



Industry Report on Electricity Infrastructure in India & Electricity Meters

July 2024

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Global Macroeconomic Scenario

The global economy, which grew by 3.3% in 2023, is expected to record a sluggish growth of 3.2% in 2024 before rising modestly to 3.3% in 2025. Between 2021 – 2022, global banks were carrying a historically high debt burden after COVID-19. Central banks took tight monetary measures to control inflation and spike in commodity prices. Russia's war with Ukraine further affected the global supply chains and inflated the prices of energy and other food items. These factors coupled with war-related economic sanctions impacted the economic activities in Europe. Any further escalation in the war may further affect the rebound of the economy in Europe.

While China, the largest manufacturing hub of world, was facing a crisis in the real estate sector and prices of properties were declining between 2020 - 2023, with the reopening of the economy, consumer demand is picking up again. The Chinese authorities have taken a variety of measures, including additional monetary easing, tax relief for corporates, and new vaccination targets for the elderly. The Chinese Government took several steps to help the real estate sector including cracking down on debt-ridden developers, announcing stimulus for the sector and measures to encourage the completion and delivery of unfinished real estate projects. The sector is now witnessing investments from developers and demand from buyers.

Global headline inflation is set to fall from an estimated 6.8% in CY 2023 to 5.8% in CY 2024 and to 4.4% in CY 2025. This fall is swifter than anticipated across various areas, amid the resolution of supply-related problems and tight monetary policies. Reduced inflation mirrors the diminishing impact of price shocks, particularly in energy, and their subsequent influence on core inflation. This decrease also stems from a relaxation in labour market pressure, characterized by fewer job openings, a slight uptick in unemployment, and increased labour availability, occasionally due to a significant influx of immigrants.

Global GDP Growth Scenario

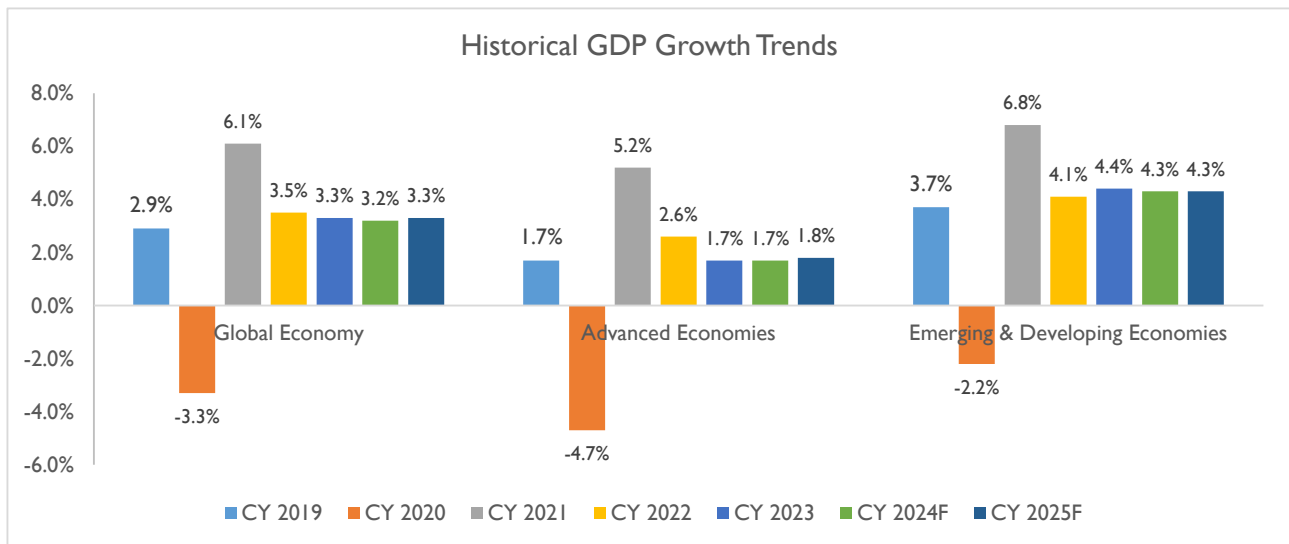
The global economy started to rise from its lowest levels after countries started to lift the lockdown in 2020 and 2021. The pandemic lockdown was a key factor as it affected economic activities resulting in a recession in the year CY 2020, as the GDP growth touched -3.3%.

In CY 2021 disruption in the supply chain affected most of the advanced economies as well as low-income developing economies. The rapid spread of Delta and the threat of new variants in mid of CY 2021 further increased uncertainty in the global economic environment.

Global economic activities experienced a sharper-than-expected slowdown in CY 2022. One of the highest inflations in decades, seen in 2022, forced most of the central banks to tighten their fiscal policies. Russia's invasion of Ukraine affected the global food supply resulting in a further increment in the cost of living.

Further, despite initial resilience earlier in 2023, marked by a rebound in reopening and progress in curbing inflation from the previous year's highs, the situation remained precarious. Economic activity lagged behind its pre-pandemic trajectory, particularly in emerging markets and developing economies, leading to widening

disparities among regions. Numerous factors are impeding the recovery, including the lasting impacts of the pandemic and geopolitical tensions, as well as cyclically-driven factors such as tightening monetary policies to combat inflation, the reduction of fiscal support amidst high debt levels, and the occurrence of extreme weather events. As a result, global growth declined from 3.5% in CY 2022 to 3.3% in CY 2023.

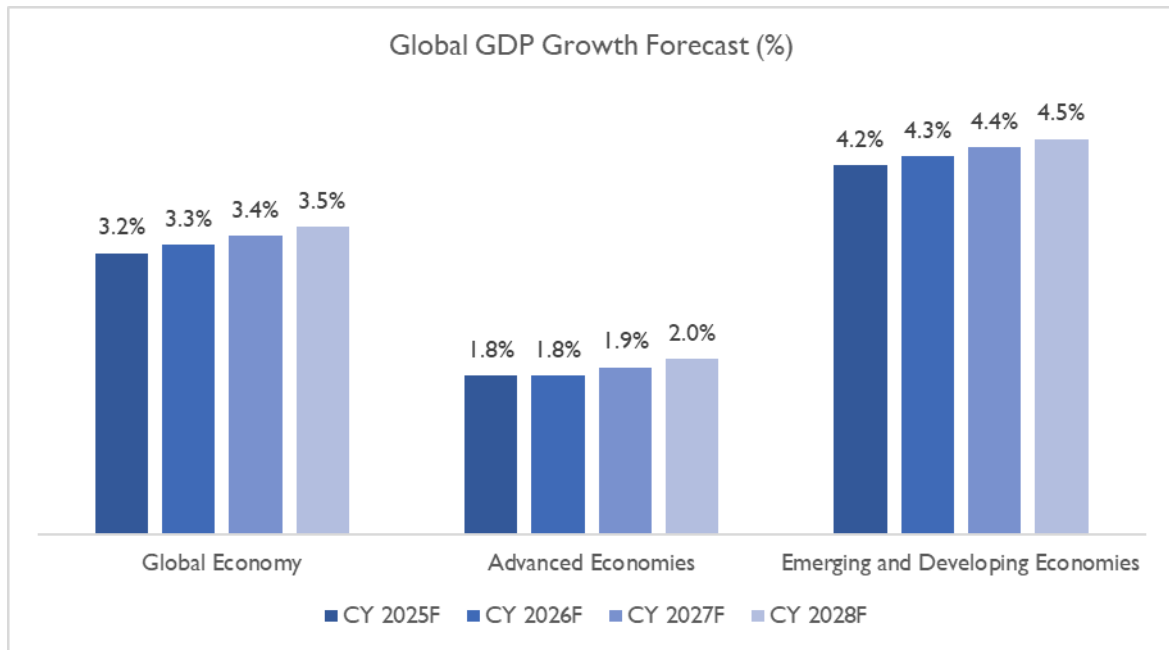


Source – IMF Global GDP Forecast Release July 2024

Note: Advanced Economies and Emerging & Developing Economies are as per the classification of the World Economic Outlook (WEO). This classification is not based on strict criteria, economic or otherwise, and it has evolved over time. It comprises of 40 countries under the Advanced Economies including the G7 (the United States, Japan, Germany, France, Italy, the United Kingdom, and Canada) and selected countries from the Euro Zone (Germany, Italy, France etc.). The group of emerging market and developing economies (156) includes all those that are not classified as Advanced Economies (India, China, Brazil, Malaysia etc.)

In the current scenario, global GDP growth is estimated to have recorded a moderate growth of 3.3% in CY 2023 as compared to 3.5% growth in CY 2022. While high inflation and rising borrowing costs are affecting private consumption, on the other hand, fiscal consolidation is affecting government consumption.

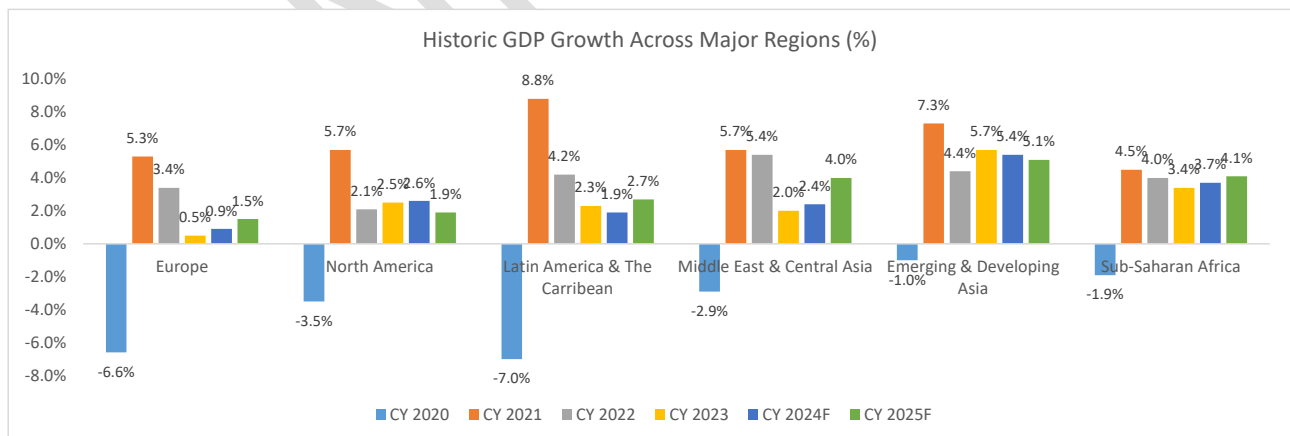
Slowed growth in developed economies will affect the GDP growth in CY 2024 and global GDP is expected to record a flat growth of 3.2% in CY 2024. The crisis in the housing sector, bank lending, and industrial sectors are affecting the growth of global GDP. Inflation forced central banks to adopt tight monetary policies. After touching the peak in 2022, inflationary pressures slowly eased out in 2023. This environment weighs in for interest rate cuts by many monetary authorities.



Source – IMF Global GDP Forecast Release 2024, D&B Estimates

GDP Growth Across Major Regions

GDP growth of major regions including Europe, Latin America & The Caribbean, Middle East & Central Asia, and Sub-Saharan Africa, were showing signs of slow growth and recession between 2020 – 2023, but leaving Latin America & The Caribbean, 2024 is expected to show resilience and growth. Meanwhile, GDP growth in Emerging and Developing Asia (India, China, Indonesia, Malaysia etc.) is expected to decrease from 5.4% in CY 2023 to 5.2% in CY 2024, while in the United States, it is expected to decrease from 2.5% in CY 2023 to 2.1% in CY 2024.

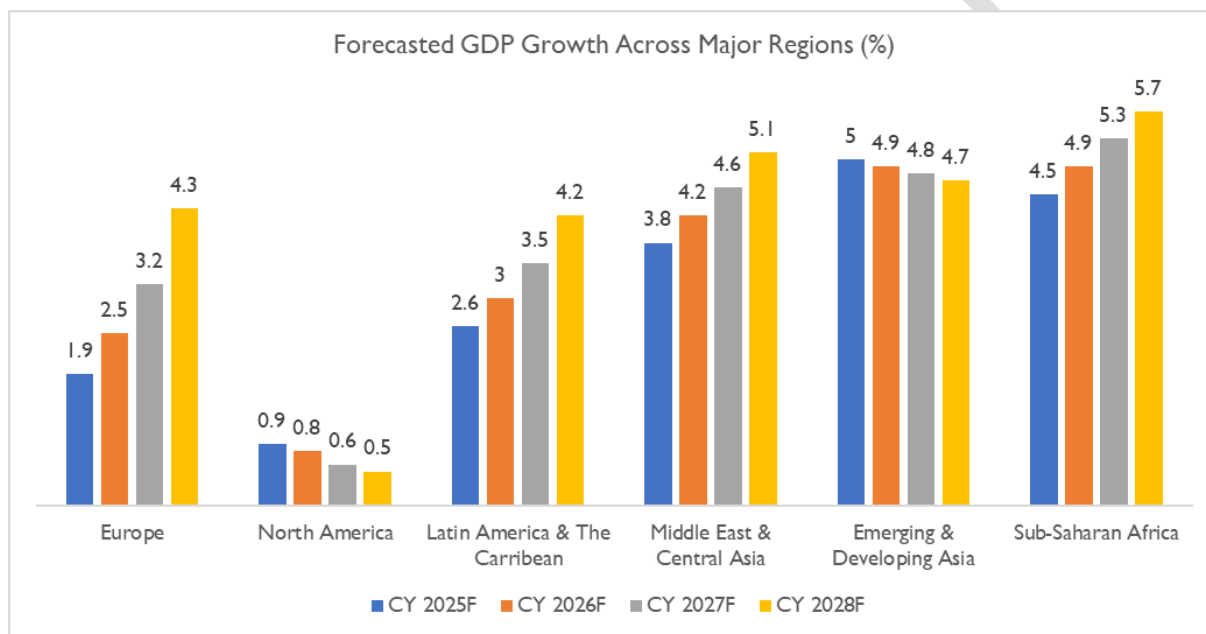


Source-IMF World Economic Outlook July 2024 update

Except for Emerging and Developing Asia, Latin America & The Caribbean and the United States, all other regions are expected to record an increase in GDP growth rate in CY 2024 as compared to CY 2023. GDP growth in Latin America & The Caribbean is expected to decline due to negative growth in Argentina. Further,

growth in the United States is expected to come down at 2.1% in CY 2024 due to lagged effects of monetary policy tightening, gradual fiscal tightening, and a softening in labour markets slowing aggregate demand.

Although Europe experienced a less robust performance in 2023, the recovery in 2024 is expected to be driven by increased household consumption as the impact of energy price shocks diminishes and inflation decreases, thereby bolstering real income growth. Meanwhile, India and China saw greater-than-anticipated growth in 2023 due to heightened government spending and robust domestic demand, respectively. Sub-Saharan Africa's expected growth in 2024 is attributed to the diminishing negative impacts of previous weather shocks and gradual improvements in supply issues.



Source-IMF, OECD, and World Bank, D&B Estimates

Global Economic Outlook

At the midpoint of the year, so far in 2024 we have seen divergence in outcomes and prospects around the world in terms of economic growth, inflation, and policy responses. On balance, global short-term economic prospects have improved over the course of the year. We expect this momentum to continue through the second half of 2024 and into 2025 as inflation eases further and monetary policy continues to loosen, supporting steady growth. Macroeconomic risks, in our view, have become more balanced.

The U.S. has performed better than other developed economies, particularly those in Europe where the consumer sentiment has been relatively weak – though the picture in Europe has been varied. A sustained recovery in tourism this year has boosted the economies of Greece and Spain, whereas Germany, France, and Italy have been held back by the slower recovery of manufacturing. Nonetheless, the European Central Bank (ECB) lowered the three key interest rates in June – for the first time since September 2019 – which will support stronger regional growth.

Growth in the Chinese Mainland has held up well so far this year despite challenges from the property market amid ongoing rebalancing, and the export cycle is supporting growth in the rest of Asia. In Latin America, larger economies, such as Brazil and Mexico, tend to be performing more moderately than smaller economies, such as Chile and Peru, indicating slower regional growth overall.

Globally, industrial production has been relatively sluggish because of restrictive trade policies, persistent supply chain disruptions, high interest rates, and anemic growth. We expect industrial production to gather steam later this year and into 2025 on the back of a gradual recovery in global trade, stimulated by stronger domestic demand for goods.

Policy responses have diverged so far this year and are set to remain so in the near term. Central banks have begun rate cutting cycles in several developed economies, including the Eurozone, Canada, Sweden, and Switzerland. However not every economy has followed suit. Disinflation has not been as predictable as it was in 2023, and underlying price pressures mean inflation is likely to remain bumpy this year – hence, policy will remain more restrictive than was anticipated at the start of the year. With relatively stronger economic growth and stickier inflation, the timing of the first interest rate cut by the U.S. Federal Reserve (the Fed) and the onward path of interest rates remains ambiguous.

The global economy is showing signs of stabilizing, yet growth will remain subdued this year before picking up pace in 2025. We forecast global growth of around 2.5% in 2024, half a percentage point softer than in the decade following the financial crisis. The weaker outlook reflects fiscal consolidation, lagged tight monetary policy, restrictive trade policies, and elevated levels of geopolitical uncertainty. Looking ahead to 2025, global growth is likely to pick up slightly to 2.8% as the impact of these factors declines and stronger growth becomes more entrenched.

Emerging economies look set for softer growth in general this year. On a regional basis, growth is likely to be markedly slower in Eastern Europe, but only slightly softer in Asia Pacific and Latin America, with growth only moderately slower in key economies such as the Chinese Mainland, India, and Brazil. Outcomes in developed economies are also mixed but largely remain subdued because of tight policy settings.

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India Macroeconomic Analysis

GDP Growth Scenario

India's economy showed resilience with GDP growing at 8.2% in CY 2023. The GDP growth in CY 2023 represents a return to pre pandemic era growth path. Even amidst geopolitical uncertainties, particularly those affecting global energy and commodity markets, India continues to remain one of the fastest growing economies in the world.

Country	Real Growth (CY 2023)	Projected GDP Growth (CY 2024)	Projected GDP Growth (CY 2025)
India	8.20%	7.00%	6.50%
China	5.20%	5.00%	4.50%
Russia	3.60%	3.20%	1.50%
Brazil	2.90%	2.10%	2.40%
United States	2.50%	2.60%	1.90%
Japan	1.90%	0.70%	1.00%
Canada	1.20%	1.30%	2.40%
Italy	0.90%	0.70%	0.90%
France	1.10%	0.90%	1.30%
South Africa	0.70%	0.90%	1.20%
United Kingdom	0.10%	0.70%	1.50%
Germany	-0.20%	0.20%	1.30%

Source: World Economic Outlook, July 2024

Countries considered include - Largest Developed Economies and BRICS (Brazil, Russia, India, China, and South)

Countries have been arranged in descending order of GDP growth in 2023).

