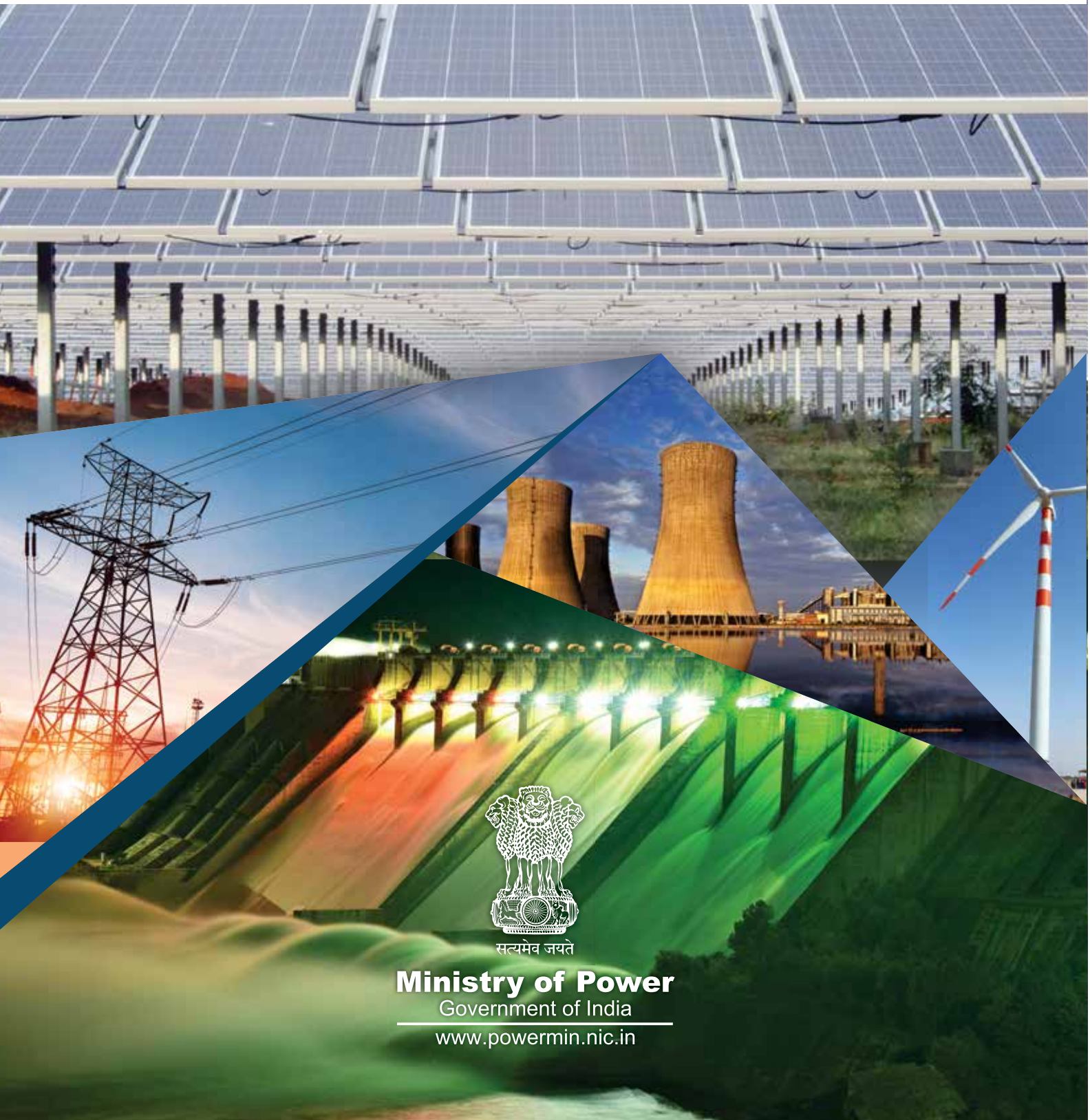
G20 भारत 2023 INDIA

वसुधैव कुटुम्बकम्
ONE EARTH • ONE FAMILY • ONE FUTURE

Azadi Ka Amrit Mahotsav

ANNUAL REPORT
2022 - 2023



सत्यमेव जयते

Ministry of Power
Government of India
www.powermin.nic.in

MAP OF INDIA

SHOWING

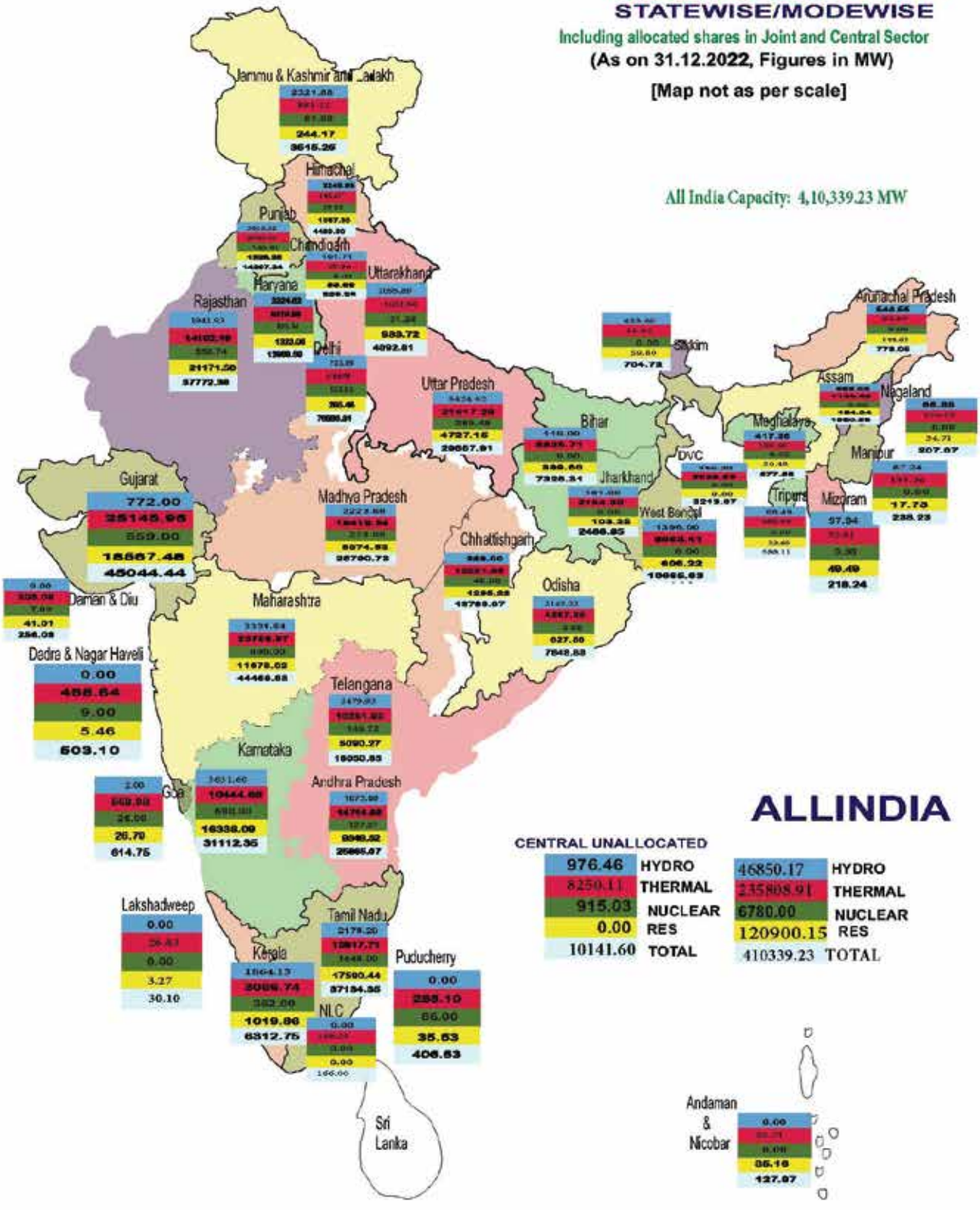
INSTALLED GENERATING CAPACITY STATEWISE/MODEWISE

Including allocated shares in Joint and Central Sector

(As on 31.12.2022, Figures in MW)

[Map not as per scale]

All India Capacity: 4,10,339.23 MW



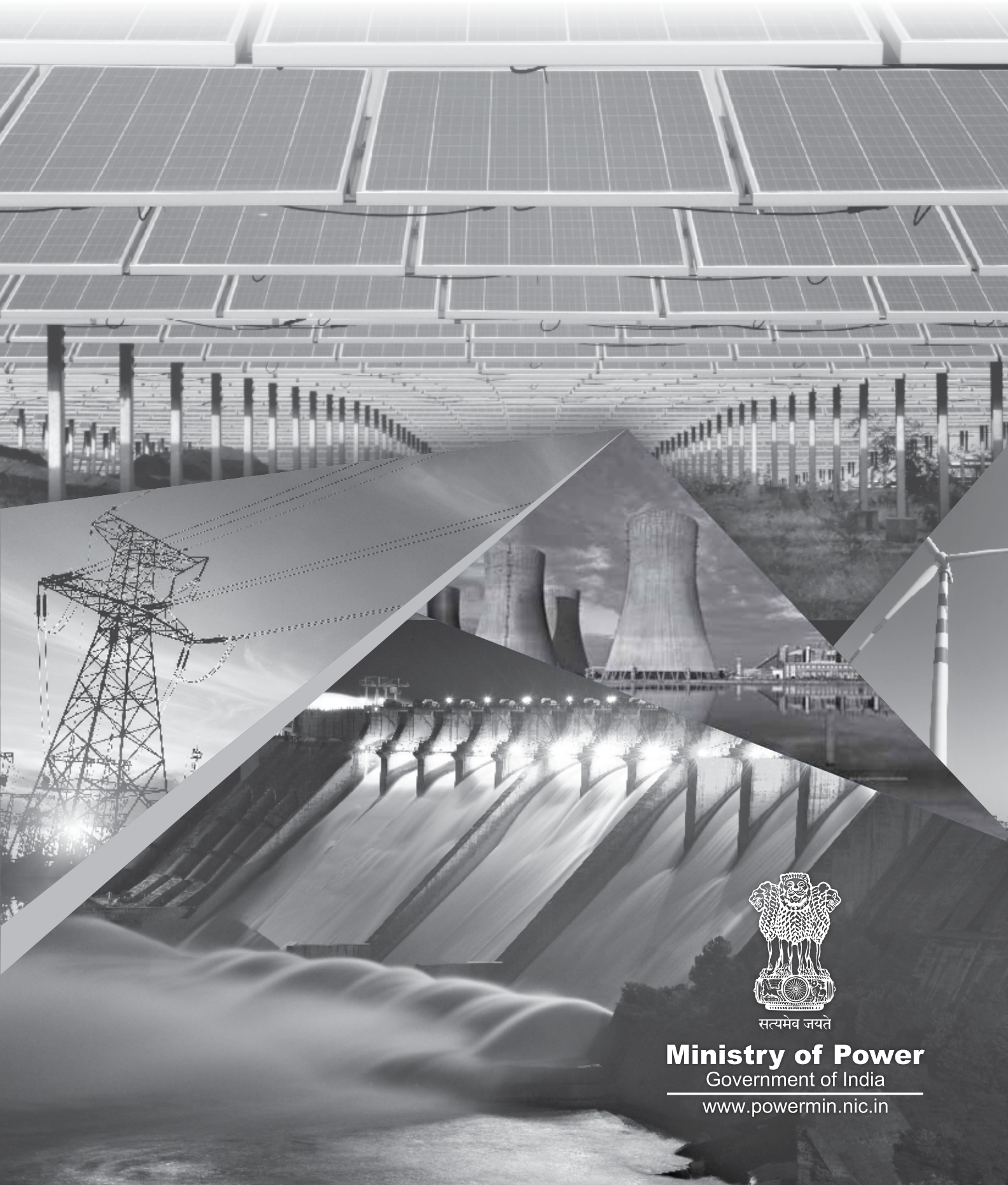
ALLINDIA

CENTRAL UNALLOCATED

976.46	HYDRO
8250.11	THERMAL
915.03	NUCLEAR
0.00	RES
10141.60	TOTAL

46850.17	HYDRO
235808.91	THERMAL
6780.00	NUCLEAR
120900.15	RES
410339.23	TOTAL

ANNUAL REPORT 2022-23



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CONTENTS

CHAPTER 01

PERFORMANCE HIGHLIGHTS

Transformation of Power Sector

The Indian power sector has undergone a significant transformation in the past decade. In 2012, the energy deficit was nearly 4.2%. Over 175GW generation capacity has been added since 2014 transforming the country to power surplus. The whole country has been connected to one grid by adding 173,459 circuit kilometres of transmission lines in the last 8 years and the power transmission capacity in Inter State Transmission Systems (ISTS) is now 112,250 MW in different directions resulting in "One Nation – One Grid – One Frequency". The Indian grid has now emerged as the largest integrated grid in the world.

Every village, every hamlet and every home has been connected to electricity thereby ensuring universal access. This transformation from an acutely power deficit country, to a situation of demand being met, except for an extremely marginal shortfall of less than 1% on account of constraints in distribution network, has been made possible by the relentless efforts of the Government and all the stakeholders. Schemes worth Rs.2.4 lakh crore has been approved for strengthening the distribution system under Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY), Integrated Power Development Scheme(IPDS)and Pradhan Mantri Sahaj Bijli Har Ghar Yojana –SAUBHAGYA. Under these schemes, 2900 new sub-stations were added, 3900 older sub-stations upgraded and 8.73 lacs circuit kilometres of HT and LT lines added/changed. The result of these steps has been stupendous. The average availability of power in rural areas - which was 12 hours in 2015 - is 22 ½ hours at present. In urban areas, the average availability is 23 ½ hours.

There is concern around the world regarding the deteriorating environment on account of greenhouse gas emissions. Transition to non-fossil fuel sources of energy is essential to reduce emissions and most countries in the world have pledged to carry out this transition according to trajectories announced by them. India has not only achieved trajectory that was announced – but is ahead of it. India has emerged as a leader in energy transition in spite of the fact that its per capita emissions are the lowest in the world. The country had pledged that by 2030 more than 40% of the installed electricity generation capacity will be from non-fossil fuel sources. This target has been achieved 9 years ahead of schedule – in November, 2021. India's non-fossil fuel capacity is already 42 percent. The country is currently on the path to honour the pledge in COP26 at Glasgow that 50% of the electricity generation installed capacity will be met from non-fossil fuel sources by 2030.

Robust Power Supply Position

The total installed capacity as on 26.01.2023 was 410.34 GW, out of which 235.81 GW is fossil fuel based (Coal/gas etc.) and 174.53 GW is non-fossil fuel (Renewable Energy + Nuclear) based. The installed capacity is now close to double the peak demand and India is exporting power to Nepal, Bangladesh and Myanmar.

The total electricity generation including generation from renewable sources in the country during the current year 2022-23 (Upto December) 2022 was 1223.135 BU as against the generation of 1113.712 BU during the corresponding period last year, showing a growth of 9.8%.

The electricity generation from Non-Fossil Fuel sources during 2022-23 (Upto December 2022) has increased by 11.5% over corresponding period last year. Share of generation from Non-Fossil Fuel sources in total generation has been 27.1% during the current year 2022-23 (Upto December 2022).

The maximum all India peak power demand in 2022-23 was 215 GW as compared to last year's maximum demand of 203 GW. The rising power demand reflects the economic growth in the country. The Government and other stakeholders are working together to ensure unhindered power supply and efforts at all fronts are being made and measures are being taken for better utilisation of various resources.

