Crisil
Intelligence

Assessment of cables, conductors industries and investments in power sector in India

September 2025

by S&P Global

Crisil Intelligence

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Global macroeconomic overview

Global GDP is estimated to grow at 2.8% in CY25 and 3.0% in CY26

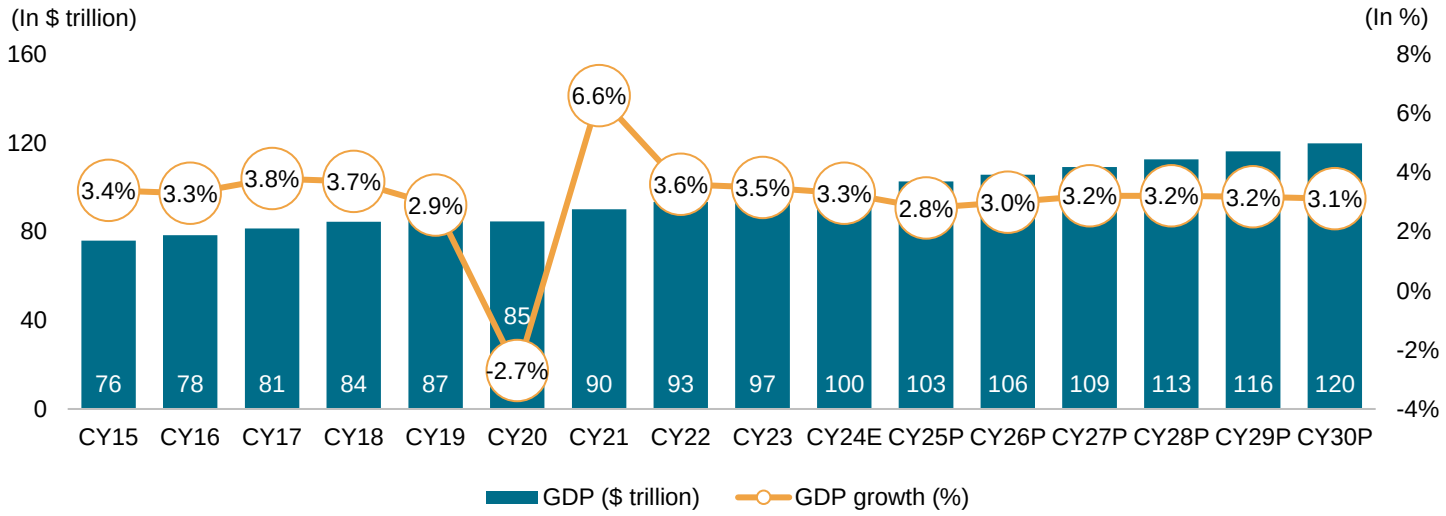
As per the International Monetary Fund's (IMF) April 2025 update, global gross domestic product (GDP) growth witnessed a growth of 3.3% in 2024 as signs of stabilization emerged- inflation came down from multidecade highs, followed a gradual as well as labour markets normalized, with unemployment and vacancy rates returning to pre pandemic levels.

However, major policy shifts are resetting the global trade system and giving rise to uncertainty in the global economy. Since February 2025, a series of new tariff measures by the United States and countermeasures by its trading partners have been announced and implemented, ending up in near-universal US tariffs on April 2 and bringing effective tariff rates to levels not seen in a century. This, on its own is a major negative shock to growth and the unpredictability with which these measures have been unfolding also has a negative impact on economic activity and the outlook.

This swift escalation of trade tensions and extremely high levels of policy uncertainty are expected to have a significant impact on global economic activity. Under the reference forecast that incorporates information as of April 4, global growth is projected to drop to 2.8% in CY25 and 3.0% in CY26. Over the medium term (CY26-CY30), global GDP is expected to expand at CAGR ~3.2%.

The adoption of technology, the rapid rise of digital infrastructure, and shifting demographic trends are set to profoundly reshape the global economy in the coming decades. As cloud computing, artificial intelligence, automation, and data-driven business models permeate every sector, productivity and innovation are accelerating, driving new sources of economic output. At the same time, the world faces contrasting demographic dynamics: developed economies are grappling with aging populations that will strain healthcare systems and reduce workforce participation, while emerging markets benefit from younger demographics that can support sustained growth. This youthful workforce, combined with technology-led advances in areas like financial inclusion, healthcare delivery, and education, is expected to narrow development gaps and boost the global contribution of emerging economies. The surge in digital infrastructure - from data centres and smart grids to electric vehicle charging networks - is also transforming energy demand. Together, these forces will redefine competitive advantages across regions, as countries that embrace innovation and build digital capabilities are positioned to drive a disproportionate share of global GDP growth over the next several decades.

Global GDP trend and outlook (2015-30P, $ trillion)



Note: E: Estimated, P: Projection
Source: IMF economic database, Crisil Intelligence

India macroeconomic overview

India among the world's fastest-growing large economies

India became the fifth largest economy in the world by CY22 and has grown at a faster growth rate of 5.3% (CAGR CY19-24) compared to top key economies.

For advanced economies, growth under the reference forecast is projected to drop from an estimated 1.8% in CY24 to 1.4 percent in CY25 and 1.5 percent in CY26. The forecasts for CY25 include downward revisions for Canada, Japan, the United Kingdom, and the United States and an upward revision for Spain.

United States: For the United States, growth is projected to decrease in CY25 to 1.8%, 1% lower than the rate for CY24 as a result of greater policy uncertainty, trade tensions, and a softer demand outlook, given slower-than-anticipated consumption growth. Tariffs are also expected to weigh on growth in CY26, which is projected at 1.7% amid moderate private consumption.

Euro area: Growth in the euro area is expected to decline slightly to 0.8% in CY25, before picking up modestly to 1.2% in CY26. Rising uncertainty and tariffs are key drivers of the subdued growth in CY25. Offsetting forces that support the modest pickup in CY26 include stronger consumption on the back of rising real wages and a projected fiscal easing in Germany.

Emerging market and developing economies: For emerging market and developing economies, growth is projected to drop to 3.7% in 2025 and 3.9% in CY26, following an estimated 4.3% in CY24.

Real GDP growth rate (%)

Real GDP growth (Annual percent change) (%)	CY19	CY20	CY21	CY22	CY23	CY24E	CY25P	CY26P
Advanced economies	1.9	-4.0	6.0	2.9	1.7	1.8	1.4	1.5
Canada	1.9	-5.0	6.0	4.2	1.5	1.5	1.4	1.6
China	6.1	2.3	8.6	3.1	5.4	5.0	4.0	4.0
Emerging market and developing economies	3.7	-1.7	7.0	4.1	4.7	4.3	3.7	3.9
Euro area	1.6	-6.0	6.3	3.5	0.4	0.9	0.8	1.2
India	3.9	-5.8	9.7	7.6	9.2	6.5	6.2	6.3
Japan	-0.4	-4.2	2.7	0.9	1.5	0.1	0.6	0.6
United Kingdom	1.6	-10.3	8.6	4.8	0.4	1.1	1.1	1.4
United States	2.6	-2.2	6.1	2.5	2.9	2.8	1.8	1.7
World	2.9	-2.7	6.6	3.6	3.5	3.3	2.8	3.0

Notes: P- projected
** Numbers for India are for financial year from April to March (CY20 is FY21 and so on).*
India's FY26 projection as per the CRISIL forecast - 6.5%
Source: IMF economic database, Crisil Intelligence

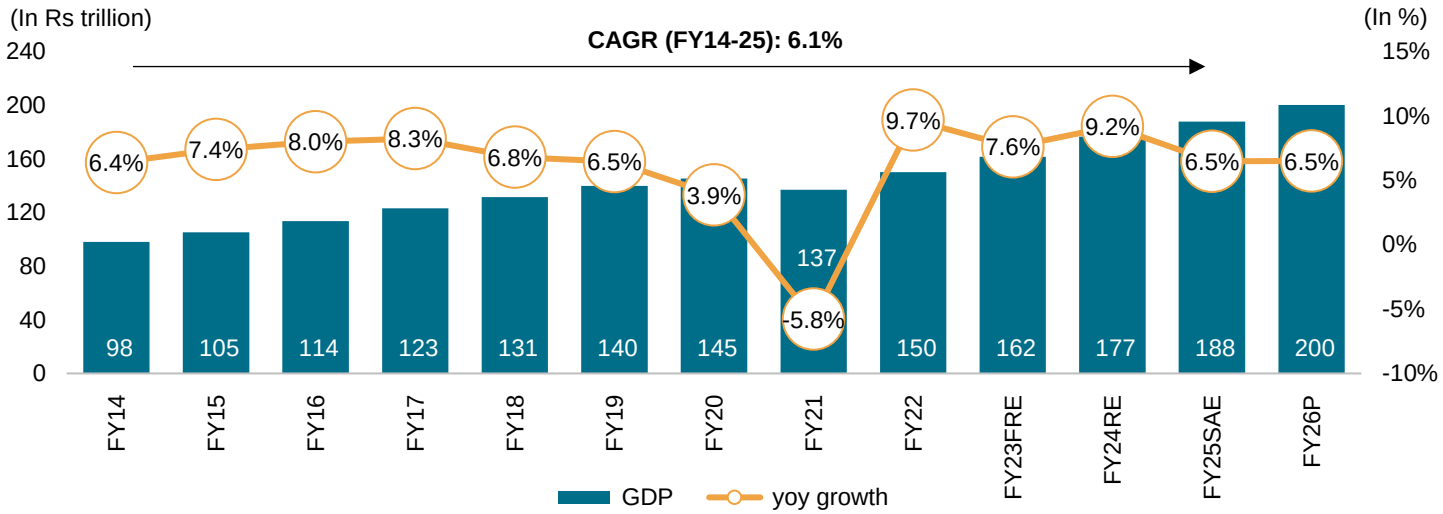
India's economy grew 6.1% from FY14 to FY25, to grow 6.5% in FY25

India's GDP grew at 6.1% compounded annual growth rate (CAGR) between FY14 and FY25 to Rs. 188 trillion in FY25 from Rs. 98 trillion in FY14. This growth was largely driven by the expansion of the non-agricultural economy. Notably, the Gross Value Added (GVA) of the financial, state, and professional services sector registered the highest CAGR of 7.4% during this period. In contrast, agriculture, livestock, forestry, and fishing sector grew at a relatively modest CAGR of 4.0% during the same period. Additionally, a key contributor to GDP growth during this period was the rise in the Private Final Consumption Expenditure (PFCE), which constitutes the largest share of GDP. This was complemented by the improvements in exports and an increase in Gross Fixed Capital Formation (GFCF). Collectively, these three components- PFCE, GFCF, and exports (imports- exports) formed ~89% of the overall GDP in FY25.

According to the Second Advance Estimates of FY25, India's GDP is projected to grow at 6.5%, a moderation from the 9.2% growth recorded in FY24. Despite this deacceleration, growth remains close to the pre pandemic decadal average of 6.6 % between FY11-FY20, enabling India to retain its position as the fastest growing major economy. The slowdown in FY25 is primarily attributed to a moderation and fixed investment, which grew at 6.1% compared to 8.8% in FY24. On the other hand, consumption and export exports showed notable improvement with growth rates of 7.6% and 7.1% respectively, up from 5.6% and 2.2% in the previous fiscal. Additionally imports contracted by 1.1% in real terms, a significant reversal from the 13.8% growth in FY24.

Moving forward, Crisil projects GDP growth to remain steady at 6.5% in FY26, despite potential headwinds arising from geopolitical developments and global trade uncertainties, including tariff actions by the United States. Factors expected to support growth includes easing food inflation, tax incentives announced in the Union Budget 2025-26, and lower borrowing cost, all of which are expected to boost discretionary consumption. However, India's Current Account Deficit (CAD) is projected to widen slightly in FY26, driven by challenges in exports amid subdued global demand and trade tensions. Nonetheless, a strong service trade surplus and continued growth in remittances are expected to mitigate the extent of the widening CAD.

Real GDP growth in India (2011-12 series) – constant prices



Note: FE: Final Estimates, FRE: First Revised Estimates, SAE: Second Advance Estimates, P: Projected
These values are reported by the government under various stages of estimates
Only actuals and estimates of GDP are provided in the bar graph
Source: Second Advance Estimates of annual GDP for 2024-25, Ministry of Statistics and Program Implementation (MoSPI), Crisil Intelligence

Per capita net national income of India further improved in FY25

India's per capita income, a broad indicator of living standards, rose from Rs 68,572 in FY14 to Rs 114,705 in FY25 as per SAE, logging 4.8% CAGR. Growth was led by better job opportunities, propped up by overall GDP growth. Moreover, population growth remained stable at ~1% CAGR.

Per capita net national income at constant (2011-12) prices

	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23FE	FY24FRE	FY25SAE	CAGR (FY14-FY25)
Per-capita NNI (Rs.)	68,572	72,805	77,659	83,003	87,586	92,133	94,420	86,034	94,054	100,163	108,786	114,705	4.8%
Y-o-Y growth (%)	4.6%	6.2%	6.7%	6.9%	5.5%	5.2%	2.5%	-8.9%	9.3%	6.5%	8.6%	5.4%	-

Note: FE: Final Estimates; FRE: First Revised Estimates; SAE: Second Advance Estimates; P: Projection
Source: Second Advance Estimates of Annual GDP for 2024-25, MoSPI, Crisil Intelligence

India's population is projected to log 0.8% CAGR between 2025 and 2030, boosting demand for power

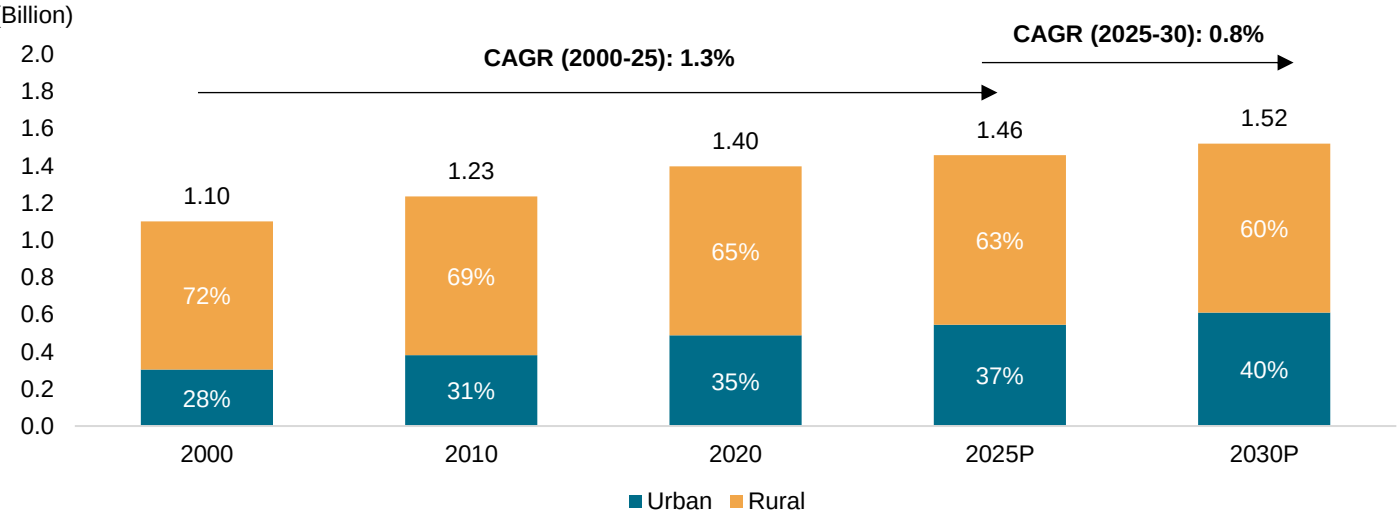
India's robust population growth has been a key structural driver shaping the evolution of its power sector over the last two decades and will continue to do so in the future. According to the World Population Prospects 2024, India's population has grown from approximately 1.0 billion people in 2000 to nearly 1.46 billion in 2025, registering a compound annual growth rate of around 1.3%. Looking ahead, India is expected to remain the world's most populous nation throughout the remainder of the century, with the population projected to reach its peak in the early 2060s at about 1.7 billion. This sustained demographic expansion has far-reaching implications for electricity demand and infrastructure development.

In parallel, India's urban population has been steadily increasing as economic development and better job opportunities attract people from rural areas to cities. From around 31% of the total population in 2010, the share of urban residents is

projected to rise to nearly 40% by 2030, according to UN reports on urbanisation. Migration can occur in various forms—sometimes involving entire families relocating, and other times only students or earning members moving to urban centres. As this urbanisation trend accelerates, it is expected to drive a marked increase in demand for reliable and high-quality electricity supply to support growing residential, commercial, and industrial activities in cities.

Rising urbanisation will also change consumption patterns significantly. Households will increasingly use modern appliances, lighting, and cooling solutions. Cities will see higher energy loads from electric vehicle charging infrastructure, high-rise construction, and a shift toward energy-intensive lifestyles. In this context, India's power sector is underpinned by a pressing need to expand generation capacity, modernise transmission and distribution networks, and integrate renewable energy to meet the aspirations of a young, rapidly growing population seeking improved living standards and economic productivity. This intersection of population growth, urban migration, and development will continue to create substantial opportunities—and challenges—for the country's power infrastructure in the decades ahead.

India's population growth



Note: P: Projected
Source: World Urbanization Prospects: The 2018 Revision, UN Department of Economic and Social Affairs, World Population Prospects 2024, Crisil Intelligence

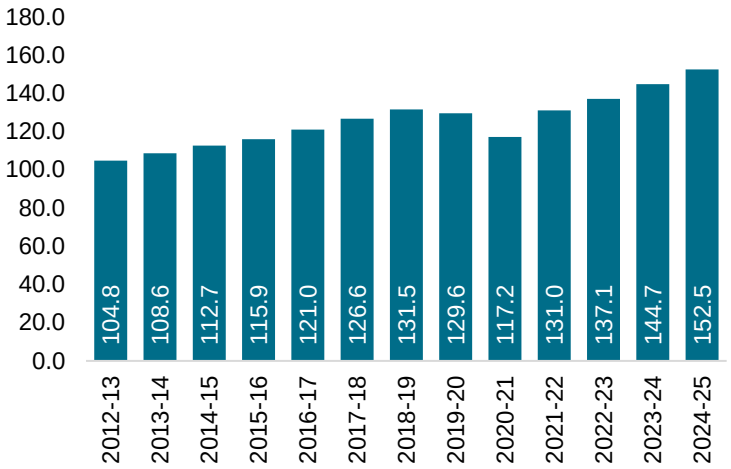
Manufacturing IIP increased to 152.5 in FY25

The Index of Industrial Production (IIP) for manufacturing rose to 152.5 in FY25 from 104.8 in FY13. The manufacturing sector is a significant contributor to the country's overall industrial growth, with 78% weightage in the overall IIP as of FY25. Manufacturing accounts for 77.6% of the IIP basket. The sector has gained from structural reforms such as GST, reduction in corporate tax, and PLI scheme which attracted investments across sectors.

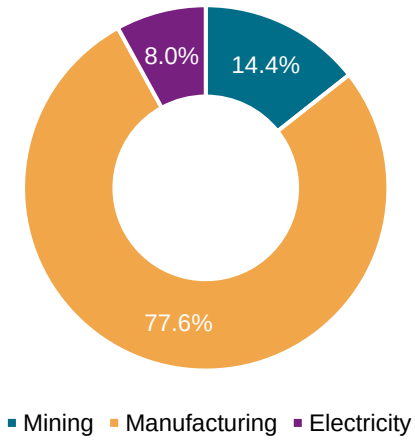
The IIP's electricity sub-index rose as the national power landscape grew. India's power sector has seen robust expansion driven by rising demand, infrastructure development, and strong policy support for both conventional and renewable energy sources. Electricity generation has increased from 1,168 billion units (BU) in FY16 to 1,824 BU in FY25. Similarly, total installed capacity has grown from 305 gigawatts (GW) in FY16 to a projected 475 GW in FY25. During this period, the Ministry of Power implemented key reforms to improve access, efficiency, and reliability. Important initiatives include the creation of a unified national power grid, the Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) for rural electrification, and the SAUBHAGYA scheme aimed at universal household electrification. This has led to reduction in energy shortages from 4.2% (FY14) to 0.1% (FY25) and increased per capita electricity consumption from 1,395 kWh in FY24 from 957 kWh in FY14.

Even though manufacturing IIP declined in FY20 to 129.6 and to 117.2 in FY21 owing to the pandemic, it recovered to 131.0 in FY22 on the back of easing of Covid-19 related restrictions, government stimulus measures, rising consumer demand and efforts to revitalise the manufacturing sector. Consequently, in FY25, manufacturing IIP stood at 152.5.

Manufacturing IIP (FY13 to FY25)



Weight of manufacturing in IIP (FY25)



Source: MoSPI, Crisil Intelligence

Industry sector accounts for ~31% of the total GVA in the Indian economy

Industry sector, which include Mining & Quarrying, Manufacturing, Electricity, Gas, Water Supply & Other Utility Services, Construction (Agriculture, forestry and fishing) and has retained its share of ~31% in FY14 and FY25.

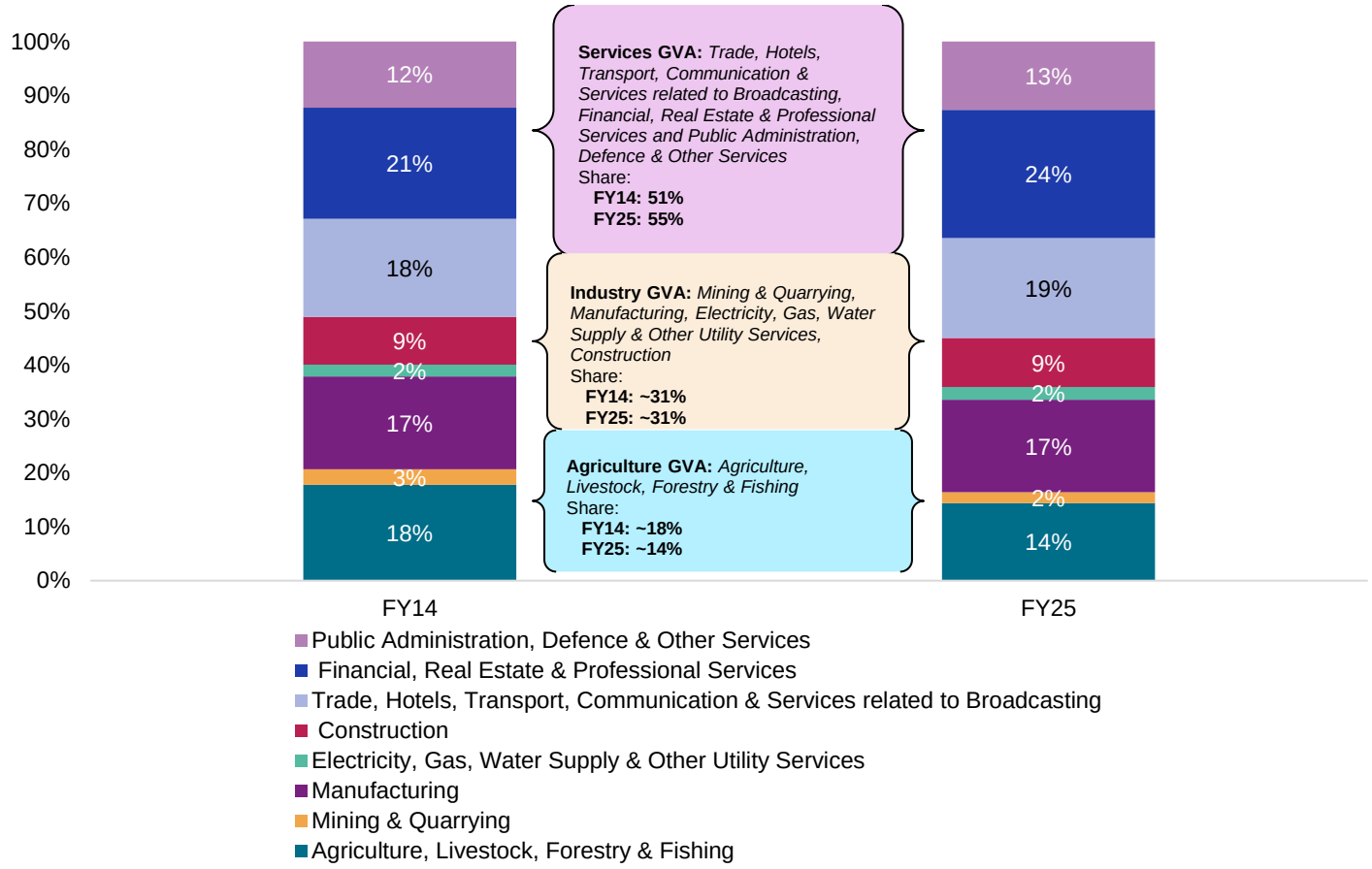
Under the industry sector, Electricity, Gas, Water Supply & Other utility services GVA grew at a CAGR of 6.7% over FY14 to FY25 from Rs. 2 trillion in FY14 to Rs. 4.1 trillion in FY25 which is faster than the industry sector GVA growth of 5.8% over the same period.

The services sector, including Trade, Hotels, Transport, Communication & Services related to Broadcasting, Financial, Real Estate & Professional Services and Public Administration, Defence & Other Services registered a CAGR of 6.7% between FY14 to FY25 and continues to be a significant contributor to India's growth.

During this period, the sector contribution to GVA expanded from 51% in FY14 to 55% in FY25, underscoring its growing significance. In absolute terms, the service sector GVA stood at Rs 94.5 trillion in FY25 compared to Rs 46.3 trillion in FY14. This growth of services was driven by the significant domestic demand, rapid urbanization, expansion of e-commerce platforms generated heightened requirements for logistics, digital related services are important factors which have determined the domestic demand of services.

Share of agricultural economy, which includes Agriculture, Livestock, Forestry & Fishing, declined from 18% in FY14 to 14% in FY25.

Share of GVA at constant prices (FY14, FY25) (%)



Source: MoSPI, Crisil Intelligence

Key government initiatives to boost manufacturing sector in India

Growth driver	Description and reasoning
Make in India	Launched on September 25, 2014, by the Prime Minister. The 'Make in India' initiative was designed to transform India into a global hub for design and manufacturing. Its core objectives were to facilitate investment, encourage innovation, and develop world-class infrastructure. As one of the pioneering 'Vocal for Local' initiatives, it sought not only to boost India's manufacturing capabilities but also to showcase its industrial potential on a global stage.
National Industrial Corridor Development Programme (NICDP)	The National Industrial Corridor Development Programme (NICDP) is a transformative initiative launched to develop world-class industrial infrastructure and promote planned urbanisation across India. By integrating smart technologies and multi-modal connectivity, the programme aims to create globally competitive manufacturing hubs while fostering economic growth and employment opportunities. These industrial corridors are being developed in collaboration with State Governments to ensure efficient planning and execution. In August 2024, the Cabinet Committee on Economic Affairs approved 12 new industrial areas across 10 states under NICDP with an investment of Rs. 286.02 billion. These industrial nodes, planned along six major corridors, is expected to strengthen India's manufacturing ecosystem and boost its global competitiveness.
PM Gati Shakti	In 2021, the Prime Minister launched PM Gati Shakti - National Master Plan for Multi-modal Connectivity, essentially a digital platform to bring 16 Ministries including Railways and Roadways together for integrated planning and coordinated implementation of infrastructure connectivity projects. It will incorporate the infrastructure schemes of various Ministries and State Governments like Bharatmala, Sagarmala, inland waterways, dry/land ports, UDAN etc. Economic Zones like textile clusters, pharmaceutical clusters, defence corridors, electronic parks, industrial corridors, fishing clusters, Agri zones will be covered, and technology will be leveraged including spatial planning tools with ISRO (Indian Space

Growth driver	Description and reasoning
	Research Organisation) imagery developed by BiSAG-N (Bhaskaracharya National Institute for Space Applications and Geoinformatics). This multi-modal connectivity will provide integrated and seamless connectivity for movement of people, goods and services from one mode of transport to another. It will facilitate the last mile connectivity of infrastructure and also reduce travel time for people. As of March 13, 2025, 115 National Highway and road projects covering approximately 13,500 km, with an investment of Rs. 6.38 trillion, have been evaluated under the initiative, leading to more efficient infrastructure development.
Production linked incentive (PLI) scheme	Production Linked Incentive Scheme was announced in Union Budget 2021-22, with the capital outlay of Rs 1.97 trillion, the PLI Schemes focus on 14 critical sectors, each strategically chosen to enhance the country's manufacturing prowess, foster technological advancements, and elevate India's position in global markets. As of Aug 2024, investments under the PLI stand at approximately Rs 1.5 trillion, with projections to reach Rs 2 trillion soon. This is anticipated to generate around ₹12.5 trillion in production and sales, creating about 0.95 millions jobs. Additionally, exports have also surpassed Rs 4 trillion, especially in electronics, pharmaceuticals, and food processing.

Source: PIB, Crisil Intelligence

2. Overview of power sector in India

Global electricity demand to grow at 3.9% CAGR over CY2024-27 with renewable energy supplying ~38% by CY2027, up from ~29% in CY2022

The world's electricity consumption is projected to experience its fastest growth in years till 2027, driven by factors such as increasing industrial activity, greater use of air conditioning, rapid electrification, and the global expansion of data centers. After a 4.3% increase in 2024, global electricity demand is expected to continue growing at a rate of nearly 4% until 2027. Over the next three years, the world's electricity consumption is forecast to increase by a significant 3,500 TWh, which is equivalent to adding the entire electricity consumption of Japan to the global total every year. This represents a substantial acceleration from the 2.5% growth seen in 2023, when gains in countries like China, India, and Southeast Asia were offset by declines in more developed economies.

The majority of the world's increased electricity demand until 2027 is anticipated to come from emerging economies, accounting for 85% of the growth. China is currently driving this trend, with a 7% increase in electricity demand in 2024, and is expected to maintain an average annual growth rate of 6% until 2027. Other emerging markets, including India and Southeast Asia, are also expected to experience significant growth, fueled by economic expansion and increasing air conditioner ownership. India's electricity demand is projected to grow at an average rate of 6.3% per year over the next three years, outpacing its previous growth rate. However, despite progress in recent years, many African countries are still struggling to provide reliable electricity access, with 600 million people in sub-Saharan Africa remaining without access to a stable power supply.

Global electricity demand, CY 2022-2027

TWh	CY 2022	CY 2024	CY 2027P	CAGR (2024-27)
Africa	754	792	922	5.2%
Americas	6,369	6,481	6,909	2.2%
United States	*4,332*	*4,336*	*4,593*	*1.9%*
Asia Pacific	13,840	15,452	17,983	5.2%
China	*8,678*	*9,935*	*11,803*	*5.9%*
*India**	*1514*	*1,695*	*1,968-2,083*	*5-7%*
Eurasia	1,309	1,369	1,450	1.9%
Europe	3,680	3,643	3,850	1.9%
Middle East	1,225	1,300	1,430	3.2%
World	27,178	29,038	32,542	3.9%

*Note: *India's demand is based on CEA data and Crisil Intelligence projections. CY2022 data above is for FY23, CY2024 is for FY25 and CY2027 is for FY28*

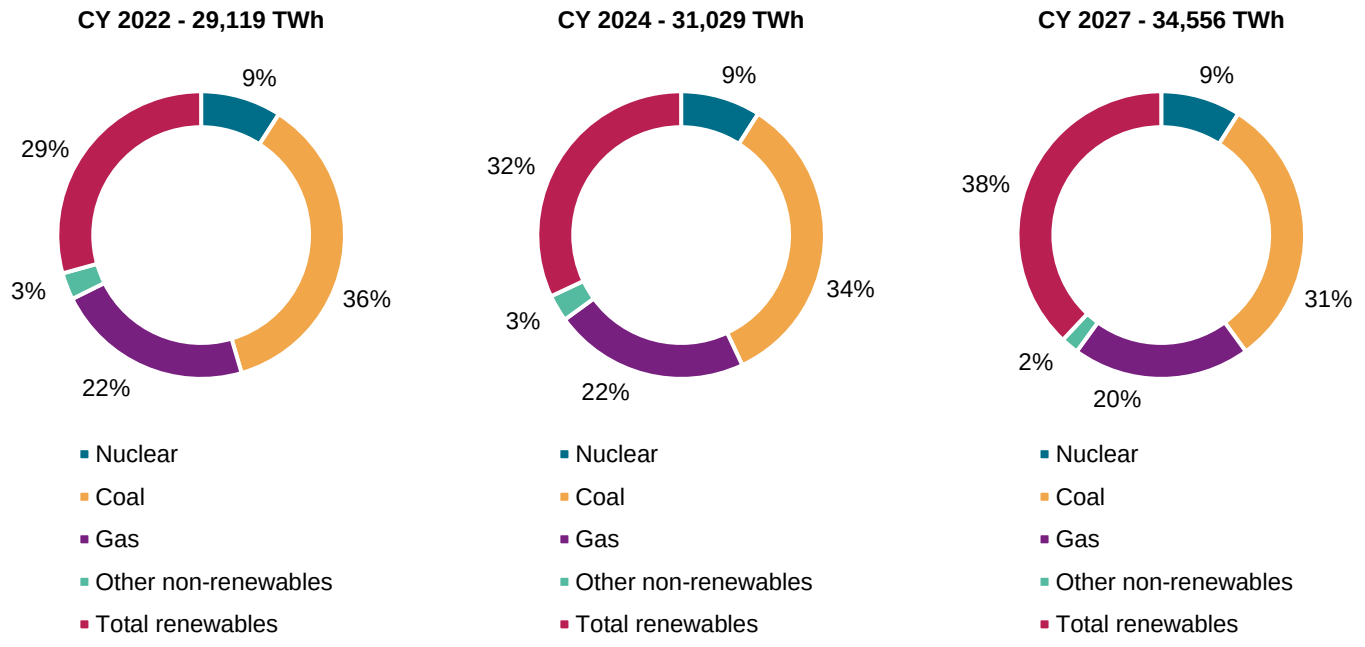
Source: IEA, CEA, Crisil Intelligence

Global electricity supply, CY 2022-2027

TWh	CY 2022	Share (%) as of CY 2022	CY 2024	Share (%) as of CY 2024	CY 2027	Share (%) as of CY 2027	CAGR (2024-27)
Nuclear	2,686	9%	2,840	9%	3,036	9%	2.2%
Coal	10,437	36%	10,704	34%	10,674	31%	-0.1%
Gas	6,525	22%	6,777	22%	6,889	20%	0.5%
Other non-renewables	927	3%	860	3%	717	2%	-5.9%
Total renewables	8,543	29%	9,848	32%	13,250	38%	10.4%
Total generation	29,119	100%	31,029	100%	34,556	100%	3.7%

Source: IEA, Crisil Intelligence

Global electricity supply, CY 2022-2027



Source: IEA, Crisil Intelligence

India accounts for 6.5% of global electricity production (2024) and ranks 3rd globally

India's demographic dynamics are combining with the broader structural changes in India's economy to fuel a surge in power consumption. India accounted for 6.5% of global electricity production in 2024, ranking as the 3rd-largest producer of electricity in the world, behind only China and the United States. The country's electricity demand has been driven by several converging forces. A rapidly expanding economy - now among the fastest-growing large economies globally - is stimulating industrial production and expanding commercial activity, which in turn increases base load demand. Simultaneously, rising household incomes and the aspiration for improved quality of life are driving widespread adoption of air conditioners, cooling appliances, and other electricity-intensive devices, especially amid increasingly intense heatwaves that have become more frequent due to climate change.

Another important catalyst is the electrification of new areas of consumption. The government's focus on digital infrastructure is accelerating the rollout of data centres, which require large, uninterrupted power supplies. In addition, the

electrification of transport and the early adoption of electric vehicles are beginning to create new demand categories that will expand significantly over the next decade. On the supply side, India is seeing rapid growth in renewable energy capacity, particularly solar and wind power, as the government advances its clean energy targets to reduce dependence on fossil fuels and enhance energy security. Policies promoting renewable integration, coupled with targeted incentives and transmission upgrades, are enabling higher shares of variable generation in the grid.

Altogether, these trends underscore that India's power sector sits at the intersection of demographic expansion, urbanisation, industrial growth, and energy transition. The combination of a large and growing population, rising urban concentration, increased electrification of consumption, and ambitious renewable energy goals will continue to drive significant investments in generation capacity, transmission infrastructure, and grid modernisation over the coming decades.

Total electricity production, global ranking, 2024

Rank	Country	Share in global electricity production %
	World	**31,029 TWh**
1	China	32.0%
2	United States	14.8%
3	**India**	**6.5%**
4	Russia	3.9%
5	Japan	3.4%
6	Brazil	2.4%
7	Canada	2.3%
8	Korea	2.1%
9	Germany	2.0%
10	France	1.6%

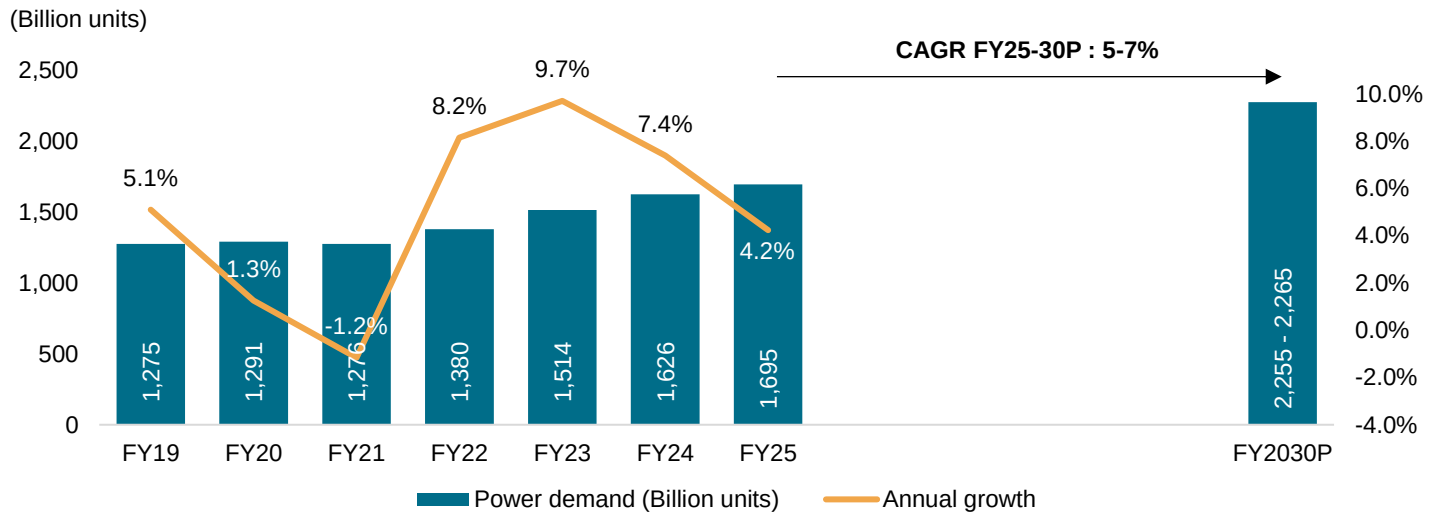
Source: IEA, Crisil Intelligence

Power demand to maintain healthy momentum slated to grow at 5-7% CAGR over fiscals 2025-2030

India's electricity demand has been rising steadily, with a CAGR of ~5% between fiscals 2019 and 2024. In fiscal 2024, power demand surged by 7.4% driven by El-Nino. The country's power demand had previously surged in the first quarter of fiscal 2023 due to a severe heatwave and continued economic activity, resulting in a 9.7% year-on-year growth from fiscal 2022 despite a high base.

In FY25, power demand is estimated to have grown by 5-6%, driven by weather volatility and a strong economy. The power demand in FY25 is around 1,695 billion units. Over the next few years, from FY26 to FY30, power demand is expected to maintain a compound annual growth rate (CAGR) of 5-7%, reaching 2,255-2,265 billion units. This growth will be supported by healthy economic expansion, improvements in distribution infrastructure, and major reforms initiated by the central government to enhance the overall health of the power sector.

Power demand growth (BU) (FY19-FY30P)



Source: CEA, Crisil Intelligence

The demand for electricity in India is expected to be driven by various sectors, including industrial, commercial, and domestic. The industrial and commercial sectors are expected to be the primary drivers of power demand, with significant investments in manufacturing, infrastructure development, and policies like the Production-Linked Incentive (PLI) scheme. The government's Aatmanirbhar Bharat relief package, spending on infrastructure through the National Infrastructure Pipeline, and commissioning of dedicated freight corridors are also expected to foster power demand. Additionally, the expansion of the services industry, rapid urbanization, and increased farm income from agriculture-related reforms will contribute to the growth in power demand.

