



KRS Infra Ventures Pvt. Ltd.

Kn^owledge

INDIAN POWER SECTOR
SPECIAL EDITION

PAPER

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From *Director* Desk

Dear Friends,

Indian infrastructure is priority for Indian Government and we have seen policy changes in last few years to make investment attractive.

Power sector, where generation as well as distribution need advancement to create infrastructure for future.

hope this knowledge paper help you to built strong believe in Indian business opportunities.

With Kind Regards,



Keshav Gandhi
*Executive Director,
KRS Infra Ventures Private Limited*

Infrastructure Sector Initiatives

Indian Government has identified power sector as a key sector of focus to promote sustained industrial growth. Some initiatives by the Government to boost the Indian power sector are as below:

Government announced to fund power projects will issue sovereign green bonds, as well as conferring infrastructure status to energy storage systems, including grid-scale battery systems.

In addition, Government allocated ₹19,500 crore (US\$ 2.57 billion) for a PLI scheme to boost the manufacturing of high-efficiency solar modules.

Electrification in the country is increasing with support from schemes like Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY), Ujwal DISCOM Assurance Yojana (UDAY), and Integrated Power Development Scheme (IPDS).

International Banks (like IMF & World Bank) shown interest to fund the Reconstruction and Development to improve the operational efficiency and reliability of electricity supply in select regions in the states in INDIA.

Government announced future plans to increase the funding under the PLI scheme for domestic solar cells and module manufacturing to ₹24,000 crore (US\$ 3.17 billion) from the existing ₹4,500 crore (US\$ 594.68 million) to make India an exporting nation.

Government of the United Kingdom announced that it will invest US\$ 1.2 billion through public and private investments in green projects and renewable energy in India to support the latter's target of 450 GW of renewable energy by 2030.

Recently, India launched the Mission Innovation Clean Tech Exchange, a global initiative that will create a whole network of incubators across member countries to accelerate clean energy innovation.

Introduction

Power sector initiatives offer multiple opportunities from power generation as well as distribution, recent changes offer various opportunities for private sector companies to invest in Indian growth story. In addition Power (Generation & Distribution) Equipment manufacturers as well as suppliers/contractors will get long term business opportunities.

Overview - Power Generation

The power generation witnessing a major shift to renewables replacing thermal power in the installed capacity mix at a fast pace. The country's installed capacity stood at 401 GW with coal and lignite-based plants (210,699.5 MW) accounting for a major share of 52% and renewables (111,399 MW) accounting for a share of 28%. The share of renewables comes to nearly 40% upon inclusion of large hydro (46,722.52 MW). This is significant given that just a few years ago, in March 2015, the share of coal in the installed capacity mix was 68% vis-à-vis renewables share of 14% (& 29% upon including large hydro). Going forward, the pace of energy transition is only expected to accelerate given the central Government's focus on meeting its climate change targets.



Capacity addition from conventional sources added about 4485 MW by thermal power plants & 393 MW was added by hydroelectric plants during the year. Conventional capacity addition has considerably slowed down in recent years due to environmental concerns.

Meanwhile, renewable energy capacity addition has continued to grow apace and stood at 14076.95 MW during previous year estimated capacity addition approx 90.6% was accounted by the solar power (with 10 GW by ground-mounted solar, 2.2 GW by rooftop solar and 407 MW by off-grid solar). The remaining was accounted for by wind with a 7.9% share in capacity addition (1.1 GW), followed by biomass with a 1% share (142MW) and small hydro with 0.5% share (or 63.75 MW). In terms of power generation, the total generation stood nearly 1500 basic units in previous year. While thermal sources accounted for 74.3% of the total, renewables including large hydro accounted for a share of 22% and the rest was contributed by nuclear (3.1%) and imports from Bhutan (0.5%).

In view of increasing renewable energy capacity, the govt is looking to promoting storage technologies. Recently, the Government of India notified the



guidelines or Procurement & utilization of BESS as part of generation, Transmission and Distribution assets along with Ancillary services. The objective of these guidelines are to facilitate the procurement of BESS, as part of individual renewable power projects or separately, to address variability and firm up power supply from renewable energy projects.

