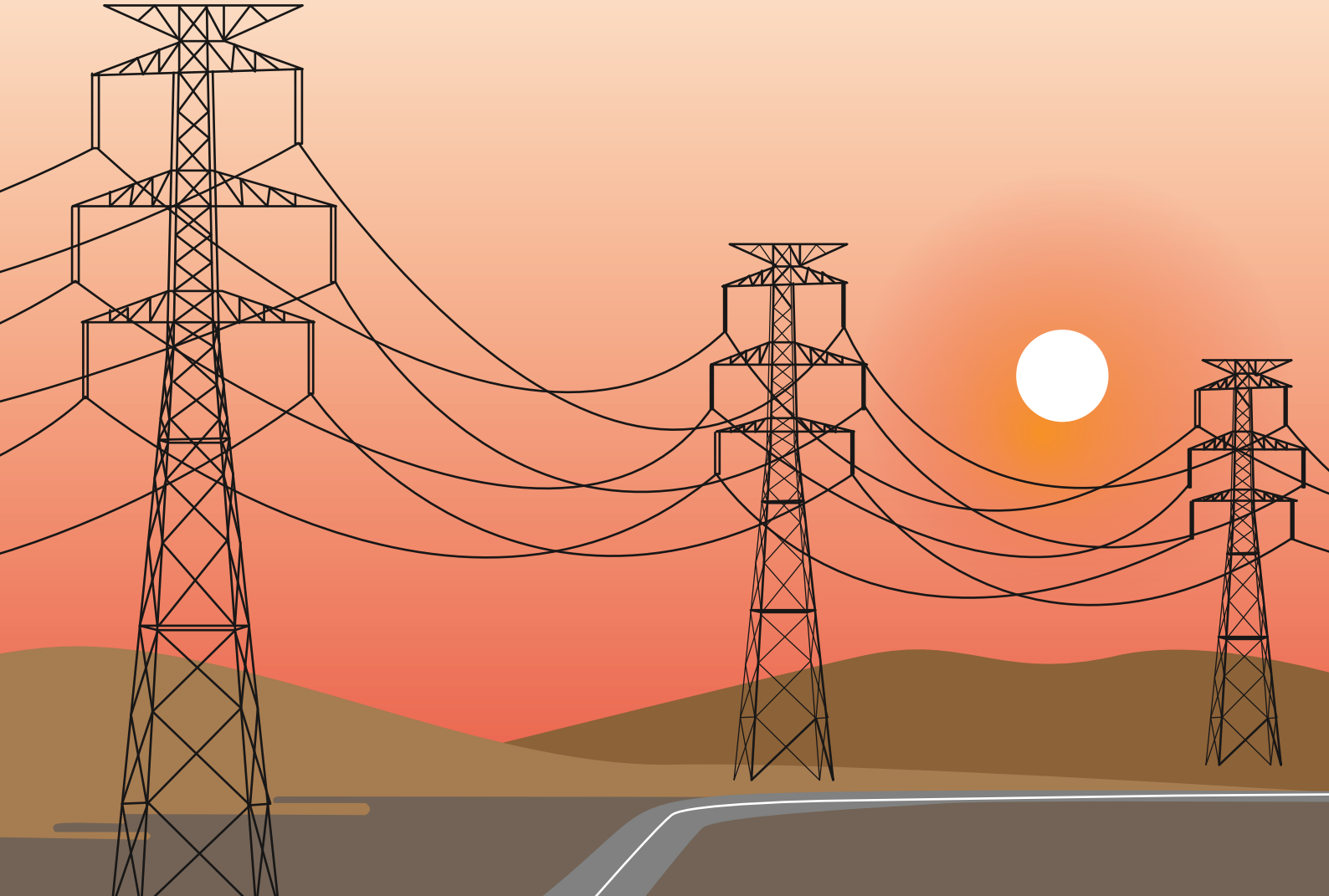
TRANSMISSION REFORM AGENDA & ACTION PLAN

FOR INDIA

SHAKTI SUSTAINABLE ENERGY FOUNDATION

Prayas (Energy Group)

Idam Infrastructure Advisory Pvt. Ltd.



Transmission Reform Agenda and Action Plan for India

May, 2021

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Organisational Profile

Idam Infrastructure Advisory Pvt. Ltd. (Idam Infra) is a company engaged in advising Project Developers, Electricity Regulatory Commissions, Government Departments and Ministries, Lenders, Banks and Financial Institutions and Multilateral Agencies on a wide range of issues in the power sector. Idam Infra has extensively worked on various aspects around transmission licensing, transmission access rules, transmission capacity usage and pricing framework thereof. Since its inception in 2007, the team at Idam Infra has gathered a multitude of experience along with rich insights in policy formulation and analysis, regulatory framework design, commercial diligence, financial structures and corporate strategic aspects across the value chain of the energy infrastructure, especially in the transmission sector.

Prayas (Energy Group) is an analysis and advocacy organisation working in the area of energy policy. The aim of Prayas is to make energy a tool for sustainable and equitable development for all citizens by analysis, discourse building, policy and regulatory engagements and collaboration with other civil society organisations. It has made significant contributions to the Indian energy sector and has established its credibility among various actors in the sector through its comprehensive and analytically sound approach to issues. Prayas strives to leverage its unique strength to achieve lasting impact through improvement in governance, prevention of gross inefficiencies and optimising resource use.

Shakti Sustainable Energy Foundation (SSEF) works to facilitate India's transition to a cleaner energy future by aiding the design and implementation of policies that promote clean power, energy efficiency, sustainable transport, climate policy and clean energy finance.