Enforcing Financial Discipline in Power Sector

As a step towards addressing the issue of mounting dues of the State power utilities which had crossed ₹1,50,000 crore, the Ministry of Power, Govt. of India has issued Electricity, (Late Payment Surcharge and Related Matters) Rules, 2022 (LPS Rules 2022). This initiative works with the sole aim of financially strengthening the electricity suppliers and bringing financial discipline in the power sector. Furthermore, it will ensure that the end consumer not only gets reliable and quality uninterrupted supply of electricity, but additionally it alleviates the interest burden on account of late payment of power purchase dues by the State utilities. REC and PFC (State run financial institutions in the power sector) were advised by the Ministry of Power to extend their support to Discoms for timely payment of their legacy dues under the new LPS rules subject to strict timely payment of current dues.

These rules are applicable to outstanding dues of generating companies, inter-state transmission licensees, and electricity trading licensees (suppliers). As per the rules, the total outstanding dues including late payment surcharge by a distribution licensee may be cleared in a maximum of 48 Equated Monthly Instalments (EMIs). The distribution licensee shall specify within thirty days of the promulgation of these rules the amount of outstanding dues and number of instalments in which they would be paid to the electricity suppliers. In case of delay in payment of an instalment, a late payment surcharge will be payable on the entire outstanding dues as on the date of notification of the rules. There will be

no additional LPS payable on the outstanding dues if timely payment is made. Thus, timely payment of outstanding dues forms the core of the LPS rules.

Ministry of Power has circulated the broad framework for implementation of the Rules vide letter dated 11.08.2022 and PFC has been designated as the Nodal Agency for implementation of Rules. Operationalization of rules is being done through an automated process using existing PRAAPTI Portal and Grid-India Portal by on boarding DISCOMs on the Portal.Further in order to streamline the process of monitoring of payments of regular bills of suppliers by the DISCOMS and identifying defaults by the DISCOMs in payment of dues in payment of dues and consequent regulation of access to power as per Rules, Ministry of Power issued Standard Operating Procedure(SOP) vide letter dt 26.08.2022.

Since implementation of these Rules, as on 11.01.2023, total bills amounting to Rs. 2,28,565 Crores have been settled from May 2022 (over and above EMI Payments against legacy dues and including Disputed Invoices). Against legacy dues of Rs. 1,38,107 Crores as on 03.06.2022, 13 States/ UTs (total outstanding of) have paid instalment of Rs 36,958 Crores (6 EMIs). 10 out of these 13 states opted for loans from PFC/ REC (total loan sanctioned of Rs 1,00,303 Crores). Further, 20 States/ UTs reported to have no outstanding dues as on 03.06.2022.

Promoting Renewable Energy (RE) through Green Open Access Rules, 2022

For unshackling the RE Sector, i.e. to remove barriers in availability and utilisation of RE and to address the issues that have hindered the growth of open access for a long time, Green Open Access Rules, 2022 have been issued. The Rules reduces the Open Access limit from 1 MW to 100 kW, which pave the way for small consumers also to purchase RE and there is no limit for Captive Consumers.

Any consumer can demand supply of Green power from DISCOMs. It will allow Commercial and Industrial Consumers to purchase RE on voluntarily basis. The Rules will streamline the Open Access approval process including timely approval, transparency and simplification. Approval of open access to be granted in 15 days or else it will be deemed to have been approved. The special provisions for cross-subsidy surcharge, additional surcharge, standby charge as well as for banking, will incentivise the consumers to get Green Power at reasonable rates. As per these Rules, the tariff for the green power will be determined by the Appropriate Commission, separately. For promoting Green Hydrogen/Green Ammonia and Waste to Energy Plants, Special concessions are given in the rules. Grid India has been notified as Central Nodal Agency to set up and operate a single window green energy open access system for renewable energy.

As mandated under these Rules to operationalise green open access, a web portal has been designed and developed by Grid India the Central Nodal Agency, and launched on 11.11.2022. This portal will facilitate as a single platform for submitting and approval of applications for open access. This will ensure faster and easier open access for utilising green energy by all stakeholders. Further, as mandated under these Rules Forum of Regulators has formulated a draft of model regulations on methodology for calculation of open access charges, as well as banking charges.

Empowering Electricity Consumers

With the objective of beginning an era of empowering Power Consumers, laying down rights of the consumers and a system of enforcement of these rights, while facilitating ease of doing business in power sector, the Ministry of Power promulgated the Electricity (Right of Consumers) Rules 2020 with the conviction that the power systems exist to serve the consumers and the consumers have rights to get the reliable services and quality electricity.

These Rules lay down the time limits and standards for the various services to be provided by the Distribution Companies across the country, which are monopolies, to provide services in accordance with standards or pay compensation to their consumers. These Rules specify the obligations of the licensee and sets the practices that must be adopted by the licensee to provide efficient, cost-effective, reliable and consumer friendly services to the consumers. These rules are one of the evolving steps to enable the transformation of a DISCOM from a mere power supplying agency to a holistic consumer focused service provider. First amendment regarding net metering provisions under Consumer Rules 2020 was notified on 29th June, 2021.

Another amendment to these Rules was notified 21st April, 2022, to specify the following parameters to maintain the reliability of supply by the distribution licensee namely System average interruption duration index (SAIDI) and System average interruption frequency index (SAIFI), customer average interruption duration index (CAIDI), customer average interruption frequency index (CAIFI) and momentary average interruption frequency index (MAIFI).Further the consumers, who are using the diesel generator sets as essential back up power, shall endeavour to shift to cleaner technology such as renewable energy with battery storage and the like in five years from the date of commencement of these rules or as per the timelines given by the State Commission for such replacement based on the reliability of supply in that city

Strengthening the Electricity Distribution Sector

Revamped Distribution Sector Scheme (RDSS)

The Government of India launched the Revamped Distribution Sector Scheme (RDSS) to help DISCOMs improve their operational efficiencies and financial sustainability by providing result-linked financial assistance to DISCOMs to strengthen supply infrastructure based on meeting

pre-qualifying criteria and achieving basic minimum operational efficiency benchmarks. RDSS has an outlay of ~INR 3.04 lakh Cr. over 5 years i.e., FY 2021-22 to FY 2025-26. The outlay includes an estimated Government Budgetary Support (GBS) of ~INR 0.98 lakh Cr. The main objectives of RDSS are:

- Reduction of AT&C losses to pan-India levels of 12-15% by FY 2024-25.
- Reduction of ACS-ARR gap to zero by FY 2024-25.
- Improvement in the quality, reliability, and affordability of power supply to consumers through a financially sustainable and operationally efficient distribution sector.

Prepaid Smart metering is the critical intervention envisaged under RDSS with an estimated outlay of ~Rs 1,50,000 Cr with ~GBS of 23,000 Cr and 250 crore prepaid smart meters are targeted to be installed during the Scheme period. Along with the prepaid Smart metering for consumers, system metering at feeder and DT level with communicating feature along with associated Advanced Metering Infrastructure (AMI) would be implemented under TOTEX mode (Total expenditure includes both capital and operational expenditure) thereby allowing the Discoms for measurement of energy flows at all level as well as energy accounting without any human interference. Proper and accurate energy accounting is the key for identification of high loss areas and theft prone areas, whereby, utilities billing and collection efficiencies will improve significantly, thereby reduces the AT&C losses of Discoms to the larger extent. Accordingly, with the installation of smart meters, utilities will be able to better manage their cash flows efficiently thereby leading to reduction in AT&C loss of Utilities. Data gathered as part of the two-way communication in a smart metering solution will help utilities to improving their load forecasting, which will help them in optimizing their power procurement thereby reducing the cost of power supply. At present, under RDSS, ~20.46 crore prepaid Smart meters, ~54.12 lakh numbers of DT meters and ~1.98 lakh numbers of Feeder meter have been sanctioned across 28 States/46 Discoms with a total sanctioned cost of INR 1,35,001.72 Cr with GBS of Rs. INR 24,908.7 Cr.

Capital investment is also budgeted for loss reduction works, system strengthening to cater load growth and modernization to make smart distribution system under RDSS. Loss Reduction works majorly includes replacement of bare conductor with AB cable, HVDS systems, feeder bifurcation etc. Similarly, system strengthening includes creation of new substations, feeders, upgradation of transformation capacity, cables etc. Modernization includes SCADA, DMS, IT/OT, ERP, GIS enabled applications, ADMS etc. to make to make distributions systems smarter. So far, Loss Reduction works of ~INR 1.19 lakh Cr. (including PMA works) have been sanctioned for total 28 States/UTs with GBS of INR 75,883.58 Cr. Rs. 3,311.42 Cr. has been released as GBS towards loss reduction works under RDSSS as per scheme guidelines. Further funds will be released based on start of works post tendering by utilities and subject to meeting pre- qualification criteria.

Additional Borrowings Scheme

Ministry of Power have notified revised Additional Prudential Guidelines 2022 for

sanctioning of loans to DISCOMs/ TRANSCOs/ GENCOs. These essentially entail that loans to DISCOMs and other State-owned utilities by PFC and REC would be contingent to their performance against prescribed conditions. The prudential norms for DISCOMs include – timely availability of audited annual accounts; timely filing of tariff petitions; timely issuance of tariff orders; determination of full cost tariff by SERCs; timely release of subsidy by State Governments; adherence to working capital norm as a percentage of revenue; outstanding Govt. Department electricity bills; AT&C trajectory and ACS-ARR gap as prescribed by MOP/ GOI Scheme; no default to any FI/ bank; preparation of quarterly accounts. The Ministry of Power has also advised all other FIs/ Banks to adopt and implement the revised Additional Prudential Norms for loan to DISCOMS/ TRANSCOs/GENCOs. It expected that such prudent lending practices will encourage States to come out of the vicious debt-trap and undertake more radical reform measures required for achieving financial sustainability of its power utilities.

Marked Reduction in AT&C losses of DISCOMs

Aggregate Technical and Commercial Loss (AT&C Loss) and ACS-ARR Gap are key indicators of DISCOM performance. In the last 2 years, the AT&C loss of the DISCOMs of the country was hovering at 21-22%. Ministry of Power instituted a number of measures to improve the performance of utilities. Preliminary analysis of data for FY2022 of 56 DISCOMs contributing to more than 96% of input energy, indicates that the AT&C losses of DISCOMs have declined significantly to ~17% in FY2022 from ~22% in FY2021.

Reduction in AT&C losses improves the finances of the utilities, which will enable them to better maintain the system and buy power as per requirements; benefitting the consumers. The reduction in AT&C losses has resulted in reduction in the Gap between Average Cost of Supply (ACS) and Average Realizable Revenue (ARR). The ACS-ARR Gap (on subsidy received basis, excluding Regulatory Income & UDAY Grant) has declined from Rs. 0.69/kWh in FY2021 to Rs. 0.22/kWh in FY2022.

The decline of 5% in AT&C losses and 47 paise in the ACS-ARR Gap in one year is the result of a number of initiatives taken by the Ministry of Power. On 04th September 2021, the Ministry of Power revised the prudential norms of PFC and REC, the lending agencies for the power sector to provide that loss making DISCOMs will not be able to avail financing from PFC and REC until and unless they draw up an action

plan for reducing the losses within a specific timeframe and get their State Government's commitment to it. The Ministry of Power also decided that any future assistance under any scheme for strengthening of the distribution system by the DISCOMs will be available to a DISCOM which is making losses only if it undertakes to bring its AT&C losses / ACS-ARR Gap down to specified levels within a specific timeframe and gets their State Government's commitment to it. The Revamped Distribution Sector scheme lays down that funding under the scheme will be available only if the DISCOM commits to an agreed loss reduction trajectory. The Ministry of Power made a series of presentations before the 15th Finance Commission as a result of which 15th Finance Commission provided for an additional borrowing window to States contingent on their taking steps to reduce to their DISCOMs losses. The Ministry of Power issued Regulations on 07th October 2021 providing for mandatory energy accounting and energy auditing for all DISCOMs. On 03rd June 2022, the Ministry of Power issued Late Payment Surcharge Rules which provide that unless the Distribution companies promptly pay for the power drawn from the ISTS, their access to the power exchange will be cut off. While putting all these in place; the Ministry of Power also worked with the distribution companies to provide the necessary finances under the RDSS for undertaking the loss reduction measures.

The above improvement is a result of the concerted efforts of the Ministry of Power, the State Governments as well as Distribution companies to implement the reforms and adoption of best practices. As a result - the viability of the power system has improved. This was necessary because the demand for power has been growing and further investments will be necessary for the power sector to expand to meet the growing demand; and the investments will only come if the power sector remains viable.

Transmission System for Integration of over 500 GW RE Capacity by 2030

Ministry of Power had constituted a high-level committee under Chairperson, Central Electricity Authority with representatives from Solar Energy Corporation of India, Central Transmission Utility of India Ltd, Power Grid Corporation of India Ltd, National Institute of Solar Energy, and National Institute of Wind Energy for planning the transmission system required for having 500 GW of non-fossil fuel based installed capacity by 2030.

The Committee prepared a detailed Plan titled "Transmission System for Integration of over 500 GW RE Capacity by 2030" in consultation with States and other stakeholders. The Plan is a major step towards achievement of the goal of integrating 500 GW of non-fossil fuel based capacity by 2030 by providing broad plan of required transmission system for having 537 GW of Renewable Energy capacity by the year 2030.The planned additional transmission systems required for having 500 GW of non-fossil fuel include 8120 ckm of High Voltage Direct Current Transmission corridors (+800 kV and +350 kV), 25,960 ckm of 765 kV ac lines, 15,758 ckm of 400 kV lines and 1052 ckm of 220 kV cable at an estimated cost of Rs 2.44 lakh crore.The transmission plan also includes transmission system required for evacuation of 10 GW off-shore wind located in Gujarat and Tamilnadu at an estimated cost of Rs. 0.28 lakh crore. With the planned transmission system, the inter-regional capacity will increase to about 1.50 lakh MW by 2030 from 1.12 lakh MW at present.

Considering the availability of Renewable Energy based generation for a limited period during day, the Plan also envisages installation of Battery Energy Storage Capacity of the order of 51.5 GW by 2030 to provide Round the Clock power to end-consumers.

The Plan has identified major upcoming non-fossil fuel based generation centres in the country, which include Fatehgarh, Bhadla, Bikaner in Rajasthan, Khavda in Gujarat, Anantapur, Kurnool RE Zones in Andhra Pradesh, offshore wind potentials in Tamil Nadu and Gujarat, RE park in Ladakh etc. and based on these potential generation centres, transmission systems have been planned.The planned transmission system projected will provide a visibility to the Renewable Energy Developers about the potential generation sites and scale of investment opportunity. Further, it will also provide the Transmission Service Providers the vision of growth opportunity available in the transmission sector along with investment opportunity of about 2.44 lakh crore.

With the launch of above transmission plan for having 500 GW of non-fossil fuel capacity by 2030, along with transparent bidding system, an open market, an expeditious dispute resolution system, India will continue to be one of the most attractive destinations for investment in Renewable Energy.

Facilitating Asset Monetization at State Level

POWERGRID has already carried out monetization of their transmission assets, so that capital raised can be utilized for further CAPEX. Considering that there is significant investment requirement for upgrading and augmenting State transmission networks, a Committee led by Member (Power Systems), CEA with representatives from POWERGRID, CTU, PFCCL, RECPDCL, representatives of STUs of Bihar and Odisha was formed to prepare the draft Guidelines on monetsiation of state transmission assets. The Committee drafted the "Guiding Principles for Monetization of Transmission assets in the Public Sector through Acquire, Operate, Maintain and Transfer (AOMT) based Public Private Partnership model". These draft guiding Principles have also been discussed with NITI Aayog. The Guiding Principles have been shared with States on 3rd October 2022 to facilitate monetization of their transmission assets.

Waiver of ISTS charges on transmission of electricity generated from new Hydro-Power Projects

In a further step to realise the Government of India's commitment to achieve its power requirement from

renewable energy sources, Ministry of Power has issued an order for the waiver of Inter-State Transmission system (ISTS) charges on transmission of electricity generated from new hydro-power projects. Government has set an ambitious plan to have 500 GW of generation capacity from non-fossil energy based sources by 2030. Hydro power projects, being clean, green and sustainable will be of paramount importance in our clean energy transition journey. They are also essential for the integration of solar and wind power, which are intermittent in nature.