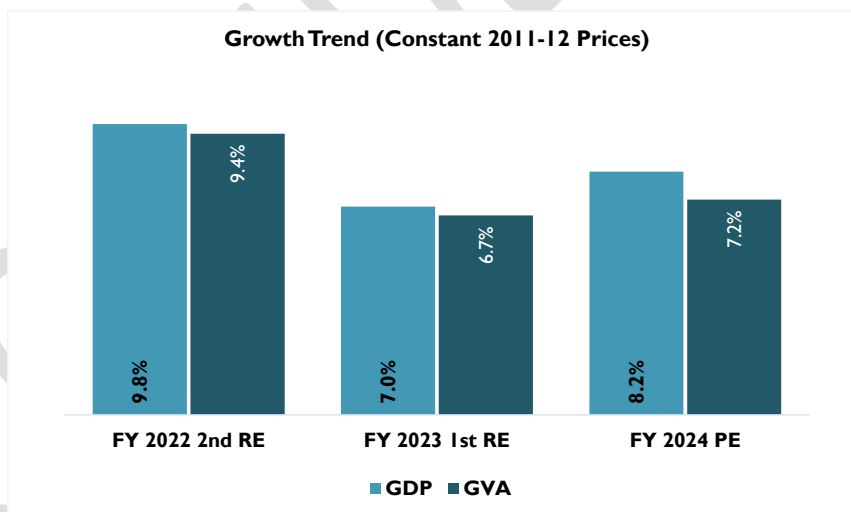
There are few factors aiding India's economic recovery – notably its resilience to external shocks and rebound in private consumption. This rebound in private consumption is bringing back the focus on improvements in domestic demand, which together with revival in export demand is a precursor to higher industrial activity. Already the capacity utilization rates in Indian manufacturing sector are recovering as industries have stepped up their production volumes. As this momentum sustains, the country may enter a new capex (capital expenditure) cycle. The universal vaccination program by the Government has played a big part in reinstating confidence among the population, in turn helped to revive private consumption.

Realizing the need to impart external stimuli, the Government stepped up its spending on infrastructure projects which in turn had a positive impact on economic growth. The capital expenditure of the central

government increased by 37.4% increase in capital expenditure (budget estimates), to the tune of INR 10 trillion in the Union Budget 2023-2024. The announcement also included a 30% increase in financial assistance to states at INR 1.3 trillion for capex. The improvement was accentuated further as the Budget 2024-2025 announced an 11.1% increase in the capital expenditure outlay at INR 11.1 trillion, constituting 3.4% of the GDP. This has provided much-needed confidence to the private sector, and in turn, attracted private investment.

On the lending side, the financial health of major banks has witnessed an improvement which has helped in improving the credit supply. With capacity utilization improving, there would be demand for credit from the corporate sector to fund the next round of expansion plans. The banking industry is well poised to address that demand. Underlining the improving credit scenario is the credit growth to the micro, small, and medium enterprise (MSME) sector as the credit outstanding to the MSME sector by scheduled commercial banks in the fiscal year 2024 grew by 14% to INR 10.31 trillion compared to INR 9.02 trillion as on 24 March 2023. The extended Emergency Credit Linked Guarantee Scheme (ECLGS) by the Union Government has played a major role in improving this credit supply.

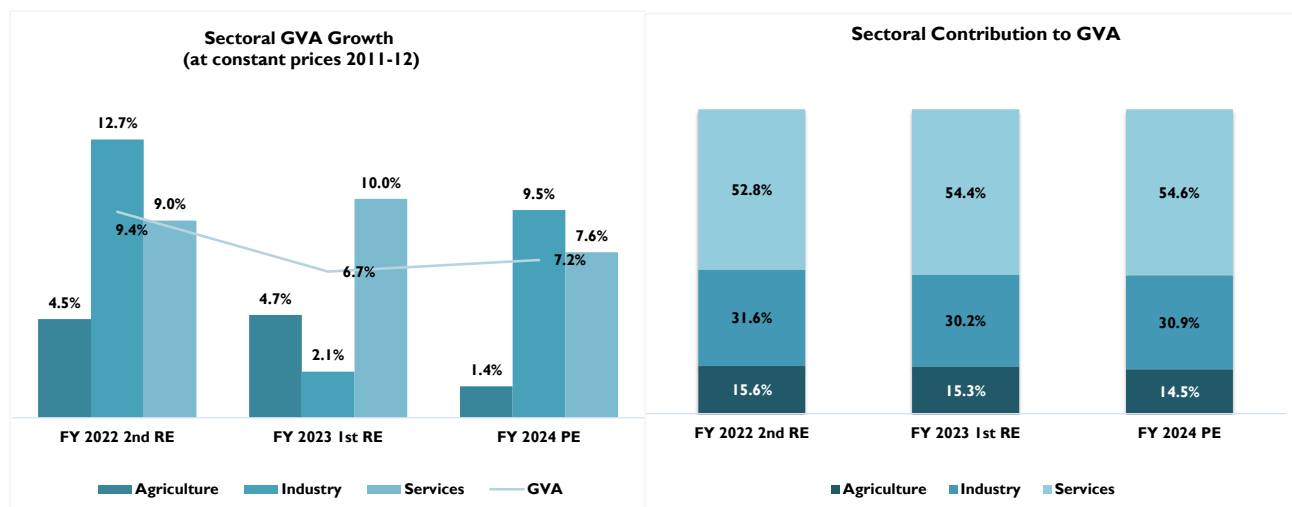
As per the provisional estimates 2023-24, India's GDP in FY 2024 grew by 8.2% compared to 7.0% in the previous fiscal on the back of solid performances in manufacturing, mining, and construction sectors. The year-on-year increase in growth rate is also partly due to by a strong growth in investment demand led by public capital expenditure.



Source: Ministry of Statistics & Programme Implementation (MOSPI), National Account Statistics, 2023-24

RE stands for Revised Estimates, SAE stands for Second Advance Estimates

Sectoral Contribution to GVA and annual growth trend



Source: Ministry of Statistics & Programme Implementation (MOSPI)

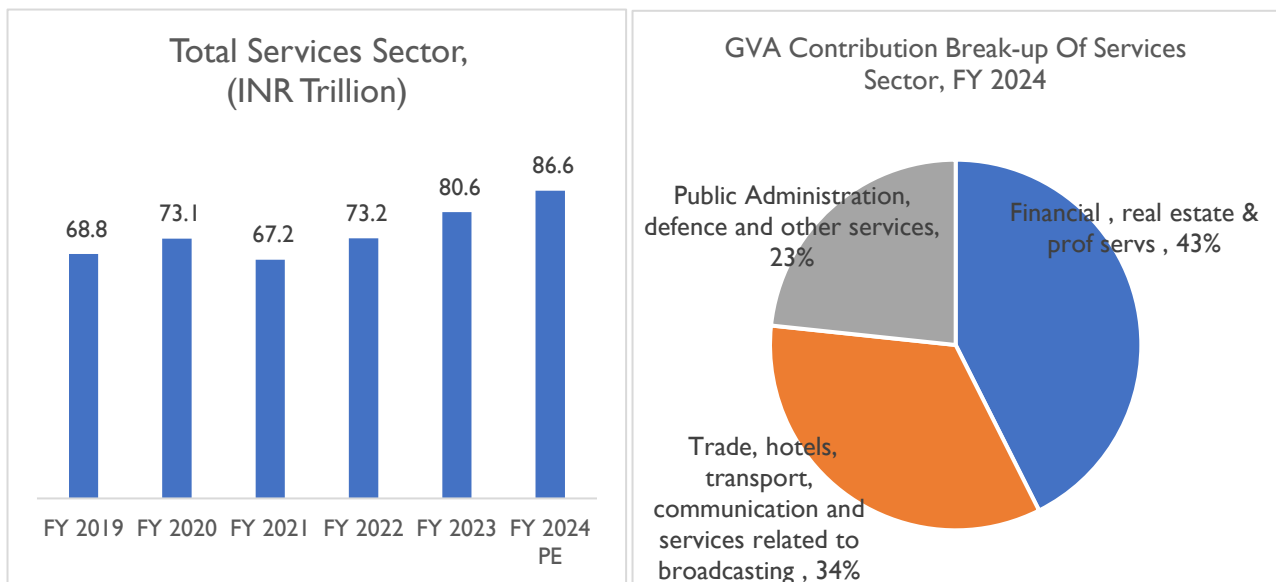
Sectoral analysis of GVA reveals industrial sector recovered sharply registering 9.5% y-o-y increase in FY 2024 against 2.1% in the previous fiscal. In the industrial sector, growth across major economic activity such as mining, manufacturing and construction sector rose significantly and it registered a growth of 7.1%, 9.9% and 9.9% in FY 2024 against a y-o-y change of 1.9%, -2.20%, and 9.44% in FY 2023, respectively. Utilities sector observed a marginal moderation in y-o-y growth to 7.5% against 9.44% in the previous years.

Talking about the services sector's performance, with major relaxation in covid restriction, progress on COVID-19 vaccination and living with virus attitude, business in the service sector gradually returned to normalcy in FY 2023. Economic recovery was supported by the service sector as individual mobility returned to the pre-pandemic level. The trade, hotel, transport, communication, and broadcasting segment continued to strengthen in FY 2023 and grow in FY 2024, although the growth hasn't shown substantial increases. In FY 2024, services sector grew by 7.6% against 10% y-o-y growth in the previous year.

Expansion in Service Sector

Services sector is a major contributor to the country's overall economic growth. In absolute terms, services sector GVA has increased from INR 68.78 trillion in FY 2019 to INR 86.6 trillion in FY 2024 (as per the provisional estimated), registering a CAGR of nearly 5%. Within Services sector, the GVA by financial, real estate and professional services-the largest contributing segment observed 6.3% CAGR while Public Administration, defence and other services¹ observed 4.5% CAGR and Trade, hotels, transport, communication, and services related to broadcasting witnessed 3.1% CAGR between FY 2019-24.

¹ Other services include Education, Health, Recreation, and other personal services.



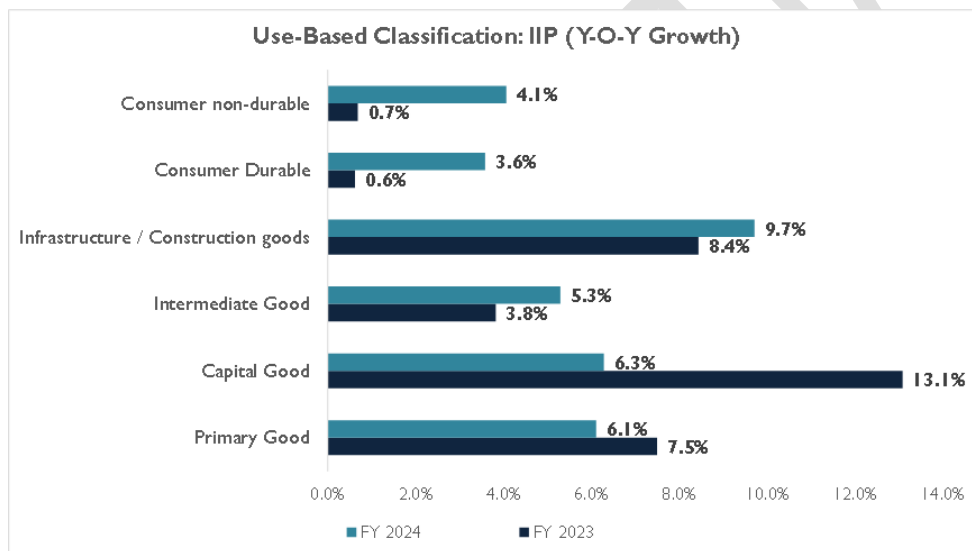
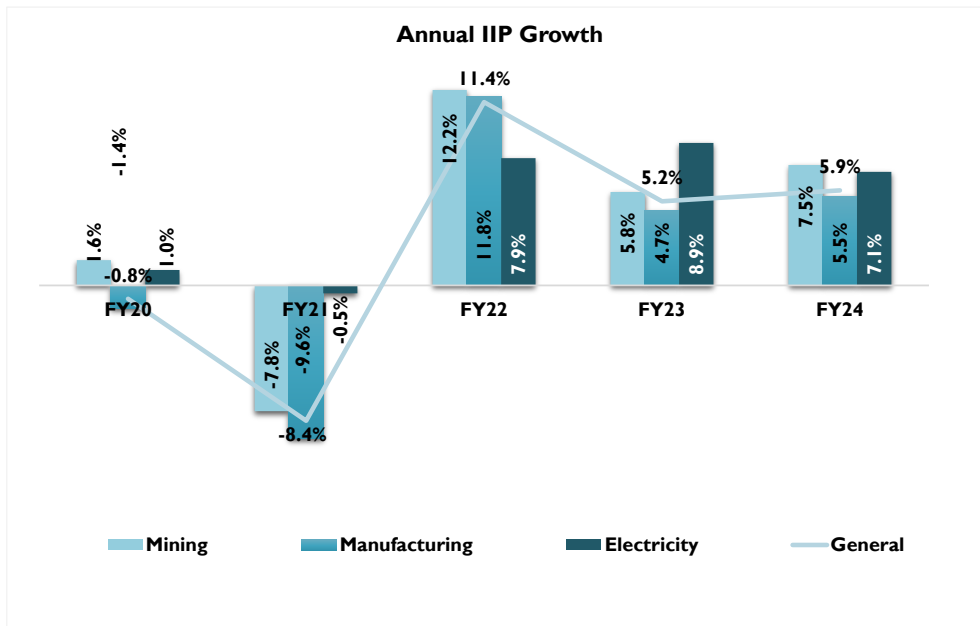
Sources: MOSPI, CMIE Economic Outlook and Dun & Bradstreet Research Estimates²

India's HSBC Services Purchasing Managers' Index, an important indicator to track service sector performance, measured 60.3 in July 2024 against 60.5 in the previous month. Since August 2021, the services sector has consistently remained above the threshold of 50, which distinguishes growth from contraction.

IIP Growth

Industrial sector performance as measured by IIP index; in FY 2024 it is growing at 5.9% (against 5.2% in FY 2023). Previously IIP index exhibited temporary recovery in FY 2022 from the low of Covid induced slowdown in industrial growth during FY 2020 and FY 2021. Manufacturing index, with 77.6% weightage in overall index, grew by 5.5% in FY 2023 against 4.7% y-o-y growth in FY 2022 while mining sector index too grew by 7.5% against 5.8% in the previous years. Mining & manufacturing both shown improvement according to previous except the Electricity sector Index, witnessed an improvement of 7.1% against 8.9% in the previous year.

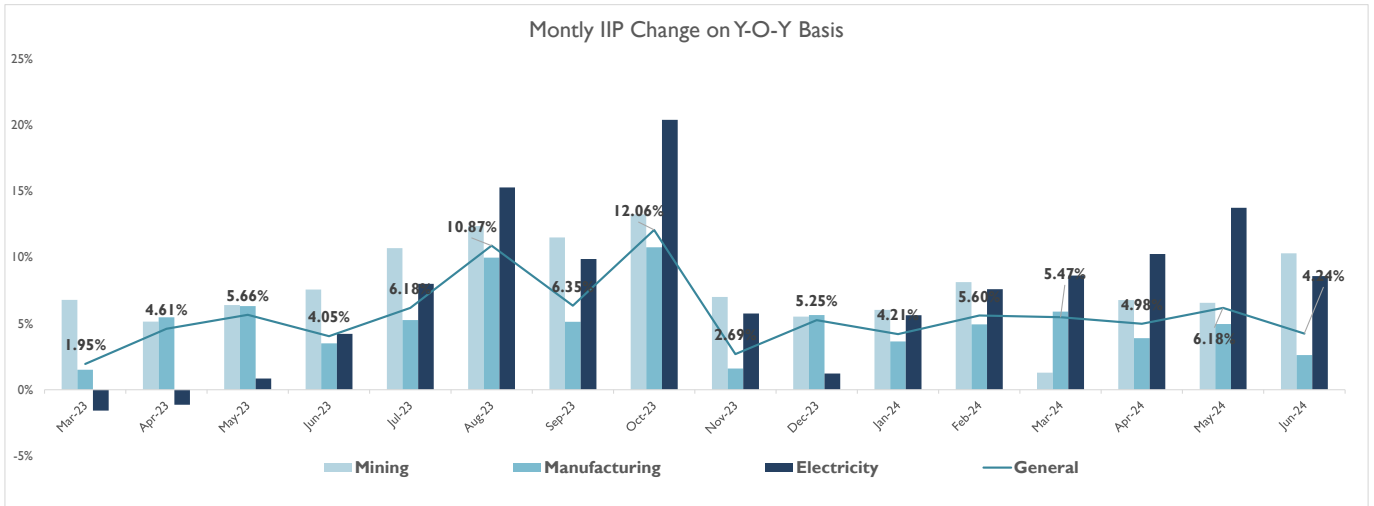
² Projection as Based on CMIE Growth rate till FY 2029 and FY 2030 is based on Dun & Bradstreet assumption.



Source: Ministry of Statistics & Programme Implementation (MOSPI)

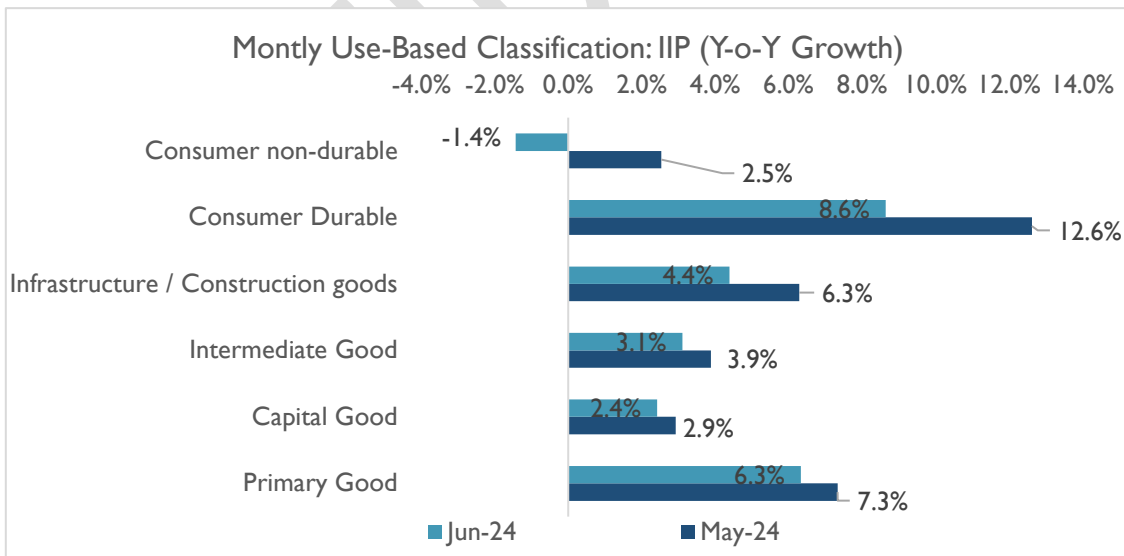
As per the use-based classification, most of the segments has shown growth for FY 2024 as compared to FY 2023. Capital good and primary goods were segments which faced less growth as compared to previous year. The contracting IIP data points towards adverse operating business climate as global headwinds, high inflation, and monetary tightening cumulatively impacted the broader industrial sector performance. In contrast all the segments except the above two have shown growth.

Monthly IIP Growth Trend



Source: Ministry of Statistics & Programme Implementation (MOSPI)

In the current fiscal FY 2025, the monthly IIP measured index has reported steady improvement over the last fiscal. However, the IIP index slowed to a 5-month low and just grew by 4.24% y-o-y in June against 6.18% in the previous month on the back of slowing growth in the manufacturing section. In June 2024, the manufacturing index growth slowed to 2.6% against 6.3% y-o-y growth in June 2023 and 5% in May 2023 while the electricity sector index and mining index exhibited substantial improvement and they grew by 8.6% and 10.3% in June 2024 against 0.9% and 6.4% growth in April 2023, respectively.