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List of Abbreviations

AC	Alternating Current
APTEL	Appellate Tribunal of Electricity
ARR	Aggregate Revenue Requirement
BOOM	Build, Own, Operate and Maintain
BOO	Build, Own and Operate
BOOT	Build, Own, Operate and Transfer
BPC	Bid Process Coordinator
BPTA	Bulk Power Transmission Agreement
CAGR	Compound Annual Growth Rate
CB	Competitive Bid
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
Ckt-km	Circuit kilo metre
DBFT	Design, Build, Finance and Transfer
DBFOT	Design, Build, Finance, Operate and Transfer
DBO	Design, Build and Operate
EPC	Engineering Procurement and Construction
FOR	Forum of Regulators
GNA	General Network Access
GST	Goods and Services Tax
HVDC	High Voltage Direct Current
POC	Point of Connection
CTU	Central Transmission Utility
EA	Electricity Act
EV	Electric Vehicle
FY	Financial Year
GW	Giga Watt
ISTS	Inter-State Transmission System
InSTS	Intra-State Transmission System
IPTC	Independent Power Transmission Company
ISTS	Inter-State Transmission System

JV	Joint Venture
kV	Kilo Volt
MVA	Mega Volt Ampere
MW	Mega Watt
NCT	National Committee on Transmission
O&M	Operation and maintenance
OTG	One Nation One Transmission Grid
PGCIL	Power Grid Corporation of India Ltd.
POSOCO	Power System Operation Corporation Limited
PPP	Public Private Partnership
SBD	Standard Bidding Document
SERC	State Electricity Regulatory Commission
SPV	Special Purpose Vehicle
STU	State Transmission Utility
TBCB	Tariff based Competitive Bidding
TEG	Transmission Expert Group
TSA	Transmission Service Agreement
TSU	Transmission System Users
VGF	Viability Gap Funding
YTC	Yearly Transmission Charge

1. Background and Context

The power sector in India is undergoing radical transformation. India has embarked upon its ambitious journey to accomplish a renewable energy (RE) capacity addition of 175 gigawatt (GW) by 2022 and 450 GW by 2030. Towards this end, several other initiatives of utility scale solar, wind farm projects, solar parks, hybrid RE projects with storage and rooftop solar have been taken up at the national and state levels.

However, stakeholders unanimously agree that a strong and robust transmission system is key to integrating high shares of renewables, reducing the overall cost of delivery and enhancing system reliability. Further, as India steadily adds RE capacities, transmission bottlenecks have begun to emerge. Evacuation constraints are visible and stakeholders witness underutilisation of new and planned transmission corridors. Moreover, accelerated technological developments, new supply-side resources, shifting consumer preferences, demand side developments, business model disruptions and a rapidly evolving fuel market are opening new challenges for power system planners and operators. These issues will only become more severe and lead to harmful lock-ins and stranded investments unless long-term planning and proactive measures are undertaken.

Despite a consensus on the preceding aspects among stakeholders, there is a lack of focussed transmission sector policy research. It is important for stakeholders to discuss new perspectives to transmission planning, pricing and allocation, along with identifying principles that address issues in the transmission sector. While several initiatives are required to fix the gaps in the sector, other steps are also required to bring in reform or appropriate changes.

At present, there are hardly any research efforts that focus on the transmission sector policy. Moreover, limited discussions and policy dialogues are available on public platforms. In this context, the present study assumes significance. Idam Infra, Prayas and SSEF agreed to carry out a study to develop a Transmission Reform Action Plan for India. This study focuses on potential solutions to address the challenges around optimal transmission capacity planning and additions and will thereby enable investment for faster development of transmission infrastructure in India.

2. Advisory Group

A group of industry experts having a proven track record on various facets of the transmission sector were identified to form an Advisory Group and provide advisory support to the present study. The Transmission Expert Group's (TEG's) expertise spans across areas like transmission planning, transmission standards, regulations/policy, system operation, market operations, transmission pricing and private investments. They anchored the dialogue process, deliberations on key issues to identify streams and methods for deeper research, efforts required to ramp up such discussions and widen policy engagement.

The members of the TEG are as follows.

Table 1: Transmission Expert Group

Sr. No.	Name	Organisation
1.	Mr. V. J. Talwar	Former Chairperson, UERC and Former Member, APTEL
2.	Mr. Y. K. Sehgal	Former COO, CTU-Planning, Power Grid Corporation of India Ltd.
3.	Mr. Akshaya Kumar	Former Chairperson, Tamil Nadu Electricity Regulatory Commission
4.	Mr. S. K. Soonee	Former CMD, Power System Operation Corporation Limited (POSOCO)
5.	Mr. A. K. Saxena	Senior Director – Energy and Fuels Division, The Energy and Resources Institute
6.	Mr. Subhash Kelkar	Former Executive Director (Operations), Maharashtra State Electricity Transmission Company Ltd.
7.	Mr. Gopal Saxena	Former CEO, BSES Rajdhani Power Limited
8.	Dr. Ravi Segal	Business Leader, South Asia, ASEAN, China, General Electric Consulting
9.	Dr. Nikit Abhyankar	Senior Scientific Engineering Associate – International Energy Studies Group, Lawrence Berkeley National Laboratory
10.	Mr. Pratik Agarwal	Managing Director, Sterlite Power Ltd.

