

Increasing Competition in India's Transmission Sector

Strengthening the Weakest Link to Achieve India's Renewable Energy Target

Executive Summary

India's national transmission grid must urgently modernise to increase the rate of renewable energy adoption.¹ This is a key prerequisite for achieving India's renewable energy investment ambitions while accelerating the excellent progress of recent years.

As of December 2019, India had installed 86 gigawatts (GW) of renewable energy capacity,² more than doubling in the last four years. Further, India has an ambitious target of 175GW of variable renewable energy by 2022, rising to 450GW by 2030.

Renewable energy resources are abundant in India, but not evenly spread. While some states have plentiful wind and solar endowments, most demand growth will come from states with less renewable energy potential.

New renewable energy infrastructure can now be built within two years from initial plans through to completion, years faster than any new coal- or LNG-fired plants.

However renewable energy is intermittent, requiring balancing from peaking power supply, electricity storage (batteries and pumped hydro storage, and/or demand-response technologies), as well strong interstate grid connectivity.

The complexities of India's grid mean that transmission is a major hurdle and is materially slowing the adoption of renewable energy.

Moreover, there is a growing risk that variable renewable power may be underutilised, and/or its development grid constrained in the absence of both grid discipline and a modern, upgraded transmission network.³

A transparent planning process is needed for a well-designed, forward-looking grid. The national grid must be able to rapidly embrace evolving new technologies. Transmission capacity must be added quickly and in the locations best suited to exploit renewable energy.

The Central Electricity Authority's National Electricity Plan highlights the urgent need for more transmission lines. An additional 1.1 lakh (110,00) circuit kilometres

¹ IEEFA. [India's Grid Transmission Infrastructure Needs Further Modernisation, Urgently](#). January 2019.

² Central Electricity Authority (CEA). [Installed Capacity Report](#). December 2019.

³ PRS Legislative Research. [Overview of the Power Sector](#). September 2019.

are required by financial year 2021/22⁴ to manage the annual peak load demand of 225.7GW, and to absorb the increasing share of variable renewable energy in the total electricity mix.

Transmission access is also considered a potentially serious bottleneck for speeding up the deployment of renewable energy. IEEFA notes that increased competition in the transmission sector can help to achieve the twin objectives of increasing renewable energy generation, without these assets becoming stranded.

We note the expansion of private sector investors has brought increased competition for new tenders, helping drive down the cost to consumers. This has also increased India's access to global debt and equity capital. The phenomenal market success of Adani Transmission Ltd shares since their initial public offering in 2015 shows how the right regulatory and policy framework can help drive capital in support of India's electricity system transformation. This is an important goal for India and provides a globally relevant model for other countries driving towards a lower cost, more sustainable domestic electricity generation system.

However, time is running out. India must begin planning to develop its transmission infrastructure at an even faster pace.

⁴ CEA. [National Electricity Plan \(Vol II\)](#). February 2019.

Growth in Energy Demand, Renewables and Transmission Capacity Additions

Across India, energy requirement (MU), peak demand (MW)⁵, and the supply of energy have all increased from an average year-on-year growth rate of ~5% in 2015/16 to 6% in 2018/19.⁶ Transmission capacity is seeing a similar growth rate of 6.5% year-on-year over the same period (see Table 1).⁷

Table 1: Transmission Line Capacity Addition 2015 - 2019

	Circuit Kilometres (ckt kms)	Central	State	Private	Total
2019-20 (up to Dec 2019)	ckt kms	1,72,971	2,47,665	36,206	4,56,843
	Share (%)	38%	54%	8%	100%
	% Growth				
2018-19	ckt kms	1,70,622	2,42,463	35,920	4,49,006
	Share (%)	38%	54%	8%	100%
	% Growth	5%	4%	12%	5%
2017-18	ckt kms	1,62,032	2,32,456	32,080	4,26,569
	Share (%)	38%	54%	8%	100%
	% Growth	6%	5%	8%	6%
2016-17	ckt kms	1,52,822	2,20,854	29,773	4,03,450
	Share (%)	38%	55%	7%	100%
	% Growth	8%	5%	18%	7%
2015-16	ckt kms	1,41,153	2,10,801	25,195	3,77,150
	Share (%)	37%	56%	7%	100%
	% Growth	11%	6%	11%	8%

Source: CEA

Renewable energy has also been building at a fast pace in India, with a rapid annual growth rate of ~26% (Table 2).