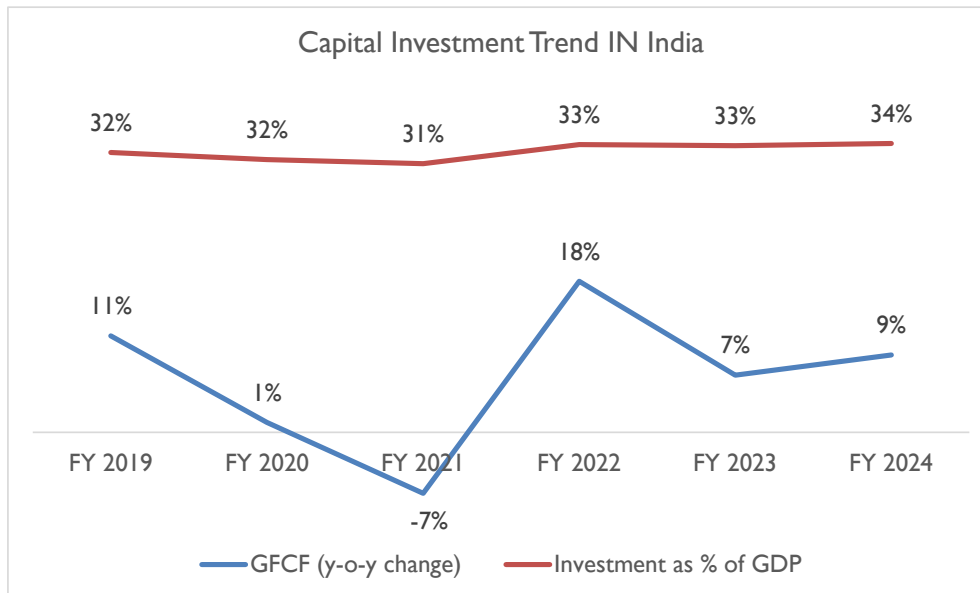


Sources: MOSPI

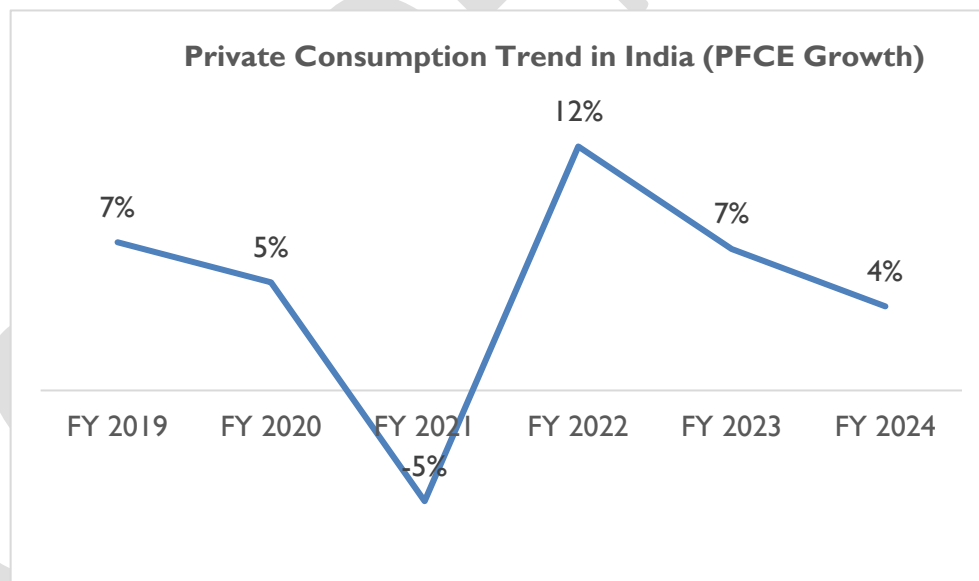
As per the use-based classification, growth in all segments slowed in June 2024 as compared to the previous month. Consumer non-durable declined by 1.4% in June 2024 against 2.5% increase in the previous month. In May 2024, all segments showed a substantial increase in growth.

Investment & Consumption Scenario

Other major indicators such as Gross fixed capital formation (GFCF), a measure of investments, gained strength during FY 2024 as it grew by 9% on a y-o-y basis against 7% yearly growth in the previous fiscal, while GFCF to GDP ratio measured an all-time high settled higher at 34%.



Sources: MOSPI



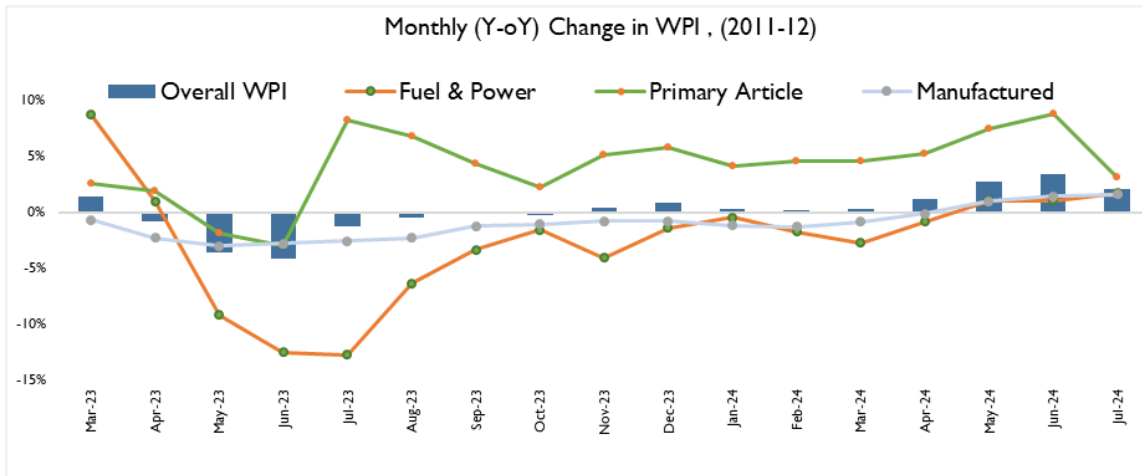
Sources: MOSPI

Private Final Expenditure (PFCE) a realistic proxy to gauge household spending, observed decelerated and registered 4% y-o-y growth in FY 2024 against 7% in FY 2023.

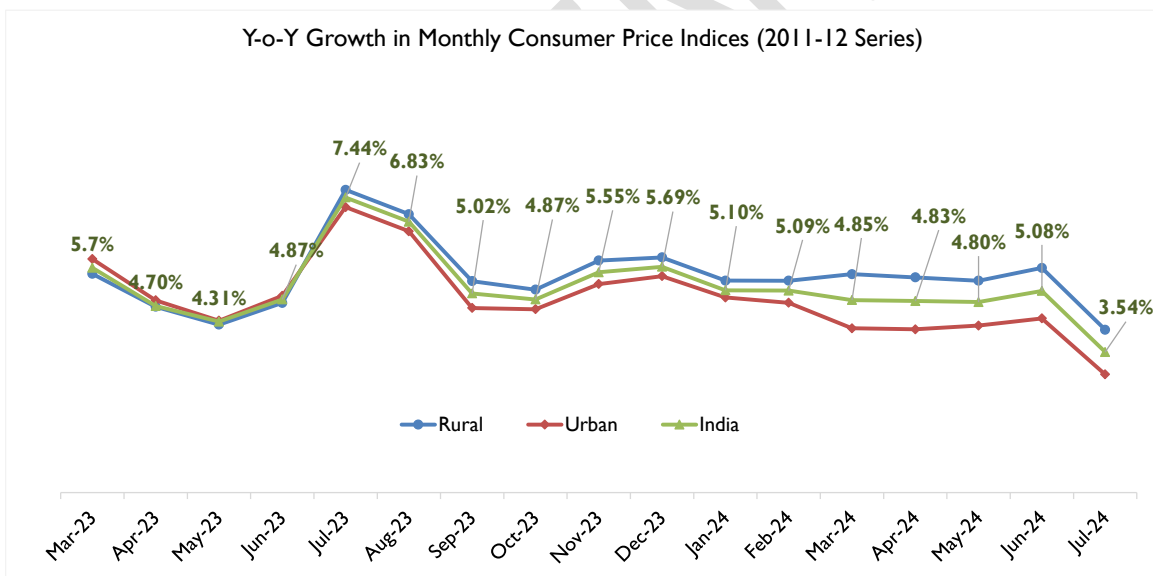
Inflation Scenario

The inflation rate based on India's Wholesale Price Index (WPI) exhibited significant fluctuations across different sectors from March 2023 to July 2024. Overall WPI saw a sharp decline to -1.2% in July 2023, primarily driven by steep drops in Fuel & Power and Manufactured Products, reflecting reduced global demand

and falling input costs. However, a recovery was noted by June 2024, with WPI reaching 3.4%, supported by a strong rise in Primary Articles and a rebound in Fuel & Power prices. By July 2024, while Primary Articles growth moderated to 3.1%, the WPI remained positive at 2.0%, indicating stabilization in the market after earlier volatility.



Source: MOSPI, Office of Economic Advisor.



Source: CMIE Economic Outlook

Retail inflation rate (as measured by the Consumer Price Index) in India showed notable fluctuations between March 2023 and July 2024. Rural CPI inflation peaked at 7.63% in July 2023, before declining to 4.10% in July 2024. Urban CPI inflation followed a similar trend, rising to 7.20% in July 2023 and then dropping to 2.98% in July 2024. Overall, the national CPI inflation rate increased to 7.44% in July 2023 but moderated to 3.54% by July 2024, indicating a gradual easing of inflationary pressures across both rural and urban areas over the period. CPI measured below 6% tolerance limit of the central bank since September 2023. As a part of an anti-inflationary measure, the RBI has hiked the repo rate by 250 bps since May 2022 to the current 6.5% while it has been holding the rate at 6.5% since 8 Feb 2023.

India's Growth Outlook

India's economy has exceeded expectations, registering an 8.2% growth in FY24. High-frequency indicators such as automobile sales, e-way bills, cargo traffic, and exports signal sustained growth momentum into Q2 FY25. However, the rural demand outlook is tied to the monsoon, where inconsistent rainfall could impact the agriculture sector and inflation. The government is proactively boosting grain storage capacity to mitigate these risks. On the credit front, the Reserve Bank of India (RBI) has kept the policy rate unchanged, with inflation expected to average around 5% in FY25. Despite stable policy rates, lending rates may rise due to the incomplete transmission of earlier hikes, while strong credit growth in the private sector suggests potential capacity expansion. Supply-side challenges persist, particularly in food storage infrastructure. The government has launched a massive initiative to enhance grain storage capacity by 70 million tonnes over the next five years. The recent long-term agreement for operating Iran's Chabahar Port is also set to bolster trade and supply chain resilience.

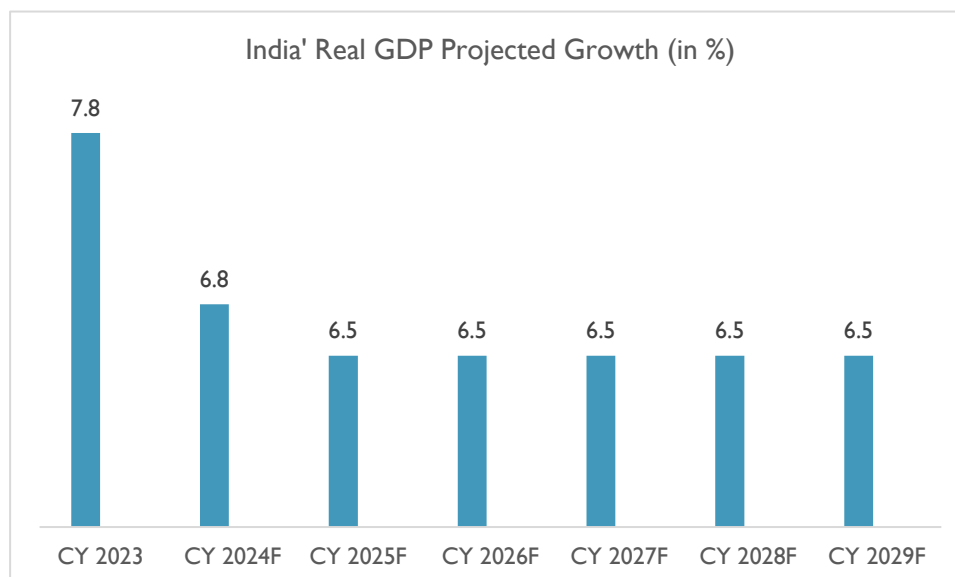
In terms of trade, India's recent agreements, particularly with the European Free Trade Association (EFTA) and Oman, are opening new markets and opportunities for exports. The proposed mega-distribution hub in the UAE by 2025 will further support India's global trade ambitions, particularly in Africa, Europe, and the US.

Politically, the continuation of the National Democratic Alliance (NDA) government signals sustained reforms, with optimism around labour and land reforms. The government is also taking steps to control retail inflation by managing food prices and import duties. The external environment remains cautious, with geopolitical tensions, particularly in Gaza, posing potential risks to global stability.

Overall, India's short-term growth outlook remains positive, underpinned by strong domestic demand, proactive government measures, and expanding global trade relationships, despite some challenges in the rural economy and supply chain infrastructure.

India's Projected Economic Growth

Looking ahead to 2024, India's projected GDP growth of 6.8% in 2024 stands out as the fastest among major emerging markets, significantly outpacing China's 4.6%, and Brazil's 2.2%. This robust growth trajectory is expected to sustain at 6.5% annually from 2025 to 2029, reflecting strong economic fundamentals and continued momentum.



Source: IMF

This decent growth momentum in near term (CY 2024) is accompanied by a slowdown in inflation, as well as various other factors in the medium to long term that will support the economy. These include enhancements in physical infrastructure, advancements in digital and payment technology, improvements in the ease of doing business and a higher quality of fiscal expenditure to foster sustained growth.

On the demand side, improving employment conditions and moderating inflation are expected to stimulate household consumption. Further, the investment cycle is gaining traction, propelled by sustained government capital expenditure, increased capacity utilization and rising credit flow. Additionally, there are positive signs of improvement in net external demand, as reflected in the narrowing merchandise trade deficit. Despite the supply disruptions, exports clocked positive y-o-y growth in December 2023 and January 2024.

From uplifting the underprivileged to energizing the nation's infrastructure development, the Government has outlined its vision to propel India's advancement and achieve a 'Viksit Bharat' by 2047 in the interim budget announced on 1st Feb 2024. Noteworthy positives in the budget include achieving a lower-than-targeted fiscal deficit for FY2024 and setting a lower-than expected fiscal deficit target for FY2025, proposing dedicated commodity corridors and port connectivity corridors, providing long-term financing at low or nil interest rates to the private sector to step up R&D (Research & Development) in the sunrise sectors.

Achieving a reduced fiscal deficit of 5.8% in FY2024 and projecting a lower than-anticipated fiscal deficit of 4.9% as announced in the interim budget in July 2024 for the current fiscal year (FY 2025) are positive credit outcomes for India. This showcases the country's capability to pursue a high-growth trajectory while adhering to the fiscal glide path. There has been a significant boost to capital expenditure for two consecutive years; capital expenditure – which is budgeted at 3.4% of GDP (INR 11.1 trillion/USD 134 billion) for fiscal year 2024-25 – is at a 21-year high (3.3% of GDP in fiscal year 2023-24). The

enhancement of port connectivity, coupled with the establishment of dedicated commodity corridors (energy, mineral and cement), is poised to enhance manufacturing competitiveness. This strategic move aims to fulfil India's export targets and reduce logistics costs.

India's optimistic economic outlook is underpinned by its demographic dividend, which brings a substantial workforce that boosts labor participation and productivity. The burgeoning middle class and urbanization contribute to increased domestic consumption, driven by rising incomes and purchasing power. Extensive investments in infrastructure, encompassing roads, railways, ports, and digital connectivity, are enhancing productivity and efficiency, with government initiatives like the Smart Cities Mission and PM Gati Shakti creating a conducive growth environment. This digital transformation, catalyzed by initiatives such as Digital India, is fostering a tech-driven economy marked by enhanced internet penetration, digital payments, and e-governance, thereby fueling growth in sectors like fintech, e-commerce, and digital services. The push to position India as a global manufacturing hub through Make in India and PLI (Production Linked Incentive) schemes is further boosting industrial output, exports, and domestic production capabilities. Compared to other major emerging markets facing demographic and economic challenges, India's combination of demographic strengths, policy reforms, and strategic initiatives positions it as a standout performer and a significant driver of global economic growth in the foreseeable future.

Some of the key factors that would propel India's economic growth.

Strong Domestic Demand

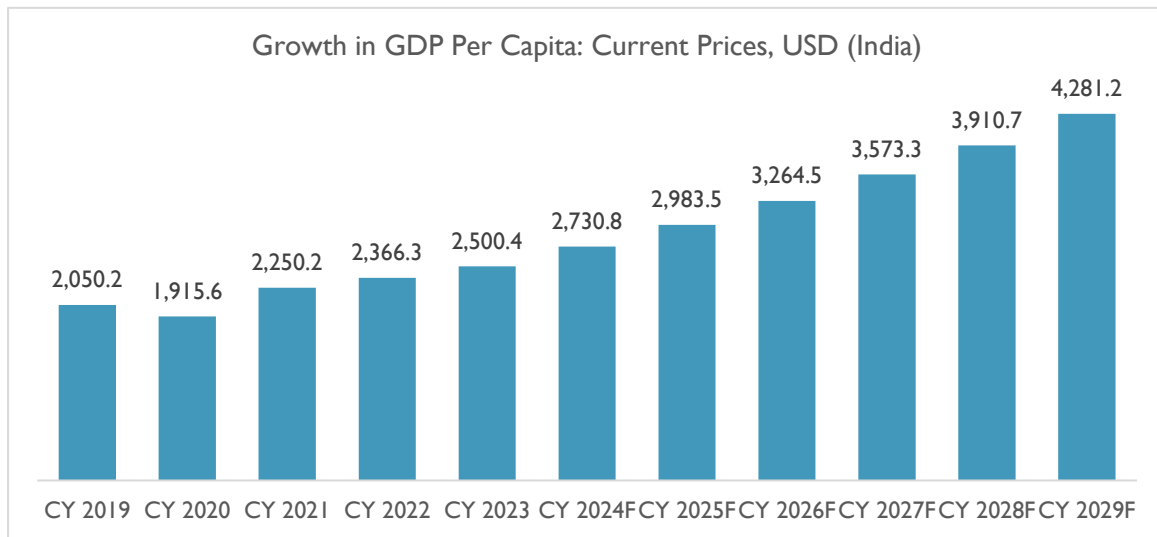
Domestic demand has traditionally been one of the strong drivers of Indian economy. After a brief lull caused by Covid-19 pandemic, the domestic demand is recovering. Consumer confidence surveys by Reserve Bank / other institutions points to an improvement in consumer confidence index, which is a precursor of improving demand. India has a strong middle-class segment which has been the major driver of domestic demand. Factors like fast paced urbanization and improving income scenario in rural markets are expected to accelerate domestic demand further. PFCE as a percentage of GDP increased to 58% during FY 2022 and FY 2023 while in FY 2024 it settled at 56%. There are two factors that are driving this domestic demand: One the large pool of consumers and second the improvement in purchasing power. As per National Statistics Office (NSO), India's per capita net national income (at constant prices) stood at INR 1.06 lakhs in FY 2024 against 99,404 in FY 2023 and 87,623 in FY 2018. This increase in per capita income has impacted the purchasing pattern as well as disposable spending pattern in the country. Consumer driven domestic demand is majorly fueled by this growth in per capita income.