3. Key Challenges

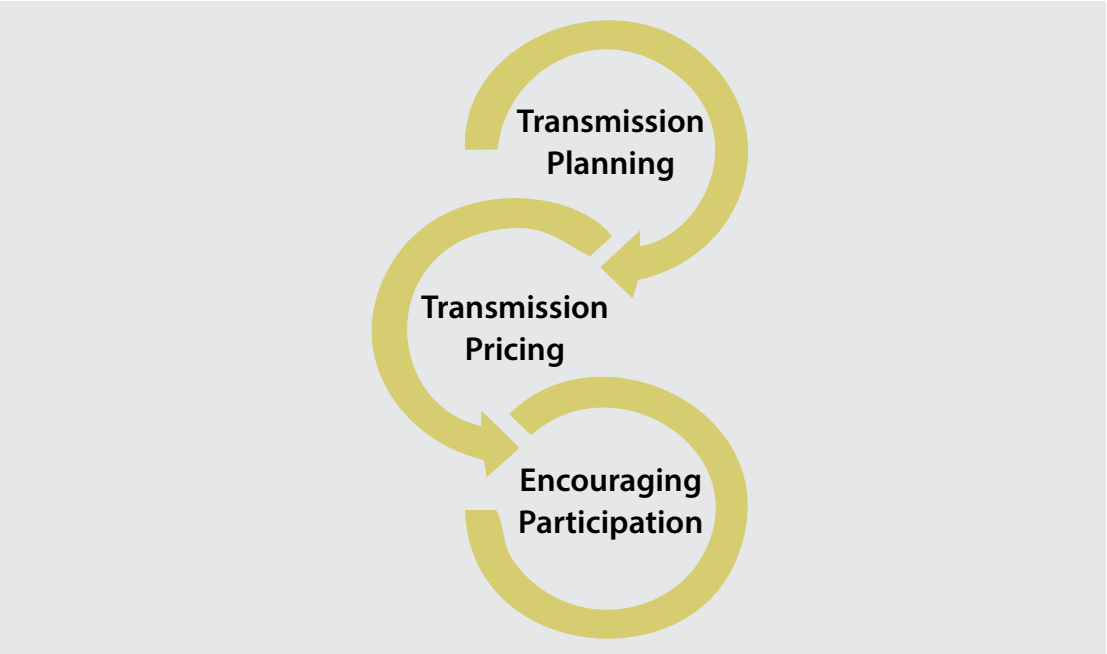
India has the largest transmission network in the South Asian region. The robust transmission grid in India can be further developed for wholesale electricity markets within India and cross-border transactions with the ultimate objective of bringing in rationalised tariffs for the electricity consumer and upgrading the quality of life. The transmission sector has grown significantly over the last few years, led by a need to cater to the growing load and provide connectivity to generation projects across India. The transmission network has also expanded its boundaries to facilitate power from neighbouring countries like Nepal, Bhutan and Bangladesh.

As of January 2021, the total transmission line length within India stood at 4,34,963 ckt. km (220 kV and above)[1] along with an AC substation capacity of 10,01,013 MVA[2]. While the line length grew at a Compound Annual Growth Rate (CAGR) of over 7% between financial year (FY) 2012-13 and FY 2018-19, the AC substation capacity has grown at about 11% during this period.

Several issues associated with the transmission sector have interlinkages to electricity market development. Addressing challenges in the transmission value chain is an important step from the perspective of the long-term sustainability of the electricity sector. The study identified specific challenges in short, medium and long-term and proposes some potential solutions for the same.

Key thematic areas where policy challenges relating to the transmission sector were investigated as part of the present study are as follows.

Figure 1: Key Thematic Areas



1. https://cea.nic.in/wp-content/uploads/transmission/2021/01/Growth_summary_tx.pdf
2. https://cea.nic.in/wp-content/uploads/transmission/2021/01/Growth_summary_ss.pdf

The key areas can be further sub-categorised into the following.

Table 2: Three P's Indicating Key Areas of Transmission Sector

Key Areas	Sub-Categories
Planning	Institutional challenges
	Aligning central and state process
	RE capacity addition
	Non-load related
	Regulatory oversight
Pricing	Reforms required
	Usage/Access based
Participation	Existing models
	New models

4. Potential Solutions and Intervention Measures

This section describes some potential solutions and intervention measures for the challenges identified.

4.1. Transmission Planning

This section lists out the suggested solutions for addressing the challenges associated with the first 'P' –Planning in the transmission sector.

Problem Statement

Multiple agencies are responsible for transmission planning across the transmission network, which requires a coordinated transmission planning approach. However, in an interconnected transmission system spanning across states and regions, inter-state and inter-regional jurisdictional issues lead to sub-optimal transmission planning and delays in coordinated development. These further lead to under-utilisation or over-planning or at times, planning bottlenecks in some parts. The cost of such inefficiencies or sub-optimal planning/ development must be borne by the beneficiaries and transmission system users.

Points for Consideration

To facilitate seamless planning of the transmission infrastructure across regions, it is required that a single agency is assigned the responsibility for transmission planning at both inter and intra-state levels. This will address the co-ordination related issues with a nimble planning institutional structure involving a single planning agency. At the same time, it will offer the required flexibility to incorporate upgrades into transmission plans while catering to the emerging and dynamic requirements of the transmission sector at both central and state levels.

- The central and state level transmission infrastructure will continue to be owned by the respective transmission companies, whether in the public or private sector.
- This shall enable planning of Inter-State Transmission System (ISTS) and Intra-State Transmission System (InSTS) by a single agency, which may be the central planning authority.
- The short or medium-term planning aspects as currently catered to by the Central Transmission Utility (CTU)/State Transmission Utility (STU) as its planning function can be entrusted to such a planning authority.
- The single agency for transmission planning will address the present issues arising out of lack of co-ordination between state and central level agencies in terms of inter and intra state transmission planning.
- Appropriate amendment, as necessary in the Electricity Act, 2003, will need to be introduced to recognise the central planning authority and specify its role in lieu of that which is assigned separately to STU and CTU at present.

4.1.1. Addressing Institutional Challenges

The following are some of the suggested measures to address institutional challenges:

- Systematic and timely sharing of accurate data is required from all stakeholders and shall form the basis of transmission planning.
- There have been several challenges regarding data compilation, adoption of methodologies, standard operating procedures and short-term planning across the stakeholder levels (especially at the state level). Methodologies and procedures must be set in place to facilitate the transfer of data across levels.
- Existing bottlenecks in efficient transmission planning (such as the inability of state agencies in adopting advanced technologies for various aspects in transmission planning and challenges in the short-term planning process) must be overcome through systematic training programs for STUs, deployment of advanced planning tools and increased coordination between transmission and generation.

