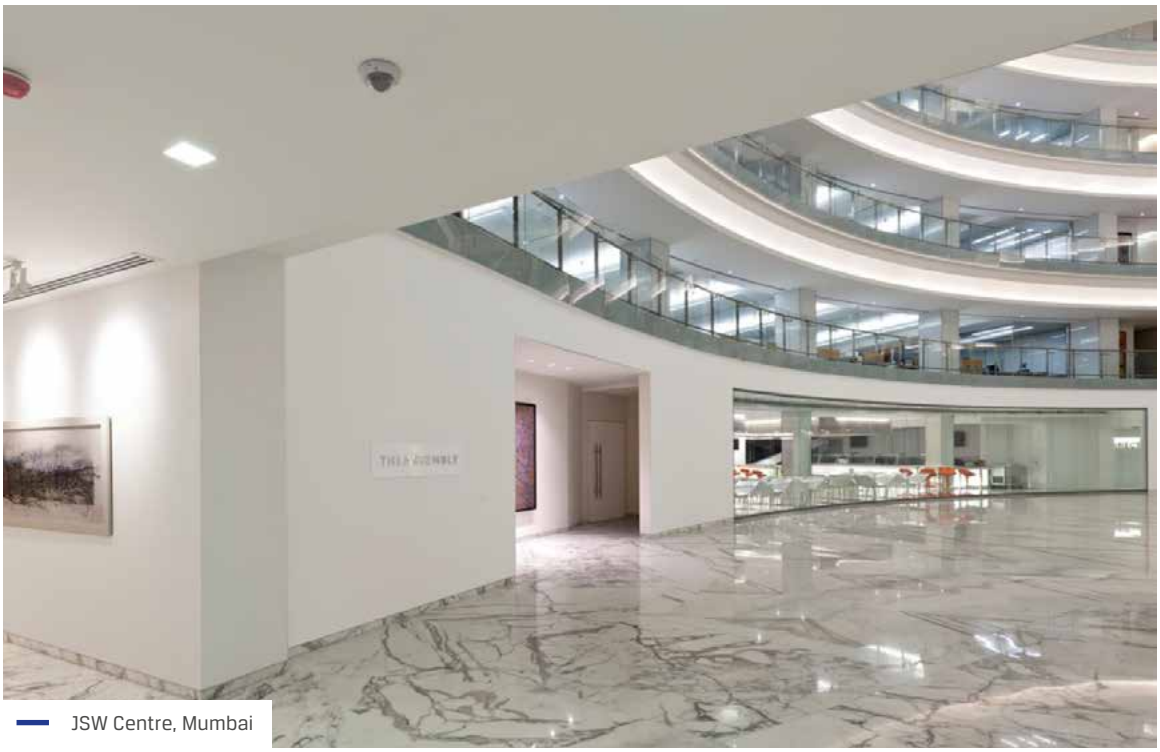
MANAGEMENT DISCUSSION & ANALYSIS



JSW Centre, Mumbai

Economic Review

World economic overview

In 2023, the global economy grew by 3.2%, exhibiting resilient growth with signs of an improved global outlook. The impact of tighter monetary conditions continues, especially in housing and credit markets, but global activity is proving relatively resilient, inflation is falling faster than initially projected, and private sector confidence is improving. Real incomes have begun to rise as inflation has slowed and trade growth has become positive. The concerted efforts of central banks across the globe to tame inflationary pressures, along with a broad base increase in labour force participation and the gradual expansion of global supplies, aided deceleration in inflation. Developments continue to differ among countries, with lacklustre outcomes in many advanced economies, particularly in Europe, counterbalanced by strong growth in the United States and many emerging markets.

As per the IMF, global growth in 2024 and 2025 is estimated to remain persistent at 3.2%, supported by robust government and private spending in several economies. A faster pace of disinflation and steady growth could lead to easing out of tight financial policies. Growth in advanced economies is expected to accelerate slightly to 1.7% and 1.8% in 2024 and 2025, respectively, from 1.6% in 2023. Economic growth in EDMEs is expected to be at similar levels of 4.3% in 2023 and 4.2% in both 2024 and 2025. In the near term, it is imperative for the central banks to manage monetary policy to ensure continued deceleration in inflation and rebuild budgetary capacity to deal with future shocks. Calibrated structural reforms remain the key to reinforcing enhanced productivity and debt sustainability and accelerating convergence towards higher income levels. Multilateral coordination has become more crucial for debt resolution, the mitigation of the effects of climate change, and facilitating the green energy transition in accordance with the 2023 Conference of the Parties to the UN Framework Convention on Climate Change (COP28).

Source: World Economic Outlook April 2024, IMF

Indian Economic Overview

Amidst a challenging global scenario, India has emerged as a significant economic and geopolitical power. 2023 was a landmark year for India, as it assumed the presidency of the G20. India remained the fastest-growing large economy in the world. According to the National Statistical Office (NSO), the real GDP growth is estimated at 8.2% for FY 2024, as compared to 7.0% in FY 2023. India has been a key growth engine for the world, contributing approximately 16% to global growth in 2023.

Real Gross Value-Added has grown by 7.2% in FY 2024 over 6.7% in 2022-23. This GVA growth has been mainly due to significant growth of 9.9% in Manufacturing sector in FY 2024 over -2.2% in FY 2023 and growth of 7.1% in FY 2024 over 1.9% in FY 2023 for Mining & Quarrying sector. The central bank, the Reserve Bank of India (RBI), continued to keep tight monetary controls with the aim of progressively aligning inflation with the 4% target.

According to the RBI, recovery in rabi sowing, sustained profitability in manufacturing, and the underlying resilience of services should support economic activity in FY 2025. It has pegged GDP growth at 7.0% in FY 2025. Consumer price inflation is expected to moderate to 4.5% as compared to the estimated 5.5% in FY 2024 and 6.7% recorded in FY 2023. While the outlook is positive, with a backdrop of risks posed by geopolitical uncertainty, climate change, global indebtedness, and technology disruptions, Inflation, although slightly down, continues to hover above the RBI's target. The ongoing geopolitical climate and potential global economic slowdown pose a threat to India's exports and foreign investments.

Continued broad-based policy initiatives and structural reforms encompassing inclusive growth, a revival in consumption, and fast-paced adoption of new and emerging technologies to enhance productivity signal a prosperous future for the Indian economy. India's economic fundamentals remain strong with the government's unwavering commitment to increase capital expenditure in the near term.

Source: NSO

RBI HAS PEGGED GDP GROWTH AT 7.0% IN FY 2025. CONSUMER PRICE INFLATION IS EXPECTED TO MODERATE TO 4.5% AS COMPARED TO THE ESTIMATED 5.5% IN FY 2024 AND 6.7% RECORDED IN FY 2023.

INDUSTRY REVIEW

On the right path to the emergence of new clean economy

Global energy consumption witnessed moderate growth, driven by the United States and Asian countries witnessing higher energy demand while demand in Europe continued to decline. The share of electricity in final energy consumption reached 20% in 2023, up from 18% in 2015. Energy markets, geopolitics, and the global economy continue to be fragile and face risks given the continued tension between Russia and Ukraine and new tensions in the Middle East.

Weather conditions globally are seen to be extreme, prompting heatwaves and a rise in greenhouse gas emissions. The condition may improve going forward with a continued focus on clean energy, experienced worldwide. Globally, CO2 emissions increased by 0.4 gigatons over the 2022 emission level of 36.8 gigatons, the highest level ever. In contrast, today, more than 8,000 companies and countries representing 90% of global GDP have made net-zero commitments and chalked out a path for decarbonisation. Legislation and policies related to climate change have grown more ambitious. Additionally, there are increasing efforts to prevent vulnerable groups and the developing world from being disproportionately affected by the transition.

The global electricity demand rose moderately in 2023 by 2.2% while reaching a record high. Global power demand is expected to grow by 3–4% per year due to growth in emerging market energy needs and global electrification. Although China, India, and North America are projected to represent more than half of the global power demand growth, economies in regions such as Africa and the Middle East are projected to see the fastest relative growth as per capita wealth grows.

It is anticipated that adoption of renewable energy will continue to increase over the coming decades, contributing 45–50% of generation by 2030 and 65–85% by 2050. This rise in renewables share is to be supported by the expansion of ever-cheaper solar PV and rising nuclear generation. This will aid in the decline in fossil-fired generation by 1.7% annually through 2026. Due to the growing share of intermittent renewable energy sources, supply and demand sides may require more flexible assets to maintain supply security. Long-term energy storage is anticipated to be crucial and is likely to reach a capacity of more than 2,000 gigawatts (GW) by 2050.

Source: EIU, IEA, Mckinsey

Tuticorin Windmill

Global Energy Outlook

The global energy system is undergoing significant shifts, with a phenomenal rise in clean energy technologies such as solar, wind, electric cars, and heat pumps. The use of energy in all aspects, including factories, vehicles, home appliances, and heating systems, is being fuelled by the increasing momentum behind clean energy technologies. Overall, energy consumption is expected to witness 1.8% growth in 2024, led by strong growth in Asia. Europe is likely to witness a third consecutive year of decline in energy demand due to high energy prices and low gas supply.

