FICCI

POWER TRANSMISSION
THE REAL BOTTLENECK

An overview of the Indian power transmission sector, its challenges, and recommendations

Knowledge Partner

booz&co.

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Contents

Foreword

India's Power Transmission networks constitute the vital arteries of the entire power value chain. It goes without saying that the growth of power sector is contingent to development of a robust and a non collapsible transmission network. Over the past decades, the total power capacity has witnessed commendable growth, with more than 232 GW of generation capacity currently installed in India. However, India's peak load supply is only 141 GW, and aggravating this situation further is that some of India's power surplus regions do not have adequate power evacuation infrastructure which could alleviate the recurring supply shortages in other parts of the nation.

While the issues related to Generation and Distribution sectors, rightfully, got due focus from policy makers to industry stakeholders, Transmission which is the critical link of power supply with no fall back option got downplayed due to multiple reasons. In light of this, FICCI constituted a Task Force on Transmission with participation from various key stakeholders including developers, contractors, reputed consultants, legal firms and regulators with primary intent of sensitizing the policy makers on prevailing problems which are hampering the growth of Transmission sector.

The inaugural report **"Power Transmission: The Real Bottleneck",** finalized after extensive discussions with our various industry partners carefully researches and documents the important findings pertaining to the reasons behind the slow growth of this sector. With a planned generation capacity addition estimated at 88 GW in the 12th Plan and improved generation with fuel issues getting sorted out for existing capacity, a corresponding increase in Transmission capacity is needed to ensure that power generated reaches the end consumer. More than 46% of the total investment required (in excess of Rs 2 lakh crore) has to come from private sector. Clearly, successful PPP in transmission would be vital to meet the huge investment & capacity enhancement target in transmission. The report highlights various reasons which currently saddle the pace of private investments in the transmission sector along with measures to address them.

We sincerely hope that the issues along with recommendations brought forth in this report will serve to highlight and provide key inputs to stakeholders towards resolving these important issues in an expedited manner.

Dr A.Didar Singh
Secretary General
FICCI

01. Executive Summary

India's GDP has grown by 6.3%[1] in 2011-12 and 5% in 2012-13 with the rise in industrial and commercial activity in the country. Disposable income has risen by 19.1% and population has increased by 15 million[2] in this period. With the growth in economy, energy demand has also seen a ~7%[3] y-o-y growth.

Despite having installed power generation capacity of 225 GW[4] and power demand of 135 GW (as of May 2013), India faced a peak power deficit of 9% (12 GW)[5]. Power shortages have adversely affected the country's economy. In 2012-13, power shortages in India accounted for a GDP loss of USD 68 billion (0.4% of GDP)[6], impacting multiple industries like agriculture, manufacturing, services etc. Improvement of this sector is essential for the economic well-being of the country and enhancement of the quality of life of citizens.

In the last 5 years, power generation capacity has grown by ~50%, whereas transmission capacity has increased by ~30%[7]. As per the 12th Five Year Plan, the future expansion in power generation capacity in India is planned around 88GW[8]. In order to meet this capacity, investment in the transmission sector needs to be increased. Overall, an addition of 90,000 ckm of 765-220 kV lines, 154,000 MVA of substation capacity and 27,350 MW of national grid capacity is required in order to meet the 12th Five Year Plan[9]. For this purpose, an investment of USD 35 billion is planned in the power transmission sector. Of this, about USD 19 billion is planned to come from Power Grid Corporation of India Limited[10]. The remaining USD 16 billion,~46% of the total investments, needs to be secured from private players.

As many as 120 transmission projects have faced delays because of the developer's inability to acquire land and get timely clearances from all stakeholders[11]. There have been instances of transmission lines being forced to take a different route than planned, resulting in the entire project budget going out of control. Power transmission constraints have also made it difficult to evacuate excess power and channel it to regions that face shortages. Projects have had to purchase power from costlier sources while others remained under-utilized. Hence, there is an urgent need to timely address underlying issues in the transmission sector to ensure power demand is effectively met in the future.

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[1] Worldbank Data
[2] Worldbank Data
[3] Central Statistical Organization, India
[4] CEA, as per May 31, 2013
[5] CEA, Load Generation Balance Report 2013-14
[6] Economic Survey of India, 2012-13
[7] Planning Commission
[8] CEA, Planning Commission
[9] Central Electric Authority
[10] PowerGrid Annual Report, 2011-12
[11] The Economic Times - 120 power transmission projects face roadblocks, 2011

India is one of the few countries where Transmission Sector has been opened up for private participation & has garnered significant interest from private players. The bidding framework is fairly comprehensive with provisions for majority of situations which may occur during the term. Introduction of Point of Connection (PoC) regime is a step in the right direction & has been appreciated by lenders and investors alike. Still, the success of other sectors, like generation, is yet to be replicated. Key policy changes which can pave way for robust capacity creation in the sector, based on experiences gained so far, have been highlighted below.

Time taken from **concept to commissioning**[11], 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. Currently, even if a developer is able to commission lines before the contractual COD (commercial operation date), revenues are realized from the contractual COD only. To ensure faster execution, it is recommended that provision for early commissioning incentives be made in the Standard Bidding Documents. Also, state owned utilities, such as PGCIL, whose order book (of Rs.1,20,000 crores) has reached saturation point, need to focus on fast track execution of projects during the next 3-4 years, and refrain from accepting new orders.

The **level of innovation and technology** in the industry must be upgraded considerably, thereby upgrading quality, speed and health and safety standards. Currently, no guidelines on use of technology are mandated and the focus is on lowest price for competitive bidding. This doesn't 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.

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 O&M undertaking through third parties.

[11] The Economic Times - 120 power transmission projects face roadblocks, 2011

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. The Planning Commission Transmission Services Agreement (TSA) and the TSA specified by the Ministry of Power have different clauses with respect to force majeure events.The TSA, as notified by the Ministry of Power has a clause which restricts consideration of any revocation or refusal to renew consents, clearances and permits as a force majeure event. The additional clause mandates approval of force majeure claims by a competent court of law. 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. In addition, an independent nodal body should be formulated to facilitate clearances, address grievances, track project status and enforce quality standards.

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 PGCIL. PGCIL 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 EC, PGCIL 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 PGCIL & in order to ensure fairness in the bidding process, an independent and impartial Empowered Committee without any representation from PGCIL 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.

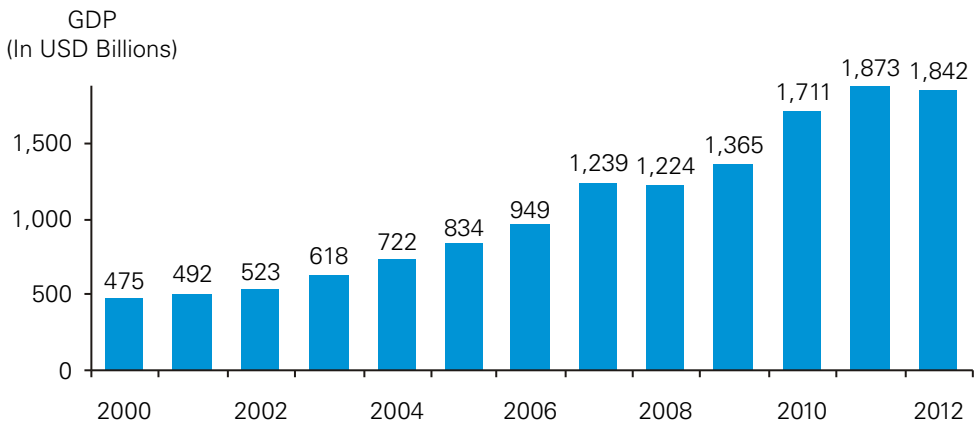
Immediate policy action is required from the MoP and CEA for reinvigorating the transmission sector. There is an urgent need to synchronise the policy framework with a new reality of wider participation by private players under competitive bidding regime. Earlier rules were designed to only cater to government companies under the cost plus regime. PPPs are a much needed catalyst in reviving this sector and in order to make this successful, policy reforms are necessary. Once PPPs are able to thrive successfully, we will be able to achieve the common objective of building the grid, meeting demand requirements and optimally utilizing generation capacity.

02. India Transmission Sector Overview

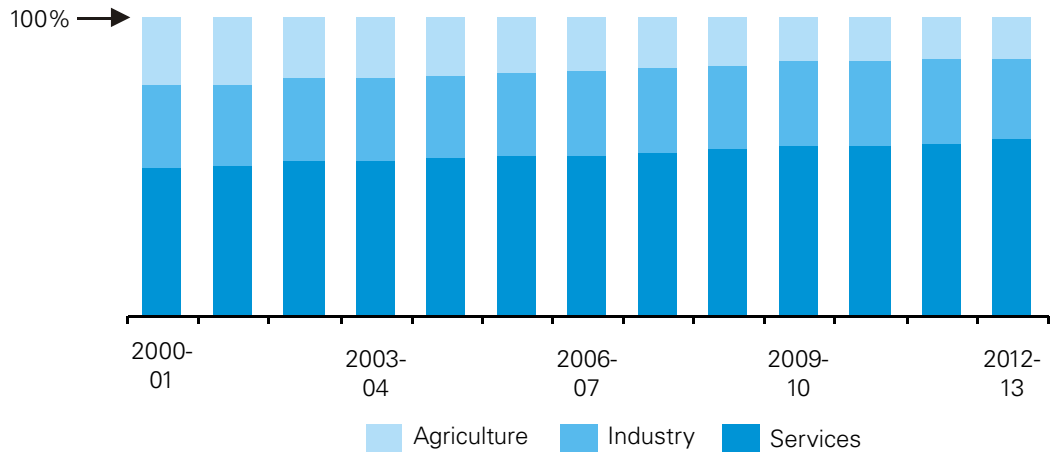
Transmission forms a critical link in the power sector value chain. India's power generation capacities are unevenly dispersed across the country creating an imbalance between the distribution of power demand and supply centres. Growth in industrialization, increasing per-capita income and rapid urbanization **(Figure 1)** has led to a ~50% growth in the installed power generation capacity over the last 5 years. However, transmission capacity has grown only by ~30% **(Figure 2)**.

Figure 1: Growing Economy[12]

Growth in Real GDP

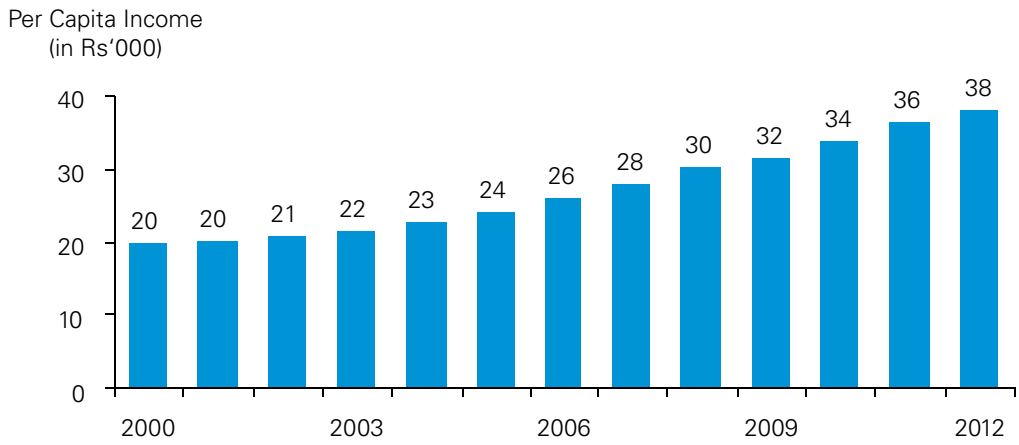


Growing industrialization.