(Action: National Transmission Data Repository Framework – Short Term)

The proposed National Transmission Data Repository framework shall have the following features:

- Ensure consistency and correctness of data used for system studies.
- Enable standardisation of data and set a protocol to share such data among all stakeholders in a transparent manner.
- Define the frequency of data sharing between the state and central planning agencies and mandate periodic upgradation of the data.
- Ensure periodic interaction with the STUs and CTUs so that the CTU can provide guidance to the STU on issues such as grid curtailment.
- Ensure accountability of stakeholders for the data shared.

4.1.2. Need for Aligning Central and State Level Transmission Planning

Considering the expected large-scale RE integration, growth of markets and the development of a more improved and coordinated central and state level transmission infrastructure, the following recommendations are made to revive the transmission planning framework.

1) Capacity Building of Transmission Planners

The capacity building of transmission planners in terms of manpower, skill-set and latest softwares is an area where immediate steps must be taken. Central and state level agencies must utilise the latest modelling/load flow software for detailed modelling with dynamic simulation of data which will provide key planning signals. In addition, performance indices should be stipulated for the transmission planners in line with the existing system operators. Adoption of these measures is important for efficient transmission planning and to avoid over-investment and associated cost implications.

(Action: Tool for Capacity Building and Certification Mechanism at State Level Planners – Short Term)

2) Institutional Strengthening for Improved Co-Ordination of Central and State Level Plans

The current approach through committees at national, regional and state levels has its advantages and limitations. While committees can continue to function to iron out differences, decide priorities, provide long-term sectoral vision and oversee implementation aspects, there is a need for an institutional mechanism to ensure the implementation of committee recommendations and a more coordinated planning at various levels. A monitoring wing at the Central Electricity Authority (CEA) could be constituted with the following roles and responsibilities:

- Ensure implementation of committee recommendations.
- Act as a repository of the Indian transmission network.
- Plan studies at the national level.
- Guide committees for optimal development of the transmission infrastructure at central and state levels.
- Guide the CTU and STU for co-ordinated development of the transmission plan.
- Monitor and check the progress of the planning process at the central and state levels.

3) Single Agency for Approval of Central and State Level Plan

While the preceding suggestions are required for short or medium-term interventions, it is desirable to have a single agency with the responsibility for approval of transmission plans at both central and state levels in the long-term. This agency will address the present issues arising out of lack of co-ordination between state and central level agencies in terms of inter-state and intra-state transmission planning.

To begin with, one of the recommendations is to have a **Monitoring Cell** at the CEA level to check the progress of the planning process, instead of taking away the functions of the state's entity (which can act as a check and balance methodology wherein the transparency could be better).

Since the CTU and STU shall continue to perform transmission planning in their respective jurisdictional areas, the suggested institutional set-up will offer the required flexibility to incorporate upgrades into transmission plans at both central and state levels while catering to the emerging and dynamic requirements of the transmission sector. Appropriate amendment, as necessary in the Electricity Act, 2003, will need to be introduced to recognise the agency for approval of central and state level transmission plans.

(Action: Monitoring Cell at CEA for Validation of STU Plans and Guidance to State Planning Agencies - Short Term)

4) Regulatory Oversight and Performance Matrix for Planning Function

Regulators should have a framework in place for the following checks and balances:

- Ensure sufficient 'certified' transmission system planners exist with the CTU and STU.
- Specify criteria to ensure utilisation of the transmission system.

- Have innovative and comparative indices such as Ckt/MW, MVA/MW, Ckt km Per Capita, Ckt/km^2 and MVA/km^2.
- Use yardsticks of reduction in loss levels, congestion and POC (Point of Connection) charges (and more) while assessing transmission plans.
- Develop tariff regulations to place some limits or framework for delays and cost overruns; can be like the Transmission Service Agreement (TSA) for Competitive Bid (CB) projects.

(Action: Development of Performance Matrix Framework for Planning Function – Medium Term)

4.1.3. Review of STU Planning Process

The following are some suggested approaches:

- It has been established that adequate capacity building of the STUs and other state agencies at par with central agencies will prove beneficial for both state and central transmission planning processes.
- States must have provisions in their grid code to ensure incorporation of the transmission plan formulated by the CTU.
- STUs should prepare a perspective plan for their respective states, which will be finalised and published after due stakeholder consultation.
- Separation at state level akin to recent separation of the CTU and Power Grid Corporation of India Ltd. (PGCIL) will be required for independence in operation and governance improvement.

(Action: Separation of STU and Transmission Licensee at State Level – Medium Term)

4.1.4. Renewable Evacuation Perspective

Efficient planning will require an integrated approach of transmission planning, which will incorporate resource planning considering generation (including RE power) and accurate load forecasts considering the changing nature of loads.

The following action points are suggested from the renewable evacuation perspective:

- Transmission plan to ensure infrastructure adequacy for RE evacuation at intra-state and regional levels.
- Transmission development plan to consider and align with the capacity offered through RE tenders.
- Expanding the balance area to be a key consideration of the transmission plan for RE integration.
- Adopting an integrated approach for transmission planning considering generation and load forecasts.
- Introducing an RE planning authority within the CEA to focus on the RE evacuation infrastructure for co-ordination of various planning activities associated with RE.