Unlike conventional thermal generation capacity which takes more than 5 years, renewable capacity addition takes less than 2 years to develop. Transmission capacity addition planning was based on new thermal capacity plants with long-term power purchase agreements (PPA), but in recent months, the lack of transmission capacity has created a bottleneck for renewable energy.

⁵ Megawatt (MW) is a unit of power and million unit (MU) is a unit of energy.

⁶ CEA. Data collected from Power Supply Report of various years.

⁷ CEA. Data collected from Executive Summary Report of various years.

In financial year (FY) 2019/20, capacity addition in renewable energy slowed considerably. A key reason cited is the uncertainty of grid access facing impending renewable energy projects.⁸

The private sector plays a dominant role in the deployment of increasing renewable energy generation, holding a 95% share in total installed renewable energy capacity over FY2014/15 to FY2018/19 (refer Table 2). But the market share of private players in transmission capacity is limited; ~8% over the same period. While the private sector has recently gained market share in total transmission line capacity, the monopolistic dominance of the Power Grid Corporation of India (PGCIL) remains firmly in effect.

Table 2: Renewable Energy Capacity 2015 - 2019

		Central	State	Private	Total
2019-20 (up to Dec 2019)	GW	1.6	2.3	81.9	85.9
	Share (%)	2%	3%	95%	100%
	% Growth				
2018-19	GW	1.6	2.3	73.6	77.6
	Share (%)	2%	3%	95%	100%
	% Growth	9%	17%	12%	12%
2017-18	GW	1.5	2.0	65.5	69.0
	Share (%)	2%	3%	95%	100%
	% Growth	-	1%	19%	21%
2016-17	GW	0	1.9	55.2	57.2
	Share (%)	0%	3%	97%	100%
	% Growth	-	2%	50%	47%
2015-16	GW	0	1.9	36.8	38.8
	Share (%)	0%	5%	95%	100%
	% Growth	-	-49%	32%	22%

Source: CEA

Efficiency Gains from Tariff-Based Competitive Bidding

The National Tariff Policy introduced competition in 2011 for the selection of transmission developers in national and state markets through tariff-based competitive bidding (TBCB). The aim was for reliable availability of electricity for all

⁸ Financial Express. [Few takers for renewal energy! Power transmission capacity addition down 31% in 2019](#). January 2020.

Indian consumers at reasonable rates. It was also intended to ensure the financial viability of the sector and hence, accelerate private sector investment.

However, certain projects were exempted from the competitive bidding route,⁹ notably:

- projects of strategic importance and technical upgrades, and
- urgent works as needed on a case-by-case basis.

An analysis of 145 inter- and intra-state projects awarded since 2012 shows that 89 projects (61%) have been awarded to Power Grid Corporation of India Ltd (PGCIL) under a regulated tariff mechanism (cost-plus route) employing the exemption provisions of tariff policy, and 56 projects (39%) have been competitively bid. Despite well-stated official policy on competitive development of transmission projects, cost-plus development held sway.

Even in the competitively awarded projects, PGCIL is the market leader having won a third (34%) of the projects, establishing itself as the competitor to be reckoned with. This disproves the claim that public sector enterprises are not competitive and need to be safeguarded or protected from pure competition. Table 3 below provides details of projects awarded under TBCB along with the market shares of various developers. Among private companies, most projects are developed by Sterlite Power, Adani Power and Essel Group, while other players collectively represent only a small share.

Table 1: Projects Awarded Under Tariff-based Competitive Bidding

Serial No.	Developer	Projects Won	Commissioned	Cost (INR Crore)	L1 Tariff (INR Crore)	Market Share (By Cost)	Market Share (By Tariff)
1	PGCIL	19	7	32,205	2,973	37.7%	36.1%
2	Sterlite	15	8	24,770	2,590	29.0%	31.5%
3	Adani	13	3	15,251	1,461	17.8%	17.8%
4	Essel	4	2	9,287	638	10.9%	7.8%
5	KPTL	2	0	2,107	332	2.5%	4.0%
6	L&T	1	1	1,240	180	1.5%	2.2%
7	RSTCL	1	1	440	29	0.5%	0.4%
8	TECHNO	1	1	200	27	0.2%	0.3%
	Total	56	23	85,500	8,231	100.0%	100.0%

Source: CEA

⁹ National Tariff Policy, Revised, 28th January 2016.