Global demand for oil, gas, and coal is expected to reach record levels in 2024, despite a rising focus on clean energy. There is a structural economic shift across the globe leading to major implications for fossil fuels. The global demand for coal, oil, and natural gas is expected to peak before 2030, with their share in global energy supply stepping down from ~80% to 73% by 2030, according to the International Energy Agency (IEA).

The global demand for electricity grew by 2.2% in 2023, underpinned by China, India, and the Southeast Asian region, which experienced robust growth in electricity demand in 2023. However, advanced economies posted declines due to a lacklustre macroeconomic environment and high inflation, which reduced manufacturing and industrial output. According to the IEA, global electricity demand is expected to rise at a faster rate over the next three years, growing by an average of 3.4% annually through 2026. A stronger economic outlook will fuel the expansion of power demand in both developed and emerging economies.

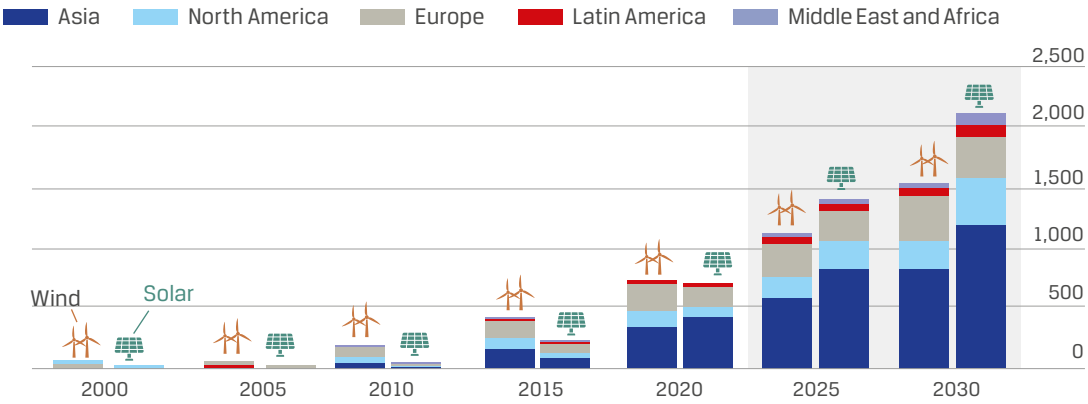
Particularly in advanced economies and Asian countries, electricity demand will be supported by the ongoing electrification of the residential and transport sectors, as well as a notable expansion of the data centre sector. It is projected that electricity will account for 20% of total energy consumption in 2023, up from 18% in 2015. In the IEA's Net Zero Emissions by 2050 Scenario, a pathway aligned with limiting global warming to 1.5 °C, electricity's share in final energy consumption will reach 30% in 2030. The worldwide additions of coal- and natural gas-fired power plants have halved from earlier peaks. Since 2020, the overall investment in clean energy has increased by 40%. Over USD 1 billion is being spent on solar deployment daily across the globe. Manufacturing capacity for key components of a clean energy system, including solar PV modules and EV batteries, is expanding at a fast pace.

Economies across the globe are working to ensure the availability of affordable, clean, and secure energy. The common strategy in this regard is decarbonisation coupled with the increasing use of renewable energy resources. In 2023, the addition of renewable capacity increased by ~50% to ~510 GW, registering the fastest growth in the past two decades. This expansion is expected to continue in 2024 and beyond to reach ~7300 GW by 2028 and 2.5x its current level by 2020. Solar PV and wind are expected to dominate the global renewable expansion

with ~95% share, benefiting from lower generation costs than both fossil and non-fossil fuel alternatives. In 2025, renewables are expected to surpass coal to become the largest source of electricity generation. Wind and solar PV are likely to surpass nuclear electricity generation in 2025 and 2026, respectively. In 2028, renewable energy sources are expected to account for over 42% of global electricity generation, with the share of wind and solar PV doubling to 25%.

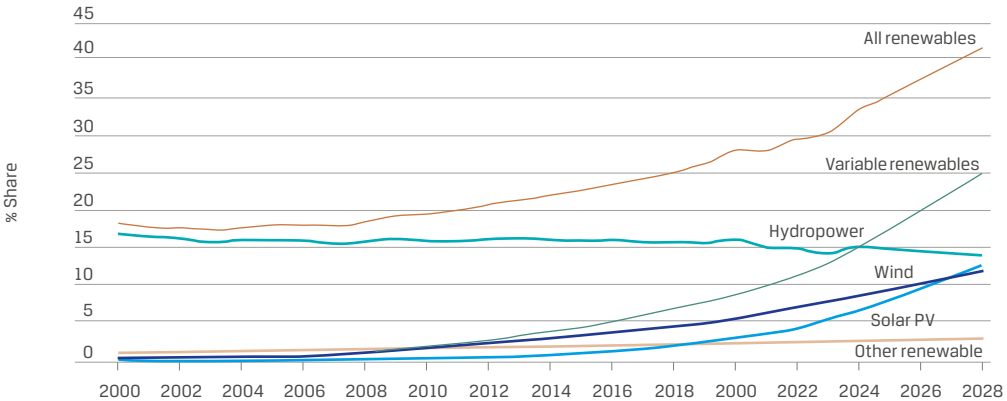
Wind Capacity continues to grow but at a slower pace than solar

(cumulative installed capacity; GW)



There has been substantial growth in renewable capacity, and China is likely to contribute ~60% of the new renewable capacity expected to become operational globally by 2028. The tremendous rise in deployment of onshore wind and solar PV in China is driven by the technologies' economic attractiveness and supportive policy environments that provide long-term contracts. China's role is critical in reaching the global goal of tripling renewables because the country is expected to install more than half of the new capacity required globally by 2030.

Share of renewable electricity generation by technology, 2000-28



In comparison with the last five years, solar PV and onshore wind additions through 2028 is expected to more than double in the United States, the European Union, India and Brazil.

Source: EIU, IEA

Ratnagiri

Climate Change Conference COP28

The 13-day-long United Nations Climate Change Conference, COP28, turned out to be the largest ever, with all parties agreeing to triple global renewable energy capacity and double the current annual rate of energy efficiency improvements by 2030. These steps are imperative if the temperature rise on the planet is to be restricted to 1.5 degrees Celsius. Twenty countries pledged to launch the 'Declaration to Triple Nuclear Energy by 2050'. 118 governments committed to tripling renewables and doubling the rate of energy efficiency improvements by 2030. Twenty-two countries committed to triple their nuclear energy capacity by 2050.

Though a complete fossil fuel phase-out was not agreed upon, all parties agreed to phase down and transition away from fossil fuels in a just, orderly, and equitable manner. This made it evident that parties realise the inevitability of the end of the fossil fuel era. This conference has gained popularity as the "beginning of an end" for fossil fuel usage across the globe.

Under the first global stocktake, parties agreed that despite efforts on mitigation, adaptation, and means of implantation and support, they were unable to achieve complete success in reaching milestones agreed upon in the Paris Agreement. A comprehensive roadmap has been created to aid the parties in getting back on track with their target of achieving net zero goals.

Progress was made in adaptation and finance, including the operationalisation of the Loss and Damage Fund, by the developed countries to help those countries suffering the worst impacts of climate change, such as flooding or drought, with little contribution to the cause of the calamity. The commitments to address loss and damage started coming in immediately after the decision was given, totalling more than USD 600 million to date.

A series of initiatives called the Global Decarbonisation Accelerator (GDA) designed to speed up the energy transition and reduce global emissions were also agreed upon. GDA is aimed at decarbonising the existing energy system and building the energy system of the future. It will enable the parties to tackle the 20–24 GtCO2 per annum greenhouse gas emissions reduction target needed by 2030 as high as the global stocktake. The O&G Decarbonisation Charter was signed by 50 companies comprising over 40% of global oil and gas production. The UAE Hydrogen Declaration of Intent was also signed to restrict emissions from cooling as usage of air conditioning is on the rise.

The Industrial Transition Accelerator (ITA) was launched at COP28. ITA is aimed at accelerating the delivery of Paris-aligned ambitions across heavy industries like cement, steel, and aluminium, transport (shipping and aviation), and energy—industries that are the major contributors to global emissions. ITA is expected

to motivate policymakers, experts, and financial institutions to collaborate to scale the implementation and delivery of decarbonisation projects. In all, the meeting motivated countries, governments, and all stakeholders to achieve their set energy goals. In addition, it emphasised the important role corporations will assume in achieving climate control targets.