4.1.5. Non-Load Related Planning

The following interventions are suggested for non-load related planning:

- **Planning for Ancillary Services:** Increased proliferation of distributed energy resources and electric vehicle (EV) charging infrastructure, which often involves two-way power flows requires proper planning for ancillary services.
- **Promotion of Solar-Wind Hybrid Generation:** Increasing tenders for solar-wind hybrid power and RE power coupled with battery storage are expected to alleviate the challenges to some degree. Hence, such initiatives are welcome and should be promoted.

4.2. Enabling the Framework for Market and Future Transmission Pricing

This section lists out the suggested solutions for addressing the challenges associated with the second 'P' – Pricing in the transmission sector.

Problem Statement

The tariff policy stipulated a transmission pricing mechanism which is flow, distance and direction-sensitive. The Central Electricity Regulatory Commission (CERC) has adopted Point of Connection (POC) based charges at the central level and over a decade-long experience of operationalising the same is in place. However, states continue to adopt the postage stamp method. This results in a non-uniform pricing mechanism of the transmission network at central and state levels, along with pancaking of transmission charges for inter-state and inter-regional transactions. Apart from pancaking, the existence of a diverse transmission pricing framework poses issues such as lack of co-ordinated transmission planning and complexities in enabling market-based despatches.

Points for Consideration

To facilitate seamless trading of power, national market operation across regions and market-based economic despatch honouring transmission/security constraints, an appropriate transmission pricing framework must operate across the national grid to reduce pancaking and increase transparency and efficiency in pricing, which in turn will help in efficient planning.

The study has focused on the need for transmission pricing reforms across the central and state transmission grids and the transmission pricing (usage-/access-based) scheme to be followed, key considerations and potential interventions for this specific problem statement.

4.2.1. Need for Transmission Pricing Reforms Across Central and State Transmission Grids

The **One Nation One Transmission Grid (OTG)** operates today as an integrated transmission system. It offers an opportunity for better utilisation of generation resources and management of load, if the transmission service is priced as one national grid. In this context, a uniform and singular transmission pricing mechanism for the transmission network access/usage anywhere in the national grid could be a potential solution to the issue in hand.

To facilitate seamless trading of power, national market operation across regions and market-based economic despatch honouring transmission/security constraints, a singular transmission pricing framework operating across the national grid will be the right approach.

The following are some suggestions to operationalise the OTG pricing framework:

- ARR approval of ISTS and InSTS or adoption of transmission service charges for Independent Power Transmission (IPT) will continue to be approved by the CERC and State Electricity Regulatory Commissions (SERCs) for the transmission licensees under their jurisdiction. Our suggestion revolves around improvement in the pricing framework through the OTG singular transmission pricing approach and not on the framework to determine the transmission's Aggregate Revenue Requirement (ARR) or the standard of performance for the transmission licensee (which is to be dealt with separately).
- For all 132 kV and above transmission systems, irrespective of whether they are inter-state or intra-state, the determination of price for usage/access shall be performed by the CERC.
- Infrequent or delayed ARR approval may be perceived as a challenge for implementing singular transmission pricing. However, this challenge could be overcome to a great extent by considering the latest approved transmission ARR or Yearly Transmission Charge (YTC) for working out the singular transmission price. The same can be determined at a predefined quarterly or semi-annual frequency and can be updated for the latest approved ARR or YTC for the most recent year.
- In order to enable OTG pricing in its true spirit, ARR determination of the transmission utilities (whether ISTS or InSTS) should be on uniform regulatory principles. Thus, harmonisation of regulatory principles across the board is important. Presently, such principles vary from state to centre and state to state. The Forum of Regulators (FOR) should come up with a model framework for harmonising the principles that approve YTC across states.
- This is envisaged to complement the suggestion of a single agency for transmission planning, thus enabling complete ISTS and InSTS planning by a single agency.

Such a shift to singular transmission pricing is expected to benefit all the stakeholders in the long run. However, in the initial years of transition from the existing framework to the proposed pricing framework, some of the states/beneficiaries will have higher transmission charges as opposed to others. The mechanism should evolve such that a direct subsidy to compensate these affected beneficiaries is framed over the initial years to dampen the impact (if any) for them. This is akin to the mechanism adopted while implementing GST compensation by the Central Government.

(Action: Conceptualisation of Singular Pricing Framework for Composite Transmission System and Market Impact Assessment Studies through Pilots – Short Term)

4.2.2. Reforms in Transmission Pricing Components and Adoption of GNA (General Network Access) Framework

With an increasing trend of short-term transactions (bilateral and collective) and several merchant power plants, there is substantial variation in the transmission connectivity/access availed through long-term transmission contracts (Bulk Power Transmission Agreement [BPTA]) and its usage thereof. The recovery of transmission charges should be reflective of the service availed by the Transmission System Users (TSUs). In that sense, classification of transmission service between connectivity, access and actual usage should be put in place.

It is important to ascertain whether the present POC form can be adopted for the OTG construct with a singular and uniform pricing scheme and whether it will support or pose challenges to market transactions. The General Network Access (GNA) framework was initially proposed by CEA in 2013 and later propagated by CERC through draft regulations.

Since a broad consensus is required for implementing the GNA framework, transmission pricing linked only to usage may not be the right way considering the expected high RE penetration, required grid resilience and so on. A modified POC mechanism on the lines of the GNA framework must, therefore, be adopted for operationalising the OTG construct in India.

The transmission pricing should ideally include:

- Reliability/Resilience
- Additional flexibility
- Network access
- Usage of transmission assets
- Congestion management

These value streams should be recognised in some way or the other. One option will be the regulator taking a broader perspective to look at the total system cost and then decide from the transmission pricing framework whether the pricing facilitates all the values.