In acknowledgement of the aforesaid inherent qualities of hydro-power, Government of India declared hydro power projects as the renewable source of power in March, 2019, However, waiver of inter-state transmission charges, provided to solar and wind projects had not been extended to hydro power projects. In order to remove this discrepancy and to provide a level playing field to hydro projects, Ministry of Power in Government of India has now issued orders to extend the waiver of ISTS Charges on the transmission of power from new hydro power projects, for which construction work is awarded and PPA is signed on or before 30.06.2025.

The waiver/or concessional charges shall be applicable for a period of 18 years from the date of commissioning of the hydro power plants. The waiver shall be allowed for Inter-state transmission charges only and not losses. The waiver would be made applicable from prospective date.This step is expected to provide a boost to the hydro sector, which will also help improve India's water security and bring development benefits to hilly states namely North Eastern States, Uttrakhand, Jammu and Kashmir, Himachal Pradesh etc. where most of the hydro potential is located.

Achievements in Energy Conservation

Perform, Achieve and Trade (PAT) scheme

The Perform, Achieve and Trade (PAT) scheme is a mechanism designed to achieve emissions reduction in energy intensive industries and it is designed on the concept of reduction in Specific Energy Consumption (SEC). It involves assessment of SEC in the baseline year and projected SEC in the target year covering different forms of net energy going into the boundary of the plant and the products leaving out of it over a particular cycle. So far six cycles have been completed covering more than 1100 units. The programme has saved energy worth Rs 55,000 crore annually and about 105 million ton of CO2 emissions have been avoided. PAT Cycle -VII has been notified commencing from 2022-23 to 2024-2025 wherein 707 Designated Consumers from 9 sectors have been notified with total energy consumption reduction target of 8.485 MTOE. The scheme now covers 1196 energy intensive industries / establishments from 13 sectors.

Standard &Labelling (S&L) program

The Bureau of Energy Efficiency launched Standard &Labeling (S&L) program for appliances/equipment under section 13 and 14 of the Energy Conservation Act, 2001. This program entails laying down minimum energy performance norms for appliances / equipment, rating the energy performance on a scale of 1 to 5, 5 star being the most energy efficient one. As on June,2022, the program covers 30 appliances out of which 11 appliances are under the mandatory regime while as the remaining 19 appliances are under the voluntary regime. The program has resulted in around 62 billion units of electricity savings per year and avoided 50 million tons of CO2 emissions.

Unnat Jyoti by Affordable LEDs for ALL (UJALA):

Hon'ble Prime Minister, on 5th January 2015 launched Unnat Jyoti by Affordable LED for All (UJALA) programme. Under UJALA scheme, LED bulbs, LED Tube lights and Energy efficient fans are being sold to the domestic consumers for replacement of conventional and inefficient variants. Till date, across India, 36.86 LED bulbs have been distributed by EESL. 126.56 LED bulbs have been distributed by private industry. This has resulted in estimated energy savings of 130 billion kWh per year, GHG emission reduction of 106 million tonne CO2 per year and estimated annual monetary savings of INR 51,950 crore in consumer electricity bills. The above programme has been successful in creating the market for above appliances by bring down their price significantly and making them affordable for consumers.

Street Lighting National Programme (SLNP)

Hon'ble Prime Minister, on 5th January, 2015 launched Street Lighting National Programme (SLNP) to replace conventional street lights with smart and energy efficient LED street lights across India.

Till date, EESL has installed over 1.26 crore LED Street Lights in ULBs and Gram Panchayats across India. This has resulted in estimated energy savings of 8.50 billion kWh per year with avoided peak demand of 1,416 MW, GHG emission reduction of 5.85 million t CO2 per year and estimated annual monetary savings of INR 5,947 crore in electricity bills of municipalities.

Guidelines & Standards for charging infrastructure for Electric Vehicles

Ministry of Power issued the revised consolidated Guidelines & Standards for charging infrastructure on 14th January, 2022. The salient features as stipulated in the guidelines and standards are as under:

a) Tariff for supply of electricity for Public Charging Station (PCS) shall be a single part tariff and shall not exceed "Average Cost of Supply" till 31st March, 2025.

b) DISCOMs may leverage on funding from the Revamped Distribution Sector Scheme (RDSS) under 'Part A – Distribution Infrastructure' for the general upstream network augmentation necessitated due to the upcoming charging infrastructure in various areas. The cost of such works carried out by the DISCOMs with the

financial assistance from Government of India under Revamped Scheme shall not be charged from the consumers for Public Charging Stations for EVs.

c) Housing Societies, Malls, Office Complexes, Restaurants, Hotels, etc. are allowed to install PCS for charging of vehicles including charging of visitor's vehicles permitted to come in its premises.

d) Charging stations meant for 100% in-house/captive utilization are free to choose charging specifications as per requirement.

e) DISCOMs have been directed to provide electricity connection to PCS in accordance with the timelines specified in the "Electricity (Rights of Consumers) Rules 2020".

f) The connection for a PCS shall be provided within 7 days in metro cities, 15 days in other municipal areas and 30 days in rural areas. Appropriate Commission may specify a lesser time limit than the aforementioned limit.

g) Any PCS/chain of charging station may also obtain electricity from any generation company through open access. Open access shall be provided within 15 days for this purpose. Only cross subsidy charges (not more than 20% as per Tariff Policy Guidelines), transmission charges and wheeling charges shall be applicable.

h) Guidelines also include the details of requirements of Public Charging Infrastructure (PCI), PCI for long range EVs and/or heavy duty EVs, Location of PCS, Database of Public EV charging stations, Tariff for supply of electricity to EV PCS and service charge at PCS.

i) Due to high cost of rent for land and charges provision of land at promotional rates for PCS have been provided in the Guidelines. Land available with Government/ Public entities shall be provided to Government/Public entity on a revenue sharing basis at a fixed rate of Re.1/ kWh (used for charging) to be paid to the land owning agency, initially for a period of 10 years.

The Charging Stations take connection from DISCOMs which in turn take the supply of electricity from the Grid. The power is supplied to grid from both Non-Renewable and Renewable Sources.

"Go Electric" Campaign

Ministry of Power launched the "Go Electric" Campaign on 19th February 2021. The objective of this campaign is to create awareness among masses about benefits of switching over to Electric Vehicles (EVs), including various initiatives taken by Centre & State Governments to enhance acceptability of Electric Vehicles, and Electrical Cooking. This campaign is being implemented through State Nodal Agencies (SNAs) designated by States for coordinating activities related to rolling out Public Charging Infrastructure in States. Under this campaign, Workshops, Webinars, Technical talks, Seminars, Road Shows are being organized to connect with the masses and spread the message of going electric. Reduction in the import bill of crude would be the outcome of the campaign as more and more consumers adopt EVs as a preferred choice while buying new vehicles over the next decade. Electric Vehicles (EVs) do not result in emission. EVs need electricity from Grid to charge on board batteries. With the rapid addition of Renewable Energy, Thermal generation is expected to reduce in overall electricity mix, further minimizing the carbon emission intensity in future.

Promoting Use of Biomass in Thermal Power Plants

In order to reduce stubble burning and to reduce carbon footprint of Thermal Power Plants while increasing the income of farmers, Government of India has taken various proactive step with the establishment of National Mission on Use of Biomass in Thermal Power Plants. The agro-residue/ biomass earlier considered as a waste product has now begun to produce net zero-carbon electricity for the citizens of the country. In turn farmers are getting additional income by selling the stubble/ biomass for conversion into torrefied/ non-torrefied biomass pellets. For overall monitoring of the Mission and to facilitate the Mission on inter-ministerial issues/constraints, a Steering Committee under the chairmanship of Secretary, Ministry of Power (MoP) has been constituted. Earlier, the Ministry had notified a policy on "Biomass Utilization for Power Generation through Co-firing in Coal based Power Plants" in October 2021 that mandates all thermal power plants in the country to use 5 to 10% biomass along with coal for power production.

The initiatives have started showing promising results. As on 31.12.2022, approximately 87869 metric tonnes (MT) of biomass have been cofired in thermal power plants in the country. Contract have already been awarded for more than 47.02 Lakh MT of biomass pellets and tenders for 1147.73 lakh metric tonnes (LMT) are at different stages of process for short term & long term duration. Out of this, the biomass co-fired in the NCR region stands at 26691 MT and tenders floated in the region are about 91.24 LMT. Contract have already been awarded for more than 29.60 LMT of biomass pellets.

Creation of India Carbon Market

The Energy Conservation Amendment Bill has been passed by the Parliament during the Winter Session 2022. The amended Act includes provisions for putting in place a carbon market. As per the framework laid down under Paris Agreement ; if any carbon credit is sold outside the country; it cannot be used for meeting the NDCs of the originating country. Carbon credit will on priority be used within the country to meet our NDCs. In specific cases; where carbon credits are created by high technology expensive assets, these may be permitted to be externally marketed by the National Designated Authority created by Government which shall exercise and perform functions that inter-alia include to receive projects for evaluation and approval of host party.

Ease of Doing Business & Reducing Compliance Burden

Significant efforts were made by the Ministry and its organizations in reducing the regulatory compliance burden of the consumers and industries. During 2021, Ministry of Power had eased compliances related to seventy-nine nos. of issues affecting industry and consumer. The Ministry had started a fresh exercise for 2022 and had prepared an Action Plan for 2022 under two phases. The first phase was till 31st Mar, 2022 while the second phase was till 15th Aug, 2022. A total of 61 compliances have been eased/simplified during 2022.

A few of the significant initiatives taken by organizations of the Ministry are as below:

(i) Bureau of Energy Efficiency (BEE) has simplified the implementation of the Standards & Labelling (S&L) program. It had also introduced Digitalization and Online tracking of status of application for manufacturers. A helpdesk has also been created to resolve grievances of Designated Consumers (DCs). In the second phase of the Action Plan for 2022, BEE has introduced QR code based labels to strengthen star labelling and also to bring transparency for consumers. It also extended the validity of ESCerts till the date it is traded.

(ii) Central Transmission Utility (CTU) has eased Connectivity Bank Guarantee under revised RE procedure unlocking about Rs. 400 Cr for RE Developers. A positive step towards RE development in the country. Further, CTU has made available an alternate mode of Payment for avoiding BG Encashment for RE Developers. About 240 nos. of existing Transmission lines have been made Go-Live on PM Gati Shakti Portal. This will help in better planning and approval for new transmission lines. Integration of Online Applications of ISTS Connectivity and Open Access to the National Single Window System (NSWS) portal has been done to facilitate the investors/ developers.

(iii) GRID-India has enhanced the Validity of registration for REC from 5 years to 10 years. National Open Access Registry (NOAR) has been launched to facilitate single point access to stakeholders for approval for transacting power. NOAR has been integrated with Single Window System. GRID-India has formulated a 'Procedure for STOA in Interstate Transmission through NOAR' to facilitate seamless and quick implementation of web based processing of pan India Open Access Transactions.

(iv) Central Electricity Authority (CEA) has abolished furnishing of various outdated formats related to Filing of Statistics, Returns and Information; and amended the regulations related to Safety Requirements for Construction, Operation and Maintenance of Electrical Plants and Electric Lines in the first phase of the 2022 EoDB-RCB exercise. Many reports published by CEA were also made available online. In the second phase, CEA has simplified process for submission of information related to utilization of Coal/Electricity generation / demand by thermal power plants with regards to Coal Linkage Auction; started Portals for registration of new renewable energy projects, Collection of data concerning the generation from renewable Power plants, and online registration of Battery Energy Storage Systems.

(v) In the first phase, the Central Electricity Regulatory Commission (CERC) has notified the Ancillary Services Regulation repealing the earlier one. The new regulation provides for the provision of primary, secondary, tertiary and other ancillary services and is expected to benefit the entity/consumer connected to the grid. In the second phase, CERC has introduced new transmission access regulations. The Commission has also revamped the Renewable Energy Certificate Regulations for promoting renewable energy in the country in second phase.

International acceptance of Indian Electrical Equipment

The export footprint for electrical equipment manufactured in India is set to rise, with an important bottleneck being addressed. The Central Power Research Institute (CPRI) an autonomous Society under the Union Ministry of Power, has been granted the prestigious accreditation from National Accreditation Board for Certifying Bodies (NABCB) - for certification of electrical equipment as per ISO/IEC 17065. This would provide a significant boost to the already robust indigenous development and manufacturing of electrical products in India and thereby strengthen 'Aatmanirbhar Bharat'. CPRI bagged Certification for its Test Reports covering Transformers & Reactors, Cables and cable accessories, Capacitors, Switchgear & Control gear, Transmission line accessories and Energy meters. With CPRI now having this accreditation, Indian exporters may not need to send their products abroad for testing. This is expected to encourage more manufacturing and exports of electrical equipment from India.

Prime Minister dedicates the 600 MW Kameng Hydro power project to the nation

Prime Minister Shri Narendra Modi dedicated the 600 MW Kameng Hydro Power Station to the nation on 19th November 2022, the biggest Hydro Power Project implemented by NEEPCO Ltd., a Mini Ratna Power PSU under Ministry of Power. Commissioning of the sixth hydro power plant in the North East i.e. 600 MW Kameng Hydro Power Station in Arunachal Pradesh will be an important step towards fulfilling Nationally Determined Contribution (NDC) of the Government of India pledged under Paris Agreement 2015. The project will form part of projected hydro capacity addition of 30000 MW by 2030.The project stretches over more than 80 kilometers in West Kameng District of Arunachal Pradesh at a cost of approximately Rs 8200 Crore.

Conference of Power and New & Renewable Energy Ministers of States & UTs

The conference of Power and Renewable Energy Ministers of State/ UTs was held on 14th and 15th October, 2022 in Udaipur, Rajasthan. Shri R.K Singh , Union Minister for Power and NRE chaired the conference. Shri Krishan Pal, Minister of State for Power, Deputy CM/ Power/ NRE Ministers of States along with Principal Secretaries of States and UTs attended the event.

During the Conference, detailed deliberations were held with focus on Financial Viability & Sustainability of distribution sector, Modernization & upgradation of power systems, and Development of Power Systems to ensure 24x7 power supply including investment requirement & Power Sector Reforms. The States provided their inputs and suggestions on each of these pertinent issues.

Ujjwal Bharat Ujjwal Bhavishya – Power @2047

Ministry of Power celebrated "Ujjwal Bharat Ujjwal Bhavishya – Power @2047" under "Azadi ka Amrit Mahotsav" (AKAM) from 25th to 30th July 2022 in all districts across the country in association with all Power CPSEs and State DISCOMs.The event showcased the achievements in Power and Renewable Energy Sectors to the public, both from National and State perspectives, and also the vision of India in these sectors for 2047 when India completes 100 years of Independence.

REC accorded 'Maharatna' status

REC has been accorded with the status of a 'Maharatna' Central Public Sector Enterprise, thus giving REC greater operational and financial autonomy. An order to this effect was issued by the Department of Public Enterprises, under the Ministry of Finance. Incorporated in 1969, REC is an NBFC focusing on Power Sector Financing and Development across India. The grant of 'Maharatna' status to REC will impart enhanced powers to the company's Board while taking financial decisions. The Board of a 'Maharatna' CPSE can make equity investments to undertake financial joint ventures and wholly-owned subsidiaries and undertake mergers and acquisitions in India and abroad, subject to a ceiling of 15% of the Net Worth of the concerned CPSE, limited to ₹5,000 crores in one project. The Board can also structure and implement schemes relating to personnel and Human Resource Management and Training. With this, REC can also enter into technology Joint Ventures or other strategic alliances among others.