The G20 Delhi Declaration: Nations with differences unite to address global climate change challenges

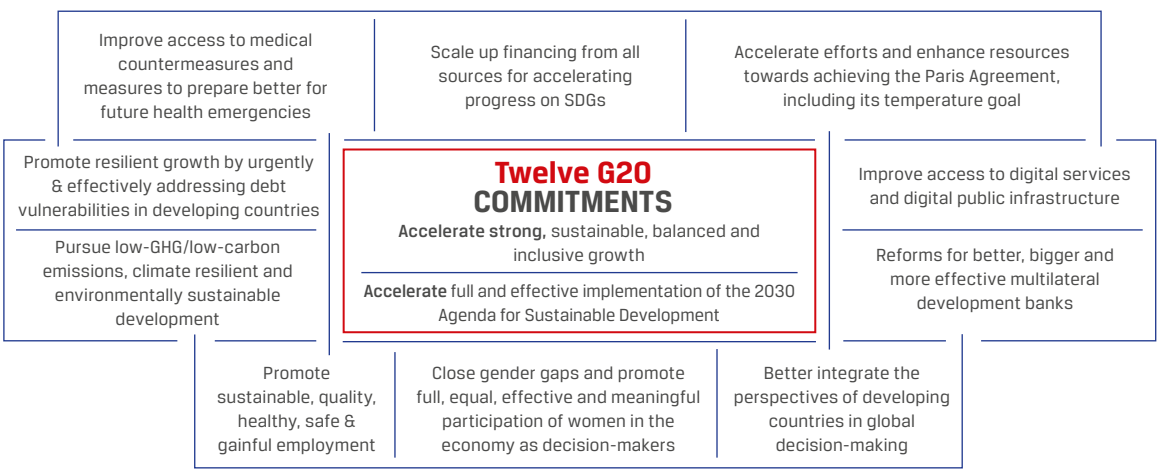
India has been a firm supporter of climate justice, climate finance, and green credit. It has been successful in achieving its emission intensity targets 11 years before the promised timeline. India is on track to generate 500 GW of renewable-based electricity generation capacity by 2030. The country has announced a Green Credit Initiative that emphasises creating more carbon sinks, which means that plants, oceans, and soil absorb more carbon from the atmosphere than they release.

In 2023, India have added 18.5 GW of renewable capacity, with solar contributing 15 GW. Indian Railways has resolved to reach net zero by 2030, thereby mitigating carbon emissions by 60 million tonnes annually. Having achieved 12% ethanol blending with petrol five months ahead of the estimated target, India is targeting 20% ethanol blending with petrol by 2025.

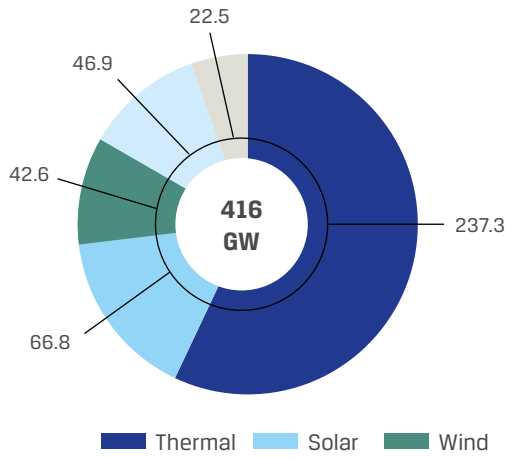
India's G20 presidency promoted multilateralism, setting the stage for COP28 and bringing together nations driven with differences. The G20 countries made a significant commitment to triple global renewable energy capacity by 2030 and expedite efforts to phase down coal power, taking into account national circumstances. The G20 Declaration comprises 12 commitments that address various global challenges, including climate change and debt vulnerability. The Declaration spelled out the pressing need of the developing nations for funding of USD 5.9 trillion until 2030 for nationally determined contributions and an additional USD 4 trillion annually for clean energy technologies to meet zero emission goals. The developed nations acknowledged this need and agreed to put the best foot forward towards raising such finances amidst the global financial crisis due to geopolitical tensions. There has been a definitive commitment to change the way of operations of multinational development banks, making available cheaper funds, providing currency exchange guarantees, and ensuring disaster clauses are included in debt repayment deals. In addition, India stressed the need for clean energy projects, research institutions working on clean energy, and global standards in the field of green hydrogen.

In COP28, India refrained from joining the group of countries backing the Global Renewables and Energy Efficiency Pledge. India has proposed to host COP33 in 2028, signifying the country's commitment to change its energy mix and increase the share of non-fossil fuels to 50% by 2030. India positioned itself as the voice for developing nations, emphasising the fact that developed countries need to play a larger role and meet the mutually agreed-upon climate goals. India currently operates nine projects with the support of the Green Climate Fund, amounting to a total financing of USD 542.3 million.

As on 31st March, 2024, India's renewable capacity stood at 143.64 GW and at 190.57 GW including large hydropower capacity.



Total installed capacity in GW (as on 31st March, 2023)



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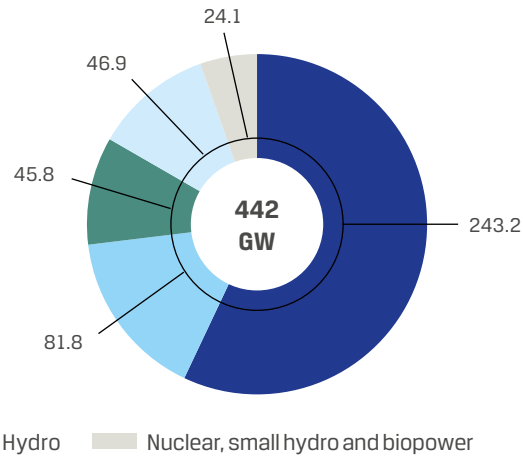

Source: Ministry of Power, Central Electricity Authority (CEA)

India riding strong on the clean energy path

India is the third-largest energy-consuming country in the world. According to the IEA, India has emerged as fourth globally in renewable energy installed capacity, fourth in wind power capacity, and fifth in solar capacity. India is on a strong footing on its Panchamrit journey on climate action, targeting 50% non-fossil installed capacity by 2030, a reduction of total projected carbon emissions by one billion metric tonnes from 2022 to 2030, a reduction of the carbon intensity of the economy by 45% by 2030 (over 2005 levels), and achieving net zero emissions by 2070.

India remains committed to unprecedented levels of investment in the energy sector. India's renewable energy sector saw an infusion of USD 6.1 billion in foreign direct investment (FDI) from April 2020 to September 2023. With a view to encouraging domestic and foreign investment in the energy sector, several initiatives have been taken by the Indian government, which include establishing a Project Development Cell to facilitate investment, creating Ultra Mega Renewable Energy Parks, and implementing new transmission lines under the Green Energy Corridor Scheme.

India has exhibited a strong foothold as the world's largest expansion plan in renewable energy. India installed a non-fossil fuel capacity of 18.5 GW during FY 2024. During the year, India held the sixth session of the International Solar Alliance Assembly at Bharat Mandapam. Also, India assumed the presidency of the 13th assembly of the International Renewable Energy Agency (IRENA), the first international organisation to focus exclusively on renewable energy, in Abu Dhabi.

India is implementing the National Green Hydrogen Mission with an investment of ₹ 19,744 crore. With this, India is aiming to emerge as the global hub for the production, usage, and export of green hydrogen and its derivatives. India has become one of the few countries to define the Green Hydrogen Standard. This helps in outlining the emission thresholds to be met in order to be classified as 'Green' (well-to-gate emission of not more than 2 kg C02 equivalent per kg H2), encompassing both electrolysis-based and biomass-based hydrogen production methods.

During the year, India approved phase II of the Green Energy Corridor-IInter-State Transmission System (ISTS) for the 13 GW Renewable Energy Project in Ladakh to be set up by FY 2030 at ₹ 20,774 crore investment and Central Financial Assistance of ₹ 8,309 crore. This project will contribute to the 500 GW renewable capacity target by 2030. In addition, India has implemented the Production-Linked Incentive (PLI) Scheme for the National Programme on High Efficiency Solar PV Modules to achieve a manufacturing capacity of GW scale in high efficiency solar PV modules with an investment of ₹ 24,000 crore. India is also focussing on offshore wind energy across the vast coastline, the solar park scheme, the expansion of the PM Kusum scheme, the grid-connected rooftop solar programme, bioenergy projects, etc.

Press Information Bureau

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Indian Power Sector

Power Demand & Generation

With fast-paced economic development and tremendous efforts by the Indian government to provide access to electricity and clean cooking in the remotest regions of the country, India continues to be among the largest producers and consumers of electricity worldwide. Total installed generation capacity in India stood at 442 GW as of March 2024. For FY 2024, against the target electricity generation of 1,750 BU, 1,738 BU were generated, up 7.1% over FY 2023. India has significantly enhanced its power-generating capacity over the years and successfully addressed the growing energy requirements.

India is the world's third-largest power producer but has a low per capita consumption rate of almost one-third of the world average, providing huge opportunity for growth. During FY 2024, power demand grew 7.5% to 1,627 BUs, led by a spike in economic activities. In 2023, India's electricity demand varied with weather conditions. Power consumption remained subdued in March, April, May, and June due to widespread rainfall, while in August, September, and October demand rose amidst humid weather conditions and growth in industrial activities for the approaching festive season. To ensure uninterrupted power supply, the government extended the mandate of blending a minimum of 6% imported coal with domestic coal until March 2024. The peak power demand in India increased from 136 GW in FY 2014 to 243 GW in September 2023. With continued economic growth momentum, peak demand is expected to rise to 260 GW in FY 2025.

While fundamental factors like increasing population, urbanisation, industrialisation, and an improved standard of living continue to boost power demand in the country, rapid economic growth coupled with the government's strong intention to provide electricity to the last mile is acting as a catalyst for surging demand.