(Action: State Preparedness Assessment and Capacity Building for Introduction of GNA Framework – Medium Term)

(Action: Rollout of GNA Framework With Singular Pricing Mechanism for Composite Transmission System - Long Term)

4.3. Competitive Framework and Transmission Investment Models

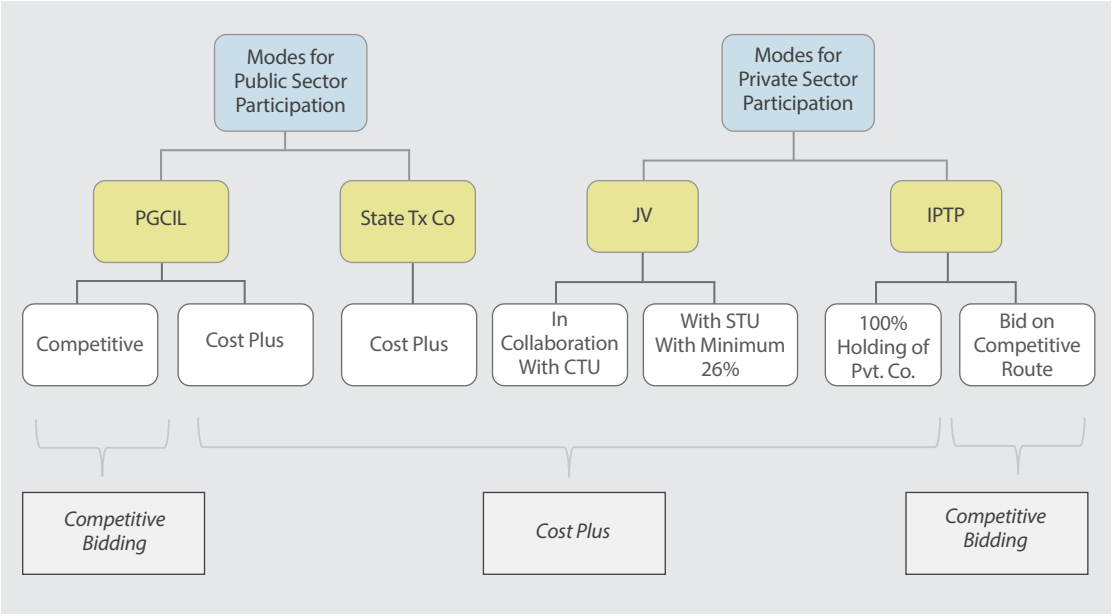
This section lists out the suggested solutions for addressing the challenges associated with the third 'P' – Participation in the transmission sector.

There are primarily two models for investment in the Indian transmission sector for private entities: Independent Power Transmission Company (IPTC) and JV (Joint Venture) models. Under the IPTC model, the entity invests in the transmission project on its own. In the JV model, the project is set up in a JV with either the CTU or STU. Further, based on the participation/selection, these models can either be under a cost-plus or competitive regime.

Only a few states have awarded intra-state transmission projects through competitive bidding so far: Madhya Pradesh, Haryana, Rajasthan, Maharashtra and Uttar Pradesh. They typically follow the PPP (Public Private Partnership) route and the projects have been set up under the Design, Build, Finance, Operate and Transfer (DBFOT) model with VGF (Viability Gap Funding) support or the Build, Own, Operate and Maintain (BOOM) model as per the competitive bidding guidelines for transmission service providers notified by the Central Government.

The following diagram depicts the different modes that currently exist for participation in the transmission investment by public and private utilities.

Figure 2: Different Modes for Participation in Transmission Investment



Based on the review of international cases, it is observed that IPT models are suitable in the Indian context. However, the following factors need to be considered while devising an IPT model scheme:

- Different variants of IPTs can be applied in case of India's transmission investment need.
- An Engineering Procurement and Construction (EPC) contracting variant of IPT can create more competitive pressure, compared to other business models, by running a tender for each line or package of lines.
- The IPT model should be consistent with the policies developed by the central and state governments.
- The JV and Special Purpose Vehicle (SPV) routes have been demonstrated in low-income countries and are more likely to apply than other business models. The JV route could be considered for intra-state projects in states where no prior experience of transmission through private sector participation exists and the SPV route can be for all other cases including inter-state projects.

Accordingly, various IPT based models (some existing and others proposed) were deliberated. The following business models have been discussed in detail:

- IPT Model 1 (BOOT-TBCB)
- IPT Model 2 (BOOM/BOOT – JV)
- IPT Model 3 (Design, Build, Finance and Transfer [DBFT], EPC + Financing)
- IPT Model 4 (Design, Build and Operate [DBO], EPC + O&M)

Different types of IPT models require enough project pipeline to attract private interest. Moreover, there exists a significant market potential for various types of IPT business models for transmission schemes at national, regional, inter-regional and state levels.

Table 3: Transmission Scheme-Wise Recommended Models

Transmission Scheme	Recommended Model	Rationale
All 765 kV Schemes, RE Evacuation and Thermal Generation Evacuation	SPV (BOOT) or EPC + Financing (DBFT)	• As all the transmission projects at the central level are adopted through competitive bidding and most of the projects have been initiated and completed in India, forming an independent transmission company through SPV and competitive bidding will be an appropriate option. • Forming an SPV will help in allocating the associated risks uniformly among the investors. • EPC financing can be an option for projects where the government is unable to provide the funds.
Inter-Regional Corridors, Cross Border Transfers and HVDC – National/Regional	EPC + Financing (DBFT) or Merchant Links	• Since the five regions of the country have different pricing, the merchant links option will be appropriate for inter-regional transfers as these investments are based on the price differentials between the two ends of the line.
Intra-State (Above Threshold)	SPV + EPC Financing	• In all those states where the threshold limit has been defined for Tariff Based Competitive Bidding (TBCB) and if the project's capital expenditure is above the limit, forming an independent transmission company through SPV and competitive bidding will be an appropriate option. • Forming an SPV will help in allocating the associated risks uniformly among the investors. • For competitive bidding arrangement to pick up in the states, EPC contracting through private utility funding will be an appropriate option. • There will be no efficiency gains for the developer as they do not bear a performance risk.
Intra-State (Below Threshold)	EPC + Financing (DBFT) or EPC + Operator (DBO)	• In states where the threshold limit has been defined for TBCB and the project's capital expenditure is below the limit, forming an independent transmission company through (EPC + Finance) or (EPC + Operator) based bidding will be an appropriate option. • As these projects are less capital intensive, allowing the EPC contractor for operation and maintenance will be appropriate. This will provide efficiency gains for the developer since they bear performance risk. • The EPC operator arrangement will also lure developers in less capital-intensive projects.
Intra-State (No Limit)	JV Route (BOOT) or SPV (BOO)	• In states where the threshold limit has not been defined for TBCB, forming a JV with the private utility will be an appropriate option for investment. • This can enable investment without borrowing funds. • Forming an SPV will help in allocating the associated risks uniformly among the investors.