[12]Indiastat, Booz & Co. Analysis

Increasing per capita income.



Rapid urbanization.

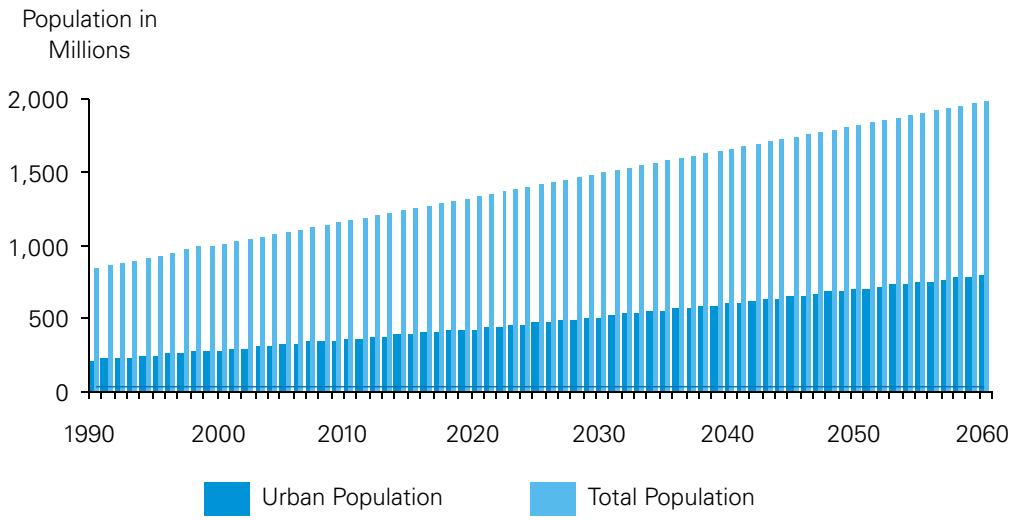
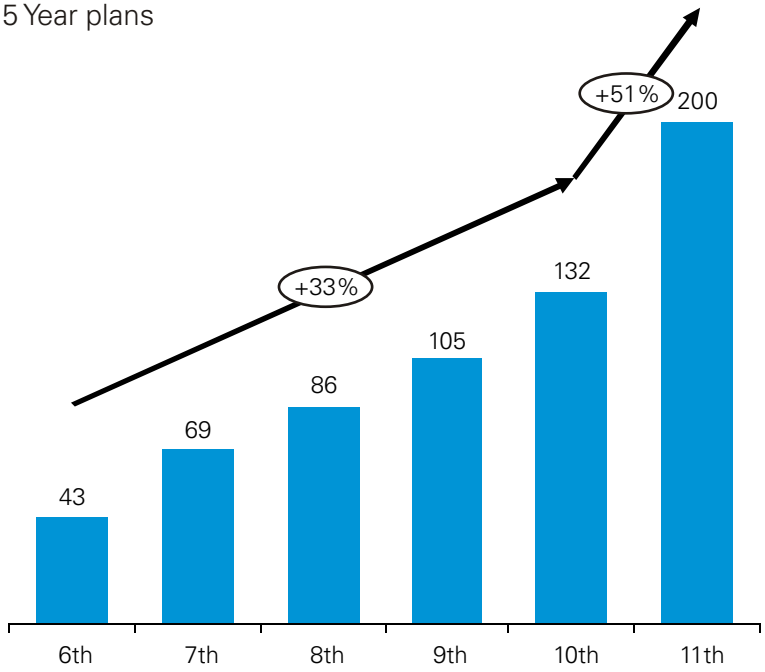
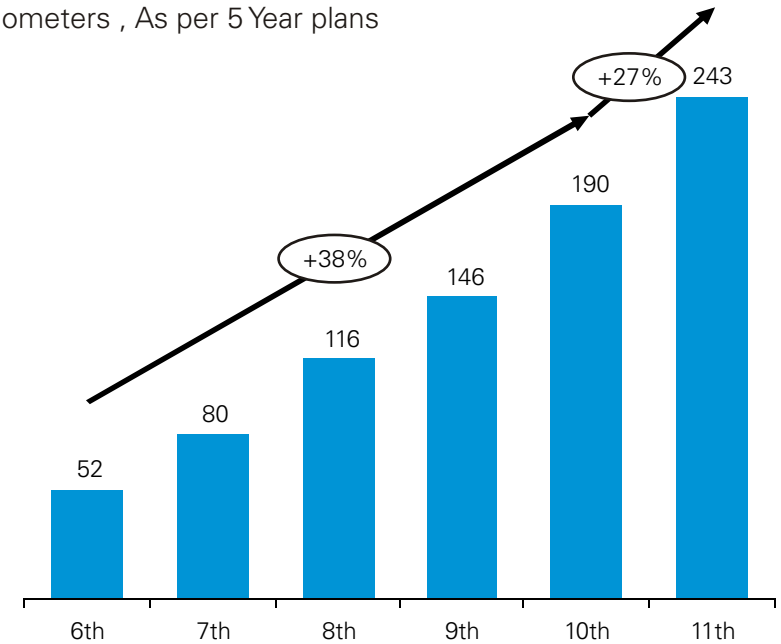


Figure 2: Historical trends in Generation vs. Transmission Capacities[13]

Installed Power Generation Capacity
In GW, As per 5 Year plans



Transmission Line Network Strength
In '000 Circuit Kilometers , As per 5 Year plans

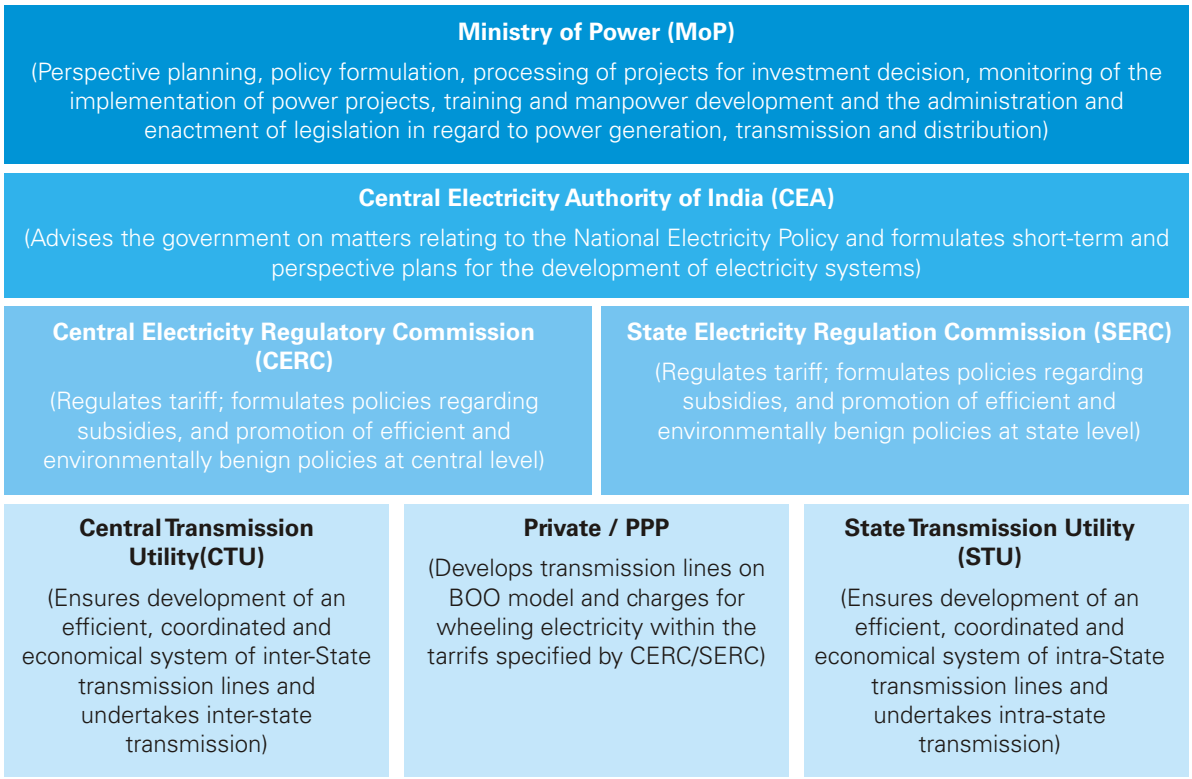


[13] Planning Commission

2.1 Current Market Structure

Both central and state governments are responsible for the development of electricity sector in India. The market structure for power transmission is as shown in Figure 3. Powergrid is the Central Transmission Utility (CTU) and is responsible for wheeling of power generated by Central Generating Utilities (CGUs) and inter-state Mega Independent Power Producers.

Figure 3: Current Transmission Market Structure



The country has been demarcated into five transmission regions viz. Northern, Eastern, Western, Southern and North Eastern. The Northern, Eastern, Western and North Eastern regions have been synchronously interconnected and operate as a single grid – National Grid. The Southern region is asynchronously connected to the National Grid through HVDC links. By January 2014, the southern grid is also expected to be connected to the existing national link synchronously.

Each of these five regions has a Regional Load Despatch Centre (RLDC), which is the apex body, as per the Electricity Act 2003, to ensure integrated operation of the power system in the concerned region. In addition, there is an apex body at the national level called the National Load Despatch Centre (NLDC) to ensure integrated power system operation in the country. The NLDC and RLDCs together form a part of the Power System Operation Corporation Limited (POSOCO),

which is a wholly owned subsidiary of Power Grid Corporation of India Limited (PGCIL). As a major move, a committee[14] was constituted in August 2008 by the Ministry of Power had recommended that ring-fencing of Load Despatch Centres must be done. The objective was to ensure that Load Despatch Centres have functional autonomy, independent and sustainable revenue streams, and are adequately staffed with people having the right skills, equipment, and incentives to deliver. However, even after concrete recommendations by the committee, five years have passed and no concrete action has been taken on this front.

The transmission system has to meet the firm transmission needs as well as the Open Access requirements. The Long term access gives the transmission system flexibility to cater to generation capacity additions in future. The Short Term Open Access facilitates real-time trading in electricity and leads to market determined generation dispatches.

2.2 Evolution of Transmission Sector

Indian power sector remained closed to private investments till 1991. Power generation was opened up for private participation in 1991. The Electricity (Amendment) Act, 1998, defined transmission as a separate activity and led to the creation of the CTU (currently PGCIL) and STUs. The Regulatory Commission Act, 1998, mandated the setting up of an independent regulatory mechanism at the central (CERC) and state levels (SERCs).

Electricity Act, 2003, further rationalized the approach for privatization of the power sector. For transmission sector, some projects were to be earmarked for Tariff Based Competitive Bidding (TBCB). CERC and SERCs would grant licenses for building, maintaining and operating transmission lines. Both, private players and public utilities (PGCIL, STUs) could participate in the bidding individually or through joint ventures.