In addition, The Government body Central Electricity Authority, flue gas desulphurisation (FGD) systems have been planned for 439 units, aggregating 168.9 GW to reduce Sox emissions. Last year, bids have been awarded for 157 units aggregating 69260 MW in capacity. Apart from this, a notice inviting tender has been issued for 132167 MW of capacity or 325 units. Currently, FGD systems have been commissioned across 20 units aggregating 8290 MW in capacity offer opportunities for suppliers.

To control of particulate matter emissions, most Power Plants have already installed electrostatic precipitators since Indian Coal has a high ash content. However, upgraded systems, could be required for the existing projects. In addition the environment ministry's decision to do away with coal washing makes it more important for Power Plants to invest in efficient PM control technologies. A detailed phasing proposal outlining the plan of action for the augmentation of ESPs for PM control upto 2024 has



been prepared by the CEA. Electrostatic Precipitators (ESPs) implementation plans are available for 222 units aggregating 64.5 GW in capacity offer opportunities for suppliers.

In terms of targets, the country's installed power capacity is expected to grow significantly to 810 GW by 2030 including at least 500 GW of non-fossil fuel-based capacity by 2030. In order to ensure a smooth energy transition, the existing TPP fleets will be required to play a balancing role to maintain grid stability and security going forward.

Overview-Power Transmission

Indian Transmission segment has grown significantly over the years, making the country's electricity grid one of the largest synchronous grids in the world. As of May 2022, the total transmission line length stood at 458258 ckt, km, the total AC substation capacity stood at 33500 MW. In last Five years the line length has grown at a compound annual rate of 5% while AC and HVDC substation capacities have grown at 8.8% and 14.3% respectively. The interregional transfer capacity has also grown considerably from 58050 MW in 2015-16 to 112250 mw in may 2022.

This expansion of transmission has facilitated seamless transfer of electricity from power surplus





regions to power deficit regions, thereby optimising the use of generation resources as well as meeting the demands of end consumers. Now, the segment is set for another phase of accelerated growth, primarily driven by the need to evacuate large-scale renewables. With India targeting to meet 50% of its energy needs from renewables and achieve 500 GW of non-fossil fuel capacity by 2030 as announced at COP 26, significant expansion and strengthening of the interstate transmission system will be required. Simultaneously, state utilities are expected to take measures to upgrade and augment intra-state transmission as well as sub-transmission networks. A look at the key trends and developments in the power transmission segment.

Government of India has undertaken many progressive policy and reform initiatives for the transmission segment in the recent years. One of the most significant in the introduction of general network access under the Electricity Rules 2021, which were released in the gazette notification dated October 1, 2021. The latest rules define GNA as non-discriminatory access to the ISTS, as requested by the designated interstate customer and granted by the central transmission utility for a maximum injection or drawl in megawatts and for a specific period. The transition to GNA would provide the much-needed flexibility to state entities in

purchasing electricity under contracts of varying durations without the limitations of ISTS network availability. For generators too, there will be enhanced flexibility in sales since target beneficiaries will not have to be specified.