India's Per capita GDP trends

India is poised to become the world's third-largest economy with a projected GDP of USD 5 trillion within the next three years, driven by ongoing reforms. As one of the fastest-growing major economies, India currently holds the position of the fifth-largest economy globally, following the US, China, Japan, and Germany. By 2027-28, it is anticipated that India will surpass both Germany and Japan, reaching the third-

largest spot. This growth is bolstered by a surge in foreign investments and a wave of new trade agreements with India’s burgeoning market of 1.4 billion people. The aviation industry is witnessing unprecedented orders, global electronics manufacturers are expanding their production capabilities, and suppliers traditionally concentrated in southern China’s manufacturing hubs are now shifting towards India.

To achieve its vision of becoming the world’s third-largest economy by 2027-28, India will need to implement transformative industrial and governmental policies. These policies will be crucial for sustaining the consistent growth of the nation's per capita GDP over the long term.



Source: IMF

From CY 2024-29, India’s per capita GDP is projected to grow at a compound annual growth rate of 9.4%. This growth will be driven by the service sector, which now accounts for over 50% of India's GDP, marking a significant shift from agriculture to services.

Digitization Reforms

Ongoing digitization reforms and the resultant efficiency gains accrued would be a key economic growth driver in India in the medium to long term. Development of digital platforms has helped in the seamless roll out of initiatives like UPI (Unified Payments Interface), Aadhaar based benefit transfer programs, and streamlining of GST (Goods and Services Tax) collections. All of these have contributed to improving the economic output in the country. Some of the key factors that have supported the digitization reforms include – the growth in internet penetration in India together with drop in data tariffs, growth in smartphone penetration, favorable demographic pattern (with higher percentage of tech savvy youth population) and India’s strong IT (Information Technology) sector which was leveraged to put in place the digital ecosystem. All these factors are expected to remain supportive and continue to propel the digitization reforms in India.

Increased adoption of digital technology and innovation, inclusive and sustainable practices, business-friendly and transparent regulations, and heightened corporate research and development (R&D) investments will further bolster the country’s growth. These factors will collectively support employment growth across both private and public sectors, including micro, small, and medium enterprises (MSMEs).

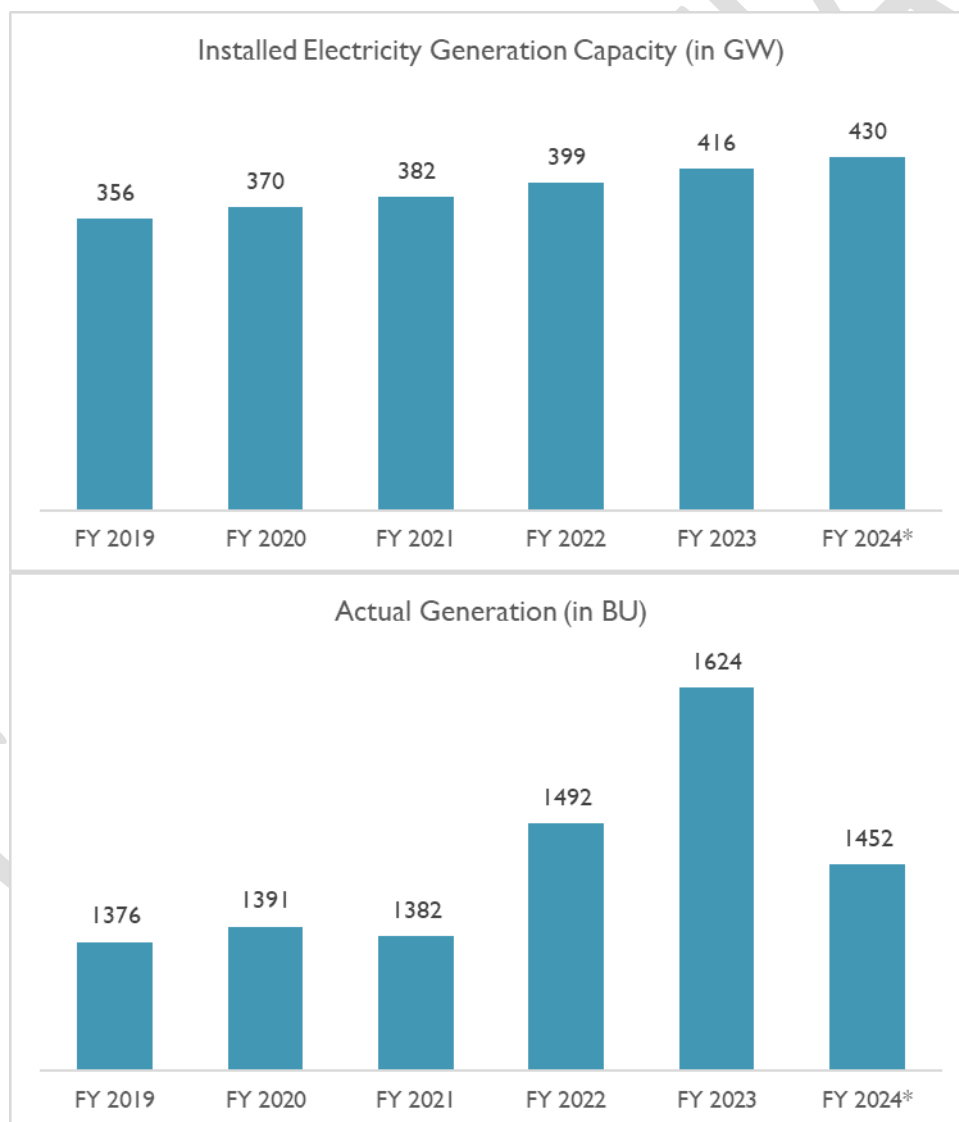
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Electricity Landscape in India

Installed Generation Capacity

Electricity demand in India has grown exponentially on the back of rapid urbanization, and large-scale industrialization. The two factors have increased the pool of consumers, as well as increased the per head unit consumption. This developing demand landscape have led to a rapid scale up in generation sector – with capacity addition happening across thermal, hydroelectric, nuclear, and renewable energy.

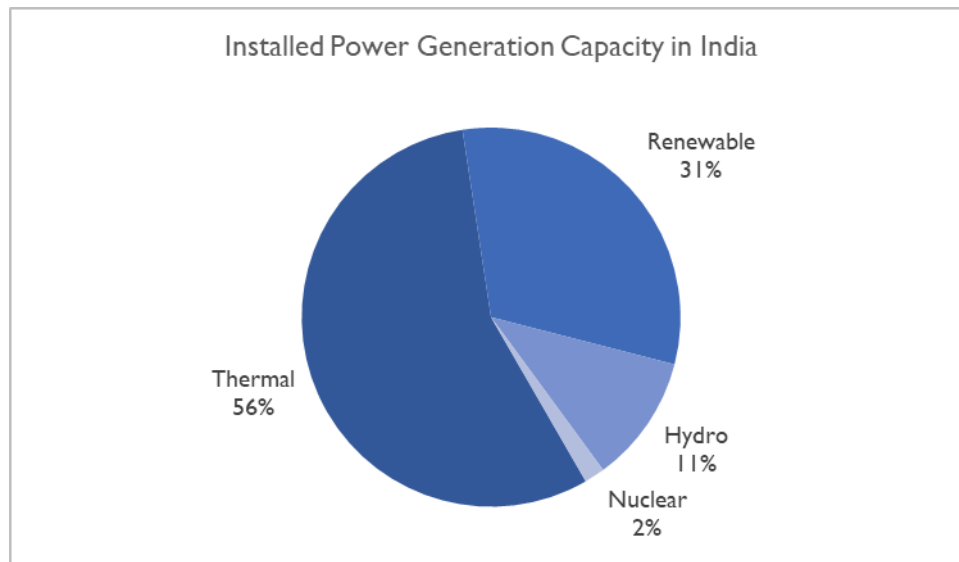
As of January 2024, the installed electricity generation capacity in the country reached approximately 430 GW. During the last five-year period (FY 2019 – 2023), the installed generation capacity in India has increased by a CAGR of nearly 4%. During the same period, electricity generated in the country increased by a CAGR of 4.2% to reach 1,624 billion units (BU) in FY 2023, and 1,452 billion units in FY 2024, as of January 2024.



Source: Central Electricity Authority, Ministry of Power

*Provisional as of January 2024

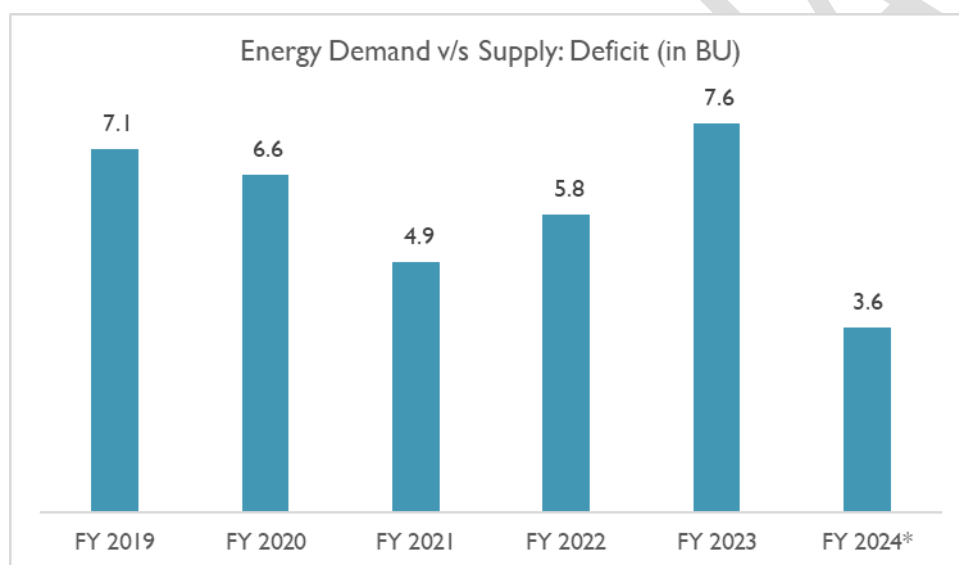
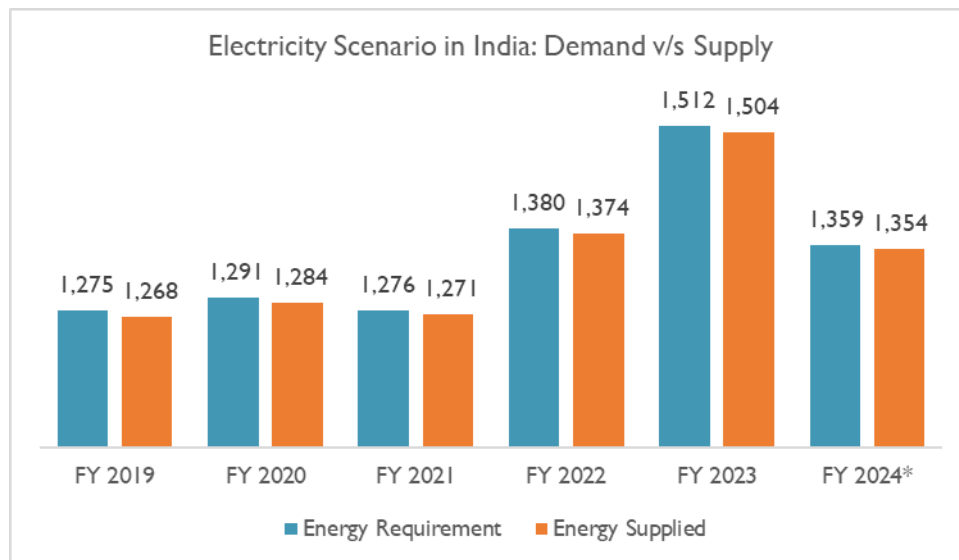
Power generation landscape in India is dominated by thermal power plants, which accounts for nearly 56% of total installed generation capacity. In thermal segment, bulk of the capacity is concentrated in coal fired thermal power plant. Indian Government's push to cut down its carbon emission and meet its ambitious climate change targets has translated into aggressive capacity addition in renewable sector. Renewable sector today accounts for nearly 31% of total installed generation capacity in India. Nearly 33% of the total generation capacity lies with the private sector with remaining divided among state and central Government.



Source: Central Electricity Authority, Ministry of Power

Electricity Demand

India has been experiencing one of the highest rates of growth in energy demand, globally. Rapid industrialization and urbanization have created strong demand. Annual demand reached approximately 1,512 billion units (BU) in FY 2023, and further to 1,359 BU in FY 2024 (as of January 2024), increasing by a CAGR of nearly 3.5% between FY 2019 and 2023. As against this demand, the total electricity generated in the country (from all sources) reached approximately 1,504 BU, creating a energy deficit of nearly 7.6 BU.

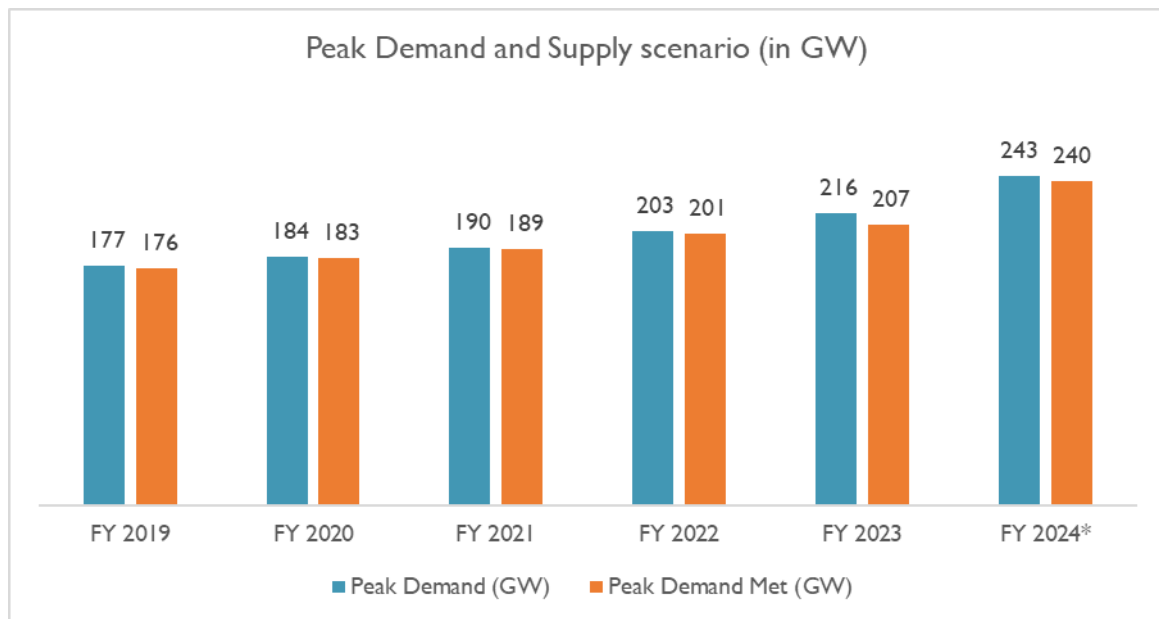


Source: Central Electricity Authority, Ministry of Power

*Provisional as of January 2024

The peak demand in FY 2023 reached 216 GW, a 6.3% y-o-y rise over FY 2022. In comparison, Peak supply was only 207 GW. The deficit in the supply has been on a rise since FY 2021. As of FY 2023, the deficit in supply reached 8.7 GW, as compared to 0.8 GW in FY 2021. During the 5-year period between FY 2019 – FY 2023, the peak demand in the country increased at a CAGR of 5.6%.

As of January 2024 (FY 2024), the peak demand reached 243 GW, while supply was 240 GW. During this period (April 2023 – January 2024), the supply deficit remained on the lower end, standing at 3.3 GW.



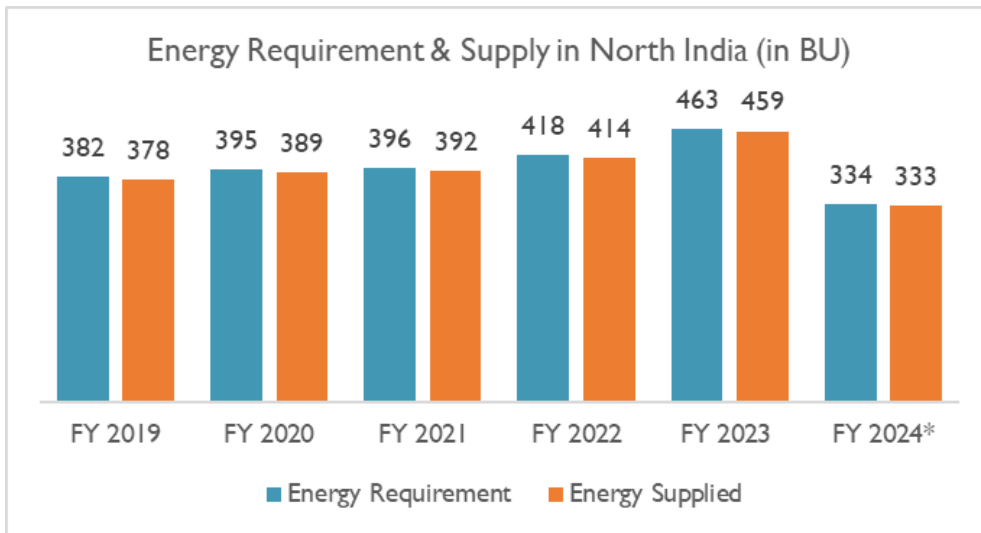
Source: Central Electricity Authority, Ministry of Power

*Provisional as of January 2024

Scenario in North India

As one of the most populous regions in the country, North India encompasses states such as Uttar Pradesh, Rajasthan, Punjab, Haryana, and Delhi, among others. Due to the dense population, rapid urbanization, and industrial growth observed in the Northern region, the energy requirement is substantial. The energy demand in this region is primarily driven by residential, commercial, and industrial sectors. To meet this growing energy requirement, the region relies on a mix of thermal power plants, hydroelectric projects, renewable energy installations, and power imports.