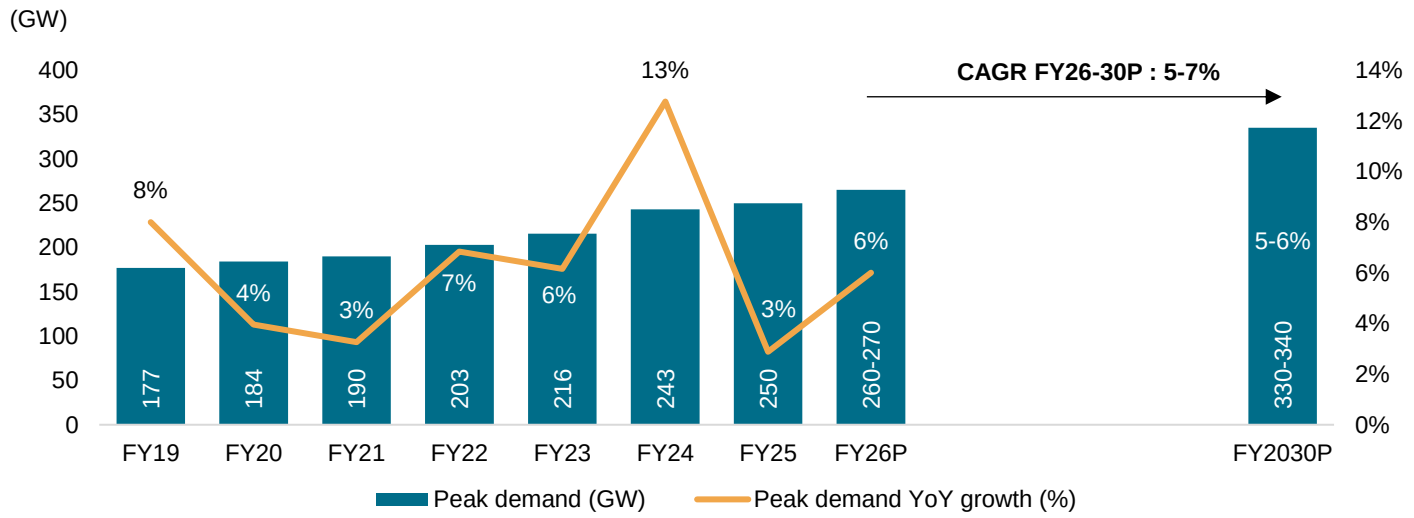
The domestic sector is also expected to see a rise in electricity consumption due to improving living standards, increased air conditioning requirements, and government schemes like the Pradhan Mantri Sahaj Bijli Har Ghar Yojana, which has achieved universal household electrification. The scheme has helped electrify 28.6 million households, driving electricity demand and aiming to ensure 24x7 power supply to separate agriculture and non-agriculture feeders. Further, railway electrification, rapid transition to electric vehicles, increased urbanization, and industrialization, smart city projects, increasingly interconnected grids and upcoming metro projects are expected to provide impetus to power demand.

Peak demand has seen sharp rise over fiscals 2024 and 2025, expected to sustain at 5-7% CAGR till fiscal 2030

Peak demand is the instantaneous surge in power requirement which occurs for a short duration. This may occur for instance when a large set of consumers utilize electricity simultaneously, such as in the evenings for lighting. Between fiscal 2019 and 2025, peak demand has grown from 177 GW to 250 GW. In fiscal 2026, Crisil Intelligence estimates peak power demand to rise to 265-270 GW driven by weather severity consequently pushing electricity consumption.

The constant rise in peak demand can be attributed to economic growth, seasonal vagaries, and an increasing daily average temperature that India has experienced over the last decade. Peak demand is expected to grow at annual average 5-7% over fiscal 2026-2030 to reach nearly 330-340 GW by fiscal 2030 with expected persistent high temperatures, rising urbanization, economic growth and infrastructure push leading to higher power consumption.

Peak demand growth (GW) (FY19-FY30P)



Note: P: Projected; Source: CEA, Crisil Intelligence

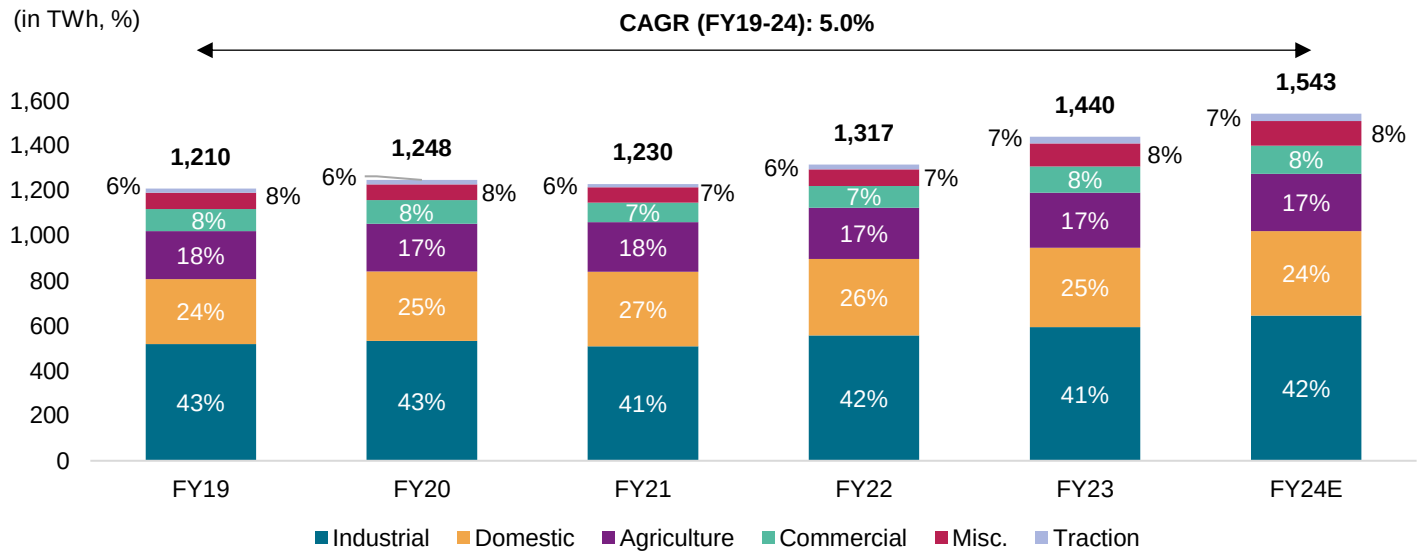
Electricity consumption has grown at a CAGR of 5.0% from FY19 to FY24

In India, electricity consumption pattern across various sectors has exhibited a steady growth trend over the past five years, with the total consumption increasing at a CAGR of 5.0% from FY19 to FY24. The industrial sector remains the largest consumer of electricity, accounting for approximately 42% of the total consumption, with a CAGR of 4.4% during this period. The domestic sector is the second-largest consumer, with a CAGR of 5.4%, driven by increasing household demand for electricity.

The agriculture sector has also witnessed a steady growth in electricity consumption, with a CAGR of 3.6%, although its share in the total consumption has remained relatively stable at around 17%. The commercial sector has experienced a CAGR of 4.9%, with its share in the total consumption remaining around 8%. The traction sector, which includes electricity consumption for transportation, has also witnessed a high growth rate of 11.9%, indicating a growing trend towards electrification of transportation

The overall electricity consumption has increased by 27% from FY19 to FY24, reaching 1,543 TWh in FY24. The growth in electricity consumption across various sectors is driven by increasing economic activity, urbanization, and electrification of various sectors. The industrial and domestic sectors are expected to continue driving electricity demand, while the growth in the commercial and miscellaneous sectors is likely to be driven by increasing economic activity and urbanization.

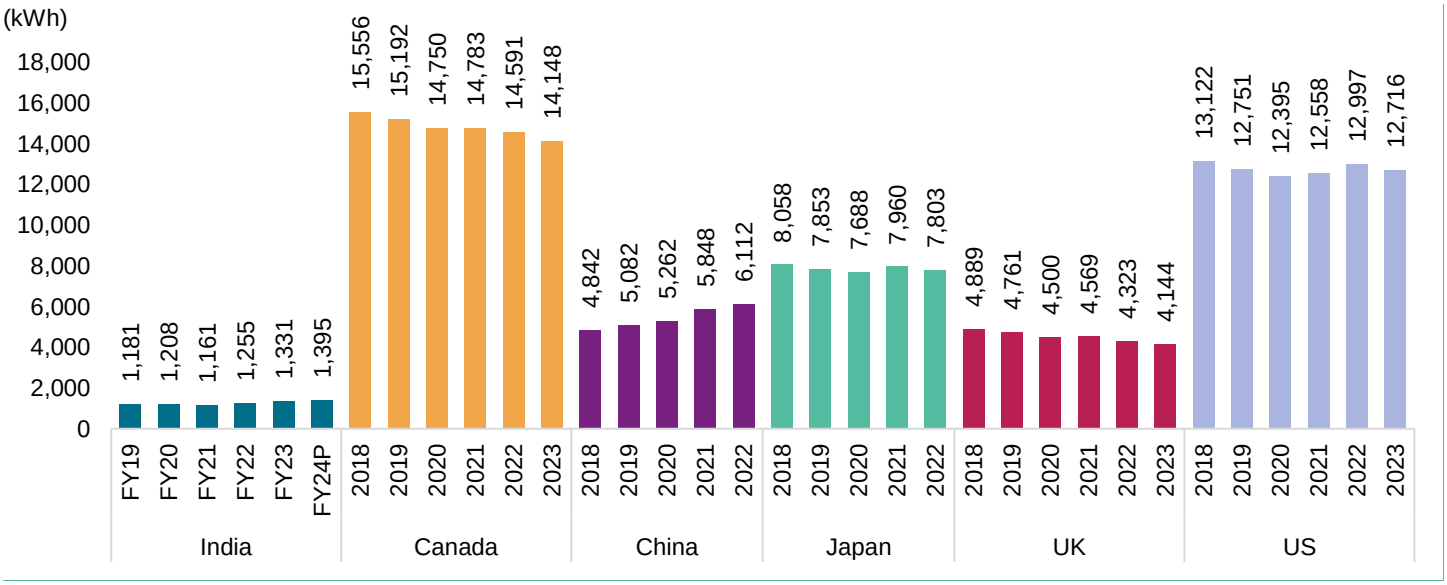
Electricity consumption split (TWh) (FY19-FY24E)



P: Projected
Source: CEA, Crisil Intelligence

Among the selected countries, Canada has the highest per capita electricity consumption, ranging from 15,556 kWh in CY18 to 14,148 kWh in CY23. In contrast, the world average has grown from 3,287 kWh in CY18 to 3,486 kWh in CY22 . China's per capita electricity consumption has been steadily increasing, It has increased from 4,842 kWh in CY18 to 6,112 kWh in CY22 while India's has shown moderate growth, growing from 1,181 kWh in FY19 to 1,395 kWh in FY24.

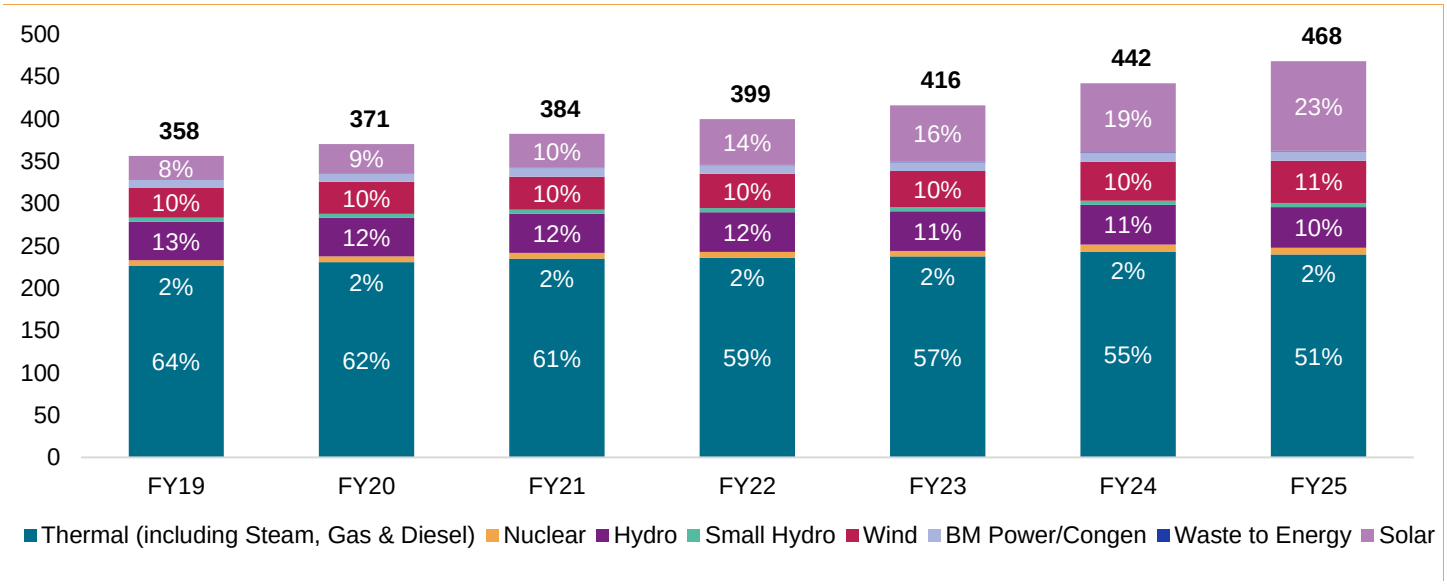
Per capita electricity consumption across countries (kWh) (FY19-FY24, CY18-CY23)



Note: P: Provisional
India numbers are as per CEA, rest of the numbers are as per World Bank / IEA
Source: World Bank, IEA, CEA, Crisil Intelligence

Renewable energy to account for ~50% of India's installed capacity by fiscal 2032

Total power generation capacity (in GW) in India, FY19-25



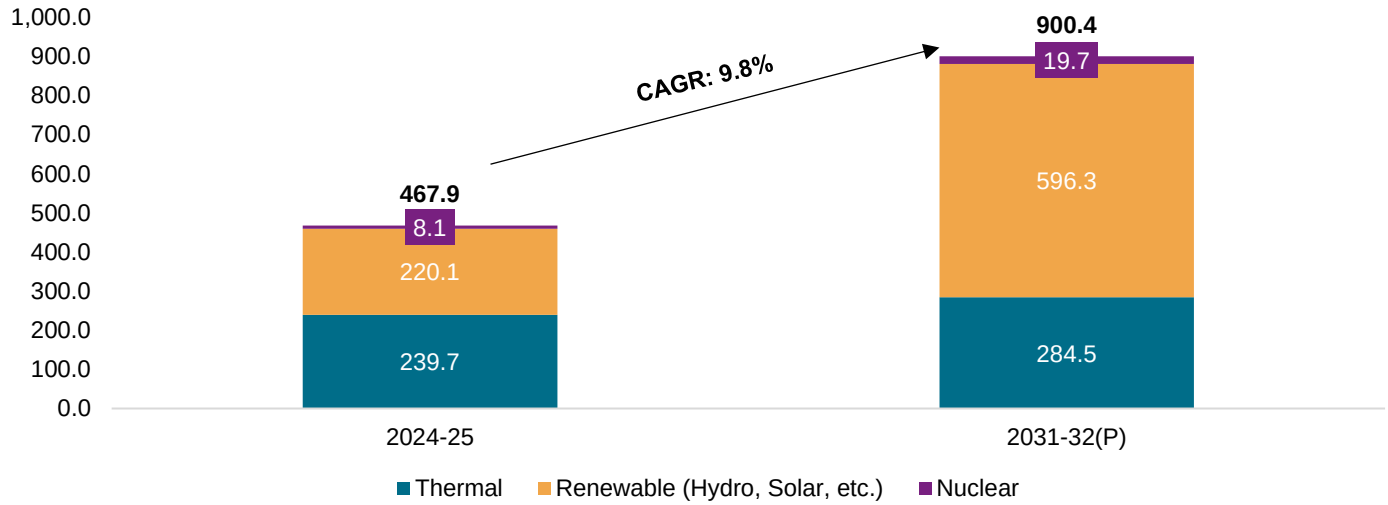
Source: CEA, Crisil Intelligence

India’s installed power capacity has expanded to 468 GW as of FY 2025, reshaping the mix while keeping pace with rapid demand growth. Thermal generation remains the backbone at ~240 GW, with 219 GW of it coal but its share has slipped to 50 % of capacity as renewables accelerate. Solar has been the standout success: capacity rocketed 39-fold from 2.82 GW in 2014 to 110.9 GW in 2025, thanks to mega parks, rooftop incentives and a Production-Linked Incentive that lifted module manufacturing from 2.3 GW to 88 GW. Wind power more than doubled, rising from about 21 GW to 51.3 GW, supported by a 4.15 GW addition in FY 2025 and a domestic turbine base capable of 18 GW a year.

Hydro capacity climbed from 35.8 GW to 48 GW from FY 2014 to FY 202, buoyed by interstate-transmission charge waivers and fresh North-East dam projects. Bio-power grew from 8.1 GW to 11.6 GW over the past 11 years, driven by the National Bioenergy Programme, which has scaled compressed-biogas projects from one plant in 2014 to 150 today.

Nuclear energy registered a 71 % jump—from 4.78 GW to 8.78 GW—after commissioning four new 700 MW reactors, all running at >80 % capacity. Together, non-fossil sources now supply 235.7 GW (49 % of capacity), positioning India well for its 500 GW non-fossil target by 2030. These additions, reinforced by flagship schemes such as PM-KUSUM, PM-Surya Ghar and nationwide grid integration, have cut power shortages from 4.2 % in 2014 to just 0.1 % in 2025 while advancing the country’s clean-energy transition.

Total power generation capacity forecast (in GW) in India



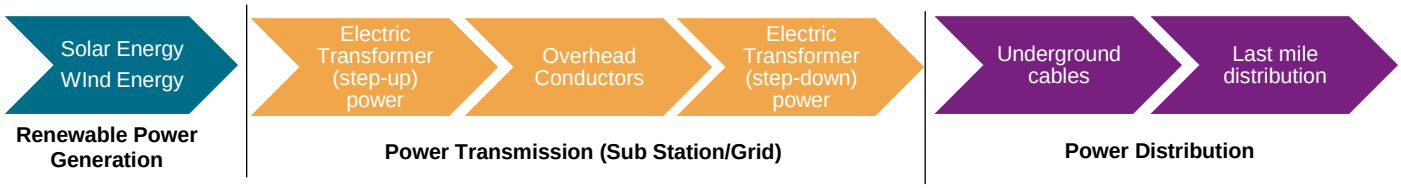
GW	Share (%) as of 2024-25	Share (%) as of 2031-32 (P)	CAGR
Thermal	51%	32%	2.5%
Renewable	47%	66%	15.3%
Nuclear	2%	2%	13.5%

Source: NEP, CEA, Crisil Intelligence

According to the National Energy Policy (NEP) plan, India's total power generation capacity is expected to grow at a CAGR of 9.8%. While the coal sector is anticipated to expand, albeit at a moderate pace, coal will play a crucial role in meeting peak demand due to its ability to rapidly ramp up generation. This is particularly important given the expected 5-7% CAGR growth in power demand and the intermittent nature of renewable energy sources. Furthermore, the stress on gas-based power plants, exacerbated by high gas prices and inadequate supply, has underscored the importance of coal in ensuring a reliable energy mix. As a result, coal retirements are expected to be negligible between fiscal 2026-2030.

With boost to rooftop solar and declining cost of renewable energy generation, the off-grid solar generation is expected to increase, reducing power demand from grid. By fiscal 2032, installed capacity is expected to be 49-50 GW resulting in diversion of 2-3% of the power demand being met directly at consumer site. Major conventional gencos have been moving towards a more RE dominated fuel mix to address the uncertainty arising out of the imminent phasing out of thermal power generation in the distant future.

Value chain of Renewable Energy generation



Power Cables & Conductors requirement at each stage

Stage	Needed select infrastructure components*
Renewable Power Generation	String Cables, Low Voltage Cables, Nacelle Wiring, Torsion Cables, Tower Cables, Control Cables, Earthing Cables, Fire Resistance OFC Cable, LAN Cable
Power Transmission (Sub Station/Grid)	Transformer Oil, CTC Conductors PICC Conductors, T&D Traditional Overhead Conductors, T&D New generation Overhead Conductors, OPGW, ADSS Cables, Turnkey Solutions, Medium Voltage Covered Conductors
Power Distribution	Application based Cables and Wires, Light Duty Cables, FTTX Cables, ADSS Cables

Note: The above list is only indicative and not exhaustive of nature
Source: Crisil Intelligence

Key growth drivers of power demand

Broad based manufacturing and infrastructural push to boost power demand

The country's economy is expected to continue expanding, driven by industrial activity, government spending on infrastructure, and initiatives like the Atmanirbhar Bharat relief package and National Infrastructure Pipeline. Key factors contributing to power demand growth include the dedicated freight corridors, expansion of the services industry, rapid urbanization, and increased farm income. Policy initiatives like production-linked-incentive (PLI) schemes have also boosted large-scale manufacturing, further driving power demand in the country.

Urbanisation to increase power demand

India's power demand is closely tied to its GDP, which has grown at a 5.8% CAGR between fiscal 2014-2024, making it the 5th largest economy globally. The growth has been supported by rapid urbanization. India’s urban population has also been increasing over the years. The trend is expected to continue as economic growth increases. From ~31% of the total population in CY2010, the country’s urban population is projected to reach nearly 40% by CY2030, according to a UN report on urbanisation.

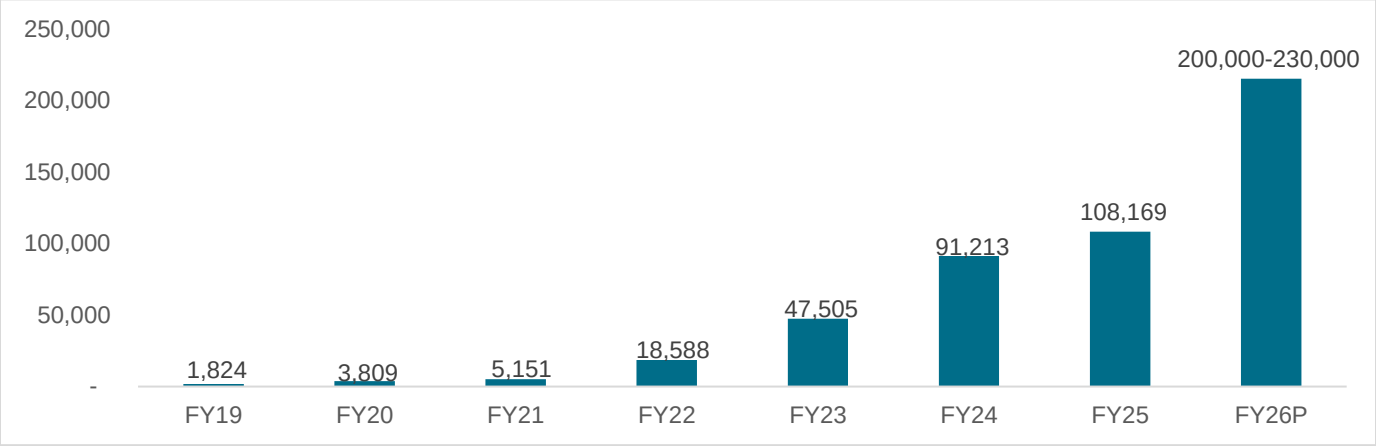
Substantial spike in the operational & upcoming metro projects to increase electricity requirement

India's metro rail network has seen significant growth, with 943 km of operational routes across 18 cities as of March 2025. Additionally, 732 km of metro lines are under construction and 1,888 km are proposed. The electricity consumption for train traction and station operation is expected to drive an average incremental power demand of 6-7 billion units (BUs) per year between fiscal 2026 and 2030. Although metro projects currently constitute a small share of total incremental demand, their contribution is expected to increase in the future due to the large number of planned projects, supporting the growing urban mobility needs.

Gradual transition to electric vehicles to increase the demand for charging infrastructure

The Indian government aims to increase the share of electric vehicles (EVs) to 30% of the overall car population by 2030, driven by demand-side incentives, subsidies, and investments in charging infrastructure. Under the National Electric Mobility Mission plan, the government plans to promote EV adoption and expand charging infrastructure across major cities. The Union Budget 2019-20 allocated Rs 10 billion for building a nationwide EV charging infrastructure, with plans to install charging stations every 25 km on major highways. Several states, including Gujarat, Maharashtra, Delhi, and Karnataka, have announced favorable policies to boost EV adoption. As a result, EV charging demand is expected to contribute to power demand, with Crisil Intelligence projecting an addition of up to 35 billion units (BUs) of power demand between fiscal 2026 and 2030, averaging 8.5-9.5 BUs per year.

EV Sales (FY19-FY26P)



Note: P: Projected
Source: Vahan, Industry, Crisil Intelligence

Electric passenger vehicle (EV) penetration in India is projected to increase to 4.5-5% in fiscal 2026, compared to 2.6% in fiscal 2025. The growth in penetration is expected to be supported by a combination of supply-side and structural factors. A key driver is the anticipated increase in the number of EV model launches, with 11 new models expected in fiscal 2026. This would take the total number of EV models available in the market to 29, improving consumer choice across price points and segments.

Union budget allocation for railway electrification rises to Rs 61.50 billion in fiscal 2025 from Rs 58.06 billion in fiscal 2024

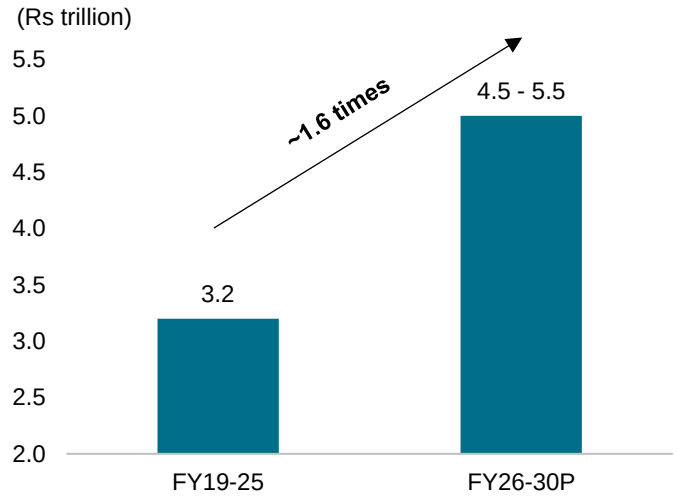
The Indian Railways, which operates 65,775 rkms of Broad-Gauge network as of 1st March 2024 making up 95% of the total rail route, aims to achieve 100% electrification by fiscal 2026, delayed from the initial target of December 2023. As of March 2024, 97% of the network is already electrified. The government has allocated Rs 61.50 billion for electrification projects in fiscal 2025, up from Rs 58.06 billion in fiscal 2024, as part of the Rs 2.5 trillion capital outlay for the Ministry of Railways. This is expected to lead to an incremental power demand of approximately 27 billion units (BUs) per year between fiscal 2026 and 2030, driven by new track laying and electrification of existing lines, supporting the country's goal to become a net zero emitter by 2030.

Strong infrastructure investments to support power demand growth

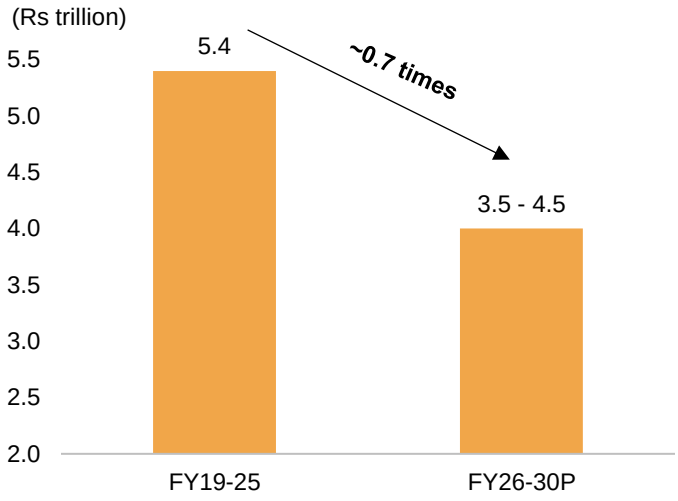
Crisil Intelligence projects investments of Rs 29-30 trillion in the power sector between fiscal 2026-2030. Investments in power generation are expected to increase ~1.7 times from Rs 11.6 trillion between fiscals 2019-2025 to Rs 19-21 trillion between fiscals 2026-2030. Investments in renewable energy (excluding hydro, pumped storage and BESS) generation capacity are expected to account for 70% of these investments over the same period as India seeks to achieve its 500 GW of non-fossil energy capacity announced in COP26.

To achieve the RE generation target, strong transmission infrastructure is needed so as to integrate large scale RE capacities into the grid. This is expected to lead to transmission investments of Rs 4.5-5.5 trillion between fiscals 2026-2030 from ~Rs 3.2 trillion between fiscals 2019-2025 led by upcoming ISTS projects. Additionally, we expect Rs 3.5-4.5 trillion worth of investments in the distribution segment between fiscal 2026-2030 driven by upgradation of distribution infrastructure along with installation of smart meters as India focuses on reduction of its carbon emission.

Investments in transmission segment of power sector



Investments in distribution segment of power sector



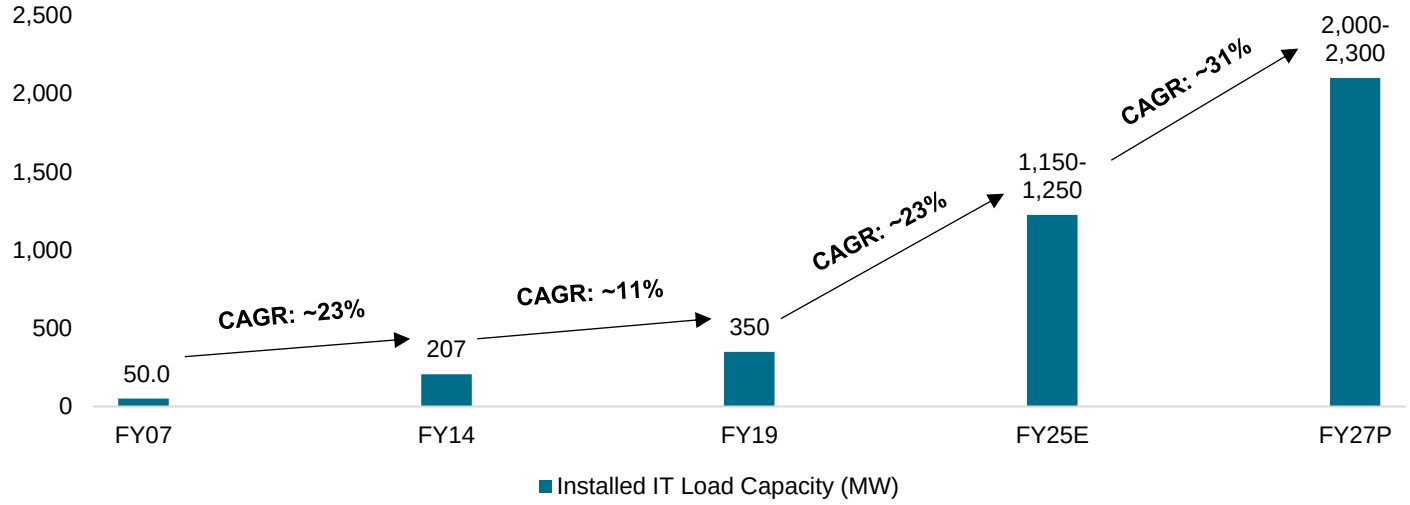
Source: Crisil Intelligence

Private sector is expected to account for ~58% of the overall investments during this period, followed by state (~25%) and center (~17%). Investments by the private sector will be largely driven by renewable capacity additions, bulk of which are funded by private generators who develop projects through multiple routes such as government-based tendering, private open access market and captive power segment. The share of the central sector would decrease to ~20% in fiscal 2030 from ~21% as estimated in fiscal 2026. Apart from a rising share of private, the fall in central sector investments will be due to the increase in state activity in the T&D segment as schemes such as the Revamped Distribution Sector and the plan to integrate 500 GW RE lead to state utilities to invest in InSTS.

India’s data centre installed capacity to cross 2 GW by fiscal 2027, driving strong power demand

The Indian data centre market has experienced significant growth and transformation in recent years. The key factors that contribute to the dynamism and potential of the market are the Digital India initiative, data localisation regulation and rapid growth in data consumption. The increasing global investment and rise of colocation and edge computing have also boosted the overall growth of data centre market in India. Data centre capacity in the country has grown from 350 MW in fiscal 2019 to 1,150-1,250 MW in fiscal 2025 and expected to reach to 2000-2300 MW by fiscal 2027

Data Centre capacity in India (fiscal 2007-27P)



Source: Industry, Crisil Intelligence; Note: E – Estimated P – Projected

India's data centre capacity is on a remarkable growth trajectory. This explosive growth was driven by a powerful trifecta of factors: i) the data boom fuelled by the proliferation of digital services and the widespread adoption of technology creating an insatiable demand for data storage and processing capabilities; ii) 5G user base to reach over 350 million by FY26 and GenAI, IOT, big data to drive further growth; iii) government regulations mandating data localisation (the storage of sensitive data within the country). The regulations align with the government's broader digital initiatives that seek to ensure data sovereignty. Collectively, these dynamics position India as a key player in the global data centre landscape.

Adoption of smart technology in India across grid modernization efforts

India's grid is under rising stress with peak demand projected to be 260-270 GW in FY26 up almost 50% compared to FY19. Electrification, EVs and renewables have surged. This pressure is pushing grid-modernisation endeavors in India. Digital-twin planning is major technological application in this regard. It enables the power sector to mirror transmission and distribution lines in a virtual model that tests renewable injections, right-of-way limits and cyber threats before projects break ground.

URTDSM (Unified Real Time Dynamic State Measurement) project is another. Under the URTDSM (Unified Real Time Dynamic State Measurement) project, bids were invited by PGCIL for installing 1184 Phasor Measurement Units (PMUs) at 351 substations and 34 control centers across India in 2014. In 2018, General Electric announced it had commissioned the 1st phase of the world's largest Wide Area Monitoring System for PGCIL for the Norther Grid in India. The project is part of the around $52.2 million contract awarded to GE T&D in January 2014 to install WAMS across all five regional grids of north, south, east, west and north-east. WAMS is an advanced measurement system that uses phasor measurement units (PMUs) to measure the dynamic state of the grid and detect the onset of any fluctuation across the grid. Through visualization displays, it supports the speedy detection of any fluctuation across the grid and provides real time data for advanced analytical applications resulting in better grid management.

Other key area of focus is the digitization of substations, which aims to reduce carbon footprint through the implementation of digital substations, process bus-based technologies, and the use of Intelligent Electronic Devices (IEDs). Additionally, advancements in grid stability, security, and renewable energy integration are being explored through modeling, simulation, and real-time studies.

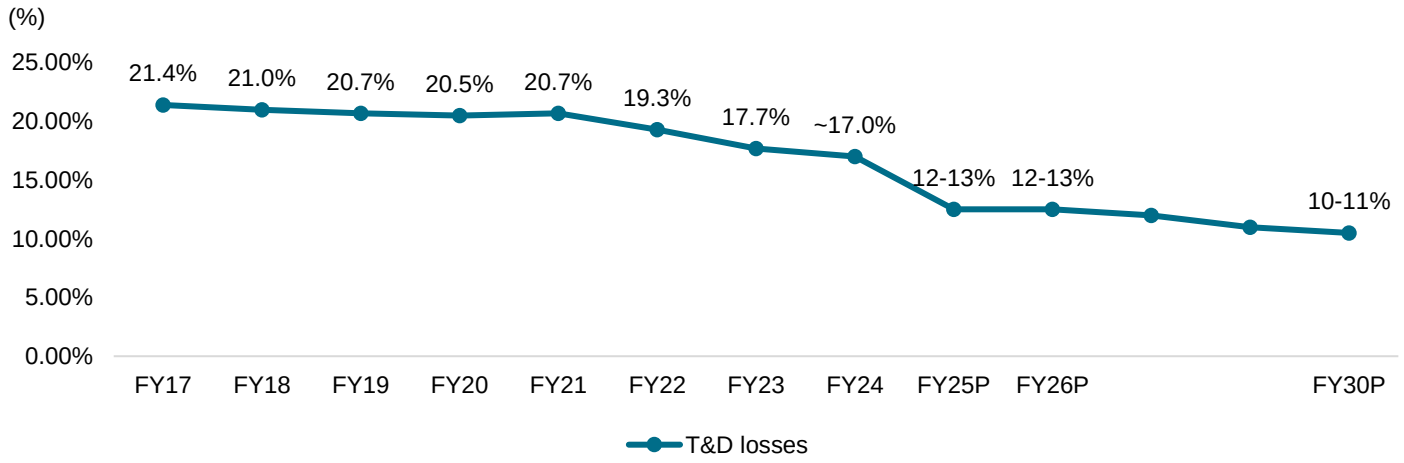
The integration of renewable resources, such as battery energy storage systems, synchronous condensers, and FACTS devices, is also a priority. Cybersecurity is another critical area, with a focus on strengthening grid resilience against emerging threats through advanced security measures and the establishment of a Centre of Excellence for assessment and mitigation. The use of advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML), and Geographic Information System (GIS) tools is also being explored for improved operational efficiency and asset management.

Key challenges influencing power demand

Declining T&D loss to constrain power demand growth

The Indian government has introduced the Revamped Distribution Sector Scheme to improve the power distribution sector's efficiency and reduce Aggregate Technical and Commercial (AT&C) losses to 12-15% nationwide. The scheme requires state governments to clear pending payments, install smart meters, and pay subsidies upfront. Additionally, the government has provided incentives for states to reduce AT&C losses and ACS-ARR gaps. As a result, T&D losses have been declining and are expected to continue decreasing, leading to a reduction in power demand by 8-9 billion units (BUs) on average every year between fiscal 2026-2030. This decline in T&D losses will constrain power demand growth, despite increasing electricity consumption from other sectors.

T&D losses (FY17-FY30)



Note: P: Projected
Source: CEA, PIB Crisil Intelligence

High capital cost for power projects and timely execution

Access to long-term and affordable debt is essential for power sector projects given the high upfront costs that are typical for energy projects like renewables. Persistent inflationary pressures and high interest rates act as an impediment to debt finance. In the recent years, spikes in interest rates have constrained fiscal capacity, with government has faced challenge in funding targeted incentives.

Power projects are highly capital intensive and have a long gestation period. Completion of projects in a time bound manner is very critical for developers to avoid the huge time and cost overruns. In the past, thermal power projects have witnessed significant cost overruns on account of delays in receipt of clearances, land acquisition and financial closure. In fact, in certain projects, there has been cost overruns of as high as 67% resulting in project cost escalating to Rs. 75 million per MW as compared to initially envisaged Rs. 45 million per MW.

Right of way and Environmental clearance

The acquisition of land and securing RoW for transmission lines has become a significant challenge, resulting in delayed project timelines and increased costs. According to the CEA monthly progress report for February 2025, over 50% of ISTS projects awarded under the TBCB route have cited right-of-way issues as the primary reason for project delays

The process of obtaining environmental clearance for transmission lines that traverse forest areas is also causing delays in project timelines, ultimately leading to increased costs. As per the CEA monthly progress report, over 30% of the projects are facing challenges related to forest and wildlife clearance, highlighting the significance of this issue in hindering project progress. Hydro power projects have also been crippled due to execution challenges like securing necessary approvals (environmental and forest clearances), land acquisition and relocation of people habitant in the area, inadequate infrastructure for power evacuation and logistical issues have constantly hampered the pace of project execution.

Grid Integration

To facilitate the transfer of power between neighbouring states, state grids are inter-connected through high-voltage transmission links to form a regional grid. There are five regional grids, namely, Northern, Western, Southern, Eastern and North-eastern grids. As peak demand for power does not take place at the same time in all states, it results in a surplus in one state and a deficit in another. Regional or inter-state grids facilitate the transfer of power from a surplus region to the one facing a deficit. Additionally, they also facilitate the optimal scheduling of maintenance outages and better coordination between power plants.

The Indian national grid has evolved over a period of past 60 years all the way from isolated state grids to regional grids and finally with the commissioning of 765 kV transmission line between Raichur and Solapur in December 2013 India achieved one nation one Grid status. Integration of the regional grid networks into the national grid involves several institutional, technical, and commercial complications and issues. Over the medium term, investments in the transmission sector are expected to focus on forming the national grid, by setting up inter-regional links and strengthening the regional and intra-state grids.

Open access transactions to limit demand for power utilities

Short-term market transactions are expected to account for 12.5-13.5% of power generation as of fiscal 2026. Share of the short-term transactions are expected to increase to 13.5-14.5% by fiscal 2030 primarily driven by demand pressure, better price discovery at exchanges. Demand on the short-term market is expected to add an average of 19-20 BUs between fiscal 2026-2030 resulting in diversion in power supply from utility demand.