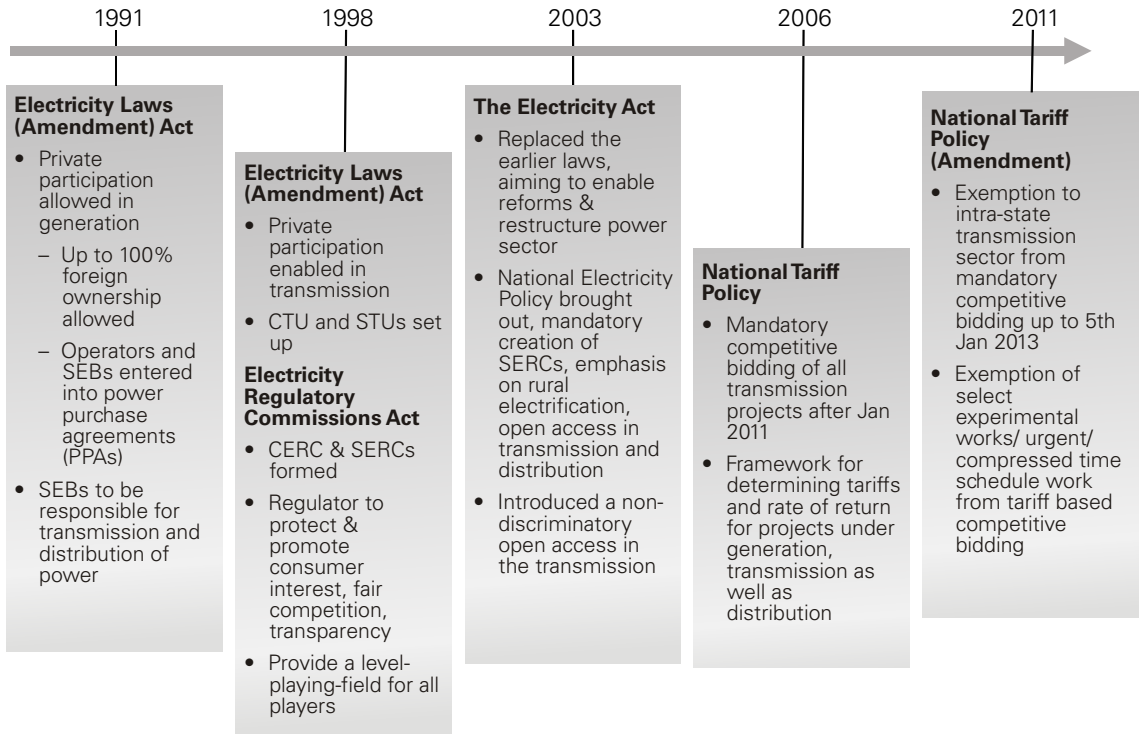
The Transmission Network Plan was created detailing out new projects, up-gradation of existing lines and the required specifications. A multi-stakeholder empowered committee would identify projects to be developed and would reward projects after the evaluation of bids. CEA would monitor the progress of projects as per the CERC's guidelines.

National Tariff Policy 2006 introduced mandatory Tariff Based Competitive Bidding (TBCB) for all transmission projects with the objective of promoting competitive procurement of transmission services, encouraging greater investment by private players in the transmission sector and increasing transparency & fairness in the process. In addition, the policy further pushed to make the power sector not only financially viable but investment worthy. It restructured the tariffs and guaranteed a 16% rate of return on investments made between 2001 and 2004, and 14% return on investments made after 2004[15] **(Figure 4)**.

[14] Chaired by Addl. Secretary, MoP, Shri Gireesh B. Pradhan, (vide order no. 6/2/2008)

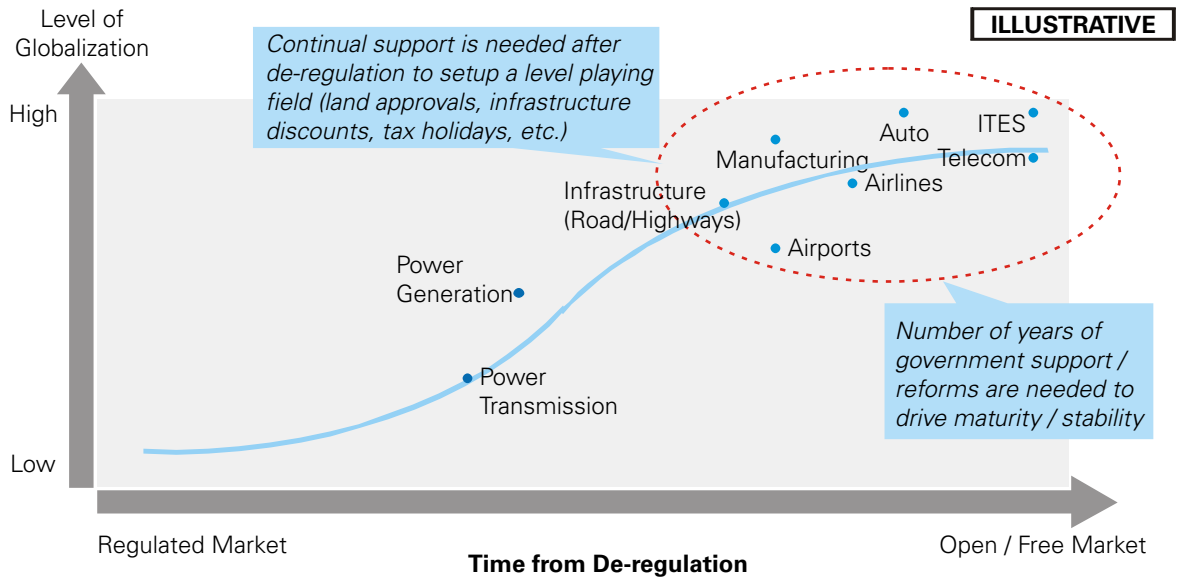
[15] CEA - Status of implementation of progress of reforms under National Tariff Policy 2006

Figure 4: Major Milestones in Indian Transmission Sector



Currently, the Indian transmission sector is in the early stages of globalization compared to other sectors like ITES, Telecom etc. **(Figure 5)**. Many private players, ranging from power generation companies like Adani, GMR, etc. to EPC and infrastructure companies like KEC, Isolux, etc. are entering the sector. However, progress in the sector is hampered by various challenges.

Figure 5: Deregulation/Globalization across Sectors in India



03. Enormity of the Problem

3.1 Deficiency in Current Transmission Capacity

Despite having more than 225 GW[16] of installed generation capacity in 2012-13, India continues to be power deficit. One of the major reasons for this situation is the inadequate transmission capacity, not matching the generation capacities and load requirements. Unlike infrastructure sectors like the road network, where substitutes like rail, ship, waterways, airways, etc. are available, no such alternative to the transmission lines exist in the power sector. With the sole exception of captive power, cross country transmission lines ferry every unit of the power generated in the country.

In 2012-13, domestic power exchanges Indian Energy Exchange and Power Exchange of India failed to consummate sales-purchase deals worth Rs.1,350 Crores[17], amounting to 15% of total traded volume of power, due to transmission constraints.

Power evacuation is turning out to be a bigger problem than power generation for the country. Plants supplying electricity to state electricity boards (SEBs) under long term power purchase agreements (PPA), lost 1.93 billion units[18] of generation due to transmission capacity bottlenecks. Based on the current supply position, Northern-North Eastern-Eastern-Western (National Grid) region is surplus to the extent of 2.3% of total regional demand during peak hours; while, the Southern region is anticipated to face a peak-time shortage of 26%[19] of regional demand in 2013-14. However, the power transmission constraints do not allow for the Southern grid's shortfall to be met by the surplus in the National grid.

Resource rich states like Chhattisgarh are also unable to evacuate the excess power. With an expected power generation capacity in excess of 30,000[20] MW by end of 12th plan, against the state's peak demand requirement of about 3,300 MW, currently there is only 7000 MW of transmission capacity available to evacuate power from the state. With a typical transmission project requiring ~4-5 years to get commissioned & inordinate delays expected in securing forest clearance in the region, it seems that the number of projects running below capacity, owing to transmission bottlenecks, will only increase in the near future.

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[16] CEA, as per May 31, 2013

[17] The Financial Express - Infra woes trip transmission despite power-surplus oases, 2013

[18] The Financial Express - Infra woes trip transmission despite power-surplus oases 2013

[19] CEA – Load Generation Balance Report 2013-14

[20] IBEF Report 2013

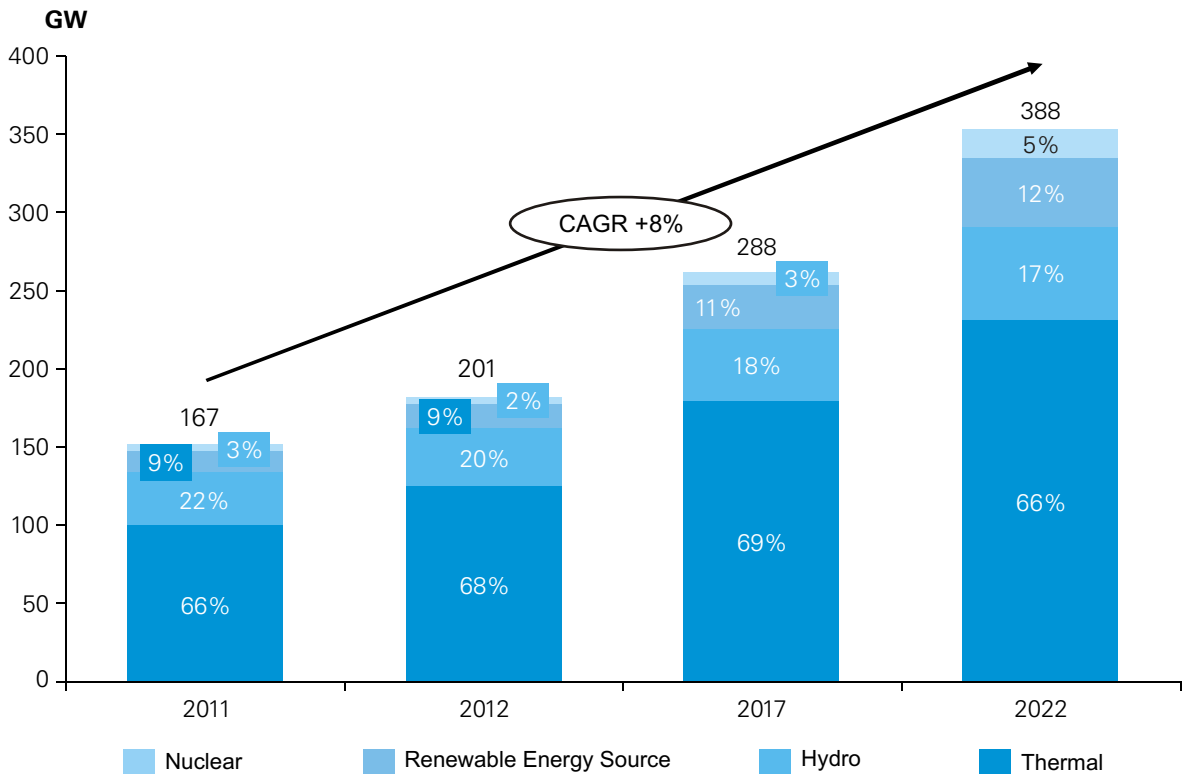
Even within a state boundary, choked transmission networks are leading to underutilization of generation capacity. For example, in 2011-12, wind energy generation sites in Tirunelveli and Udumalpet, Tamil Nadu, with cumulative installed capacity of 6,943 MW, ran below capacity, as the transmission capacity available was only 4,997 MW. This under-utilization of the sites meant an annual opportunity loss of 559.03 MU. In addition, the state had a net deficit of electricity and had to purchase power from costlier sources[21].

Going forward, the demand side capacity is expected to further increase with the industry moving towards Open Access. Open access will allow every end-user of electricity in the country to choose from all available transmission lines, thereby increasing transmission load across the country. If India's transmission capacity is not timely augmented, this problem is expected to further aggravate.

3.2 Delays in Future Transmission Capacity Addition

With the installed power generation capacity planned to increase to 388 GW[22] by 2022, transmission sector will need to do quite a lot of catching up **(Figure 6)**. However, one of the major reasons for delays in new capacity addition is Right-Of-Way (ROW) issues.