Launch of Virtual Smart Grid Knowledge Center and Innovation Park

The Virtual Smart Grid Knowledge Center(SGKC) has been established by POWERGRID with support from the MOP and NSGM for demonstration and advancement of frontier smart grid technologies. It is located within the POWERGRID.SGKC aims to be one of the leading Centers of Excellence globally to foster innovation, entrepreneurship and research in smart grid technologies and create capacities in the power distribution sector. The Virtual SGKC that was launched enables a digital footprint of the physical setup of SGKC, the need for which was felt during COVID-19 pandemic.The Virtual SGKC has been conceptualized and developed by POWERGRID with support from the Ministry of Power and technical assistance from USAID. The platform as launched co-exists with the physical setup and provides remote access to all existing SGKC offerings and more.The platform presently hosts more than 50 solutions from over 30 technology partners across 8 thematic areas spanning across new and advanced technologies such as artificial intelligence, machine learning, blockchain, IOT, etc.The solutions which are physically present at SGKC premises at Manesar are also hosted on this platform. This includes solutions such as Advanced Metering Infrastructure (AMI), smart homes, microgrids, Outage Management System (OMS), etc.

Coal Stock Position

The coal stock position for thermal power plants (180 nos.) is monitored in Central Electricity Authority on daily basis for regular/ smooth supply of coal. With regular monitoring and follow up with coal companies and Railways, the coal stock position has become manageable. As on 31.12.2022, the total coal stock reported by the power utilities was 32.32 Million Tonnes (MT). An overview of source wise coal received in coal based thermal power stations during 2022 (January to December) is given below:

Source	Coal Receipt in Million Tonnes
Coal India Ltd. (CIL)	550.8
Singareni Collieries Co. Ltd. (SCCL)	55.2
Captive Mines	82.6
E-auction	32.4
Import (Blending purposes)	30.7
Import (Import coal based)	19.7
Total Receipt	771.4

As reported by the power utilities, the total coal consumption by the power plants monitored in CEA, during 2022 (January to December) was 762.9 MT.

ORGANISATIONAL SET-UP

Shri Raj Kumar Singh assumed charge as the Minister of State (Independent charge) for Power with effect from the 5th September, 2017 to 6th July, 2021 and as Minister of Power from the 7th July, 2021.

Shri Krishan Pal Gurjar assumed charge as the Minister of State for Power with effect from the 7th July, 2021.

Shri Alok Kumar assumed charge as Secretary in the Ministry of Power with effect from the 31st January, 2021 (A/N). The Ministry has sanctioned strength of two Additional Secretaries, one Financial Adviser, four Joint Secretaries and one Economic Adviser. Presently One post of Additional Secretary, one post of Special Secretary and Financial Adviser (SS& FA), two posts of Joint Secretaries and one Economic Adviser are filled up.

Shri Ashish Upadhyaya, Special Secretary and Financial Adviser, oversees the Internal Finance and Budgetary Control of this Ministry.

Shri Ajay Tiwari, Additional Secretary, oversees the Policy & Planning; Training & Research including CPRI & NPTI; Power Projects Monitoring; All Tax related Matters; e-Samiksha; PRAGATI portal; EC,ET&EV; Hydro Power including NHPC,SJVNL, NEEPCO,THDC, BBMB, Environment Management for Hydro Projects; Hydro Projects in SAARC countries; V&S & CVO and G-20; IC and IT&CS.

The allocation of work amongst the Joint Secretaries and Economic Adviser in the Ministry of Power is as under:

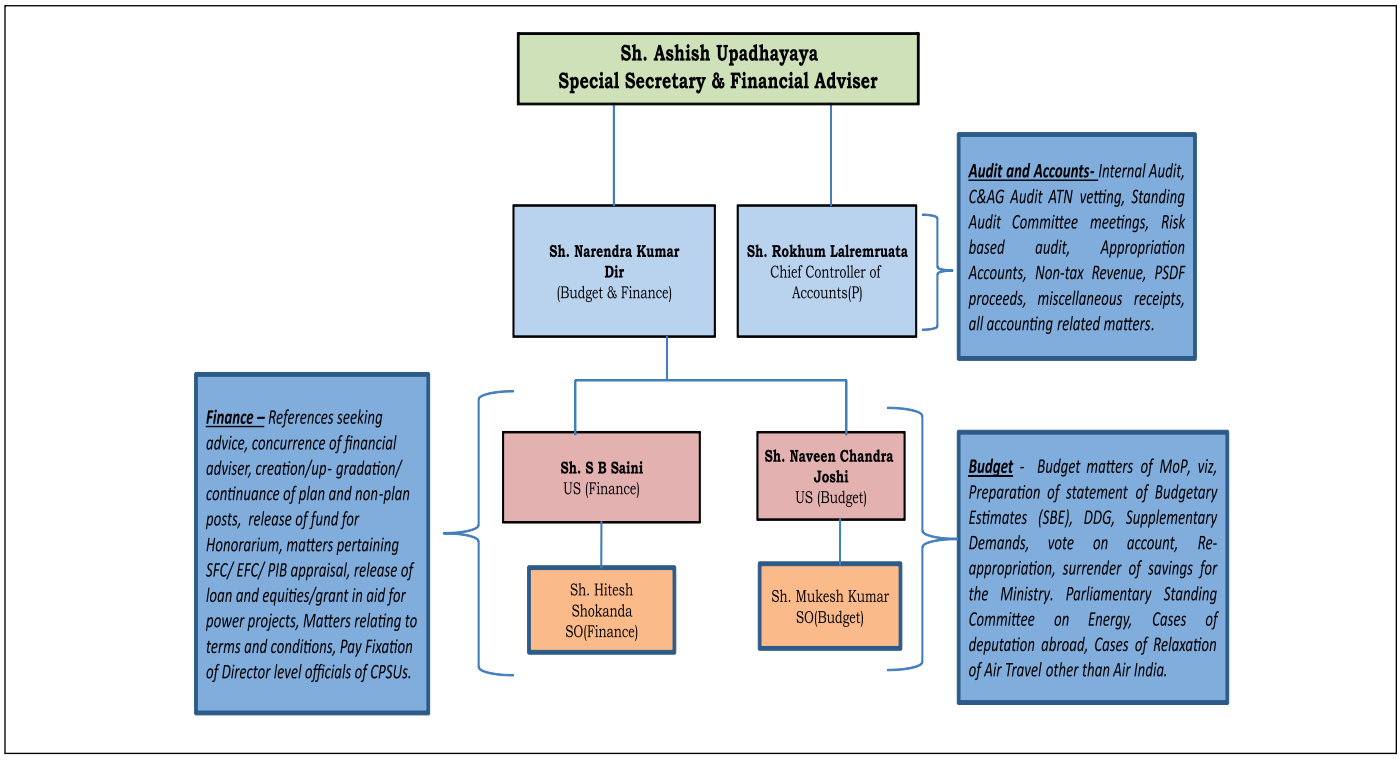
Shri Piyush Singh, Joint Secretary look after the work of **Thermal Power**, NTPC; DVC; Ultra Mega Power Project; IPC; Fuel Supply; Fuel Supply Agreements; ACQ Matters; Monitoring of Coal to Thermal Power Plants, **Distribution & Reforms;** Distribution; UR&SI; **Administration.**

Shri Mohammad Afzal, Joint Secretary look after the work of **Hydro Power** including NHPC, SJVNL, NEEPCO, THDC, BBMB, Environment Management for Hydro Projects; Hydro Projects in SAARC countries; **Transmission,** PGCIL,Grid Integration of Renewable Energy; **Parliament; Public Grievance; RTI; Reservation; Record.**

Shri Jithesh John, Economic Advisor oversees the Policy & Planning; Training & Research including CPRI & NPTI; Power Projects; Monitoring Panel; All Tax related Matters; e-Samiksha; PRAGATI portal; Coordination; Official Language.

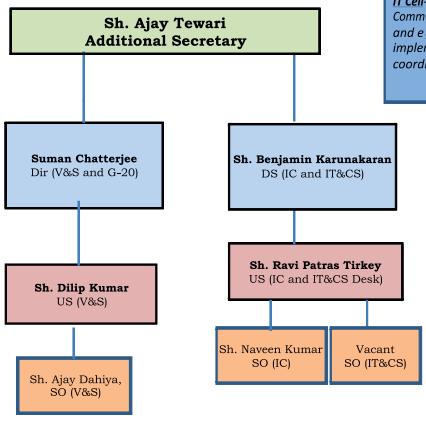
Two Chief Engineers from Central Electricity Authority are taken on loan basis, against the vacant post of Joint Secretary, to assist the work relating Reforms and Restructuring; RCM; Electricity Act, 2003; Tariff Policy; CERC; JERC; APTEL Std; Bidding Documents for Procurement of Power and ECET&EV; OM & POSOCO (Grid India).

Further, there is a Principal Accounts Office headed by the Chief Controller of Accounts who in turn reports to the Financial Adviser in the Ministry of Power. Matters relating to reservations for SC/ST, Physically disabled and Ex-Servicemen in the Ministry including PSUs under its administrative control are dealt with by the Deputy Secretary/Director Level Officer who is also the Liaison Officer for SC/ST and another Deputy Secretary level officer is the Liaison officer for OBCs.



V&S– *All Vigilance cases/issues of MoP employees and Board Level members of power sector PSU, maintenance of APARs, security of power projects*

IC Cell – *Matters relating to internationalcooperationwith variouscountries/multilateral agencies in the power sector (except renewable energy), Tie up of external assistance/multi lateral funds, Joint Working Group & Joint Commission meetings, Energy Dialogues/ Forum, Updating the country briefsandnotesfor meetings of foreign dignitaries, Deputation/Delegation abroad, Interministerial coordination and consultation for matters relating to international cooperation*



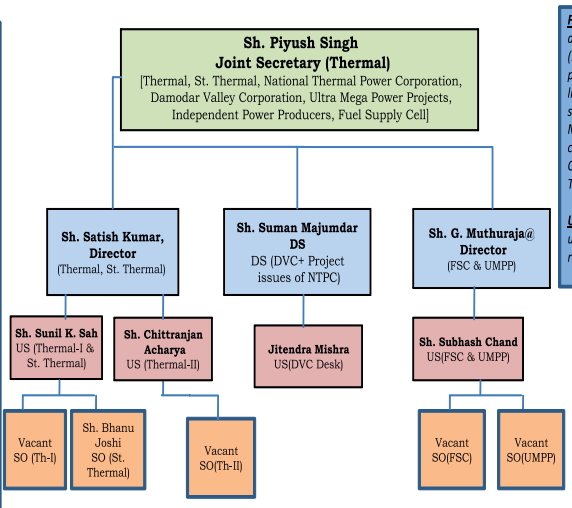
IT Cell*- Ensure Information & Communication Technology and e governance implementation in MoP in coordination with NIC*

AS (AT) is also looking after the work of Hydro through JS (MA),T&R and P&P through EA (JJ) and ECET&EV through CE(SKK).

Thermal.I*- Appointment of CMD, Full/part time Director on NTPC BoD,, Gas issues/BTPS issues, Thermal Audit paras, VIP references.*

Thermal.II*- All project issues of NTPC Ltd. (Coal mine/FSA/JVs/ Power allocation/ super critical technology/ NTPC's QPR, Annual Report etc.*

DVC- *Administrative & financial matters of DVC, Selection/ Appointment of Chairman/Members of DVC Board, part-time members of DVC Board. All DVC's project related issues/ concerns., Audit paras of DVC, VIP references, QPR of DVC.*



FSC *– Private power policy and matters of private sector (IPPs & CPPs) power projects, policy for allocation of coal linkage/ coal blocks to power sector, FDI in power sector, Mega Power Policy, issues of commissioning/ Commercial Operation Date (CoD) of TPPs.*

UMPP- *All issues in setting up of UMPP and other related matters.*

@ Sh.G. Muthuraja, Dir is also reporting to JS(MA) for Reservation matters.

Distribution Section – *Administration of all schemes such as NEF, IPDS, DDUGJY, Saubhagya.*

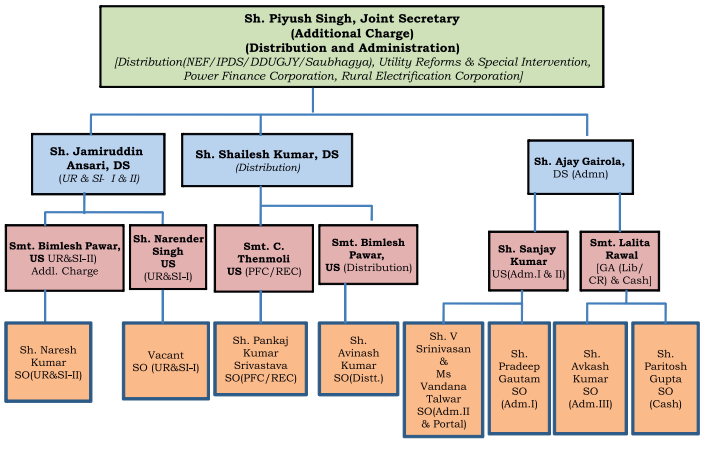
REC/PFC Section – *All administrative matters of REC/PFC.*

Utility Reforms & Special Intervention – *Formulation of Reforms linked scheme and any other new scheme. Utility Financial Matters, Utility Privatization, Power Sector Vision, National DISCOM.*

Admin. I *– Cadre management of CPES and appointment of Chairperson/ Members in CEA*

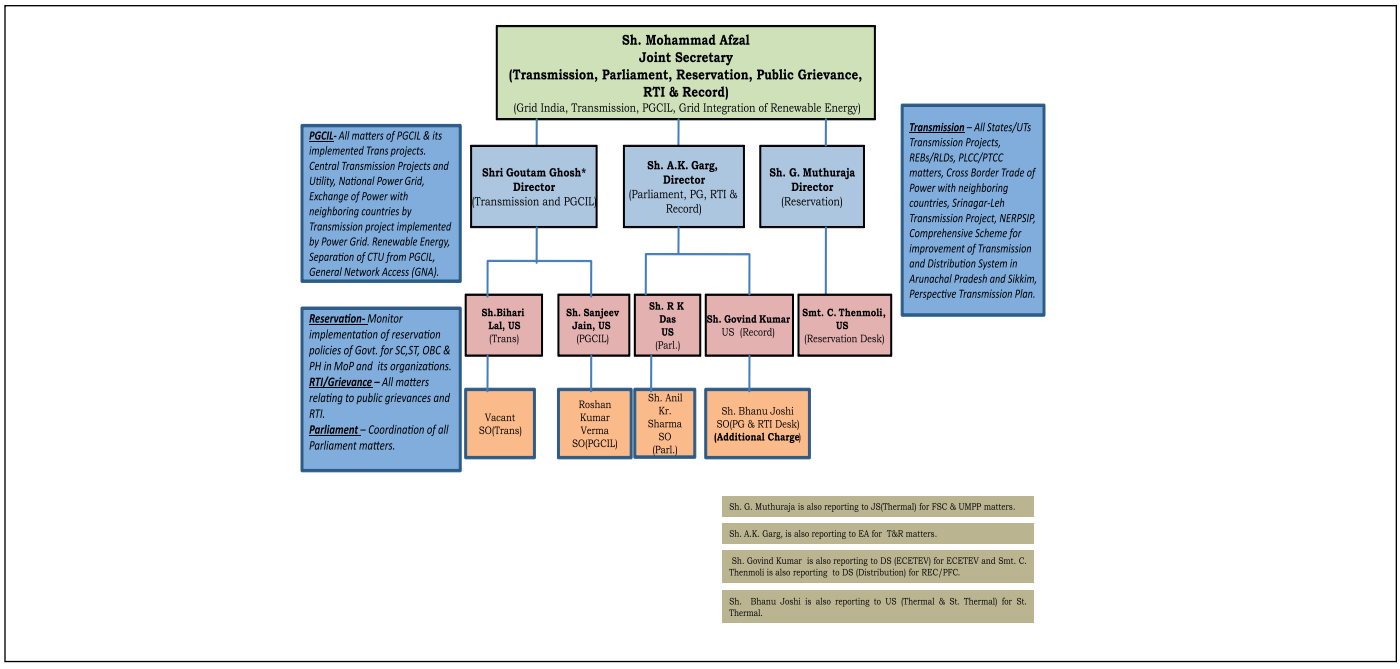
Admin. II *– All service matters concerning Senior level posts, Central Staffing Scheme,. centralized grades of MoP cadre of CSS, CSSS & CSCS, other grades of Gr. C, ex-cadre posts*