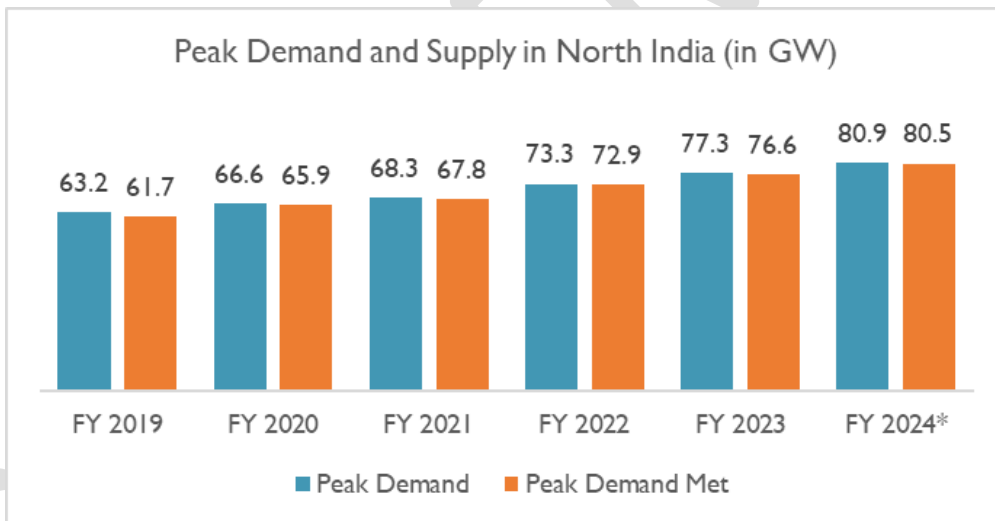
Energy requirement in North India reached approximately 334 BU in FY 2024 (until November 2023) while energy supplied stood at 333 BU, creating a deficit of nearly 1 BU. In FY 2024 (until November 2023), both energy requirement and energy supply in North India accounted for nearly 30% of pan India energy requirement. Between the period FY 2019 and 2023, the energy requirement in the region has increased by a CAGR of nearly 4.9%, while supply has grown at the same rate (CAGR of 5%) to keep track with demand. However, the energy deficit in the region has been increasing for the past couple of months, increasing from 3.8 BU in FY 2021 to nearly 4.4 BU in FY 2023. In this regard, FY 2024, until November 2023, has performed significantly better, with this period recording a deficit of only 1 billion unit.



Source: Central Electricity Authority, Ministry of Power

*Provisional until Nov 2023

The peak power demand in North India region reached 80.9 BU in FY 2024, while supply was nearly 80.5 BU thereby creating a peak deficit of nearly 0.4 BU. The peak power deficit in the region was the highest in FY 2023 over the past four years. This points to a mismatch in demand and supply scenario.



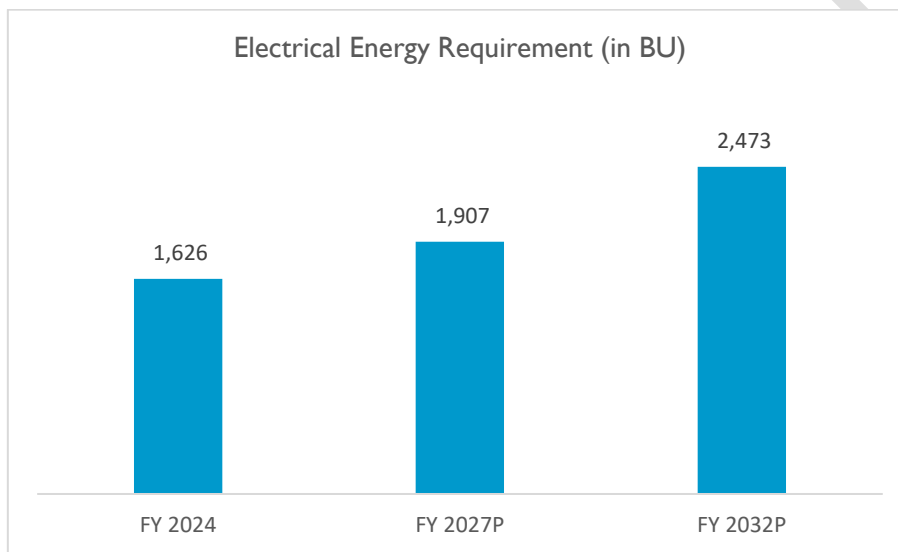
Source: Central Electricity Authority, Ministry of Power

*Provisional until Nov 2023

Growth Forecast

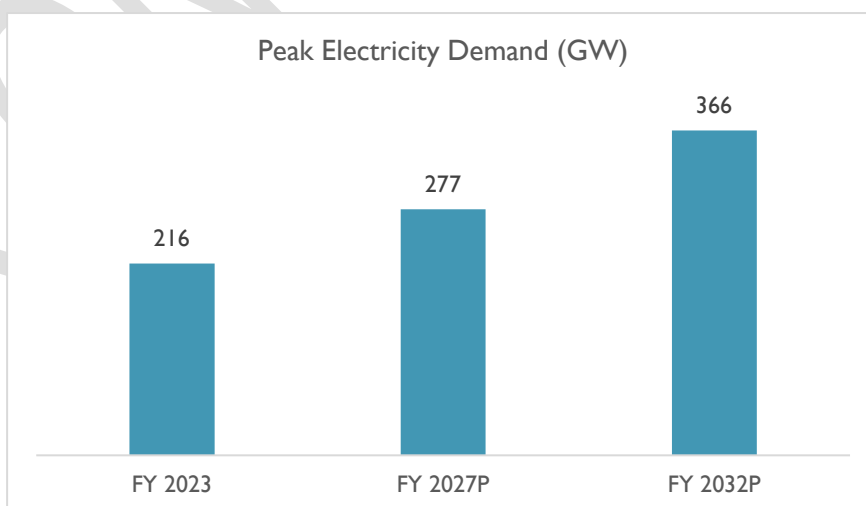
Growth in Electricity Demand

India has been experiencing a significant and steady increase in the demand for power and electricity, driven by its rapidly growing population, urbanization, and industrialization. With these factors in play, the projected electrical energy requirements are expected to surge from 1,626 billion units (BU) in FY 2023 to 1,907 BU in FY 2027 and further to 2,473 BU in FY 2032. This surge in demand reflects the nation's increasing reliance on electricity for various sectors such as residential, commercial, and industrial.



Sources: CEA, (Electric Power Survey, 2022)

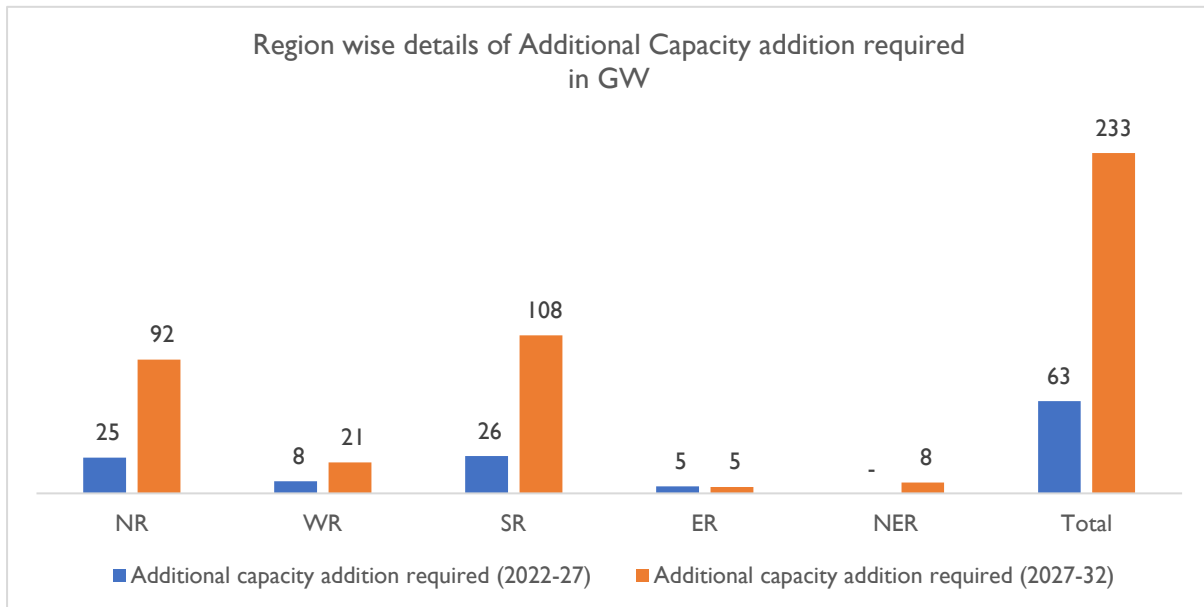
Furthermore, the peak electricity demand is estimated to rise from 216 GW in FY 2023 to 277 GW in FY 2027 and further to 366 GW in FY 2032.



Sources: CEA, (Electric Power Survey, 2022)

These projections highlight the need for robust infrastructure development, energy conservation measures, and sustainable energy sources to meet the escalating power requirements while ensuring uninterrupted and reliable access to electricity for all segments of society.

To add to it, apart from capacity already under-construction, it is estimated that a total of 63 GW of additional capacity will be required between FY 2022 and 2027 while nearly 233 GW of additional capacity would be required between FY 2027 – 32, if the expected demand growth is to be met.



Source: National Electricity Plan 2022

Electricity Transmission & Distribution Infrastructure in India

The power transmission and distribution infrastructure of India is a critical component of the country's electricity sector. The transmission infrastructure consists of high-voltage transmission lines and substations that transmit electricity over long distances from power plants to various regional grids. India has a vast network of transmission lines, including Extra High Voltage (EHV) and Ultra High Voltage (UHV) lines, which facilitate the bulk transfer of electricity.

With high energy requirement and last-mile electrification goals, India has made significant strides in expanding and modernizing its transmission and distribution networks over the years. In FY 2024 (January 2024), India added 9,985 circuit kilometres (ckm) of transmission line and increased its transformation capacity by 44,908 MVA. Over a period of last 5 years (FY 2019 – FY 2023), India has annually added an average of 16,074 ckm in transmission line, and 70,679 MVA in transformation capacity.

This aggressive capacity addition has helped India become one of the largest synchronous electricity grids in the world with a cumulative transmission line infrastructure of nearly 481,326 ckm and a transmission capacity of nearly 1,225,260 MVA.



Source: Central Electricity Authority, Ministry of Power

Growth Forecast

Transmission & Distribution Scenario

Based on the projected increase in electrical energy requirements and peak electricity demand in India, there is a clear need for substantial growth in power transmission and distribution infrastructure. To meet the rising demand, significant investments and advancements in the power sector are being made. It is expected that the transmission and distribution infrastructure will experience a substantial expansion to accommodate the growing electricity requirements.

In order to support the projected energy demand of 1,907 billion units (BU) in FY 2027 and 2,472 BU in FY 2032 and the expected increase in peak electricity demand from 216 gigawatts (GW) in FY 2023 to 277 GW in FY 2027 and 366 GW in FY 2032, the power transmission and distribution network will need to be strengthened and expanded with significant augmentation of the distribution infrastructure. This will involve the construction of new transmission lines, substations, and transformers, as well as upgrades to existing distribution networks to enhance the capacity and efficiency of the grid. Additionally, the deployment of advanced technologies such as smart grids and grid automation will be necessary to ensure optimal power flow and monitoring.

Furthermore, the expected increase in additional capacity requirement will also require a transformation in the power transmission and distribution network with the installation of new transformers, distribution lines, and metering systems to handle the higher loads and ensure reliable power supply to consumers. Thus, growth in power transmission and distribution infrastructure in India is essential to meet the steadily increasing demand for electricity. The expansion of these networks will enable the efficient and reliable supply of power, supporting the nation's economic growth, industrial development, and achieving all power and energy goals.

Key Demand Drivers

India, with its vast population, rapid urbanization, and thriving industrial and commercial sectors, is experiencing a significant surge in the demand for electricity. The increased demand has enforced government to support commissioned power plants to sell electricity even in the absence of valid Power Purchase Agreement (PPA). Several factors are driving this increasing appetite for power. The major factors driving the growth of the sector are increasing urbanization, rising disposable income witnessing a lifestyle shift thereby, having an increasing consumption of electricity. To meet this burgeoning demand, it becomes imperative to bolster the transmission and distribution infrastructure across the nation.

Population Growth

India is home to the largest population (~17.2% of the world), with population density of 481 people per square kilometer. In 2023, India became the country with highest population, with approximately 1.428 billion

individuals. While India's population growth has slowed remarkably over the past few years, it's still growing faster. As the population continues to grow, there is an increasing need for housing to accommodate the expanding population. This growth in population is expected to create a huge demand for houses and residential units, thus resulting in increased requirement for power and electricity.

To meet the electricity demand driven by population growth, India needs to enhance its transmission and distribution infrastructure. The existing infrastructure might not be sufficient to supply electricity to densely populated areas or far-off rural areas with little to no connectivity. Upgrading and expanding transmission and distribution networks is necessary to ensure a reliable and uninterrupted power supply.

Urbanization

The growing population is expected to create a huge demand for residential units, especially in urban areas. As per the handbook of urban statistics 2022, India's urban population has been on a steady rise, with urban dwellers accounting for over 469 million in 2021, a number projected to soar to over 558 million by 2031 and further exceed to 600 million by 2036. This rapid pace of urbanization is expected to create a huge demand for residential units.

This urbanization represents the transformation occurring within Indian cities, as millions flock to urban centers in search of opportunities and a higher standard of living. Moreover, increasing number of nuclear families and changing consumer preferences will further propel the demand for houses. Urban areas require electricity for residential, commercial, and industrial purposes, leading to a surge in overall electricity consumption.

In order to meet the electricity requirements arising from urbanization, India must improve its transmission and distribution infrastructure. The current infrastructure may not adequately provide electricity to densely populated regions or newly established urban areas. Upgrading and expanding the transmission and distribution networks is essential to guarantee a dependable and uninterrupted power distribution.

Growth in demand from Industrial & Commercial Consumers

India is experiencing significant industrial and commercial growth across various sectors. It is set to become a global manufacturing hub with investments across the value chain among all the industries. Industries such as manufacturing, construction, information technology, and services require substantial electricity for their operations. Additionally, the growth of commercial establishments like shopping malls, hotels, and offices further contributes to the demand for electricity.

Out of total power consumption, the industrial sector holds a share of approximately 43%. Per Capita consumption of Energy showed a CAGR of 3.78 % for the period FY 2019 - 2023. Such industrial expansion along with increasing per capita income is contributing to the increased electrification and per capita usage.

Power consumption from April 2022 to March 2023 surpassed the FY 2021-22 level where FY 2023 stood at 1,403.40 BU, higher than the 1316.76 BU recorded in the entire 2021-22 fiscal. Further, increasing

government focus on infrastructure development to fulfil the demand of growing population will contribute to the overall growth of the sector.

To cater to these demands, as well as industrial and commercial expansion, there is a need to reinforce the transmission and distribution infrastructure. Industries and commercial entities often require high-capacity power connections, and the existing infrastructure may not be equipped to handle the increased load in the coming years. Expanding the network and upgrading the transmission and distribution lines is crucial to support the growing demands of these sectors.

Growth in demand from retail consumers

With rising incomes and improving living standards, the demand for electricity in households is increasing. Households depend on electricity for lighting, cooking, heating, cooling, and powering various appliances and electronics. As more households gain access to electricity or upgrade to higher-powered appliances, the overall electricity demand rises.

In this case scenario, India needs to enhance its transmission and distribution infrastructure at the local level to meet the growing household consumption. This involves strengthening distribution networks, upgrading transformers, and installing additional distribution substations to ensure an adequate supply of electricity to households, especially in rural and semi-urban areas.

Infrastructure Development

India is heavily investing in massive infrastructure projects. This substantial increase in infrastructure development spending in India, as highlighted in the Budget 2024-25, is set to drive the demand for transmission and distribution of power in the country. With the government nearly tripling its infrastructure spending to Rs. 11.1 lakh crore (US\$ 134 billion), equivalent to approximately 3.6% of GDP, compared to previous years, there will be a significant boost in the construction of highways, railways, airports, and smart cities.

Furthermore, the continuation of the interest-free loan to state governments for infrastructure investment for an additional year, amounting to Rs. 75,000 crores incentivizes the states to undertake complementary policy actions and invest in infrastructure development. In addition, the establishment of the Urban Infrastructure Development Fund (UIDF) utilizing the priority sector lending shortfall to create urban infrastructure in Tier 2 and Tier 3 cities, with an annual outlay of Rs. 10,000 crore, further contributes to the demand for electricity.

As a result of the increased infrastructure spending and the implementation of various initiatives, there will be a surge in the demand for transmission and distribution infrastructure across the country. Upgrading and expanding the transmission lines, transformers, and distribution networks will be essential to ensure that the power generated from these new infrastructure projects can be effectively distributed to the end-users. The reinforcement of the transmission and distribution infrastructure will enable the reliable and efficient supply

of electricity, meeting the increased demands arising from the country's infrastructure development endeavours.

Increasing Demand from Agriculture

Agriculture is a vital sector in India, employing a significant portion of the population. As farmers adopt modern irrigation techniques, such as electric pumps, the demand for electricity in the agricultural sector increases. Additionally, electricity is essential for post-harvest processing and storage of agricultural produce.

Hence, the need to strengthen the distribution infrastructure in rural areas has become crucial. This involves expanding the network to reach remote agricultural regions, installing dedicated agricultural feeders, and providing reliable electricity supply for irrigation and agro-processing units. Many of these concerns were being undertaken by government initiatives like DDUGJY and RDSS.

Government Initiatives

The Indian government has been implementing various schemes and initiatives to provide electricity access to all citizens, such as the Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya), Deen Dayal Upadhyaya Gram Jyoti Yojana and Revamped Distribution Sector Scheme. These initiatives aim to electrify rural areas and households that are still without access to electricity. Such efforts increase and help meet the demand for electricity, especially in rural areas.

To fulfill the government's electrification goals, it is crucial to enhance transmission and distribution infrastructure in rural areas. This involves extending transmission lines, setting up new substations, and strengthening distribution networks.

Government Regulations

Deen Dayal Upadhyaya Gram Jyoti Yojana

The Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY), launched in December 2014, is a government scheme in India aimed at providing uninterrupted power supply to rural areas. It has three components under its umbrella:

1. **Separation of agriculture and non-agriculture feeders:** The main objective of this component is to separate the feeders in order to provide regulated supply of power to agricultural consumers and continuous power supply to non-agricultural consumers in rural areas.
2. **Strengthening and augmentation of sub-transmission & distribution (ST&D) infrastructure in rural areas:** The requirement for electricity in rural regions is growing steadily because of the expanding customer base and shifts in lifestyle and consumption habits. Consequently, it is important to enhance and reinforce the sub-transmission and distribution infrastructure to guarantee dependable and high-quality electricity provision in rural areas.

3. **Rural electrification:** The previous Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) program, which aimed to electrify villages and establish electricity distribution infrastructure in rural areas, has now been incorporated into the DDUGJY scheme.

The scheme had a total budget of INR 75,893 crores. Out of this, components (1) and (2) with a cost of Rs. 43,033 crores received a budgetary support of Rs. 33,453 crores from the Indian Government throughout the implementation period. The third component of the scheme had an approved cost of Rs. 39,275 crores, including a budgetary support of Rs. 35,447 crores.

The Ministry of Power provided guidance for the scheme, while the Rural Electrification Corporation Limited was responsible for its implementation. Initially, the government allocated 60% of the project cost to most states and reserved 85% for special states. Additional funding of 15% was granted by the government when the first milestones were achieved, with 5% of that amount being reserved for special states.

Achievements under DDUGJY RE:

Under the previous Rural Electrification (RE) program, as of December 31, 2021, a total of 1,365 projects with a combined budget of Rs. 66,380 crore were approved. The Government of India (GoI) released a grant of Rs. 53,414 crore to the states. The progress made in terms of implementation is as follows:

- 2,993 Sub-stations (Incl. augmentation of 2,101 Sub-Stations) commissioned
- 10.14 Lakh Distribution Transformers commissioned
- 7.83 Lakh CKm of LT Lines erected
- 4.73 Lakh CKm 11KV Lines erected
- 0.15 Lakh Ckm 33 & 66 KV HT Lines erected
- As reported by the States, all the inhabited un-electrified villages across the country, as per Census 2011, were electrified by 28th April, 2018.