Figure 6: Planned Generation Capacity Additions



[21] The New Indian Express - Power transmission losses dip during 2011-12

[22] Booz & Company analysis

Though the Electricity Act, 2003 empowers the licensee with the Right of Way (ROW) under the Telegraphic Act 1885, it is rarity for a transmission project to be executed without any delays in land acquisition or getting the ROW. In 2011, Central Electricity Authority (CEA) estimated that more than 120[23] transmission projects faced delays because of the developer's inability to get ROW or acquire land and get timely clearances from the host of stake-holders like forest department, aviation department, defense, and PTCC (Power and Telecommunication Coordination Committee). In the same year, PGCIL had challenges in spending its planned Rs.6000 Crores[24] in capital expenditure, for the construction of the inter-state transmission lines, primarily because of the hurdles in land acquisition & ROW problems.

At times, transmission lines are forced to take a different route altogether, leading to the whole project plan to go astray. For example, Kerala government is planning to take an alternative route on the Edamon - Pallikkara stretch for the 310-km-long transmission corridor to evacuate power from the Koodankulam Nuclear Power Project (KKNPP). Currently the 170 km stretch on the corridor is stalled because of lack of ROW clearances. This is expected to seriously delay project & also result in unforeseen increase in project cost[25]. Recently, protest by one land owner delayed crucial India-Bangladesh transmission link by more than four (4) months[26]. Ministry of Power acknowledges ROW as a critical issue and emphasizes its importance in developing a national grid[27]. In addition, planning guidelines issued by CEA for the transmission sector also emphasize on ROW being a major impediment in setting up new lines.

3.3 Future Investments & Adverse Spiral Effect

Despite USD 75 Billion[28] worth of investments being planned for the next two Five Year Plans (12th and 13th), the investments in the transmission sector are still not adequate. For every dollar invested in power generation, at least 50 cents should be invested in power transmission. In India, this ratio stands at 30%[29]. To make up for this investment deficit, India needs to invest more than 0.5 times of the future investments made in generation into transmission. Also, as per the 12th Five Year Plan, the investment required in the power transmission sector is about USD 35 billion[30], out of which about USD 19 billion[31] is planned to come from Power Grid Corporation of India Limited. The remaining USD 16 billion (~46% of the total investments) would have to be secured from private players. Over and above these planned numbers for the 12th Five Year Plan, in order to ensure **true** open access in the future, the investment required may increase manifold[32]. This makes it extremely important to ensure PPP projects in the power transmission sector are successful in the long run. In spite of taking significant steps to

[23] The Economic Times - 120 power transmission projects face roadblocks, 2011
[24] MoneyControl - Power Grid seeks Telegraph Act amendment to ease land buy, 2012
[25] The New Indian express - Kerala yet to fill gap to claim share of KKNPP power, 2013
[26] The Indian Express - One tower standing in way, PowerGrid quietly sealed Bangla deal
[27] Ministry of Power - Annual Report (2009 – 10)
[28] Booz & Company Analysis
[29] The Financial Express - Infra woes trip transmission despite power-surplus oases, 2013
[30] Ministry of Power, CEA
[31] Power Grid Corporation of India Limited Annual Report 2011-12
[32] IPPA: National Power Beltway

encourage private players to invest in the sector, the response has been relatively lackluster. Projects have faced various implementation challenges with tariff setting and adjustments, regulatory disputes, ambiguous contracts, hasty allotment of contracts leading to re-negotiations, and unequal risk sharing. It is therefore, the need of the hour to learn from other sectors & countries and reform policies so as to ensure greater private participation in the power transmission sector.

Additionally, the installed transmission capacity in India is depleting, therefore necessitating strengthening and upgradation of installed infrastructure. India suffered the world's biggest-ever power outage in July 2012 as transmission networks serving areas inhabited by 680 million people collapsed. The grid failure affected 18 states and two union territories in north and eastern India, bringing trains across large stretches of the country to a halt, forcing thousands of hospitals and factories to operate on generators, stranding hundreds of coal miners underground and causing losses to businesses estimated in the hundreds of millions of dollars[33].

Apart from upping the investment levels, project execution and completion is another area of concern. The 11th Five Year Plan (2007-12) had the target of increasing inter-regional transmission capacity of 32.6 GW. Only about 85% (27.8 GW) of it could be achieved by 2012[34]. The Ministry of Power has set an ambitious target of building the world's largest transmission network spanning across 140,000 ckm by 2017 from the current capacity of 100,000 ckm[35]. In the first quarter of 2012-13, only 70% of the targeted 4551 ckm could be achieved[36].

Without serious & timely reforms in the transmission sector, the country runs the risk of an adverse spiral effect on rest of the power sector and the economy. Current level of power shortages is estimated to account for a loss of US$3.4 billion in generation capacity, which is equal to a GDP loss of US$68 billion (0.4% of GDP) [37]. This may hamper the private investment inflow into the sector. Growth in agriculture, manufacturing and services sector will also be impacted. This stagnation in growth can have serious implications on the country's socio-economic stability. As a first step towards these reforms, it is important to identify the current challenges in the sector and develop suitable solutions for the same.

[33] Wall Street Journal, 'India's Power Network Breaks Down'

[34] IEA – Understanding Energy Challenges in India - 2012 – Pg. 38

[35] Mint - Govt aims to build world's largest transmission grid by 2017

[36] Renew India - India Power Sector review, 2012

[37] Economic Survey of India, 2012-13

Challenges & Potential Recommendations |4

04. Challenges & Potential Recommendations

The transmission project cycle consists of 5 main phases, as mentioned below. There are different challenges associated with each phase:

1) Attracting Players
2) Planning & Project Award
3) Project Execution
4) O&M
5) Exit

Based on the analysis of all phases of the transmission project cycle, certain key challenges have been identified **(Figure 7)**. These challenges are the major causes for the problems prevailing today in the transmission sector.

Figure 7: Challenges faced across the transmission project cycle

Attracting Players	Planning & Award	Project Execution & Commissioning	O&M	Project Exit
• Relaxed qualification requirements • No requirements on technology & innovation, HSE in the bid document	• Under-utilization of resources / technology during planning • Lengthy conceptualization & award phase • Overburdening of PSUs with projects	• Difficulty in obtaining ROW/ forest clearances • No impetus on technology & innovation • Lack of transparent redressal (unforeseen) mechanisms • No incentives for early commissioning	• No impetus on technology & innovation • Limited O&M capabilities	• Failure to attract FDI • Discouraging holding requirements

4.1 Project Planning

Power transmission is already a bottleneck in the flow of power from the power surplus regions to the power deficit regions. In the last 5 years, transmission capacity has grown by ~30%, as compared to ~50% growth in the power generation capacity, leaving for significant ground to be covered by the transmission sector[38].

[38] Planning Commission, Booz & Company Analysis

To successfully accelerate the development of transmission sector, project planning needs to be lean and optimal. However, there are major issues related to the slow pace of project commissioning and sub-optimal utilization of critical resources like land and Right of Way that have slackened the growth in transmission capacity.

4.1.1 Issues

4.1.1.1 Concept to Commissioning (C2C) time is significantly high

An important factor for this slower rate of growth is the long process time for concept to commissioning (C2C). In the current system, average time for C2C is about 60 months[39] **(Figure 10)**.

Figure 8: Major steps in the project cycle (C2C)

Almost one-third (20 months) of this 5 year period is taken in the process of awarding the projects to the developer.

- It takes 3 months for a project approved in Standing Committee (SC) to come to Empowered Committee (EC).
- Then, post approval in EC it takes 8 months in finalization of the structure of the project, formation of SPV by Bid Process Coordinator (BPC), appointment of a consultant and publishing of RFQ.
- Following this, Bid Process Coordinator (BPC) carries out a survey, evaluates technical bids, and publishes RFP & invites financial bids. BPC takes ~9 months in this step.
- Then, a developer is awarded the project and the execution takes about 40 months. There is significant scope to compress the planning process and reduce redundant steps, cutting short the commissioning time.

Besides this, the current incentives for a developer are not aligned to the objective of faster execution of the project. If a developer is able to commission lines before the contractual COD (commercial operation date) – revenues can flow in from the contractual COD only. This leaves the developer with little motivation to speed up the development phase of the transmission line, which ultimately results in delays.

[39] Sterlite Grid's Analysis based on interaction with PFC/ REC

4.1.1.2 Delay in Commissioning of Projects Under Cost-Plus Regime

PGCIL, the state-owned Central Transmission Utility, has been mandated with the development of inter-state transmission lines on a cost plus basis. After 5th January 2011, procurement of transmission has been made mandatory on competitive bidding basis, except for urgent projects which are required within a 2-3 year timeframe, which continue to be done on a cost plus basis. So far, under this route, PGCIL has been allotted projects aggregating to Rs.1,10,000 crores, which need to be executed over the next 4 years.

For faster execution, due regard should be given to the execution capability and track record of state owned entities at the time of planning. PGCIL, so far, has demonstrated a capacity to execute projects up to Rs.17,000 crores per year at best. Going by this track record, it would be in a position to execute projects worth only Rs. 68,000 crores in the next 4 years. This would leave a huge gap of around Rs.25,000 crores between the expected and actual investments in transmission. An analysis of PGCIL's execution of its current order-book reveals that PGCIL has been taking 60-72 months in completing projects. For instance, projects worth Rs 40,192 crore started by PGCIL before 31st March 2009 are only 71% complete as of 30th April 2013. Similarly, projects worth Rs 8,015 crore started in Financial Year 2009-10, are only 55% complete.

Even though the execution capacity of PGCIL is constrained, it continues to add projects to its order book. The projects added are a combination of urgent projects granted on a cost plus basis, projects won under tariff based competitive bidding and projects secured on JV basis from the states. During FY13 itself, PGCIL has added projects worth Rs.5,000 crores won under competitive bidding and Rs.8,800 crores secured under JV basis to its order book. The project execution timeframe, though fixed by the grid planners as 3 years, might eventually end up extending to over 6 years as PGCIL's execution capability has already reached saturation point.

4.1.1.3 Sub-optimal planning is leading to under-utilization of resources

4.1.1.3.1 Lack of targeted planning for short, medium & long term transactions

At present, the transmission planning process takes into account only long term access (LTA) commitments with no capacity plans for medium term or short term transactions. Moreover, the bidding process is becoming highly prescriptive in lieu of the shift from Case 1 to Case 2 bidding and being based on long term objectives, does not take market realities into account. This coupled with the increase in short & medium term transactions post the Electricity Act of 2003 results in inadequate transmission capacity leading to stranded generation on one hand and unserved loads on other.

Lack of differentiation between short and long term objectives extends to similar treatment of long term and short term access applicants. Under present regulations, a Generator with Long Term Access (LTA) but lacking long term PPA is treated at par with short term access applicants leading to a delay in obtaining transmission rights. This results in stranding of generated power despite regular payment of LTA charges by the Generator.

Further, in case if a contract with a Generator is frustrated despite possession of a long term PPA with ISTS having been developed in accordance with the same, the Generator is unlikely to be able to supply power to third party customer because of transmission constraints.

4.1.1.3.2 Insufficient focus on up gradation of existing transmission lines

Transmission lines utilize many natural resources, like land and forest cover, as they traverse across the country. Presence of a transmission line reduces the commercial value of the land to almost nil as it can't be put for any alternative commercial use, often leading to protests from the land owners. It also affects the nearby eco-system, more so while passing through the forest cover.

Land and forests are scarce resources of prime importance for the nation and expanding the transmission network will only demand more of them. For implementing the transmission lines / sub-stations identified under the 12th Plan, the overall land affected would be about 1.4[40], million acres - Equivalent to area of state of Sikkim.