According to the National Electricity Plan notified in May 2023, installed capacity is expected to be increased to 900 GW by FY 2032, out of which carbon-free capacity is expected to be 616 GW. In addition, a battery energy storage system (BESS) with a capacity of 47,244 MW / 2,36,220 MWh is also expected to be installed.

Renewable energy source	Target capacity in MW
Nuclear	19,680
Large Hydro	62,178
Solar	364,566
Wind	121,895
Small Hydro	5,450
Biomass	15,500
Pump Storage Power	26,686

Source: CEA and Press Information Bureau

As of the end of FY 2024, India has an installed capacity of 442 GW, of which 243 GW comes from fossil-fired power plants (coal, gas and oil), 52 GW from hydro, 139 GW from renewable energy plants such as solar PV and wind, and the rest from nuclear power plants.

Generation in Bus	FY 2024	FY 2023	FY 2022
Thermal	1,326	1,206	1,115
Hydro	134	162	152
Renewables	225	203	169
Others (Nuclear+Import)	53	53	55
All-India	1,738	1,624	1,490

(Source: Executive Summary on Power sector, March 2024, CEA)

Thermal Energy: Coal

India's net thermal capacity of 243 GW, as of 31st March, 2024, was comprised mainly of coal. The share of thermal energy has reduced by 2% YoY, though it continues to be the largest source, occupying 55% of the total installed capacity in the country. The growth in thermal capacity was 6 GW during FY 2024, notwithstanding the strong commitment to renewable energy sources to meet growing electricity demand.

Strong economic growth in India is leading to massive power requirements. While India remains committed to its net zero goals, it has to resort to thermal power in the short term to meet the rising power demand. In the next decade, it is estimated that about 80 GW of additional thermal capacity will be needed, according to the government. While thermal energy sources currently dominate power generation, it is expected that the share of coal-fired generation will decline from 74% of total electricity generation in 2023 to 68% in 2026.

Renewable Energy

As per the REN21 Renewables 2022 Global Status report, globally, India is ranked 4th in renewable energy installed capacity (including large hydro), in wind power capacity, and in solar power capacity. In 2023, after the successful hosting of the G20 Summit, India has positioned itself as an attractive destination for energy transition-related investments. While continuing to focus on energy security and affordability, in the coming years, India is expected to push harder on its implementation strategy for the energy transition. By 2030, the target is to achieve 500 GW of non-fossil fuel-based installed capacity, implying 50% of the installed capacity from the non-fossil mode of generation, a key pledge under Panchamrit. By the end of 2030, India aims to reduce the carbon intensity of the economy by less than 45%, achieve 50% cumulative electric power installed from renewables, and achieve net-zero carbon emissions by 2070. India aims to produce 5 MT of green hydrogen by 2030, supported by 125 GW of renewable energy capacity. In FY 2024, India's renewable energy sector witnessed an annual new capacity addition of 18.5 GW, with solar capacity additions constituting 15.0 GW.

Vijayanagar, Solar

1. Hydro Power

Hydroelectric power is a crucial energy source for India, given the abundance of rivers, good rainfall, and a vast coastline. With a view to leveraging this opportunity, projects with an aggregate capacity of 15 GW are under construction in the country. The hydroelectric capacity is aimed at being scaled up to 67 GW by FY 2032.

India's total hydroelectric installed generation capacity stood at 46.9 GW as of 31st March, 2024, constituting 10.6% of the total installed capacity. The government has set a target of 67 GW of hydropower generation capacity by FY 2032.

In FY 2024, hydropower generation declined 17% YoY due to lesser rainfall in India and natural disasters in the northern and northeastern parts of India. In FY 2025, high rainfall and snowmelt in the Himalayan region, led by a rise in temperature, are expected to aid hydropower generation.

2. Solar Power

India is the 4th largest player globally in terms of solar power capacity, having added solar capacity at a fast pace from 21,651 MW in FY 2018 to 81,813 MW in FY 2024. Led by a strong government push with policies like the Production-Linked Incentive (PLI) for domestic manufacturing of modules and panels.

India's total solar installed generation capacity as of 31st March, 2024 stood at 81.8 GW, compared to 66.8 GW as of 31st March, 2023. The contribution of solar energy increased to 18.5% of total installed generation capacity, up from 16% on 31st March, 2023.

According to the Union Ministry of New and Renewable Energy, in FY 2024, the solar power segment added a total new capacity of 15.3 GW, slightly higher than the 12.8 GW added in FY 2023. New solar capacity additions in FY 2024 made up 83% of the total renewable power capacity installed.

The government is encouraging solar production through various schemes and initiatives. The solar park scheme has been designed to establish 50 solar parks of 500 MW and above with a cumulative capacity of ~38 GW by FY 2026. These solar parks will aid in solar energy generation and achieve economies of scale, making solar energy more affordable and accessible. Under this scheme, 11 solar parks with an aggregate capacity of 8,521 MW have been completed, and 7 solar parks with an aggregate capacity of 3,985 MW have been partially completed. In these parks, solar projects of an aggregate capacity of 10,237 MW have been developed.

Other schemes include PM-KUSUM, aimed at achieving a solar power capacity addition of 30.8 GW by March 2026 in the agricultural sector to replace diesel pumps with solar agriculture water pumps and solarise existing grid-connected agriculture pumps. To make solar energy commonplace in rural areas, the rooftop solar programme for the residential sector and the off-grid solar PV applications programme are providing subsidies. India is working to become a solar powerhouse, making solar energy more sustainable and efficient.

3. Wind Power

India ranks fourth in wind power capacity globally. India has set a target to significantly increase its wind energy capacity, with a projected addition of 25 GW between FY 2025 and FY 2028 at a cost of ₹ 1.8–2 lakh crore.

In the wind sector, about 3.3 GW of new capacity was added in FY 2024, about 43% higher than the 2.2 GW capacity added in FY 2023.

India's Central Electricity Authority (CEA) has projected an increase in wind power capacity from 40 GW in FY 2022 to 73 GW by FY 2027 and further to 122 GW by FY 2032, amounting to ~8 GW of new installations per year till FY 2032. Central and state governments are working together to utilise the enormous potential of its 195 GW of offshore energy.

According to the revised strategy for the development of offshore wind energy projects issued in September 2023, a bidding trajectory for the installation of 37 GW of offshore wind energy is in place. The central transmission utility has completed the planning of the required transmission infrastructure for offshore wind projects for an initial 10 GW offshore capacity (5 GW each off Gujarat and Tamil Nadu coasts). The government has also notified the "Offshore Wind Energy Lease Rules, 2023" to regulate the allocation of offshore wind sea blocks to developers. With a vast coastline, India holds good potential for offshore wind energy generation.

4. Storage: Hydro Pumped Storage

Hydro Pumped Storage Projects have assumed significance in the ongoing energy transitions in the country, primarily as PSPs provide greater inertia and balance power to the grid. PSPs are also known as 'the Water Battery', an ideal complement to modern clean energy systems. Currently, PSPs with an aggregate capacity of 2.7 GW are under construction in the county, and another 50 GW is under various stages of development. It is projected that PSP capacity will increase from 4.7 GW to around 27 GW by FY 2032.

Source: National Electricity Plan, May 2023

5. Storage: Battery Energy Storage System (BESS)

As a part of the mega-energy transition movement, India is fast adopting technology to fortify its leadership. To enhance the share of renewable energy, it is crucial to encourage the adoption of battery storage. Energy storage plays a significant role in the integration of renewable energy and unlocking the benefits of local generation, especially at peak load durations. It is expected that by FY 2032, India will have 47.2 GW or 236.2 GWh of installed battery energy storage systems.

To efficiently harness the potential of renewable energy sources such as solar and wind power, the government approved the Scheme for Viability Gap Funding (VGF) for the development of Battery Energy Storage Systems (BESS) with an initial outlay of ₹ 9,400 crore, including a budgetary support of ₹ 3,760 crore. This scheme envisages the development of 4,000 MWh of BESS projects by FY 2031, with financial support of up to 40% of the capital cost as budgetary support in the form of VGF. By offering VGF support, the scheme targets achieving a levelised cost of storage ranging from ₹5.50 to 6.60 per kilowatt-hour. This will enable us to make stored renewable energy a viable option for managing peak power demand on a large scale.

Source: Cabinet approves the Scheme titled Viability Gap Funding for development of Battery Energy Storage Systems (BESS) | Prime Minister of India (pmindia.gov.in)

6. Advanced Solar Module

Solar energy has taken a central place in India's National Action Plan on Climate Change with initiatives such as the National Solar Mission, PLI for the National Programme on High-Efficiency Solar PV Modules, etc. According to an independent assessment by the National Institute of Solar Energy (NISE), the country's installed capacity for producing solar PV modules is approximately 50 GW. According to industry feedback, the country's installed capacity for solar cell manufacture is approximately 6 GW. Thus, the country has achieved self-sufficiency in the manufacturing of solar modules and panels, but it has yet to reach significant capacity in the production of solar cells.