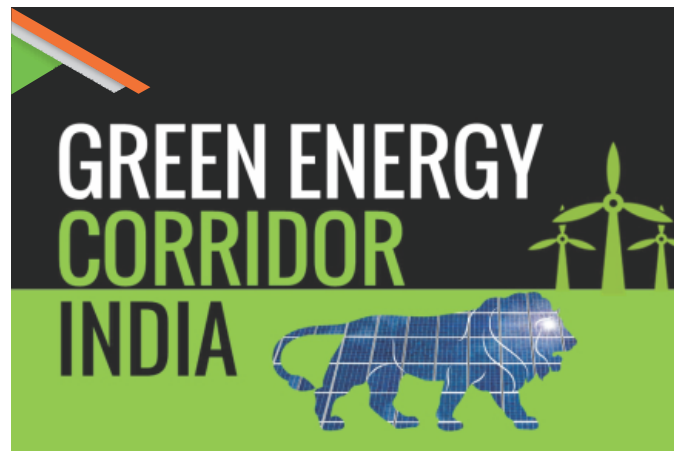
Government of India revised the terms of reference of the National Committee on Transmission (NCT) to fast-track the process of ISTS development. Earlier, all ISTS projects were approved by the Ministry based on the NCTs recommendations. Now the Ministry will only look at ISTS projects upto Rs 1 billion and ₹5 billion will be approved by the NCT. Further, in order to encourage private participation in transmission, the MOP released revised standard bidding documents for tendering of projects via tariff-based competitive bidding.

Other important policy initiatives includes separation of the Central Transmission Utility from Power Grid Corporation of India Ltd (PowerGrid) to provide transparency and a level playing field in TBCB, a reduction in the lock-in period for transmission projects in order to attract investments and more competition, proposal to bring all 33KV systems, which are currently maintained by the state discoms, under State Transmission Utility for better upkeep, and an extension of the ISTS charges waiver on solar and wind energy projects commissioned upto June



30th, 2025. Another important development in the segment was the launch of the initial public offering of the PowerGrid Infrastructure Investment Trust, the maiden infrastructure investment trust of PowerGrid, last year begin to initiate asset monetisation drive. ₹77.35 billion public issue was oversubscribed nearly 4.83 times, having received bids for 2.05 billion units against an offer size of 425.4 million units. The National Monetisation Pipeline has set a target of monetising PowerGrid transmission assets worth ₹452 billion between 2021-22 and 2024-25.

The Green Energy Corridors is a key program for renewable energy evacuation in the country. Under GEC Phase I, 3200 ckt km of interstate transmission lines and 17000 MVA of substation capacity have been commissioned. At the intra-state level, GEC Phase I targets an addition of 9700 ckt km of transmission lines and 22600 MVA of substation capacity with completion in 2022. Recently, the Government of India approved the GEC Phase II program for intra-state transmission systems. Under this phase, projects would be set up in 7 states – Gujarat, Himachal Pradesh, Karnataka, Kerela, Rajasthan, Tamil Nadu & Uttar Pradesh – for evacuation of about 20 GW of renewable energy. In addition, under the Transmission Scheme for Renewable Energy Zones (REZs), evacuation infrastructure for about 66.5 GW of renewable



energy capacity is being created with an investment of ₹432 billion.

The transmission segment is at the forefront of adopting the latest technology. The voltage level has increased from 220 KV to 765 KV, +800 KV HVDC and 1200 KV, and advanced technologies such as voltage source converter and FACTS are being deployed.

The govt expects an addition of about 17500 ckt km of transmission lines per year and 80000 MVA of transformation capacity per year over the next 3 years. The National Infrastructure Pipeline has estimated a capital expenditure of about ₹3040 billion for the power transmission segment between 2020 & 2025. State utilities are expected to lead the transmission segment with a projected capex of ₹1900 billion. In addition to expanding the physical grid, utilities will increasingly need to invest in advanced and grid-enhancing technologies to improve capacity, grid-resilience and stability.

India is likely to have an installed power capacity of around 810 GW by 2030 and Government target is to have at least 500 GW of non-fossil-fuel-based capacity. The biggest challenge for India's energy transition is how to integrate such a large quantum of intermittent and seasonal renewable energy into the grid. Government of India decided that the first low



hanging fruit is the flexible operation of coal-based plants. Government of India is going to work closely with the states in the next 2-3 years to make sure almost all the country's coal-based power plant fleet is able to flex upto 40%. Flexing upto 55% does not require significantly additional expenditure, but when going down from 55% to 40%, we need around 1 million per MW expenditure. Thus, it is a low hanging fruit with small expenditure that will give enough capacity to the grid to absorb renewables.