Since acquiring new land is complex and usually marred with delays and uncertainties, it is extremely important to utilize the existing land, forest cover, and RoW optimally.

Hence, a better alternative to laying out new lines (in many cases) could be to upgrade the existing corridors to higher voltage or to re-conductoring the lines to higher capacity conductors. However, due consideration is not given to them before planning a new corridor under the current guidelines.

4.1.2 Recommendations

4.1.2.1 Prune the Concept to Commissioning time to ~40 months

There is potential to reduce the conceptualization-to-award process from ~21 months to ~5-6 months under the competitive bidding framework. Additionally, the Ministry of Power can save ~5-6 months from the project development time by acquiring some key clearances in parallel to the project bidding phase. Following changes can be enforced across the process chain to expedite the commissioning of the project

- CEA/Empowered Committee (EC) should ask BPC to release RFQ within 1 month of approval by EC. Most of the bid documents are already standardized and significant time (~7 months) can be saved in this step
- Pre-qualification process should be held annually, rather than on the project to project basis. Up to 3 months can be saved by cutting down the redundancy of evaluating the same technical bid by a developer for different project, differently each time. NHAI also conducts qualification bids on annual basis and has saved significant time in awarding of

[40] 12th plan envisages building 1,00,000 ckm of transmission lines. Average span (width) assumed at 70 m.

the projects

- Bids should be awarded within 3 months of approval by EC. Currently, this process takes about 17 months
- Route surveys should not be conducted by BPC. As all the developers conduct their own surveys, citing data quality issues in the BPC's surveys, this exercise can be avoided altogether. This will avoid ~3 months lost in carrying out the survey.
- Pre-approvals should be awarded to the SPV by the Ministry of Power (MoP). Currently, the developer has to apply separately for section 164 and other statutory approvals to the MoP. Allowing these approvals to be obtained in parallel to the bidding process and can save 3-6 months, as already done to some extent for Ultra Mega Power Plants (UMPP)

With these changes, time for commissioning of the project could be reduced by one-third, from ~61 months to ~40 months and even lesser (18-24 months) for urgent projects. This recommendation should be implemented within next quarter with high priority with support from CERC, Ministry of Power, CEA, and Bid Process Coordinators (REC/PFC).

4.1.2.2 Reduce concentration of projects with PSUs

State owned utilities such as PGCIL need to solely focus on speedy implementation of its current order book (of Rs.1,20,000 crores) for the next 3-4 years. Before granting new projects to state owned utilities, Grid Planners should give due regard to the project execution capability and the current order book of the utilities and practice judicious allocation in awarding new projects, until utilities are able to complete projects within the stipulated time on a consistent basis. In case of UMPP, Standard Bidding Documents (SBD) do not allow a developer to participate in a bid if the developer has three UMPPs (equivalent to an investment of Rs 60,000 crore) in pre-commissioning stage. This is a welcome move.

It is recommended that CEA and CERC monitor the order book / project implementation capacity of state owned utilities, such as PGCIL, before allocating more projects to it. MOP can issue a guideline to this effect.

4.1.2.3 Incentivize early commissioning and speedier execution

Policy guidelines should make a shift towards incentivizing the faster commissioning of transmission projects. Early commissioning bonus should be included in the RFP and TSA. In case a line is commissioned before the contractual COD, the developer should be allowed to declare CoD and be eligible to earn early tariff for the same. Early commissioning and hence early tariff should be allowed for a period of upto 6 months before the contractual CoD. Funds from Short Term Open Access (STOA) Pool can be used to reward early commissioning of projects.

These incentives are the norms across other infrastructure sub-sectors like roads, metro, ports, power generation, etc. and have worked well to ensure speedy commissioning. Even PGCIL

gets incentives for early commissioning of its' projects. These norms should be made part of the Standard Bidding Documents (SBD) by the SBD Modification Committee (comprised of MoP, PFC, REC), possibly within the next 3 months.

4.1.2.4 Focused planning for short and medium term transactions

The planning process needs to account for market realities so as to provide flexibility to buyers and sellers. Instead of being based on just the LTA applications, transmission system should be planned based on potential generation areas and load projections such that transmission highways creation leads generation.

4.1.2.5 Differentiation between long term and short/medium term applicants

Regulations need to be clarified/ modified so that Generators applying for long term applications are given preference over short and medium term applicants. In case a Generator has taken long term transmission access but does not have a long term PPA, transmission access should be given ahead of medium term and short term access applicants.

4.1.2.6 Use of High Performance Conductors in Existing & New Lines

Use of High Performance Conductors (HTLS: High Temperature Low Sag) needs to be taken up to increase power transfer intensity. In 2012, a leading Indian conductor manufacturer collaborated with CTC Cable Corporation to re-conductor an existing 132 kV line in Ahmedabad[41]. The new line with ACCC (Aluminium Conductor Composite Core) conductor doubled the capacity of the existing transmission line, without modifying or reinforcing the existing lattice towers[42]. Israel Electric Corp (IEC) also upgraded a major part of its transmission network to HTLS (High Temperature Low Sag) conductors, increasing the circuit capacity by an additional 40% to 50%[43].

Possibility of upgrading an existing power transmission corridor on the same route should be mandatorily explored before conceptualizing a new line. Upgradation and re-conductoring of existing lines can save valuable time, cost, RoW, and forest cover. This would also mean lesser delays, and faster commissioning at a much lower cost to the nation.

Re-conductoring takes much lesser time (~6 months), as compared to creating a new parallel corridor (~4-5 years). It also increases the power intensity without utilizing any incremental land. PGCIL upgraded the 220kV D/C Kishenpur-Kishtwar line in Jammu and Kashmir to 400 kV, resulting in significant increase of power transfer capacity with about only 5.7% increase in the ROW[44] (from 35m to 37m).

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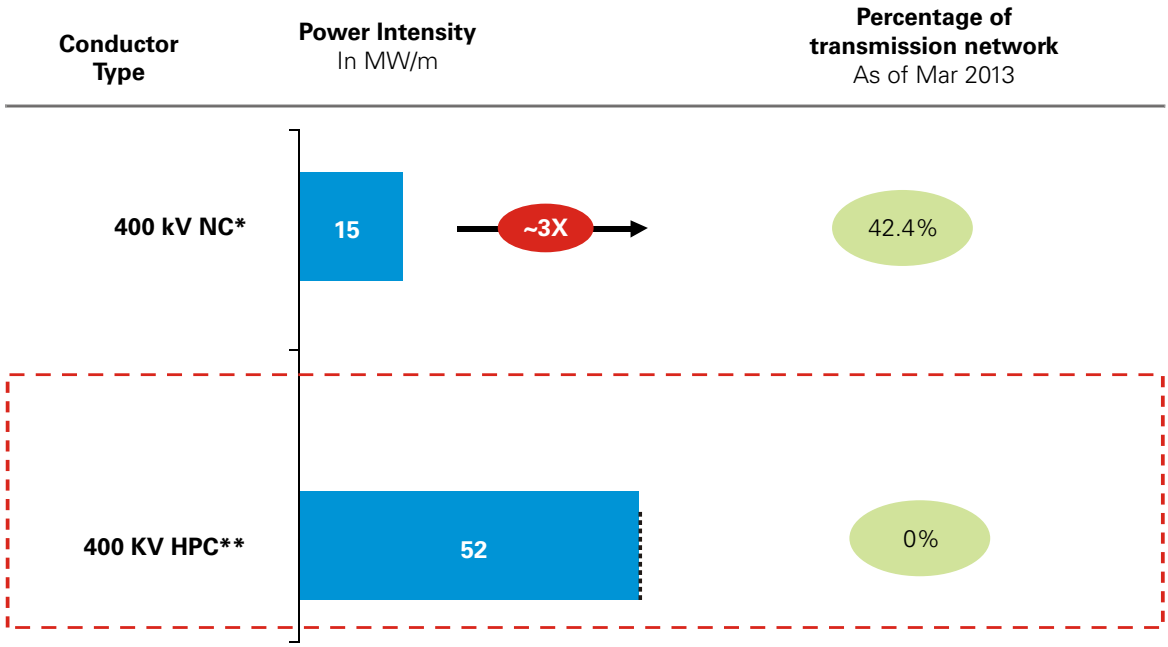
[41] Press Release - http://www.ctcglobal.com/news/new-transmission-line-energized-in-india

[42] Torrent Power LTD energizes CTC Global's first ACCC transmission line in India

[43] T&D World Magazine - Less Sag, More Power: Israel Refurbishes Transmission Lines, 2013

[44] PGCIL - Transmission and Distribution in India Report, Booz & Co. Analysis

Figure 9: Comparison of power intensity across conductor type



NC* - Normal Conductor, HPC** – High Performance Conductor

An analysis of POSOCO data reveals details of 28 transmission lines aggregating around 2,900 ckms (across 220 KV and 400 KV) which are severely over-loaded and for which alternatives (in terms of capacity enhancement) are urgently required. Upgrading these lines with HPC can provide immediate solutions to the problems of over-capacity within a relatively short period of time without any major changes in the transmission network. The details of the 28 lines are as provided in Annexure II.

Both, upgradation or re-conductoring of existing lines, are technically and economically viable alternatives to setting up new lines. They also ensure minimum environmental impact and efficient utilization of national resource (Land, RoW, and Forest), while reducing timelines and remaining compliant to the international design standards.

Team from CTU and CEA needs to ensure that an exercise which explores the possibility of re-conductoring/upgradation of existing lines is mandatorily carried out before new projects are being planned and approved. The transmission planning criteria needs to be changed to this effect. This recommendation needs to be implemented with priority within the next 3 months.

4.2 Technology and Innovation

Key steps in the development of a transmission line are survey, tower design, type testing, laying of the foundation, supply of the material, erection of the towers, and stringing of the lines. Of these, tower design, supply of conductors and material amount for 80-85% of the total costs

and effort. The processes and methods being used in India take up considerably more time and money than the best in class practices available globally. While the average time for commissioning is lesser in other western countries like US, UK, etc., it takes ~4-5 years in India to develop a project following the acquisition of the SPV. Even comparable developing nations like Brazil, China take considerably lesser time in developing a project.

This low level of mechanization not only considerably slows down the processes, but also has serious implications on quality, speed, and safety of the workers. However, issues like micro-managing specifications and not giving developers a free hand on the innovation affect the usage of technological methods in transmission in India. Four key areas where technology can be used while implementing projects are:

I. Survey
II. Tower design
III. Selection of Conductor
IV. Mechanized construction methods

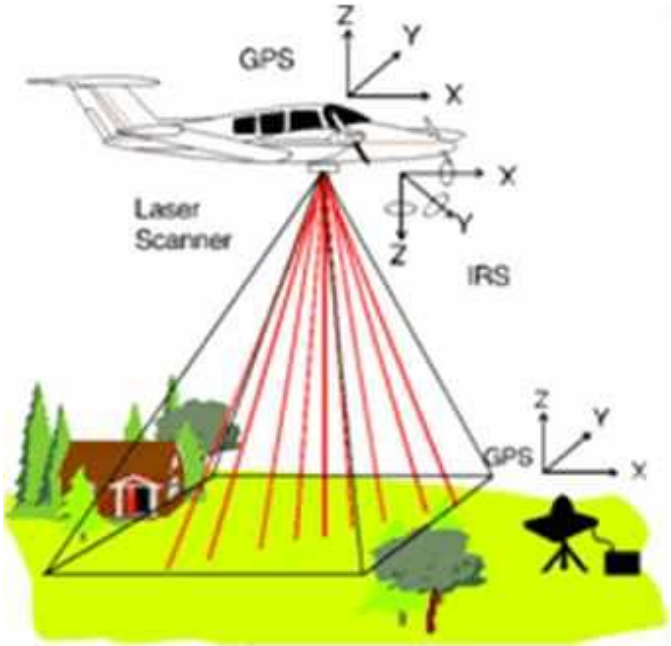
Standard bidding documents currently allows flexibility with respect to Survey and tower design; while provisions of bidding document restrict flexibility with respect to Conductor selection and no specific incentives exist to promote mechanized construction methods. The following section describes these four areas in greater detail:

I. Survey

There is considerable amount of technology already in use by private players while undertaking survey for projects. Transmission Line route optimization through LiDar survey is one of the advanced technologies adopted globally. Light detection and ranging technology is deployed to conduct topographic mapping and functions well in cloudy conditions and can penetrate through dense vegetation as shown in figure given below.