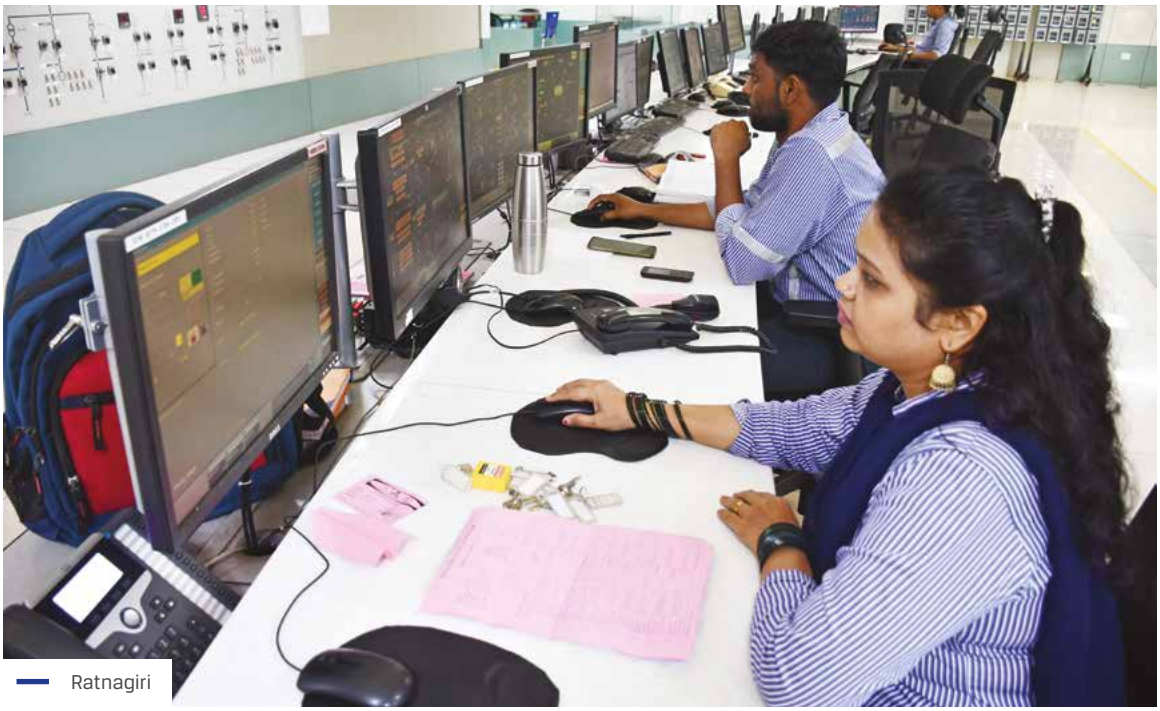
The government is striving to boost domestic manufacturing of solar PV modules and establish India as a solar powerhouse globally. Under the Solar PLI, work is underway to achieve a manufacturing capacity of Giga Watt scale in high-efficiency solar PV modules with an outlay of ₹ 24,000 crore. An integrated capacity of 8,737 MW has been added under the Solar PLI Tranche-I, while 39,600 MW of domestic solar PV module manufacturing capacity has been allocated to 11 companies under Tranche-II. These efforts have resulted in an investment of ₹ 93,041 crore and are generating over 1 lakh direct and indirect jobs.

7. Green Hydrogen

Green hydrogen, primarily produced through the electrolysis of water using renewable energy, is a crucial energy resource to address the decarbonising needs of the future. Green hydrogen is a much cleaner and more sustainable energy carrier as compared to the grey hydrogen produced from natural gas, which is currently in use. Green hydrogen has wide applications across industries like steel, cement, chemicals, decentralised power generation, aviation, and maritime transportation. Derivatives of green hydrogen, green ammonia, and green methanol find applications as green feedstocks or green transportation fuels. The Ministry of New and Renewable Energy defines green hydrogen as having a well-to-gate emission (i.e., including water treatment, electrolysis, gas purification, drying, and compression of hydrogen) of not more than 2 kg CO_2 equivalent per kg H_2.

Realising the importance of green hydrogen, the Indian government has embarked on the Green Hydrogen Mission with the aim of making India the global hub for the production, usage, and export of green hydrogen and its derivatives, serving as an inspiration for the global clean energy transition. The mission will lead to significant decarbonisation of the economy, reduce dependence on fossil fuel imports, and enable India to assume technology and market leadership in green hydrogen. The ministry of new and renewable energy is implementing this mission with an outlay of ₹ 19,744 crore. Though at an initial stage, the project has been adopted in India in various forms, like blending 2–8% of green hydrogen in gas distribution networks and using it in hydrogen fuel cell buses. Several entities have announced plans to set up production facilities for green hydrogen and its derivatives in India.

India is striving to promote green hydrogen production and usage with low-cost, made-in-India electrolysers. The green hydrogen production capacity is to be scaled up under the Green Hydrogen Mission to 5 million metric tonnes annually, contributing to a reduction in dependence on the import of fossil fuels worth ₹ 1 lakh crore cumulatively by 2030. This is likely to leverage over ₹ 8 lakh crore in total investments and create over 6 lakh jobs.



Ratnagiri

Company Overview

Since commercial operations in 2000, the energy arm of JSW Group, India's leading conglomerate, JSW Energy (hereafter referred to as the Company), has emerged as one of the largest and most diversified independent power producers in the country. Relentlessly striving to achieve efficient utilisation of all available resources, JSW Energy is playing a crucial role in India's clean energy transition. The company is strategically transforming itself from 'Pure Play' power generation to a 'Energy Products and Services' company. In addition to its superior power generation capacity dominated by renewables, the company has successfully forayed into new-age businesses of energy storage, both battery and hydro pumped, and energy products and services such as solar modules, wind turbine manufacturing, and green hydrogen and its derivatives. The company has established a strong foothold across the value chain of the power sector with diversified assets in power generation and transmission.

JSW Energy has grown steadily and strongly through the years with a strong balance sheet and robust business model. The company has a pan-India presence across 11 Indian states. It is well placed to achieve 10 GW of generation capacity in 2025 with a foray into new-age businesses. Under the government's PLI scheme, the company intends to create 1 GW manufacturing capacity of advanced solar modules. It has contracted India's largest commercial-scale green hydrogen project of 3,800 TPA for green steel manufacturing. The company has also entered into a technology licensing agreement for the manufacturing of 3.X MW WTGs in India for captive usage by the company. The energy generation capacity is a mix of thermal, hydro, wind, and solar power, with a total locked-in capacity of 13.2 GW and a healthy mix of renewables and thermal. In the energy storage space, the company has a locked-in capacity of 2.4 GWh of hydro pumped storage and 1.0 GWh of battery storage. The company has built a well-diversified portfolio focussed on maximising cash returns.

During the year, the company signed a MoU with JSW Steel for building 6.2 GW of renewable capacity, 2.7 GWh of storage capacity, and 85,000–90,000 tonnes of green hydrogen and associated RE solutions for manufacturing green steel by 2030.

With superior execution capabilities entailing set-up at the minimum possible cost and time in challenging locations, the company has established a strong footing in the power sector. This strength is well reflected in the capability of turning around underutilised assets like acquired RE assets of Mytrah. Operational transparency, a strong management team, perceptive decision-making, strategic capital allocation track record,

the ability to leverage technology and digitalisation, and a healthy balance sheet enable JSW Energy to deliver sustainable growth and create value for all its stakeholders. While focussing on growing a profitable business entity, the company distinguishes itself as a responsible corporate house with an unwavering focus on sustainability. This is reflected in the leadership band's 'A-' score in the 2023 CDP Climate Change rating. The company is placed among the highest-rated power generation companies in India by various independent ESG rating agencies.

Progress on Strategy 2.0

Enabling energy security has been the motive at JSW Energy. The company has clearly stated its objective to be carbon neutral by 2050. JSW Energy envisioned its expansion plans and commitment to reduce its carbon footprint. Hence, Strategy 2.0 was initiated in FY 2023 to accelerate and broaden its growth journey, with numerous targets set for 2030.

- 1 GW/annum of solar module manufacturing under the PLI scheme by 2025
- 20 GW of installed generation capacity by 2030. This can be backward integrated into PV modules and WTG manufacturing and forward integrated into energy products and services
- 40 GWh/5 GW of energy storage (hydro pumped energy storage and battery storage) by 2030
- ~3,800 TPA green hydrogen production plant to be set up by 2025 (India's largest commercial-scale green hydrogen project) for the purpose of producing green steel

With this, the company aims to further diversify its portfolio with forward and backward integration spanning across the power sector value chain. The company has emerged as a complete solution provider with a strong share in the renewables market. This is backed by a healthy balance sheet, which is expected to post accelerated growth of 22% CAGR from FY 2023 to FY 2030. The company is well positioned to leverage the huge growth opportunity in the power sector due to the demand-supply gap and a healthy bidding environment.

JSW Energy had a remarkable year. The company realised numerous accomplishments, establishing record financial and operational performance. The key achievements during the year are:

- **Strong Financial Performance:** EBITDA for the year increased by a robust 53% YoY to ₹ 5,837 crore resulting in PAT growth of 17% YoY to ₹ 1,723 crore.
- **Strengthens Project Pipeline:** Secured additional RE projects with cumulative capacity of 3.4 GW during the year, exhibiting a notable 35% surge in the locked-in capacity to 13.2 GW.
- **Capacity Growth:** Added capacity of 681 MW during the year. Achieved a significant milestone by sychronising Ind-Barath Unit 1 (350 MW), marking it one of the fastest revival of a stalled thermal power plant in India.
- **Forayed into Energy Products and Services:** Signed BESPA for India's largest BESS project and the preparatory site works have started.
- **ESG Stewardship:** Achieved 'Leadership Band (A-)' in CDP Climate Change for third consecutive year, the highest rating in the Indian power sector.