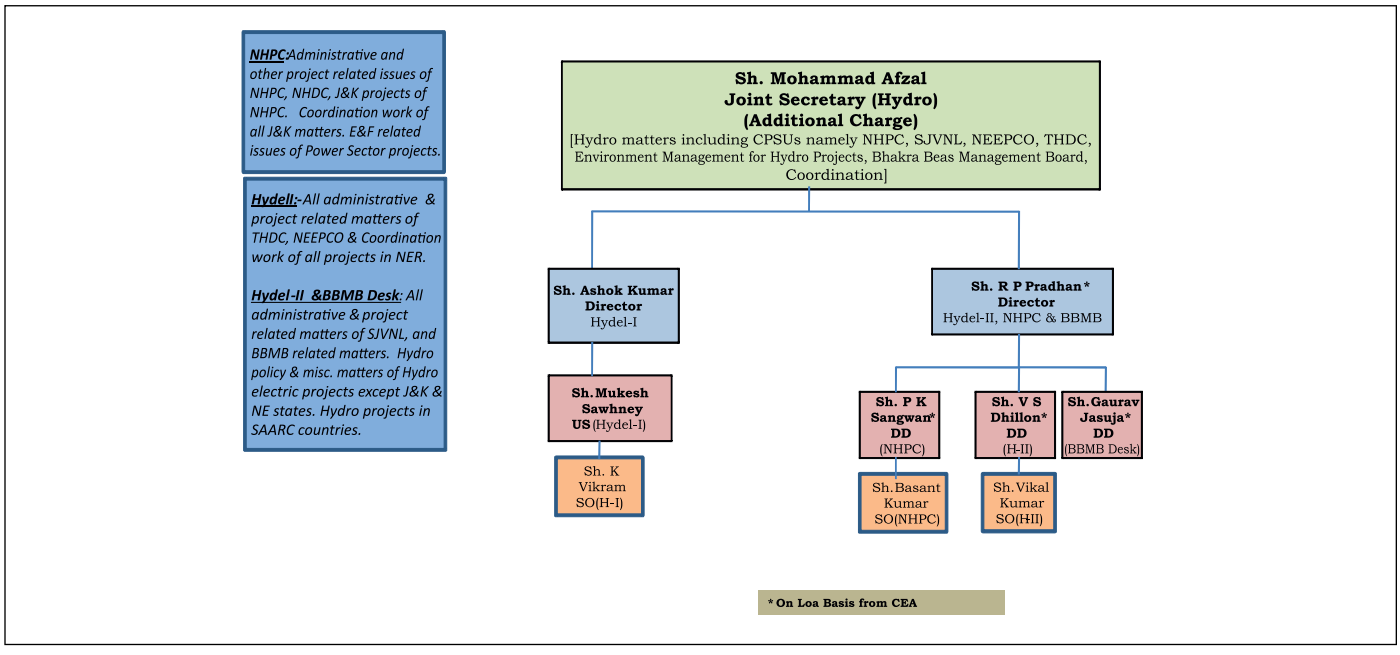
Admin. III *– General administration, Matters relating to CGHS facility, Estate Office, CR etc.*

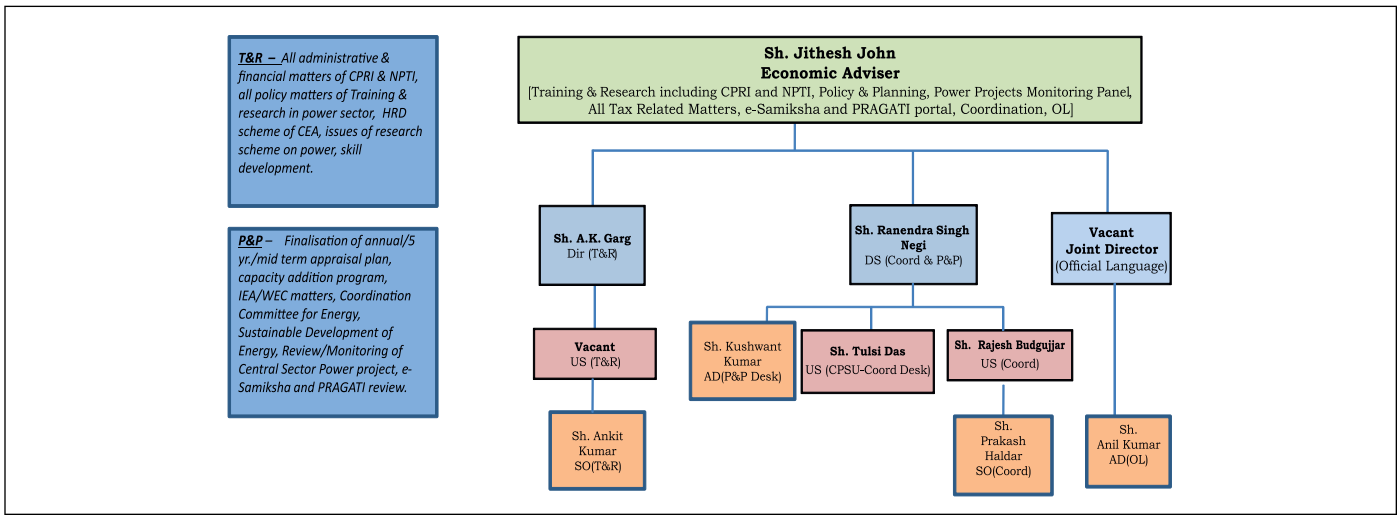


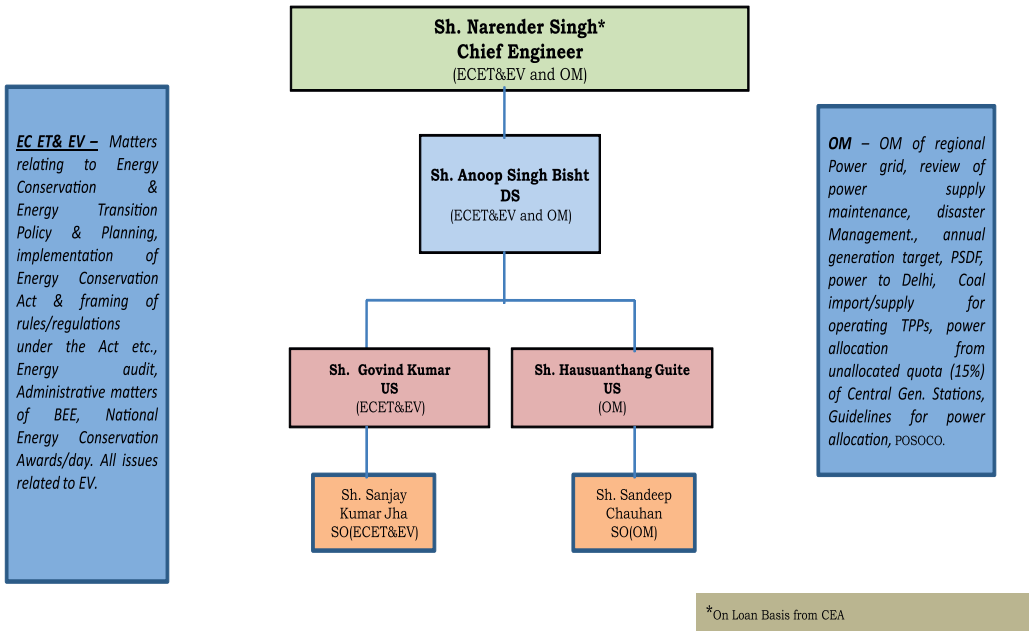
*On Loan Basis from CEA

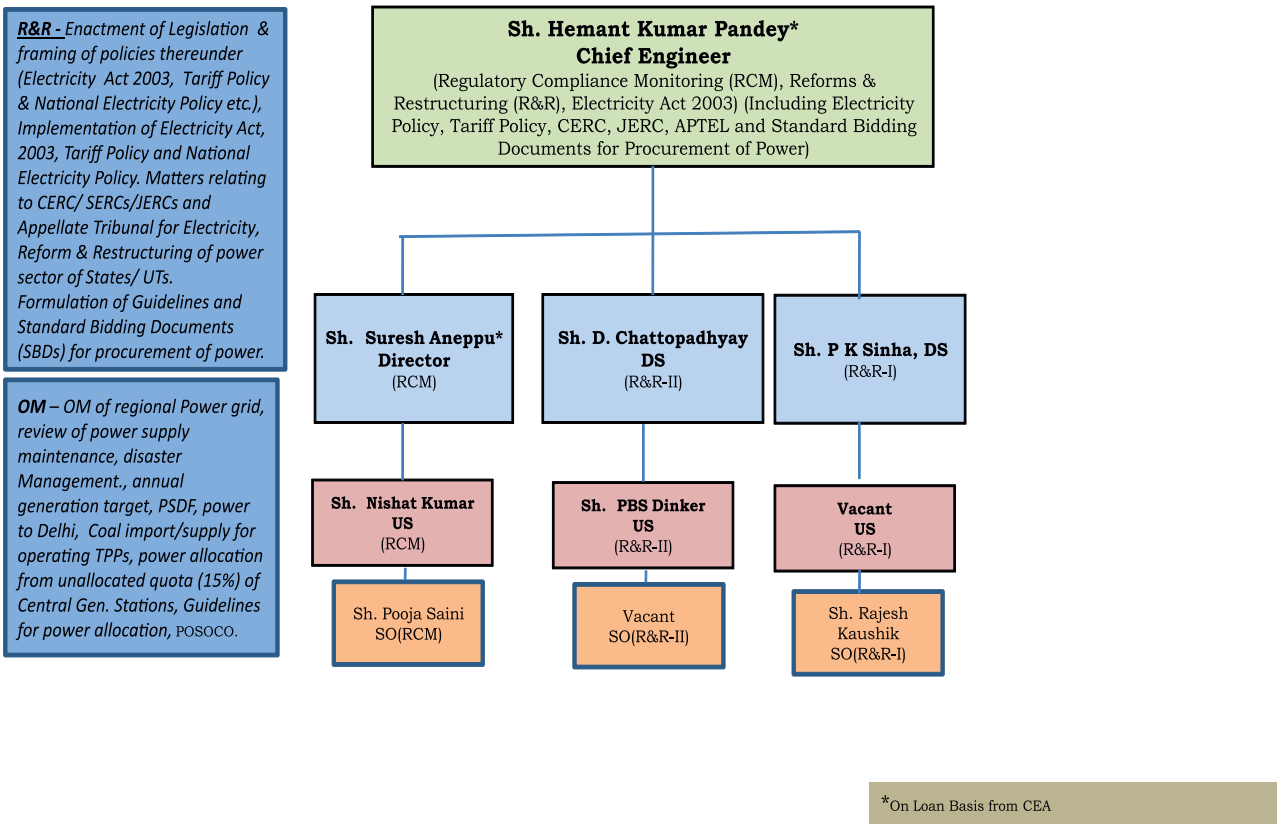
Smt. C. Themoli is also reporting to Dir (Reservation) for Reservation matters.


Sh. Mohammad Afzal
Joint Secretary
(Transmission, Parliament, Reservation, Public Grievance, RTI & Record)
(Grid India, Transmission, PGCIL, Grid Integration of Renewable Energy)
PGCIL- All matters of PGCIL & its implemented Trans projects. Central Transmission Projects and Utility, National Power Grid, Exchange of Power with neighboring countries by Transmission project implemented by Power Grid. Renewable Energy, Separation of CTU from PGCIL, General Network Access (GNA).
Shri Goutam Ghosh* Director (Transmission and PGCIL)
Sh. A.K. Garg, Director (Parliament, PG, RTI & Record)
Sh. G. Muthuraja Director (Reservation)
Transmission – All States/UTs Transmission Projects, REBs/RLDs, PLCC/PTCC matters, Cross Border Trade of Power with neighboring countries, Srinagar-Leh Transmission Project, NERPSIP, Comprehensive Scheme for improvement of Transmission and Distribution System in Arunachal Pradesh and Sikkim, Perspective Transmission Plan.
Reservation- Monitor implementation of reservation policies of Govt. for SC,ST, OBC & PH in MoP and its organizations.
RTI/Grievance – All matters relating to public grievances and RTI.
Parliament – Coordination of all Parliament matters.
Sh.Bihari Lal, US (Trans)
Sh. Sanjeev Jain, US (PGCIL)
Sh. R K Das US (Parl.)
Sh. Govind Kumar US (Record)
Smt. C. Thenmoli, US (Reservation Desk)
Vacant SO(Trans)
Roshan Kumar Verma SO(PGCIL)
Sh. Anil Kr. Sharma SO (Parl.)
Sh. Bhanu Joshi SO(PG & RTI Desk) (Additional Charge)
Sh. G. Muthuraja is also reporting to JS(Thermal) for FSC & UMPP matters.
Sh. A.K. Garg, is also reporting to EA for T&R matters.
Sh. Govind Kumar is also reporting to DS (ECETEV) for ECETEV and Smt. C. Thenmoli is also reporting to DS (Distribution) for REC/PFC.
Sh. Bhanu Joshi is also reporting to US (Thermal & St. Thermal) for St. Thermal.


NHPC:Administrative and other project related issues of NHPC, NHDC, J&K projects of NHPC. Coordination work of all J&K matters. E&F related issues of Power Sector projects.
Hydell:-All administrative & project related matters of THDC, NEEPCO & Coordination work of all projects in NER.
Hydel-II &BBMB Desk: All administrative & project related matters of SJVNL, and BBMB related matters. Hydro policy & misc. matters of Hydro electric projects except J&K & NE states. Hydro projects in SAARC countries.
Sh. Mohammad Afzal
Joint Secretary (Hydro)
(Additional Charge)
[Hydro matters including CPSUs namely NHPC, SJVNL, NEEPCO, THDC, Environment Management for Hydro Projects, Bhakra Beas Management Board, Coordination]
Sh. Ashok Kumar Director Hydel-I
Sh. R P Pradhan* Director Hydel-II, NHPC & BBMB
Sh.Mukesh Sawhney US (Hydel-I)
Sh. K Vikram SO(H-I)
Sh. P K Sangwan* DD (NHPC)
Sh. V S Dhillon* DD (H-II)
Sh.Gaurav Jasuja* DD (BBMB Desk)
Sh.Basant Kumar SO(NHPC)
Sh.Vikal Kumar SO(HII)
* On Loa Basis from CEA


T&R – All administrative & financial matters of CPRI & NPTI, all policy matters of Training & research in power sector, HRD scheme of CEA, issues of research scheme on power, skill development.
P&P – Finalisation of annual/5 yr./mid term appraisal plan, capacity addition program, IEA/WEC matters, Coordination Committee for Energy, Sustainable Development of Energy, Review/Monitoring of Central Sector Power project, e-Samiksha and PRAGATI review.
Sh. Jithesh John
Economic Adviser
[Training & Research including CPRI and NPTI, Policy & Planning, Power Projects Monitoring Panel, All Tax Related Matters, e-Samiksha and PRAGATI portal, Coordination, OL]
Sh. A.K. Garg Dir (T&R)
Sh. Ranendra Singh Negi DS (Coord & P&P)
Vacant Joint Director (Official Language)
Vacant US (T&R)
Sh. Kushwant Kumar AD(P&P Desk)
Sh. Tulsi Das US (CPSU-Coord Desk)
Sh. Rajesh Budgujjar US (Coord)
Sh. Ankit Kumar SO(T&R)
Sh. Prakash Haldar SO(Coord)
Sh. Anil Kumar AD(OL)


Sh. Narender Singh*
Chief Engineer
(ECET&EV and OM)
EC ET& EV – Matters relating to Energy Conservation & Energy Transition Policy & Planning, implementation of Energy Conservation Act & framing of rules/regulations under the Act etc., Energy audit, Administrative matters of BEE, National Energy Conservation Awards/day. All issues related to EV.
Sh. Anoop Singh Bisht
DS
(ECET&EV and OM)
OM – OM of regional Power grid, review of power supply maintenance, disaster Management., annual generation target, PSDF, power to Delhi, Coal import/supply for operating TPPs, power allocation from unallocated quota (15%) of Central Gen. Stations, Guidelines for power allocation, POSOCO.
Sh. Govind Kumar
US
(ECET&EV)
Sh. Hausuanthang Guite
US
(OM)
Sh. Sanjay Kumar Jha
SO(ECET&EV)
Sh. Sandeep Chauhan
SO(OM)
*On Loan Basis from CEA