To overcome the limitations of manual survey, for the first time in India, a leading private sector developer used the LiDAR survey for transmission line optimization for two of its BOOM projects i.e. Bhopal–Dhule Transmission Company Ltd. (BDTCL) and Jabalpur Transmission Company Limited (JTCL). LiDAR survey clubbed with PLS CADD allowed the transmission line engineers to evaluate several alignment options, including the cost of construction which eventually helped in finalising an alternative, which was both cost-effective and time efficient.

Figure10: LiDAR Survey



LiDAR is a very effective process. Its usage offers more benefits in terms of resource saving (both time and money). One of the key principles of line optimization is to increase the span by using extensions as per accurate terrain condition and minimum ground clearance requirement. It can also provide solutions for real time RoW problems on the ground

II. Tower Design

Private developers have used technology effectively in designing towers optimally. One such example being Green towers. It involves designing towers which use the least amount of steel and other metals, but have the same capacity. In addition, lighter towers yield the following benefits for the environment:

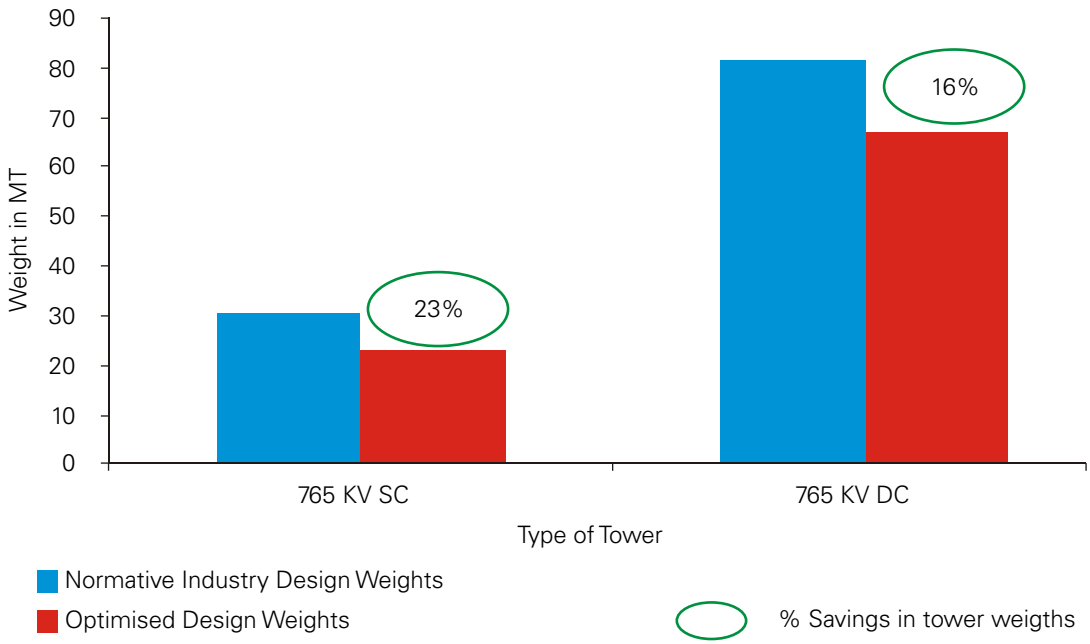
a. Lesser steel and other metals required for towers results in lesser carbon emissions in metal production

b. Lighter towers require lower volumes of civil foundations and hence result in lesser quantities of cement and other construction material. The above results in lower carbon footprint.

c. Lighter towers require lower land footprint and results in lower land / Right of Way footprint and conserve land for alternative commercial use.

Due to design innovations by one of the largest private sector developers, the following has been achieved so far:

Figure 11: Savings in tower weights due to design innovations



As seen in the above table, the private sector developer's type tested towers have been able to achieve a lower carbon footprint (on an average by 15-20%) as compared to the similar towers made as per industry normative weights for the same technical specifications.

III. Selection of Conductor

High performance conductors are conductors of different configurations, which have the capacity to carry higher power with lesser transmission losses. The key benefits of high performance conductors are:

- Can transfer up to twice the power using the same towers and line corridor.
- Lower sag than the conventional conductor at the higher operating temperatures help in reducing tower weight and increasing span and hence reducing the total steel requirement which results in a lower carbon footprint.
- In case of Re-conductoring
    - Faster implementation (within 6 months) vis-à-vis creating new parallel corridors (which take 4-5 years)
    - Conservation of scarce land, RoW and forest resources, etc
    - delays in capacity enhancement and hence lower instances of power bottlenecking due to capacity constraints.

Case Study:

Given below is a comparative case study for building a new line with conventional ACSR conductor and with HPC conductor. This is for a 100 kms 400 kV D/C Quad.

Items	% of project cost	Cost - New ACSR Line	Cost - New HPC Line	Differential (%)
		Rs. In crores		
Tower cost	20%	45	39	-12%
Conductor cost	38%	84	248	194%
Erection & Foundation	15%	33	32	-3%
Other costs	27%	58	55	-26%
Total cost (100 KM Line)	**100%**	**220**	**375**	
Transfer Capacity		**3,400 MW**	**6,800 MW**	**100%**
Cost in Rs. / MW / KM		**6469**	**5510**	**-15%**

It can be seen that though the cost of building a line with high capacity conductor is higher, but on a per MW/km basis, it is actually 15% cheaper. Also, if a re-conductoring exercise is undertaken for an existing ACSR line, the cost of the project would be equivalent to the cost of building a new ACSR line (with significant time benefits) and with no further wastage of land / forest resources.

IV. Mechanized Construction Methods

Various mechanized construction methods, which are commonly used for transmission line construction globally, can be adopted in India. The 2 important methods are:

1. Transmission tower erection using helicopters
2. Transmission line stringing using helicopters

Some of the key benefits, resulting out of these construction methods are:

1. Difficult terrains:

   These methods can be gainfully employed for speedier execution where terrains are difficult such as hilly and snow covered regions, areas covered by dense forest, wherein the passage of man and material becomes a challenge. Transmission lines which are proposed to be developed during the 12th Plan in the states of Jammu & Kashmir and Himachal Pradesh and in densely forested states such as Chhattisgarh & Jharkhand can be built using these methods. These methods are widely used in South Africa, parts of Europe & America.

2. Faster execution:

   Aerial construction methods help to ensure speedier implementation of the project and cut down on any delays due to a higher degree of mechanisation and also due to elimination of the requirement to carry and assemble the tower parts at site. Also, as

most of the sites in difficult terrains do not have proper approach roads, these methods easily help to save 40-50% of the total time required for tower erection & stringing.

4.2.1 Issues

4.2.1.1 No freedom given to the developer to innovate

As a part of the process for awarding projects under competitive bidding, the empowered committee approves a project, whereas the Bid Process Coordinator (BPC) releases guidelines for the project in the Standard Bidding Documents (including RFP and TSA). As mentioned earlier, the restrictions are more prominent in areas of selection of conductor and selection of material towers. Thereby there has been very low level of technology innovation in these areas.

For example, SBD quotes "The Tower shall be fully galvanized using mild steel or/and high tensile steel sections. Bolts and nuts with spring washer are to be used for connection". This micro-management seriously restricts the choices given to a developer leaving them tied to the stated guidelines only, leaving no scope for innovation in the methods or the technology used.

This focus on the input factors also acts a major de-motivator for major global players, who play on technology and innovation to minimize the cost over the life-cycle of the project. Specifying the methods and techniques strongly limits their ability and reduces them to the role of a contractor, than being a partner to the project. Quicker, better implementation are neither rewarded nor demanded. Only delivering within the stated quality parameters and on the agreed timeline is accepted.

4.2.2 Recommendations

4.2.2.1 Promote technology & give freedom to developers to innovate

BOOM model, by definition, implies that it is in the developer's best interest to build a line that is able to withstand the test of time without tripping or breakdown, since the developer has to maintain and operate the line for 35 years. But the policies continue to be impervious to this. Policy guidelines should be realigned to focus on output factors like performance, capacity, quality, timeliness and rewards or penalties for achieving or not achieving them.

While the grid is integrated & hence window of specification is necessary in certain areas like conductor selection; policies need promote use of High Capacity Conductors which use less RoW & transfer higher power. The same can be mandated in bid documents. Similarly, mechanized construction methods including aerial technology of construction can be promoted and specified in certain cases. Suitable facilitations for use of these technologies need to be made by CEA & MOP. Adoption of these technologies will benefit the environment, save forests, and promote health & safety and will also deliver a higher capacity system in lesser time & cost.

The required changes in the technical norms as specified in the SBD are as mentioned in Annexure 6.

4.3 Qualification / Bid Document requirements

For a sector to be attractive to credible private participation, qualification norms are of paramount important. Qualification requirements should be able to deliver on two aspects – a) keeping the inexperienced players out of the bidding process, and b) ensuring that credible players with track record are attracted to enter the sector.

4.3.1 Issues

4.3.1.1 Participation from inexperienced players

Developers bidding for transmission projects face high uncertainty from a number of factors that increase the project costs and risks, such as – wind zones, soil conditions, route assessment, RoW issues, river crossings, difficult terrains etc. This makes it necessary for adequate pre-bid due diligence to be done by bidders to arrive at realistic project cost prior to bidding. However, many participants, without appropriate pre-bid due diligence, submit aggressive and unviable bids. Later, on better understanding of the issues they either stall or abandon the project, resulting in decade long litigations & crippling of transmission system.

Out of the 10 projects awarded till July 2013, only 5 have managed to take off and are under execution[45]. The other 5 have been stuck in litigation for various reasons. This leads to additional and unplanned costs of dealing with such issues.

The reason why inexperienced players are being allowed into the process is that prior transmission experience is not a mandatory requirement.

4.3.1.2 Inability to generate participation from established global players

As a consequence of inexperienced players coming into the fray and competing aggressively on price alone, many established and credible global players are shying away from actively participating in the bids. They feel that the current pricing does not justify a timely and quality project delivery. Sensitive about their reputation at being at stake as well, they avoid these projects that are not in sync with the best global practices.

Besides the non-stringent qualification requirements, rigid exit norms leave the sector unattractive to private sector's investments. The current lock-in requirements for transmission projects result in locking up of investor's capital for 5 years after the completion of the project.

[45] CERC orders & CEA compilation of private projects

Since this dampens any opportunity for asset churning once the project is completed, this is a major disincentive for the foreign capital and private equity investments in transmission sector.

4.3.2 Recommendations

4.3.2.1 Stringent QRs to filter out the inexperienced participants

Qualification requirements should be tailored to keep inexperienced participants filtered out of the process. In this regard, transmission sector can borrow from the recommendations that planning commission has made for ports and highways –

- Minimum technical experience for a bidder should be two times the project cost. Out of this total technical experience, at least 25% of the experience has to come from relevant sector.
- Credit should be given for pure infrastructure experience only. Standard Bidding Document (SBD), currently, qualifies capex even for projects that do not relate to infrastructure such as factory buildings. Technical experience of the affiliates should be allowed to be used by the bidder only when it demonstrates control of these affiliates through majority ownership.