Business Segments

Power Generation

The Company is primarily engaged in the business of power generation through thermal and renewables. As of 31st March, 2024 the total locked-in generation capacity stands at 13.2 GW comprising total installed capacity of 7.2 GW, under-construction capacity of 2.6 GW and pipeline projects of 3.4 GW of capacity.

Installed Capacity: 7,245 MW

Thermal	Hydro
3,508 MW	1,391 MW
Solar	**Wind**
675 MW	1,671 MW

Under-construction: 2,550 MW

Thermal	Hydro
350 MW	240 MW
Wind	
1,960 MW	

Pipeline Capacity: 3,400 MW

Solar	Wind
2,400 MW	1,000 MW

Power Transmission

Stable electricity supply is made possible through an efficient power transmission system. Jaigad Power Transco Limited (JPTL) is a 74:26 joint venture between the Company and Maharashtra State Electricity Transmission Company Limited. Under JPTL, we have two operational 400 kV transmission lines.

Power Trading

Almost two decades ago, JSW Energy launched JSW Power Trading Company Limited (JSWPTC) as part of its vision to become a full-spectrum power company. Having established itself as a leading power trading company in India, JSWPTC has obtained a category "IV" licence issued by the Central Electricity Regulatory Commission to trade in power across India. It is a member of Indian Energy Exchange (IEX), Power Exchange of India Limited (PXIL) and Hindustan Power Exchange Limited (HPX).

Operational Review

The Company's net generation in FY 2024 stood at 27,862 MUs as compared to 21,866 MUs in FY 2023, a robust growth of 27% YoY. Long-term generation (tied under PPA) increased 22% YoY to 24,400 MUs as compared to 20,075 MUs in FY 2023. The Company reported a total income of ₹ 11,941 crore in FY 2024 as compared to ₹ 10,867 crore in FY 2023.

Thermal Power Plants

Vijayanagar

PLF: The plant comprises two Strategic Business Units (SBUs) – SBU 1 and SBU 2. In FY 2024, the plant achieved an average actual PLF of 58% as against 51% in FY 2023.

Total Gross Power Generated: 4,405 MUs

Net Power Generated: 4,067 MUs

Power Sales: Long-term sales to JSW Steel Limited, JSW Cement Limited, JSW Paints Private Limited, JSW Severfield Structures Limited, Epsilon Carbon Private Limited under power purchase agreements (PPA), and short-term / merchant sales to distribution companies and on power exchanges in India and Section 11.

Key Strengths of the Plant:

- Located in high power demand areas of South India
- Operationally strong plant leading to high fuel efficiency, lower O&M cost and higher PLF efficiency
- Provision to blend up to 50% of domestic coal with imported coal increases operational flexibility

Ratnagiri

PLF: In FY 2024, the plant operated at an average deemed PLF of 98% as against 84% in FY 2023

Total Gross Power Generated: 8,546 MUs

Net Power Generated: 7,850 MUs

Power Sales: Long-term sales to Group captive consumers, Maharashtra State Electricity Distribution Company Limited (MSEDCL) and other third-party industrial consumers under PPA. Short-term/merchant sales to distribution companies and on power exchanges in India

Key Strengths of the Plant

- Strategic location near the Jaigad port to help cost saving in coal transportation
- High recovery and robust ROE as 92% capacity is tied up under long-term PPAs
- Provision to blend up to 50% of domestic coal with imported coal increases operational flexibility

Barmer

PLF: In FY 2024, the plant achieved an average deemed PLF of 78% as against 80% achieved in FY 2023

Total Gross Power Generated: 7,084 MUs

Net Power Generated: 6,329 MUs

Power Sales: To Rajasthan DISCOMs

Key Strengths of the Plant:

- Assured fuel (lignite) availability sourced from pit-head captive lignite mines under a Fuel Supply Agreement
- Full recovery of fuel cost and fixed cost, including ROE ensured by the long-term PPA with DISCOMs for full capacity

Nandyal

PLF: In FY 2024, the plant achieved an average deemed PLF of 100% as against 98% achieved in FY 2023

Total Gross Power Generated: 94 MUs

Net Power Generated: 84 MUs

Power Sales: Long-term sales to group company under captive mechanism

Key Strengths of the Plant:

- 100% LT PPA under Group Captive scheme

Ind-Barath

PLF: In FY 2024, the plant achieved an average deemed PLF of 70% as the plant started operations in Q4 FY 2024

Total Gross Power Generated: 212 MUs

Net Power Generated: 196 MUs

Power Sales: Currently selling in short-term market

Key Strengths of the Plant:

- Low fixed cost and located near to key resources

Hydro Power Plants

Baspa-II

PLF: The plant achieved an average PLF of 44% for FY 2024 as against 51% in FY 2023

Total net power generated after auxillary consumption: 1,151 MUs

Power sales: To Himachal Pradesh State Electricity Board (HPSEB)

Key Strengths of the Plant:

- 100% LT PPA with HPSEB ensuring full recovery of fixed cost

Karcham Wangtoo

PLF: The plant achieved an average PLF of 41% for FY 2024 as against 47% in FY 2023

Total net power generated after auxillary consumption: 3,762 MUs

Power sales: Uttar Pradesh, Rajasthan, Haryana, and Punjab DISCOMs through long-term PPA with PTC India Limited

Key strengths of the plant:

- 100% LT PPA with PTC India Limited, which in turn has PSA with various discoms ensuring full recovery of fixed cost, including ROE under the Central Electricity Regulatory Commission (CERC) regulations

Kutehr Hydroelectric Project

JSW Energy (Kutehr) Limited, is a wholly-owned subsidiary of JSW Neo Energy.

Kutehr Hydroelectric Project (3x80 MW Kutehr HEP) with 240 MW capacity is located in the upper reaches of Ravi Basin in district Chamba of Himachal Pradesh. Signed 35-years PPA with Haryana Power Purchase Center. Commissioning of the plant is expected in FY 2025

Solar Power Plants

Operational Solar capacity 675 MW

Net Power Generated: 1,311 MUs

Power Sales: Captive tie-up within JSW Group and various state DISCOMs

225 MW Vijaynagar; 25-year PPA with JSW Steel

Commenced operations from April 2022

10 MW Solar Plant

Ground-based and rooftop solar power projects across various locations with captive power tie-up within JSW Group

18 MW Solar Plants

Long-term PPA with group company under captive mechanism commenced operations in FY 2024

Acquired Solar Assets 422 MW

Located in Punjab, Telangana and Karnataka

Status: Operational

Net Generation – 756 MUs

In addition, the Company has pipeline projects of 2.4 GW.

Wind Power

Operational Wind capacity 1,671 MW

Wind plants in Tamil Nadu;

SECI IX (810 MW); Signed 25-year PPA with SECI

Status: Under construction, 92 MW of SECI IX commissioned in FY 2024, Balance to be commissioned in CY 2024

SECI X (454 MW); Signed 25-year PPA with SECI

Status: Under construction, 248 MW of SECI X commissioned in FY 2024; Balance to be commissioned in CY 2024

Acquired RE Wind Plants (1,331 MW)

Located in Karnataka, Maharashtra, Tamil Nadu, Andhra Pradesh, Telangana, Madhya Pradesh, Gujarat and Rajasthan

Status: Operational

Net Generation: 2,581 MUs

Captive Wind Plant (737 MW)

Located in Karnataka, Maharashtra and Tamil Nadu; 25 year PPA with JSW Steel

Status: Under construction expected commissioning progressively from Q1 FY 2025

In addition, the Company is constructing 300 MW SECI XII and has pipeline wind projects of 1.0 GW of total capacity.

Financial review including financial ratios

Standalone Financial Performance

Revenue from operations

(₹ crore)

Parameters	FY 2023	FY 2024	% change
Sale of Power	4,343.86	3,780.03	-13%
Interest Income on Assets under Finance lease	19.62	59.91	205%
Sale of Goods	363.24	118.80	-67%
Sale of Services	1,002.21	1,151.41	15%
Other Operating Revenue	10.30	18.94	84%
Total	**5,739.23**	**5,129.09**	**-11%**

In FY 2024, revenue from operations stood at ₹ 5,129 crore as compared to ₹ 5,739 crore in the previous year. The fall in operating revenue is primarily due to lower fuel cost which is pass-through in nature and increased job work arrangements for power generation.

Other Income

(₹ crore)

Parameters	FY 2023	FY 2024	% change
Interest Income	48.69	93.22	91%
Dividend Income from Long-term Investments	121.52	74.69	-39%
Net Gain on Sale of Investments	44.38	15.46	-65%
Other Non-operating Income	65.26	27.03	-59%
Total	**279.85**	**210.40**	**-25%**

Other income decreased in the current fiscal, primarily on account of lower dividend income from JSW Steel Limited.