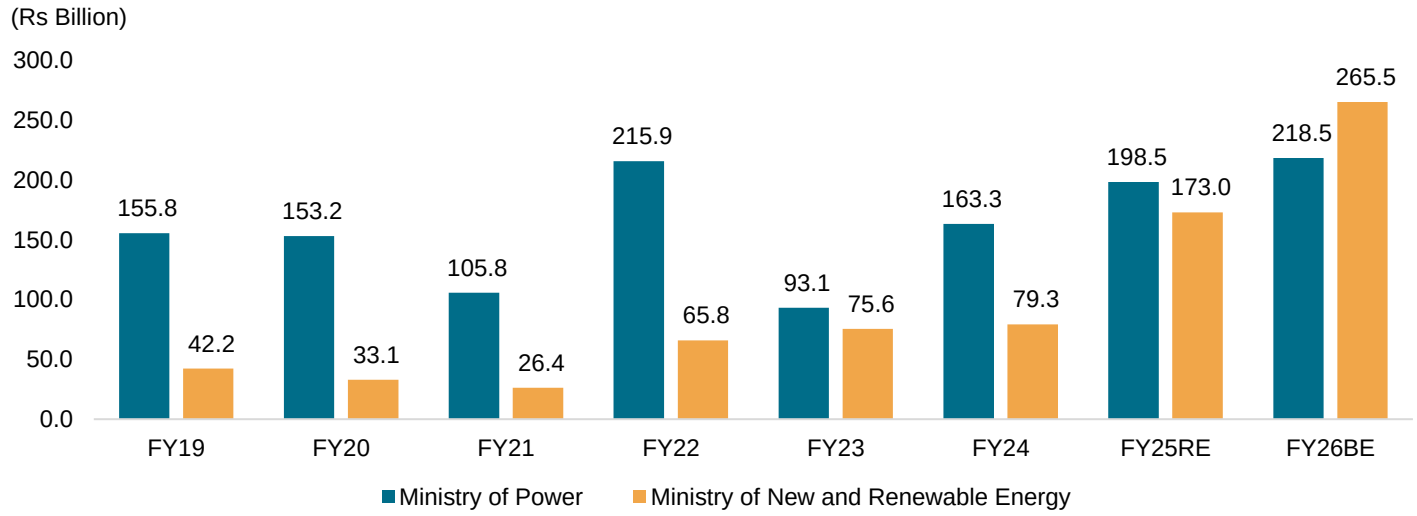
Key government schemes and investment for the power sector in India

Policies and initiatives of Indian government to boost power sector in India backed by strong budgetary allocations

The Government of India implemented multiple initiatives aimed at ensuring uninterrupted power supply to every household since 2014. Under the Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY), Integrated Power Development Scheme (IPDS) introduced in 2014, and the Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA), introduced in 2017, about Rs. 1850 billion has been invested to boost distribution infrastructure across various states. Consequently, 18,374 villages have been electrified under DDUGJY, and 29 million households have gained access to electricity through SAUBHAGYA. The capital outlay for these initiatives are done through the budget for ministry of power and ministry of

new & renewable energy. As per the lates budget, Rs 218.5 billion and Rs 265.5 billion has been allocated to ministry of power and ministry of new & renewable energy, respectively.

Overview of budget for Ministry of Power and New & Renewable Energy



Source: India Budget, Crisil Intelligence

Revamped Distribution Sector Scheme (RDSS)

The Central Government has launched the Revamped Distribution Sector Scheme (RDSS), a comprehensive initiative aimed at transforming the power distribution landscape. With a total outlay of Rs. 3,037.58 billion over five years (FY22 to FY26), the scheme has a Gross Budgetary Support of Rs. 976.31 billion from the Government of India. Also known as the Reform Linked Distribution Scheme (RLDS) in budget documents, this reforms-based and results-linked initiative has approved projects worth Rs. 2800 billion to develop distribution infrastructure and implement smart metering solutions. The scheme's primary objective is to enhance the quality, reliability, and affordability of power supply to consumers by fostering a financially sustainable and operationally efficient distribution sector. To achieve this, the RDSS has a result-linked evaluation framework, where DISCOMs must meet pre-qualifying criteria every year to be eligible for funds. The scheme also subsumes ongoing projects under IPDS and DDUGY, which were launched prior to its introduction in 2021.

In a bid to transform the power distribution landscape, the Central Government has unveiled a comprehensive Revamped Distribution Sector Scheme, a reforms-based and results-linked initiative with a substantial outlay of Rs. 3,037.58 billion over five years (FY22 to FY26) with a Gross Budgetary Support of Rs. 976.31 billion from Government of India over a period of five years from 2021-22 to FY 2025-26, projects worth Rs. 2800 billion have been approved to develop distribution infrastructure and implement smart metering solutions. The RDSS Also known as the Reform Linked Distribution Scheme (RLDS) in budget documents, is a result-linked evaluation scheme, where DISCOMs must meet the pre-qualifying criteria every year to be eligible for funds under the scheme. Upon the launch of RDSS scheme in 2021, the ongoing projects under IPDS and DDUGY have been subsumed under RDSS

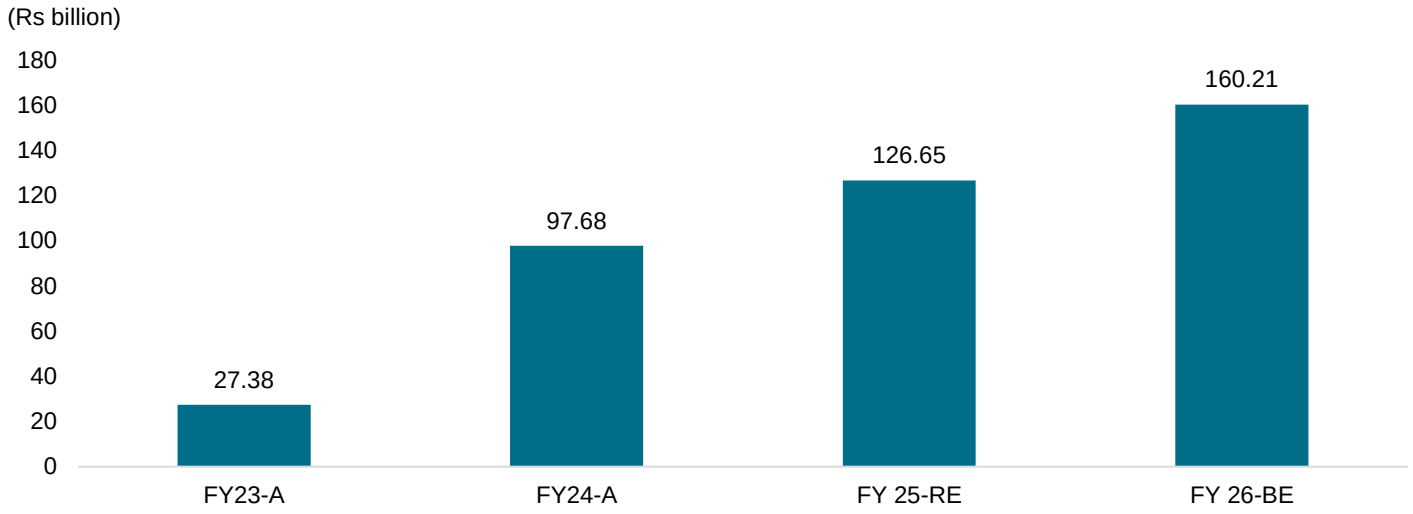
The primary objective of this scheme is to significantly enhance the quality, reliability, and affordability of power supply to consumers by fostering a financially sustainable and operationally efficient distribution sector.

The scheme aims to achieve two critical milestones by 2024-25:

- **Reduce AT&C losses**: Bring down Aggregate Technical and Commercial (AT&C) losses to a pan-India level of 12-15%, ensuring a significant reduction in energy wastage and revenue leakage.

- **Eliminate ACS-ARR gap**: Achieve a zero gap between the Average Cost of Supply (ACS) and Average Revenue Realized (ARR) by improving the operational efficiencies and financial sustainability of all state-owned Distribution Companies (DISCOMs and Power Departments, excluding private sector DISCOMs

Budget estimates and actuals for Reform Linked Distribution Scheme (RLDS)



Note: A: Actuals, RE: Revised Estimates, BE: Budget Estimates
Source: India Budget, Crisil Intelligence

Integrated Power Development Scheme (IPDS)

It aims to enhance the transmission and distribution networks throughout India. The scheme focuses on reducing AT&C losses, implementing IT-enabled energy accounting and auditing systems, improving billed energy based on metered consumption, and enhancing collection efficiency. The scheme primarily focuses on urban areas, including the strengthening of sub-transmission and distribution networks, provision of solar panels on government buildings, metering of feeders, distribution transformers, and consumers, as well as IT enablement of the distribution sector.

Details of works executed under IPDS till November 2024:

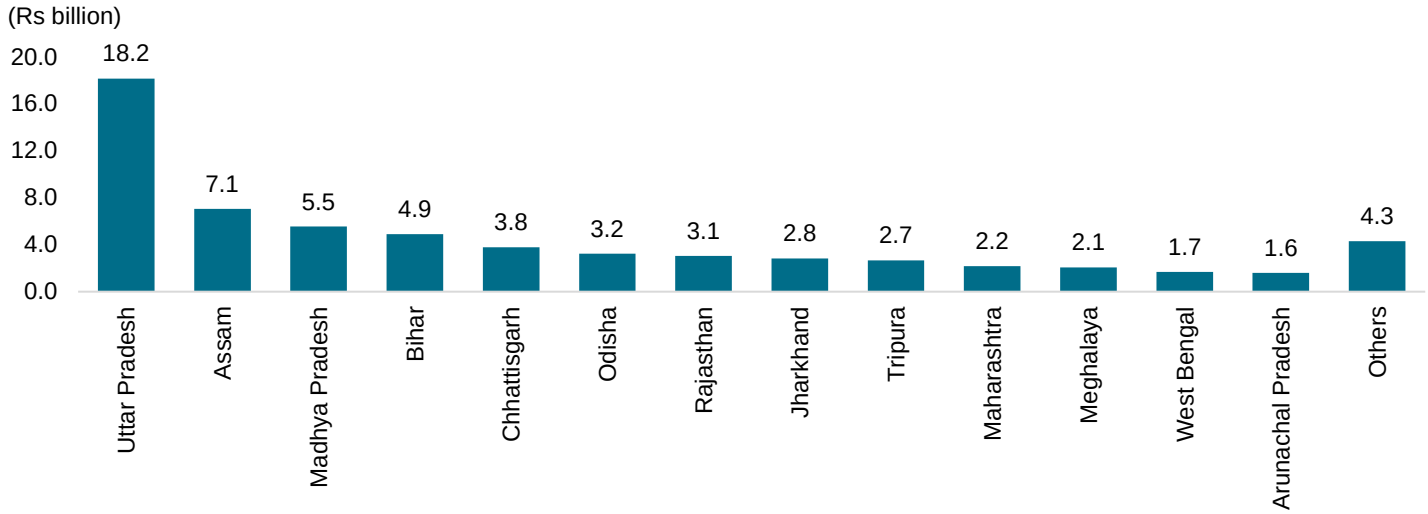
- Total closure Cost: Rs. 288.86 billion.
- Installation of 994 nos. of new 33/11kV substations.
- Augmentation of 1609 nos. of 33/11kV substations.
- Laying of 33,884 CKm of HT and LT lines.
- Installation of 59,993 nos. of Distribution Transformers (DTRs).
- Installation of 89,67,566 nos. of Consumer meters/smart meters/prepaid meters/DT meters/Feeder meters/Boundary meters.

Pradhan Mantri Sahaj Bijli Har Ghar Yojana – (Saubhagya)

The Saubhagya scheme, launched in October 2017, has successfully achieved its objective of providing electricity connections to all un-electrified households in rural areas and poor households in urban areas. As of the end of FY22, all states have reported 100% electrification of willing un-electrified households, identified prior to March 31, 2019. This

remarkable achievement is a testament to the scheme's effectiveness, with a total of 29 million households electrified since its inception, as reported by the states.

Grants released by central government under Saubhagya scheme till FY23



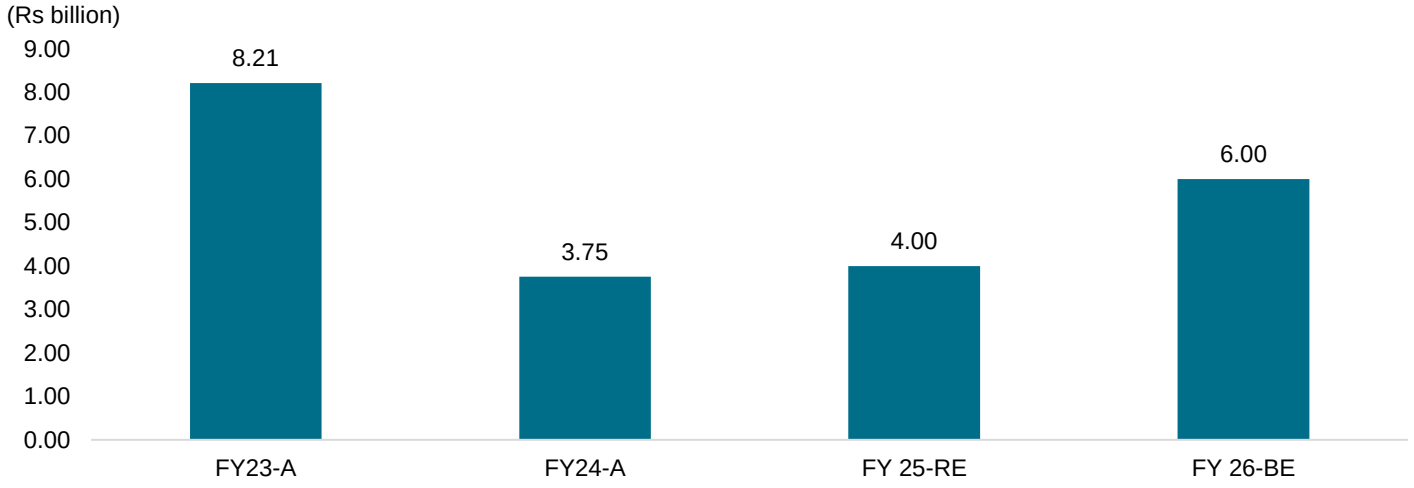
Source: Ministry of Power, Crisil Intelligence

North Eastern Region Power System Improvement Project (NERPSIP)

In December 2014, the Government of India launched the NERPSIP to strengthen the intra-state transmission and distribution systems in six states: Assam, Manipur, Meghalaya, Mizoram, Tripura, and Nagaland. It was initiated to address the region's power infrastructure challenges, which had hindered economic growth and development. The project aimed to enhance the reliability, efficiency, and sustainability of the power supply in the region, ultimately improving the quality of life for its inhabitants. With an initial estimated cost of R. 51.13 billion, the project was designed to be funded 50% by a loan from the World Bank

As of March 2024, the NERPSIP has made significant progress, with 433 out of 446 sanctioned elements (lines and substations) completed. During the period from January 2023 to March 2024, 26 new elements were completed, further augmenting the region's power infrastructure. A total of Rs. 4.84 billion was spent by POWERGRID, the implementing agency, during the same period.

Budget estimates for NERPSIP (Rs. Billion)



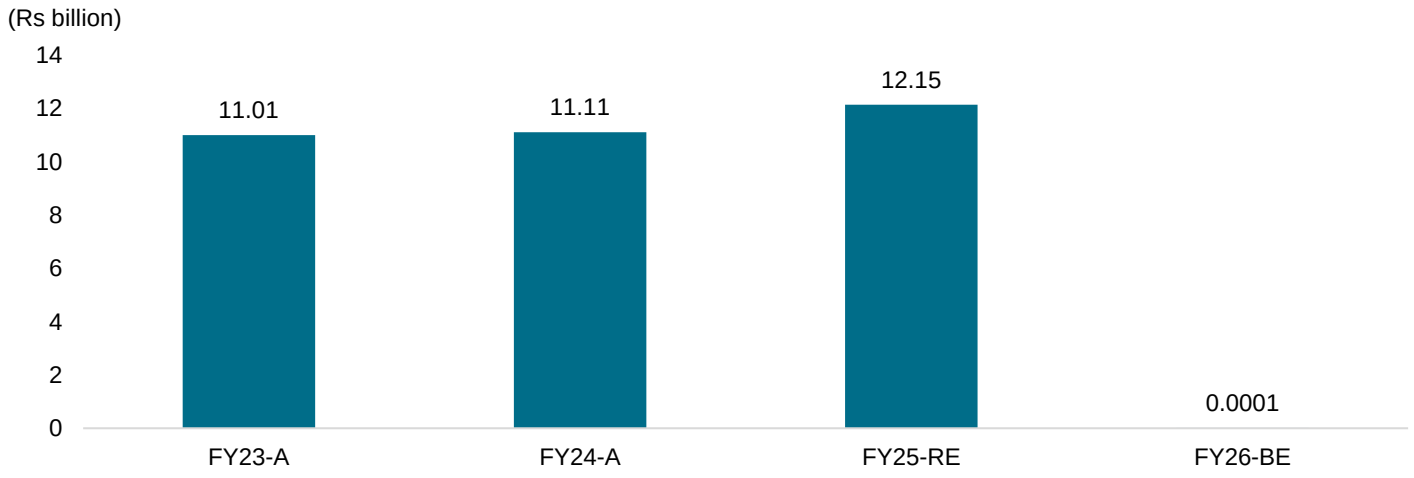
Note: A: Actuals, RE: Revised Estimates, BE: Budget Estimates
Budget for Power System Improvement in North Eastern States excluding Arunachal Pradesh and Sikkim (Program Component) and Power System Improvement in North Eastern States excluding Arunachal Pradesh and Sikkim (EAP Component) are added at the above number
Source: India Budget, Crisil Intelligence

Scheme for strengthening of Transmission & Distribution in Arunachal Pradesh and Sikkim

In October 2014, the Government of India approved a comprehensive scheme to strengthen the transmission and distribution systems in Arunachal Pradesh and Sikkim. The initial estimated cost of the project was Rs. 47.54 billion, with a completion timeline of December 2018. However, the project's cost has been revised to Rs. 91.29.32 billion, with a revised completion timeline for the awarded scope of work (204 elements) and additional timeline for the unawarded packages (88 elements).

Significant progress has been made, with 175 out of 292 sanctioned elements, including lines and substations, completed. Between January 2023 and June 2024, an additional 64 elements were completed, contributing to the project's progress

Budget estimates and actuals



Note: A: Actuals, RE: Revised Estimates, BE: Budget Estimates
Source: India Budget, Crisil Intelligence

Green Energy Corridor:

The Green Energy Corridor (GEC) is a transmission infrastructure project aimed at evacuating and transmitting power from large-scale solar and wind power plants in India. The project was initiated in 2012 by the Power Grid Corporation of India Limited (PGCIL), which conducted a study to identify the need for dedicated transmission infrastructure for renewable energy (RE) sources. The study found that the power evacuation and transmission infrastructure in the vicinity of potential RE sites was inadequate, leading to the planning of dedicated transmission infrastructure for large-scale solar and wind power plants. The objective of the GEC project is to ensure the smooth integration of RE into the national grid by providing accurate forecasting, real-time monitoring, and efficient scheduling of RE.

Key Characteristics

The GEC project comprises of both Inter-State Transmission System (ISTS) and Intra-State Transmission System (InSTS), along with the establishment of Renewable Energy Management Centres (REMCs) and other control supporting infrastructure such as reactive power compensation and energy storage systems. The REMCs are installed at various locations, including the Southern Region, which includes states such as Tamil Nadu, Andhra Pradesh, and Karnataka, the Western Region, which includes states such as Gujarat, Maharashtra, and Madhya Pradesh, and the North Region, which includes states such as Rajasthan and Delhi. These REMCs provide accurate forecasting, real-time monitoring, and efficient scheduling of RE to ensure the smooth integration of RE into the national grid. The key features of the GEC project include the evacuation of approximately 24 GW of RE power, the setting up of transmission lines and substations, and the establishment of REMCs.

Phase 1: Intra-State Transmission System Green Energy Corridor Phase-I and Inter-State Transmission System

The first phase of the GEC project includes the Intra-State Transmission System Green Energy Corridor Phase-I, which was approved by the Cabinet Committee on Economic Affairs (CCEA) in 2015. The project has a total target of 9700 ckm of intra-state transmission lines and 22600 MVA sub-stations, and is being implemented by State Transmission Utilities (STUs) in 8 RE-rich states, including Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Tamil Nadu. The project cost is approximately Rs. 101.42 billion, with funding from the Ministry of New and Renewable Energy (MNRE), KfW, and the STUs.

GEC Phase-I has been completed in State of Madhya Pradesh, Rajasthan, Tamil Nadu and Karnataka. Completion date for GEC Phase-I for States of Andhra Pradesh, Himachal Pradesh, Maharashtra is December 2024 and for State of Gujarat is March 2025. The projects have been delayed mainly due to delay in land acquisition, Right of Way (RoW) issues and forest clearances.

The Inter-State Transmission System (ISTS) GEC project, which was commissioned in March 2020, has a total of 3200 ckm of inter-state transmission lines and 17000 MVA substations, and was implemented by PGCIL at a cost of Rs. 113.69 billion. Some of the key points of this phase include:

Phase 2: Intra-State Transmission System Green Energy Corridor Phase-II and Inter-State Green Energy Corridor Phase-II

The InSTS GEC-II scheme with total target of 10,750 ckm intra-state transmission lines and 27,500 MVA sub-stations was approved by the CCEA in January 2022.

The project cost is Rs. 120.31 billion with central financial assistance from MNRE of Rs. 39.70 billion (i.e. 33% of project cost). The balance 67% of the project cost is available as loan from KfW/REC/PFC. The transmission schemes would be implemented by the State Transmission Utilities (STUs) of seven states, i.e. Gujarat, Himachal Pradesh, Karnataka,

Kerala, Rajasthan, Tamil Nadu and Uttar Pradesh for evacuation of approx. 20 GW of RE power in the seven States. Currently, the STUs are inviting tenders for implementing the projects. The scheduled commissioning timeline for the projects under this scheme is March 2026. Subsequently, some states had requested for revision of projects under the GEC-II Scheme and the same has been approved by MNRE.

State	Estimated project cost (Rs billion)	Length of transmission lines envisaged (ckm)	Capacity of substations envisaged (MVA)	RE addition envisaged
Gujarat	36.68	2470	7460	5,100
Himachal Pradesh	4.90	62	761	317
Karnataka	10.37	938	1225	2,639
Kerala	4.20	224	620	452
Rajasthan	9.08	659	2191	2,478
Tamil Nadu	7.20	624	2200	4,000
Uttar Pradesh	48.48	2597	15280	4,000
Total	**120.89**	**7574**	**29737**	**18,986**

Source: Ministry of Power, Crisil Intelligence

National Green hydrogen Mission

The National Green Hydrogen Mission is a comprehensive initiative launched by the Indian government to promote the production, use, and export of green hydrogen and its derivatives, with the aim of establishing India as a global hub in this sector. The mission is a key component of India's clean energy transition strategy, seeking to reduce the country's dependence on fossil fuels and promote sustainable economic growth.

Key Features of the Scheme:

- The SIGHT program, a major financial initiative under the mission, has a budget of Rs.174.90 billion
- Rs. 44.40 billion allocated for domestic manufacturing of electrolysers and Rs 130.50 billion for green hydrogen production
- Waiver of interstate transmission charges for renewable energy used in green hydrogen production
- Simplified procedures, favorable taxation, and single-window clearances for green hydrogen projects
- Exemption from environmental clearance requirements for green hydrogen and ammonia plants
- Waiver of interstate transmission system charges for 25 years for green hydrogen and green ammonia production units using renewable energy

Objectives of the Government:

- To establish India as a global hub for the production, use, and export of green hydrogen and its derivatives
- To promote a clean energy transition and reduce dependence on fossil fuels
- To support India's goal of becoming self-reliant through renewable energy
- To create a domestic manufacturing ecosystem for green hydrogen and related technologies
- To reduce the cost of green hydrogen and make it viable for use in emerging sectors

- To achieve scale and sustainability in the production of green hydrogen and its derivatives, and to make India a leader in the global clean energy market.

The Electricity (Late Payment Surcharge and Related Matters) Rules, 2022" (LPS Rules) and amendment

In June 2022, the Ministry of Power introduced the Electricity (Late Payment Surcharge and Related Matters) Rules, 2022, with the aim of addressing the cash flow challenges faced by generation companies and transmission companies in the power sector. The rules provided a mechanism for the settlement of outstanding dues of generating companies, inter-state transmission licensees, and electricity trading licensees. The key features of the rules included the clubbing of all outstanding dues into a consolidated amount, which could be paid in interest-free equated monthly installments (EMIs) over a maximum period of 48 months. The rules also specified penalties for non-payment of dues and modalities for implementation.

Despite the introduction of the 2022 rules, some power generators were not offering their surplus power in the market, resulting in unused power capacity at the national level. This led to a situation where some distribution companies were facing power shortages, while others had surplus power that was not being utilized. To address this issue and optimize the use of available power, the Government of India decided to amend the Electricity (Late Payment Surcharge and Related Matters) Rules, 2022.

Amendments to the Rules in March 2024

In March 2024, the Government of India amended the Electricity (Late Payment Surcharge and Related Matters) Rules, 2022, to ensure adequate supply of electricity to meet the growing demand in the country. The key amendments made to the rules include:

- Power generators who do not offer their surplus power in the market will not be eligible to claim capacity or fixed charges corresponding to that surplus quantum.
- Surplus power cannot be offered for sale in the power exchange at a price of more than 120% of the energy charge plus applicable transmission charge, to increase the likelihood of the surplus electricity getting purchased and utilized.
- Amendments have been made to align the rules with statutory provisions related to accessing the national power grid, facilitating quicker restoration of access to the national grid for distribution companies facing curtailment of access due to payment defaults, once they settle their outstanding dues.

These amendments aim to promote the optimal use of available power, ensure a reliable supply of electricity to all consumers, and prevent power generators from withholding surplus power from the market.

Viability Gap Funding

The Department of Economic Affairs, under the Ministry of Finance, operates the Viability Gap Funding (VGF) scheme, which was initially introduced in 2005 and revamped in 2020. The scheme aims to support Public-Private Partnership (PPP) projects that are socially and economically desirable but may not be financially viable for private firms to invest in. The VGF scheme enables the expansion of public infrastructure projects into the social sector, including areas such as wastewater management, education, healthcare, and more.

The VGF scheme provides financial support to PPP projects by subsidizing a portion of the total project cost. The current scheme allows for:

- Up to 60% of the total project cost to be subsidized for projects in the social sector

- Up to 80% of the total project cost to be subsidized for pilot projects in education and healthcare
- Up to 40% of the total project cost as viability gap funding for all other sectors

The scheme is administered by an empowered committee, which reviews and approves proposals before funds are disbursed.

In recent years, the VGF scheme has been utilized to support various initiatives, including:

- A separate VGF scheme for off-shore wind energy projects, launched in 2024, to boost renewable energy production in the country
- The Union Cabinet's approval of the VGF scheme for Battery Energy Storage Systems (BESS) in September 2023, to support the development of BESS

The Electricity (Amendment) Bill, 2022

The Electricity (Amendment) Bill, 2022, was introduced in the Lok Sabha on August 8, 2022, with the aim of amending the Electricity Act, 2003. The Act regulates the electricity sector in India, establishing the Central and State Electricity Regulatory Commissions (CERC and SERCs) to oversee inter-state and intra-state matters, respectively.

The Bill introduces several significant changes to the Electricity Act, 2003, including:

- **Multiple Discoms in the Same Area:** The Bill allows for multiple distribution licensees (discoms) to operate in the same area of supply, removing the requirement for discoms to distribute electricity through their own network. Instead, discoms must provide non-discriminatory open access to their network to other discoms operating in the same area, on payment of certain charges.
- **Power Procurement and Tariff:** The Bill specifies that upon grant of multiple licenses for the same area, the power and associated costs as per existing power purchase agreements (PPAs) will be shared between all discoms. Discoms may enter into additional PPAs to meet additional power requirements, which need not be shared with other discoms.
- **Cross-Subsidy Balancing Fund:** The Bill introduces a Cross-Subsidy Balancing Fund, which will be set up by the state government to finance deficits in cross-subsidy for discoms in the same area or other areas.
- **License for Distribution in Multiple States:** The Bill empowers the CERC to grant licenses for distribution of electricity in more than one state.
- **Payment Security:** The Bill provides that electricity will not be scheduled or despatched if adequate payment security is not provided by the discom.
- **Contract Enforcement:** The Bill empowers the CERC and SERCs to adjudicate disputes related to the performance of contracts, including contracts related to the sale, purchase, or transmission of electricity.
- **Renewable Purchase Obligation:** The Bill specifies that renewable purchase obligations (RPO) should not be below a minimum percentage prescribed by the central government, and failure to meet RPO will be punishable with a penalty.
- **Selection Committee for SERCs:** The Bill replaces the Chairperson of the Central Electricity Authority or the Chairperson of the CERC with a nominee of the central government in the selection committee to recommend appointments to the SERCs.
- **Composition of Commissions and APTEL:** The Bill increases the number of members in SERCs from three to four and requires at least one member in both the CERC and SERCs to be from a law background. The Bill also provides

that the Appellate Tribunal for Electricity (APTEL) will have three or more members, as may be prescribed by the central government.

These amendments aim to promote competition, improve the efficiency of the electricity sector, and enhance the role of regulatory commissions in ensuring a reliable and sustainable electricity supply.

Guidelines for tariff based competitive bidding process for procurement power from grid connected wind solar hybrid projects

The Guidelines for tariff-based competitive bidding process for procurement of power from grid-connected wind-solar hybrid projects aim to promote competitive procurement of electricity from these projects to protect consumer interests. The specific objectives of these Guidelines are to facilitate renewable capacity addition and fulfillment of Renewable Purchase Obligation (RPO) requirements of distribution companies (DISCOMs). Additionally, the Guidelines aim to ensure transparency and fairness in procurement processes and provide a standardized framework for intermediaries (aggregators/traders) for inter-state sale-purchase of long-term power at competitive prices. Furthermore, the Guidelines establish a risk-sharing framework between stakeholders and ensure reasonable returns to investors, encouraging further investments and enhancing project bankability.

These Guidelines are applicable to long-term procurement of electricity through competitive bidding from hybrid power projects with a bid capacity of 10 MW and above for projects connected to intra-state transmission systems, and 50 MW and above for projects connected to inter-state transmission systems. The rated power capacity of one resource (wind or solar) must be at least 33% of the total contracted capacity. The solar and wind projects of the hybrid project may be located at the same or different locations. Storage may be added to the hybrid power project to reduce the variability of output power, provide higher energy output, or ensure firm power availability for a particular period.

Key Provisions:

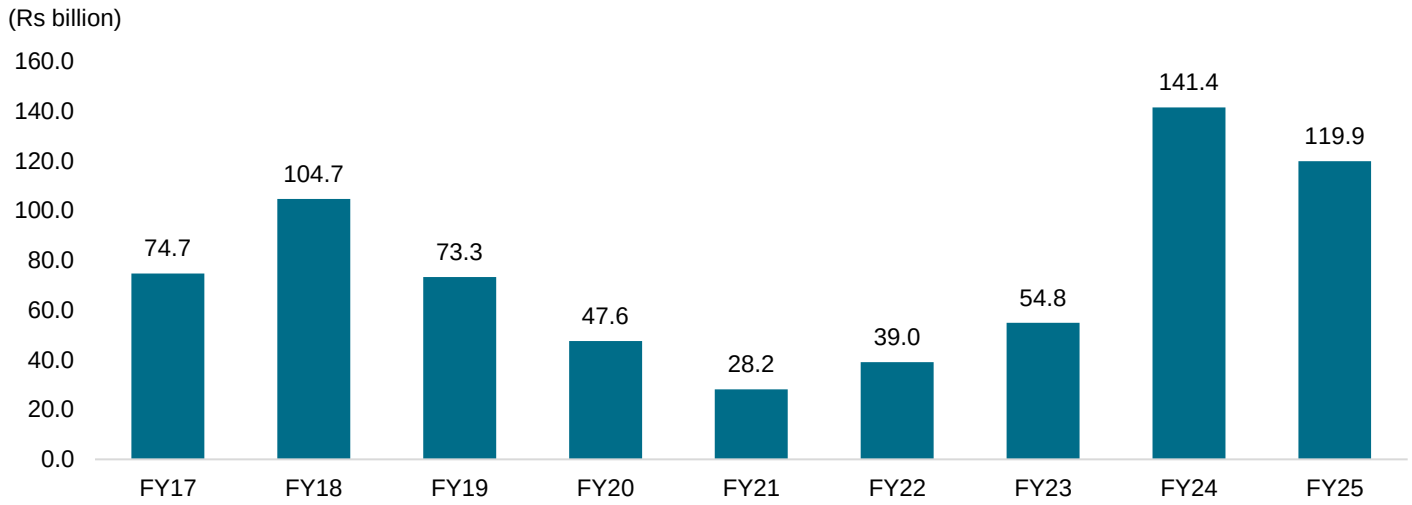
- Solar and wind projects can be located at the same or different sites.
- Storage can be added to reduce output variability, increase energy output, or ensure firm power availability.
- The guidelines are binding on procurers, authorized representatives, and intermediary procurers.
- Power procured from these projects can be used to fulfill RPO requirements in proportion to the rated capacity of solar and wind power.
- The guidelines will be detailed in standard bidding documents, including model request for selection, power purchase agreements, and power sale agreements.

In case there are any ongoing bids wherein the last date of bid submission is after the date of notification of these Guidelines, then the bid documents in respect of such bids shall be appropriately modified to bring them in alignment with these Guidelines. The Guidelines will provide a framework for the procurement of power from grid-connected wind-solar hybrid projects, ensuring a transparent and competitive process. The implementation of these Guidelines is expected to promote the growth of renewable energy in the country, reduce the dependence on fossil fuels, and contribute to a sustainable energy future. By following these Guidelines, stakeholders can ensure a smooth and efficient procurement process, ultimately benefiting consumers and the environment.

Power sector FDI grew at a CAGR of ~6% from FY17 to FY25

FDI is crucial to India's economic growth and development particularly in capital intensive sectors like construction and power sector. Foreign Direct Investment (FDI) up to 100% is permitted in the power sector, under the automatic route. In the power sector, FDI stood at Rs 119.9 billion in fiscal 2025, as against Rs 74.7 billion in fiscal 2017, indicating strong momentum in the sector. FDI investments in power sector spiked in fiscal 2024 to Rs 141.4 billion due to the government's initiatives to promote renewable energy and reduce dependence on fossil fuels, which led to a surge in investments in solar and wind energy projects, as well as the establishment of new power transmission and distribution infrastructure, making India an attractive destination for foreign investors looking to capitalize on the country's growing energy demands and ambitious renewable energy targets

FDI equity inflow in Power sector (FY17- 25) (Rs. Billion)



Source: Department of Industry Policy & Promotion, Crisil Intelligence

Global investments in power sector

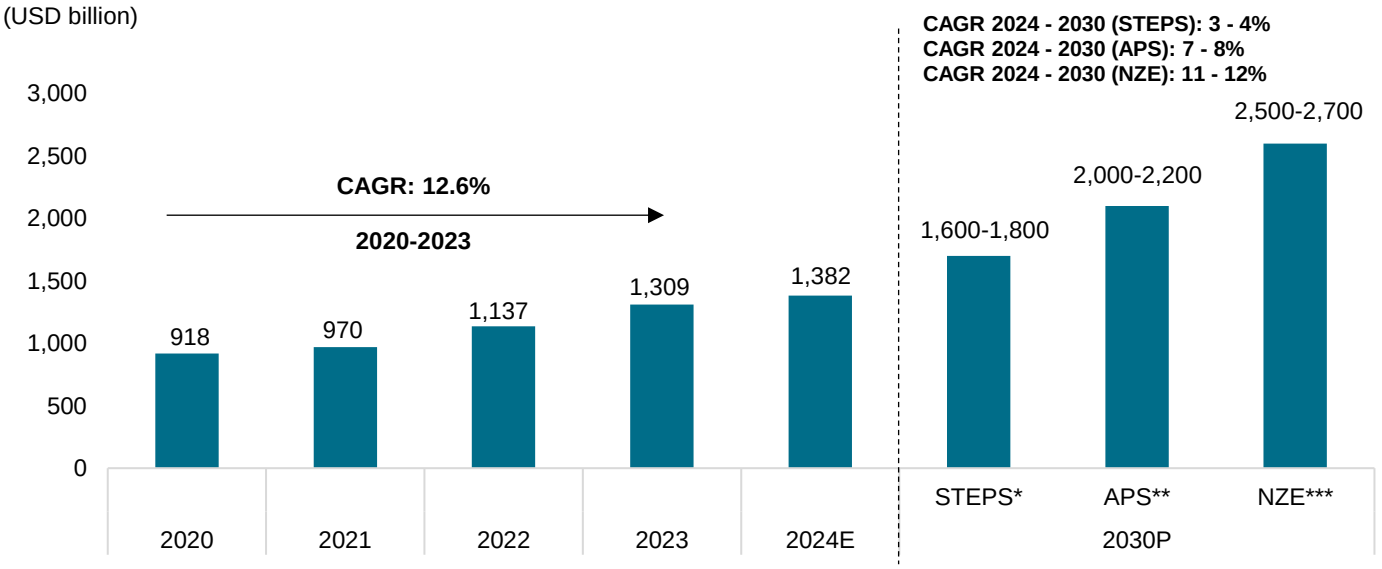
Global power sector investments expected to grow at a CAGR of 7-8% from 2023 to 2030 based on APS scenario

Global power sector investments increased from USD 918 billion in 2020 to USD 1,309 billion in 2023. Power sector investment grew by ~17% in 2022, crossing USD 1,000 billion for the first time, and saw a further increase of 15% in 2023 to ~USD 1,309 billion. Major effect of the global energy crisis has been to accelerate the investments to deploy cleaner energy technologies. Moving forward, investments in power sector is estimated to moderately grow by ~6% to reach USD 1,382 billion by 2024 due to cost reductions for renewables and a decline in fossil fuels.

Global investments on renewables reached USD ~605 billion in 2022, driven by solar and wind investments. As there is a push for renewables in large markets such as USA, China, Europe and India, and the gradual decrease in supply chain pressures, higher capacity additions are expected in solar and wind power sectors going forward. As a result, 2023 investments in global renewables reached USD 735 billion. Moving forward, the investments are estimated to further grow by ~5% to reach ~USD 771 billion by 2024. Factors such as the stabilization of interest rates, ongoing technological advancements, and the increasing competitiveness of renewable energy sources are likely to support this continued investment. However, the market may also face challenges, including regulatory uncertainties and the need for further infrastructure development to accommodate the growing share of renewables in the energy mix.

Moving forward, global power sector investments are estimated to rise to USD 1,600-1,800 billion by 2030 in STEPS scenario, majorly driven by investments in wind PV, solar PV and grids. In the APS scenario, investment is estimated to increase to USD 2,000-2,200 billion by 2030 as low-emissions sources of energy and storage technologies are deployed more rapidly than in the STEPS. In case of NZE scenario, investments in global power sector is estimated to reach USD 2,500-2,700 billion by 2030.

Global investments in power sector (projections based on multiple scenarios) (CY20-CY30)



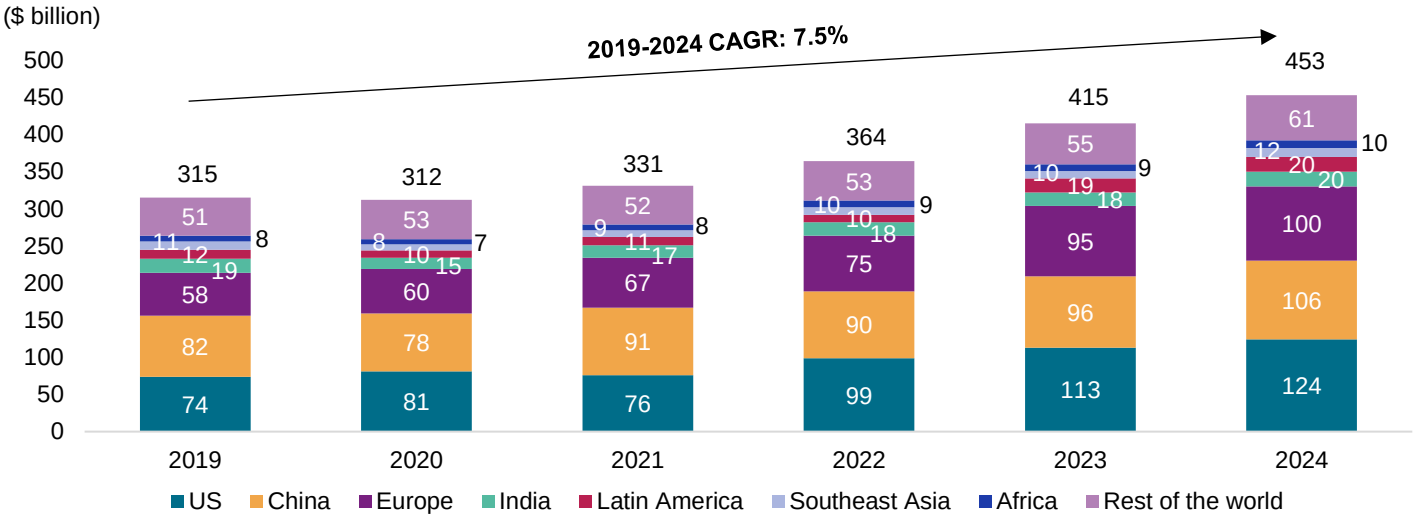
*Note: E stands for estimated, P stands for projected; *2030 projections based on Stated Policies Scenario (STEPS); **As per Announced Pledged Scenario (APS); ***As per Net Zero Emissions (NZE) by 2050 Scenario*
All numbers based on 2023 USD rates
Source: IEA, Crisil Intelligence

Global investments in power grids and renewables

Global investments in power grids and storage have grown at a CAGR of 7.5% from 2019 to 2024

The US, China and Europe have been the largest contributor to investments in power grids and storage over 2019 to 2024 with Europe showing the highest growth in investments of 11.5% over the same period followed by the US at 10.9% and Latin America at 10.8%.The growth is primarily driven by the accelerating global transition to renewable energy, which demands smarter, more resilient grid infrastructure and advanced energy storage systems to handle variability in power supply. Rising electrification coupled with increased policy focus on decarbonization and energy security has also spurred higher investment levels, notably emerging regions like India, South Asia and Africa showed gradual yet steady increase in indicating efforts to expand energy access reduce transmission losses and support growing energy demand. Overall, Global investments in power grids and storage has grown at a CAGR of 7.5% from USD 315 Billion in 2019 to USD 453 Billion in 2024.