Transmission Scheme	Recommended Model	Rationale
Projects of Strategic Importance to Government	EPC + Finance (DBFT)	• As per the tariff policy, projects of strategic importance to the government do not have the option to undergo the TBCB process. • Hence, private participation in such projects could be through the EPC and finance models.

Implementation of these models calls for proactive steps from the central and state level entities. While some of the variants of this model are already in practice in India, accelerating its implementation is vital. Therefore, improvements should be carried out for streamlining the process and ensuring a competitive framework.

The steps required at the central and state levels are listed in the following table ('☑' indicates that the steps are already in place and '✶' indicates that steps need to be initiated/process needs to be streamlined).

Table 4: Steps at Central and State Levels for Implementing IPT Models

Central Level Steps	Indicators	State Level Steps	Indicators
Publish guidelines for Bidding, Standard Bidding Document (SBD) and Transmission Service Agreement (TSA).	☑	Not applicable.	
Amend the guidelines for Bidding, SBD and TSA to recognise new variants of the IPT model discussed above.	✶	SERCs will determine the threshold limit above which projects shall be bid out.	✶
Appoint a National Committee on Transmission (NCT) as the nodal agency to identify transmission projects for development under the various models in coordination with the CTU and CEA.	☑	Appoint a State Level Committee for Transmission (SCT) as the nodal agency to identify transmission projects for development under the various models in coordination with the STU.	✶
Appoint a central Bid Process Coordinator (BPC).	☑	Appoint a state level BPC.	✶
A mechanism will be in place for a single window for private entities participating in the IPT model for investment.	✶	A mechanism will be in place for a single window for private entities participating in the IPT model for investment.	✶
NCT will develop a data room of projects to bid. Preparation of the bidding calendar must be in consultation with the central BPC.	✶	SCT will develop a data room of projects to bid. Preparation of the bidding calendar must be in consultation with the central BPC.	✶
BPC/CTU will approach CERC to seek approval of deviation in the SBD clauses.	☑	State BPC/STU will approach CERC to seek approval of deviation in the SBD clauses.	✶

Central Level Steps	Indicators	State Level Steps	Indicators
Ensure execution of the payment security mechanism is in place.	☑	Ensure execution of the payment security mechanism is in place.	✶
CERC will adopt tariff and issue a transmission licensee for IPTs.	☑	SERC will adopt tariff and issue a transmission licensee for IPTs.	✶

(Action: Devising Pilot Project Scheme for Select IPT Structure and Finalising Through Stakeholder Consultation – Short Term)

(Action: Update of (Competitive Bidding Guidelines) CBG and Model SBD for Implementation of Select IPT Structure – Medium Term)

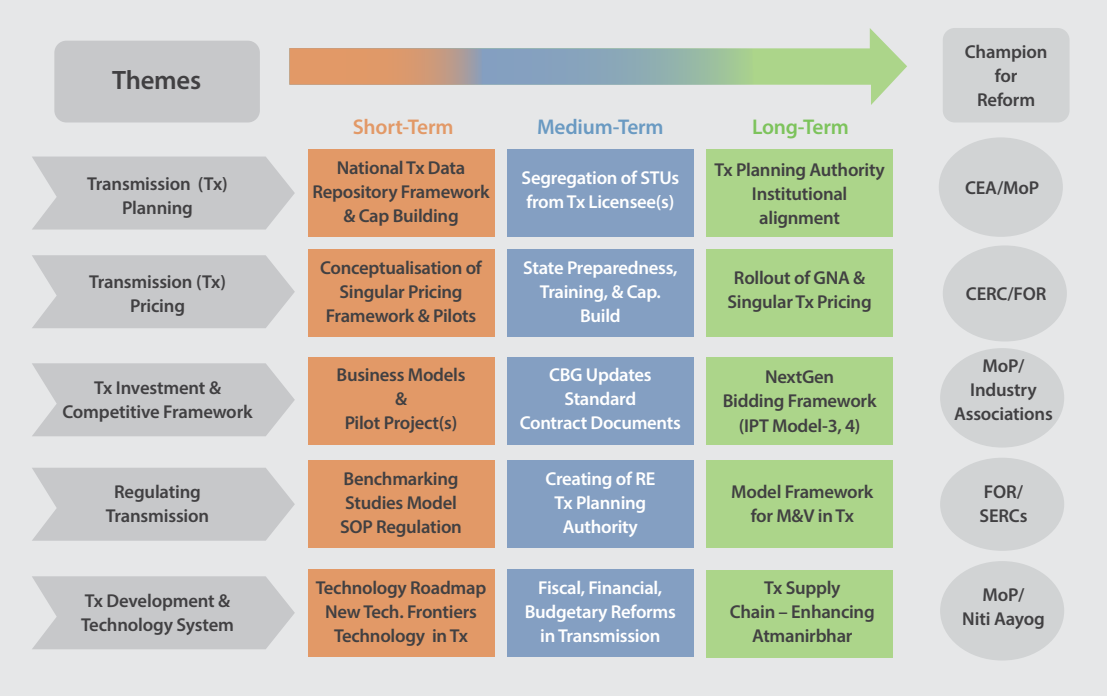
Designing an IPT transaction requires expertise in multiple fields. To prepare for an IPT transaction, it is important to identify the suitability of a particular IPT model for a particular transmission scheme, clearly lay down the eligibility conditions of the bidders and conduct market sounding/stakeholder consultation prior to initiating an IPT transaction.