For the realization of large-scale renewable energy installations, the Green Energy Corridor project (GEC-I) was formulated in 2012 and is set to play a critical enabling role for India's energy system transformation. The Intra State Transmission System (InSTS) project was sanctioned by the Ministry of New and Renewable Energy (MNRE) in 2015/16. The project includes about ~ 9400 ckt kms of transmission lines and substations with total capacity of ~19000 MVA to be completed by March 2020.

The project is being implemented in the seven renewable-rich states (Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Rajasthan, Maharashtra and Madhya Pradesh) by their respective State Transmission Utilities (STUs). The purpose is to generate ~20,000 megawatts (MW) of large-scale renewable power and improve the grid in implementing States.¹⁰ These projects are awarded on a cost-plus basis, with a total project cost of ~Rs10,141 crore (US\$1.4bn). The funding mechanism consists of 40% in a grant from the Government of India (Rs4,057 crore), 20% from State Government equity, and 40% from KfW, Germany (€500m). However, little progress has been made to date.¹¹

In 2018, Solar Energy Corporation of India Ltd. (SECI), in consultation with MNRE and renewable energy developers, identified Solar Energy Zones (SEZ) and Wind Energy Zones (WEZ) in the seven states rich in renewable energy. These zones have a potential of about 50GW of solar and 16.5GW of wind power. Inter-state transmission projects for capturing energy from these renewable energy-rich zones has been identified with the implementation of transmission infrastructure in two phases. The transmission system for generating a total of 20GW of solar and 9GW of wind projects is planned in Phase-I (to be commissioned by December 2020), and another 30GW of solar and 7.5GW of wind projects is planned for Phase-II (to be commissioned by December 2021).

The bid results for transmission projects for generating 9.4GW of renewable energy under Phase-I are summarised below. The Ministry of Power has yet to decide on how to develop the remaining transmission projects linked to these zones. Given the results seen so far, it would be natural to pick competition as the route for development.

¹⁰ MNRE. [Green Energy Corridor](#).

¹¹ Centre for Science and Environment. [The State of Renewable Energy in India. A Citizen's Report](#). 2019.

Table 2: GEC Phase 1 Bid Outcome

Project Name	Winning Bidder	Project Cost (Rs Crore)	Winning Tariff (Rs Crore)	Cost-Plus Tariff (Rs Crore)	Reduction From Cost-Plus Tariff
P1 - WRSS 21 - Part A	Adani	1,090	95	153	38%
P2 - WRSS 21 - Part B	Sterlite	2,003	179	280	36%
P3 - Bhuj Dwarka Lakadiya	Adani	1,053	83	147	43%
P4 - Bhuj II	PGCIL	1,409	124	197	37%
P5 - Jam Khambaliya	Adani	394	34	55	39%
P6 - Ajmer Phagi	PGCIL	872	61	122	50%
P7 - Raj SEZ Part B	PGCIL	1,186	72	166	57%
P8 - Rajasthan SEZ Part C	PGCIL	1,448	122	203	40%
P9 - Rajasthan SEZ Part D	Adani	1,631	100	228	56%

Source: CEA, RECPTCL and PFCCL Bid Results

The introduction of competition is yielding benefits by driving down construction costs, introducing new technology and new ways of thinking, and promoting timely completion of projects.

Reduction in Tariffs

Comparing cost-plus tariffs for electricity against tariffs reached by competitive bidding clearly shows the benefits of competition. For cost-plus bids, the tariff-to-project cost ratio is in the range of 14% to 17%. But in the case of competitively derived tariffs, the ratio is in the range of 8% to 10%. The nine GEC Phase 1 projects are listed in table 4, while the cost-to-tariff ratios under open bidding and cost-plus are shown in table 5.