Investments in power grids and storage (CY19-CY24) ($ billion)



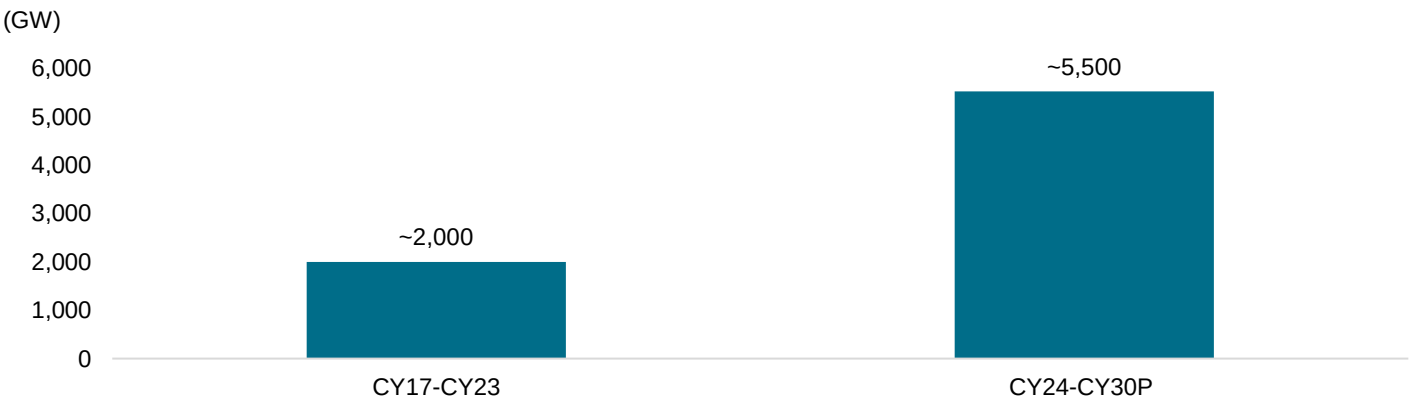
Source: IEA, Crisil Intelligence

Clean energy sources in global power generation are on track to break new records over the period of 2024-2030

Global electricity generation from renewable energies rose 10% y-o-y in 2024, double the 5% increase in 2023. Hydropower generation, which had declined by around 2% in 2023 amidst severe droughts in many regions, most notably in China, posted a substantial rebound in 2024, up by 4%. The increase was led by a strong recovery in both China and Europe due to higher precipitation.

Moving forward, global renewable capacity is expected to increase to over 5,520 GW during 2024- 2030, 2.6 times more than deployment of the last six years (2017-2023). Utility scale and distributed solar PV growth more than tripled, accounting for almost 80% of renewable electricity expansion worldwide. Solar PV adoption accelerated due to declining equipment costs, relatively rapid permitting and widespread social acceptance. PV project size can range from few watts to gigawatt-level utility-scale plants, providing low-cost zero-emission electricity to individuals, small companies, large industries and utilities.

Renewable electricity capacity



Note: P stands for projected
Source: IEA, Crisil Intelligence

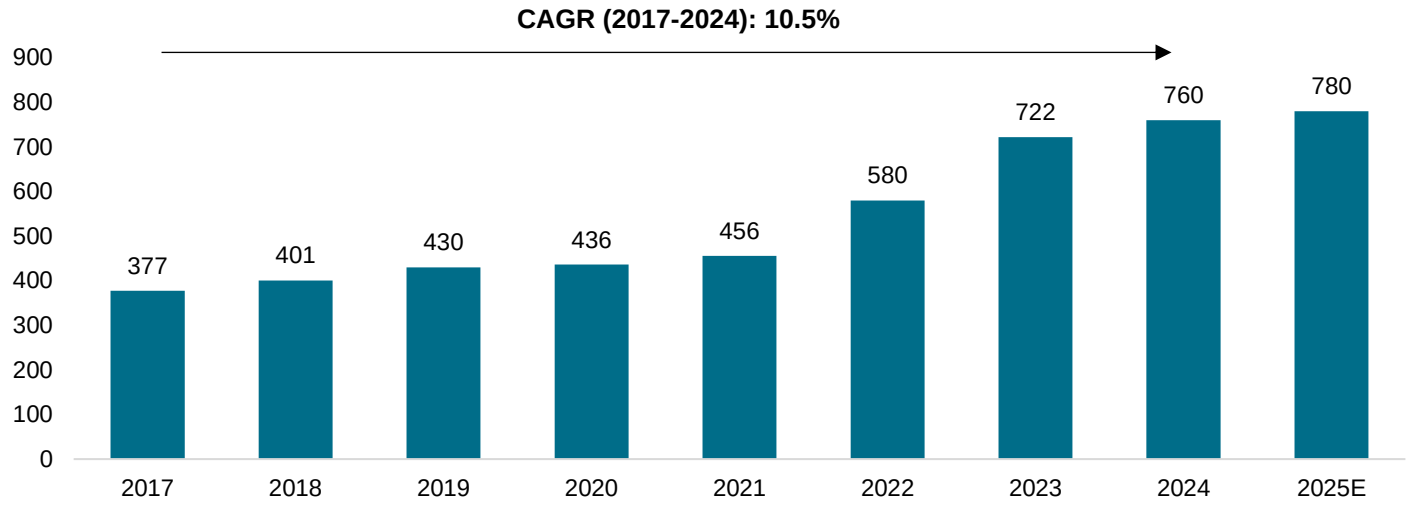
Investments in renewables have accelerated registering a CAGR of ~10.5%, during 2017-24

Based on 2023 USD rates, global investments in renewable power have grown from USD ~354 billion in 2017 to USD ~760 billion in 2024, registering a CAGR of ~10.5%.

As there is a push for renewables in large markets such as USA, China, Europe and India, higher capacity additions are expected in solar and wind power sectors. As a result, 2025 is expected to ~USD 780 billion of global investments in renewable power. As per IEA, the current momentum behind renewable power is notable, and if the current spending trend persists, it is estimated that approximately two-thirds of the total capacity required to triple the renewable capacity by 2030 will be met.

However, to fully achieve this target, an additional USD 500 billion per annum will be necessary. This shortfall highlights the need for the doubling of current annual spending on renewable power generations grid, and storage by 20-30 in order to successfully triple global renewable energy capacity.

Global investments in renewable power (CY17-CY25)



Note: E stands for estimated; all numbers based on 2023 USD rates
Source: IEA, Crisil Intelligence

3. Assessment of power cables and power conductors industry

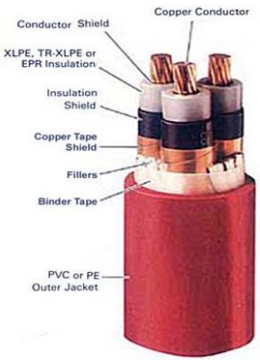
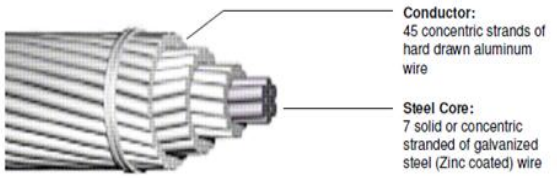
The electrical power cables and power conductors industry has witnessed significant growth in recent years, driven by increasing demand from various sectors such as infrastructure, construction, and telecommunications. As the country continues to urbanize and industrialize, the need for reliable and efficient electrical infrastructure has become paramount. This section provides an assessment of the Indian power cables and power conductors industry.

Overview of cables and conductors

The power sector value chain comprises three segments - generation, transmission and distribution. Electricity is generated at a power plant from where it is transmitted through conductors to the nearest grid with the help of step-up transformers. From there, it is transmitted through conductors to the state grid with the help of step-up or step-down transformers. This power is transmitted to a power sub-station through high voltage cables with the help of step-down transformers. In the final leg of the chain, medium voltage and low voltage are used to transmit power from the sub-transmission point to the end consumer.

Power conductors and cables are used for the bulk transfer of electrical energy from generating power plants to sub-stations and thereon for distribution to end consumers. While bare conductors are largely used for the transmission of power, power cables are used in the sub-transmission and distribution segment

The table highlights the key differences between cables and conductors across various parameters, including definition, insulation, current carrying capacity, cost, durability, and signal integrity.

Parameters	Cables	Conductors
Definition	 A cable is a collection of two or more wires or conductors bundled together, often with insulation and protective covering	 ACSR (Aluminum Conductor Steel Reinforced) Lapwing Power Transmission Conductor Conductor is made of strands of conducting material such as aluminium or copper through which power is transmitted
Insulation	Cables have multiple layers of insulation to protect against electrical shock and environmental factors	Conductors may have a single layer of insulation or none at all, depending on the application
Current carrying capacity	Cables have a lower current carrying capacity due to the multiple conductors and lower heat dissipation due to insulation	Conductors have a higher current carrying capacity because of their lack of insulation which allows better heat dissipation
Durability	Cables are designed to withstand environmental factors such as temperature, moisture, and mechanical stress	Conductors are more susceptible to environmental factors, requiring additional protection and maintenance

Parameters	Cables	Conductors
Signal Integrity	Cables are designed to maintain signal integrity over long distances, with features such as shielding and twisting	Conductors can be prone to signal degradation, particularly over long distances or in noisy environments

Source: Industry, Crisil Intelligence

Introduction to electrical wires and cables

Wires consist of single conductor and cables are assembly of one or more conductors that are used for the transmission of electricity, data or signals. There are various types and varieties of cables, each designed to perform a specific function. Classification is based on the core structure of the conductor metal (majorly copper and aluminium), number of cores, type of insulation material and arrangement, etc.

Power and electrical cables are segmented into the following, based on voltage capacity:

- Low Tension / Voltage (LV) [1.1 kV and below]
- Medium Voltage (MV) [above 1.1KV to 33 KV]
- High Tension / Voltage (HV) [above 33 KV]
- Extra High voltage (EHV) [66 kV and above] cables

Major uses of power cables are in the power sector (central, state and private electricity utilities) and sectors like petrochemicals, mining, steel, non-ferrous, shipbuilding, cement, railway, defence, Datacentres, etc.

The performance and durability of cables depend on the quality of raw materials. Specialised applications require superior chemical, mechanical, thermal and electrical performance from cables, resulting in usage of high-performance materials in cable construction. Additionally, it is seen that in order to achieve properties suited for varying applications, every cable has a distinguished construction. The number of SKUs of cables and wires are very high, with 500-600 fastest selling SKUs, differing in application and offering variation in cross-sectional area (size), number of cores used, core material (mainly copper or aluminium), insulation material used, armoured or unarmoured construction for strength, etc.

Type of cables and its applications

Types of cables	Description	Applications
Power Cable	A power cable is an assembly of two or more conductors with insulation and a protective jacket. The power cables industry is classified into low voltage, medium voltage, high voltage and extra high voltage cables. These cables are predominantly used in sub-transmission and distribution of power.	Transmission and distribution of electricity in mainly commercial and industrial settings
Building Wires	Building wires are usually made up of copper and aluminium. These are majorly used in residential settings and their carrying capacity/ voltage depends on their end use.	Commonly used in everyday household items like for connecting household appliances, power outlets, etc.
Communication Cables	Communication cables are specifically designed to support data transmission across distance at high speed and minimal loss. Examples include, LAN cables, Optic fibre cables, etc.	Used for transmission of data/ voice/ video signals at high speed without major energy loss.
Instrumentation cables	Instrumentation cables are generally used in industrial settings lo carry low voltage signals with high accuracy. These cables are properly shielded to ensure no external signal interference and are mainly used to monitor/ control electric systems. The functions of measurement and control are vital in manufacturing and processing applications.	Few of the applications include industrial equipment control, process controls for e.g. in oil and gas or chemical plants, or mass transit systems which require cables to be heat resistance, resistance due harsh environment and chemicals, etc.

Types of cables	Description	Applications
Railway signal cables	Railway signal cables are specialized cables designed to provide reliable and safe transmission of signal information for railway operations. These cables are designed to withstand harsh environmental conditions, such as extreme temperatures, vibration, and moisture, and are used to control and monitor railway signals, track circuits, and other safety systems.	Used in railway signaling systems to control and monitor train movements, track circuits, and other safety systems, ensuring safe and efficient railway operations.
Other special cables	This class of cables includes cables that are especially designed for a particular end use/ industry due to particular requirements. These types of cables are usually provided as customized solutions against stringent requirements, including temperature, tensile strength, and chemical resistance. For example, Solar cables, which are required to have lifetime reliability of up to 30 years, resistance to extreme temperatures (-40°C to 120°C), ozone, and ultraviolet (UV), halogen free, flame and fire retardancy, etc.	Multiple specialized applications including sonar detection, mine sweeping and defence purposes across industries like marine, defence, aerospace, etc.

Source: Crisil Intelligence

Overview of MVCC (medium voltage cable systems)

Medium Voltage Covered Conductors (MVCCs) are overhead conductors used in distribution circuits with voltages ranging from 1 kV to 33 kV. They feature an extruded insulating jacket that prevents accidental contact and flashovers, making them a safer alternative to traditional bare conductors. MVCCs are manufactured in accordance with international standards, including IEC 61089, IS 3982, and BS EN 50182/50397. A modern MVCC consists of a stranded aluminum alloy or aluminum-clad steel core, surrounded by three layers,

- A longitudinal water-blocked semi-conductive screen
- A track-resistant XLPE inner insulation layer
- A UV- and tracking-resistant XLPE/HDPE outer sheath

MVCCs are commonly used in various settings, including:

- Overhead feeders (substation to load) for main 11-33 kV distribution lines
- Vegetated or forest corridors, where the touch-tolerant cover reduces tree-related faults
- Urban and suburban streets, where compact clearances and improved streetscapes are desired
- Coastal, polluted, or high-altitude routes, where the jacket resists salt, moisture, ice, and pollution
- Industrial plants, railways, and renewable energy installations, where reliable power is essential and space for undergrounding is limited

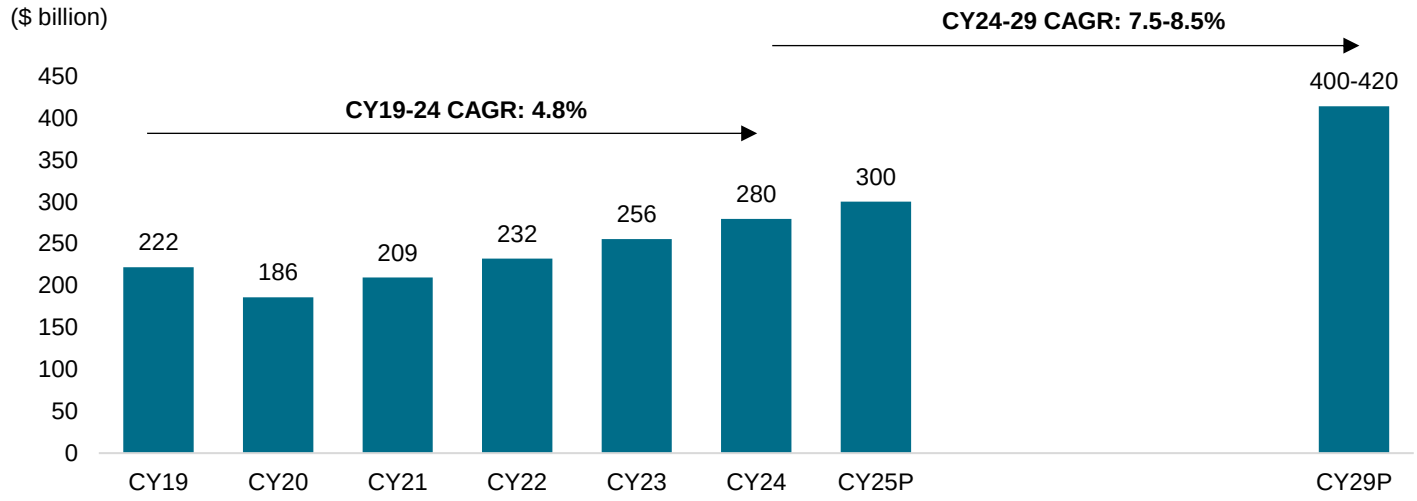
MVCCs offer several advantages, including:

- Enhanced Safety: Insulation prevents accidental human or animal contact
- Lower Electrical Losses: The smooth XLPE surface suppresses corona and enables tighter phase spacing
- High Durability and Corrosion Resistance: Dual XLPE layers shield against UV, rain, salt, and temperature swings
- Weather-Proof Reliability: Branches, snow, or wind-blown debris rarely cause faults, reducing outage minutes

- Narrow Rights of Way: Reduced phase spacing and longer pole spans reuse existing corridors and lower structure costs
- Lower Life Cycle Cost: Fewer fault repairs, minimal tree trimming, and reduced maintenance compared to underground or aerial bunched cable
- Environmental and EMI Benefits: Less vegetation clearing, lower electromagnetic interference, and compliance with sustainability goals

The global wires and cables market has experienced significant growth, reaching a value of USD 280 billion in 2024, with a Compound Annual Growth Rate (CAGR) of 4.8% from 2019 to 2024. Looking forward, the market is projected to accelerate its growth, with an expected CAGR of 7.5-8.5% from 2024 to 2029, and is anticipated to reach a value of USD 400-420 billion by 2029. Notably, higher voltage cables, such as 400 kV-500 kV cables and Medium Voltage Cables (MVCC), offer more lucrative margins compared to lower voltage cables, presenting a promising opportunity for growth and profitability in the industry.

Market size of global electrical wires and cables market (CY19-CY29)



P: Projected
Source: Crisil Intelligence

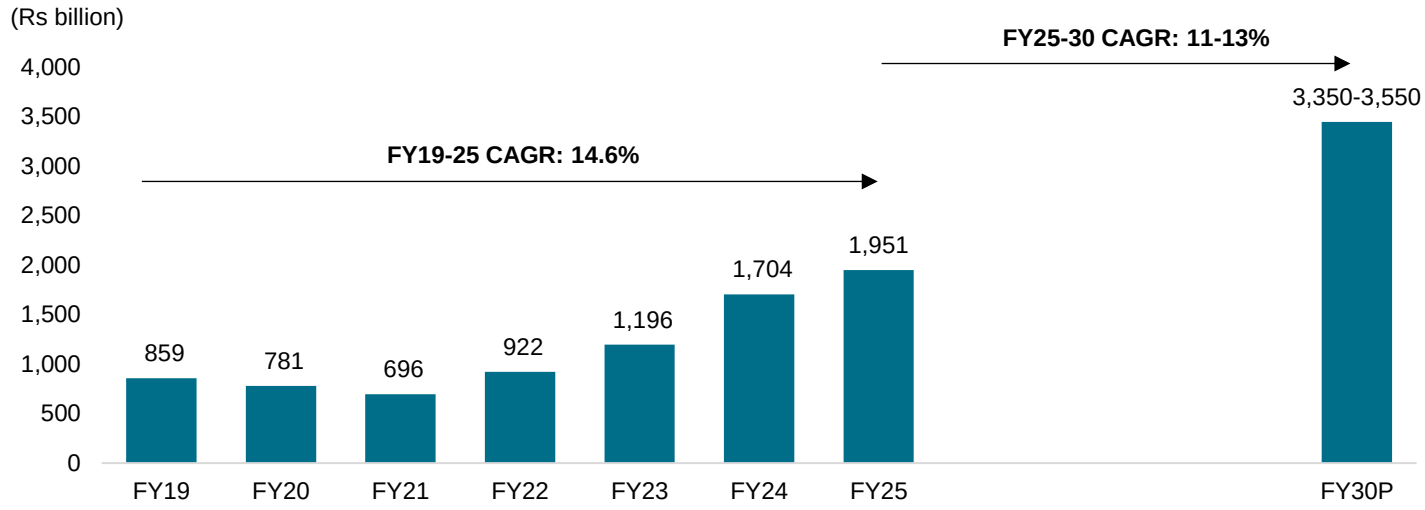
Overview of India wires & cables market

India wires & cables market to grow at 11-13% CAGR between FY25-FY30

In FY25, cables and wire market were valued at ~Rs 1,951 billion, up from Rs 859 billion in FY19, registering a CAGR of 14.6%. This notable surge can be primarily attributed to a remarkable growth of High Voltage (HV) & Extra-High Voltage (EHV)- Above 33 KV cables and Elastomeric Cables, which have registered exponential growth on the back of increased expansion of transmission lines and electrification initiatives in rural areas. Other cable categories contributing substantially to the accelerated market growth include PVC Control Cables & Instrumentation, building wires, and switchboard cables, driven by pickup in construction activities in both commercial and residential sectors post COVID-19.

Moving forward, Crisil Intelligence expects the wires and cables market size to grow at a CAGR of 11-13% between FY25 and FY30 and reach Rs 3,350 billion - Rs 3,550 billion by FY30 due to ongoing infrastructure development projects, surge in construction activities and increasing digital connectivity.

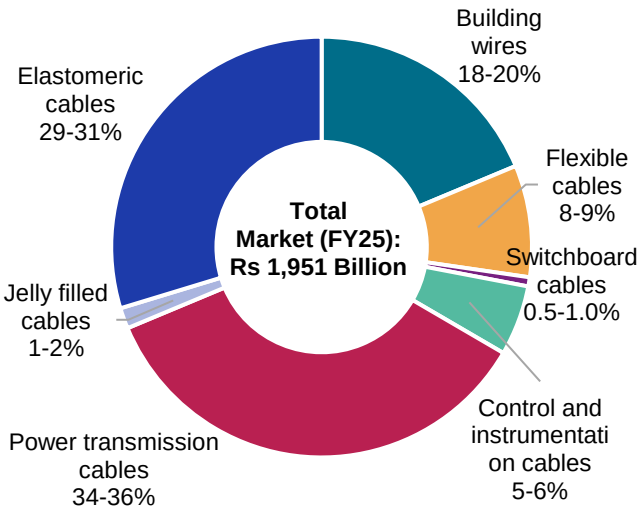
Market size of wires and cables in India (FY19-FY30)



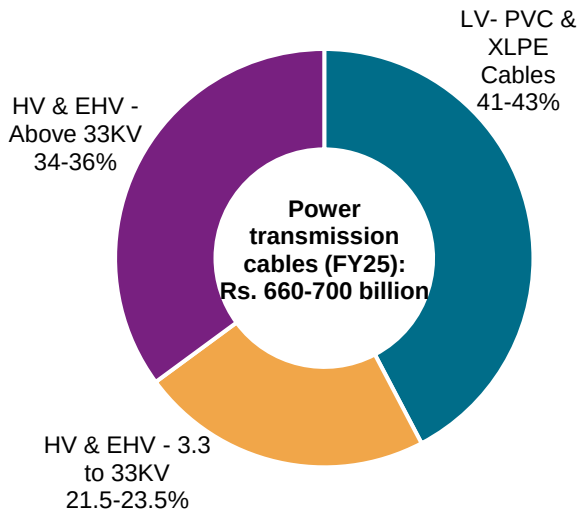
Source: IEEMA, Crisil Intelligence

Power transmission cables formed the highest market share in FY25 in value terms

Segment wise split of cables and wires market (FY25)



Segment wise split of power transmission cables (FY25)



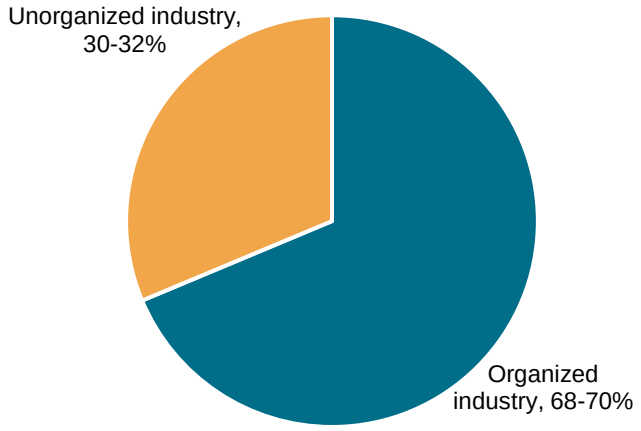
Source: IEEMA, CRISIL MI&A

In FY25, power transmission cables formed the highest market share in the overall domestic cables and wire industry at 34-36%, followed closely by elastomeric cables at 29-31%. Within power transmission cables, Low Voltage Polyvinyl Chloride (LV-PVC) and Cross-Linked Polyethylene (XLPE) Cables had the highest share of 41-43%, followed by HV and EHV (above 33 KV) at 34-36% and HV and EHV (3.3 to 33 KV) at 21.5-23.5%.

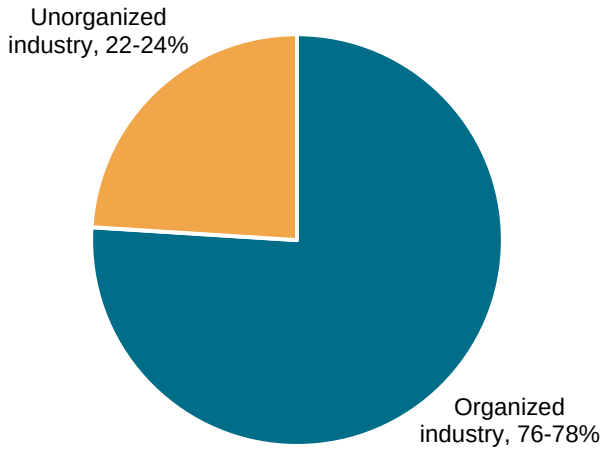
The high share of power transmission cables in owning to favourable government initiatives in power segment like rural electrification schemes, railway electrification, etc. Additionally, increasing construction spends in building segments coupled with growing Fast-Moving Electric Goods (FMEG) industry is contributing to the demand of building wires

Organized players dominate the overall domestic cables and wires industry in value terms

FY19 – Rs 859 billion



FY25 – Rs 1,951 billion



Source: IEEMA, CRISIL MI&A

The share of organized players has improved between FY19 and FY25 from ~68-70% to 76-78%. Consequently, share of unorganized industry has dropped from 30-32% in FY19 to 22-24% in FY25. Additionally, within the overall industry, share of organized players is relatively higher in cables like power transmission cables. Moving forward, the share of organized players is expected to increase further as the industry consolidates.

Cables and wires production crossed 21 million km in FY25

In FY25, cables and wire production in India crossed 21 million km, up from 16 million km in FY19, registering a CAGR growth of 5.2%. Out of the 21.7 million km, cables accounted for ~9.5 million km in FY25. Major factors contributing to this growth included an overall upswing in exports, favourable government initiatives such as the REC, rural electrification programs and demand stemming from various segments. Notably, the production of High Voltage (HV) and Extra-High Voltage (EHV) cables (Above 33 KV) registered a strong CAGR of 53.8% from FY19 to FY25, primarily due to increased investments in power transmission infrastructure and ambitious grid modernization projects supporting renewable energy integration. Medium Voltage (MV) and High Voltage (HV) (3.3 – 33KV) benefitted from ongoing electrification and industrial and urban expansion, as well as upgrades in distribution networks to meet rising demand and enhance reliability. Elastomeric cables saw a CAGR of 30.4% from FY19 to FY25 driven by their adoption in specialized, demanding environment across heavy engineering, automotive, railways and infrastructure where flexibility, heat resistance and durability are critical requirements. The post-pandemic recovery in construction activity has simultaneously bolstered demand for building wires and switchboard cables, as rapid urbanization and infrastructure projects surged.

Collectively, the growth momentum for specialty product segments is underpinned by strategic sectoral investments, evolving industry requirements, technological advancements, and a supportive policy environment all contributing to the sector' expansion.

Total production of cables and wires

Production (in '000 kms)	FY19	FY20	FY21	FY22	FY23	FY24	FY25E	CAGR FY19-25
LV- PVC & XLPE Cables	726	617	478	472	567	645	736	0.2%
MV & HV- 3.3 to 33 KV	52	49	54	49	57	97	118	14.6%
HV & EHV- Above 33 KV	2	6	3	3	5	9	22	53.8%
Control and instrumentation cables	756	626	543	598	758	960	841	1.8%
Elastomeric cables	179	165	158	216	291	630	879	30.4%
Jelly filled cables	181	129	84	86	47	144	84	-12.0%
Switchboard cables	982	890	781	834	1,041	1,035	1,154	2.7%
Building wires	9,818	8,966	7,793	8,685	10,951	11,500	12,137	3.6%
Flexible cables	3,326	3,265	3,056	3,519	4,318	5,473	5,758	9.6%
Total Production (in '000 kms) *	**16,021**	**14,713**	**12,950**	**14,462**	**18,036**	**20,492**	**21,729**	**5.2%**

Note: Production data of Elastomeric cables is in core kilometres
LV-PVC: Low Voltage Polyvinyl Chloride
XLPE: Cross-Linked Polyethylene
MV: Medium Voltage
HV: High Voltage
EHV: Extra-High Voltage
Source: IEEMA, Crisil Intelligence

Exports of wires & cables to grow at a CAGR of 10-11% between FY25-30

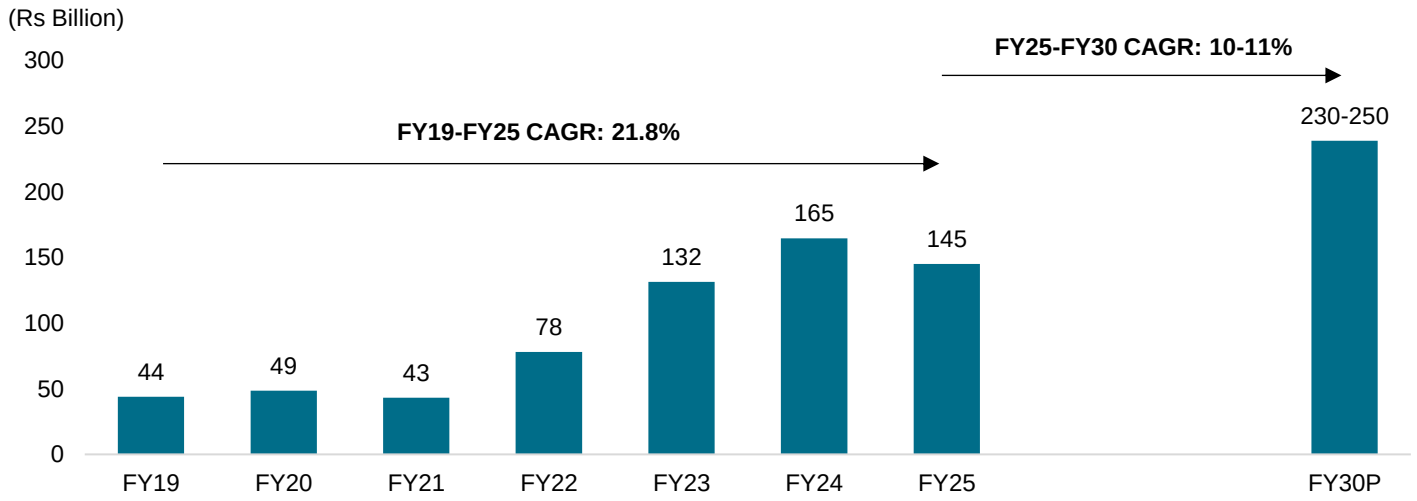
The Indian wire and cable industry has witnessed significant growth in recent years, with exports increasing from Rs 44 billion in FY19 to Rs 145 billion in FY25, registering a compound annual growth rate (CAGR) of 21.8%. This growth can be attributed to heightened international demand, particularly from organizations such as the International Development Association (IDA) and the International Bank for Reconstruction and Development (IBRD), which have invested heavily in transmission projects. Key export partners for wires and cables in FY25 included Saudi Arabia, the USA, UAE, UK, Australia, and several African countries, with Nigeria, South Africa, Liberia, Tanzania, and Kenya being the leading destinations.

India has emerged as a preferred global supplier of cables due to its cost-competitive manufacturing capabilities, driven by low labor costs and a skilled workforce. This enables the production of high-quality cables at lower prices than competitors like China or developed nations. The 'China+1' strategy has also boosted demand for Indian cables, particularly in the US and Europe, where exports have grown at a 44% CAGR from FY17 to FY24. Additionally, robust domestic demand, which is projected to reach USD 32.85 billion by 2030, supports economies of scale, while investments in capacity expansion and diverse products like XLPE and fiber optic cables align with global trends in renewables and telecom.

Looking ahead, Crisil Intelligence expects the export of wires and cables to moderate and grow at a CAGR of 10-11% between FY25-30, reaching Rs 230-250 billion in FY30. This growth will be driven by increasing demand from emerging markets and the ongoing expansion of transmission and distribution infrastructure globally. The analysis of wire and cable exports from India is based on specific Harmonized System (HS) codes, including 74081190, 85359090, 85444920, 85444930, 85446020, 85446030, and 90011000, which cover a range of products such as copper wires, plastic insulated conductors, and optical fibers.

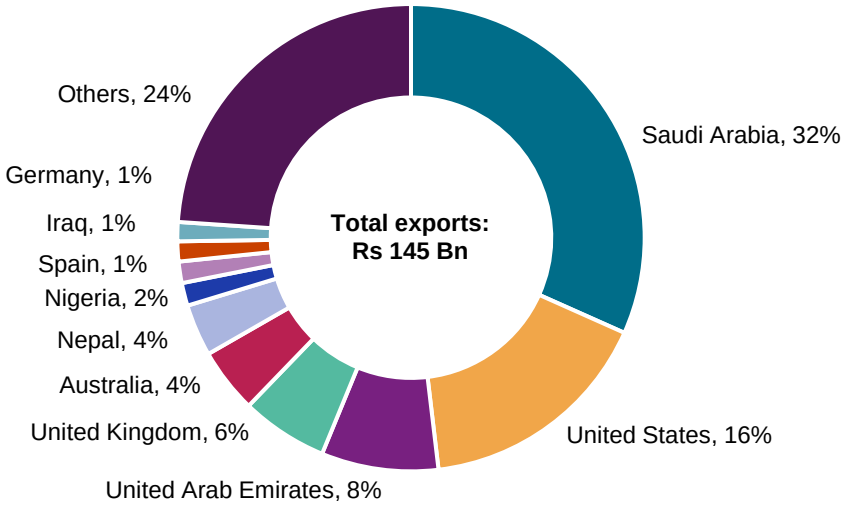
However, despite the growth prospects, the Indian wire and cable industry faced a temporary decline in exports in FY25, particularly in optical fiber and copper wire. This decline was caused by a 34% drop in copper cathode imports due to a quality control order (QCO) effective December 2024, which disrupted supply and raised costs. Global demand fluctuations for optical fiber, tied to slower 5G rollouts, and volatile raw material prices (copper and aluminum) further squeezed margins, reducing export competitiveness. The completion of foreign Engineering, Procurement, and Construction (EPC) projects also reduced demand for copper wire used in power and infrastructure projects, contributing to the export dip. With copper supply stabilizing and new EPC opportunities emerging in Africa and Southeast Asia, exports are expected to recover in FY26.

Export value of wire and cables (FY19-FY30)



Source: Ministry of Commerce & Industry, Crisil Intelligence

Country wise export value of wire and cables, FY25



Source: Ministry of Commerce & Industry, Crisil Intelligence

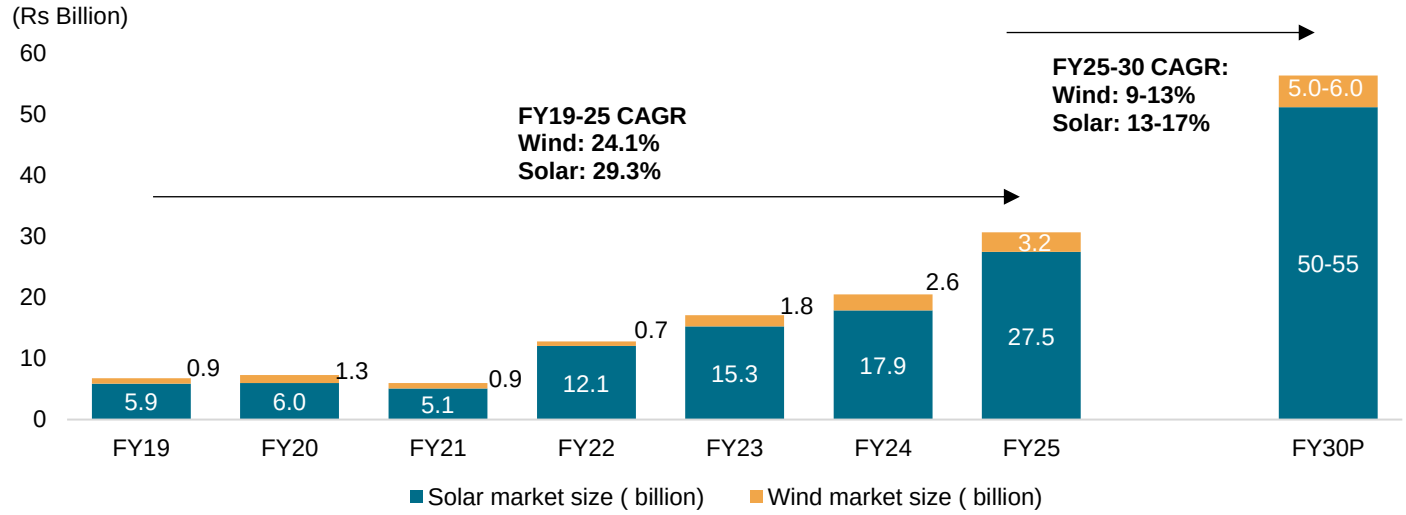
Demand for wind and solar cables expected to grow from renewables sector due to planned capacity expansions

The demand for cables in the renewables sector, specifically in solar and wind applications, has experienced noteworthy growth in tandem with the global shift towards sustainable energy sources. Due to increased focus on renewable energy by corporate and government alike, the solar as well as wind industry are growing at remarkable pace.

Solar power transmission relies on essential components, with solar cables playing a crucial role. These specialized cables are engineered to withstand harsh weather, UV exposure, and high electrical loads, solar cables provide flexibility, durability, and reliability in advancing solar power system development and helps in connecting solar panels to the electrical grid, facilitating the widespread integration of solar power. The solar cables industry in India is propelled by factors including growing embrace of renewable energy, government initiatives and subsidies for solar projects, and an escalating awareness regarding the advantages of clean energy. Consequently, the market size of solar cables has risen from Rs 5.9 billion in FY19 to Rs 27.5 billion in FY25, and it is anticipated to reach approximately Rs 50-55 billion by FY30, reflecting a CAGR of approximately ~13-17% between FY25 and FY30. As the solar industry continues to expand, the demand for specialized solar cables is expected to rise in tandem.

Similar to solar energy, wind energy installations are growing in India. In the wind power sector, cables play a critical role in wind turbine installations as these are required to endure challenging environmental conditions, including exposure to wind, moisture, and temperature fluctuations. The demand for high-quality cables in wind energy projects arises from the need for reliable power transmission from the wind turbines to distribution networks and the overall market size of wind cables is expected to reach to Rs 5.0-6.0 billion in FY30 from Rs 3.2 billion in FY25, registering a CAGR of ~9-13%.

Market Size: Wind and Solar Cables (FY19-FY30)



Source: Crisil Intelligence

Introduction to conductors

Conductors, such as all aluminium conducts (AAC), all alloy aluminium conductors (AAAC), aluminium conductors steel reinforced (ACSR), high ampacity conductors, AL-59 alloy conductors, High Performance Conductors (HPC) and High Temperature Low Sag (HTLS) are used as transmission and distribution lines to deliver bulk power from generating stations to the load centres and large industrial consumers. Bulk power transmission is generally done over bare, overhead conductors at voltage levels of 220 kV and above.

The Transmission system is to deliver bulk power from power stations to the load centres and large industrial consumers beyond the economical service range of the regular primary distribution lines whereas distribution system is to deliver power from power sector or substations to the various consumers.

