recommendations and Activities of IPPAI, 2014
- ▶ The Great Game of Energy: Asia Energy Security Summit, 2015
- ▶ The Epochal Shift in the Idea of India: Meeting Aspirations – RPR 2015
- ▶ Discussion Paper on Competitive Bidding in the Indian Power Sector, 2015
- ▶ IRPRI Module I on Regulatory & Policy Framework in the Indian Power Sector, February 2016
- ▶ IRPRI Module II on Renewable Energy and Challenges in Mainstreaming Infirm Power (Grid Integration of RE, Energy Efficiency, Ancillary Services), April 2016





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