Table 3: Cost-to-Tariff Ratios Under GEC Phase 1 Bid

Project Name	Project Cost (Rs Crore)	Winning Tariff (Rs Crore)	Cost-Plus Tariff (Rs Crore)	Tariff to Cost Ratio (TBCB)	Tariff to Cost Ratio (Cost-plus)
P1 - WRSS 21 - Part A	1,090	95	153	8.7%	14.0%
P2 - WRSS 21 - Part B	2,003	179	280	8.9%	14.0%
P3 - Bhuj Dwarka Lakadiya	1,053	83	147	7.9%	14.0%
P4 - Bhuj II	1,409	124	197	8.8%	14.0%
P5 - Jam Khambaliya	394	34	55	8.5%	14.0%
P6 - Ajmer Phagi	872	61	122	7.0%	14.0%
P7 - Raj SEZ Part B	1,186	72	166	6.0%	14.0%
P8 - Rajasthan SEZ Part C	1,448	122	203	8.4%	14.0%
P9 - Rajasthan SEZ Part D	1,631	100	228	6.1%	14.0%

Source: CEA, RECPTCL and PFCCL Bid Results

Analysis of other projects that were bid out reveals that competitive bidding resulted in tariffs up to 51% lower from normative tariffs for certain projects, while the average reduction in project tariffs is ~31% compared to the cost-plus under CERC norms.¹²

Timely Completion of Projects

Projects secured without competition are not only likely to prove more expensive but are also more often delayed beyond the maximum allotted timescale. A detailed analysis of projects awarded under a cost-plus basis excluding the exemption provisions of the Tariff Policy since 2012, shows that 31% of the projects were delayed beyond their scheduled commercial operation date (SCOD). Table 7 below summarises reasons for projects awarded on a cost-plus basis, the cost of such projects, and the number of projects delayed from their SCOD.

¹² CEA. Minutes of 29th Empowered Committee. June 2012.

Table 4: Projects Awarded Under Cost-plus Basis Since 2012

Reasons for Projects Awarded Under Cost-Plus	Total No. of Projects	No. of Projects Delayed from SCOD	Total Cost of Projects Delayed -INR Crore	% of Projects Delayed from SCOD
Compressed Time Schedule	26	13	11,844	50.0
Strategic Importance	10	3	20,877	30.0
Technical Upgrade/ Augmentation	40	5	627	12.5
Miscellaneous Reasons	13	4	1,104	30.7
Total	89	25	34,452	
Average % of Projects Delayed Under RTM				30.8

Source: CEA

Projects awarded under a compressed time schedule (CTS) are required to be completed in a maximum of 50 months. Public data of CTS projects undertaken by PGCIL indicates that only 50% of such projects are completed within the maximum allotted period. The longest time taken to complete any such project is 64 months, a delay of more than a year.

Financial Performance of Private Transmission Firms

The share price of Adani Transmission, a private transmission company, has done much better than that of PGCIL, showing how the market rewards companies that gain market share by winning projects via a competitive route versus companies that still have most of their projects under regulated tariff regimes. Figure 1 below shows Adani Transmission Limited's (ATL)¹³ share price performance over the last five years (since the initial public offering) relative to the S&P BSE Sensex Index and to its dominant peer, the largely state-owned enterprise PGCIL.

PGCIL also earned higher returns on projects operational under TCBC than ones regulated on a cost-plus basis. At the end of FY2018/19, in five out of eight operational TBCB projects, PGCIL reported return on equity (RoE) in excess of 20%. Some large projects even reported RoE of 30%+.¹⁴

¹³ ATL is the largest private T&D company in India and operates more than 11,000 ckt kms of transmission lines and around 18,000 MVA of power transformation capacity. In 2018, ATL forayed into the distribution space with the acquisition of Reliance Infrastructure's Power Generation, Transmission & Distribution Business in Mumbai.

¹⁴ SBICap Securities. Power Grid Ltd. Company Update. November 2019.

Competition will attract more entrants and is seen as improving access to international debt and equity capital markets, a key positive given India's need to invest US\$20bn annually in transmission and distribution (T&D) capital expenditure over the coming decade to facilitate strong, sustainable economic growth.