Major types of Conductors

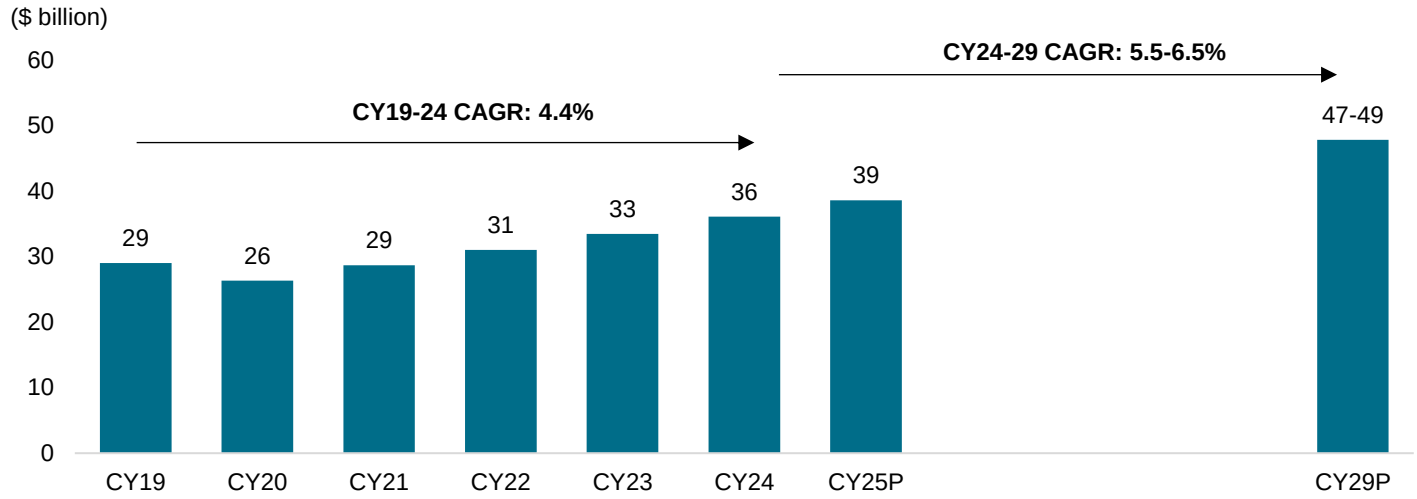
Conductor	Type	Description	Example use cases
AAC – All Aluminium Conductors	Conventional	AAC conductors are made entirely of aluminium, offering high conductivity due to aluminium's low electrical resistance. They are used in low and high voltage overhead lines, particularly in urban areas where spans are short, and high conductivity is critical. However, their relatively low strength-to-weight ratio limits their use in long-span applications.	**Urban Power Distribution**: AAC is ideal for short-span distribution lines in cities due to its high conductivity and lightweight nature, ensuring efficient power delivery in densely populated areas. **Substation Busbars**: Used in substations where high current-carrying capacity is needed over short distances. **Coastal Regions**: AAC's corrosion resistance makes it suitable for coastal environments with high humidity and salt exposure.
ACSR – Aluminium Conductor Steel Reinforced	Conventional	ACSR conductors consist of a central steel core surrounded by aluminium strands, combining high strength with good conductivity. The steel core provides mechanical support, making ACSR suitable for long-span overhead power lines. Its high capacity, low weight, and cost-effectiveness make it a popular choice for transmission networks.	**Long-Distance Transmission Lines**: ACSR is widely used in high-voltage transmission lines spanning rivers, valleys, or rural areas due to its strength and ability to handle long spans. **Rural Electrification**: Employed in rural grids where cost-effective, durable conductors are needed for extended distances. **High-Wind Areas**: The steel core provides stability in windy or stormy conditions, making ACSR suitable for regions with adverse weather.
AAAC – All Aluminium Alloy Conductors	Conventional	AAAC conductors are made from a high-strength aluminium-magnesium-silicon alloy, offering a better strength-to-weight ratio than AAC and superior corrosion resistance compared to ACSR. They provide improved electrical properties and excellent sag-tension characteristics, making them a preferred choice for specific applications.	**Coastal and Industrial Areas**: AAAC's superior corrosion resistance makes it ideal for coastal regions or areas with high pollution levels, such as industrial zones. **Medium-Span Transmission**: Used in overhead lines where moderate spans require a balance of strength, conductivity, and low sag under thermal loads. **Renewable Energy Projects**: Employed in wind and solar farm connections due to their lightweight nature and ability to handle variable loads.
OPGW- Optical Ground Wire/ Optical fibre composite overhead ground wire	Specialised	OPGW is a specialized conductor that combines the functions of a ground wire and a communication cable. It consists of optical fibers encased in a protective aluminium or steel tube, surrounded by aluminium or ACSR strands. OPGW serves as an earth wire in transmission lines while enabling high-capacity data transmission, replacing traditional ground wires in modern networks.	**Transmission Line Communication**: OPGW is used in high-voltage transmission lines to provide grounding while enabling data transfer for grid monitoring, control, and telecommunication. **Intercountry Data Networks**: Facilitates high-capacity data transmission across countries, forming the backbone for utilities, railways, and telecom networks. **Smart Grid Applications**: Supports real-time monitoring and control in smart grids, enhancing reliability and efficiency in power systems.
AL-59 alloy conductors	Specialised	AL-59 conductors are made from an aluminium-magnesium-silicon alloy with a conductivity of 59% IACS (International Annealed Copper Standard). Their low DC resistance and high current-carrying capacity make them suitable for applications requiring efficient power	**Urban Transmission Lines**: Used in urban areas for medium-voltage lines where high current capacity and corrosion resistance are needed over short to medium spans.

Conductor	Type	Description	Example use cases
		transfer. These conductors offer a balance of strength, conductivity, and corrosion resistance, outperforming traditional aluminium conductors like AAC in specific scenarios.	**Renewable Energy Integration**: Employed in solar and wind farm connections to handle high current loads with minimal losses. **Industrial Power Distribution**: Ideal for industrial settings requiring reliable, high-capacity conductors for heavy machinery and equipment.
HPC - High Performance conductors	Specialised	HPCs are stranded conductors combining annealed aluminium or aluminium alloy wires for conductivity with a reinforced core (often steel or composite materials) for mechanical strength. They are designed for continuous operation at temperatures above 150°C, maintaining stable electrical and mechanical properties under high thermal loads. HPCs offer enhanced current-carrying capacity and durability compared to conventional conductors.	**High-Load Transmission** Networks: Used in transmission lines where high current demands and elevated operating temperatures are common, such as in densely populated regions. **Grid Upgrades:** Applied in reconductoring projects to increase capacity without replacing existing infrastructure, leveraging their high ampacity and thermal stability. **Industrial and Mining Applications:** Suitable for powering heavy industrial equipment and mining operations where sustained high currents are required.
HTLS – High Temperature Low Sag Conductors	Specialised	HTLS conductors, such as Aluminium Conductor Alloy Reinforced (ACAR) or Aluminium Conductor Steel Reinforced (ACSR) variants, are engineered to operate at temperatures up to 250°C or higher. They combine high mechanical strength, thermal stability, and low sag characteristics, allowing them to carry high currents over long distances without excessive drooping. These conductors are ideal for high-voltage transmission lines.	**Long-Distance Power Transmission**: Used in high-voltage transmission lines across vast distances, such as intercity or interstate grids, to minimize losses and sag. **Grid Modernization**: Employed in upgrading aging transmission lines to increase capacity without requiring new towers, thanks to their low sag at high temperatures. **Renewable Energy Evacuation**: Critical for transmitting power from remote renewable energy sources (e.g., wind farms in deserts) to urban centers, handling high currents under extreme conditions.
Copper conductors	Conventional	Copper conductors, made from pure copper or copper alloys, offer excellent electrical conductivity (near 100% IACS), high current-carrying capacity, and low resistance. Their high ductility and ability to withstand harsh environmental conditions make them suitable for various applications, though they are more expensive than aluminium conductors and may require corrosion protection in certain environments.	**Underground Power Cables**: Widely used in underground distribution systems for urban areas due to their high conductivity and durability in confined spaces. **Substation and Transformer Connections**: Employed in substations and transformers where high current capacity and reliability are critical. **High-Precision Industrial Applications**: Used in industries requiring minimal voltage drop, such as data centers, EV charging infrastructure, and heavy machinery.

Source: Crisil Intelligence

The global conductors market stood at USD 36 billion in 2024, growing with a CAGR of 4.4% from 2019 to 2024. Looking ahead, the market is expected to grow at a CAGR of 5.5-6.5% from 2024 to 2029, reaching a value of USD 47-49 billion by 2029.

Market size of global conductor's market (CY19-CY29)



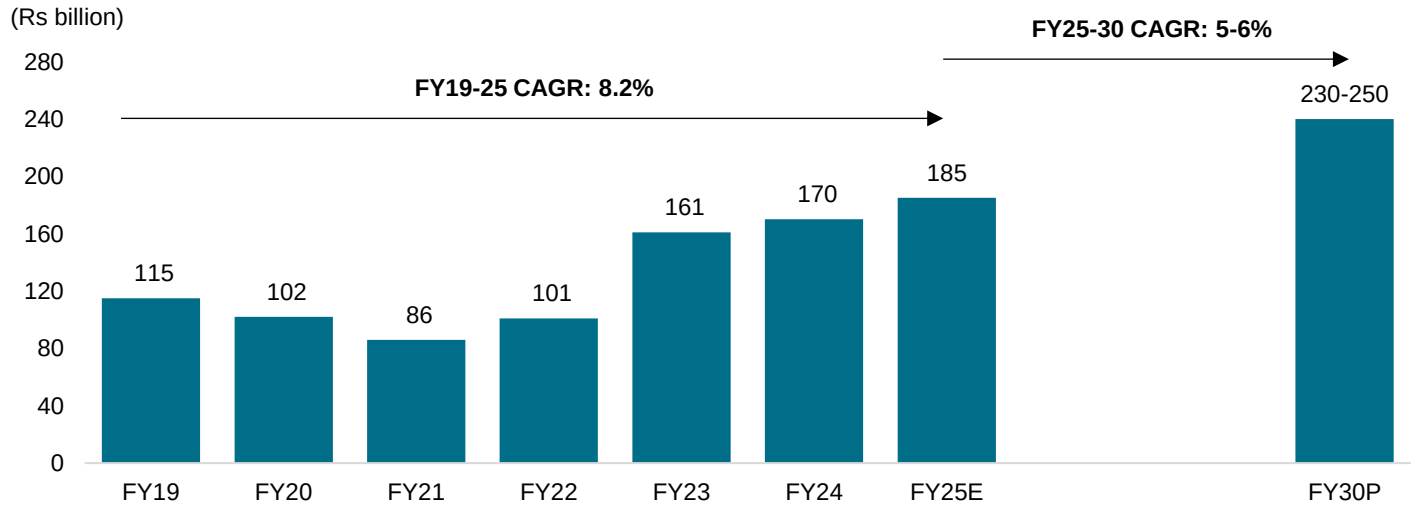
P: Projected
Source: Crisil Intelligence

Market size of Indian power conductors to reach ~Rs 230-250 billion by FY30

In FY25, total market size of conductors reached Rs 185 billion up from Rs 115 billion in FY19, registering a CAGR growth of 8.2%. Major factors influencing this demand includes railway electrification, healthy transmission line additions, etc.

Moving forward, Crisil Intelligence expects conductor industry to grow at a CAGR of ~5-6% from FY25-FY30 to reach Rs. 230-250 billion by FY30 due to ongoing government schemes in power segment as well increased exports of conductors from India.

Market size: Indian power conductors (FY19-FY30)

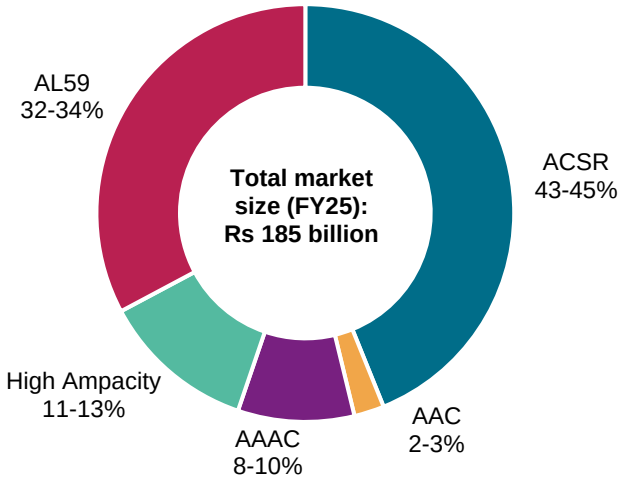


Source: IEEMA, Crisil Intelligence

ACSR conductors had the most share of 43-45% in the conductors' market in FY25

The conductor's market in India is dominated by ACSR conductor which accounts for a share of 43-45%. This significant lead can be attributed to its widespread use in overhead power transmission due to its high strength and durability. This is followed by AL59 conductors which has a share of 32-34%, likely driven by their enhanced conductivity and corrosion resistance making them suitable for coastal and high-load regions. High ampacity conductors had a share of 11-13% reflecting a growing demand for efficient, low loss power transmission. AAAC and AAC had a share of 8-10% and 2-3 respectively.

Segment wise share of conductors (FY25)



Source: IEEMA, Crisil Intelligence

Conductors' production stood at 587,948 MT in FY25

In FY23, conductors' production in India reached 419,653 MT. Newer technology conductors' entry in the market (high ampacity conductors and AL-59 conductors), drop in overall orders and the Covid-19 pandemic saw production of conductors drop between FY20-22.

Volumes recovered in FY23. Major factors contributing to this recovery included an overall upswing in exports, favourable government initiatives such as the REC and rural electrification initiatives fostering demand for conductors, and large planned capacity addition of renewable energy in the country, thereby providing an impetus to the growth of conductors' market in India. Additionally, infrastructure investments in Indian railways, Metros and High-speed rail are expected to grow exponentially, which will further boost the conductor industry.

In FY25, production volume of conductors stood at 587,948 MT up ~2% on the back of healthy demand for AL-59 conductors.

Total production of conductors

Production	FY19	FY20	FY21	FY22	FY23	FY24	FY25E	FY19-FY25 CAGR
Conductor volumes (in MT)	517,051	454,805	377,609	282,933	419,653	576,226	587,948	2.2%

Source: IEEMA, Crisil Intelligence

Conductors export grew at a CAGR of ~9.6% in value between FY19-25

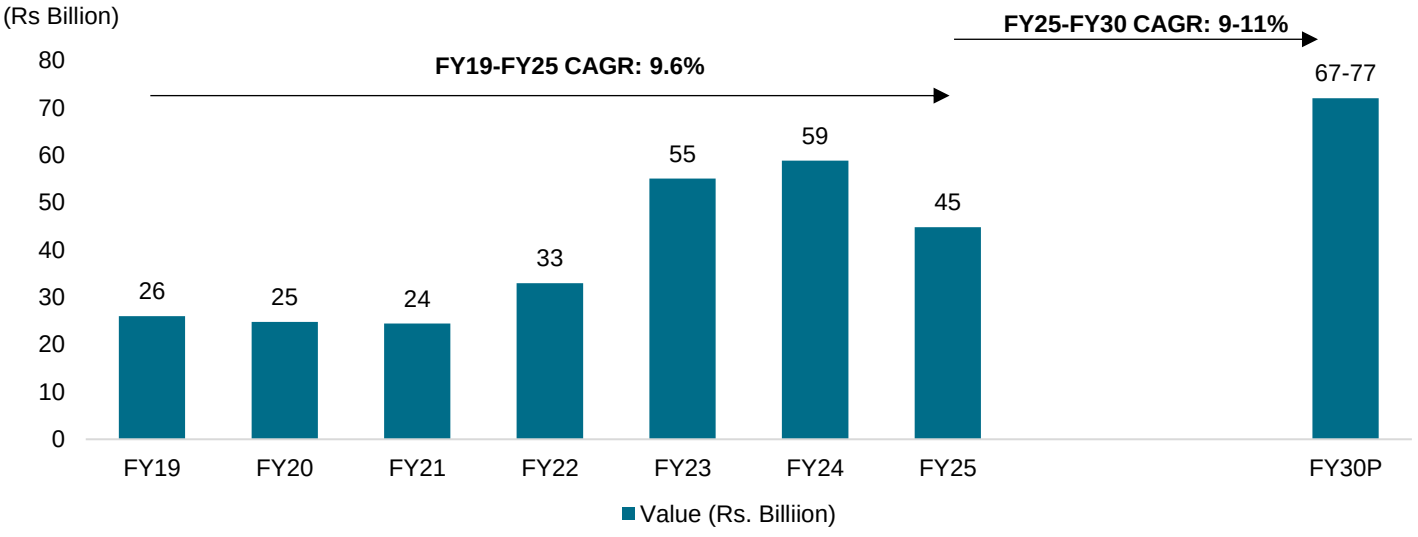
The export demand for power conductors from India has experienced significant growth, with a Compound Annual Growth Rate (CAGR) of 9.6% between FY19 and FY25. The export value reached approximately Rs 45 billion in FY25, up from Rs 26 billion in FY19, driven by increased international demand. India's power conductor exports are diversified across several countries, with the USA (23%), Bangladesh (10%), Iraq (10%), Cameroon (7%), Egypt (6%), Nepal (5%), and Ghana (5%) being some of the key markets of the total exports in FY25, respectively.

Several factors are expected to boost India's power conductor exports, including multilateral funding from organizations like the World Bank and International Bank for Reconstruction and Development (IBRD) for power transmission projects in regions such as Africa, Central Asia, South, and East Asia. Additionally, India's cost-effective manufacturing, driven by lower labor costs and a strong supply chain for raw materials like aluminum and copper, enables competitive pricing, making Indian conductors appealing to price-sensitive markets in Asia, Africa, and Latin America. The government's initiatives, such as the Make in India program and Production-Linked Incentive (PLI) schemes, have also enhanced domestic production capabilities, enabling surplus capacity for exports. Furthermore, India's neutral trade relations and free trade agreements (FTAs) with countries like the UAE, Australia, and the UK enhance market access, unlike some APAC competitors, which face trade barriers due to geopolitical tensions.

However, in FY25, Indian electrical conductor exports experienced a marginal decline, primarily due to global trade disruptions and geopolitical challenges. The US Tariff announcement, although not implemented, created market uncertainty, and the high statistical base from previous years, coupled with stagnant domestic demand for certain transmission equipment, contributed to the decline. Nevertheless, this decline is expected to be temporary, with a projected increase in exports driven by the anticipated easing of US tariffs, India's strategic focus on diversifying export markets and enhancing localization, and the global push for renewable energy. The growing demand for renewable energy infrastructure, coupled with India's expertise in producing specialized conductors like solar and wind power cables, further strengthens its position in emerging markets, ensuring a temporary setback followed by growth.

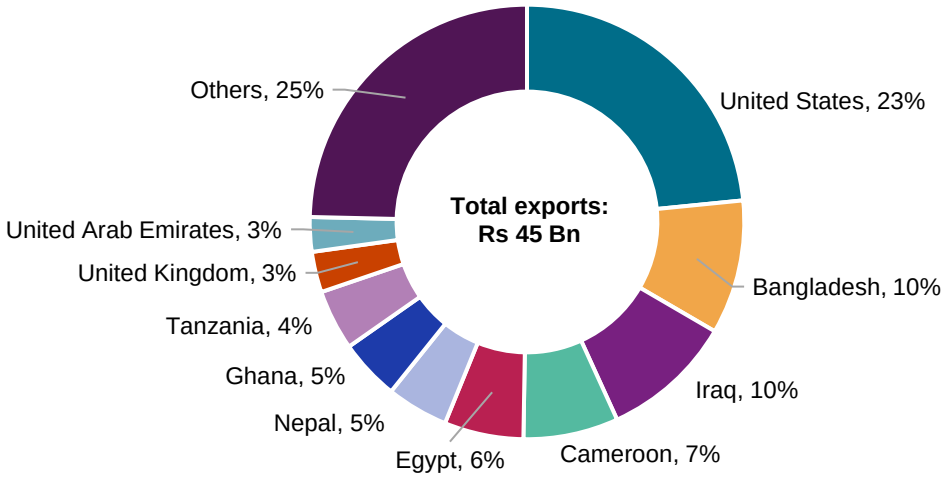
Note: Crisil Intelligence has considered following HSN codes for the analysis of conductor’s exports from India- 76042910, 76042920, 76042930, 76042990, 76141000, 76149000. These include hard drawn bare Aluminium conductors steel re-in forced, wire rods, stranded wires, cables with steel core, etc.

Export value of conductors (FY19-FY30)



Source: Ministry of Commerce & Industry, Crisil Intelligence

Country wise export value of conductors, FY25



Source: Ministry of Commerce & Industry, Crisil Intelligence

Overview of OPGW cables

Optical Ground Wire (OPGW) cables are a type of cable that combines the functions of a ground wire and an optical fiber cable, playing a crucial role in the transmission of electrical power and communication signals. Essentially, OPGW cables are designed to serve as a ground wire for high-voltage transmission lines, providing a path to ground for fault current and protecting the transmission line from lightning strikes and other electrical surges. OPGW cables are strung above HV lines. Another key function of the OPGW cable is to serve as a high bandwidth fiber backbone running along the length of the transmission corridor. Its added benefit of containing optical fiber can be used for telecommunication purposes. OPGW provides dual benefit to transmission companies - safeguarding the infra via earthing and providing additional revenue at a substantially lower capex.

As the Indian government aims to achieve its ambitious targets of increasing power generation capacity and ensuring reliable transmission, the demand for OPGW cables has been on the rise. These cables, which combine the functions of a ground wire and an optical fiber cable, have become an essential component in the construction of high-voltage transmission lines, offering a reliable and efficient means of transmitting data and protecting against power outages. With several major players, including domestic manufacturers and international companies, operating in the Indian market, the industry has become increasingly competitive, driving innovation and advancements in technology.

The Optical Fiber Network in India is driven by the National Broadband Mission’s target to fiberise 70% of India’s base transceiver stations (BTS) as an ideal requirement for the efficient rollout of 5G services. This need for Fiberisation, incremental Base Transceiver Stations (BTS's) and various forms of towers (small, lean, feather etc) are driving the capex. Additionally, growing digital content, digital transformation, IoT, AI, data analytics, cloud computing and other internet services have led to the growth of data centres. End-use sectors such as telecom, railways, defence and industrial are driven by digital transformation and adoption of new age technologies. These factors directly contribute to demand for OPGW cable as the cable can support fiber infrastructure expansion with minimal or no additional RoW costs of since it utilizes the existing power grid infrastructure.

Furthermore, the Indian government's initiatives, such as the "Smart Grid" and "Digital India" programs, have also contributed to the growth of the OPGW cables industry, as these initiatives emphasize the need for efficient and reliable

power transmission and communication systems, thereby creating a favorable business environment for OPGW cable manufacturers and suppliers in the country.

Overview of Convergence services

Convergence refers to the integration of power utility infrastructure and telecommunications networks to provide reliable and efficient connectivity. This concept enables the sharing of existing infrastructure, such as transmission and distribution towers, substations, and Optical Ground Wire (OPGW) networks, between power utilities and telecommunications service providers. By leveraging these shared resources, telecommunications companies can deliver high-quality connectivity services to a wider audience, while power utilities can generate additional revenue streams.

The convergence of power and telecommunications infrastructure offers numerous benefits, including improved network reliability, reduced costs, and increased efficiency. Usage of OPGW cables provides opportunities for transmission companies and telecom players to engage together. Convergence services enable power utility infrastructure, such as transmission towers and substations, to be shared with telecommunications companies, providing reliable connectivity nationwide. For instance, Maharashtra Transmission Communication Infrastructure Ltd (MTCIL), a joint venture between Sterlite Power and Maharashtra State Electricity Transmission Company (MSETCL), has established an OPGW network across Maharashtra. This network supports MSETCL's operations, including voice and data communication, remote monitoring, and asset management, but also offers excess fibre capacity to telecom providers. The network's ring architecture connects major cities, serving over 35 customers, including major telcos and ISPs. Additionally, a dedicated OPGW corridor has been built in Mumbai, home to many major data centers, to provide low-latency connectivity to telecom service providers, enhancing their network performance and supporting the needs of OTT and enterprise customers.

Convergence services also include co-location services, which provide secure and reliable data center facilities with uninterrupted power supply and backup systems. The convergence of power and telecommunications infrastructure has also led to innovative public-private partnerships (PPPs) around the world. For example, governments and private companies are collaborating to develop smart city initiatives, which rely on the integration of power and telecommunications infrastructure to provide efficient and sustainable services to citizens. The growth of the convergence services is expected to be driven by increasing demand for high-speed data connectivity, government initiatives, and technological advancements, which will enable the delivery of high-quality, reliable, and efficient connectivity services to a wider audience. This growth will be further fueled by the rising need for smart city infrastructure and sustainable energy solutions.

Overview of E-beam irradiated cables

Electron beam processing is a technology that has a wide range of commercial, medical, and industrial applications. It modifies materials' properties and improves their performance. The technology is used to sterilize medical devices, and enhance wire and cable insulation. The process is energy-efficient, fast, and doesn't require additives or generate hazardous by-products. Electron beam cross-linking is used to improve wire and cable insulation, and it increases their strength, thermal resistance, and protects them from heat.

Electron beam accelerators are used to generate electrons in the range of 0.1-100 MeV energy range. The technology is widely used in various industries, including plastics, automotive, wire and cable, semiconductors, healthcare, aerospace, and environmental. The electron beam cross-linking of wire insulation and cable jackets is done with electron energies in the range of 500 keV to 1.5 MeV. By crosslinking, polymer chains are linked together by so-called cross links. A three-dimensional polymer network is created where the molecules have been joined together into a new non meltable polymer system. Now, the polymer chains loose some of their ability to move as individual chains. The result is no melting. The

process improves wire and cable properties, including tensile strength, thermal resistance, and flame propagation resistance. It also increases shear and compressive strength of wires and cables.

E-beam cables offer several advantages over chemically cross-linked cables. They have a higher degree of crosslinking, up to 75-80%, compared to 50-55% in chemically cross-linked cables. Additionally, E-beam crosslinking occurs at room temperature, eliminating polymer degradation caused by high temperatures. This process also prevents oxidative degradation, which can occur due to leftover chemicals, oxygen, and operating temperatures.

E-beam cables have a shorter curing time and can withstand higher temperatures, with a rating of 125°C. This results in a longer lifespan, higher ampacity, and protection from thermal overloads. They also exhibit improved abrasion resistance, allowing for reduced wall thicknesses, which can lead to cost savings, energy efficiency, and weight reduction. This is particularly beneficial in transportation systems, where lighter cables can reduce energy consumption.

In the event of a fire, E-beam cables are safer, with no dripping, less flame spreading, and reduced smoke and pollution. They also resist melting, which reduces the risk of short circuits in critical areas like public buildings and transportation systems. Furthermore, E-beam cables are more resistant to mechanical pressure, cutting, and oil and fluid damage, making them a more reliable choice for a wide range of applications. Overall, E-beam cables offer improved performance, safety, and durability compared to traditional chemically cross-linked cables.

Overview of Master System Integrator

A Master System Integrator (MSI) is a comprehensive contractor that assumes full responsibility for complex brown-field grid projects, encompassing survey, design, engineering, procurement, execution, and commissioning on behalf of utilities. By outsourcing the entire project to a single vendor, utilities with limited in-house resources or right-of-way constraints can benefit from a streamlined process, reduced costs, and faster completion times. MSIs specialize in upgrading existing grid infrastructure, minimizing land acquisition, vegetation clearance, and community disruption, which facilitates faster permit approvals. The scope of MSI services typically includes diagnostics and design, advanced reconductoring, tower and foundation works, strengthening aging assets, and digital upgrade.

Typical scope elements include:

- Diagnostics & design – LiDAR surveys, thermal & mechanical studies to identify the cheapest uprating path.
- Advanced reconductoring – Reconductoring with HTLS/ACCC, dynamic line-rating sensors, raising tower tops, or voltage uprating from 110 kV→220 kV—without changing the corridor
- Tower & foundation works – Micro-piles, stiffeners, or height extensions so existing structures carry the new loading.
- Strengthening ageing assets – Replacing insulators, hardware, foundations, or earth-wire with OPGW; adding monopoles, GIS bays, real-time digital controls so the uprated line is safe, reliable and ready for another long term period
- Digital upgrade – OPGW back-bone, PMU/SCADA integration and condition-monitoring to unlock dynamic ratings.

In the power sector, MSIs adapt their expertise to integrate electrical generation, transmission, distribution, and management systems, often referred to as Power System Integrators (PSIs). PSIs combine components like generators, renewable sources, battery energy storage systems (BESS), sensors, controls, and grid infrastructure to create reliable and resilient power networks. This is crucial in addressing grid instability, renewable intermittency, and demand fluctuations, particularly in the transition to low-carbon energy. MSIs/PSIs support smart grid development, renewable integration, and digitalization, aligning with government initiatives like the National Smart Grid Mission (NSGM) and Revamped Distribution Sector Scheme (RDSS).

The role of MSIs in the power sector is multifaceted, involving system design, implementation, and optimization. MSIs conduct system audits, design customized architectures, procure components, install and test integrations, and provide predictive maintenance using artificial intelligence (AI) and analytics. In power-specific contexts, they manage peak load shifting, outage detection, and cybersecurity for critical infrastructure, deploying advanced metering infrastructure (AMI) and distributed energy resources (DERs) to enable bidirectional power flow in smart grids. By leveraging their expertise, MSIs can help utilities and grid operators navigate the complexities of modern grid management, ensuring reliable, efficient, and sustainable energy delivery to meet growing demand.

Key drivers of Master systems integrator in India are:

- **Accelerated Renewable Energy Integration and Energy Storage**: India's ambitious target of 500 GW non-fossil fuel capacity by 2030, surge in standalone Energy Storage Systems (ESS) tenders, and integration of variable renewables with battery energy storage and hybrid systems.
- **Grid Reliability Enhancement**: Electricity demand growth, transmission and distribution losses, and need for modernizing aging grids through smart grid deployments, real-time monitoring, and predictive analytics.
- **Digitalization, AI Adoption, and Industry 4.0 Convergence**: Integration of AI, IoT, and cloud platforms in energy management systems, digital twins, advanced metering infrastructure, and data analytics for optimizing operations and slashing energy costs.
- **Regulatory Mandates and Policy Reforms**: Government initiatives like RDSS, Energy Conservation (Amendment) Act 2022, and customs duties mandating efficient, compliant systems, and driving net-zero transitions via energy efficiency and EV grid integration.
- **Economic Pressures, Investment Inflows, and Supply Chain Resilience**: Cost-effective solutions like energy-as-a-service models, OPEX reductions, investments in renewables, and robust supply chains for components driving MSIs to localize integrations and mitigate global disruptions.

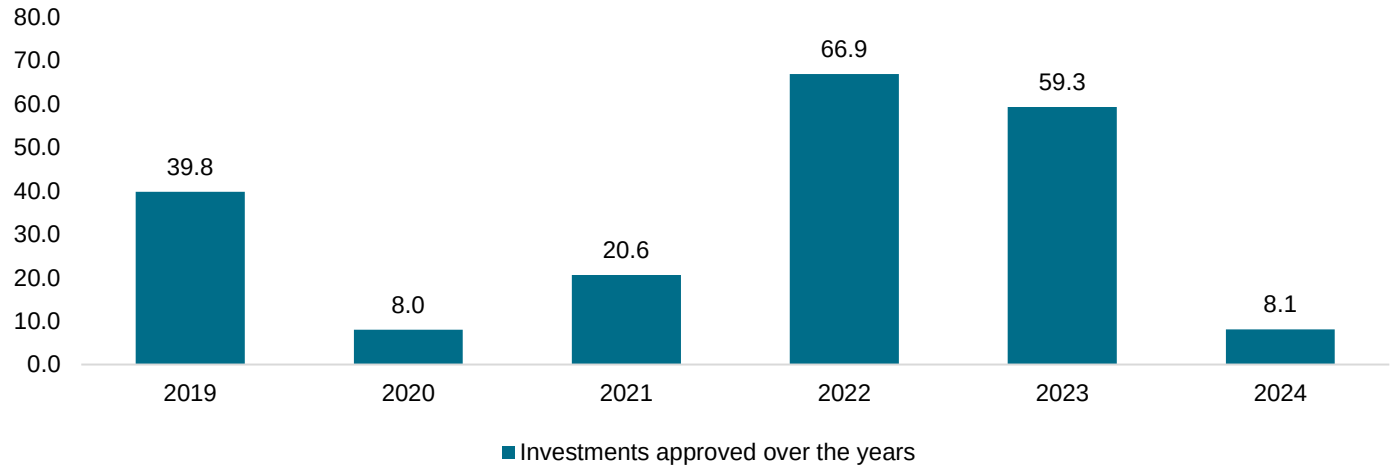
Key growth drivers for the power cables and power conductors industry

Growth in investments from Power Grid Corporation of India Ltd to aid demand of cables and conductors

Power Grid Corporation of India Limited (PGCIL) has approved total cumulative investments of Rs 202.7 billion between CY19-24. These projects comprise of interstate plans, both under GEC and routine system strengthening undertaken by PGCIL. Renewable energy integration efforts account for ~50% of PGCIL investments approved since 2019, while system strengthening continues to remain mainstay of PGCIL tasks, contributing towards 49% of its investments outlay. Consequently, this significant investment outlay is poised to have a positive impact on the demand for conductors and cables, driving growth in the sector.

Major PGCIL investment approvals for CY19-CY24

(Rs billion)



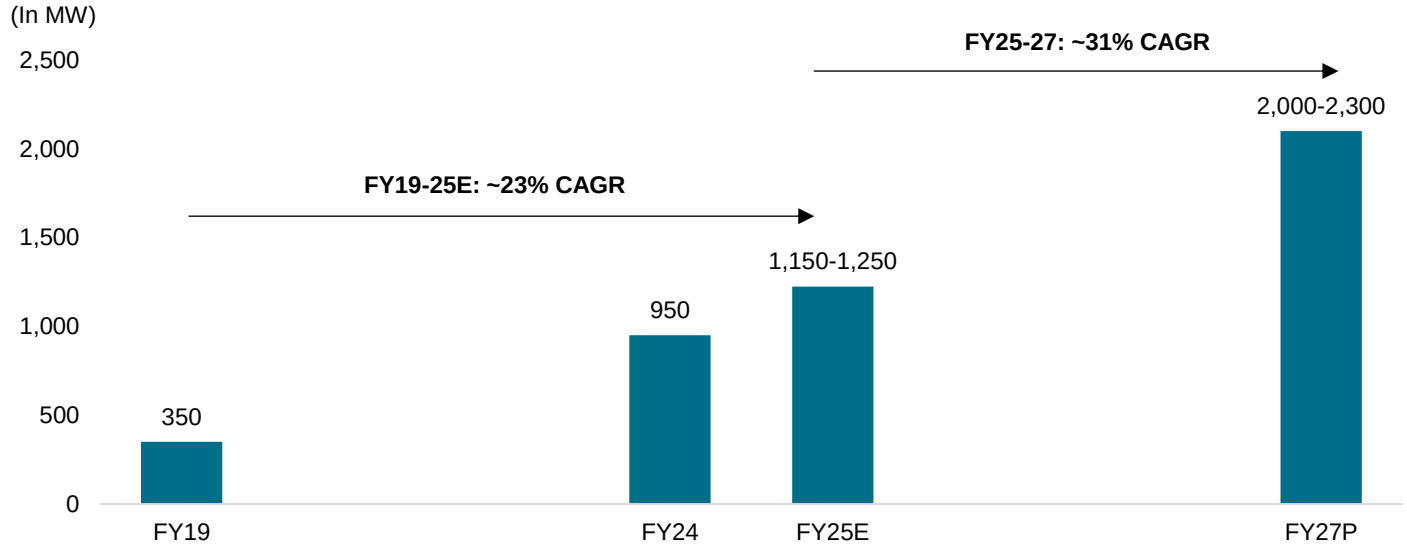
Note:
Source: PGCIL, Crisil Intelligence

Growing Indian data centre industry expected to boost demand of cables and conductors

From fiscal 2019 to fiscal 2025, the Indian data centre industry has seen a growth at CAGR of ~23% in terms of capacity. This growth can be attributed to factors such as growth in internet accessibility, surge in e-commerce adoption, rise in digital adoption, remote working, rise in OTT (over-the-top) consumption, etc.

Going forward, the industry is expected to witness a CAGR of ~30% between fiscal 2024 and 2027, crossing 2 GW in terms of installed capacity. The growth is enabled by increasing consumption of data, 5G rollouts across India as well as advancement in technologies such as IoT, Big data, Artificial intelligence and Machine Learning. This emergence of data centres and cloud computing is expected to present promising opportunities for growth and development within the cable sector.

Data centre industry in India (installed capacity) (FY19-FY27)



Note: P: Projected,
"Capacity" refers to the data centre load that is consumed or is dedicated to IT equipment such as servers, storage equipment, communications switches, routers. Power for lighting or cooling the data centre is excluded from IT power. Further, the capacity mentioned in the above chart pertains to third party data centre only.
Source: Industry, company reports, Crisil Intelligence

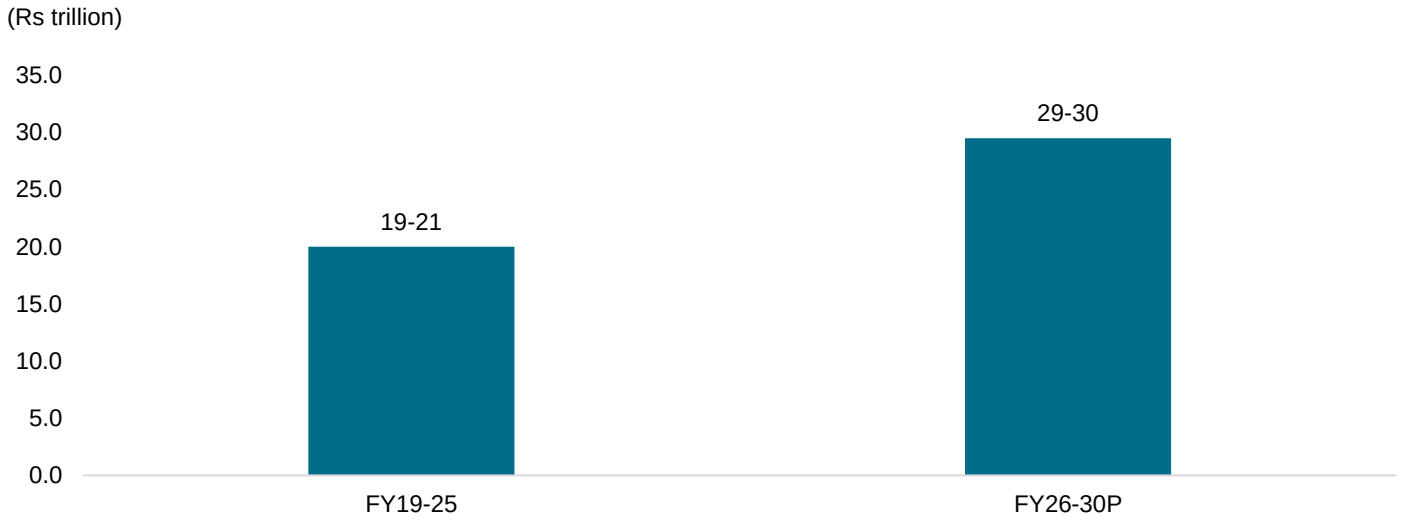
Investments worth Rs 29-30 trillion expected between fiscal 2026-2030 as India aims for 500 GW of RE capacity by 2030

Crisil Intelligence projects investments of Rs 29-30 trillion in the power sector between fiscal 2026-2030. Investments in power generation are expected to increase ~1.7 times from Rs 11.6 trillion between fiscals 2019-2025 to Rs 19-21 trillion between fiscals 2026-2030. Investments in renewable energy (excluding hydro, pumped storage and BESS) generation capacity are expected to account for 70% of these investments over the same period as India seeks to achieve its 500 GW of non-fossil energy capacity announced in COP26.

To achieve the RE generation target, strong transmission infrastructure is needed so as to integrate large scale RE capacities into the grid. This is expected to lead to transmission investments of Rs 4.5-5.5 trillion between fiscals 2026-2030 from ~Rs 3.2 trillion between fiscals 2019-2025 led by upcoming ISTS projects.

Additionally, Crisil Intelligence expects Rs 3.5-4.5 trillion worth of investments in the distribution segment between fiscal 2026-2030 driven by upgradation of distribution infrastructure along with installation of smart meters as India focuses on reduction of its carbon emission.

Overall investments in Indian power sector



Increased renewable energy (RE) capacity addition

The global shift to renewable energy sources, including wind and hydro energy are expected to positively impact the demand on the specialty cables including photovoltaic cables, submersible cables, umbilical cables, that are used in renewable energy systems like solar energy, hydro energy and wind energy.