Cost of Fuel

(₹ crore)

Parameters	FY 2023	FY 2024	% change
Cost of Fuel	3,643.63	2,730.82	-25%

Some of the existing customers of the Company having long-term PPAs had entered into job work arrangements for generation of electricity. Under the agreement, the coal required is provided by the customer while the Company converts it into power and supplies to the customer. In addition, this year we witnessed declining trend in coal prices. During the year the Company incurred fuel cost of ₹ 2,730.82 crore, a decline of 25% YoY as compared to previous year.

Expenses

(₹ crore)

Parameters	FY 2023	FY 2024	% change
Employee Benefit Expense	134.73	153.23	14%
Finance Costs	259.80	477.87	84%
Depreciation and Amortisation Expense	317.42	269.54	-15%
Other Expenses	399.44	409.56	3%

Employee Benefit Expense is increased 14% YoY while finance cost increased 84% YoY due to increase in borrowings.

EBITDA and Profit After Tax (PAT)

(₹ crore)

Parameters	FY 2023	FY 2024	% change
EBITDA before Exceptional items	1,486.83	1,928.72	30%
Profit/(Loss) after tax	**711.02**	**950.22**	**34%**

The EBITDA increased to ₹ 1,928.72 crore in FY 2024 from ₹ 1,486.83 crore in the previous year majorly on account of increased generation. The Company's standalone PAT increased to ₹ 950.22 crore in FY 2024 as compared to ₹ 711.02 crore in FY 2023.

Ratio

Parameters	FY 2023	FY 2024	% change	Reason
Debtors Turnover (number of days)	41	49	20%	Increase was primarily on account of decrease in turnover.
Inventory Turnover (number of days)	71	78	10%	Increase was primarily on account of decrease in cost of goods sold.
Interest Service Coverage Ratio	11.73	6.22	-47%	Decrease is due to increase in interest expenses.
Current Ratio	0.53	0.58	9%	Increase was primarily on account of decrease in current liabilites (mainly decrease in current borrowings) and increase in current assets (mainly increase in cash and cash equivalents).
Debt Equity Ratio	0.46	0.46	1%	
Operating EBITDA Margin (%)	20.38	33.50	59%	Increase is due to decrease in turnover on account of lower fuel costs (mainly pass-through in revenue).
Net Profit Margin (%)	11.81	17.80	51%	

Consolidated Financial Performance

The Company's total Income increased by 10% to ₹11,941.34 crore from ₹10,867.05 crore in FY 2023 while EBITDA for the year grew by 53% YoY to ₹5,837.21 crore. The Company reported highest-ever EBITDA on the back of incremental contribution from RE portfolio, superior O&M practices, and gains from buoyancy in the short term / merchant markets.

Consolidated Profit after Tax increased by 17% YoY to ₹ 1,722.71 crore as compared to ₹ 1,477.76 crore in FY 2023.

The Consolidated Net Worth and Net Debt as on 31st March, 2024 were ₹20,831.74 crore and ₹26,635.57 crore respectively, resulting in Net Debt to Equity ratio of 1.3x. Net Debt to EBITDA[1] stood at 4.5x, with Net Debt to EBITDA[1] (excl. CWIP) at a healthy 2.9x.

[1] Proforma since two acquired RE entities were consolidated in Q1 FY 2024

Income & Expense (Consolidated)

(₹ crore)

Parameters	FY 2023	FY 2024	% change
Revenue from Operations	10,331.81	11,485.91	11%
Other Income	535.24	455.43	-15%
Fuel Cost	5,569.70	4,581.60	-18%
Purchase of Stock-in-trade	367.60	124.79	-66%
Employee Benefits Expense	307.60	364.47	18%
Finance Costs	844.30	2,053.40	143%
Depreciation and Amortisation Expense	1,169.23	1,633.41	40%
Other Expenses	805.07	1,032.64	28%

EBITDA and Profit after Tax (PAT)

(₹ crore)

Parameters	FY 2023	FY 2024	% change
EBITDA before Exceptional items	3,817.08	5,837.21	53%
Profit for the year	1,477.76	1,722.71	17%
Other Comprehensive Income	31.78	775.34	High
Total Comprehensive Income	1,509.54	2,498.05	65%

Risk Management and Mitigation

JSW Energy Limited follows the globally recognised 'COSO' framework of Enterprise Risk Management. ERM brings together the understanding of the potential upside and downside of all those factors which can affect the organisation with an objective to add maximum sustainable value to all the activities of the organisation & to various stakeholders.

The Company recognises that the emerging and identified risks need to be managed and mitigated to:

- Protect its shareholders and other stakeholder's interest,
- Achieve its business objective, and
- Enable sustainable growth.

Pursuant to the requirement of Regulation 21 of the Securities and Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015 and Companies Act, 2013, the company has Risk management framework in place. It has constituted a committee of Directors to oversee Enterprise Risk Management framework to ensure:

- Execution of decided strategies with focus on action and
- Monitoring risks arising out of unintended consequences of decisions or actions related to performance, operations, compliance, incidents, processes, systems and the same are managed appropriately.
- The Risk management process and structure is given below:
- **Department Heads at Plants:** Identification, assessment, response and tracking of risks is done by the Risk Owners (Department Heads) at respective locations.
- **Plant Heads:** Risk identified by the Risk Owners at the plant level is reviewed by the respective Plant Head. Plant level integration across the Plants is done to ensure consistency in risk identification and benchmarking.
- **Senior Management at Corporate:** Risks at all the plants, contingency planning and Organisational risks requiring review of macro environment, policies, processes are discussed at the corporate level.
- **Board of Directors:** Oversee the Risk strategy and Risk Management framework, reviews the key risks and mitigation plans.
- All these activities are coordinated by the Chief Risk Officer.

Business Continuity Plan

The Company has a Business Continuity Policy duly approved by the Board. All the major generation plants have formulated Business Continuity Plans (BCP). The main objective of BCP is to maintain business continuity during / post disruptive incidents with an aim to minimize impact on:

- Human life and other living beings
- Environment and related eco systems
- Economic losses
- All stakeholders (such as investors, employees, local communities)

The Company has been conducting awareness and training sessions and mock drills across the Plants on BCP.

Type of Risk / Opportunity	Risk Movement	Impact	Risk Response Strategies
Demand fluctuations - Offtake risk		Demand-supply dynamics impacting power demand & tariff rates	✓ The Company has already tied up 85% of its capacity through PPAs and long-term contracts. ✓ Power demand has grown at 7.5%, in FY 2024 creating a good opportunity in merchant power sector. ✓ The untied power is being sold on exchanges/short term contracts and under Section 11 ✓ Untied power of Vijayanagar and Ratnagiri would be tied up based on expansion plans of Group companies.
Raw material availability & cost		During the year thermal coal prices saw downward movement resulting in lower fuel cost.	✓ The imported coal prices have softened to ~USD 110 per ton in FY 2024 vs ~USD 250 per ton in FY 2023. Prices are expected remain in this range. The Company continues to manage this risk through ✓ Broadening sourcing options- different geographies, multiple vendors ✓ Buying cheaper coal irrespective to the geography ✓ Prudent hedging strategies to mitigate the foreign exchange fluctuations risk. Various contract options like long term contracts and monthly / quarterly / spot contracts for cost effectiveness
Regulatory changes		Ministry Of Environment and Forests (MOEF) notified regulations for 100% utilization of ash and legacy ash in an eco-friendly and time-bound manner. Any noncompliance would attract financial penalty.	✓ The Company's plants have been disposing most of their fly ash to cement manufacturers and brick manufacturers. ✓ The legacy ash is being used/would be used in highway expansion projects, land filling during Group companies' expansions; which are permissible eco-friendly ways defined in the MOEF notification. ✓ The legacy ash would fully be put to use much before the defined timeframe.
Recovery of dues from DISCOMs		Due to poor financial health, payments from the Discoms against our power supply are delayed. This impacts the working capital cash flow	✓ Regular follow-up for the overdue payments. ✓ The Company has availed bill discounting facility from bank for Discom bills. The interest cost would be borne by Discoms

Type of Risk / Opportunity	Risk Movement	Impact	Risk Response Strategies
Interest rates		The RBI has maintained the repo rate at 6.50% which was last changed in February 2023.	✓ Evaluation of growth projects are done on conservative basis over life of PPA. Hence, underline cash flows and return metrics over a long term have adequate protection from short term volatility. ✓ The Company has followed a balanced approach in structuring its finances by having mix of fixed and floating rate of interest and mix of INR and foreign currency loans. ✓ The Company has been renegotiating credit spreads and refinancing to arrest the impact of rate increase.
Cyber security		Cyber security risk could result in substantial reputation and financial loss arising from: 1. Theft of corporate information 2. Theft of financial information (e.g. Financial results, bank details etc.) 3. Ransom ware – cyber extortion. 4. Disruption to business.	✓ Implementation of multi factor authentication for remote VPN access. ✓ Alternate disaster Recovery secure VPN created for resiliency ✓ Strengthening Incident Response process ✓ On boarding of an Incident Response Retainer services ✓ Google Advanced phishing and malware protections features ✓ Periodic critical security updates of Operating System (OS) for all the remote endpoints ✓ Information security Awareness campaigns ✓ Controlling System vulnerability through Vulnerability Assessment and Penetration testing for all public facing assets. ✓ Implementation of Firewall hardening Rule Sets ✓ ISO 27001:2013 certified for IT and OT function ✓ Firewall remediation tool deployed and improvements done in identified areas ✓ Subscribed to cyber insurance policy
Forex risk		Recent geo political events have led to volatility in USD-INR rate.	✓ The Company's robust hedging policy is reviewed by the Board and hedging is done accordingly. ✓ The Company hedges outstanding liability on CAPEX. ✓ The Company has also hedged liability of green bonds as per scheduled payment dates
Poor monsoon - Due to subnormal rain fall in the Karnataka state this year, the reservoir levels are very low as compared to last year.	New	Water availability & the generation	✓ Developing adequate water storage facilities / water conservation (RO plant) ✓ Changing chemical regime to increase COC(Cycle of concentration) ✓ Promoting and enforcing strict water conservation measures across the plant . ✓ Exploring the feasibility to convert existing water cooled condenser to air cooled condenser to conserve water as a long term measure