R&R - Enactment of Legislation & framing of policies thereunder (Electricity Act 2003, Tariff Policy & National Electricity Policy etc.), Implementation of Electricity Act, 2003, Tariff Policy and National Electricity Policy. Matters relating to CERC/ SERCs/JERCs and Appellate Tribunal for Electricity, Reform & Restructuring of power sector of States/ UTs. Formulation of Guidelines and Standard Bidding Documents (SBDs) for procurement of power.
OM – OM of regional Power grid, review of power supply maintenance, disaster Management., annual generation target, PSDF, power to Delhi, Coal import/supply for operating TPPs, power allocation from unallocated quota (15%) of Central Gen. Stations, Guidelines for power allocation, POSOCO.
Sh. Hemant Kumar Pandey*
Chief Engineer
(Regulatory Compliance Monitoring (RCM), Reforms & Restructuring (R&R), Electricity Act 2003) (Including Electricity Policy, Tariff Policy, CERC, JERC, APTEL and Standard Bidding Documents for Procurement of Power)
Sh. Suresh Aneppu*
Director
(RCM)
Sh. D. Chattopadhyay
DS
(R&R-II)
Sh. P K Sinha, DS
(R&R-I)
Sh. Nishat Kumar
US
(RCM)
Sh. PBS Dinker
US
(R&R-II)
Vacant
US
(R&R-I)
Sh. Pooja Saini
SO(RCM)
Vacant
SO(R&R-II)
Sh. Rajesh Kaushik
SO(R&R-I)
*On Loan Basis from CEA

CAPACITY

The Indian power sector has come a long way in the past decade, transforming from a power- deficit to a power-surplus nation. A series of concerted measures led to a 45% increase in generation capacity – from 275 GW in Mar'15 to ~400 GW in Mar'22. Electricity generation also increased in tandem at a CAGR of ~4%, enabling India to reduce its energy and peak deficit from 4.2% and 4.5% in 2014 to 0.4% and ~1% in 2022 respectively. The Peak demand has grown at a CAGR of 4.6 % during 2014-15 to 2021-22 while Energy Requirement has grown at a rate of 3.71% during 2014-15 to 2021-22. The peak not met and energy not supplied of the country is observed to be very minimal over last five years and was on account of factors other than lack of generation capacity in the country.

GROWTH IN INSTALLED CAPACITY

The installed generation capacity in the country increased from 3,82,151 MW as on 31.03.2021 to 3,99,497 MW as on 31.03.2022. As on 31st January 2023, total installed capacity in the country is 4,11,649 MW. Contribution of various fuel sources to the total installed capacity is shown in the tables below:

Category	Installed Capacity (MW) As on 31.3.2021	% Share in Total Installed Capacity	Installed Capacity (MW) As on 31.03.2022	% Share in Total Installed Capacity	% Increase in Installed Generation Capacity
Fossil Fuel Capacity					
Coal	2,02,675	53.0	2,04,080	51.1	0.7
Lignite	6,620	1.7	6,620	1.7	0.0
Gas	24,924	6.5	24,900	6.2	-0.1
Diesel	510	0.1	510	0.1	0.0
Total Fossil Fuel Capacity	**2,34,728**	**61.4**	**2,36,109**	**59.1**	**0.6**
Non-Fossil Fuel Capacity					
Total RE (Including Hydro)	1,40,643	36.8	1,56,608	39.2	11.4
Hydro	46,209	12.1	46,723	11.7	1.1
Wind, Solar &Other RE	94,434	24.7	1,09,885	27.5	16.4
Wind	39,247	10.3	40,358	10.1	2.8
Solar	40,085	10.5	53,997	13.5	34.7
Small Hydro	4,787	1.3	4,849	1.2	1.3
Bio Power	10,146	2.7	10,206	2.6	0.6
Waste to Enegy	169	0.0	477	0.1	182.7
Nuclear	6,780	1.8	6,780	1.7	0.0
Total Non-Fossil Fuel Capacity	1,47,423	38.6	1,63,388	40.9	10.8
Total Installed Capacity	**3,82,151**	**100.0**	**3,99,497**	**100.0**	**4.5**

Installed Generation Capacity as on 31-01-2023(in MW)

	Category	Installed Generation Capacity (MW)	% Share in Total
Fossil Fuel	Coal	2,04,435	49.7%
	Lignite	6,620	1.6%
	Gas	24,824	6.0%
	Diesel	589	0.1%
	Total Fossil Fuel :	**2,36,469**	**57.4%**

Non-Fossil Fuel	RES (Incl. Hydro)	1,68,400	11.4%
	Hydro	46,850	29.5%
	Wind, Solar & Other RE	1,21,550	10.2%
	Wind	41,983	15.5%
	Solar	63,894	2.5%
	BM Power/Cogen.	10,210	0.1%
	Waste to Energy	523	1.2%
	Small Hydro Power	4,940	1.6%
	Nuclear	**6,780**	**42.6%**
	Total Non-Fossil Fuel :	**1,75,180**	**42.6%**

	Total Installed Capacity (Fossil Fuel & Non-Fossil Fuel)	**4,11,649**	**100%**

The List of Power Plants Commissioned during 2020-21, 2021-22 and 2022-23 (upto December) is at Annex.

GROWTH IN GENERATION

The total electricity generation in the country increased from 1,381.855 BU during 2020-21 to 1,491.859 BU during 2021-22. In the current Financial Year (2022-23), the generation during the period April 2022 to January 2023 stood at 1,359.216 BU as against 1,234.756 BU during the corresponding period in Financial Year 2021-22. Contribution of various fuel sources to the total generation is shown in the tables below:

Growth in Generation during 2021-22

Category-wise :	Year 2020-21		Year 2021-22		Growth (%)
	Generation (BU)	% of Total Generation	Generation (BU)	% of Total Generation	
• **Generation from Fossil Fuel :**					
Coal	950.938	68.8	1041.487	69.8	9.52
Gas	50.944	3.7	36.016	2.4	-29.30
Lignite	30.506	2.2	37.094	2.5	21.60
Diesel	0.126	0.0	0.117	0.0	-7.18
Total (Fossil Fuel) :	1032.514	74.7	1114.714	74.7	7.96
• **Generation from Non-Fossil Fuel :**					
Wind	60.150	4.4	68.640	4.6	14.11
Solar	60.402	4.4	73.476	4.9	21.64
BioPower & Others	26.695	1.9	28.796	1.9	7.87
Total : Solar, Wind, BioPower & Others	147.248	10.7	170.912	11.5	16.07
Hydro	150.300	10.9	151.627	10.2	0.88
Bhutan Import	8.766	0.6	7.493	0.5	-14.51
Total RE Generation (Incl. Hydro)	306.313	22.2	330.033	22.1	7.74
Nuclear	43.029	3.1	47.112	3.2	9.49
Total (Non-Fossil Fuel) :	349.342	25.3	377.145	25.3	7.96
• **Total Generation (Fossil Fuel & Non-Fossil Fuel) :**					
Total Generation :	**1,381.855**	**100.0**	**1,491.859**	**100.0**	**7.96**

Growth in Generation during 2022-23

Category-wise :	Year 2021-22 (April-Jan., 2022)		Year 2022-23 (April-Jan., 2023)		Growth (%)
	Generation (BU)	% of Total Generation	Generation* (BU)	% of Total Generation	
• Generation from Fossil Fuel :					
Coal	850.779	68.9	948.132	69.8	11.44
Gas	31.436	2.5	20.406	1.5	-35.09
Lignite	30.713	2.5	29.875	2.2	-2.73
Diesel	0.094	0.0	0.165	0.0	75.10
Total (Fossil Fuel) :	913.022	73.9	998.578	73.5	9.37
• Generation from Non-Fossil Fuel :					
Wind	61.525	5.0	64.570	4.8	4.95
Solar	57.861	4.7	81.498	6.0	40.85
BioPower & Others	22.552	1.8	23.736	1.7	5.25
Total : Solar, Wind, BioPower & Others	141.939	11.5	169.804	12.5	19.63
Hydro	133.610	10.8	146.117	10.8	9.36
Bhutan Import	7.292	0.6	6.710	0.5	-7.98
Total RE Generation (Incl. Hydro)	282.840	22.9	322.630	23.7	14.07
Nuclear	38.894	3.1	38.008	2.8	-2.28
Total (Non-Fossil Fuel) :	321.735	26.1	360.638	26.5	12.09
• Total Generation (Fossil Fuel & Non-Fossil Fuel) :					
Total Generation :	1,234.756	100.0	1,359.216	100.0	10.08

* Provisional

FUTURE GROWTH OF POWER SECTOR

Expected Demand

As per the 20th Electric Power Survey Report published by Central Electricity Authority, the peak demand and energy requirement is around 335 GW and 2280 BU respectively by 2029-30. To meet the growing demand, the generation capacity is required to be added in advance to avoid any shortage scenario in future. Consumers must be given 24x7 reliable, quality power.

Generation Capacity Addition

Central Electricity Authority (CEA) has carried out generation expansion studies with the projected All India peak electricity demand for the year 2029-30. Scenario analysis was also carried out to assess the capacity addition requirement to meet the projected demand in the year 2029-30.

Based on the studies the projected power generation installed capacity required to meet the electricity demand in the year 2029-30 in base case is 774.7 GW comprising of 248.3 GW of Coal, 25.3 GW of gas, 21.1 GW of Nuclear, and 480 GW of RE (including 57.7 GW of Large Hydro, 270.1 GW of PV, 118.4 GW of Wind, 19.3 GW of other RE). Additionally, Pumped storage plants (PSP) based installed capacity of 14.5 GW (with daily storage of 6-7 hours), BESS storage-based capacity of around 25 GW with 5-hour may be required in 2029-30.

Energy storage systems can prove useful in combating the challenges posed by integrating intermittent generation sources into the grid and the grid stability issues due to large fluctuations in demand, to ensure quality of supply on real time basis

by storing excess generation over different time horizons (minutes, days, weeks). Further, the cost of storage is projected to decrease rapidly in the next decade rending the technology quite competitive to other conventional technologies.

The share of non-fossil fuel based generation capacity in the total installed capacity of the country is likely to increase from around 42.5% as on 31.12.2022 to around 64.7% by 2029-30. The share of fossil fuel based capacity in the total installed capacity of the country as on 31.12.2022 is 57.5%, which is likely to reduce to 35.3 % by 2029-30. The projection of total capacity addition is in line with the target of the country to achieve 50% of non-fossil based installed capacity by the year 2029-30. It is estimated that non-fossil fuels generation contribution is likely to increase from 25.3 % in 2021-22 to around 46.2 % of the gross electricity energy generation during the year 2029-30.

Thermal Capacity Addition

Coal based plants are also required in future because there are various challenges associated with Renewable energy sources (RES) with respect to intermittency and variability of RE generation. Solar PV generation is not available during night hours and wind generation is highly variable across seasons. RES being non-dispatchable energy sources would require flexible coal generation to absorb RE generation variability and intermittency to ensure grid security. Additionally, Coal based plants are dispatchable and dependent energy sources. Coal based capacity addition of around 47 GW is required by the year 2029-30 in various scenarios.

A capacity totalling to 26,900MW is under various stages of construction comprising of 13,240 MW from Central sector and 13,660MW from state sector. The year-wise schedule for commissioning of under-construction coal based plants is given below:

	Central		State		Total	
	No. of units	Capacity (MW)	No. of units	Capacity (MW)	No. of units	Capacity (MW)
2022-23	3	2120	3	2400	6	4520
2023-24	10	6740	11	7680	21	14420
2024-25	4	3060	5	3580	9	6640
2027-28	2	1320	0	0	2	1320
Total	**19**	**13240**	**19**	**13660**	**38**	**26900**

Further, Coal based capacity of 20,580 MW has been identified comprising of 14,220 MW of Central sector capacity and 6,360MW of state sector capacity which is under initial stages of development. Additionally, coal based capacity totaling to 10,080 MW has been identified, which may be considered for development in future, if required. Apart from this a coal capacity totaling to around 4,770 MW is from stressed private sector plants under review.

Hydropower generation capacity addition

Hydropower provides strong contribution to flexibility in the power system by filling the gap between supply and demand that has been induced by the non-dispatchable variability of RES. The storage capabilities of many hydropower plants make them a perfect instrument for optimizing the use of variable RES over shorter and longer periods, thus facilitating the integration of variable RES into the power system and providing a key tool to maintain a stable and balanced grid. Hydropower also provides a number of ancillary services which are needed in order to manage a transmission system in a way that secures system stability and security of supply. Hydro based capacity totalling to around 13 GW (including Pump Storage Plants [PSP] of 2.7 GW) are under active construction and likely to yield benefit by the year 2026-27. Apart from this a hydro capacity of around 1.2 GW are stalled due to various reasons. Efforts are being made to resolve these issues. The year-wise schedule of commissioning of hydro plants under-active construction (in MW) is given below:

All figures in MW

Summary (Hydro)				
	Central	**State**	**IPPs**	**Total**
2022-23	60	10	0	**70**

2023-24	2800	90	150	**3040**
2024-25	1084	783.5	0	**1867.5**
2025-26	3370	640	240	**4250**
2026-27	540	450	0	**990**
Total	**7854**	**1973.5**	**390**	**10217.5**
Summary (PSP)				
	Central	**State**	**IPPs**	**Total**
2023-24	1000	0	0	**1000**
2024-25	0	500	1200	**1700**
Total	**1000**	**500**	**1200**	**2700**

Nuclear generation capacity addition

A nuclear based capacity of 8700 MW is under construction to yield benefits during 2022-23 to 2029-30. Additionally, a capacity of 5600 MW is under various stages of administrative approval and may yield benefit by 2029-30.

Solar and wind-based capacity Addition

As per the studies, a solar and wind based installed capacity of 270GW and 118 GW respectively, is required by the year 2029-30. At present solar installed/pipeline capacity is 137.74 GW which comprises of installed capacity of 61.63 GW, under implementation of 49.73GW and tendered capacity of 26.38 GW. At present Wind installed/pipeline capacity is 55.27 GW which comprises of installed capacity of 41.84 GW, under implementation of 11.73GW and tendered capacity of 1.7 GW.