The above norms have been implemented in sectors such as highways & ports and have been successful in keeping large credible private players engaged in the bidding process while keeping the inexeperienced participants out of the process. New players would be able to gain entry & experience by partnering with experienced players from around the world. Ministry of Power and CEA can implement the above suggestions in the short term by rationalizing the qualification requirements in the Standard Bidding Documents.

4.3.2.2 Simplified exit norms to allow for asset churning

The Concessionaire should be allowed to completely exit the project at any point in time before or after COD. In case of exit before COD, transfer of equity should be allowed to an equally qualified (technically and financially) substitute concessionaire as at this stage there are substantial construction risks like RoW, BOQ increase, or other factors which can impact project cost & time of delivering the project. As these risks exist in an under-construction project, hence only an equal or more capable developer be allowed to take over such projects.

After COD, the projects may even be sold to financial investors who are willing to provide adequate O&M undertaking through third parties. Relaxing the exit norms gives an opportunity to the investment companies that have resources to acquire projects, but are unwilling to take up the construction risks. It also provides the concessionaire an opportunity to exit from the investment they had not been able to manage. This significantly reduces the business risk associated with the project, making the sector more investment worthy. In other emerging countries like Brazil, complete exit is allowed by the regulators to asset churning.

Ministry of Power and CEA should act on this recommendation with a medium term outlook (within next six months).

4.4 Clearances & redressal mechanism for unforeseen events

Long clearance processes and poor redressal mechanisms are severe bottlenecks that have been hindering the progress of the transmission sector in the country.

4.4.1 Issues

4.1.1.1 Delay in approvals / clearances as a ground for force majeure & relief

Delays in granting of statutory and Government approvals/ consents are usually on account of administrative and procedural delays. The Planning Commission Transmission Services Agreement (TSA), which is applicable to STUs, allows any unlawful or un-authorized refusal to renew or grant a clearance, consent or permit without valid cause to be considered as a force majeure event. However, the TSA, as notified by the Ministry of Power, restricts consideration of any such revocation or refusal to renew any consents, clearances and permits as a force majeure event. It specifies an additional mandate that approval would be granted only if certified by a competent court of law. This becomes a big hassle since the judicial process in India is time consuming and is also subject to different interpretations by different courts. As transmission projects are time bound and crucial for the country, these projects should be insulated from any matter that is litigious and hence time consuming. Also, the additional requirement to get such determination by a court of law defeats the purpose of treating it as force majeure. Also, there are specific issues pertaining to obtaining approvals and clearances.

4.4.1.1.1 Grant of an authorization under section 164

Authorization under Section 164 of the Telegraph Act confers authority to a developer to erect a transmission line on someone's land in lieu of compensation as per stipulated norms. In the absence of this approval, land owners can question the developing authority resulting in litigation and disputes. This is often used as a tool for extortion by land owners. For example, in the JTCL project being done by a leading private sector developer, even after 27 months of project award, authorization under Section 164 has not been granted. Due to this, there is severe resistance from land owners for erecting towers, extortion where land owners demand compensation of up to 15-20 times the actual stipulated compensation for RoW, numerous litigations by land owners being piled up against the developer, which would require significant time, investment and legal resources, the cost of which would exceed Rs.20-30 Crores[46].

Currently, the developer is responsible for obtaining this clearance from the Ministry of Power and no tentative timeline is given for granting the same. This has resulted in significant delays where projects have not been provided clearances even 30 months after awarding the project[47].

[46] Sterlite internal data

[47] ENICL Project

4.4.1.1.2 Central Projects Status for Forest Clearance

In the event of the project being awarded to a private developer, the developer mandatorily needs to acquire compensatory land for afforestation. This is a pre-requisite for receiving the forest clearance which is applicable only to private players. Central Government bodies, on the other hand, need to pay twice the compensation for afforestation without the need for acquiring compensatory land. Land acquisition poses a major hurdle for private developers and has significant delays associated with it.

4.4.1.2 Redressal mechanism for unforeseen events

The tariff for a transmission project remains fixed during operation, but there are significant risks assumed by a private developer during project execution. This has the potential to adversely affect project economics and render it economically unviable for the developer. In such cases, the developer has no redressal mechanism available and therefore, slows down or abandons the project. In a recent case, Reliance had filed a petition in CERC for compensation in lieu of delays caused in Section 164. After a long time elapsed, costs increased multiple fold post the financial bid. As the project became unviable and no redressal was provided, Reliance abandoned two of its projects, one in North Karanpura and the other in Talcher, both of which were crucial for the northern and eastern grid. These projects were awarded in 2009 & were supposed to be commissioned by now; however there is little progress on the ground. Due to absence of transparent redressal mechanism both these projects are under dispute while fate of power plants dependent on these lines hangs in balance.

When a developer abandons an operational project, the power flow in the region being served is severely affected. This poses significant risks to the nation's grid. A similar case has happened in Uttar Pradesh where 900 MW worth of power units, namely Reliance Power's Rosa and Lanco's Anpara, have become non-operational following disputes with UP Power Corporation Limited (UPPCL). Both Rosa and Lanco have shown their unwillingness to run their power units, lest they are paid their dues or have their charges revised by the state government. An acute power crisis is being faced by the state forcing it to draw from the National Grid[48]. Currently, there is no guideline to deal with abandoned projects & past experience in power and other sectors show that such projects create dead-lock thereby hurting all the stakeholders and finally the consumer.

Some examples of events that adversely impact project economics at the time of operation which could not be predicted at the time of financial bidding are as follows:

- Abnormal fluctuations in commodity prices/interest rates/foreign currency
- Revenue loss/increases in project cost due to delay in crucial clearances, Force Majeure events, Difficult Right of Way/land acquisition process.
- Change in any laws post project bid

[48] 'UP staring at Power crisis as Rosa, Anpara plants shut 900 MW units'- Times of India

- Differential treatment to public and private sector

Currently, the Advance Loss of Profit (ALOP) insurance policies cover only the interest component for certain delays in project commissioning and no compensation is provided for project losses due to delay in RoW/clearances/Force Majeure events. There have been some cases where certain compensation was given. However, clear relief clauses still do not exist in the SBD and is subject to the interpretation of developers and the adjudicating body (CERC). This creates uncertainty for private investment, thereby lowering investor confidence. For example, recently, the effect of depreciation of rupee and consequential increase in the project cost (due to higher cost of construction) has been challenged by Sasan Power Ltd. in a petition before the CERC. The order of the CERC in this matter will provide clarity on the position of the Commission on the effect of the fiscal regime on the feasibility of projects.

Another case is that of Adani Power Limited and Coastal Gujarat Power Limited. CERC, in its recent orders in the cases of Adani Power Limited and Coastal Gujarat Power Limited, acknowledged the hardships faced by developers whose plants were based on imported fuel and allowed for a compensation package (which would be over and above the tariff). The CERC in these orders, while concluding that increase in costs of imported fuel did not tantamount to force majeure or change in law, however, allowed relief to the petitioners even after the tariffs were discovered through competitive bidding.

Relief has been provided in cases where tariff was determined by the Commission (as opposed to being adopted) for instance in the matter of PGCIL v. MPPTCL, in which CERC allowed an increase in the capital cost due to foreign exchange rate variation as additional capital expenditure incurred by PGCIL as it was on account of unavoidable circumstances not attributable to it and agreed to factor the same in the tariff.

4.4.2 Recommendations

4.1.2.1 Key clearances & authorizations to be in place before financial bid

It is recommended that Authorization under Section 164 & Section 68 should be obtained by SPV prior to award of a project. Provisional Authorization under section 164 can be obtained by SPV prior to award while final Authorization within 6 months can be given on submission of final route by developer. This decision, once taken by the MoP and CEA can be implemented in the short term.

4.4.2.2 Adequate redressal for unforeseen events

A specific clause for material adverse effect should be inserted which allows the parties to seek relief, as opposed to the parties electing to terminate the agreement. Material adverse effects could include those events which restrict the ability of either party to perform its obligations or which cause a material financial burden on the party. As a further safeguard to prevent misuse, the Transmission Service Agreement (TSA) should provide relief/compensation for a material

adverse effect will be subject to the discretion of the appropriate commission. By introducing this provision, the appropriate commission will have the right to adjudicate on the issue and decide an appropriate relief/compensation.

In addition, it should be noted that the Planning Commission TSA allows extension of the period to achieve financial close, the time set forth in the Project Completion Schedule and extension of the Concession Period, as the case may be, depending upon the time when a particular force majeure event occurs. Additionally, as regards monetary relief allowed in that TSA, Force Majeure Costs includes interest payments on debt, loss of revenues, O&M Expenses, any increase in the cost of Construction Works on account of inflation and all other costs directly attributable to the Force Majeure Event. Similar provisions should be introduced in the MoP TSA which currently does not provide much clarity on the force majeure costs and time extensions that can be sought by the affected party.

CERC is the body that should be empowered to provide relief (in terms of tariff increase) for events unforeseeable at the time of bidding with a clear mechanism for the same specified in the SBD, to reduce subjectivity. This recommendation once approved by the MOP and CEA could be implemented in the medium term.

4.5 Level Playing Field between private developers and state owned entities

In the Power Transmission Sector, a competitive bidding process was mandated for all future projects w.e.f. 5th January 2011. Although private players have participated in 15 project bids since then, there are inherent disadvantages that the private players face as compared to their public sector counterpart i.e. PGCIL in the bidding process.

4.5.1 Issues

4.5.1.1 Differential treatment for award of forest clearances and Section 164 authorisation

Acquiring land in order to attain forest clearances is one of the most time consuming and tedious processes in executing projects. The forest clearance process is very different in the case of private players and PGCIL. Private developers are required to acquire the compensatory land for afforestation in the same state and hand it over to the Forest Department as pre-requisite to getting Stage I clearance. This is in complete contrast to PGCIL which only has to pay double the afforestation compensation for getting the clearance. Clearly for private players, the process is very cumbersome and as a result, several private projects are currently stalled or extensively delayed. Similarly, for securing authorization under Section 164, PGCIL is not required to secure separate authorizations for each project whereas in the case of private players, project wise authorizations are mandatory.

4.5.1.2 Preferential Access to Confidential Information and ability to influence bidding decisions

Being a part of the Empowered Committee (EC), PGCIL (as CTU) is privy to sensitive information and have the ability to influence critical bidding related decisions. Private players, on the other hand, have no representation in the Empowered Committee and hence, don't get these benefits.

Being a part of the EC, PGCIL has know-how of the entire project pipeline along with preliminary cost estimates. This, in turn, helps PGCIL in its internal bid planning process. In addition, PGCIL can influence bid decisions so as to suit its commercial interests, such as:

- *Technology selection:* These include decisions on multiple technology parameters, e.g. voltage of the line, HVDC or AC, new corridor or Upgradation etc.
- *Awarding Process:* This entails deciding the process for awarding projects, e.g. project being placed in Tariff Based Competitive Bidding vs. giving on nomination basis
- *Project Structuring:* PGCIL, being a beneficiary of cost plus is also a participant in TBCB. PGCIL (as CTU) has the potential to influence decisions in its favor. These decisions pertain to project timing, project size, project prioritization, project consolidation/clubbing etc. PGCIL has the unfair advantage to align key project parameters with its ongoing projects in order to extract greater commercial benefits.