Renewable capacity is expected to surpass the 360 GW mark in fiscal 2030 on the back of strong renewable capacity additions over fiscals 2026-30. By fiscal 2030, RE capacity is expected to account for 45-50% of the installed capacity of 745-755 GW. Inclusion of hydro and nuclear power in clean energy as compared with coal plants is expected to provide a fillip to non-fossil capacity (RE, nuclear, hydro and storage), taking it to 470-480 GW by fiscal 2030, constituting a staggering 60-65% share in installed capacity.

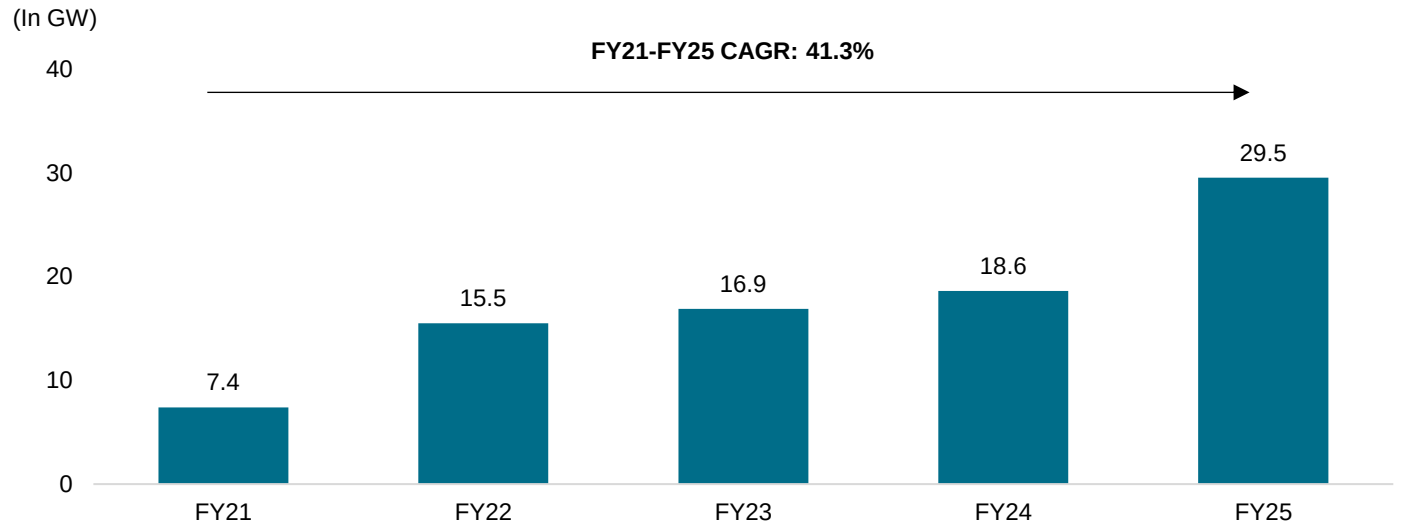
Crisil Intelligence foresees a surge in solar power capacity additions, reaching 140-160 GW from fiscal years 2026 to 2030, significantly surpassing the 78 GW added between fiscal years 2020 and 2025. This growth is primarily spurred by robust government backing, demonstrated through an aggressive tendering strategy. Key catalysts include technological advancements (e.g., floating solar and module efficiency), affordable financing, and supportive policies. However, infrastructural challenges such as land and connectivity availability are impacting project momentum as on date.

Wind power meanwhile is expected to see capacity additions of 25-27 GW over fiscal 2026 to 2030 led by pipeline build-up under existing schemes and new tendering schemes, improvement in technology and mixed resource models.

Additionally, the Government of India has implemented a range of measures and initiatives aimed at promoting and accelerating renewable energy capacity across the nation, with an ambitious target of achieving 500 GW of installed electric capacity from non-fossil sources by 2030. Key programs include the National Green Hydrogen Mission, PM-KUSUM, PM Surya Ghar, and PLI schemes for solar PV modules.

Such multi fold generation expansion plans also require large-scale development in the transmission sector because grid-connected solar and wind plants are usually located in far-flung areas which have limited transmission infrastructure. Extensive transmission and cable infrastructure transmit power from remote generation sites to consumption centres. This in turn is expected to drive the demand of cables and conductors.

Renewable energy capacity additions



Source: Crisil Intelligence

Solar power and wind power accounted for ~90% of the renewable energy sources as of FY25

As of FY25, solar power and wind power dominated the renewable energy sources accounting for close to 90% of the total renewable energy sources capacity with solar power having a capacity of 105,646.49 MW and wind power having a capacity of 50,037.82MW. Small hydro power and bio-power accounted for the remaining ~10% of the renewable energy capacity having capacities of 5,100.55 MW and 11,583 MW respectively.

Breakup of renewable energy sources (As of 31st March 2025) in MW

Small Hydro Power	Wind Power	Capacity		Solar Power^	Total Capacity
		Biomass Power/Cogen	Waste to Energy*		
5,100.55	50,037.82	10,743.11	840.21	105,646.49	172,368.18

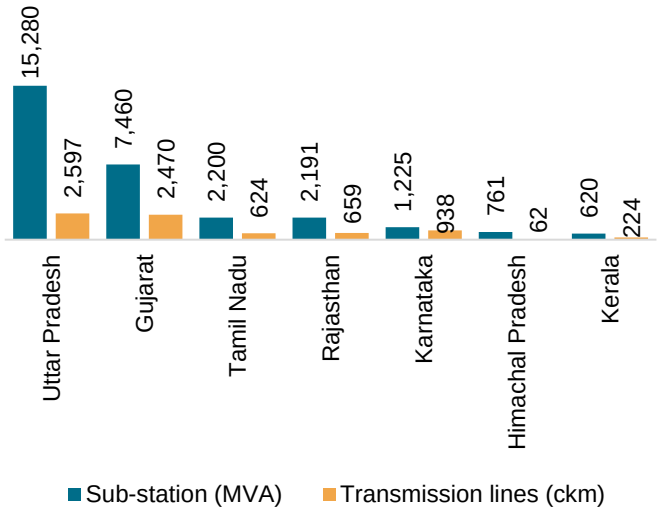
Note:
**Includes Waste to Energy and Waste to Energy (Off-grid)*
^Includes Ground Mounted Solar, Rooftop Solar, Hybrid Solar Comp. and Off-grid Solar/ KUSUM
Source: CEA, Crisil Intelligence

Renewable integration through GEC to lead to growth in the high voltage segments

The Green Energy Corridor (GEC) initiative is poised to be a significant growth driver for the power cables and conductors' industry in India. With a substantial investment of over Rs. 100 billion for the intra-state component and approximately Rs. 113.69 billion for the inter-state component in Phase-I, the project has already demonstrated its potential to boost demand for high-voltage transmission lines. Although the inter-state component was completed in March 2020, the intra-state component still has 632 ckm of transmission lines to be completed as of June 2024. The upcoming Phase-II of the GEC is expected to witness investments of around Rs. 120 billion, with Uttar Pradesh and Gujarat accounting for approximately 70% of the investments. This phase will play a crucial role in providing connectivity for around 19 GW of renewable capacity, thereby driving demand for high-voltage power cables and conductors. Furthermore, the Ministry of New and Renewable Energy (MNRE) will facilitate a credit facility of 33% for State Transmission Utilities (STUs) during the second phase, while the remaining 67% of the project cost can be availed

through loans from KfW, PFC, or REC. This financial support is expected to accelerate the completion of the project, leading to a significant increase in demand for power cables and conductors, and subsequently, driving growth in the industry. Overall, the GEC initiative is a testament to the government's commitment to promoting renewable energy and strengthening the country's power transmission infrastructure, which is expected to have a positive impact on the power cables and conductors' industry in the coming years.

Planned grid augmentation under GEC Phase-2



Source: Ministry of Power, Crisil Intelligence

GEC Phase-2 estimated project cost (Rs. billion)

State	Estimated project cost	Central financial Assistance (CFA)
Gujarat	36.7	12.0
Himachal Pradesh	4.9	1.6
Karnataka	10.4	3.4
Kerala	4.2	1.4
Rajasthan	9.1	2.9
Tamil Nadu	7.2	2.4
Uttar Pradesh	48.5	16.0
Total	**120.9**	**39.7**

Investments in railway sector to aid growth of cables and conductors

100% electrification by fiscal 2026

The Indian Railways' ambitious plan to achieve 100% electrification by fiscal 2026 is a significant growth driver for the cable and conductor industry. With ~99% of the 69,512 km Broad-Gauge network already electrified as of March 31st 2025, the government's allocation of Rs 61.50 billion for electrification projects in fiscal 2025 is expected to boost demand for railway signaling cables, overhead conductors, feeder cables, and other specialized cables. This will also drive the adoption of advanced cable technologies, such as fiber optic cables and high-temperature resistant cables. As the rail network becomes increasingly electrified, the demand for cables and conductors is expected to increase, driven by the need for efficient and reliable conductor systems, including high-speed overhead conductors and advanced pantograph systems.

High speed rail projects

The Government of India has envisaged development of high-speed rail (HSR) corridors and has identified 8 corridors for constructing HSR projects of which the Mumbai Ahmedabad corridor is under construction while DPR preparation of the remaining projects is under preparation.

Mumbai-Ahmedabad High Speed Rail (MAHSR) project passes through high growth rate States of Gujarat and Maharashtra connecting business centres of Mumbai, Surat, Vadodara and Ahmedabad. The sanctioned cost of the MAHSR project is Rs. 1,080.0 billion. As of 9th February 2024, 290.64 km of pier foundation, 267.48 km of pier construction, 150.97 km of Girder Casting and 119.00 km of Girder launching have been completed. As per the Economic survey 2024-25, as of October 2024, it has achieved 47.17% physical progress with an expenditure of Rs 674.86 billion.

As of June 2025, majority of the HSR projects are in DPR stage. As per National Rail Plan total cost across the following HSR projects i.e. Mumbai-Ahmedabad, Delhi-Varanasi, Delhi-Ahmedabad, Mumbai-Nagpur, Mumbai-Hyderabad, Chennai-Bengaluru-Mysore, Delhi-Chandigarh-Amritsar, Varanasi-Kolkata is Rs 11,012 billion.

Metro projects

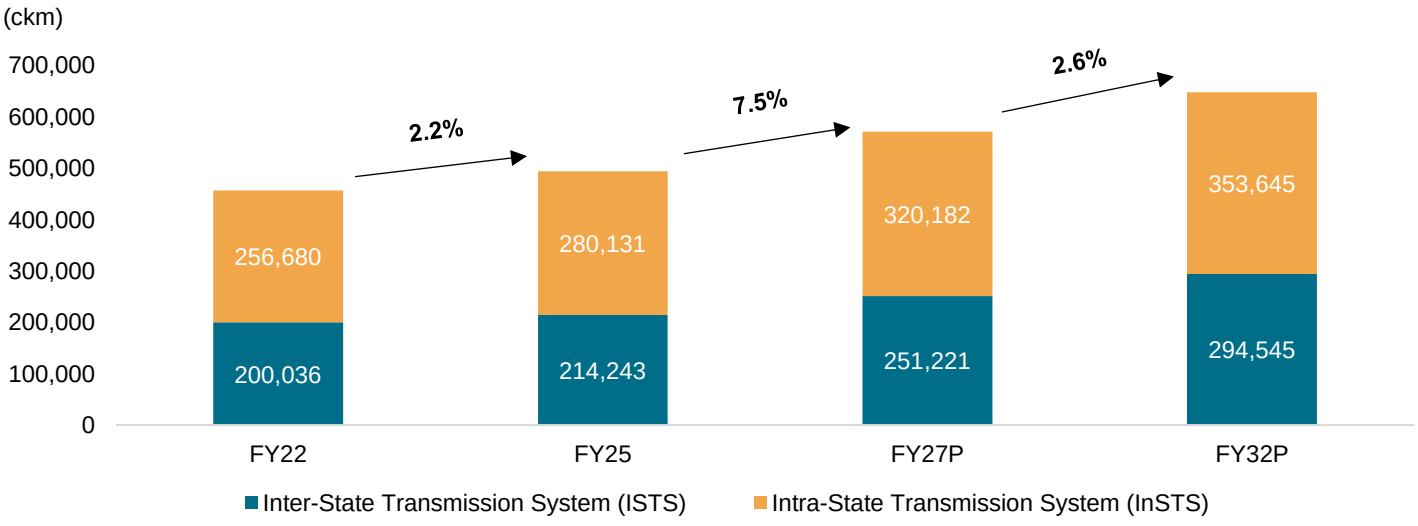
Rising urbanization and population growth in India are driving the demand for efficient railway network in the country. New metro systems are being constructed in order to accommodate the increasing the number of commuters in urban areas and also to reduce the traffic congestion as well as pollution in the urban cities. India's metro rail network has seen significant growth, with 943 km of operational routes across 18 cities as of March 2025. Additionally, 732 km of metro lines are under construction and 1,888 km are proposed. As of June 2025, key metro rail projects accounts for a total cost of nearly Rs 2767.1 billion across Ahmedabad, Chennai, Bhopal, Indore, Delhi, Surat, Kanpur, Agra, and Nagpur.

State transmission line additions up after pandemic

The Central Electricity Authority (CEA) has released the National Electricity Plan (Volume II: Transmission), which outlines the development of the transmission system from 2017-2022 and provides a roadmap for 2022-2027, with a perspective on 2027-2032. The plan is based on projected peak electricity demand and anticipated generation capacity additions. Key highlights include:

- Transmission line capacity is expected to increase by 17.7% to 571,403 circuit kilometers (ckm) by 2027, up from 485,544 ckm in 2024.
- By 2032, transmission line capacity is projected to reach 648,190 ckm.
- Substation capacity is expected to grow to 1,881,780 Mega Volt-Amperes (MVA) by 2027 and further increase by 28% to 2,411,885 MVA by 2032, supporting the expansion of the transmission network.

Total transmission line capacity outlined as per NEP

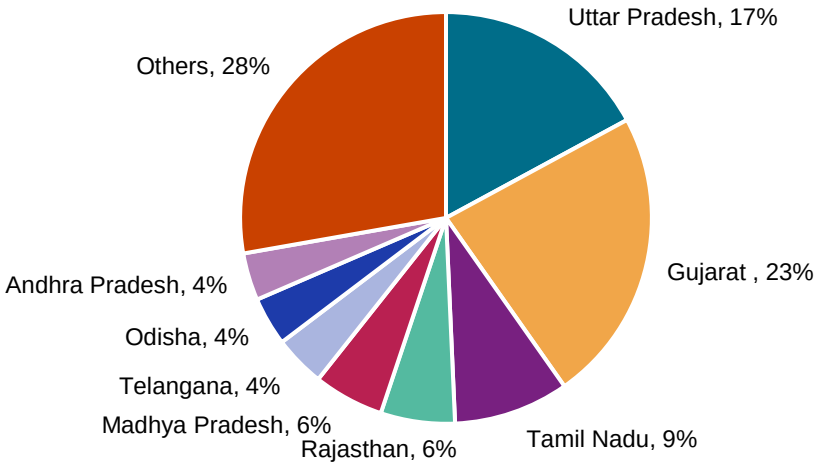


Source: CEA, Crisil Intelligence

To achieve the targeted 500 GW RE capacity by 2030, the central government has proposed an additional 63,502 ckm of transmission lines under intrastate transmission (InSTS) by 2027 on top of the existing 256,680 ckm as of March 2022 leading to a total InSTS line of 320,182 ckm. As of March 2025, India's InSTS line is 279,732 ckm . Central government agencies will issue the tenders for these lines and bidding will be open for government-owned (central and state) and

private players. The top 10 states (by InSTS transmission line additions) are expected to account for ~81% of the transmission line additions by 2027 under InSTS. Gujarat is expected to lead the way with nearly 16% share in expected additions followed by Uttar Pradesh (15%) and Maharashtra (11%).

Share of states in transmission lines addition over fiscals 2022-2027

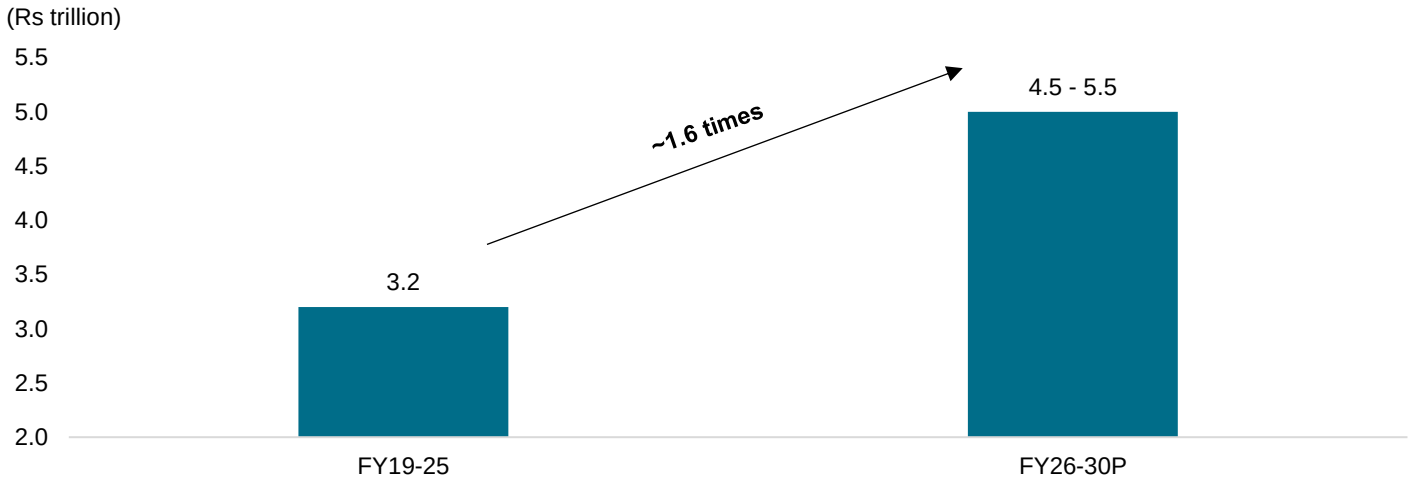


Note: The data pertains to intra-state transmission line additions (ckm)
Source: CEA, Crisil Intelligence

Renewable energy evacuation, ISTS network expansion and upgradation to boost investment in transmission

To service a large generation installed base, the estimated investment in the transmission sector is expected to cumulatively reach Rs 4.5-5.5 trillion over fiscals 2026-2030. Investments in the sector are expected to be driven by the need for a robust and reliable transmission system to support continued generation additions and the strong push to the renewable energy sector as well as rural electrification. Also, strong execution capability coupled with healthy financials of PGCIL will drive investments.

Investments in transmission segment of power sector



Source: Crisil Intelligence

As capacity additions in the country are not evenly distributed geographically, few regions in the country will be in deficit and others in surplus. To cater to this, there will be need to import/export from/to regions. Several inter-regional transmission corridors have been planned, and some of these high-capacity transmission corridors are in various stages of implementation. Newly sanctioned projects under the North-Eastern System Strengthening Scheme and system strengthening schemes focused in the Ladakh region are also expected to augment investments in the transmission segment.

The following schemes in the North-East and Kashmir are partially funded by the centre with multilateral organisations such as World Bank funding the remaining. The estimated cumulative cost funded by multilateral organisations is approximately Rs 194 billion.

- North-Eastern Region Power System Improvement Project for Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura (NERPSIP)
- Comprehensive Scheme of Transmission & Distribution System in Arunachal Pradesh & Sikkim
- Prime Minister Development Package-2015
- Prime Minister's Reconstruction Plan- 2004

Overall, the inter-regional transmission capacity is 118 GW as of October 2024. This number is expected to reach ~143 GW by fiscal 2027 as per the National Electricity Plan (Transmission) as the country looks to plug the gap between power deficit regions and power surplus regions

Transmission system plan until fiscal 2032

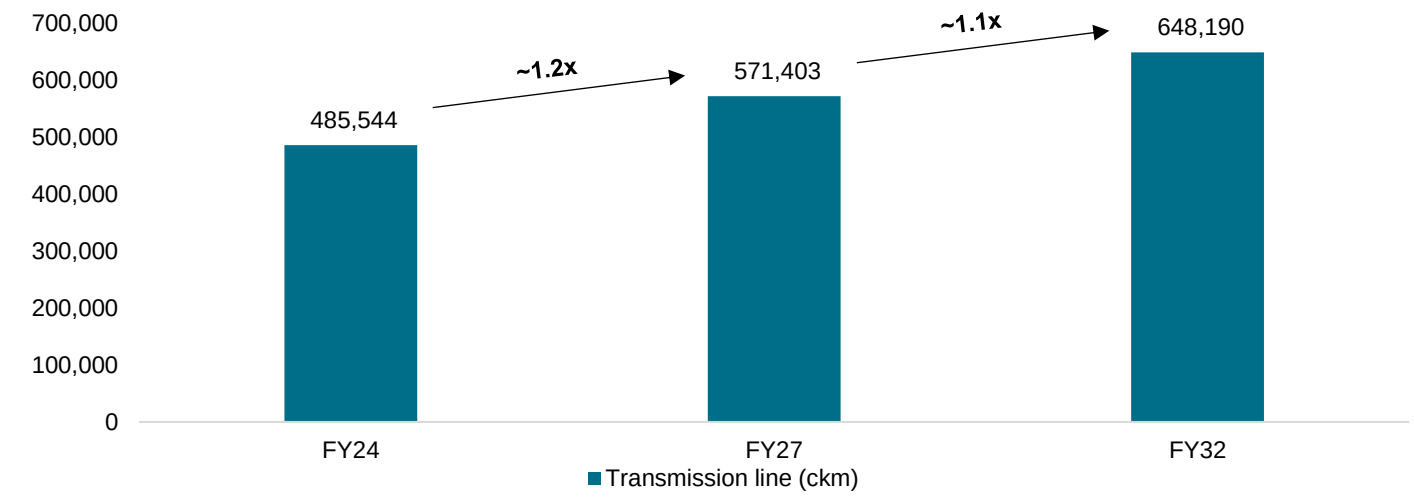
As per Section 3 of the Electricity Act 2003, the CEA must prepare a National Electricity Plan (Transmission) in accordance with the National Electricity Policy and notify it once in five years. The plan would cover transmission and related aspects.

It was estimated that the country would require about 110,281 ckm of transmission lines and about 383,690 MVA of transformation capacity in the substations at 220 kV and above voltage levels for the 13th plan period (fiscals 2017-2022). Against this target, 88,865 ckm of transmission lines and 349,685 MVA of transformation capacity were added during the period.

In October 2024, the CEA released the National Electricity Plan (Volume II: Transmission) covering the review of development of the transmission system during fiscals 2017-2022 and detailing the plan for fiscals 2022-2027. It also provided some perspective for fiscals 2027-2032.

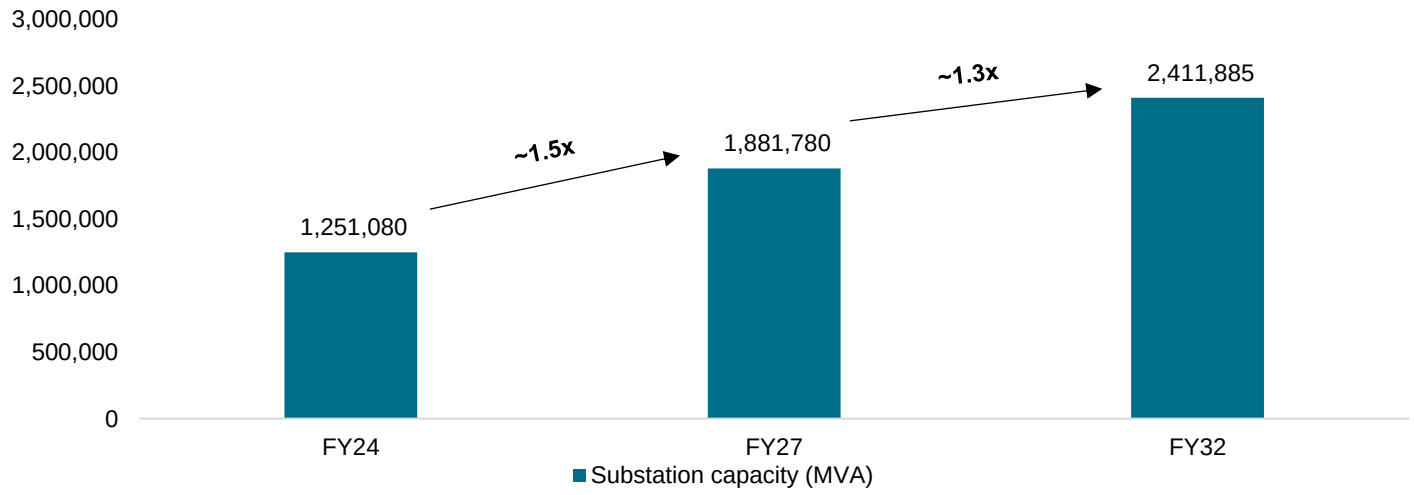
The plans for these periods have been prepared based on peak electricity demand projections and expected generation capacity addition. Based on government transmission line capacity is expected to increase 1.17x and to 571,403 ckm by fiscal 2027 from 485,544 ckm in fiscal 2024. Similarly, transmission line capacity is expected to increase to 648,190 ckm by fiscal 2032. To aid this growth, substation capacity is expected to rise to 1,881,780 MVA by fiscal 2027 and by 1.3x to 2,411,885 MVA by fiscal 2032.

Total transmission line capacity outlined as per National Electricity Plan (NEP)



Source: CEA, Crisil Intelligence

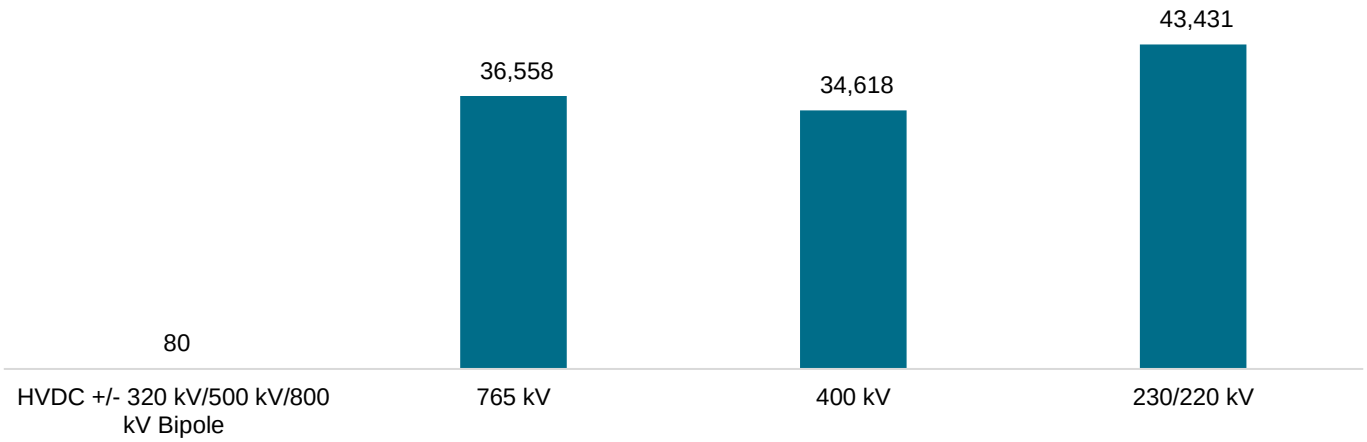
Total transmission substation capacity outlined as per National Electricity Plan (NEP)



Source: CEA, Crisil Intelligence

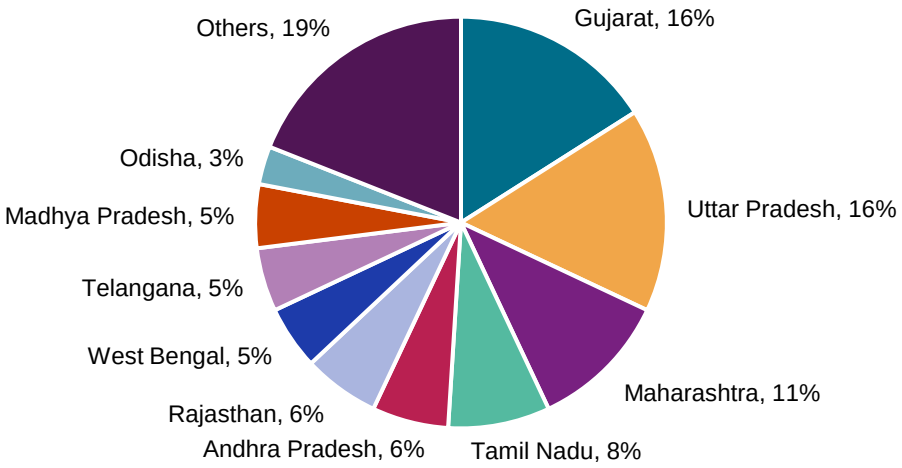
Outlook for voltage-wise line additions over fiscals 2022-2027

(ckm)



Source: CEA, Crisil Intelligence

Share of states with most transmission lines additions over period fiscal 2022-2027

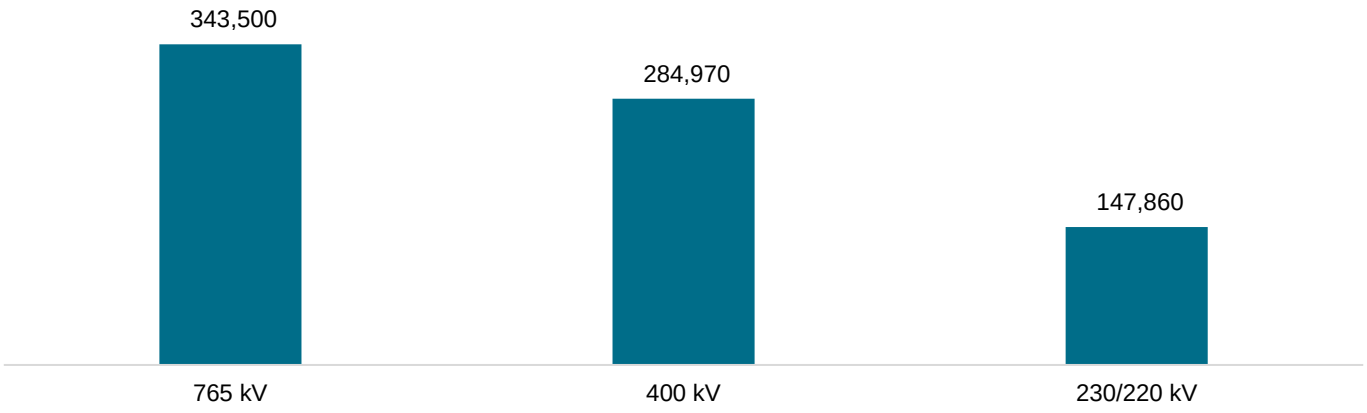


Note: The data pertains to intra-state transmission line additions (ckm)
Source: CEA, Crisil Intelligence

To achieve the targeted 500 GW RE capacity by 2030, the central government has proposed an additional 63,502 ckm of transmission lines under intrastate transmission (InSTS) by 2027 on top of the existing 256,680 ckm as of March 2022 leading to a total InSTS line of 320,182 ckm. As of October 2024, India's InSTS line is 277,316 ckm . Central government agencies will issue the tenders for these lines and bidding will be open for government-owned (central and state) and private players. The top 10 states (by InSTS transmission line additions) are expected to account for ~81% of the transmission line additions by 2027 under InSTS. Gujarat is expected to lead the way with nearly 16% share in expected additions followed by Uttar Pradesh (15%) and Maharashtra (11%).

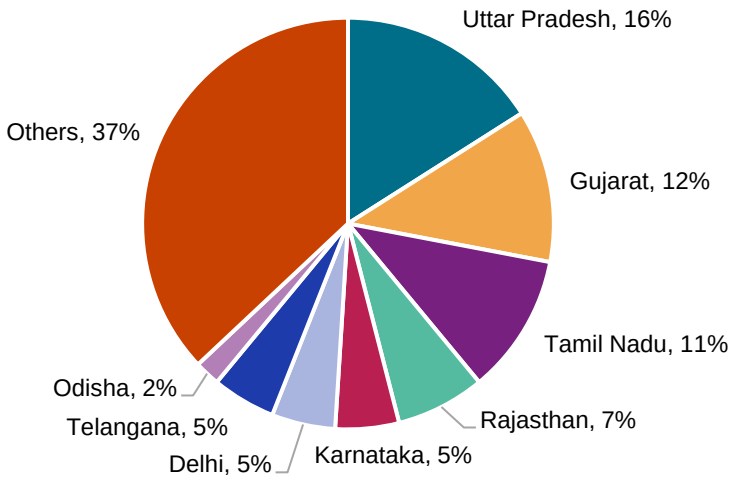
Outlook for voltage wise substation additions over fiscals 2022-2027

(MVA)



Source: CEA, Crisil Intelligence

Share of top states in substation addition over fiscals 2022-2027



Note: This data pertains to intra-state substation additions (MVA)
Source: CEA, Crisil Intelligence

Distribution investments to be aided by Revamped Distribution Sector Scheme (RDSS) and other schemes

State distribution companies (discoms), the major players undertaking investment in the distribution space, have been reeling under severe financial burden for the last few years on account of collection inefficiencies and mounting receivables to power generation companies (gencos). Revenue dipped in fiscal 2021 due to fall in demand from high-paying industrial and commercial consumers on account of reduced economic activity as a fallout of the Covid-19 pandemic.

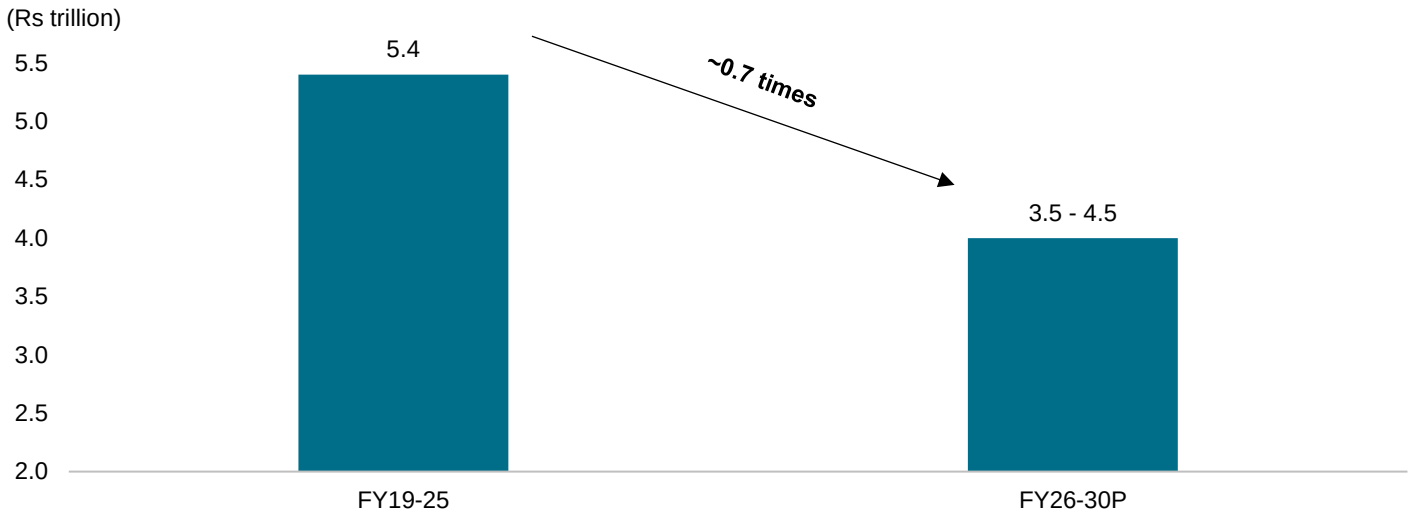
Although the government's relief package providing loans worth Rs 1.35 trillion by Power Finance Corporation (PFC) Ltd / Rural Electrification (REC) Ltd for clearing power generators' dues eased discoms' liquidity problems in the second half of

the fiscal by aiding payments of dues to gencos', the impact was short-lived with dues on the rise again post March 2021. The relief package is also expected to have worsened the debt profile of discoms, forcing them to curb investments over the medium term.

Investments in the segment are likely to gradually pick up fiscal 2026 onwards with central / state government(s) expected to provide the required funding support. The distribution segment is expected to attract investments worth Rs 3.5-4.5 trillion over fiscals 2026 to 2030 vis-à-vis ~Rs 5.4 trillion between fiscal 2019-2025 led by the government's thrust on the Revamped Distribution Sector Scheme, improving access to electricity and providing 24x7 power to all.

Several foreign institutions such as Japan International Cooperation Agency (JICA) and Asian Development Bank (ADB) are also expected to extend credit to the distribution sector. For instance, ADB approved a $48 million loan to finance the expansion and upgrading of the power distribution system in Assam. In December 2020, the ADB approved a loan of $190 million to Bangalore Electricity Supply Company Ltd for modernisation of the power distribution system in Bengaluru city in Karnataka.

Investments in distribution segment of power sector



Source: Crisil Intelligence

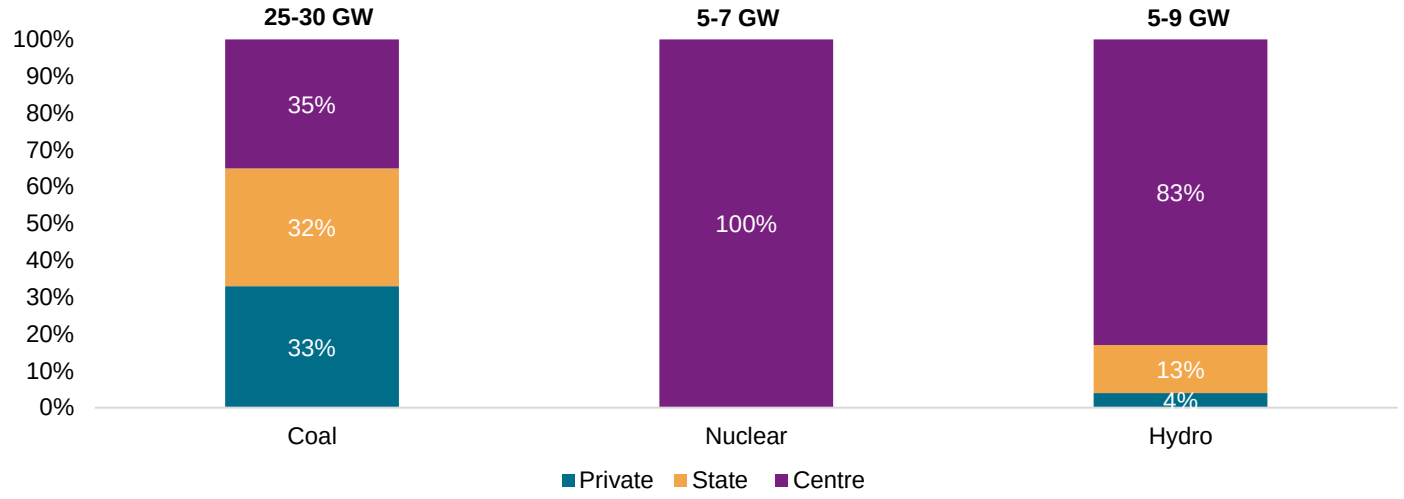
PM-KUSUM scheme: It was launched in 2019 and scaled up in 2024, aims to provide energy and water security to farmers, enhance their income, and reduce environmental pollution. The scheme has three components Farmers can install solar power plants on their land and sell excess power to DISCOMs, stand-alone solar agriculture pumps for irrigation with 30% central financial assistance, solarisation of grid-connected agriculture pumps with 30% central financial assistance.

Pradhan Mantri Sahaj Bijli Har Ghar Yojana – (Saubhagya): The Saubhagya scheme, launched in October 2017, has successfully achieved its objective of providing electricity connections to all un-electrified households in rural areas and poor households in urban areas. As of the end of FY22, all states have reported 100% electrification of willing un-electrified households, identified prior to March 31, 2019. This remarkable achievement is a testament to the scheme's effectiveness, with a total of 29 million households electrified since its inception, as reported by the states.

40-45 GW of capacity additions expected in coal, hydro and nuclear power between fiscal 2026-2030

Additions in fiscal 2025 have been limited to 4.2 GW compared to 7.1 GW in fiscal 2024. Coal capacity remain delayed due to cost and time overruns and lack of intent in some cases. As per Crisil intelligence estimates, additions of 8-9 GW on an average is expected in coal, hydro and nuclear capacities between fiscal 2026-2030.