Annex

LIST OF POWER PLANTS COMMISSIONED DURING 2020-21

NAME OF PROJECT	SECTOR	STATE	DEVELOPER	CAPACITY (MW)
THERMAL PROJECTS				
Lara STPP, U-2	Central	Chhatisgarh	NTPC	800
Gadarwara STPP, U-2	Central	Madhya Pradesh	NTPC	800
Mejia STPP, U-2	Central	Uttar Pradesh	JV of NTPC & UPRVUNL	660
Neyveli New TPP-Lignite, U-2	Central	Tamil Nadu	NLC	500
Tanda TPP St-II, U-6	Central	Uttar Pradesh	NTPC	660
New Nabi Nagar STPP	Central	Bihar	JV of NTPC & BSPGCL	660
Namrup CCGT-Gas, ST	State	Assam	APGCL	36.15
Bhadradri TPP, U-1 to U-3	State	Telangana	TSGENCO	810
			A. Total (Thermal)	**4926.15**
HYDRO PROJECTS				
Kameng, U-3 & U-4	Central	Arunachal Pradesh	NEEPCO	300
Sawara Kuddu, U-1 to U-3	State	Himachal Pradesh	HPPCL	111
Singoli Bhatwari HEP, U-1 to U-3	Private	Uttarakhand	L&T Uttaranchal Hydro power Limited	99
			B. Total (Hydro)	**510**
			C. Total (Nuclear)	**0**
			Total Commissioned (A+B+C)	**5436.15**

LIST OF POWER PLANTS COMMISSIONED DURING 2021-22

NAME OF PROJECT	SECTOR	STATE	DEVELOPER	CAPACITY (MW)
THERMAL PROJECTS				
Barh STPP-I U-1	Central	Bihar	NTPC	660
Darlipalli STPP St-I, U-2	Central	Odisha	NTPC	800
Nabi Nagar TPP	Central	Bihar	BRBCL (JV of NTPC & Rly)	250
Nabi Nagar STPP, U-3	Central	Bihar	NPGCL (JV of NTPC & BSPGCL)	660
Suralgarh SCTPP U-8	State	Rajasthan	RRVUNL	660
Harduaganj TPS Exp-II U-1	State	Uttar Pradesh	UPRVUNL	660
Bhadadri TPP	State	Telangana	TSGENCO	270
Tuticorin TPP Stage-IV	Private	Tamil Nadu	SEPC	525
			A. Total (Thermal)	**4485**
HYDRO PROJECTS				
Sorang U-1 & U-2	Private	Himachal	Sorang Power	100
Rongnichu U-1 & U-2	Private	Madhya Bharat Power Corporation	Sikkim	113
Bajoli Holi HEP , U-1 to U-3	Private	GMR	Himachal Pradesh	180
			B. Total (Hydro)	**393**
			C. Total (Nuclear)	**0**
			Total Commissioned (A+B+C)	**4878**

LIST OF POWER PLANTS COMMISSIONED DURING 2022-23 (AS ON 30.12.2022)

NAME OF PROJECT	SECTOR	STATE	DEVELOPER	CAPACITY (MW)
THERMAL PROJECTS				
			A. Total (Thermal)	**0**
HYDRO PROJECTS				
Vyasi , U-1 & U-2	State	Uttarakhand	UJVNL	120
			B. Total (Hydro)	**120**
			C. Total (Nuclear)	**0**
			Total Commissioned (A+B+C)	**120**

CHAPTER 04

GENERATION & POWER SUPPLY POSITION

Generation:

The total electricity generation including generation from renewable sources in the country during the current year 2022-23 (Upto December 2022) was 1223.135 BU as against the generation of 1113.712 BU during the corresponding period last year, showing a growth of 9.83%.

The electricity generation from Fossil Fuel Power Plants (Thermal) during 2022-23 (Upto December 2022) has increased by 9.2% over same period last year. The electricity generation from Non-Fossil Fuel Power Plants during 2022-23 (Upto December 2022) has increased by 11.5% over corresponding period last year. Share of generation from Non-Fossil Fuel in total generation has been 27.1% during the current year 2022-23 (Upto December 2022).

The electricity generation in the country increased from 878.3 Billion Unit (BU) during 2014-15 to 1223.1 BU during the year 2022-23 (Upto December 2022).

Plant Load Factor (PLF)

The Plant Load Factor (PLF) of Thermal Power Stations (TPSs) is an index of utilization of the installed capacity, The average PLF of TPSs of Power Utilities during the year 2022-23 (upto December 2022) was 63.23%. The sector-wise and overall PLF from 2014-15 was as under:

Year	Central	State	Private	Overall
2014-15	74.0	59.8	60.6	64.5
2015-16	72.5	55.4	60.5	62.3
2016-17	72.0	54.3	55.7	59.9
2017-18	71.4	55.1	55.2	59.8
2018-19	72.6	57.8	55.2	61.1
2019-20	64.2	50.2	54.6	56.0
2020-21	63.4	46.2	54.7	54.5
2021-22	69.7	54.5	53.6	58.9
2022-23 (Upto Dec.)	73.9	60.7	56.1	63.2

Power Supply Position:

The power supply position from 2014 onwords was as under:

Year	Energy Requirement (MU)	Energy Availability (MU)	Energy Shortage (MU)	Energy Shortage (%)
2014-15	1068923	1030785	38138	3.6
2015-16	1114408	1090850	23558	2.1
2016-17	1142929	1135334	7595	0.7
2017-18	1213326	1204697	8629	0.7
2018-19	1274595	1267526	7070	0.6
2019-20	1291010	1284444	6566	0.5
2020-21	1275534	1270663	4871	0.4
2021-22	1379812	1374024	5787	0.4
2022-23 (Upto Dec.)	1135192	1129139	6053	0.5

The peak demand from 2014-15 onwards was as under:

Year	Peak Demand (MW)	Peak Met (MW)	Peak Shortage (MW)	Peak Shortage (%)
2014-15	148166	141160	7006	4.7
2015-16	153366	148463	4903	3.2
2016-17	159542	156934	2608	1.6
2017-18	164066	160752	3314	2.0
2018-19	177022	175528	1494	0.8
2019-20	183804	182533	1271	0.7
2020-21	190198	189395	802	0.4
2021-22	203014	200539	2475	1.2
2022-23 (Upto Dec.)	215888	207231	8657	4.0

THERMAL POWER

1. Thermal Power Generation

During Apr- Dec 2022, Gross generation from NTPC stations, excluding joint ventures and subsidiaries is 254.6 BU while that including JV and subsidiaries is 295BUs. During this period, NTPC coal-based stations achieved a PLF of 74.45 % with 92.23 % availability (DC %).

During Apr- Dec 2022, six NTPC coal stations achieved more than 85 % PLF, viz. Korba (90.69%), Singrauli (90.48%), Vindhyachal (89.92%), Rihand (89.21%), Talcher Kaniha (87.72%) & Kanti (85.12%). During Jan-March 2023 expected Gross generation from NTPC Stations, excluding joint ventures and subsidiaries is 93.5 BU. Overall NTPC coal-based stations may achieve PLF of 77 % in FY 2022-23.

2. Thermal Capacity Addition

NTPC Nabinagar Unit -3 (660 MW) and NSPCL Durgapur PP-III (20 MW), have started commercial operation in the current financial year.

NTPC also acquired Jhabua Power Limited (600 MW) under NCLT route.

3. Under-construction Thermal capacity

As on 31st Dec 2022, capacity of 9960 MW is under construction by NTPC Group (i.e. NTPC 6220 MW and 3740 MW of JVs and subsidiaries)

4. Use of Biomass in Thermal Power Plants

In line with the Government's National Biomass Mission, NTPC has initiated blending of biomass-based fuels with coal. NTPC has developed capability to co-fire 10% biomass in the existing coal fired stations. After successfully demonstrating at Dadri, the Company has started commercial scale biomass co-firing at its existing coal-based stations. Further NTPC is exploring possibilities to co-fire biomass beyond 20%, ammonia up to 100%, and methanol up to 30%. For this, a MOU has been signed with GE Power India Limited. Design provisions are being made in new thermal power project for additional space for 10-20% Carbone capture and biomass cofiring up-to 20%. This will help in decarbonizing power from coal fired power plant and resolve issue of crop residue burning by farmers. NTPC has cumulatively fired more than 84,000 MT biomass in its stations.

5. Implementation of FGD in Thermal Power Stations

For reduction of SOx emission, NTPC has installed & commissioned Flue Gas Desulphurization (FGD) units at Vindhyachal U#13 (500 MW), DadriUnit#5 (490 MW), UnchaharUnit#6 (500MW) and Dry Sorbent Injection (DSI) in Dadri (4X210MW). Construction works of FGD at various stations and projects (~60 GW capacity) are in progress and at some stations it is in advance stage of completion.

Status of UMPPs

I. UMPPs Operational: Four UMPPs namely Sasan in Madhya Pradesh, Mundra in Gujarat, Krishnapattnam in Andhra Pradesh and Tilaiya in Jharkhand were transferred to the identified developers. Out of the four awarded UMPPs, two UMPPs namely Mundra UMPP and Sasan UMPP are in operation and PPAs of remaining two UMPP namely Krishnapattnam and Tilaiya have been terminated. A brief detail of operational UMPPs is as below:

   a. **Mundra UMPP in Gujarat:** The project was handed over to the successful Bidder i.e. Tata Power Company Ltd., on 23.04.2007 at the evaluated levelised tariff of Rs. 2.26367/kWh. Mundra UMPP is fully commissioned.

   b. **Sasan UMPP in Madhya Pradesh:** The project was handed over to the Successful Bidder i.e. M/s Reliance Power Ltd., on 07.08.2007 at the evaluated levelised tariff of Rs. 1.19616/kWh. Sasan UMPP is fully commissioned.

II. Other UMPPs: Ministry of Power has taken policy decision to encourage Brownfield project for setting up of new Thermal Power Plants and no new large Greenfield Projects would be taken up in light of the Government of India's endeavor for transition from Fossil Fuels towards Non-Fossil Fuels. In light of this decision, no new Ultra Mega Power Projects would be implemented.

   a. **UMPPs closed:** Chhatisgarh UMPP, Andhra 2nd UMPP, Maharashtra UMPP and Karnataka UMPPs have been closed.

   b. **UMPPs under closure:** Ministry of Power has accorded approval to PFCCL for closure of Uttar Pradesh UMPP, Gujarat 2nd UMPP and Tamil Nadu 2nd UMPP.

   c. **UMPPs where consent of Lead Procurers/ State Governments have been received for closure:** Consent for closure of Cheyyur UMPP and Bhedabahal UMPP has been received from Lead Procurers.

d. **UMPPs where consent of Lead Procurer/State Government has not been received for closure:** Odisha 1st Additional UMPP (Sakhigopal UMPP), Odisha 2nd Additional UMPP (Ghogarpalli UMPP), Banka/Bihar UMPP, Deoghar UMPP.

Feasibility and acceptability for usage of Gypsum as a byproduct of Installation of Flue Gas Desulphurization (FGD) in Thermal Power Plants

MoEF&CC on 7th December 2015 notified new environmental norms for TPPs including SO2 emissions. This necessitated the need for the installation of the FGDs in the TPPs. FGD Gypsum is a by-product of the operation of wet limestone based FGD systems in TPPs. It has been estimated that FGD Gypsum production will be between to the tune of 10 million TPA to 14 million TPA from 2024 onwards depending on the PLF of the TPPs. This huge quantity of FGD Gypsum which is similar to natural gypsum in its characteristics is required to be utilized in a gainful manner.

Keeping in view of the same, a Task Force was constituted by MoP in June, 2021 for "Standards for usage of FGD Gypsum having acceptability to various end users, regulators and also evaluate hazardous nature of FGD gypsum". This Task Force comprised members from CEA, NTPC, DVC, CPRI, NCCBM, CPCB, BIS, CMA, IIT Bombay, Knauf India (erstwhile USG Boral), Saint Gobain and IIT Madras. The comprehensive testing of FGD Gypsum collected from all the available operating FGD plants of the country was conducted in the CPRI, IITB and CPCB for finalizing the standards for usage of FGD Gypsum & its hazardous nature.. The testings were carried out over the period up to 90 days from the receipt of the samples at various labs. ICAR-Central soil Salinity Research Institute, Karnal and NTPC Vindhyachal is also conducting a three year collaborative study to explore the reclamation potential of FGD Gypsum for rehabilitation of sodic soils.

The results of the above tests and studies conducted are encouraging and it has emerged that FGD Gypsum is a Non-Hazardous By-product and can be can be safely used in applications like cement manufacturing, building materials, wallboards, building plaster, reclamation of sodic soil etc. where natural gypsum is being used presently. It has been further recommended that with the increase in production of FGD Gypsum over a period of time, it can gradually reduce the dependence of various industries on imported gypsum and thus would preserve Forex. CEA has also taken up with BIS to issue suitable Indian Standards in regard to usage of Gypsum in the cement manufacturing, building materials, wallboards, building plaster, reclamation of sodic soil etc. In this regard, the Indian Standard IS 12679:2021 was taken up for revision by BIS and the draft of revision [CED04(19482) WC] was issued in consulting/commenting stage. presently, these draft standards have been finalized for publication.

Further, CPCB has also been requested to notify FGD Gypsum as a non-hazardous By-product and issue guidelines on Handling and Management of FGD Gypsum. The status of notification of FGD Gypsum as a non-hazardous was discussed in the 74th meeting of the Technical Review Committee constituted by MoEF&CC wherein the Committee based on the Report of the Task Force and analysis results of CPCB, IIT Bombay, CPRI and ICAR-CSSRI has recommended FGD Gypsum as Non-hazardous. Regarding the status of draft guidelines on Handling and Management of Flue Gas Desulfurization (FGD) gypsum, CPCB has initiated the process of preparation of guidelines on handling and management of FGD Gypsum and had completed consultative meetings with representatives of Ministry of Power; MOEF&CC, Thermal Power Plants (including FGD gypsum generating units), Association of Power Producers, Cement Manufacturers Association and Gypsum Board Manufacturing units. Based on the inputs received the revised guidelines would be finalized shortly. A web portal for information on data related to production/availability of FGD Gypsum at various thermal power plants has been designed by NTPC in consultation with CEA for potential users.

Implementation of FGD in Thermal Power Stations

On December 7, 2015, the Ministry of Environment, Forest and Climate Change (MoEF&CC) introduced stricter environmental standards for coal-based TPPs under the Environment (Protection) Act, 1986. MOEF&CC vide gazette notification dated 31.03.2021 categorized thermal power plants in three categories having different timelines along with the environment compensation for non-compliance. Further, MOEF&CC vide gazette notification dated 05.09.2022 has revised the timeline for installation of FGD in different categories of TPPs as follows:

Category A - Within 10 km radius of NCR or cities having million plus population as per 2011 census of India. Completion timeline 31.12.2024.

Category B - Within 10 km radius of critically polluted areas or Non-Attainment cities as defined by CPCB. Completion timeline 31.12.2025.

Category C - Other than those included in category A and B. Completion timeline 31.12.2026.

The summary of aforementioned categorization along with present status of 600 thermal units till 15th January, 2023 where FGD system is being implemented and monitored by CEA/ MoP (unit-wise) has been given in table below:

Summary (MW)

S. No.	Category	Total (MW)	CFBC	Claims SO_2 compliance	Retired	Feasibility study not started	Feasibility Study started	Feasiblity Study Completed	Tender specification made	NIT issued	Bid opened	Bid Awarded	FGD Installed
1	A	20577	0	0	210	0	2640	2225	0	2540	2842	6720	3400
2	B	24057	300	0	430	0	837	1620	0	7550	5300	8020	0
3	C	166885.5	5614	1430	60	1370	7416.5	12640	12800	15385	18600	85690	5880
	Total	211519.5	5914	1430	700	1370	10893.5	16485	12800	25475	26742	100430	9280

Summary (No. of units)

S. No.	Sector	Total (No. of units)	CFBC	Claims SO_2 compliance	Retired	Feasibility study not started	Feasibility Study started	Feasiblity Study Completed	Tender specification made	NIT issued	Bid opened	Bid Awarded	FGD Installed
1	A	66	0	0	1	0	15	9	0	8	7	17	9
2	B	72	2	0	3	0	4	4	0	26	14	19	0
3	C	462	50	6	1	2	28	41	37	49	52	183	13
	Total	600	52	6	5	2	47	54	37	83	73	219	22

There are defferent available FGD technologies like, Dry Sorbent Injection, Semi Dry, Sea Water, Wet lime stone for controlling SO2 in flue gas of thermal power plant. The FGD technology is being selected by Generating utilities for a particular unit on the basis of life cycle cost analysis. More than 90 percent of thermal units are implementing Wet Lime Stone Based FGD (WLFGD) as it is economical. The construction time of WLFGD is about 44 -48 months. The project cost for wet lime based FGD technology is varying between rupees 0.39 crore to 1.40 crore per MW, which is quite high, around 3 times higher than the expected cost presumably due to demand supply gap in FGD market.

Utilisation of Fly Ash:

Coal / Lignite based Thermal Power Generation has been the backbone of power capacity addition in the country. Indian coal is of low grade with ash content of the order of 30-60 % in comparison to imported coals which have a low ash content of the order of 2-20 %. A large quantity of ash is, thus being generated at Coal / Lignite based Thermal Power Stations in the country, which not only requires a large area of precious land for its disposal but is also one of the sources of pollution of both air and water.