Opportunities for foreign investment in India's power sector

India's electricity consumption patterns are indicative of surging demand, presenting opportunities for foreign investors. The industrial sector accounted for 42 percent of total energy consumption in FY 2019. The sector is projected to attract investment worth INR 9.5 trillion (US\$135.37 billion) between FY 2019 to FY 2023. In the last two



Going Forward, while capacity additions by power majors are expected to continue apace in the renewable energy segment, the conventional generation segment is expected to remain subdued. Transmission front, in the next 4-5 years, the segment looks poised for significant investment inflow. In addition to expanding the physical grid, utilities will increasingly need to invest in advanced and grid-enhancing technologies to improve capacity, grid resilience and stability.

decades, the power sector in India has attracted foreign direct investment (FDI) worth US\$15.36 billion, accelerated by the liberalized FDI policy allowing 100 percent on the automatic route.

The Central Electricity Authority (CEA) estimates India's power requirement to grow to reach 817 GW by 2030. The government plans to establish renewable energy capacity of 500 GW by 2030.

Other Infra Highlights

Rail Sector

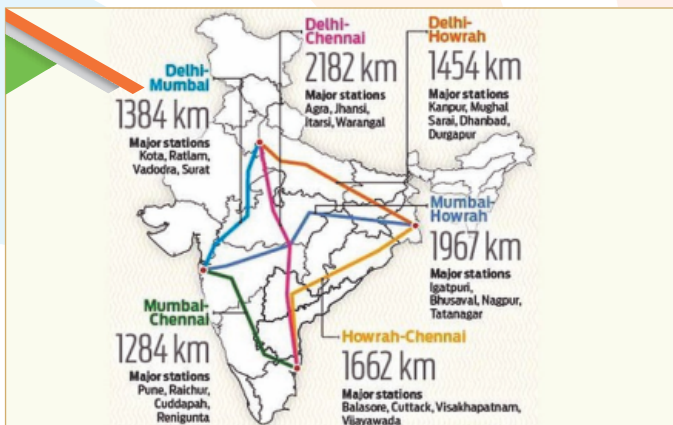
Railway Technology provides insight into the number of new railway projects in the world by country and stage of development.

As at the start of 2022, Railway Technology had identified 3,026 railway projects over \$25m at various stages of development, including 1,219 in execution.



National Rail Plan 2030

- a. Upgradation of speed to 160 kmph on Delhi-Howrah and Delhi-Mumbai routes
- b. Upgradation of speed to 130 kmph on all other Golden Quadrilateral-Golden Diagonal (GQ/GD) routes



- c. Dedicated Freight Corridors
- d. High Speed Rail Corridors
- e. Involvement of the Private Sector in areas like operations and ownership of rolling stock, development of freight and passenger terminals, development / operations of track infrastructure etc.



- f. 58 Super critical Projects of a total length of 3750 kms costing ₹39,663 Crore and 68 Critical Projects of a total length of 6913 kms costing ₹75,736 Crore, have been identified for completion by 2024.



Tunnelling Opportunities

India is one of the fastest growing markets for tunnel construction, with the tunnelling industry witnessing high growth and ready to adopt advanced technologies. It is estimated that over ₹5.00 trillion worth of projects will be awarded in the next five years. Over the past few years, the size of tunnelling projects has witnessed a substantial

the pressure on land increases for productive economic and social uses, there will be greater need to construct underground structures in the metro, water and sewerage, and road sectors.