5. Summary and Way Forward

Based on the detailed deliberations and research carried out for this study, we have developed a thematic issue-wise action plan roadmap that includes the upcoming areas of work in the short, medium and long-term. This plan also includes the potential champion responsible for spearheading the specific theme reform agenda and the steps to be initiated.

Here, **Short-Term** refers to a period from six months to a year, **Medium-Term** ranges from one to three years and **Long-Term** is beyond three years.

Figure 3: Action Plan Roadmap



The following table lists some important suggestions and action points.

Table 5: Important Suggestions and Action Points

Themes	Important Suggestions	Action Points
Transmission Planning	• Systematic and timely sharing of accurate data across all stakeholders that forms the basis of transmission planning. • Removing information asymmetry and gaps in coordination across state and central level planning agencies. • Emphasising non-load related planning aspects at the state level. • Separation of STU and transmission licensee function at the state level. • Monitoring cell at CEA for validation of STU plans and guidance to state planning agencies.	• National transmission data repository framework. • Tools for capacity building in planning for practitioners. • Certification mechanism for state level planners. • Operationalising a monitoring cell within the CEA for guidance and handholding the STU.

Themes	Important Suggestions	Action Points
Transmission Planning	• Formation of a transmission planning authority at the national level for RE. • Development of a performance matrix framework for the planning function.	• Formation of RE Transmission planning authority at the national level.
Transmission Pricing and Market Mechanism	• Conceptualisation of a singular pricing framework for composite transmission system (ISTS and InSTS) and market impact assessment studies through pilots. • Assessment of state preparedness and undertaking capacity building for introduction of the GNA framework. • Roll out of GNA framework with singular pricing mechanism for a composite transmission system.	• Framework document for singular Transmission pricing for OTG construct. • Roadmap for operationalising the GNA framework under OTG construct.
Transmission Investment and Competitive Framework	• Devising a pilot project scheme for select IPT structures and finalising it through stakeholder consultation. • Devising a contractual framework and standard bid documents (model contract documents) for implementation of select IPT structures.	• Design document for pilot project for select IPT structures. • Update of CBG and Model SBDs for select IPT structures.
Regulating Transmission	• The practice of comparing the project cost with a benchmark capital cost as was practiced by CERC could be continued. However, the benchmark cost needs to be updated frequently to keep pace with on ground/market conditions and with advancements in technology/execution techniques. • Benchmarking studies will have to be carried out for different configurations and for different regions like for a hilly/plain region. • SOP regulations for Tx licensees to be formulated across states and strict measurement, monitoring, reporting and enforcement of performance standards to be undertaken.	• Benchmarking of capital cost. • Adoption of operations and maintenance cost norms in the states and their periodic revision. • Institutional arrangement for project appraisal and commercial data repository. • Model SOP (Standard Operating Procedures) regulations and monitoring framework.
Transmission Ecosystem and Technology Development	• Need for creating repository of advancements and best practices in transmission technologies. • Identification of areas of upgradation of transmission network with special emphasis on advancement in IT/OT technologies, communication infrastructure, cyber security compliance requirements etc. • Identification of requirements of fiscal, budgetary and financial reforms in transmission sector upon wider stakeholder consultation to attract private and public capital into transmission. • Facilitating indigenisation efforts in transmission supply chain (Atmanirbhar Transmission).	• Centre of Excellence (CoE) for advancement in transmission technologies. • Knowledge exchange platform. • Roadmap for fiscal, budgetary and financial reforms in the transmission sector. • Atmanirbhar opportunities in the transmission supply chain.

Conclusion

As part of the deliberations for the Transmission Reform Action Plan, several fundamental issues have been identified. Many innovative suggestions are made to address these issues. Changes proposed in the transmission pricing framework and transmission planning are transformational in nature and implementation of the same is envisaged to benefit the sector in the long run. Various other suggestions are improvements suggested in the existing framework.

The implementation of the proposed changes is suggested to be made in a transformational way rather than a phased manner to derive the desired benefit to the sector. While it is important that various stakeholders involved will have to be taken into confidence for implementation of the suggestions, it is equally important that stakeholders are amenable to adopt change for the better. Along with the broader reform for the transmission sector, the need for specific reform agenda regarding transmission pricing and transmission planning must evolve.

The implementation of some of these suggestions might require bringing in amendments to the Electricity Act, 2003 as well as to various central and state level regulations. Multiple stakeholders, including the central and state agencies, have a key role to play in ensuring successful implementation of the proposed suggestions.

The transmission business is a natural monopoly and must be regulated to ensure fair access and prices for users, efficient and reliable operation and to encourage optimal investments. A strong and robust transmission system is key to reducing the overall cost of power and enhancing system reliability. This assumes even more importance in light of the inevitable transition to integrating high shares of renewables.

Along with strong regulatory oversight, effective Planning, Pricing and Participation models will be key elements within the Transmission sector reforms. This reform and action plan focuses on potential solutions to address the challenges around optimal transmission capacity planning and additions and will thereby enable investment for faster development of transmission infrastructure in India. It has evolved through extensive deliberations and consultations with a Transmission Expert Group and captures priorities of the reform agenda and suggests potential actionable interventions.

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