Achievements under DDUGJY New:

By December 31, 2021, a total of 4,404 projects with a budget of Rs. 47,972 crore were approved, including various components. The GoI released a grant of Rs. 22,755 crore to the states. The physical progress achieved so far is as follows:

- 3,958 Sub-stations (including augmentation of 2,093 Sub-stations) commissioned
- 3.95 Lakh Distribution Transformers commissioned
- 1.23 Lakh CKms of new 11 KV line erected
- 2.96 Lakh CKms of LT Lines erected
- 0.28 Lakh CKms of HT Lines (33 & 66 KV Lines) erected
- 1.22 Lakh CKms of 11 KV Feeders segregated

- Energy Meters in 153.80 Lakh consumer premises, 2.53 Lakh Distribution Transformers & 0.13 Lakh 11 KV Feeders installed

Achievement under DDUGJY Addl. Infra

An amount of Rs. 14,179 crore had been sanctioned to 20 states upon their request for the creation of additional infrastructure exclusively for households covered under the Saubhagya scheme. As of December 31, 2021, a cumulative grant of Rs. 7,165.52 crore has been released by the Government of India to the states. The physical progress made is as follows:

- 228 Sub-stations (including augmentation of 220 Sub-stations) commissioned
- 2.19 Lakh Distribution Transformers commissioned
- 0.66 Lakh CKms of new 11 KV line erected
- 1.96 Lakh CKms of LT Lines erected

The scheme stands closed as on 31-03-2022. However, the power reforms and larger goal of rural electrification under DDUGYJ has been taken under RDSS.

Integrated Power Development Scheme

Ministry of Power, Government of India notified "Integrated Power Development Scheme" (IPDS) on 3rd December, 2014 with the aim to ensure 24x7 Power supplies for consumers, reduction in AT&C (aggregate technical and commercial) losses, and providing access to power to all households. IPDS has the following components under its umbrella:

1. **Strengthening of Sub-transmission and Distribution network in urban areas including provisioning of solar panels on Govt. buildings including Net-metering:** The Indian government has been offering financial assistance to State-owned Discoms/Power Departments through various programs. However, these departments have been unable to keep up with the increasing demand for electricity, resulting in significant gaps and deficiencies in the sub-transmission and distribution network. As a result, the sub-transmission and distribution network has become a hindrance in ensuring reliable and high-quality power supply to consumers.
2. **Metering of feeders / distribution transformers / consumers in urban areas:** The implementation of end-to-end metering is crucial for the power sector. Having effective metering for all consumers ensures accurate accounting, billing, assessment of load patterns, and proper infrastructure planning. It also enables the identification of areas with high losses, prompting corrective measures to reduce those losses.
3. **IT enablement of distribution sector and strengthening of distribution network:** In July 2008, the Ministry of Power, Government of India, launched the Restructured Accelerated Power Development and Reforms Programme (R-APDRP) with the aim of establishing baseline data, promoting accountability, reducing Aggregate Technical and Commercial (AT&C) losses to a level of

15% through strengthening and upgrading the sub-transmission and distribution network, and adopting Information Technology. The R-APDRP has now been integrated into the Integrated Power Development Scheme (IPDS).

The scheme has a total budget of Rs. 76,623 crore. Out of this, the estimated budget for components (1) and (2) is Rs. 32,612 crore, which includes a budgetary support of Rs. 25,354 crore from the Government of India throughout the implementation period.

The R-APDRP scheme, with a cost of Rs. 44,011 crore, including a budgetary support of Rs. 22,727 crore as approved by CCEA, will be carried forward to the new IPDS scheme, in addition to the budget allocation for components (1) and (2) mentioned above.

For the majority of states, the government has allocated 60% of the project cost, while 85% was allocated for special states. Upon achieving the initial milestones, the government provided an additional 15% of funds, with 5% specifically allocated to special states.

According to the February 2022 data from the Ministry of Power and New and Renewable Energy, projects worth Rs.30,802 Crore [with Government of India (GoI) Grant of Rs. 19,332 Crore] have been sanctioned under IPDS covering project components outlined herein, of which GoI grant of Rs.16,717 Crore has been released to the States. The distribution system strengthening works have been successfully completed in 544 circles.

The targets set and the achievements under IPDS 2014- 2022 strengthening project for major works are tabulated below

Items (Unit)	Target	Achievement
New Power Sub Station (Nos.)	999	994
HT Lines (cKm)	24,262	23,539
LT Lines (cKm)	10,769	10,409
AB Cable (cKm)	65,029	64,364
UG Cable (cKm)	21,551	21,336
Roof Top Solar Panels (kWp)	46,544	46,107

This scheme has been subsumed under RDSS, to be implemented as per its extant guidelines, and marked closed as of March 2022. No new projects will be sanctioned under this scheme but projects already sanctioned were eligible to receive funds up to 31st March 2022. However, projects sanctioned for Ayodhya, Uttar Pradesh under IPDS were allocated funds till 31st March 2023.

Revamped Distribution Sector Scheme

The Government of India has introduced the Revamped Distribution Sector Scheme (RDSS), which is a comprehensive initiative aimed at transforming the distribution sector. With a significant budget of Rs. 3,03,758 crore and an estimated financial assistance of Rs. 97,631 crore from the Central Government over a period of 5 years from Financial Year (FY) 2021-22 to FY 2025-26, the scheme focuses on reducing Aggregate Technical & Commercial (AT&C) losses to pan-India levels of 12-15% and eliminating the Average Cost of Supply (ACS)-Average Revenue Realized (ARR) gap by 2024-25.

The primary goal of the RDSS is to improve the operational efficiency and financial sustainability of power distribution companies (DISCOMs). It accomplishes this by providing financial assistance to DISCOMs based on their adherence to pre-qualifying criteria and their achievement of minimum benchmarks. The scheme is divided into two main components:

1. Part 'A' includes financial support for prepaid smart metering, system metering, and the upgradation of distribution infrastructure, while
2. Part 'B' focuses on training, capacity building, and other enabling and supporting activities.

Under the RDSS, DISCOMs must achieve a minimum score of 60% and fulfill specific parameters to be eligible for funding. This encourages DISCOMs to undertake necessary reforms and enhancements in their operations and infrastructure. The scheme also integrates existing power sector reform programs, including the Integrated Power Development Scheme, Deen Dayal Upadhyaya Gram Jyoti Yojana, and Pradhan Mantri Sahaj Bijli Har Ghar Yojana, streamlining efforts under a unified program.

Through the RDSS, the government aims to strengthen the distribution sector, enhance supply infrastructure, and promote the adoption of prepaid smart metering systems. By reducing AT&C losses and closing the ACS-ARR gap, the scheme will improve the financial viability of DISCOMs, ensuring efficient and reliable electricity delivery to consumers. This comprehensive approach will contribute to the overall development and growth of the power distribution sector in India, benefiting both DISCOMs and electricity consumers nationwide.

Achievements

The reform measures implemented under the RDSS, in conjunction with other initiatives by the Ministry, have led to a significant decrease in AT&C losses of DISCOMs from 22.32% in the fiscal year 2021 to 16.44% in the fiscal year 2022. This reduction in AT&C losses has subsequently narrowed the gap between Average Cost of Supply (ACS) and Aggregate Revenue Requirement (ARR) from Rs. 0.69/kWh in FY2021 to Rs. 0.15/kWh in FY2022.

Furthermore, the AT&C losses in the power sector have further decreased to 15.41% (provisional) in FY 22-23. The direct implication of this achievement is a tangible improvement in the ACS-ARR gap, ultimately benefiting end consumers by ensuring the provision of quality power supply.

National Grid: One Nation - One Grid

The "One Nation One Grid" initiative of the Government of India is an ambitious initiative aimed at integrating and unifying the power grids across the country into a single national grid. The policy's objective is to enable the seamless transmission and sharing of electricity across states and regions, ensuring efficient utilization of power resources and promoting grid stability.

Under this policy, the different regional power grids in India, such as the Northern, Western, Eastern, and Southern grids, are interconnected to form a synchronized and interconnected power transmission network. The integration of these grids allows for the transfer of surplus power from one region to another, ensuring a reliable and consistent power supply across the country.

The achievement of this goal was realized with the commissioning of the 765kV S/c Raichur – Sholapur line on December 31, 2013. This milestone paved the way for the integration of the regional grids and laid the foundation for a unified and synchronized power transmission network across the country.

The central agency responsible for the development and strengthening of the transmission network is POWERGRID. Their focus lies in establishing inter-state and inter-regional transmission links to enhance the capacity of the national grid. This proactive approach ensures optimal utilization of India's diverse and unevenly distributed energy resources.

In the fiscal year 2021-22 alone, the country witnessed the addition of 7,200 MW of inter-regional (IR) transmission capacity. This continuous expansion of the transmission infrastructure has resulted in a cumulative capacity of 1,225,260 MVA as of January 2024. These developments reflect the commitment of the government to reinforce the national grid and facilitate the seamless transfer of power across regions.

The implementation of the National Grid system signifies India's commitment to developing a robust and unified power transmission infrastructure. Through the continuous strengthening of inter-state and inter-regional transmission links, the country aims to achieve optimal utilization of resources, enhance grid stability, and foster competition in the power market. These efforts are vital for meeting the growing electricity demand, promoting renewable energy, and ensuring reliable and affordable power supply for all.

Green Energy Corridor

The Green Energy Corridor initiative in India focuses on the development of transmission corridors and associated infrastructure to facilitate the integration of renewable energy into the power grid. It aims to address the challenges of integrating large-scale renewable energy generation by strengthening the transmission network by upgrading existing transmission lines, constructing new high-capacity lines, and establishing substations and transformers.

The initiative aims to balance power supply and demand by transmitting surplus renewable energy from regions with high generation potential to areas with high consumption. It also aims to improve grid stability and reliability, minimize transmission losses, and enable open access and market mechanisms for renewable energy trading.

The 12th Plan Period facilitated the integration and transmission of 32,713 MW of renewable energy capacity. The scheme initially estimated a total funding requirement of Rs. 34,141 Crore for the development of transmission infrastructure and control systems in states with abundant renewable resources such as Andhra Pradesh, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Maharashtra, Rajasthan, Madhya Pradesh, and Tamil Nadu.

The Green Energy Corridor project requires an estimated cost of Rs. 12,693.94 Crore for intra-state transmission systems and Rs. 15,455 Crore for inter-state transmission systems (revised figures). The funding for intra-state transmission schemes involves 20% equity from the State Government, 40% grant from the National Clean Energy Fund (NCEF), and 40% soft loan. Inter-state transmission schemes, on the other hand, are funded with 30% equity from PGCIL (Power Grid Corporation of India Limited) and 70% soft loan.

To support the funding of green energy corridors, a loan agreement has been signed between PGCIL and KfW Germany for a soft loan of Euro 500 million. Additionally, PGCIL has obtained a loan from ADB (Asian Development Bank) for the implementation of transmission schemes under Green Energy Corridor-Part D. Various states including Tamil Nadu, Rajasthan, Himachal Pradesh, Andhra Pradesh, Gujarat, and Madhya Pradesh have signed loan agreements with KfW Germany for financial assistance in implementing intra-state transmission projects.

Green Energy Corridor (GEC) Phase I

GEC-I, was approved by the Cabinet Committee on Economic Affairs (CCEA) in 2015. This scheme involves the implementation of intra-state transmission lines and sub-stations in eight renewable energy-rich states: Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Tamil Nadu. The project aims to evacuate approximately 24 GW of renewable energy power, with around 16.4 GW already commissioned and connected to the grid. The project's total cost is Rs. 10,141.68 crore, funded by 40% central grant from MNRE (Rs. 4,056.67 crore), 40% loan from KfW Germany (EUR 500 million), and 20% equity by the State Transmission Utilities (STUs). As of October 31, 2022, 8,651 ckm of transmission lines and 19,558 MVA of substations have been constructed, with Rajasthan, Madhya Pradesh, and Tamil Nadu having completed all their projects. The commissioning timeline for projects under GEC-I was extended until March 2023.

Green Energy Corridor (GEC) Phase II

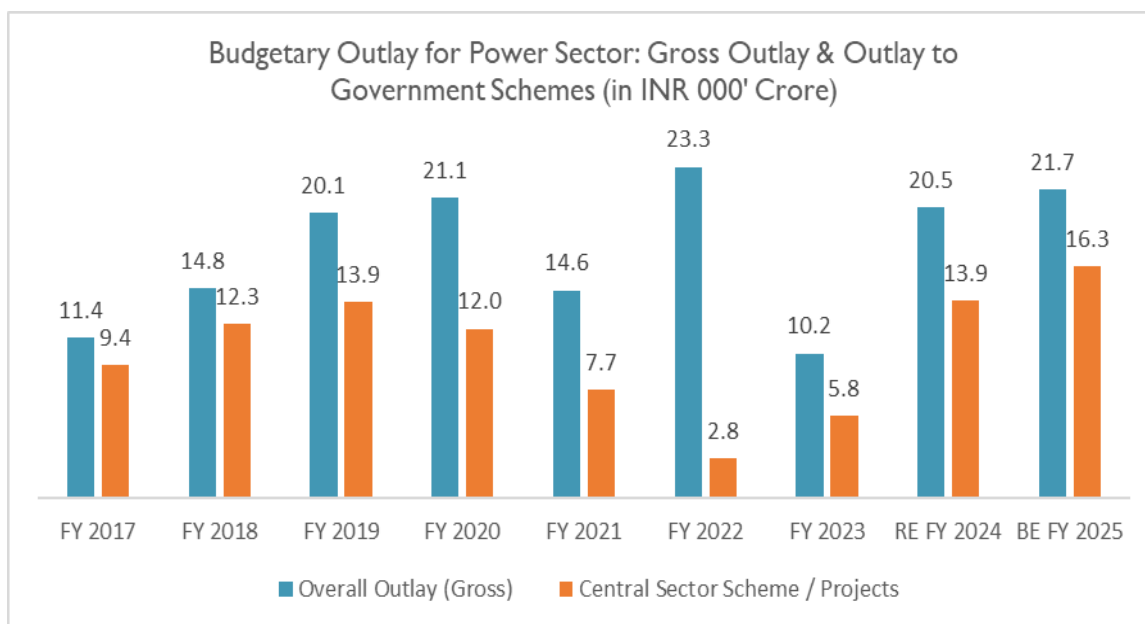
GEC-II was approved by the CCEA in January 2022. This scheme targets the implementation of intra-state transmission lines and sub-stations in seven states: Gujarat, Himachal Pradesh, Karnataka, Kerala, Rajasthan, Tamil Nadu, and Uttar Pradesh. The project's objective is to evacuate approximately 20 GW of renewable energy power in these states with addition of 10,753 circuit kilometres (ckm) of transmission lines and 27,546 Mega Volt-Amperes (MVA) capacity of sub-stations. The project cost is Rs. 12,031.33 crore, with 33% central financial assistance from MNRE (Rs. 3,970.34 crore) and the remaining 67% available as a loan from KfW/REC/PFC. The State Transmission Utilities (STUs) in these states are currently preparing the packages and issuing tenders for the project implementation. The scheduled commissioning timeline for projects under GEC-2 is March 2026.

The State-wise brief of the projects under the scheme is as under:

State	Estimated project cost (₹ Crore)	Length of transmission lines envisaged (ckm)	Capacity of substations envisaged (MVA)	RE addition envisaged (MW)
Gujarat	3636.73	5138	5880	4000
Himachal Pradesh	489.49	62	761	317
Karnataka	1036.25	938	1225	2639
Kerala	420.32	224	620	452
Rajasthan	880.92	1170	1580	4023
Tamil Nadu	719.76	624	2200	4000
Uttar Pradesh	4847.86	2597	15280	4000
Total	12,031.33	10753	27546	19431

Budgetary Outlay for Power Sector

The recent interim budget (FY 2024-25) witnessed a significant growth in budgetary allocation for ongoing Government schemes. Although power sector has always remained a key focus area of successive Governments, there was a moderate decline in budget outlays for existing schemes during FY 2022 and FY 2023. In its latest budget, the Government reversed this trend by increasing its outlay - underlining a renewed commitment to infrastructure development and central sector initiatives, reflecting the government's efforts to boost economic growth and address key developmental needs.



Union Budget, Government of India

Realizing the challenges faced by the T&D segment, the budget provides special emphasis on Reform Linked Distribution Scheme – which was launched to improve the operational efficiency & financial stability of stakeholders in distribution segment. The program saw an outlay of INR 14,500 crore in budget FY 2025, an increase of nearly 40% from the outlay that was provided during the previous budget (RE 2023-24).

Aggregate Technical & Commercial (AT&C) losses in Indian power sector

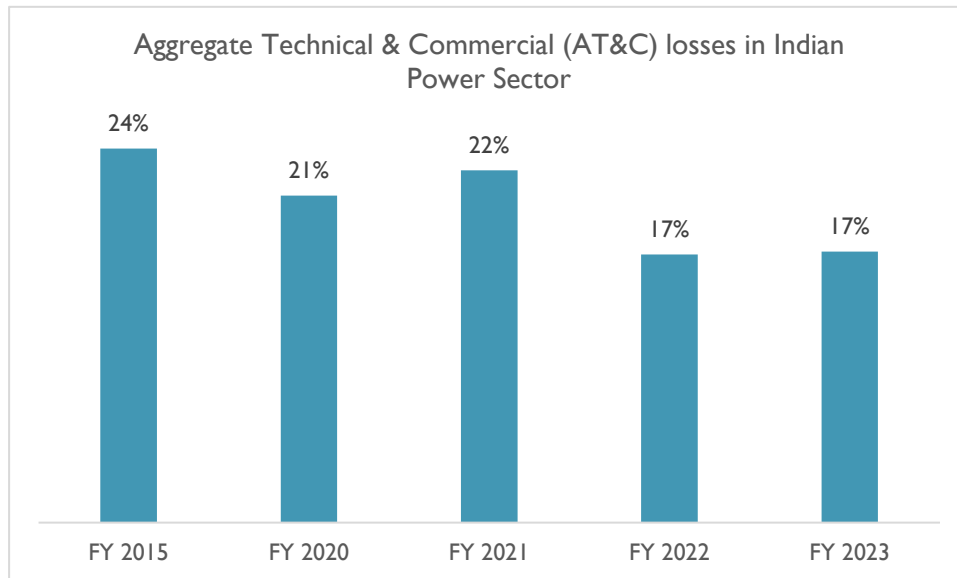
Mounting AT&C Losses in India

Power distribution sector in India have undergone transformative changes in the past, to become one of the complex distribution networks in the world. The developments at the distribution level have helped in improving access to grid power, moving towards the goal of 100% electrification. The gap in power demand – supply have reduced, while renewable power integration to the grid become a reality.

Despite these advances in power distribution, the distribution companies (DISCOMs) suffer losses. Annual losses incurred by state owned DISCOMs is estimated to be INR 90,000 crore. One of the reasons behind these losses is the high Aggregate Technical & Commercial (AT&C) losses. Among developing economies,

India had one of the highest AT&C losses, hovering around 30% during 2000s. Power reforms at distribution & transmission levels and efforts by discoms have brought it down, but it still continues to remain high.