HR Management

JSW Energy considers human capital critical for strategic business growth. In order to achieve the Organisational Objectives of growth, agility and increased productivity, HR policies play a crucial role. During the year under review, several new HR initiatives were conducted to enhance business efficiency and keep employee morale high. CARE (Communication, Agility, Responsibility and Elevation) continued to be at the centre stage of HR policies enabling the Company to provide a holistic growth environment and a superior employee experience. CARE has been an important aspect of JSW Energy being an engaging workplace.

The Care Model of JSW Energy

CARE is a unique model implemented at JSW Energy which works on the principle that "a well-Communicated employee who is Agile, becomes Responsible and is Elevated". The implementation of this model has resulted in grander employee engagement.

- **Communication:** A multi-level communication structure with multiple channels enables employee engagement at various levels. In addition to employee engagement, the structure also enables grievance redressal mechanisms. Knowledge management enables to plough back organisational learning in solving business problems. Quarterly townhall named as Samwaad, Business Review Meetings, Candid Conversations, Skip Level Meetings, Peer Group Meetings, Family Get-together etc. enable dissemination of information and transparency in communication.
- **Agile:** To create analytical problem-solving facilitators and experts, the Company has adopted a 3-tier analytics training programme. Enhanced capability building practices thus results in better employee engagement. Agility enables the Company to stay competitive in the fast-paced business environment.
- **Responsible:** With a view to create engagement within the organisation, multiple problem-solving practices have been designed. Problem-solving experts enable the Company strive to cascade the policies to the last level of employees. Other activities like the Kaizen culture, the QC activities were also introduced in the shop-floor.
- **Elevated:** All improvements in the organisation are evaluated and duly rewarded. Multi-level R&R system for Kaizens, employee of the month, IGNITE, Safety hero, Special Contribution Awards, and LAMHE Long Service Awards were instituted to engage contributing employees.

Employee Safety

At JSW Energy, all stakeholders have to mandatorily comply with "10 JSW Critical Safety Rules". This helps to cover critical safety practices and control injuries and illnesses. Employees are encouraged to anticipate, report, address and mitigate any hazards at the workplace which helps to avoid injuries and serious accidents.

Dharapuram

Kutehr, Hydro

The details of the safety measures undertaken during the year include:

Strengthening the safety systems at all JSW Energy plants, especially at the renewable energy locations

Occupational health and safety training including GWO training at wind turbine locations

- Digitisation - Initiated software-based incident reporting at wind and solar plants

TQM

Total Quality Management, "TQM", is an integral part of JSW Energy's sustainable journey enabling accomplishment of stated objectives. TQM is a part of the business culture DNA and it promotes the "Better Every day" culture. The Company was able to successfully clear the management diagnosis conducted by Japanese Union of Scientists and Engineers (JUSE) during the Deming challenge journey, which helped to strengthen the TQM practices at all locations and businesses. With a zest to achieve their best, various teams adopted rigorous training of analytical quality measures, such as "J2 refresher". The "Q-star program", is another similar initiative which has enabled the Company to create several competence level experts.

TQM strengthens the capabilities of front line employees, thereby encouraging them to participate in several regional, national and international quality competitions. The Company has been able to adopt a culture of continuous improvement with the help of TQM, furthering sustainable growth for the Company.

Across all plants, "Daily-Sunrise Meeting", a layered communication structure for daily work management, has helped in increasing employee engagement and involvement in the business improvement process.

TQM includes several new practices like:

- organising business plans
- conduction of performance assessments
- reviewing in the TQM way
- benchmarking peer industries
- visiting quality benchmark industries
- inter-plant quality cross learning, and
- implementing quality management tools for the business

CSR

Our agenda of inclusive social and economic growth is carried out through JSW Foundation, the social development arm of the JSW Group. We strive to provide equal opportunities to communities at large and engage with local communities to carry out social development activities. We aim to create a value-based empowered society through continuous and purposeful engagement with the local communities. The different social issues addressed through the Foundation include hunger and poverty eradication, tackling malnutrition, promoting social development, women empowerment, addressing social inequalities by empowering the vulnerable sections of the society, various environmental issues, preservation of national heritage and promotion of sports training.

CSR Framework

JSW Foundation supports, plans and executes our CSR interventions. The Board appoints a CSR Committee which approves and administers all the initiatives and conducts periodic reviews, as per the CSR policy. Reviews are conducted at different levels throughout the organisation, depending on the importance of synergy and interdependence. Various intervention strategies are adopted to promote sustainable growth of both community and individuals. The strategies adopted in this regard are as follows:

- Direct Influence Zone (DIZ): These are the villages in the immediate vicinity of the plant locations and given utmost priority. Each plant has the autonomy to define their own DIZ as per the policy. Plants also have the provision to expand the scope as per the scale of operations. In addition, certain programmes are allowed to be expanded to Indirect Influence Zone (IIZ), areas beyond the geographical purview of DIZ
- Programmes are designed based on specific measurable impacts assessed through different quantitative and qualitative methods. Either the Foundation directly or in partnership with the government and civil society groups at various levels, implements these programmes
- In each sector, interventions are designed to cover social mobilisation, advocacy at various levels, and/or appropriate policy changes
- For details of the CSR initiatives undertaken by the Company during FY 2024, please also refer to Annexure B to the Board's Report for the Annual Report on the CSR activities, starting on Page 259
- Our Sustainability Report's Chapter on Social Development starting on Page 132
- Our Business Responsibility and Sustainability Report starting on Page 185

Internal Control

In keeping with the size and nature of its business and complexity of its operations, the Company has in place a well-designed strong internal control system with unique features like:

- Preparation of annual budget with regular monitoring
- Integrated ERP system deployment to manage smooth transaction processing and to ensure integrity of accounting system
- Well documented authorisation matrix, policies, procedures and guidelines covering all important operations of the Company
- Deployment of compliance tool to ensure compliance with laws, regulations and standards
- Testing of internal financial controls over reporting by internal auditors and statutory auditors to ensuring reliability of financial information
- Protection of the Company's assets / resources against any loss through adequate insurance
- A comprehensive Information Security Policy and continuous updating of IT systems
- Review by the Board-appointed Audit Committee comprising Independent Directors who are experts in their field

All audit plans are regularly monitored by the Audit Committee which is responsible for ensuring adequate internal control measures are in place. It reviews significant audit findings and ensures audit recommendations are effectively implemented.

Internal Audit

JSW Energy's vital Internal Audit function encompasses best global standards and practices of international majors into its operations. The Internal Audit Department reports to the Audit Committee comprising Independent Directors who are experts in their respective fields. COSO framework is an integral part of the audit process. This enables the Company to further improvise the quality of its financial reporting compatible with business ethics, effective controls and governance. With a view to create effective checks and balances within the system, the Company has adopted delegation of authority across its teams. This enables to identify and correct all possible gaps in a timely manner. The Internal Audit team has access to all information in the organisation facilitated by the ERP implementation across the organisation.

Based on the risk ratings of the respective areas/functions, the Internal Audit Department prepares risk-based audit plans. The Audit Committee approves the audit plan which is then executed by the Internal Audit team. To ensure the robustness of the plan in keeping with the emerging industry trends, it is periodically reviewed. Internal customer feedback and other external events also help to increase the robustness of the audit plan in addition to the regular review of the Internal Audit findings by the Audit Committee.

Internal Financial Control

As per Section 134(5)(e) of the Companies Act 2013, the Directors have overall responsibility for ensuring that the Company has implemented a robust system and framework of Internal Financial Controls. The Company

had already developed and implemented a framework for ensuring Internal Controls over Financial Reporting. This framework includes entity-level policies, processes controls, IT General Controls and Standard Operating Procedures (SOP).

The entity-level policies include anti-fraud policies (such as code of conduct, conflict of interest, confidentiality and whistleblower policy) and other policies (such as Organisation structure, Insider Trading policy, HR policy, IT security policy, Treasury policy and Business continuity and disaster recovery plan). The Company has also prepared a risk control matrix for each of its processes such as procure to pay, order to cash, hire to retire, treasury, fixed assets, inventory and manufacturing operations. These Internal Financial Controls are reviewed by the Internal and Statutory Auditors every year.