Tunnelling infrastructure holds immense promise for contractors, consultants, technology and equipment providers, material suppliers etc. over the long term.



increase. Almost all the upcoming tunnel projects are of longer lengths, larger diameters, and even higher contract values. Rising investments in tunnel construction have resulted in high growth in the tunnel equipment market as well. Going forward, as

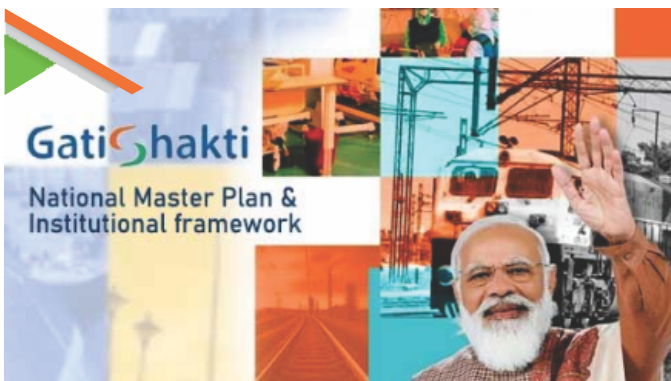
With more industry players tying up with international players, either for risk assessment, design or construction technology, the industry will witness reduced risks in project construction and timely completion.



Gati-Shakti—Overview

Gati Shakti is a digital backbone on which infrastructure projects planned by the government under the ₹110 trillion National Infrastructure Plan (NIP) will be implemented by 2025. It provides an institutional framework for implementation, and a monitoring and support mechanism for providing multimodal connectivity.

The sheer scale of the Gati Shakti Plan can be gauged from its 2024-25 targets. The highway capacity is to be increased to 2 lakh routes km while cargo handling by the railways will be scaled up from 1200 mt in 2020 to 1600 mt. Under Gati Shakti, aviation is set to get a big boost with 200 new airports, heliports and water aerodromes. Power



Recently launched Gati Shakti National Master Plan aims to prevent wasteful delays, may well serve as a tool to fast track infrastructure development, which holds the key to the growth of real estate as well. Gati Shakti will incorporate different infra schemes such as Bharatmala, Sagarmala and inland waterways together with textile and pharma clusters, defence and industrial corridors, electronic parks as well as food parks, fishing clusters, and agricultural zones to boost logistics and provide world-class infra facilities.

transmission network will go up to 454200 circuit km. Renewable energy capacity will be increased to 225GW, up from 87.7 GW, along with completion of 17000 km of gas pipelines by 2025. The plan will involve 11 industrial parks and two defence corridors with a total investment of ₹20,000 crore. The other highlights include 197 food parks and agro processing centres and 38 electronics manufacturing clusters with a production target of ₹15 lakh crore.





KRS MARKETING Partnership Proposal

Marketing Requirements

Handling business opportunities in India require various steps and Marketing Partnership will help you to understand the practice and management to work in India. Considering the promotion before official participation in business, few steps like promotion, introducing own product range to manage the requirement development accept our standard products or services, advance preparation of participation in Indian Opportunities, management of local vendor team, if required for joint participation, handling tenders, offers, negotiations, contract management support etc., the list is ongoing and KRS Infra Ventures Pvt. Limited ensure that our experience being in this trade from last three decades offer you wider experience base in INDIA.

Marketing Proposal

The KRS Group herewith introduce KRS Infra Ventures Pvt. Limited herewith offers the marketing partnership to your organization to promote you and yours associates interest in Indian Infrastructure Sector with following ways:

- ▶ Informing Business Opportunities in India for business scope of your organization.
- ▶ Promoting your organization with introducing and presenting details to various clients in Government and

Private Sector and follow-up for acquisition formalities (tendering process, finalization of business, all assistance during implementation & after sales etc.)

- ▶ Informing the current scenario of market in view of Government Policies, Procurements plans etc.
- ▶ Advising the strategies required during promotion for successful business opportunities.

The partnership terms will require discussions to finalize, which will be second step after receiving your principal approval and suggest you to work on following options for understanding:

- ▶ Marketing Partnership Joint Venture-which means "KRS Infra Ventures" will be offering all Marketing support in India and your organization handle the technical & commercial need of the projects targeted and rest terms & conditions of arrangement will decided after in principal approval of partnership.
- ▶ Exclusive Agent in INDIA-KRS will be offered exclusive Agency Agreement for 3 years minimum to develop and managing business opportunities for your organization and terms & conditions of this agreement will be discuss after principal approval of working.



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