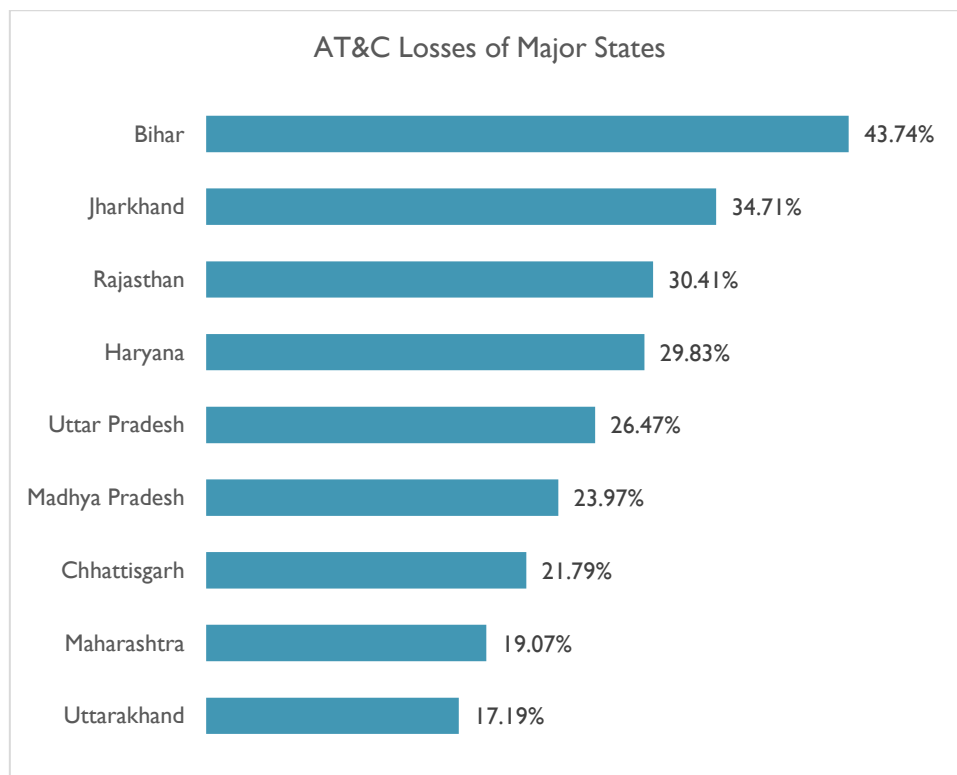
For the year FY 2021, AT&C losses suffered by discoms was approximately 22%³, increasing by nearly a percentage point over the previous year. The year FY 2022 turned out to be a transformative period, as the discoms were able to lower the AT&C losses to 17%, on the back of reforms & policy measures that were implemented during the period.



Ministry of Power, Industry Sources

The regulations & reform measures introduced by the Government over the years has helped in lowering the AT&C losses, bringing it down to less than 20%. Although this is a notable achievement, the current rate is still uncomfortably high. For comparison, AT&C losses in some of the developed economies in the world is in single digit.

³ Indicates the percentage of electricity that is supplied by the discom to the customer, but for which it did not receive revenue.



Source: Ministry of Power, Government of India. Only states with AT&C Loss higher than 17% is considered

AT&C loss is part of any electricity grid and cannot be completely eliminated. This is because part of the loss is due to technical factors, mostly due to outdated technology. However, there is a second part to the AT&C loss, and this is caused by theft in power. Indian power distribution infrastructure lags in both the country – the grid infrastructure is notoriously outdated, and theft of electricity is widespread.

High AT&C losses, and the resultant revenue loss meant discoms were unable to pay power generators. Moreover, under recovery in power distribution meant, the Government was finding it difficult to invest in modernizing the power distribution infrastructure.

Government Initiatives to Reduce AT&C Losses

There have been several reform measures over the years to address the losses incurred by DISCOMs. These included schemes to upgrade the distribution infrastructure, restructuring of DISCOMs, introducing open access in distribution, and formation of independent regulators at state and central level. Some of the notable schemes introduced as part of addressing the power distribution woes include – Ujjwal DISCOM Assurance Yojana, Deen Dayal Upadhyaya Gran Jyoti Yojana, and Integrated Power Development Scheme.

Continuing the reform measures, the Government in 2021 introduced a series of measures that put the onus on discoms to reduce AT&C losses. Most notable of these reforms were “Revamped Distribution Sector Scheme”, a reform measures which was linked to results. This particular reform defined the key benchmarks

& criteria that discoms have to achieve to access Government financial support and grants. Aspects like liquidity infusion and borrowing permissions were all linked to the results achieved as part of the scheme.

Revamped Distribution Sector Scheme

The primary objective of the scheme was to reduce the AT&C losses to the level of 12 – 14% as well as reduce the Average Cost of Supply (ACS) – Average Revenue Realized (ARR) gap to zero. Achievement of both these goals is set for FY 2026. The Government outlay for the scheme was INR 3.03 lakh crores, over five-year period FY 2022 – FY 2026.

The financial outlay for the scheme would be used for two purposes – one to modernize the distribution infrastructure and second to impart training & capacity building activities. However, access to the financial support is contingent on discoms meeting qualification criteria, which includes commitments and actions plans by discoms to reduce their losses.

Scheme Details⁴

- Reduce the AT&C losses to pan India level of 12 – 14% by FY 2025
- Reduce ACS – ARR gap to zero by FY 2025
- Improving the quality & reliability of power supply to consumers (by ensuring an efficiency power distribution infrastructure is in place).

The first part of the scheme, that focuses on improving the distribution infrastructure has financial support linked to installation & adoption of smart metring system. With respect to smart metering, the key features include:

Prioritizing smart meter installation for

- 500 AMRUT cities which has AT&C loss in excess of 15%
- All union territories
- MSME, Industrial and Commercial Consumers
- All Government offices at block level and above
- Any other areas with high AT&C losses

Smart metering for remaining consumers (outside the above given segments) to be taken up in a phased manner by respective discoms.

The scheme would be implemented through a TOTEX (CAPEX + OPEX) mode. For installation of smart meters (for retail consumers), the scheme provides for a 15% subsidy on the meter cost (with an upper limit of INR 900 per meter). For special category states, the cap is 22.5% of cost of the meter (with an upper limit

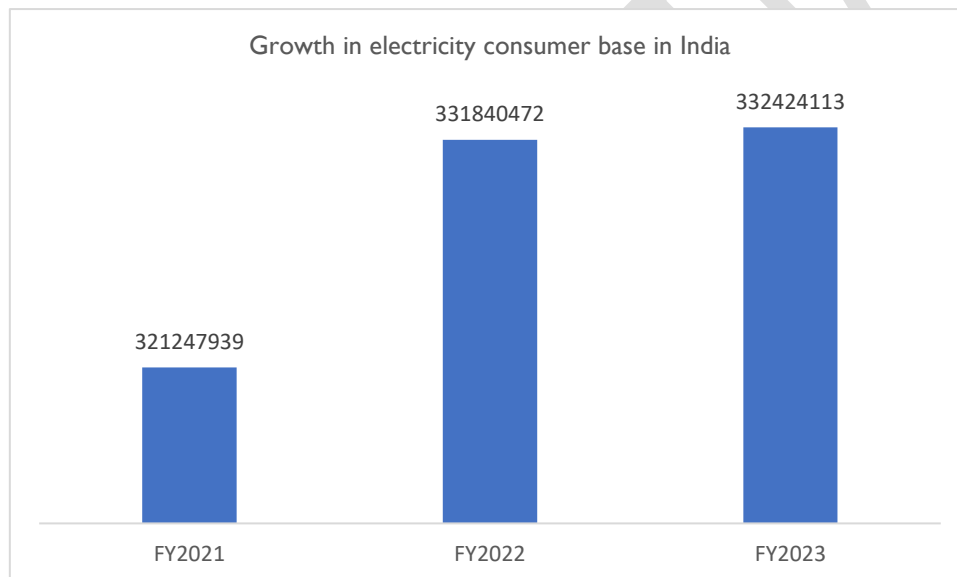
⁴ REC India

of INR 1,350). In this particular case, D&B notes, the subsidy is on a lumpsum basis viz. INR 900/- per meter for single phase, 3 phase and LT-CT meters for consumers and INR 3450/- per meter for DT meters.

Electricity consumer base & electricity Meter infrastructure in India

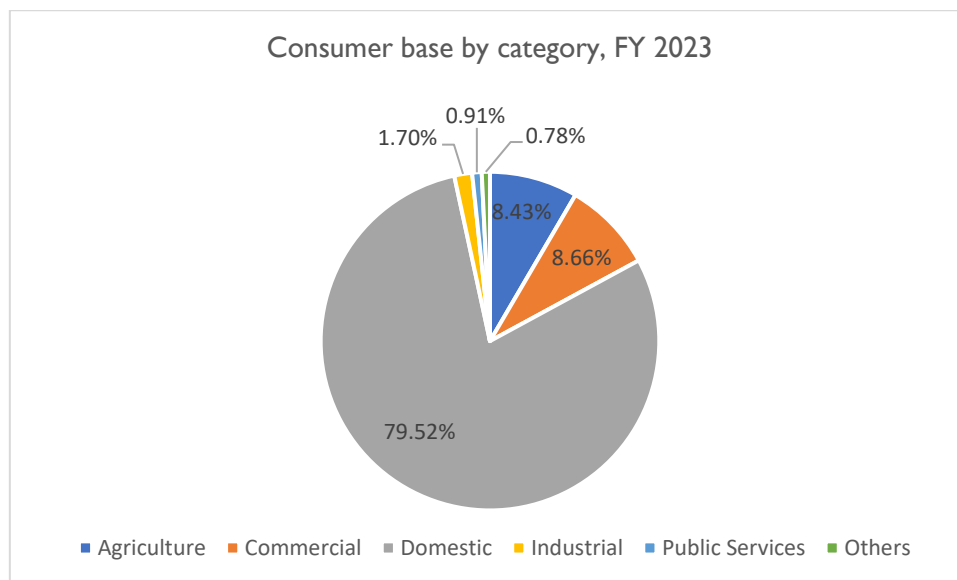
Installed growth in electricity consumer base in India

India's electricity consumer base witnessed a steady rise between fiscal years 2021 and 2023. From FY 2021 to FY 2022, there was a jump of approximately 1.06 million consumers, reflecting a growth rate of around 3.3%. This upward trend continued in FY 2023, with the consumer base adding another 0.58 million connections. While the growth rate appears to have moderated slightly in FY 2023, this ongoing expansion indicates a growing demand for electricity across the country. These figures likely reflect a combination of factors, including government initiatives for rural electrification, increasing urbanization, and rising per capita income leading to higher appliance ownership.



Source: NITI Aayog, India Climate and Energy Dashboard

In FY 2023, India's electricity consumer base showcased a varied composition across categories. Domestic consumers, representing households, formed the dominant group at 79.52%, underlining the prevalence of electricity use in homes nationwide. Commercial establishments came in a close second at 8.66%. The agricultural sector, reliant on electricity for irrigation and other operations, accounted for 8.43% of the consumer base. Industrial consumers comprised a smaller segment at 1.70%, followed by public services at 0.91% and other categories at 0.78%.



Source: NITI Aayog, India Climate and Energy Dashboard

Smart meter installation in India

Smart meter (with respect to electricity distribution sector) is part of the Advanced Metering Infrastructure (AMI) that defines the modern electricity grid. AMI is a two-way communication system to collect real time information on electricity usage by the utility. AMI is a combination of hardware, software, and communication protocols. Based on the requirement of utility, AMI can collect electricity usage by consumer at hourly intervals or every 15 minutes. This eliminates the need for manual meter reading and bill generation. Smart meter is the hardware component of the AMI, which is installed at the consumer’s premise and records the power consumption happening at the consumers end.

To meet the AT&C target outlined in RDSS, within the prescribed time period, nearly 250 million conventional meters will have to be replaced with smart meters. This transition will have to be carried out simultaneously with smart metering feeder level too.

Scenario in India

Smart meter installation predates RDSS, but it gained traction after the implementation of RDSS, in 2021. Of the total 229 million smart meters sanctioned to be installed, nearly 89% is under the RDSS program. Remaining are spread between several schemes like Prime Minister Development Scheme (PMDP), Integrated Power Development Scheme (IPDS), as well as those owned by utilities.

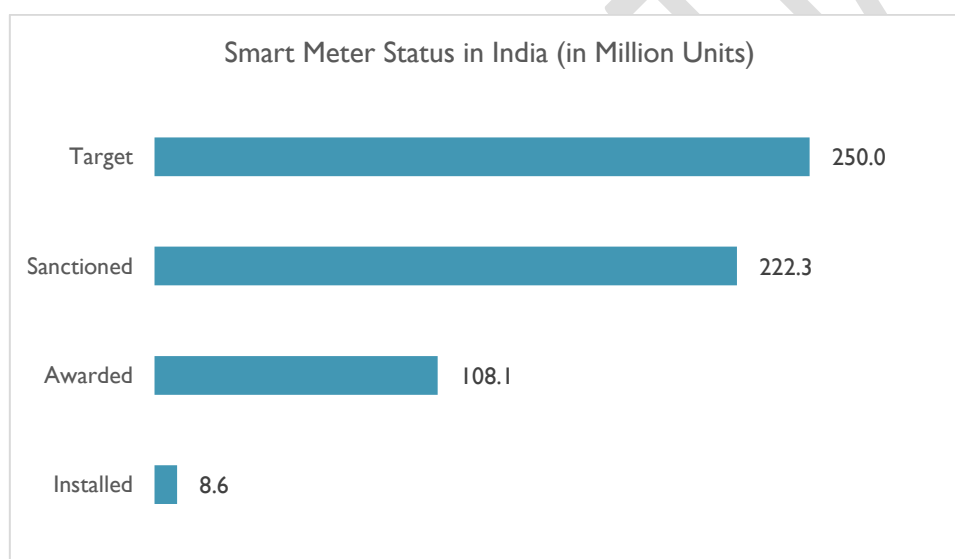
Under RDSS one of the criteria for discoms to access funding (as part of RDSS financial outlay) was to reduce the AT&C losses. It is the requirement that led to the introduction of AMI and replacing conventional meters with smart meters.

However, conversion of conventional meters to smart meters predates RDSS. It first gained traction in 2018, as part of the Government’s Smart Cities Mission. The year 2018 saw tender issuance by multiple agencies

for procuring & installing smart meters. The initial plan was to begin replacing all conventional meters with smart meters from 2019 onwards and complete the program over the next 3 – 4 years. However, the initiative did not pan out as planned, and by the time RDSS was introduced no notable progress was made.

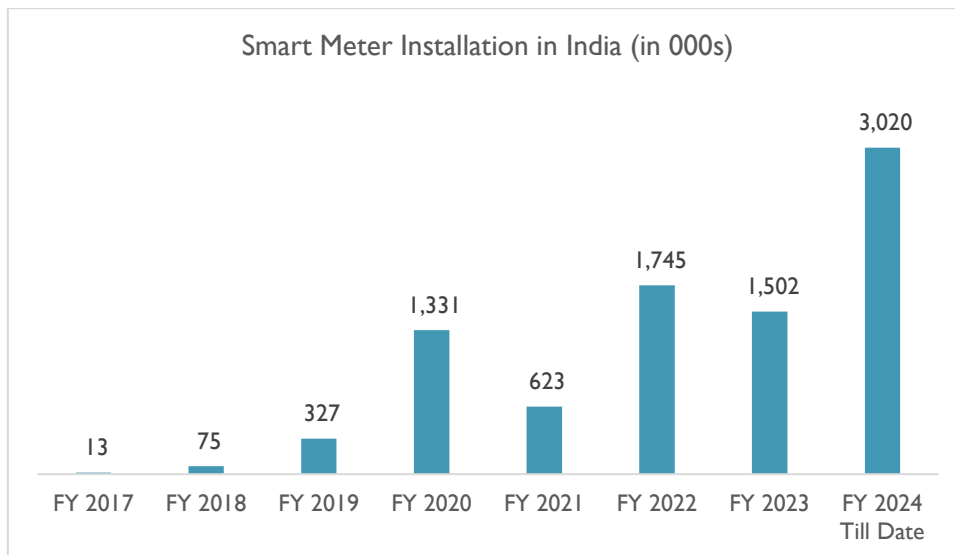
Although past record in smart meter installation has been dismal, the current initiative (through RDSS) is unlikely to repeat it. For one, the Government has linked the funding access of RDSS to tangible results & actions plans by discoms. Hence, unlike earlier, the onus is on discoms to integrate smart meters into their distribution network.

The level of progress attained in smart meter installation since the launch of RDSS points to the effectiveness achieved by the policy. A total of 222.3 million smart meters has been sanctioned while tenders to install nearly 108.1 million has been already awarded. By the end of Jan 2024, nearly 8.6 million smart meters has been installed in the country. Although it represents a fraction of the overall base of electricity meters in the country, the progress made so far is unprecedented.



Source: National Smart Grid Mission, Ministry of Power, As on end Jan 2024

The installation of smart meters started in FY 2017, but the number of meters installed remained low. It was not until FY 2020 when the pace of installation picked up. Installation have gathered pace from FY 2022, when nearly 1.7 million smart meters were installed, followed by another 1.5 million in the succeeding year. So far in FY 2024 nearly 3020 thousand smart meters has been installed.



Source: National Smart Grid Mission, Ministry of Power, As on end Jan 2024

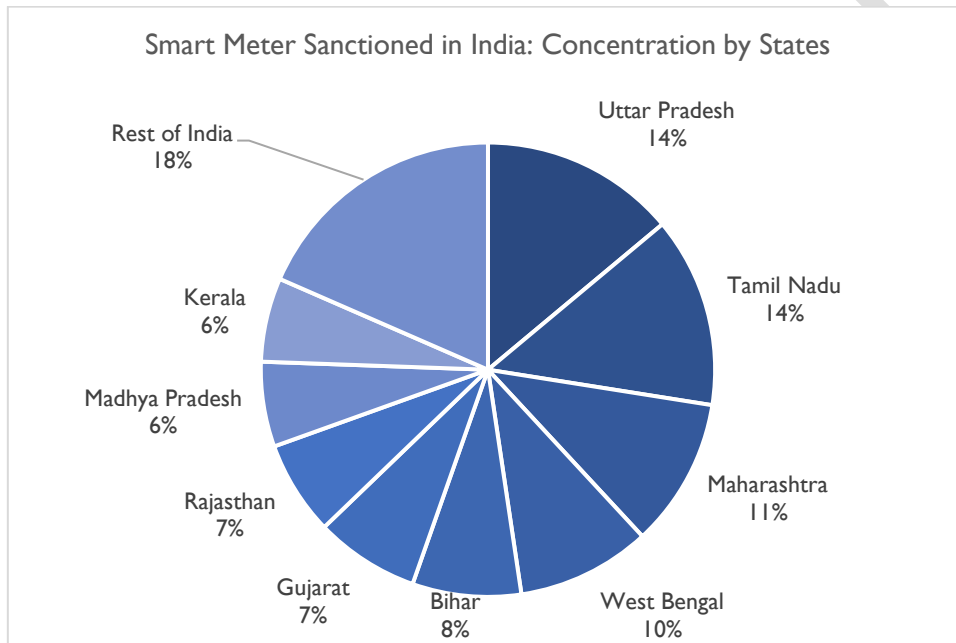
Despite the pickup in installation over the past couple of years, the ground scenario remains nascent. So far tenders for only 15% of 250 million meters to be replaced has been awarded while less than 3% of the total meters has been replaced / upgraded. Hence there is a lot of ground to cover if the target of replacing 250 million conventional meters with smart meters by FY 2026 has to be met.