Sector wise fossil and non-fossil capacity additions from FY26-FY30



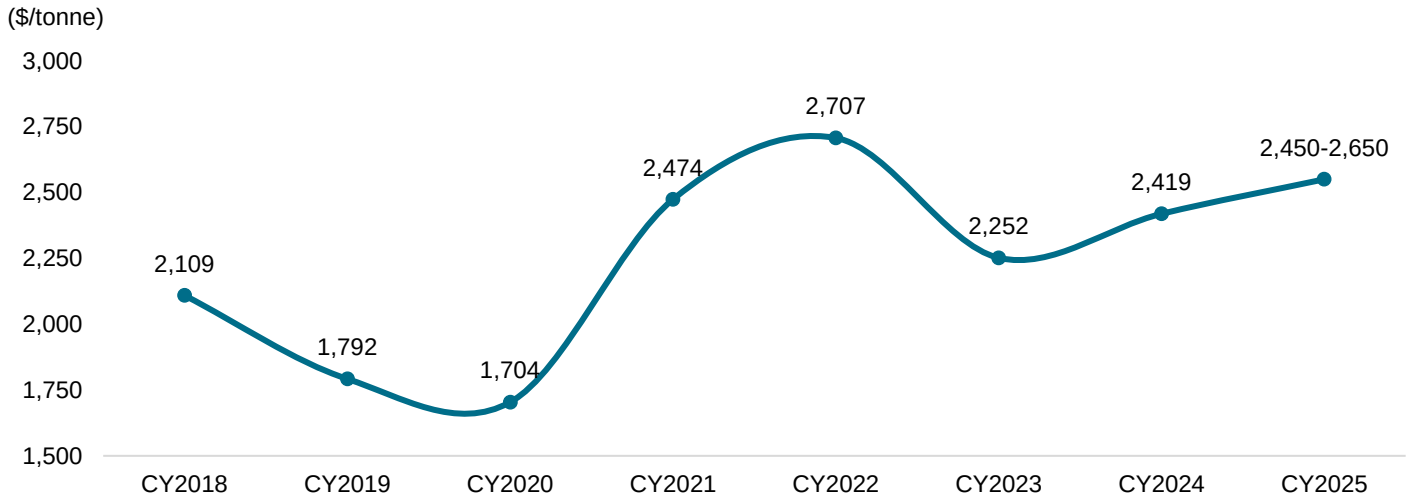
Source: Crisil Intelligence

Key risks and challenges impacting the power cables and conductors industry

Commodity prices volatility

Profitability of players in the power conductor segment majorly relies on the input prices of raw material as well as capacity utilisation levels of their production plants. Power conductor industry has high working capital requirements, given long gestation periods. The industry's profile is further constrained by the raw material price risk and stiff competition. As raw material cost accounts for nearly 70-75% of net sales, effective inventory management remains critical, especially given the prevalent volatility in global commodity prices. In cable industry too, a prevalent challenge lies in the volatility of raw material prices. Particularly the surge in costs for essential materials like copper, zinc, and aluminium. This price increase significantly affects profit margins within the industry. However, in large contracts, which includes transmission and distribution companies in India, the price adjustment clause has been mandated. Hence, executing contracts with price escalation clauses and hedging the cost of key raw materials also protects players from volatility of raw material prices.

Aluminium prices (London metal exchange)



Note: The prices listed above represent the average annual prices for aluminium on the London Metal Exchange (LME) for the respective calendar years.
Source: LME, Crisil Intelligence

Weak financial health of state distribution companies

The distribution sector is controlled by state distribution utilities (SDU) with private participation limited to circles such as Mumbai, Ahmedabad, Surat, Delhi, Agra, and Kolkata. State distribution utilities continue to reel under huge losses due to unprofitable tariff structures, high AT&C losses and inadequate subsidies received from state governments coupled with delays in payments. The sector is marred with financial irregularities due to the nature of the business. Inability to increase power tariffs along with high commercial and technical losses have led to high losses for the discoms.

Keeping up with competition and innovations

The sector is characterized by a diverse pace of innovations in product development, with new technologies and materials emerging rapidly. To stay ahead of the curve, companies must continuously update their technology and manufacturing processes to compete in the market. This requires significant investments in research and development, as well as a commitment to adopting new materials and production methods. Technology, price, design, quality, delivery, and engineering capabilities are the primary elements of competition in the power cables and conductors industry. Some of the new technologies include,

- **E-beam Cables**: Numerous Indian players have setup Electron Beam Accelerator which can produce cables which have superior thermal, chemical, barrier, impact wear and other mechanical properties than cables produced through conventional curing techniques
- **HTLS Conductors**: These conductors are specifically engineered to handle higher operating temperatures with minimal sag and higher current carrying capacity compared to conventional conductors. Conventional conductors tend to sag significantly under high temperatures due to the expansion of materials. This sagging can lead to reduced clearance, posing safety risks and limiting the amount of power that can be transmitted.

There has been increasing demand for high-performance and specialized cables, such as those used in renewable energy and electric vehicle applications. This has created a need for companies to develop new products and solutions that meet these emerging requirements. Additionally, there is a constant pressure to reduce costs, improve efficiency, and

minimize environmental impact adds to the complexity, making it a challenging task for companies to balance innovation with sustainability and profitability.

Supply chain disruptions and geopolitical risks

The cable and conductor manufacturers rely on globally traded commodities. Any external disruptions can have impact on the cost and delivery schedules. Over the past few years, numerous global events have impacted the sector and have highlighted the fragility of these supply chains. Disruptions in the supply of raw materials, such as copper and aluminum, have led to price volatility and shortages, impacting the industry's production and profitability.

Since December 2023 Houthi attacks have squeezed the Red Sea–Suez artery. Major carriers have rerouted round the Cape, reducing global container capacity and adding 10-14 days to India-Europe voyages. This has impacted the freight rates, pushing average lead times. Regional conflict in the middle east has kept the pressure high: Israel–Gaza and Israel-Iran hostilities have lifted war-risk premiums, threatening PVC and XLPE feedstock flows critical to insulation lines.

The Ukraine war led to energy shortages and sanctions. This curtailed European smelter increasing copper cost and driving similar spikes in aluminium. Price volatility erodes thin margins and forces Indian manufacturers to hedge larger volumes and stagger purchases.

Geopolitical tensions, particularly between the US and China, have also affected the industry. Taking the example of copper, India relies on copper imports for ~40% of its copper supply. The same is expected to come down as newly operational domestic capacity reduces dependence. However, more than half of global copper smelting capacity is in China. Any disruptions in such upstream supply can lead to increased sea freight rates and extended lead times across the globe.

Trade policy of US has added fresh layers of uncertainty. Washington’s decision in June 2025 to double tariffs on foreign steel and aluminium imports to 50% impacted futures markets and arbitrage exports of aluminium rods. At the same time, outbound shipments face headwinds after the European Commission slapped anti-dumping duties on Indian optical-fibre cables.

Together, these developments are reshaping sourcing strategies. Cable makers are locking long-term metal off-take with domestic smelters, qualifying alternate polymer suppliers, and rerouting exports via Jawaharlal Nehru Port–Cape of Good Hope loops.

Dependence on government spending

In India the transmission and distribution sector is a three tiered system comprising of distribution networks, state grids and regional grids. While the demand for power conductor arises from transmission networks and generation associated transmission, the demand for power cable mainly arises from the distribution network (low voltage (up to 33 kV) arial bunched cables). The growth of the power conductors segment is mainly dependent on evacuation systems for power generation capacities. Further, demand for power cables and conductors arises from strengthening of transmission infrastructure. The capex across all these segments is driven by the government and any slowdown in the same will impact the demand for cables and conductors.

Key emerging trends and recent development in the power cables and conductors’ industry:

The power cables and conductors industry in India has experienced significant growth and transformation in recent years, driven by rapid urbanization, industrialization, and the government’s push for renewable energy and infrastructure

development. Technological advancements are reshaping the industry, with a notable shift toward high-performance conductors and cables tailored for specific applications. High Temperature Low Sag (HTLS) conductors, such as those using INVAR steel, aluminum-zirconium alloys, and composite cores, are increasingly adopted for their ability to carry higher currents with minimal thermal elongation, optimizing power transfer in constrained right-of-way (RoW) areas. Cross-linked polyethylene (XLPE) cables, known for superior tensile strength, low dielectric loss, and resistance to environmental factors, are replacing older insulation materials like PVC, particularly in high-voltage applications up to 220 kV. Additionally, gas-insulated lines (GILs) and superconducting transmission lines (SCTLs) are emerging as viable alternatives for underground and high-capacity transmission, offering lower resistive losses and enhanced reliability in RoW-constrained urban settings. E-beam cross-linked cables, with their higher temperature resistance and reduced thickness, are gaining traction in specialized sectors like solar, railways, and steel mills.

Emerging trends in the industry reflect a strong focus on sustainability and safety, aligning with global and domestic environmental goals. The rising demand for renewable energy has led to the development of specialized solar and wind power cables designed to withstand extreme temperatures, UV radiation, and harsh weather conditions, ensuring efficient power evacuation from photovoltaic modules and wind turbines. The growth of electric vehicle (EV) infrastructure is another key driver, with low-voltage cables tailored for EV charging stations, including Level 1 (120V AC), Level 2 (240V AC), and DC fast charging (400-900V DC), experiencing increased demand due to India’s push for widespread EV adoption. Additionally, three major undersea cable projects—2Africa Pearls, India-Asia-Express (IAX), and India-Europe-Express (IEX)—announced in 2024, highlight the industry’s role in enhancing digital and power connectivity. The government’s Smart Cities Mission and railway electrification initiatives, such as the Gati Shakti program, further amplify the need for advanced cabling solutions, including Cu-Ag conductors for railways.

Consumer preferences are shifting toward cables with enhanced safety and environmental features, driven by stricter regulations and growing awareness of health and environmental risks. Low-smoke, zero-halogen (LSZH) cables and flame-retardant cables with low fire propagation are increasingly preferred in public infrastructure, commercial buildings, and residential settings due to their ability to minimize harmful emissions during fires. Green cables, compliant with RoHS and REACH standards, are gaining popularity for their lack of heavy metals and carcinogenic compounds, aligning with India’s sustainability goals and the global push for eco-friendly materials. These cables are critical in supporting India’s 500 GW renewable energy target, as they reduce environmental impact while meeting the stringent safety requirements of modern infrastructure projects.

4. Peer benchmarking

In this section, Crisil Intelligence has analysed some key players operating in the power cables, and conductors industry in India. Data has been obtained from publicly available sources, including annual reports and investor presentations of listed players, regulatory filings, rating rationales, and/or company websites and social media pages.

Note: The competitive landscape peers mentioned are not an exhaustive list and is an indicative list. Peers have been selected based on the product and service offerings and comparable revenue range.

Overview of peers considered

Company Name	Year of incorporation	Description
Apar Industries Limited	1989	Apar Industries is a part of the Apar Group, which has presence in the electrical and power sector. Apar Industries Limited is into the production of conductors, transformer oils, polymers, etc. The company caters to various sectors including power transmission, telecommunication, and the automotive industry, etc.
JSK Industries Private Limited	2005	JSK Industries was incorporated in 2005 offers range of aluminium and aluminium alloy rods and conductors, primarily catering to the high voltage power transmission sector.
KEI Industries Limited	1992	KEI Industries is into manufacturing of electrical cables, including high voltage, extra-high voltage, instrumentation, and house wiring cables, etc. The company has presence in multiple industries such as construction, utilities, and infrastructure, etc.
Lumino Industries Limited	2005	Lumino (LIL) was started as a partnership firm in 1989 by Mr Purushottam Dass Goel and was reconstituted as a closely held company in 2005. It manufactures aluminium conductors, power cables, PPC poles and sub-stations components. The company also has an EPC division for laying down transmission and distribution lines and construction of power sub-stations under different government schemes. LIL began installing solar power plants from 2019.
Sterlite Electric Limited	2015	Sterlite Electric Limited is engaged in manufacturing and supplying high-performance power conductors, extra-high voltage (EHV), high voltage (HV) and medium voltage (MV) cables and optical ground wires (OPGW), to over seventy countries. Formerly part of Sterlite Power Transmission Ltd, the company has four manufacturing facilities. The company's manufacturing facilities are located near key raw material sources and transportation hubs. Its Jharsuguda facility, for instance, is situated near aluminium manufacturing sites and has access to Paradip Port, while the Silvassa facility is also located near aluminium manufacturing sites with access to Mumbai Port.
Siechem Technologies Private Limited	1994	STPL was founded in 1994 by Mr. P. Damodaran and his wife, Ms. Padma Damodaran. The company started producing specialty wires and cables in 2002 at its Puducherry facility, which initially had a daily production capacity of 15 MT. Utilizing electron beam irradiation technology for cable curing, STPL expanded its capabilities with the installation of its first e-beam accelerator in 2009, followed by a second one in 2015 to tap into the railway sector. Over time, the company has broadened its customer base beyond the telecom industry to serve various sectors, with railways becoming a significant client segment. To meet growing demands, STPL has increased its production capacity to 45 MT/day by establishing a new unit near its existing plant in Puducherry.
Universal Cables Limited	1945	Universal Cables Limited provides range of products within cables as well as capacitors segment. Its cables and capacitors are known by the brand name “UNISTAR”.

Note: Year of incorporation as per MCA website
Source: Company websites, Crisil Intelligence

Geographical presence (fiscal 2025)

Company Name	Geographic Presence[1]
Apar Industries Limited	National: 28 states + 8 UTs International: 140+ countries
JSK Industries Private Limited*	National: Yes International: N.A.
KEI Industries Limited	National: Pan India International: 60+ Countries
Lumino Industries Limited	National: 30 states & UTs International: 17 countries
Sterlite Electric Limited	National: Pan India International: 70+ Countries
Siechem Technologies Private Limited*	National: Yes International: Yes
Universal Cables Limited	National: Pan India International: 19 countries

Note:
** The information pertains to FY24 as FY25 annual report has not been issued by the company*
N.A.: Not available
[1]Represents markets served by entity as disclosed in annual report by respective companies
Source: Company websites, Crisil Intelligence

Export revenue (FY25)

Company Name	Export revenue share[1] (%)
Apar Industries Limited	25.78%
JSK Industries Private Limited	N.A.
KEI Industries Limited	13.11%
Lumino Industries Limited	4.47%
Sterlite Electric Limited	20.19%
Siechem Technologies Private Limited	N.A.
Universal Cables Limited	8.68%

Note:
N.A.: Not Available
[1] For Apar industries Ltd., KEI Industries Ltd., and Universal Cables Ltd., contribution of exports as a percentage of the total turnover of the entity is considered as export revenue share which is as reported by the company
Source: Annual reports, Company documents, Crisil Intelligence

Revenue segmentation in terms of business activities (FY23-FY25)

Company Name	Details of key business activities/ products and services sold by company (accounting for at least 90% of the turnover)	Revenue contribution** FY23	Revenue contribution** FY24	Revenue contribution** FY25
Apar Industries Limited	1. Manufacturing of AAC/ AAAC/ ACSR Conductors	47%	48%	49%
	2. Manufacturing of Transformer & Speciality Oils	31%	29%	26%
	3. Manufacturing of Power/ Telecom Cable	22%	23%	25%

Company Name	Details of key business activities/ products and services sold by company (accounting for at least 90% of the turnover)	Revenue contribution** FY23	Revenue contribution** FY24	Revenue contribution** FY25
	4. Manufacturing of Polymer	1%	1%	1%
JSK Industries Private Limited	1. Manufacture of basic Metals[1]	100%	100%	N.A.
KEI Industries Limited	1. Manufacturing and selling of Wires and Cables	90%	90%	94%
	2. Manufacturing and selling of Stainless-Steel Wires	4%	3%	2%
	3. Turnkey Projects / Engineering, Procurement and Construction (EPC)* Projects Segment	6%	7%	4%
Lumino industries Limited[3]	1. Supply of Manufactured goods & Others^	94%	22%	30%
	2. EPC Projects & other services	5%***	77%	70%
	3. Other operating revenue^^^	0.35%	0.24%	0.27%
Sterlite Electric Limited[2]	1. Overhead Conductors & OPGW cables	59%	61%	64%
	2. Power Cables	14%	14%	16%
	3. MSI	24%	24%	17%
	4. Others^^	3%	2%	3%
Siechem Technologies Private Limited	N.A.	N.A.	N.A.	N.A.
Universal Cables Limited	1. Manufacturing of power (Electrical) and other Cables, Wires and related turnkey projects	97%	95%	96%
	2. Others@@	3%	5%	4%

Note: N.A.: Not Available

***Revenue contribution is considered as disclosed in the respective company's annual report and have not been reclassified by CRISIL*

@@The company has not provided 100% revenue breakup of key business activities/ products and services sold by company. Therefore, the remaining revenue, has been classified as "Others"

** Excluding Cables*

^For Lumino Industries Ltd., Revenue from EPC Projects & other services includes in-house manufactured goods amounting to Rs. 57,411.97 Lakhs & Rs. 52,826.72 Lakhs for Financial year ended 31st March, 2025 and 31st March, 2024 respectively, which has been reduced from the gross sale of manufactured goods as an inter-unit transaction.

^^^ For Lumino Industries Ltd., Other operating revenues comprises of Government grants, Sale of scrap and job work

**** Supply of services*

[1]As per JSK Industries Pvt Ltd. fiscal 2023 and 2024 annual report, aluminium wire formed 100% of the company's revenue from operation

[2]For Sterlite Power Transmission Ltd., the share has been calculated using revenue breakup BU wise and excludes eliminations

^^ Others comprises of revenue from IRU/ARC contracts, revenue from network infrastructure, revenue from management fees and sale of scrap.

[3]For Lumino Industries Ltd., The segmental revenue contribution for FY23 is including GST of Rs. 1,226.66 million which is deducted from revenue to arrive at revenue from operations

The percentages may not add up to 100% due to rounding off

Source: Company annual reports, filings, Crisil Intelligence

Revenue segmentation in terms of good and services (FY25)

Company Name	Sale of goods/products as % of Operating revenue	Sale of services as % of Operating revenue	Other operating revenue as % of Operating revenue
Apar Industries Limited	99.32%	0.20%	0.48%

Company Name	Sale of goods/products as % of Operating revenue	Sale of services as % of Operating revenue	Other operating revenue as % of Operating revenue
JSK Industries Private Limited	N.A.	N.A.	N.A.
KEI Industries Limited	93.02%	5.66%	1.32%
Lumino Industries Limited	29.76%	69.97%	0.27%
Sterlite Electric Limited[4]	80.03%[1]	16.58%[2]	3.38%[3]
Siechem Technologies Private Limited	N.A.	N.A.	N.A.
Universal Cables Limited	94.11%	4.71%	1.19%

Note:

N.A.: Not Available

[1] Revenue from Overhead conductors & OPGW cables and power cables

[2] Revenue from MSI

[3] Other operating revenue consists of Others as reported by the company

[4] For Sterlite Electric Limited, Revenue segmentation is excluding eliminations

Source: Annual reports, Company documents, Crisil Intelligence

Order Book*

Company Name	Order Book as on 31 March 2023 (Rs. million)	Order Book as on 31 March 2024 (Rs. million)	Order Book as on 31 March 2025 (Rs. million)
Apar Industries Limited	Conductors: 51,240.00 Cables Segment:12,210.00	Conductors: 68,850.00 Cables Segment:14,360.00	Conductors: 71,630.00 Cables Segment:16,900.00
JSK Industries Private Limited	Total: 13,212.00[1]	Total: 17,774.00[2]	Total: 16,029[5]
KEI Industries Limited	Total: 34,123.00	Total: 35,978.00	Total: 34,829.00
Lumino Industries Limited	Total: 22,180.29	Total: 19,405.66	Total: 24,362.69
Sterlite Electric Limited	Overhead conductors & OPGW: 31,740.00 Power Cables: 5,050.00 MSI Services: 9,090.00 Total: 45,880.00	Overhead conductors & OPGW: 46,720.00 Power Cables: 9,710.00 MSI Services: 8,400.00 Total: 64,830.00	Overhead conductors & OPGW: 53,890.00 Power Cables: 15,290.00 MSI Services: 5,310.00 Total: 74,490
Siechem Technologies Private Limited	N.A.	N.A.	N.A.
Universal Cables Limited	Total: 13,800.00[3]	EPC and cables: 13,233.40[4]	EPC and cables: 17,920.00[6]

Note:

N.A.: Not Available

** Please note that in the table, wherever 'total' is not explicitly mentioned, the presented numbers may not represent the complete order book data for companies for the respective years.*

1 Order book value as on 03.12.2022 as per rating rationale dated January 2023

2 Order book value as on 31.12.2023 as per rating rationale dated February 2024
3 Order book as per ratings rationale dated July 2023
4 Order book as per ratings rationale dated July 2024
5 Order book value as on 28.1.2025 as per rating rationale dated March 2025
6 Order book as on 31.3.2025 as per ratings rationale dated July 2025
Source: Annual reports, Crisil Intelligence

Manufacturing facilities and capacity

Company Name	Total Manufacturing Facilities (FY25)	Manufacturing Capacity[3] (FY23)	Manufacturing Capacity[3] (FY24)	Manufacturing Capacity[3] (FY25)
Apar Industries Limited	Cables & Telecom: 2 Conductors: 4 Polymers: 1 Oil & Lubricants: 3 Total: 10	Conductors: 180,000+ MT Alloys / HEC / HTLS: 3,120 KM per month Polymers: 10,000MT	Conductors: 210,000 MT Cables: 6,81,780 KM Alloys / HEC / HTLS: 5,722 KM per month Polymers: 35,000MT per month	Transformer oils[4]: 861,600 KL Conductors[4]: 444,607 MT Cables[4]: 880,176 KM
JSK Industries Private Limited	1[1]	N.A.	Conductors[5]: Multi Strand (upto 61 strand): 48,000 kms, Seven Strand: 1,90,000 kms Wire Rods[2]: EC, Alloy & De-oxi Flipped Coils: 68,400 MT	Conductors[2]: Multi Strand (upto 61 strand): 48,000 kms, Seven Strand: 1,90,000 kms Wire Rods[2]: EC, Alloy & De-oxi Flipped Coils: 68,400 MT
KEI Industries Limited	8	Cables: 125,200 KM House Wires/Winding wires: 1,332,000 KM Communication cable: 28,800 KM Stainless steel: 9,000 MT	Cables: 141,400 KM House Wires/Winding wires: 1,818,400 KM Communication cable: 28,800 KM Stainless steel: 9,000 MT	Cables: 194,900 KM House Wires/Winding wires: 2,375,000 KM Communication cable: 28,800 kms Stainless steel: 9,000 MT
Lumino Industries Limited	1	Cables and Conductors: 35,000 MT	Cables and Conductors: 40,000 MT	Cables and Conductors: 40,000 MT
Sterlite Electric Limited	4	Overhead conductors: 93,574 MT Power cables: 2,400 KM OPGW: 21,000 KM	Overhead conductors: 98,146 MT Power cables: 2,400 KM OPGW: 21,000 KM	Overhead conductors: 1,17,196 MT Power cables: 2,400 KM OPGW: 21,000 KM
Siechem Technologies Private Limited	1	Copper/ Aluminium Wires and Cables: 15 MT per day[7]	Copper/ Aluminium Wires and Cables: 45 MT per day[8]	Copper/ Aluminium Wires and Cables: 45 MT per day[9]
Universal Cables Limited[1]	2	N.A.	XLPE Insulated Medium Voltage Power cables of all types and voltage grades: ~6,000 KM/ annum[6]	N.A.

Note:
N.A.: Not Available
The manufacturing facilities mentioned in the above table may not be exclusively allocated to the manufacturing of the specific product and may be used for the production/ manufacturing of other products as well.
[1]As per disclosure dated March 2024
[2]As per JSK Industries website accessed in August 2025

[3] *Manufacturing capacity details may not be exhaustive as capacity details are not entirely reported by all the peers*
[4] *As per rating rationale dated August 2025*
[5] *As per JSK Industries website accessed in October 2024*
[6] *As per disclosure dated March 2024*
[7] *As per rating rationale dated April 2023*
[8] *As per rating rationale dated June 2024*
[9] *As per rating rationale dated August 2025*
Source: Company websites, Company Annual reports, Crisil Intelligence

Product offerings – Cables & Conductors

Company	Cables			Conductors				
	XLPE	E-Beam	OPGW	ACSR	AAC	AAAC	AL59	High Ampacity
Apar Industries Limited	✓	✓	✓	✓	✓	✓	✓	✓
JSK Industries Private Limited	✓	✓	✓	✓	✓	✓	✓	✓
KEI Industries Limited	✓					✓	✓	
Lumino Industries Limited	✓			✓	✓	✓	✓	✓
Sterlite Electric Limited	✓	✓	✓	✓	✓	✓	✓	✓
Siechem Technologies Private Limited	✓	✓						
Universal Cables Limited	✓	✓						

Note: The above table is only indicative and not an exhaustive representation of the respective company's offerings
Source: Crisil Intelligence

- The large players are differentiated from the smaller players by the depth of the offering they have across products and services in the EPC and power industry. Sterlite Electric Limited is one of the integrated player which has presence across power T&D offering products and services such as overhead conductors, power cables, OPGW and MSI services

Overview of capex incurred/planned

Company	Description
Apar Industries Limited	The company reported Rs 10.88 billion capex incurred at an overall level in last 3 years, as of FY25. In FY25, the company incurred capex of Rs 2.06 billion in conductors segment and Rs 1.87 billion in cables segment
JSK Industries Private Limited	The company does not have any major capital expenditure plans in the near-to-medium term as of March 2025.
KEI Industries Limited	In FY25, the company reported that in FY26 and FY27, they plan to invest Rs 13 billion in Sanand Project. After completion of Sanand Project, the plan is to do capital expenditure Rs 7-8 billion each year for low voltage and medium voltage cables
Lumino Industries Limited	In FY25, the company incurred Rs 390.65 million capex towards manufacturing and Rs 3.98 million towards EPC
Sterlite Electric Limited	During FY26-FY27, the company plans to invest Rs 2.25 billion from its IPO proceeds in capital expenditures, primarily to purchase plant, machinery, and equipment, for the Vadodara power cable plant facility, to increase production capacity and support expansion into new segments such as solar, EV, and data centers.
Siechem Technologies Private Limited	As per August 2025 credit rating rationale, the company is incurring capex towards Unit II extension project
Universal Cables Limited	During FY25, the company incurred capital expenditure aggregating to Rs 1261.32 million, consisting of additions to (a) Plant & Equipment of Rs 894.69 million; (b) Other Fixed Assets

	of Rs 12.62 million; (c) Intangible Assets of Rs 3.55 million; (d) Capital Work-in-Progress of Rs 344.83 million and (e) Intangible Assets Under Development of Rs 5.62 million primarily directed towards capacity expansion

Note: The above table is only indicative and not an exhaustive representation of the respective company's capital expenditure and future plans
Source: Annual reports, Credit ratings reports, Crisil Intelligence

Financial parameters

Revenue from operations

Revenue from Operations (Rs. million)	FY23	FY24	FY25	CAGR (FY23-25)
Apar Industries Limited	143,363.00	161,529.80	185,812.10	13.85%
JSK Industries Private Limited*	19,814.42	18,301.84	N.A.	N.A.
KEI Industries Limited	69,081.74	81,207.28	97,358.77	18.72%
Lumino Industries Limited	7,602.12	14,073.15	19,179.68	58.84%
Sterlite Electric Limited	32,786.46	49,178.94	49,557.60	22.94%
Siechem Technologies Private Limited*	7,419.18	8,511.50	N.A.	N.A.
Universal Cables Limited	22,019.51	20,206.68	24,083.86	4.58%

Note:
N.A.: Not Available
**On standalone basis*
Source: Annual reports, Quarterly reports, Crisil Intelligence

EBITDA

EBITDA (Rs. million)	FY23	FY24	FY25
Apar Industries Limited	12,644.00	16,081.40	16,467.00
JSK Industries Private Limited*	901.76	915.71	N.A.
KEI Industries Limited	7,337.93	8,862.33	10,627.58
Lumino Industries Limited	523.69	1,625.29	2,516.48
Sterlite Electric Limited	4,344.02	5,510.51	5,430.60
Siechem Technologies Private Limited*	1,098.88	1,314.97	N.A.
Universal Cables Limited	2,713.90	2,593.53	2,486.21

Note:
N.A.: Not Available
**On standalone basis*
EBITDA = PAT + Tax expense + Finance expense + Depreciation and amortisation expenses
Please note that EBITDA is inclusive of exceptional items and share of profits/loss in JVs and associates as reported by the companies
Source: Annual reports, Quarterly reports, Crisil Intelligence

PAT

PAT (Rs. million)	FY23	FY24	FY25
Apar Industries Limited	6,377.20[1]	8,251.10[1]	8,213.00[1]
JSK Industries Private Limited*	501.36	396.49	N.A.
KEI Industries Limited	4,773.42	5,807.33	6,964.14

Lumino Industries Limited	193.98	867.53	1,251.28
Sterlite Electric Limited	1,834.43[1]	2,301.27[1]	1,830.30[1]
Siechem Technologies Private Limited*	722.75	807.77	N.A.
Universal Cables Limited	1,181.52	1,082.25	893.85

Note:
N.A.: Not Available
[1] Profit / (loss) for the year from continuing operations
**On standalone basis*
Source: Annual reports, Quarterly reports, Crisil Intelligence

EBITDA Margin

EBITDA Margin (%)	FY23	FY24	FY25
Apar Industries Limited	8.80%	9.91%	8.82%
JSK Industries Private Limited*	4.52%	4.95%	N.A.
KEI Industries Limited	10.57%	10.87%	10.84%
Lumino Industries Limited	6.83%	11.41%	12.93%
Sterlite Electric Limited	13.20%	11.12%	10.87%
Siechem Technologies Private Limited*	14.53%	15.18%	N.A.
Universal Cables Limited	12.23%	12.69%	10.23%

Note:
N.A.: Not Available
**On standalone basis*
EBITDA Margin = EBITDA / Total Income
Source: Annual reports, Quarterly reports, Crisil Intelligence

PAT Margin

PAT Margin (%)	FY23	FY24	FY25
Apar Industries Limited	4.44%	5.08%	4.40%
JSK Industries Private Limited*	2.51%	2.15%	N.A.
KEI Industries Limited	6.88%	7.12%	7.10%
Lumino Industries Limited	2.53%	6.09%	6.43%
Sterlite Electric Limited	5.57%[1]	4.64%[1]	3.66%[1]
Siechem Technologies Private Limited*	9.56%	9.32%	N.A.
Universal Cables Limited	5.32%	5.29%	3.68%

Note:
N.A.: Not Available
**On standalone basis*
PAT Margin = PAT / Total Income
[1] PAT Margin calculated basis Profit / (loss) for the year from continuing operations
Source: Annual reports, Quarterly reports, Crisil Intelligence

Return on Equity (RoE)

RoE (%)	FY23	FY24	FY25
Apar Industries Limited	32.28%	27.00%	19.60%

JSK Industries Private Limited*	13.57%	9.57%	N.A.
KEI Industries Limited	20.21%	20.24%	15.59%
Lumino Industries Limited	5.56%	21.53%	24.61%
Sterlite Electric Limited^	11.44%	16.19%	13.23%
Siechem Technologies Private Limited*	16.25%	15.49%	N.A.
Universal Cables Limited	8.47%	6.62%	5.04%

Note:
N.A.: Not Available
**On standalone basis*
RoE = PAT / Average of Total Equity
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
Source: Annual reports, Quarterly reports, Crisil Intelligence

Return on Capital Employed (RoCE)

RoCE (%)	FY23	FY24	FY25
Apar Industries Limited	46.48%	35.38%	31.13%
JSK Industries Private Limited*	19.28%	17.51%	N.A.
KEI Industries Limited	25.37%	26.78%	17.24%
Lumino Industries Limited	7.11%	17.39%	16.60%
Sterlite Electric Limited^	6.31%	24.72%	28.30%
Siechem Technologies Private Limited*	16.26%	17.09%	N.A.
Universal Cables Limited	10.22%	8.17%	7.45%

Note:
N.A.: Not Available
**On standalone basis*
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
RoCE = PBIT / Capital Employed
PBIT= PAT + Tax expense + Interest expense
Capital employed: Tangible net worth + Total borrowings (Long Term Borrowings + Short Term Borrowings) + Deferred Tax Liabilities (net)
Tangible Networth = Total Equity – Intangible Assets – Intangible assets under development – Right-of-use assets
Source: Annual reports, Quarterly reports, Crisil Intelligence

Fixed Assets

Fixed Assets (Rs. Million)	FY23	FY24	FY25
Apar Industries Limited	14,814.00	18,281.50	22,843.00
JSK Industries Private Limited*	2,100.87	2,291.44	N.A.
KEI Industries Limited	8,615.97	11,213.80	14,109.42
Lumino Industries Limited	631.09	866.40	1,193.25
Sterlite Electric Limited^	7,935.30	8,702.68	10,063.95
Siechem Technologies Private Limited*	1,413.95	2,610.21	N.A.
Universal Cables Limited	2,854.58	3,475.01	4,279.27

Note:
N.A.: Not Available

*On standalone basis
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
Fixed Assets = Gross value of Property, Plant and Equipment + Gross value of Right-of-use assets
Source: Annual reports, Quarterly reports, Crisil Intelligence

Fixed Asset Turnover Ratio

Fixed Asset Turnover Ratio	FY23	FY24	FY25
Apar Industries Limited	10.24	9.76	9.04
JSK Industries Private Limited*	9.66	8.33	N.A.
KEI Industries Limited	8.45	8.19	7.69
Lumino Industries Limited	12.98	18.80	18.62
Sterlite Electric Limited^	4.23	5.91	5.28
Siechem Technologies Private Limited*	5.33	4.23	N.A.
Universal Cables Limited	7.94	6.38	6.21

Note:
N.A.: Not Available
*On standalone basis
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
Fixed Asset turnover ratio = Revenue from operations / Average Gross Block
Gross Block = Gross value of Property, Plant and Equipment + Gross value of Right-of-use
Source: Annual reports, Quarterly reports, Crisil Intelligence

Total Net Worth (Total Equity)

Total Net Worth (Total Equity) (Rs. Million)	FY23	FY24	FY25
Apar Industries Limited	22,363.90	38,764.30	45,035.40
JSK Industries Private Limited*	3,945.82	4,341.62	N.A.
KEI Industries Limited	25,891.66	31,482.64	57,857.50
Lumino Industries Limited	3,594.02	4,463.12	5,704.46
Sterlite Electric Limited^	15,092.77	13,327.80	14,338.70
Siechem Technologies Private Limited*	4,809.58	5,617.35	N.A.
Universal Cables Limited	14,966.09	17,750.49	17,719.91

Note:
N.A.: Not Available
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
*On standalone basis
Source: Annual reports, Quarterly reports, Crisil Intelligence

Total Borrowings

Total Borrowings (Rs. Million)	FY23	FY24	FY25
Apar Industries Limited	3,041.60	4,055.40	4,701.40
JSK Industries Private Limited*	102.32	137.77	N.A.
KEI Industries Limited	1,352.55	1,342.30	1,783.25

Lumino Industries Limited	3,054.27	4,422.70	8,629.86
Sterlite Electric Limited	46,114.47	7,705.27	3,272.21
Siechem Technologies Private Limited*	1,451.81	1,310.71	N.A.
Universal Cables Limited	6,571.58	7,685.02	8,465.77

Note:
N.A.: Not Available
**On standalone basis*
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
Total Borrowings: Long Term Borrowings + Short Term Borrowings
Source: Annual reports, Quarterly reports, Crisil Intelligence

Debt to Equity Ratio

Debt to Equity Ratio	FY23	FY24	FY25
Apar Industries Limited	0.14	0.10	0.10
JSK Industries Private Limited*	0.03	0.03	N.A.
KEI Industries Limited	0.05	0.04	0.03
Lumino Industries Limited	0.85	0.99	1.51
Sterlite Electric Limited^	3.06	0.58	0.23
Siechem Technologies Private Limited*	0.30	0.23	N.A.
Universal Cables Limited	0.44	0.43	0.48

Note:
N.A.: Not Available
**On standalone basis*
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
Debt to Equity Ratio = Total Borrowings / Total Equity
Total Borrowings = Long Term Borrowings + Short Term Borrowings
Source: Annual reports, Quarterly reports, Crisil Intelligence

Operating Working Capital

Operating Working Capital (Rs. Million)	FY23	FY24	FY25
Apar Industries Limited	5,949.20	20,401.30	18,414.10
JSK Industries Private Limited*	1,014.79	2,054.05	N.A.
KEI Industries Limited	17,419.21	18,526.80	27,484.24
Lumino Industries Limited	2,606.85	5,021.13	8,801.21
Sterlite Electric Limited^	1,615.16	3,834.37	(172.88)
Siechem Technologies Private Limited*	3,088.78	3,181.42	N.A.
Universal Cables Limited	8,831.52	10,398.00	9,927.69

Note:
N.A.: Not Available
**On standalone basis*
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
Operating Working Capital = Total Inventories + Total Receivables – Total Payables

Source: Annual reports, Quarterly reports, Crisil Intelligence

Net Working Capital Days

Net Working Capital Days	FY23	FY24	FY25
Apar Industries Limited	(14.01)	3.73	17.23
JSK Industries Private Limited*	12.24	25.93	N.A.
KEI Industries Limited	85.62	74.88	82.65
Lumino Industries Limited	115.76	93.97	130.05
Sterlite Electric Limited^	(67.70)	(15.96)	(15.84)
Siechem Technologies Private Limited*	121.39	138.81	N.A.
Universal Cables Limited	128.14	157.34	142.58

Note:
N.A.: Not Available
**On standalone basis*
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
*Receivables days = Average receivables / Revenue from Operations *365*
*Inventory days = Average inventory / Cost of sales *365*
*Payable days = Average (Payables + Acceptances) / Material costs *365*
Working Capital (in days) = Receivables days – Payables days + Inventory days.
Source: Annual reports, Quarterly reports, Crisil Intelligence

Net Debt or Net cash surplus

Net Debt or Net cash surplus (Rs. Million)	FY23	FY24	FY25
Apar Industries Limited	(2,259.40)	(2,404.90)	(2,908.90)
JSK Industries Private Limited*	(1,349.09)	(788.88)	N.A.
KEI Industries Limited	(4,019.16)	(5,664.03)	(17,369.65)
Lumino Industries Limited	1,280.29	3,098.14	6,357.92
Sterlite Electric Limited^	31,736.17	1,636.04	(8,963.15)
Siechem Technologies Private Limited*	(232.24)	(676.54)	N.A.
Universal Cables Limited	6,534.52	7,634.79	8,384.62

Note:
N.A.: Not Available
**On standalone basis*
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
Negative sign indicates Net cash surplus
Net Debt: Total Borrowings – (Cash and Cash equivalents + Bank Balances other than cash and cash equivalents)
Source: Annual reports, Quarterly reports, Crisil Intelligence

Net Debt to EBITDA

Net Debt to EBITDA	FY23	FY24	FY25
Apar Industries Limited	N.M	N.M.	.N.M
JSK Industries Private Limited*	N.M	N.M.	N.A.
KEI Industries Limited	N.M	N.M	N.M.

Lumino Industries Limited	2.44	1.91	2.53
Sterlite Electric Limited^	7.31	0.30	N.M.
Siechem Technologies Private Limited*	N.M	N.M.	N.A.
Universal Cables Limited	2.41	2.94	3.37

Note:
N.A.: Not Available
**On standalone basis*
^ For Sterlite Electric Limited, Financial information derived from the company's restated statement of assets and liabilities as at March 31, 2023 is not comparable with the corresponding information as at March 31, 2024 and March 31, 2025.
NM: Not Meaningful as Net Debt is negative
Negative sign indicates Net cash surplus
Net Debt: Total Borrowings – (Cash and Cash equivalents + Bank Balances other than cash and cash equivalents)
Net Debt to EBITDA = Net Debt / EBITDA
Source: Annual reports, Quarterly reports, Crisil Intelligence

Key observation

- Sterlite Electric Limited accounts for ~15% market share in the Indian power conductors market, in FY25 in value terms
  - Sterlite Electric Limited accounts for 25-28% market share in High Ampacity and AL59 conductors market, in FY25 in value terms
- Sterlite Electric Limited reported the third highest CAGR in revenue from operations of 22.94% from FY23-FY25 among the considered peers
- Among the considered peers, Sterlite Electric Limited reported the second highest EBITDA margin in FY25 of 10.87%
- Among the peers considered, Sterlite Electric Limited reported the second highest RoCE in FY25 of 28.30%
- Sterlite Electric Limited reported the second highest net cash surplus of Rs. 8,963.15 million in FY25 among the peers considered.