Figure 1: Share Price Performance of Adani Transmission and PGCIL Over the Last Five Years



Adani transmission – orange, PGCIL – green, S&P BSE Sensex Index – purple.
Source: Thomson Reuters.

Adani Transmission Ltd.'s (ATL) robust financials helps it find value-building growth opportunities. ATL is the only private sector power company to have an investment grade credit rating from international agencies (S&P, Moody's and Fitch). ATL has an AA+ rating for its domestic debt.¹⁵

ATL reported profit of Rs559 crore (US\$78m) in FY2018/19 and the share price has increased dramatically, providing exceptional returns to shareholders. In November 2019, ATL announced a Rs3,500 crore (US\$500m) raising via U.S. dollar-denominated bonds to refinance debt.¹⁶

Given India's transmission system is a profitable and well-regulated business, global capital is looking for opportunities for investment in this space. The market has rewarded the investment in the transmission sector by bringing in efficiencies through the introduction of competition, thereby creating interest for more global capital to flock to India.

¹⁵ ATL. [Integrated Annual Report 2018-19](#).

¹⁶ ET Markets. [Adani Transmission aims to raise \\$500 million via dollar bonds for refinancing](#). November 2019.

Way Forward

The Working Group on Power for the Twelfth Plan¹⁷ has envisaged a growing role for the private sector in transmission, especially in the intra-state networks. But like their public peers and other infrastructure developers in India, private sector transmission projects face many challenges, such as acquiring right of way, delays in land acquisition and forest clearances, cost escalation due to delays, and rules that prevent them from taking part in competitive bidding.

Increasing competition from private players, such as Sterlite and Adani Transmission with their strong balance sheets and increasing access to global capital markets, now compete with one-time PGCIL's monopoly in the new bids. Further, global capital majors, such as Government of Singapore Investment Corporation (GIC) and KKR, are helping to drive India's power sector transformation.¹⁸

Competition will help bring in more efficiencies not only by private players but also by the state-owned utilities. Analysis of bid data reveals that even in the competitively awarded projects, PGCIL is the market leader having won a third (34%) of the projects, and RoE from such projects is financially more rewarding than the cost-plus projects.

IEEFA notes that the transmission sector must respond to increasing renewable energy generation, which is quick to install, although variable in nature.

Conventional generation plants would take 5 to 7 years to develop and the necessary transmission capacity could be built in 3 to 4 years. Renewable energy infrastructure takes just 12 to 24 months to develop, but needs rigorous planning and a more responsive transmission and distribution (T&D) grid market for timely supply of intermittent but low-cost clean power as India continues to develop.

IEEFA further notes that the development of a smart grid, including advanced meters that remotely monitor and facilitate two-way electricity flows, enables a more efficient 'producer-consumer' (prosumer) sector to develop from small solar installations.

Additionally, digitalisation provides greater transparency across the value chain via an intelligent system that incorporates asset monitoring, consumer behaviour and demand loads.¹⁹

¹⁷ Government of India. [Report of The Working Group on Power for Twelfth Plan \(2012-17\)](#). January 2012.

¹⁸ Financial Express. [Few takers for renewable energy! Power transmission capacity addition down 31% in 2019](#). January 2020.

¹⁹ IEEFA. [India's Grid Transmission Infrastructure Needs Further Modernisation, Urgently](#). January 2019.

Low-cost renewable energy has great potential as a traded commodity not only across India's states, but also with neighbouring countries (Bhutan, Nepal, Bangladesh, and even Sri Lanka and Myanmar over time).

IEEFA notes that given India's enormous natural resources allowing exceptionally low-cost, sustainable generation, states with such resources must be incentivised to speed up the development of clean energy resources by selling excess energy to other states, and to export power internationally.

Grid expansion to neighbouring states and countries will improve energy security and grid balancing by taking advantage of geographic renewable endowments, time zones, and possible differences in peak hours.

Transmission is considered a potentially serious bottleneck for speeding up the deployment of renewable energy. IEEFA notes that competition in the transmission sector can help to achieve the twin objectives of increasing renewable energy generation, without these assets becoming stranded.

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