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State Level Scenario

Nearly 39% of the total smart meters sanctioned to be installed is concentrated in three states – Uttar Pradesh, Tamil Nadu, and Maharashtra. Nearly 82% of the total smart meters sanctioned is concentrated in 10 states.

Apart from leading the list of sanctioned smart meters, Uttar Pradesh has also made strong progress es to awarding tenders for installation, and actual installation. The state accounts for nearly 29% of the total number of smart meters for which contract has been awarded, and 14% of total smart meters that has been installed in the country till now.



Source: National Smart Grid Mission, Ministry of Power, As on end Jan 2024

Smart Meter: Long Term Benefits

Often smart meter installation is seen with a short-term lens of reducing AT&C losses. The flagship scheme RDDS has AT&C reduction as one of its objectives and uses smart meter installation as one of the tools to achieve this target. However, updation of conventional meters with smart meters go beyond reducing AT&C losses. In the long run smart meters would form the core of the smart grid.

Globally electricity distribution is transforming to a dynamic environment with aspects like predictive demand estimation, and demand led pricing is becoming a reality. These grids are more attuned to reacting to consumers' needs and improves the efficiency of the overall grid. Features like demand side management, demand response, load control & curtailment, and remote measuring helps smart meter enhances the overall quality and efficiency of the grid.

In addition, smart meter fits into India' stated goals of net zero emissions, promotion of renewable power over fossil fuel, and grid integration. India has outlined a target of achieving net zero (greenhouse gas) emissions by 2070 and meeting 50% of its electricity demand through renewable energy by 2050. Given the strong energy demand – from industrial users and transportation sector due to the transition to electric mobility – meeting these targets would require development of a response modern power grid which can handle the variations in renewable power. It is here the smart meter and AMI becomes relevant.

Key Challenges

Smart meters that are replacing conventional meters in India comes with two options – prepaid and post-paid – very similar to the operating models in cellular telecom. The greatest challenge that discoms are facing is with respect to consumer acceptance of prepaid meters.

Electricity usage and its payment has long been a contentious issue in India. This is especially true in the case of domestic consumers, with presence of subsidized tariffs, and in some cases free usage. The presence of these attributes has already impacted the revenue / earnings of discom who are struggling to pay generators. Given the strategic nature of the utility, the Government has subsidized electricity tariff to ensure access to lower income people too. In most cases the tariff structure did not take into consideration the true cost of generating & distributing electricity. The resultant tariff structure has created a perception that electricity is priced cheaply. In addition, there is the case of electricity theft which is widely prevalent in India. In fact, theft is one of the reasons behind the high AT&C losses incurred by discoms.

While the AT&C losses can be plugged by improving the distribution network and installing smart meters (which will make meters tamper proof), the biggest challenge would be to change the perception of consumers. Making consumers pay for their usage of electricity, at market rates / near market rates would be the biggest roadblock to rolling out smart meters. The challenge would be strongest in the case of installation of prepaid meters, where consumers have to pay in advance.

Consumer Experience

Since consumer perception about paying the true cost of electricity is the biggest roadblock in smart meter implementation, there is a need to gauge the consumer reaction to smart meters that are already installed and in usage. One such study was conducted by Council on Energy Environment and Water (CEEW) – a not for profit think tank and policy institution based in New Delhi. CEEW conducted an independent survey of 2,700 domestic consumers using smart meters (both prepaid and post paid options). The survey was conducted between March 2022 – April 2022, among ~1,500 post paid consumers and ~1,200 pre-paid consumers, spread across Assam, Bihar, Haryana, Madhya Pradesh, Rajasthan and Uttar Pradesh. These states have the highest concentration of smart meters, and hence preferred as the geography to carry out the survey.

Billing Experience

The remote management nature of smart meters makes the need for a manual meter reading process redundant. Subsequently, bill can be generated remotely with the click of a button. Utilities have used this feature to make bill generation a regular affair, at a fixed date for the consumer. In manual readings, there was no fixed date for bill generation – as it depends on when the meter reading takes place. Hence the biggest impact of smart meters – with respect to billing – is the regularity of receiving bills. Nearly 50% of consumers surveyed as part of the study expressed improvements in their billing process (regularity in billing) after switching to smart meters. Three factors are cited for this improvement:

Billing frequency & bill generation date: In the case of manual bill reading, electricity bill generation takes place once in two months, with actual payment following days / weeks after that. On the other hand, in the case of smart meters billing is done monthly and at a regular / fixed date. For the sample surveyed, smart meter has introduced regularity in electricity billing process – both in terms of making it a monthly process as well as creating a fixed data of bill generation. This in turn has helped impart predictability in electricity bill payments – with respect to date of payment as well as quantum of payment.

Access to Detailed Bill

Switch to smart meters meant billing details are communicated to consumer through digital mode – web interface / mobile app / SMS. In some of the cases, consumers have complained that none of these modes provide a detailed breakup of bill, which will help the consumer understand their electricity usage pattern. Since one of the long term benefit of switching to smart meters is the transparency in billing process offers, the issues concerning access would be the first issues to be addressed.

Awareness and Usage of App

Most of the smart meters installed by utilities is bundled with an interactive portal (web based or mobile app based) which makes it easier for consumers to track their consumption pattern / pay bills / recharge their meters. For consumers, it is this interface that is the key differentiator between a smart meter and a

conventional meter. Realizing this many discoms have invested in developing robust interfaces and taken steps to increasingly engage consumers through the portal. However, the survey results on consumer awareness – which quizzed consumers on awareness of interactive portal – found that nearly 48% of consumers are not aware of the app and only 45% of consumers who are aware of the app is using them.

Bill Payment Experience and Acceptance of Smart Prepaid Meters

Nearly 66% of respondents surveyed have reported ease of bill payment after converting to smart meters – primarily due to the bill payment through digital channels. The positive experience is higher in the case of prepaid consumers. Among prepaid consumers, nearly 58% recharges once in a month while nearly 29% recharging more than once a month. Remaining respondent recharge at higher or lower frequency. The high frequency of users recharging on a monthly & shorter frequency point to the flexibility allowed by the prepaid meters.

Conventional meters operate in a rigid billing cycle, with bill generated every two months. There was a feeling that prepaid meters would face strong resistance from domestic consumers, as they were perceived to be comfortable with the long billing cycle associated with conventional meters. However, the survey response proves otherwise. Given the choice consumers opted to recharge at shorter intervals. The experiment of prepaid meters was most successful in Bihar, which is not the most progressive in terms of electricity bill payment. The success can be attributed to the flexibility and control that smart prepaid meters provided to their consumers.

Overall Consumer Satisfaction

Overall experience of smart meter consumers has been positive (this includes experience on installation, billing, and bill payment). Nearly 60% of smart meter consumers surveyed are satisfied with the technology, as it has made their experience smooth. The satisfaction level is higher in the case of prepaid smart meters (with 63% smart prepaid meter consumers satisfied as against 55% smart post paid meter consumers). Some of the attributes that came to light during the survey, and behind the enhanced consumer satisfaction are:

- Fewer issues during meter installation process
- Ability to access detailed bill, at their convenience (through mobile phone / web portal)
- Transparency in billing process, as well as electricity consumption pattern
- Better control over electricity consumption

Major entities involved in smart meter installation in India

Entities	Overview
Government Bodies	The National Smart Grid Mission (NSGM) spearheads the initiative, setting guidelines and

	<p>providing financial support. State Power Departments and DISCOMs (Distribution Companies) play a crucial role in tendering projects, awarding contracts, and managing meter deployment across their jurisdictions.</p>
Manufacturers	<p>Leading Indian and international manufacturers like HPL Electric & Power, Genus Power Infrastructures, and Itron Inc. design, develop, and supply smart meters that meet the specific technical requirements of the Indian market.</p>
System Integrators	<p>These companies act as a bridge between manufacturers and DISCOMs. They handle project management, communication network setup, data management systems, and integration with existing DISCOM infrastructure. Examples include Accenture, TCS, and Wipro</p>
Financing Institutions	<p>Banks and financial institutions play a vital role by providing loans and credit facilities to DISCOMs and system integrators. This facilitates the large-scale procurement and installation of smart meters.</p>
Installation & Service Providers	<p>Skilled technicians from specialized companies or DISCOMs themselves handle the physical installation, commissioning, and maintenance of smart meters at consumer premises.</p>

Growth prospects

India's smart meter landscape is on a fast track to significant growth. While the current installed base of 3.02 million smart meters (as of January 2024) represents a promising start, the future holds immense potential.

The National Smart Grid Mission's target of installing 250 million smart meters by 2027 is a massive leap forward. This ambitious goal reflects the government's strong commitment to modernizing the country's power grid. It signifies a significant shift from the current base of over 3 million smart meters.

The recent surge in installations further emphasizes this commitment. The number of smart meters installed in 2023-24 nearly doubled compared to the previous year. This rapid acceleration highlights a clear focus on achieving the ambitious target within the set timeframe. Additionally, tenders for over 143.8 million smart meters have already been awarded, with millions more under evaluation and tendering stages. These swift actions by authorities demonstrate a strong resolve towards large-scale rollout, paving the way for a significantly expanded smart meter base in India.

The rise of electric vehicles (EVs) presents another significant growth driver for the smart meter base. With millions of EVs expected to hit the road in the coming years, smart meters will play a crucial role in managing the strain on the power grid. These meters can facilitate dynamic pricing, which adjusts electricity costs based on real-time demand. This allows for efficient load management, ensuring a stable grid even with the increased demand from EVs. Furthermore, smart meters can provide valuable data on charging patterns, which can be used to optimize grid infrastructure and support the widespread adoption of EVs. The synergy between EVs and smart meters creates a mutually beneficial relationship, necessitating a broader smart meter base to accommodate the growing EV market.

Smart meters offer a win-win situation for both consumers and power distribution companies (DISCOMs). Consumers benefit from real-time energy monitoring, empowering them to make informed choices about their energy usage. This transparency allows them to identify areas for potential reduction, leading to lower electricity bills. Additionally, smart meters provide convenient features like remote meter reading, eliminating the need for manual meter readers and potential billing discrepancies. For DISCOMs, smart meters offer a multitude of advantages. They significantly reduce electricity theft, a major concern for the power sector. Furthermore, smart meters enable efficient billing processes, reducing administrative costs and improving revenue collection. Additionally, these meters provide valuable data on grid performance and consumer behavior, allowing DISCOMs to optimize grid management and improve overall efficiency. These widespread benefits for both consumers and DISCOMs further incentivize the adoption of smart meters, propelling the growth of the smart meter base across India.

Competitive landscape

India's electricity infrastructure landscape is undergoing a transformation, driven by the government's push for smart meters. This shift is impacting competition across the sector. While established global giants like Larsen & Toubro (L&T), Schneider Electric, and Siemens hold a strong grip on the high-value segment, specializing in transmission and distribution equipment, the scene is transforming. Domestic companies like Genus Power and HPL Electric are making significant strides, particularly in the manufacturing of meters. This creates a fragmented landscape where international players lead in some areas, while Indian companies are carving a niche in meter production. Further stirring the pot are international technology providers like Itron and Analog Devices, who bring advanced metering functionalities to the table. This mix of established players, domestic challengers, and technology specialists makes for a dynamic and competitive market.


When it comes to securing contracts in the Indian electricity infrastructure market, cost reigns supreme. Government tenders typically award projects to the most economical bidder, driving intense competition on price. However, a race to the bottom isn't the only game in town. Technological innovation plays an equally crucial role. Companies that can offer advanced functionalities like tamper detection and robust data security solutions stand out from the crowd. These features are essential for ensuring the integrity of the smart metering system and protecting against potential manipulation.

Beyond cost and technology, building strong relationships with Discoms (Distribution Companies) is a game-changer. Discoms act as the gatekeepers to a significant portion of the market, and fostering trust and collaboration with them is crucial for securing projects. Furthermore, companies with proven expertise in project execution hold a significant advantage. The ability to efficiently plan, deploy, and integrate complex smart metering systems is essential for success in this rapidly evolving space

The smart meter segment is undoubtedly the most fiercely contested arena within the Indian electricity infrastructure market. Domestic companies are strategically leveraging the "Make in India" initiative to gain a crucial cost advantage. This allows them to offer competitive pricing and make inroads into the market. Established players are not taking this lying down. They are countering this threat by forming strategic partnerships with domestic companies and technology providers. This allows them to combine their expertise in areas like system integration with the cost benefits and local knowledge of their partners. The competition further extends to system integrators, who play a critical role in managing the deployment and integration of these complex smart metering systems. Their ability to seamlessly connect various components and ensure smooth operation is a vital piece of the puzzle.


In conclusion, the Indian electricity infrastructure landscape is undergoing a significant transformation driven by the smart meter rollout. This shift is fostering a dynamic and competitive market where established international players, domestic challengers, and technology specialists all vie for a slice of the pie. Success in this evolving market hinges on a company's ability to navigate a mix of cost pressures, technological innovation, strategic partnerships, and project execution expertise.

Key Players Profiling

Genus Power Infrastructures Limited	
	<p>Company Profile:</p> <p>Genus Power Infrastructures Limited is Indian company engaged in manufacturing and supplying smart metering solutions and undertaking turnkey power projects. They are a part of the Kailash Group, incorporated in 1992 . The metering business segment of the company manufactures and supplies a wide range of electricity meters, including Multi-functional single-phase and three-phase meters, CT operated meters, ABT and grid meters,</p>

	<p>DT meters, Prepayment meters, Smart meters, Net meters, AMI (Advanced Metering Infrastructure), MDAS (Meter Data Acquisition System).</p>
	<p>Services Provided:</p> <p>Metering Solutions: Genus Power offers a complete range of metering solutions, from design and manufacturing to installation and commissioning. They cater to various applications, including residential, commercial, and industrial sectors.</p> <p>Engineering, Procurement, and Construction (EPC) Services: Genus Power undertakes turnkey power projects on an EPC basis. Their services include:</p> <ul style="list-style-type: none"> • Substation erection up to 420 kV • Laying of transmission and distribution lines • Rural electrification • Switchyard development • Network refurbishment
	<p>Products:</p> <p>Genus Power manufactures a wide variety of metering products, including:</p> <p>Smart Meters: They offer a range of smart meters that enable remote monitoring, two-way communication, and tamper detection.</p> <p>Prepayment Meters: These meters allow consumers to prepay for their electricity consumption.</p> <p>Distribution Transformers: Genus Power manufactures distribution transformers for various applications.</p> <p>Metering Data Management Systems (MDMS): They provide MDMS solutions for collecting, managing, and analyzing meter data.</p>
	<p>Key Strengths:</p> <p>Strong Manufacturing Capabilities: Genus Power has a robust manufacturing infrastructure with a capacity to produce millions of meters annually.</p> <p>Diversified Product Portfolio: They offer a wide range of metering solutions to cater to different customer needs.</p>

	<p>Experience in Turnkey Power Projects: Genus Power has extensive experience in executing complex power projects.</p> <p>Focus on Innovation: They continuously invest in research and development to develop new and advanced metering solutions.</p> <p>Strong Customer Base: Genus Power has a large and established customer base across India and internationally.</p>
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Avon Meters Pvt. Ltd	
	<p>Company Profile:</p> <p>Avon Meters Pvt. Ltd is an ISO 9001 certified Indian company established in 1995 , operating in the field of energy metering technology, specializing in manufacturing and supplying a wide range of meters to State Electricity Boards (SEBs) across India. Avon Meters focuses primarily on the metering segment, offering solutions for accurate and reliable measurement of electricity consumption. Their facility in Dera Bassi, Punjab, boasts a production capacity of over 6 million meters annually.</p>
	<p>Services Provided:</p> <p>While their primary focus is manufacturing, Avon Meters also provides some related services:</p> <p>Consultation: They offer consultation services to SEBs regarding their metering requirements.</p> <p>Calibration and Testing: Avon Meters ensures their products meet quality standards through in-house calibration and testing facilities.</p> <p>After-Sales Support: The company provides after-sales support to their customers, ensuring smooth functioning of their meters.</p>
	<p>Products:</p> <p>Avon Meters offers a diverse range of metering solutions, including:</p>

	<p>Electro-Mechanical Meters: These traditional meters were their initial offering, known for their durability and reliability.</p> <p>Static Meters: Avon Meters transitioned to manufacturing static meters in 2001, offering higher accuracy and improved functionalities.</p> <p>Single-Phase and Three-Phase Meters: They cater to both residential and commercial/industrial applications.</p> <p>Smart Meters: While their core focus is not smart meters, Avon Meters is adapting to the evolving market by developing smart meter solutions.</p> <hr/> <p>Key Strengths:</p> <p>Extensive Experience: With over 25 years in the industry, Avon Meters has a deep understanding of the Indian power sector's metering needs.</p> <p>Focus on Quality: Their ISO 9001 certification and in-house testing facilities ensure high-quality products.</p> <p>Strong Manufacturing Capabilities: The company's robust infrastructure allows for large-scale production, catering to demand from various SEBs.</p> <p>Wide Product Range: Avon Meters offers a variety of meters to cater to different applications and customer preferences.</p> <p>Established Customer Base: They have built strong relationships with SEBs across India, solidifying their position in the market.</p>
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Inesh Smart Energy Pvt Ltd	
	<p>Company Profile:</p> <p>Inesh Smart Energy (P) Ltd is an Indian company established in 2014, focusing on innovative metering solutions and smart grid technologies. They position themselves as a bridge between global technology and the Indian smart grid opportunity.</p> <p>Inesh Smart Energy operates as a subsidiary of a global venture, leveraging its expertise to cater to the Indian market. They specialize in:</p>

	<ul style="list-style-type: none"> • Design and Development: The company focuses on research and development to create advanced metering solutions. • Manufacturing: Inesh Smart Energy manufactures smart grid products and metering devices.
	<p>Services Provided:</p> <p>Inesh Smart Energy's primary service lies in providing:</p> <p>Smart Metering Solutions: They offer a range of smart meters with features like remote monitoring, two-way communication, and data analytics capabilities.</p> <p>Smart Grid Products: The company manufactures components that facilitate smart grid functionalities, such as communication modules and software.</p> <p>Consulting Services: Inesh Smart Energy might provide consultation services related to smart grid implementation (information not readily available on their public website).</p>
	<p>Products:</p> <p>Inesh Smart Energy's core product offerings include:</p> <p>Smarte™ Smart Metering System on Module: This patented technology is a key product, enabling meter manufacturers to develop and deploy smart meters efficiently.</p> <p>Communication Modules: They offer communication modules for smart meters to connect with the grid.</p> <p>Software Solutions: Inesh Smart Energy might develop software related to smart grid management and data analysis (details not explicitly mentioned on their website).</p>
	<p>Key Strengths:</p> <p>Focus on Innovation: Inesh Smart Energy prioritizes research and development, contributing to advancements in smart metering technology.</p> <p>Proprietary Technology: Their Smarte™ system offers a unique solution for meter manufacturers.</p> <p>Global Technology Expertise: Being a part of a global venture grants them access to advanced technologies and knowledge.</p>

	<p>Alignment with Smart Grid Initiatives: Their products and services cater directly to the growing demand for smart grid solutions in India.</p>
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