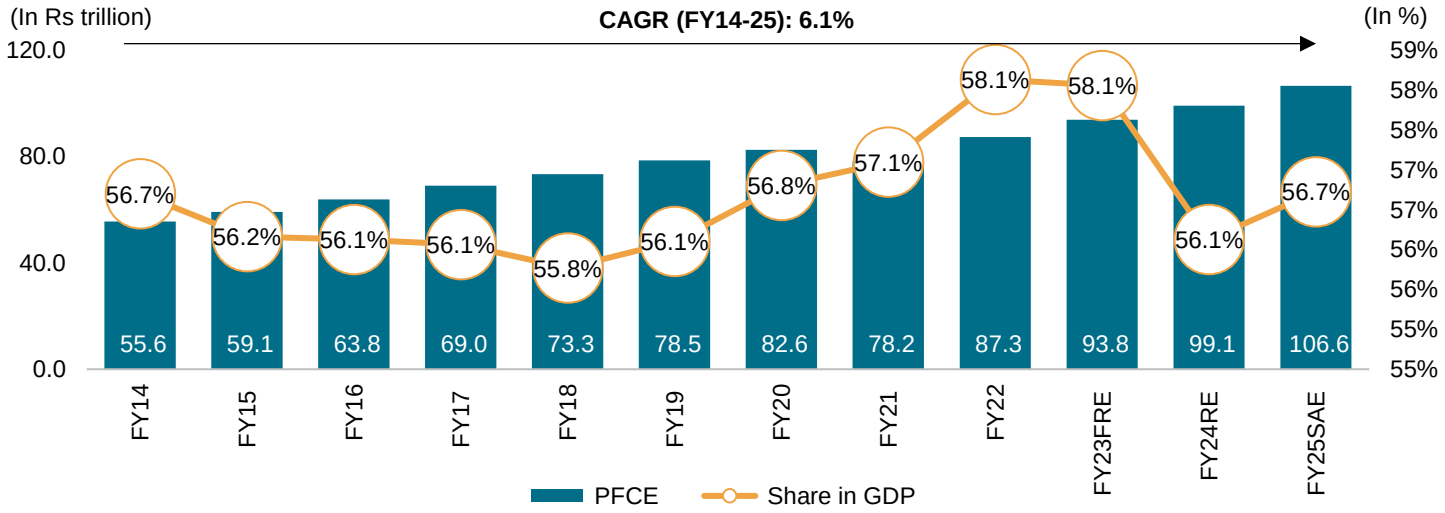
Annexure

PFCE maintains leading share in India’s GDP, reflects sustained domestic demand

PFCE continues to be the largest component of India's GDP with the share of 56.7% in FY25. It recorded a CAGR of 6.1% between F14 and FY25, thereby mirroring the overall GDP growth rate during the same period and was estimated at Rs 106.6 trillion in FY25 compared to Rs 55.6 trillion in FY14.

Growth was led by healthy monsoon, wage revisions due to the implementation of the Seventh Central Pay Commission’s (CPC) recommendations (effective from 1st July 2017), benign interest rates, growing middle age population and low inflation. Furthermore, the tax benefits announced in the Union Budget 2025-2026 are also expected to positively boost the PFCE. As of FY25, PFCE is estimated to have increased to Rs. 106.6 trillion, registering a y-o-y growth of 7.6% and forming ~56.7% of India’s GDP. Overall, PFCE has consistently led India’s GDP growth from the demand side, underscoring sustained domestic consumption.

PFCE (at constant prices)



Note: FE: Final Estimates; FRE: First Revised Estimates; SAE: Second Advance Estimates
Source: Second Advance Estimates of Annual GDP for 2024-25, MoSPI, Crisil Intelligence

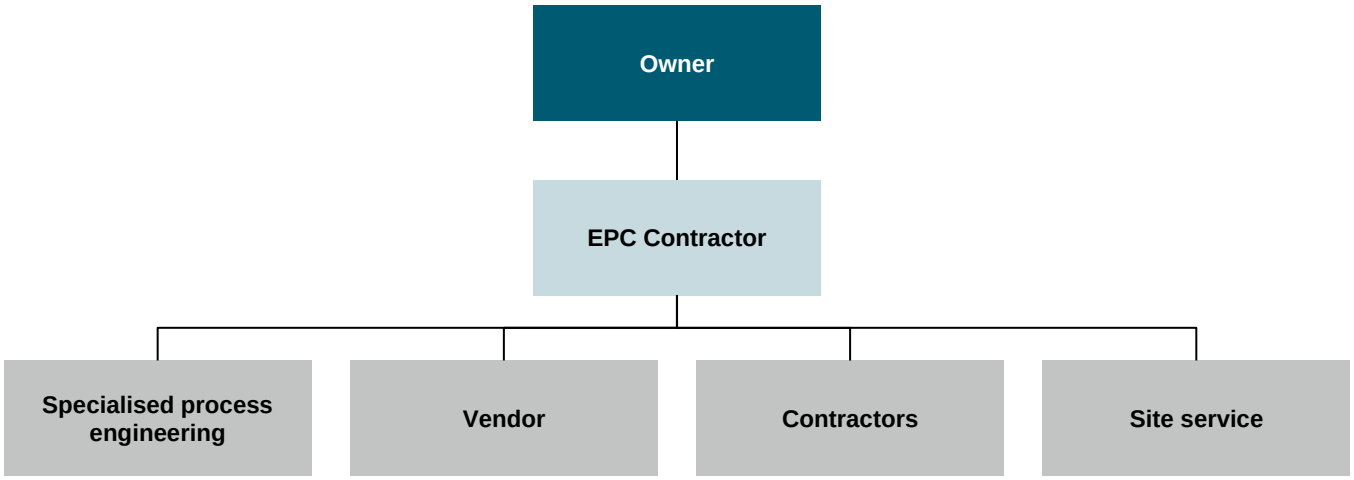
Assessment of construction investments in power sector in India with focus on transmission

Overview of power EPC in India

Over the years, the infrastructure business has seen various contracting methods evolve. Traditional contracting models have been replaced by new approaches as projects have grown more complex. Gradually, the responsibility for project management has moved from the owner or developer to the contractor.

This shift is evident in the move from owner-managed projects to Engineering, Procurement, and Construction (EPC) contracts. In EPC contracts, the contractor assumes the risks of time and cost overruns, along with the responsibilities for

design, material procurement, and construction. These contracts also shield the owner/developer from currency and interest rate fluctuations. Unlike other contracts where procurement and design are separate processes, EPC contracts integrate them, reducing the overall project duration. Contract which requires heavy financial and technically requirement generally divided into smaller EPC projects.



A typical EPC project covers design, civil works, equipment purchase installation, and commissioning. However, the scope of an EPC work has been evolved over the years and now may also include O&M (Operation and Management) services. Most of the EPC players provide integrated and customised solutions as per the client requirements through a consultative approach. The overall project works are classified as supply (material) contracts and services contracts. In a comprehensive package, most of the EPC providers offer 3-5 years of O&M services after commissioning of the project and after expiry of the services, the developer executes a separate long-term O&M agreement with a dedicated O&M service provider.

Overview of key client types in Indian power EPC industry

In the Indian Engineering, Procurement, and Construction (EPC) industry, clients can be broadly categorized based on their sector and specific requirements. Here are some key client types:

Public Sector Institutions

These include government bodies and public sector undertakings (PSUs) involved in large-scale infrastructure projects.

- **Ministries and Government Departments**: Ministry of power, State electricity boards and ministries, Central Transmission Utility of India Ltd, National Load Despatch Center, etc.
- **Public Sector Undertakings (PSUs)**: Organizations like Power Grid Corporation of India, National Thermal Power Corporation, National Hydroelectric Power Corporation, Satluj Jal Vidyut Nigam, Northeast Electric Power Company, etc.

Private Sector Clients

EPC industry also involves significant participation from private companies across different sectors. In the areas of generation, transmission, and distribution, numerous private companies subcontract specific segments to other EPC companies.

Notably, most inter-state transmission projects are awarded through a tariff-based competitive bidding model, which operates on a build-own-operate basis. As a result, companies that win these projects often subcontract certain components to other EPC companies.

Key categories of works undertaken in EPC segment

Mechanical, instrumentation, civil, electrical, operations & maintenance (O&M) and annual maintenance contracts (AMCs) are the key type of EPC works undertaken in the Indian power industry

Mechanical works / erection works is the most critical component when building a power plant due to its high complexity, necessitating involvement of highly specialised suppliers/contractors of power generation, material handling and instrumentation equipment. In terms of civil works, construction requires high design prowess and construction capability due to installation of specialized equipment. Instrumentation and electrical works are of medium complexity level, with equipment and power plant operations conforming to uniform industry standards. Environmental clearance is a must for all the projects. As per interactions with industry stakeholders, EPC contracting is the preferred route for power plants due to standardized process of power plant construction. EPC players typically subcontract different packages of civil, mechanical, instrumentation and electrical works, with specialized suppliers / vendors being awarded contracts for supply of equipment's such as boilers, turbines and generators (BTG), heaters and cooling systems.

Below is the overview of types of EPC works that are undertaken in the power sector. It majorly includes Erection, Testing and Commissioning (ETC) power plants, with complete boilers, turbines and generators (ETC-BTG) and balance of plant (BOP) works, for various sizes and scale. It also includes integrated construction services to power plants, which include responsibly sourced gas (RSG) reactors, waste heat recovery boilers (WHRB), circulating fluidized bed combustion (CFBC) boilers, steam turbine generators, steam generators including auxiliaries, electrostatic precipitators (ESPs), hydro turbines and BOP packages, including structural steel works, ash handling, coal handling, fuel oil systems, selective catalytic reduction (SCR) & flue gas desulphurization (FGD), high-pressure piping works

Overview of EPC works across generation, transmission and distribution in the power sector

Civil (15-20%)*	Mechanical/Erection works (50-55%)*	Instrumentation (10-15%)*	Electrical (10-15%)*	O&M and AMCs (8-12%)*	Miscellaneous (~5%)*
• Includes Buildings, chimney, cooling tanks, land development, roads & boundary walls, erection and fabrication, substations, foundation for different machinery and material handling, etc.	• Erection, testing and commissioning including Various complex and heavy engineering equipment - Turbine-generator and boilers, heaters, cooling system, condensing system, SCR and FGD, substations etc.	• Instrumentation and process control requirement is high in case of power sector and various equipment involves: Distributed digital control monitoring, PLC based control, Control system of boiler, turbine & balance of plant etc.	• Electrical systems such as auxiliary transformers, generators, panels, electrostatic precipitators, switchgears and cabling, transmission lines, transmission towers, substations, electrification and distribution etc.	• Operation and maintenance of power plants • Electrical network maintenance • O&M contracts of exports	• Other components such as procuring licenses, contingencies, pre-operative expenses, other development costs, etc

*Note: *Figures in brackets indicate estimated break-up of total project cost across various verticals shown above (civil, mechanical, instrumentation, electrical, O&M and miscellaneous)*
Source: Crisil Intelligence

Mode of construction in the power EPC segment

Nations, majorly developing ones, have been investing heavily on large infrastructure projects through public as well as private investments. To ensure efficient and timely construction, it is imperative to have an effective model which ensures timely project execution, minimise construction delays and improve transparency. The EPC model is primarily used in construction.

Type	Description
Turnkey projects	Under turnkey project structure, the contractor holds full responsibility of design and execution of the works, including EPC. Therefore, the contractor makes the facility ready to be used at the turn of a key. The project must be delivered at a pre-determined time and pre-determined cost and the contractor must adhere to project specifications. In case of deviations, the contractor is liable to pay monetary compensation.
Balance of plant	In case of balance of plant (BoP) structure, the entire project is broken into multiple packages with a major chunk contracted through EPC route and the rest through BoP. For coal based thermal plants, main plant equipment BTG (Boiler-Turbine-Generator) can be sourced singularly and BoP comprising of all Mechanical, Electrical, Instrumentation & Control systems and equipment as well as entire civil works along with system engineering and plant interfacing can be procured from various manufacturers.

Source: Crisil Intelligence

Overview of transmission sector and EPC offerings in this segment

The transmission system in the country is comprised of two main components: the Inter-State Transmission System (ISTS) and the Intra-State Transmission System (InSTS).

The development of ISTS projects is undertaken through a tariff-based competitive bidding process, utilizing e-reverse bidding for transmission services. This process is guided by the Ministry of Power's guidelines under Section 63 of the Electricity Act, 2003. The selected developers are awarded projects on a Build, Own, Operate, and Transfer (BOOT) basis.

The InSTS is primarily owned and operated by State Transmission Utilities (STU) within each state. The InSTS plays a crucial role in serving the transmission needs within the state, including evacuating power from the state's generating stations, both public and private sector, to beneficiaries within the state. Furthermore, it is responsible for transmitting power within the state from the ISTS boundary to various substations in the state grid network and ultimately delivering power to load centers within the state. The contract period for intra-state transmission projects typically ranges from 35 years or as determined by the Long-Term Transmission Customers (LTTCs) or the Board of Power Commissioners (BPC), in accordance with the relevant regulations of the Appropriate Commission.

EPC Services in Transmission Sector

EPC Services in Transmission Sector play a vital role in supporting both new under construction projects and old projects under repair and maintenance (R&M) with Transmission service providers (state power authorities, PSUs, and private companies).

In new projects, EPC companies provide specialized services to transmission service providers (TSPs), which can be state authorities, PSUs, or private companies that have won projects. The partnership model between TSPs and EPC companies is typically based on a subcontracting arrangement, where the EPC company is responsible for delivering a specific scope of work.

EPC companies offer a range of specialized services, including transmission line survey and routing, tower design and fabrication, and substation design and construction. They also provide services related to the installation or supply of

transmission equipment, such as transformers, circuit breakers, and switchgear, as well as testing and commissioning of the transmission system. These services can be provided on a turnkey basis, where the EPC contractor is responsible for delivering the entire project from conception to completion. This allows TSPs to leverage the expertise and experience of EPC companies, ensuring that projects are completed to the required quality standards.

In addition to supporting new projects, EPC companies also play a critical role in repair and maintenance (R&M) contracts. The scope of R&M contracts involves upgradation and modernization of existing transmission infrastructure to improve efficiency and capacity. This includes uprating existing transmission lines, upgrading of substations and transmission equipment, replacement of aging infrastructure with new, high-performance equipment, and expansion of transmission capacity through the addition of new transmission lines or substations. R&M contracts are typically awarded on a competitive basis, with EPC companies bidding for the work based on their technical expertise, experience, and pricing.

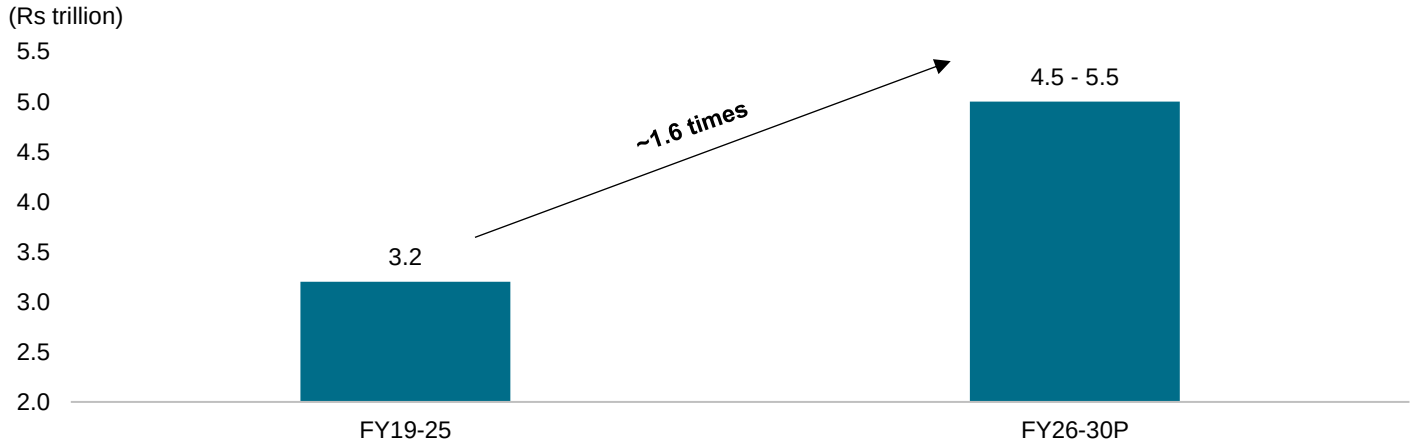
By partnering with EPC companies, TSPs can benefit from reduced risks, improved efficiency, and cost savings. The EPC companies bring specialized expertise and experience to the project, ensuring that it is completed to the required quality standards. Furthermore, EPC companies can provide innovative solutions and technologies, such as advanced materials and construction techniques, to improve the efficiency and reliability of the transmission system. This collaboration enables TSPs to leverage the strengths of EPC companies, ultimately leading to successful project outcomes. The partnership between TSPs and EPC companies is crucial for the successful delivery and maintenance of transmission projects, and by working together, the industry can achieve improved efficiency, reliability, and sustainability.

Overview of investments in power transmission sector across segments

Renewable energy evacuation, ISTS network expansion and upgradation to boost investment in transmission

To service a large generation installed base, the estimated investment in the transmission sector is expected to cumulatively reach Rs 4.5-5.5 trillion over fiscals 2026-2030. Investments in the sector are expected to be driven by the need for a robust and reliable transmission system to support continued generation additions and the strong push to the renewable energy sector as well as rural electrification. Also, strong execution capability coupled with healthy financials of PGCIL will drive investments.

Investments in transmission segment of power sector



Source: Crisil Intelligence

As capacity additions in the country are not evenly distributed geographically, few regions in the country will be in deficit and others in surplus. To cater to this, there will be need to import/export from/to regions. Several inter-regional transmission corridors have been planned, and some of these high-capacity transmission corridors are in various stages of implementation. Newly sanctioned projects under the North-Eastern System Strengthening Scheme and system strengthening schemes focused in the Ladakh region are also expected to augment investments in the transmission segment.

The following schemes in the North-East and Kashmir are partially funded by the centre with multilateral organisations such as World Bank funding the remaining. The estimated cumulative cost funded by multilateral organisations is approximately Rs 194 billion.

- North-Eastern Region Power System Improvement Project for Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura (NERPSIP)
- Comprehensive Scheme of Transmission & Distribution System in Arunachal Pradesh & Sikkim
- Prime Minister Development Package-2015
- Prime Minister's Reconstruction Plan- 2004

Overall, the inter-regional transmission capacity is 118 GW as of October 2024. This number is expected to reach ~143 GW by fiscal 2027 as per the National Electricity Plan (Transmission) as the country looks to plug the gap between power deficit regions and power surplus regions

Transmission system plan until fiscal 2032

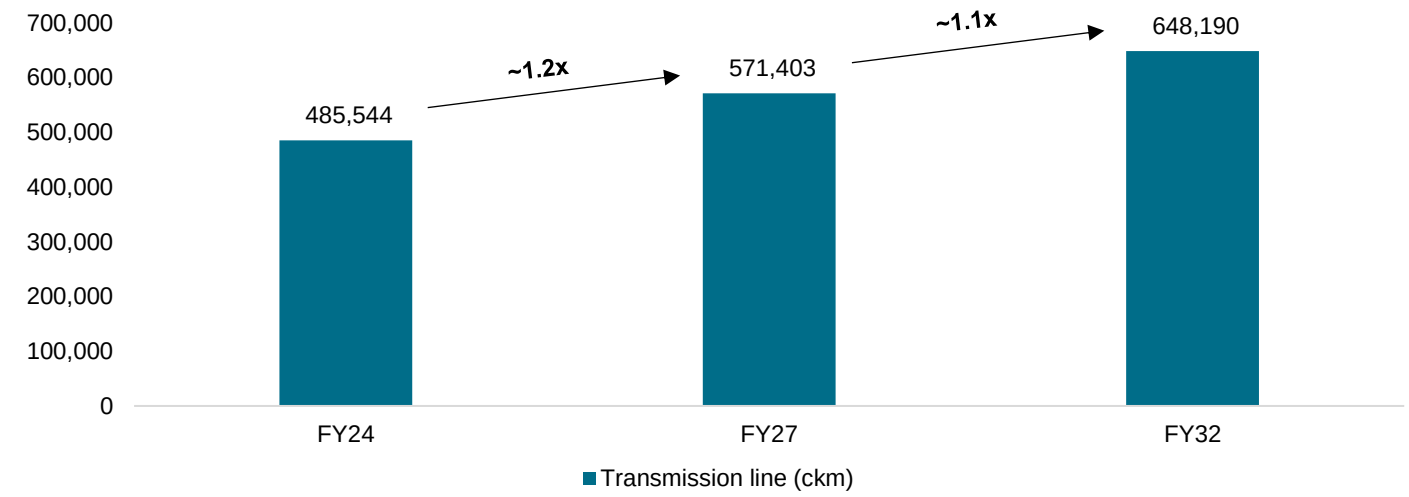
As per Section 3 of the Electricity Act 2003, the CEA must prepare a National Electricity Plan (Transmission) in accordance with the National Electricity Policy and notify it once in five years. The plan would cover transmission and related aspects.

It was estimated that the country would require about 110,281 ckm of transmission lines and about 383,690 MVA of transformation capacity in the substations at 220 kV and above voltage levels for the 13th plan period (fiscals 2017-2022). Against this target, 88,865 ckm of transmission lines and 349,685 MVA of transformation capacity were added during the period.

In October 2024, the CEA released the National Electricity Plan (Volume II: Transmission) covering the review of development of the transmission system during fiscals 2017-2022 and detailing the plan for fiscals 2022-2027. It also provided some perspective for fiscals 2027-2032.

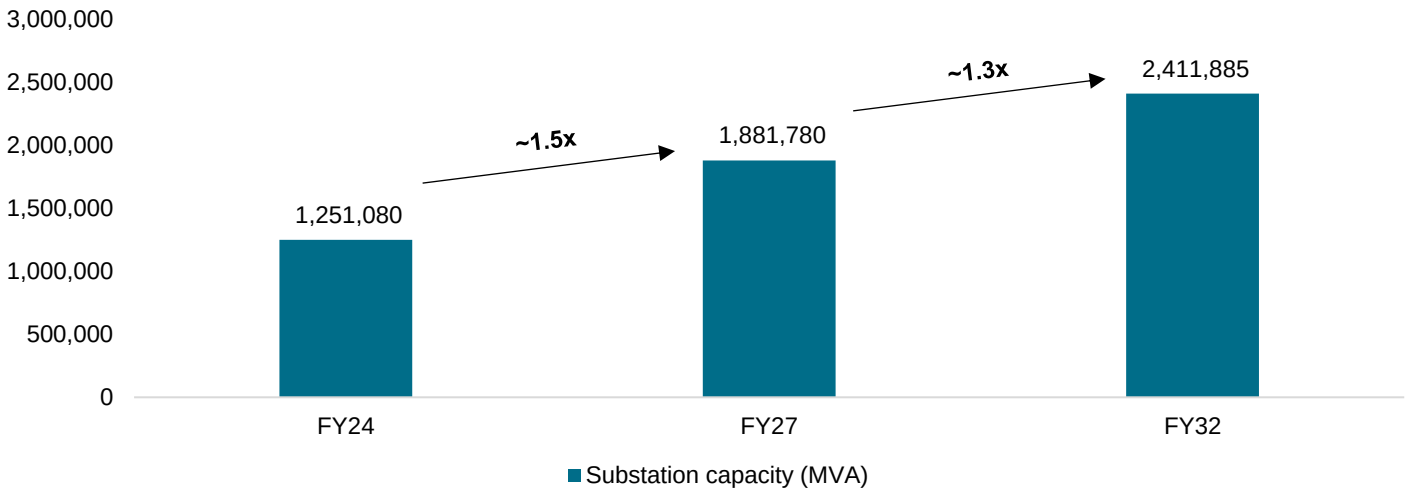
The plans for these periods have been prepared based on peak electricity demand projections and expected generation capacity addition. Based on government transmission line capacity is expected to increase 1.17x and to 571,403 ckm by fiscal 2027 from 485,544 ckm in fiscal 2024. Similarly, transmission line capacity is expected to increase to 648,190 ckm by fiscal 2032. To aid this growth, substation capacity is expected to rise to 1,881,780 MVA by fiscal 2027 and by 1.3x to 2,411,885 MVA by fiscal 2032.

Total transmission line capacity outlined as per National Electricity Plan (NEP)



Source: CEA, Crisil Intelligence

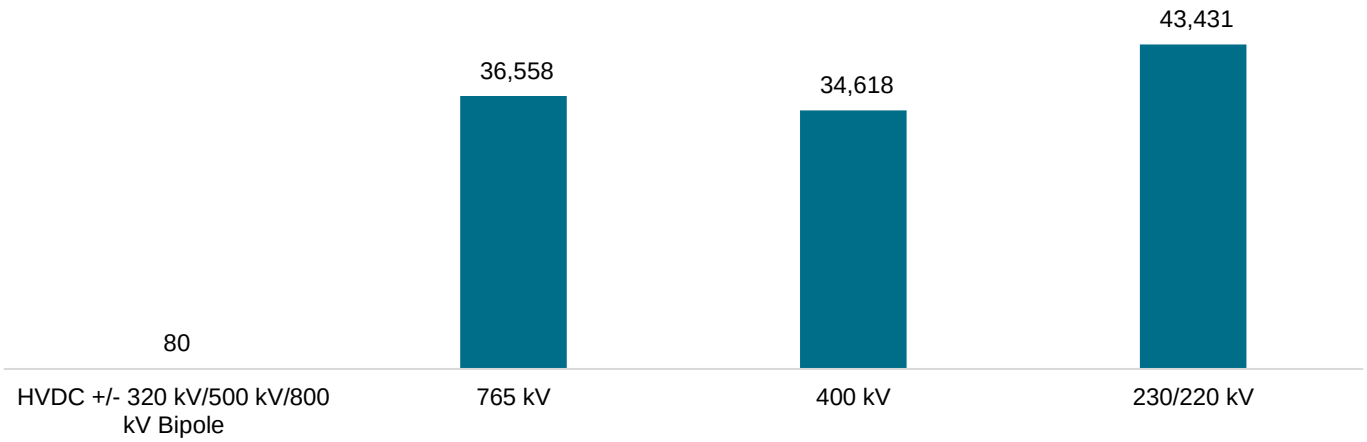
Total transmission substation capacity outlined as per National Electricity Plan (NEP)



Source: CEA, Crisil Intelligence

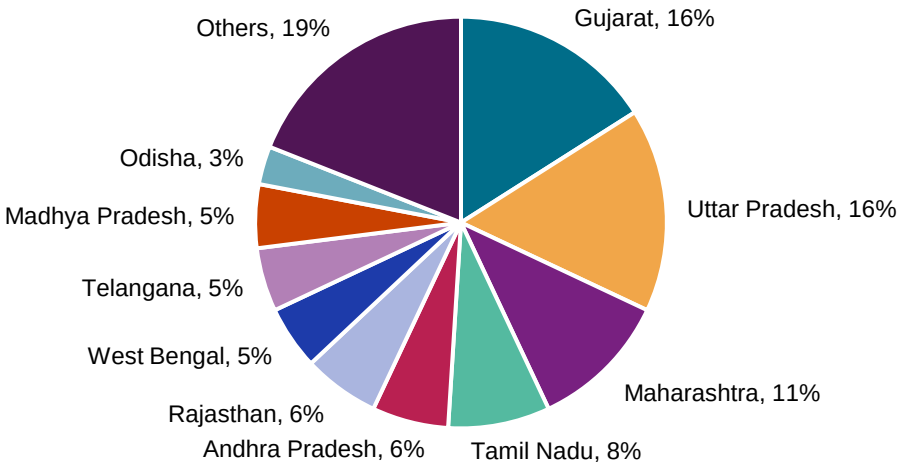
Outlook for voltage-wise line additions over fiscals 2022-2027

(ckm)



Source: CEA, Crisil Intelligence

Share of states with most transmission lines additions over fiscals 2022-2027

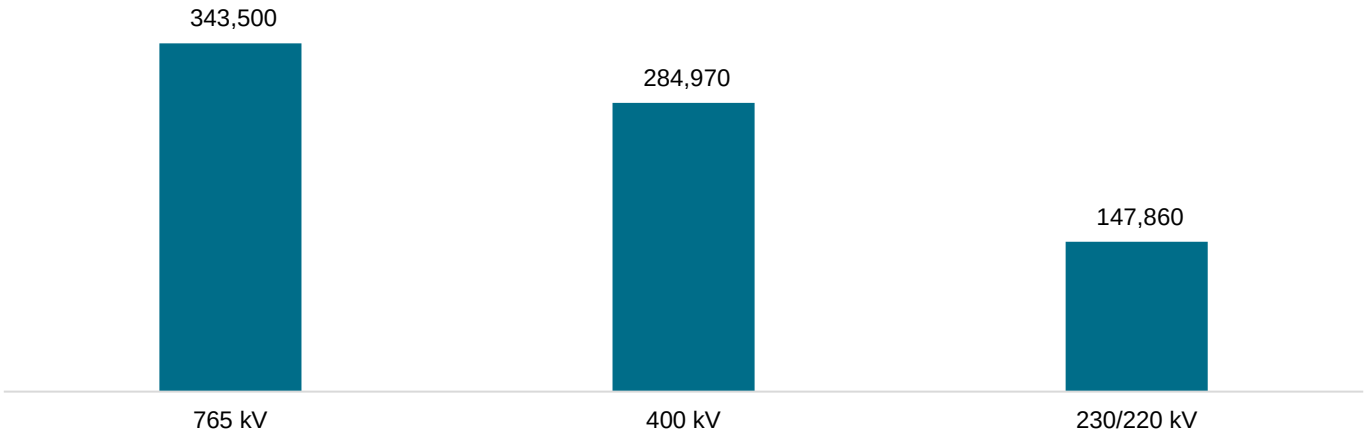


Note: The data pertains to intra-state transmission line additions (ckm)
Source: CEA, Crisil Intelligence

To achieve the targeted 500 GW RE capacity by 2030, the central government has proposed an additional 63,502 ckm of transmission lines under intrastate transmission (InSTS) by 2027 on top of the existing 256,680 ckm as of March 2022 leading to a total InSTS line of 320,182 ckm. As of October 2024, India's InSTS line is 277,316 ckm . Central government agencies will issue the tenders for these lines and bidding will be open for government-owned (central and state) and private players. The top 10 states (by InSTS transmission line additions) are expected to account for ~81% of the transmission line additions by 2027 under InSTS. Gujarat is expected to lead the way with nearly 16% share in expected additions followed by Uttar Pradesh (15%) and Maharashtra (11%).

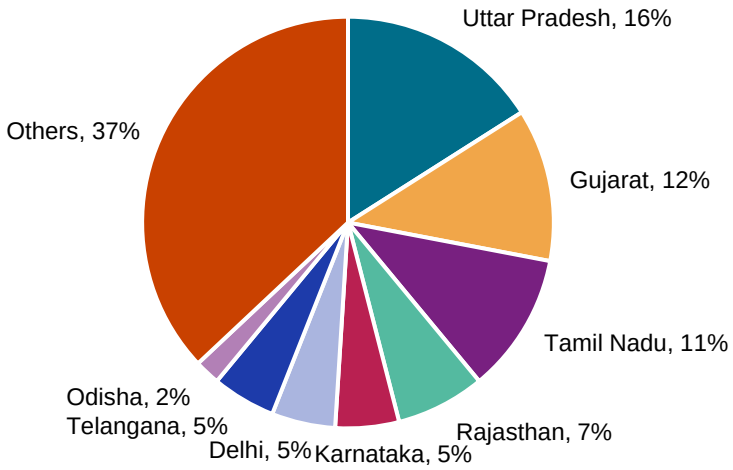
Outlook for voltage wise substation additions over fiscals 2022-2027

(MVA)



Source: CEA, Crisil Intelligence

Share of top states in substation addition over fiscals 2022-2027



Note: This data pertains to intra-state substation additions (MVA)
Source: CEA, Crisil Intelligence

Distribution investments to be aided by Revamped Distribution Sector Scheme (RDSS) spending

State distribution companies (discoms), the major players undertaking investment in the distribution space, have been reeling under severe financial burden for the last few years on account of collection inefficiencies and mounting receivables to power generation companies (gencos). Revenue dipped in fiscal 2021 due to fall in demand from high-paying industrial and commercial consumers on account of reduced economic activity as a fallout of the Covid-19 pandemic.

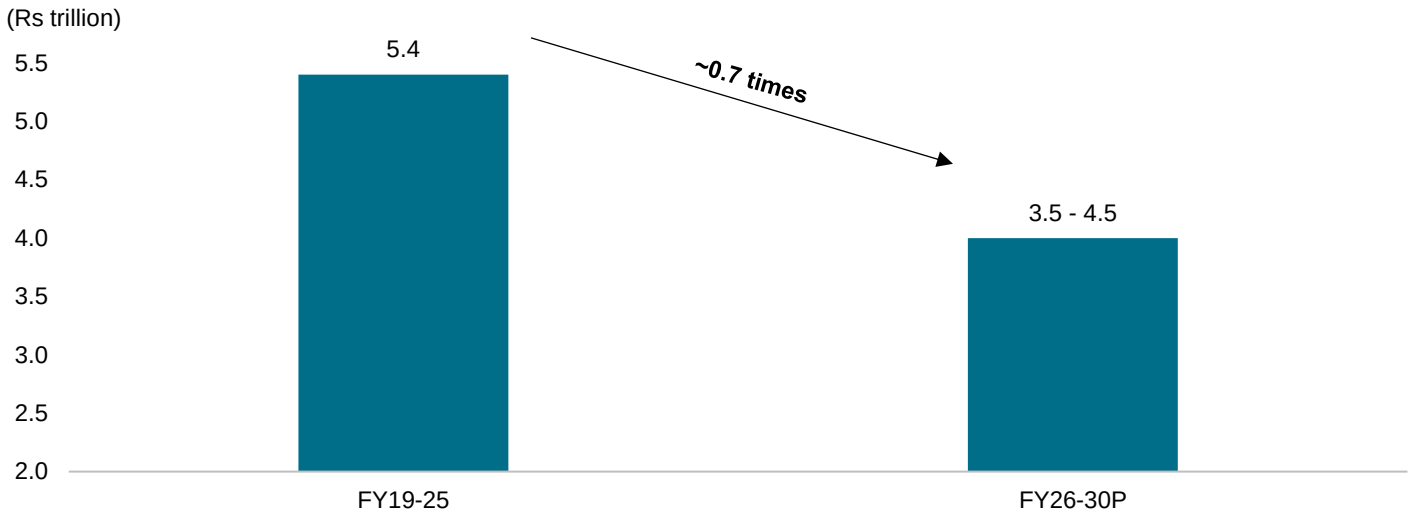
Although the government's relief package providing loans worth Rs 1.35 trillion by Power Finance Corporation (PFC) Ltd / Rural Electrification (REC) Ltd for clearing power generators' dues eased discoms' liquidity problems in the second half of

the fiscal by aiding payments of dues to gencos', the impact was short-lived with dues on the rise again post March 2021. The relief package is also expected to have worsened the debt profile of discoms, forcing them to curb investments over the medium term.

Investments in the segment are likely to gradually pick up fiscal 2026 onwards with central / state government(s) expected to provide the required funding support. The distribution segment is expected to attract investments worth Rs 3.5-4.5 trillion over fiscals 2026 to 2030 vis-à-vis ~Rs 5.4 trillion between fiscal 2019-2025 led by the government's thrust on the Revamped Distribution Sector Scheme, improving access to electricity and providing 24x7 power to all.

Several foreign institutions such as Japan International Cooperation Agency (JICA) and Asian Development Bank (ADB) are also expected to extend credit to the distribution sector. For instance, ADB approved a $48 million loan to finance the expansion and upgrading of the power distribution system in Assam. In December 2020, the ADB approved a loan of $190 million to Bangalore Electricity Supply Company Ltd for modernisation of the power distribution system in Bengaluru city in Karnataka.

Investments in distribution segment of power sector



Source: Crisil Intelligence

EPC projects make up 40-50% of investments in the power sector

In the power sector, EPC refers to a variety of activities which include design, construction of power plants, substations, transmission lines, procurement of equipment, machinery and materials etc. Projects in the Indian power sector are usually allotted via three primary routes namely EPC, Public Private Partnership (PPP) or the project is executed in-house by the internal teams. Largely, projects are given out via EPC and PPP route barring a few brown field projects which are taken up in-house by power companies.

Indian power EPC sector has witnessed strong growth over the last few years, driven by the increasing demand for electricity, government initiatives, and rising investments in the sector. Specifically, from the construction point of view, activities involve buildings, chimney, cooling tanks, land development, roads & boundary walls, erection and fabrication, substations, foundation for different machinery and material handling, etc. Most of the small and mid-sized projects in the sector happen via the EPC route, while some bigger projects happen via PPP route on an itemized basis. Some brownfield expansions also happen in-house using internal teams by the companies.

Crisil Intelligence estimates that out of the total investments flowing in the power sector in the country, 40-50% are coming via EPC mode of projects.

EPC investments in the power sector

Source: Crisil Intelligence

Key growth drivers for power transmission in India

Market drivers	Details
Increasing power demand	• Power demand is directly linked to GDP. With rising India's GDP coupled with other factors such as urbanization, rise in population, rise in industrial output the power demand is expected to see a growth of 5-7% between fiscal 2025 and 2029. • In order to meet the rising demand, the power sector is expected to see a capacity addition from 442 GW in fiscal 2024 to 700-710 GW in fiscal 2029. This addition of capacities will further push to increase transmission lines & sub stations of high voltage as well as upgradation of existing transmission lines
Focus on green energy integration	• To achieve its ambitious target of 500 GW of renewable energy capacity by 2030, the Indian government has introduced the Green Energy Corridor (GEC) scheme, which aims to integrate electricity generated from renewable sources like wind and solar into the conventional power grid • Under GEC Phase 1, 24 GW of renewable energy has been integrated into the grid by 2023, with an additional 19.43 GW planned in GEC phase 2 at a cost of Rs 120.3 billion • Cabinet Committee on Economic Affairs has approved to develop 10,750 ckm of transmission lines and 27,500 MVA of sub-stations to support renewable energy growth with commissioned deadline by 2026
Expansion of transmission lines as well as increasing inter regional transmission capacity	• As per the National Electricity Plan, over 1,91,000 ckm of transmission lines and 1270 GVA of transformation capacity is planned to be added during the ten-year period from 2022-23 to 2031-32 (at 220 kV and above voltage level) • The inter-regional transmission capacity is planned to increase to 143 GW by the year 2027 and further to 168 GW by the year 2032, from the present level of 119 GW
Technological advancements	• The National Electricity Plan (2022-2032) recommends the adoption of cutting-edge technologies in substations, transmission lines, and communication systems, as well as the use of advanced surveying tools and robust cybersecurity measures. • The integration of these modern technologies is expected to enhance the efficiency and reliability of the transmission network, while also attracting new investments in the sector, supporting both new projects and the upgrade of existing infrastructure

Market drivers	Details
Increase in cross border power transfer	• India's central location in South Asia has sparked regional energy cooperation, with the Ministry of Power introducing guidelines for cross-border electricity trade in 2018 to facilitate imports and exports with neighboring countries. • Multiple transmission projects are planned or underway, including lines connecting India to Nepal, Myanmar, and others, while the "One Sun One World One Grid" (OSOWOG) initiative is under discussion to create a global renewable energy grid, potentially interconnecting with countries like Maldives, Singapore, UAE, and Saudi Arabia. • Once completed, these initiatives will further boost India's transmission infrastructure, attracting new investments and driving growth in the sector.

Key challenges in power transmission sector in India

Market challenges	Details
InSTS infrastructure lag in investment	• While there has been good progress in developing Inter-State Transmission Systems (ISTS) in recent years, Intra-State Transmission Systems (InSTS) remain a concern. • The lack of adequate transmission infrastructure within states can lead to congestion, power shortages, and reduced grid reliability, ultimately affecting the overall efficiency of the power system
Right of Way (RoW) Issues	• The acquisition of land and securing RoW for transmission lines has become a significant challenge, resulting in delayed project timelines and increased costs. • According to the CEA monthly progress report for February 2025, over 50% of ISTS projects awarded under the TBCB route have cited right-of-way issues as the primary reason for project delays
Additional time taken in environmental clearances	• The process of obtaining environmental clearance for transmission lines that traverse forest areas is also causing delays in project timelines, ultimately leading to increased costs. • As per the CEA monthly progress report, over 30% of the projects are facing challenges related to forest and wildlife clearance, highlighting the significance of this issue in hindering project progress
Synchronous Commissioning (SCOD) Issues	• The synchronized commissioning of multiple projects is essential to ensure that the transmission infrastructure is ready to evacuate power from generating stations in a timely and efficient manner. • Delays in one project can trigger a ripple effect, impacting connected projects and leading to a cascade of delays and inefficiencies, ultimately hindering the overall progress of the transmission infrastructure development.
Dominance of PSUs	• Although attempts have been made to draw private investment into the power transmission sector, a significant proportion - over 50% - of the projects currently under implementation as part of the National Electricity Plan (NEP) 2022-2032 are still being undertaken by Public Sector Undertakings (PSUs)
Rigourous tendering process	• The High Voltage (HV) and Extra High Voltage (EHV) segment poses entry barriers, particularly for companies seeking to participate in government tenders. To secure contracts in this sector, companies must navigate a rigorous and lengthy procedure for obtaining customer approvals, which can be time-consuming and resource intensive. Furthermore, they must demonstrate extensive industry experience with track record in delivering high-quality power cables and pass stringent pre-qualification (“PQ”) testing to ensure compliance with technical and safety standards.

About Crisil Intelligence (formerly Market Intelligence & Analytics)

Crisil Intelligence is a leading provider of research, consulting, risk solutions and advanced data analytics, serving clients across government, private and public enterprises. We leverage our expertise in data-driven insights and strong benchmarking capabilities to help clients navigate complex external ecosystems, identify opportunities and mitigate risks. By combining cutting-edge analytics, machine learning and AI capabilities with deep industry knowledge, we empower our clients to make informed decisions, drive business growth and build resilient capacities.

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