4.5.1.3 Unfair Commercial Advantages for PGCIL

When bidding for projects, PGCIL, which is Central Public Sector Enterprise is entitled to various duty benefits, such as customs duty benefits of around 3%[49] and other benefits. These benefits are not available to the Private Developers.

In February 2012, PGCIL won two projects under TBCB regime. Industry sources & analyst reports suggest PGCIL had quoted very low unviable tariffs. However, PGCIL (as CTU) knew everything about planning & need of corridors post bid as well. This knowledge was used by PGCIL to file a petition with CERC to enable itself to withdraw from the Projects. Hence, PGCIL, which itself, had approved the projects being the planner and later as member of EC revisited the decision. This unfair practice helped PGCIL gain unlawfully from acting as CTU.

Therefore, CTU being a member of EC is privy to significant amount of material non-public & cost-sensitive information in addition to having the right to influence critical decision making in the EC. Due to the non-existence of a Chinese wall between PGCIL & CTU, PGCIL is significantly benefited and private players are heavily disadvantaged.

[49] Custom notification chapter 98 & 84; 12/2012 dated 17th March 2012

One of the other advantages to PGCIL being a PSU with sovereign backing is very low cost of capital which puts private sector at a substantial disadvantage. Cost of debt for PGCIL is as low as 8% while for private sector same stands at more than 12%.

4.5.2 Recommendations

4.5.2.1 Similar treatment in land acquisition for Compensatory Afforestation

All Inter-State Transmission Projects, whether cost-plus or TBCB, whether executed by private players or by PSUs, are clearly central projects. Therefore, as per statute same norm of "double compensation" should be applicable for forest clearance. This would ensure greater enthusiasm from private players and also reduce the reluctance of financial organizations in lending to private transmission players.

The relevant stakeholders for this recommendation are the MoP and MoEF. The recommendation can be implemented in next 3 to 6 months.

4.5.2.2 CTU to be made an independent body & creation of an unbiased Empowered Committee (without PGCIL representation)

It is recommended to separate CTU from PGCIL and also make the Empowered Committee independent of PGCIL. This would remove the conflict of interest of PGCIL as the planner, proposer and commercial bidder. In addition, this would eliminate all unfair commercial advantages available to PGCIL by having CTU as one of its functions.

The process of separating the CTU from PGCIL and removal of PGCIL's representation in the Empowered Committee would require the involvement of MoP, CEA and CTU and can be implemented in the short term.

Conclusion & Way Forward

05. Conclusion & Way Forward

The power transmission sector in India has not been able to keep pace with the rising power demand and generation capacity in the country. India faces power deficit despite having 225 GW of installed generation capacity in 2012-13.Transmission bottlenecks are an important reason for these shortages. Another important issue in the transmission sector has been the inability to evacuate excess power from surplus regions and channel it to regions that face shortages Power shortages currently cost India a GDP loss of US$68 billion (0.4% of total GDP). There is strong correlation between power consumption and the GDP of the country. Non-performance of the power transmission sector has an adverse spiral effect on the entire economy. Improvement of this sector is, therefore, essential for the economic well-being of the country and enhancement of the quality of life of citizens. Since demand and generation capacity are both expected to increase in the future, transmission constraints need to be addressed urgently.

Inordinate amount of time taken in seeking of clearances and ROW has been another challenge faced by the developers in this sector. As many as 120 transmission projects have faced delays because of the developer's inability to acquire land and get timely clearances from all stakeholders. There have also been instances of transmission lines being forced to take a different route altogether causing the entire project plan to go astray.

With the future investments in the sector planned to be USD 75 Billion for the next two Five Year Plans (12th and 13th), the investments in the transmission sector certainly need to be jacked up significantly. The transmission sector is already lacking in its investments made so far. Ideally, 50% of the amount invested in power generation should be invested in power transmission; however in India, this figure stands at a mere 30%. In order to make up for this investment deficit, 1.3 to 1.4 times the investment made in power generation must be made in power transmission going forward.

The investment required in the power transmission sector is about USD 35 billion, out of which about USD 19 billion is planned to come from Power Grid Corporation of India Limited. The remaining USD 16 billion (~46% of the total investments) would have to be secured from private players. It has therefore, become the need of the hour to ensure much more private participation in the sector. Timely action is required from policy makers for reinvigorating the transmission sector with the help of both private and public participation. They key areas that need action are easing of the clearance process and enforcement of adequate redressal mechanisms. Private players need to be treated at par with PGCIL while awarding and executing projects. It is recommended that qualification requirements be framed such that only experienced players are allowed into the bidding process. Efforts must be made to streamline and optimize the project commissioning process and also, policies must be realigned to focus on output parameters in order to encourage technology usage and innovation.

Greater investment and active participation from the private sector is a much-needed catalyst to achieve the objective of building the grid, meeting demand requirements, and optimally utilizing generation capacity. Summary of recommendations to implemented by CEA & MoP towards achieving these objectives is reproduced below :

Area	Order	Recommendation
Planning	1	Prune the Concept to Commissioning time to ~40 months
	2	Reduce concentration of projects with PSUs
	3	Incentivize early commissioning and speedier execution
	4	Use of High Performance Conductors in New & Existing Lines
Technology & Innovation	5	Promote technology & give freedom to developers to innovate
Qualification / Bid Document requirements	6	Stringent QRs to filter out the inexperienced participants
	7	Simplified exit norms to allow for asset churning
Clearances & redressal mechanism	8	Key clearances & authorizations to be in place before financial bid
	9	Adequate redressal for unforeseen events
Level Playing Field	10	Identical norms & processes for granting forest clearance to public and private sector
	11	CTU to be made an independent body & creation of an unbiased Empowered Committee (without PGCIL representation)

Annexures |6

6. Annexures

Annexure I

Reference	Current Clause	Suggested Changes
Schedule 2, Specific requirement for Lines, point 2	IS Steel section of tested quality in conformity with IS 2062:2006, grade E 250 (Designated Yield Strength 250 Mpa) and/or grade 350 (Designated Yield Strength 350 Mpa) are to be used in towers, extensions, gantry structures and stub setting templates. *The contractor* can use other equivalent grade of structural steel angle sections and plates conforming to latest International Standards. However, use of steel grade having designated yield strength more than that of *EN 10025 grade S355 JR/JO (designated yield strength 355 Mpa) is not permitted.* The steel used for fabrication of towers shall be manufactured *by primary steel producers* only.	1) Globally accepted quality standards to be mentioned here without limiting grade to E250 to 350. Higher grades need to be allowed. 2) Yield strength of more than of EN 10025 grade S355 JR/JO (designated yield strength 355 Mpa) to be allowed. Simply because, in other countries which have much extreme weather, this steel has been used successfully. 3) Secondary steel, other than from primary steel producers–with adequate provision for controlling quality of steel, be allowed in building tower. The same is being currently used in transmission grids across North America, Europe and China.
Schedule 2, Specific requirement for Lines, point 1	The Tower shall be fully galvanized using mild steel or/and high tensile steel sections. Bolts and nuts with spring washer are to be used for connection.	1) Other type of towers like guyed type towers be allowed. These type of towers while having similar or higher strength affect lesser amount of land & are also lesser in weight by 15%. These towers have been successfully used world over
Schedule 2, Specific requirement for Conductor, point 3	The conductor configuration shall be hexagonal ACSR Zebra or hexagonal AAAC (equivalent to ACSR Zebra) for [Name of Line] and Quad ACSR Moose or Quad AAAC (equivalent to ACSR Moose) for [Name of line]	The selection of conductors in bundled position, needs to be flexible, subject to its meeting the carrying capacity and performance parameters under Corona and RIV.
Clause 6.1.1 & 6.1.2	The TSP shall give the RLDC(s), CTU/ STU, as the case may be, the Long Term Transmission Customers and any other agencies as required at least sixty (60) days advance written notice of the date on which it intends to connect an Element of the Project, which date shall be not earlier than its Scheduled COD or Schedule COD extended as per Article 4.4.1 of this Agreement, unless the Lead Long Term Transmission Customer otherwise agrees.	The TSP shall give the RLDC(s), CTU/ STU, as the case may be, the Long Term Transmission Customers and any other agencies as required at least sixty (60) days advance written notice of the date on which it intends to connect an Element of the Project, which date shall be not be earlier than 6 months prior to Scheduled COD or 6 months prior to Schedule COD extended as per Article 4.4.1 of this Agreement, unless the Lead Long Term Transmission Customer otherwise agrees. In case of line getting commissioned prior to Scheduled COD, the Long Term Transmission Customers will be obliged to pay TSP monthly Tariff (equal to Levellised Tariff) for each month of early commissioning.

Annexure II

List of 28 Lines which are severely overloaded & require immediate attention

S. No.	Name of Line	Voltage Level(kV)	Line Length (Ckt. Kms.)	Coductor Type
1	Kawas - Ichchapur	220	3	ACSR Moose
2	Gunadala-Nunna-1	220	5	ACSR Moose
3	Vijayawada T.P.S.-Nunna-1	220	17	ACSR Moose
4	Tadikonda-Vijayawada T.P.S.-1	220	25	ACSR Moose
5	Ballabhgarh-Badarpur-1	220	25	ACSR Moose
6	Ballabhgarh-Badarpur-2	220	25	ACSR Moose
7	Chinakampalli-Rajampet-1	220	56	ACSR Moose
8	Vijayawada T.P.S.-Narasaraopet-1	220	68	ACSR Moose
9	Chinakampalli-Kalikiri-1	220	84	ACSR Moose
10	Tarkera-Budhipadar-1	220	109	ACSR Moose
11	Tarkera-Budhipadar-2	220	109	ACSR Moose
12	Kadakola-Kaniyampet-1	220	119	ACSR Moose
13	Chinakampalli-Renigunta-1	220	130	ACSR Moose
14	Vijayawada T.P.S.-Podili-1	220	147	ACSR Moose
15	Btps -Jindal -I	400	8	ACSR Moose
16	Deepalpur-Bawana	400	18	ACSR Snowbird
17	Singrauli - Anpara	400	25	ACSR Moose
18	Ballabgarh - Gurgaon	400	43	ACSR Moose
19	Unnao-Panki-I	400	49	ACSR Moose
20	Bhiwani(PG)-Mahindergarh HVDC	400	50	ACSR Moose
21	Khammam -Ktps -I	400	68	ACSR Moose
22	Khammam -Ktps -II	400	68	ACSR Moose
23	Nellore - Almahy-I	400	194	ACSR Moose
24	Nellore - Almahy-II	400	194	ACSR Moose
25	Gooty - Neelamangala	400	256	ACSR Moose
26	Gooty-Somanahalli-I	400	301	ACSR Moose
27	Vijayawada - Nellore-I	400	341	ACSR Moose
28	Vijayawada - Nellore-II	400	341	ACSR Moose
	Total		**2,879**	

Source: POSOCO

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Transmission investments have not kept pace with generation in 10th and 11th plan resulting in lack of sufficient transmission capacity. India has installed capacity of 225 GW, yet we are able to meet peak demand of only 123 GW – one of the key reasons being lack of transmission lines. India, sadly, has co-existence of power surplus and deficit region. Despite severe need of having robust capacity, there are certain challenges restricting quicker project delivery.

More than 46% of the total investment required (in excess of Rs 2 lac crore) in 12th Plan needs to come from Private Sector. Clearly, Successful PPP in transmission would be vital to meet the enormous investment & capacity enhancement target in transmission. **The report "Transmission: The Real Bottleneck",** intensively dwells on the challenges across life cycle of Transmission project based on experiences gained so far in the sector & benchmarking against other infrastructure sectors. Further, the report makes specific recommendations to overcome these challenges.

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