In order to reduce the requirement of land, for the disposal of fly ash in the ash ponds, and to address the problem of pollution caused by fly ash, the Ministry of Environment, Forests (MoEF) has issued various Notifications on fly ash utilization. The First Notification was issued on 14th September 1999 which was subsequently amended in the years 2003, 2009 and 2016 vide Notifications dated 27th August 2003, 3rd November 2009 and 25th January 2016 respectively.

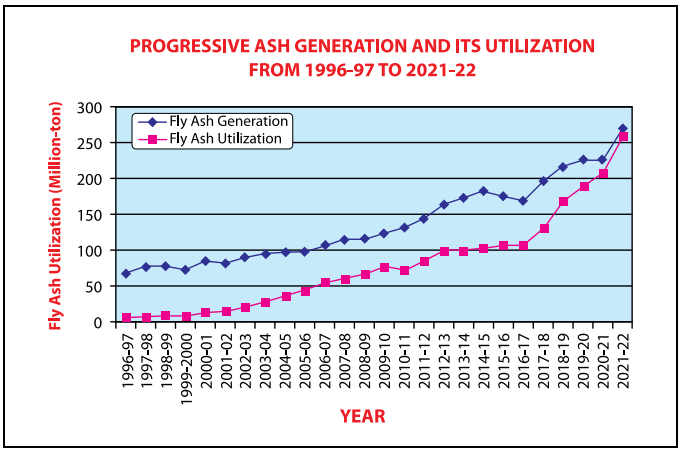
These notification prescribes the targets of Fly Ash utilization in the country so as to achieve 100% utilization of fly ash. Ministry of Environment, Forest and Climate Change (MoEF&CC) has now issued a revised Notification on 31st December 2021 in supersession of earlier Notifications in order to widen the scope of ash utilization. MoEF & CC has issued an amendment dated 30.12.2022 to this Notification.

Ash utilisation during Year 2021-22

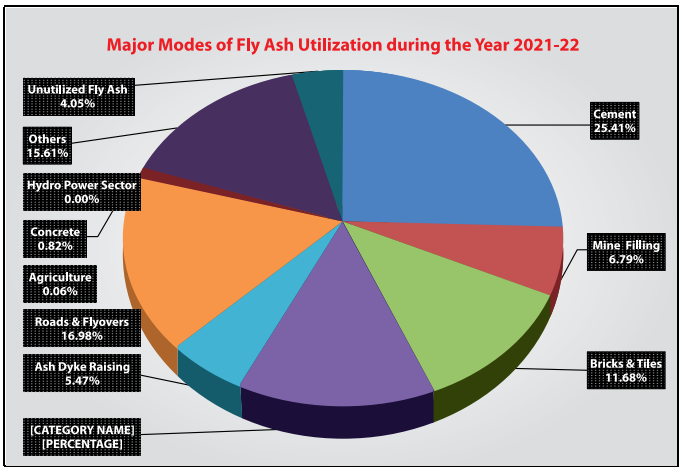
No. of Thermal Power Stations from which data have been received	200
Installed capacity (Mega watts)	213620.5
Coal Consumed (Million tons)	759.02
Fly Ash Generation (Million tons)	270.82
Fly Ash Utilization (Million tons)	259.86
Percentage Utilization (%)	95.95
Percentage Average Ash Content (%)	35.68

The data of fly ash generation and utilization for the year 2021-22 was received from 103 Power Utilities out of which 50 Power Utilities have achieved fly ash utilization level of 100% or more and 10 Power Utilities have achieved fly ash utilization level in the range of 90% to less than 100%. The information of ash utilisation is made available in public domain so as to help industry and other user to know source and quantum of ash available for disposal.

The progressive utilisation of Fly Ash since 1996-97 is showning an increasing trend and it is expected that in near future it would reach 100%



The usage of Ash in various industries during 2021-22 is given below:



HYDRO POWER

Hydro Power has been a mainstay of the Indian Power sector for long. The importance of hydro power has a renewed emphasis due to the changing energy mix of India. Hydro power is critical in India's response to the challenge of meeting the energy needs of an aspiring population even as climate change issues are also addressed.

Government of India has set an ambitious target for enhancement of non-fossil fuel Energy capacity to 500 GW by 2030 (as announced in the COP26 Summit in Glasgow by the Hon'ble Prime Minister of India). The commitment regarding non- fossil fuel capacity is proposed to be met mainly from installation of Solar and Wind power capacities, which are infirm sources of power, i.e. the generation from these sources varies significantly with the availability of wind and sunshine. With the increased share of intermittent Renewables in the energy mix of the country, the existing flexibility in Generation of power will not be sufficient to meet the balancing requirement in the electricity grid and the stable operation of Grid for ensuring 24x7 Power will require. Hydro Power, which has unique features like quick ramping, black start capability etc.

The development of Hydro Power and the Hydro Pumped Storage projects is of paramount importance for achieving above goals. Hydro is clean, green, renewable, non-polluting and environmental friendly. Hydro projects improve quality of life in remote hilly and backward areas by benefits of electrification, industrialization & road/rail communication development. It promotes conservation Installed Capacity – Operational category-wise of fossil fuel and provides escalation free & cheapest energy in long run. It has the ability for instantaneous starting, stopping and load variation, thereby ideally suited for peaking and balancing operation and improves reliability of power system.

Storage projects increase lean season flows, provide flood control, navigation, irrigation and drinking water supply benefits etc. and thus help in the maximum utilization of scarce water resources. Projects like Hirakund & Bhakra Dam have increased Agriculture Productivity and have been behind the success of Green Revolution in India while the role of Tehri Dam in mitigating the 2013 Uttarakhand disaster floods is well known.

Hydro projects also have a long useful life. Some projects like Bhakra are in operation for last 50 years, while some others like Pykara (59.2 MW) & Mettur Dam (50 MW) in Tamil Nadu, Pallivasal (37.5 MW) in Kerala and Sivasamudram (42 MW) in Karnataka etc., are in existence for more than 70-80 years now.

Installed Capacity and Generation Performance of Hydro-Electric Stations:

Installed Capacity – Sector-wise

Sector	Total	
	No.	MW
Central	42	15664.7
State	148	27254.45
Private	22	3931
Total	211*	46850.15

Installed Capacity – Operational category-wise

Sector	RoR		RoR (P)		Storage (S)						Total	
					S(P)		S(MPP)		PSS			
	No.	MW	No.	MW	No.	MW	No.	MW	No.	MW	No.	MW
Central	8	2133.50	19	7263.0	6	1725.00	9	4543.2	0	0	42	15664.70
State	15	892.15	51	7710.0	32	6487.30	43	7569.4	7	4595.6	148	27254.45
Private	5	892.00	13	2592.0	3	297.00	0	0.0	1	150.0	22	3931.00
Total	**28**	**3917.65**	**83**	**17565.0**	**41**	**8509.30**	**52**	**12112.6**	**8**	**4745.6**	**211***	**46850.15**

* - Total No. of HE Stations are 211 as Nagarjuna Sagar has 1 conventional and remaining 7 PSS units.

Abbreviations: RoR - Run of River, RoR(P) – Run of River with Pondage, S(P) – Storage (Purely Power), S(MPP) – Storage (Multipurpose Project), PSS – Pumped Storage Scheme

Generation (BU)

	Actual Generation in BU (% of Target)							
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
All India	121.37 (94.83 %)	122.37 (91.33 %)	126.12 (89.20%)	134.89 (103.76%)	155.77 (113.7%)	150.30 (107.1%)	151.63 (101.39%)	138.10* (110.11%)

* As on 31st Dec, 2022 (tentative).

Hydro Capacity Addition:

Sector-wise Hydro Capacity Addition in the last few years is as under:-

S. No.	Year	Central Sector (MW)	State Sector (MW)	Private Sector (MW)	Total (MW)
1	2015-16	480	610	426	1516
2	2016-17	80	1555	24	1659
3	2017-18	390	200	205	795
4	2018-19	110	30	-	140
5	2019-20	300	-	-	300
6	2020-21	300	111	99	510
7	2021-22	-	-	393	393
8	2022-23*	-	120	-	120
Grand Total		**1660**	**2626**	**1147**	**5433**

* Till Dec'22

Year-wise anticipated commissioning schedule of Hydro projects presently under construction is as under:-

Year	2022-23*	2023-24	2024-25	W2025-26	2026-27	Total
Capacity Under Construction (MW)	70	4040	3567.5	4250	990	12917.5

*Vyasi HEP (120 MW) have already been commissioned in 2022-23 (May'22) till 31.12.2022.

- Out of total Installed Capacity of the country the share of hydro power was ~ 11.5% (as on Nov' 2022)
- Generation from hydro power plants during 2021-22 ~ 151.6 BU.
- Hydro Capacity addition beyond in the recent years- 795 MW during 2017-18, 140 MW in 2018-19, 300 MW in 2019-20, 510 MW in 2020-21, 393 MW in 2021-22 and 120 MW in 2022-23 (till Dec'22).
- Capacity under construction – 12663.5 MW .

Hydro Capacity Addition by 2030:

Considering the unique advantages of hydropower (including Pump Storage Projects) and the increasing need of hydropower for grid stability/balancing, the Government has envisaged to add 51 no. of hydro schemes with an aggregate Installed capacity of around 26.4 GW (including 13 no. of Pumped Storage Schemes of 14.2 GW).

Reforms in Hydro Power Sector:

Government Policy Measures to promote Hydro Power Sector March 2019

In March 2019, Govt. of India approved number of measures for promoting hydro power sector, which are as under:

i) Declaring Large Hydro Power (LHPs) (> 25 MW projects) as Renewable Energy source.

ii) Hydro Purchase Obligation (HPO) as a separate entity within Non-solar Renewable Purchase Obligation (RPO).

iii) Tariff rationalization measures for bringing down hydro power tariff.

iv) Budgetary Support for Flood Moderation/Storage Hydro Electric Projects (HEPs).

v) Budgetary Support to Cost of Enabling Infrastructure, i.e. roads/bridges.

   a. Rs. 1.5 crore per MW for projects upto 200 MW.

   b. Rs. 1.0 crore per MW for projects above 200 MW.

As a result of these measures, the capital cost as well as the project tariff would be reduced in initial years which would improve project viability & saleability.

Guidelines to reduce the incidence of time and cost over-runs in Hydro Power Projects

Construction of Hydro Electric Projects usually gets delayed on account of various reasons resulting in Time and Cost overrun. Guidelines to reduce the incidence of time and cost overruns in hydro power projects were issued on 08.11.2019. These guidelines covered various aspects viz. realistic scheduling, usage of software tools, concept of sunset date, listing critical/ non critical works, delegation of power, timely settlement of claims, adoption of international best practices, resource mobilization, dispute resolution, incentivizing labour on achieving project milestones in time, etc.

Dispute Avoidance Mechanism through 'Independent Engineer'

A Dispute Avoidance Mechanism through 'Independent Engineer' has been put in place for avoidance of contractual disputes in hydro projects executed by CPSUs under MoP at the inception stage itself or amendment in provisions of old contract with consent of contractor. Ministry has also prepared a panel of domain experts. The CPSE & Contractor shall jointly select one Member from the panel of experts for each package of works. Till Dec'22, Independent Engineers (IEs) has been appointed for 11 packages from 8 under construction hydro projects and 2 disputes has also been resolved by IEs..

Dispute Resolution through Conciliation - Constitution of Conciliation Committee of Independent Experts (CCIE)

Government has decided to constitute three (3) Conciliation Committees of Independent Experts (CCIE), for settlement of disputes through Conciliation for Contractual Disputes in Projects implemented by CPSUs / Statutory Bodies under the administrative control of Ministry of Power. Each CCIE shall have three members having high level of integrity and proven track record. Till Dec'22, four numbers of disputes has been allocated to CCIE.

Other recent Policy Measures by GoI:

- Hydropower Purchase Obligation (HPO) trajectory has been notified on 29.01.2021 and varies from 0.18% to 2.82% for the period of 2021-22 to 2029-30 respectively. The above HPO trajectory shall be trued up based on annual basis depending upon the revised commissioning schedule of hydro Projects.
- Guidelines for Budgetary Support for Flood Moderation/ Storage Hydro Electric Projects (HEPs) and towards Cost of Enabling Infrastructure, i.e. roads/bridges have also been notified on 28.09.2021.
- Waiver/ reduction in transmission charges for PSPs commissioned up to 30.06.2025 have been notified by Govt. vide MoP order dated 21.06.2021.
- Scheme for bundling of Hydro Power with Renewable Energy has been notified vide MoP order dated 15.11.2021.
- MoP vide order dated 22.12.2021 has done the basin wise allocation of Hydro Electric Projects in Arunachal Pradesh to the Hydro CPSUs [NHPC, SJVN, THDC & NEEPCO] for carrying out suitable analysis and preparing evaluation reports on the projects indicated. Besides, following regions have also been identified to be pursued for Hydro Projects by the respective CPSUs:-

Uttarakhand	THDCIL
Himachal Pradesh	SJVNL
UT of Jammu & Kashmir and Ladakh	NHPC, except Ujh HEP by NEEPCO

- MoP vide order dated 08.08.2022 has indicated identified Pumped Storage Projects sites to the Hydro CPSUs/ DVC/BBMB for development & to take up the matter with concerned State Govt. & carrying out suitable analysis and preparing evaluation reports on the projects indicated. CPSUs/DVC /BBMB have been indicated PSPs in the following States/UTs :-

BBMB	Himachal Pradesh
NHPC	Jammu & Kashmir, Maharashtra , Odisha, Mizoram, Madhya Pradesh
THDCIL	Uttarakhand, Maharashtra, Tamil Nadu, Kerala
NTPC	Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka
SJVNL	Himachal Pradesh, Maharashtra, Mizoram
NEEPCO	Arunachal Pradesh, Assam, Manipur, Mizoram
DVC	West Bengal, Jharkhand

- From FY 2022-23 onwards, the energy from all Hydro Power Projects will be considered as part of RPO vide MoP order dated 22.07.2022. The HPO trajectory, as has been notified earlier will continue to prevail for LHPs commissioned after 8th March 2019. All other HPPs will be considered as part of 'RPO' under category of other RPO".
- Waiver of ISTS Charges on the transmission of power from new Hydro Power Projects, for which construction work is awarded and PPA is signed on or before 30.06.2025. Subsequently, part waiver of ISTS charges, in steps of 25% from 01.07.2025 to 01.07.2028, have been extended for HEPs for which construction work is awarded and PPA is signed up to 30.06.2028.
- An Evaluation Committee for facilitating takeover of Stalled Hydro Projects has been constituted on 04.01.2022 under the chairmanship of CMD, PFC to ensure appropriate valuation of the Hydro projects stalled at initial stage and sought to be taken over by CPSUs. Committee has given recommendations for 9 no. HEPs in Arunachal Pradesh to be taken over by CPSUs so far.

Revival of Hydro Sector:

Through untiring efforts of the Government, a number of stalled projects have been revived. Further, few other projects have taken off due to the persistence efforts of the Government in this regard. List of such hydro projects is as under:

a. **Teesta III (1200 MW)** in Sikkim- The works on the project were held up since September, 2014 due to funds constraints. Works re-started in October, 2015 and the project was commissioned in 2017.

b. **Subansiri Lower (2000 MW)** of NHPC in Arunachal Pradesh was stalled since 2011. Works restarted after NGT case was dismissed on 31.07.2019. The project is likely to be commissioned during 2023-24.

c. **Teesta VI (500 MW)** in Sikkim was allotted to LANCO but was stalled since 2012. It has been revived through NHPC's bid in NCLT in 2019. CCEA has approved the investment of Rs. 5748.04 crore. The project is under construction and is likely to be commissioned during 2025-26.

d. **Rangit IV (120 MW)** in Sikkim was originally allotted to Jal Power Corporation Ltd (Private Sector) and was stalled since October, 2013. The project has been revived through NHPC's bid in NCLT and NHPC has taken over Jal Power Corporation Ltd. on 31.03.2021. The project is under construction and is 25.

e. **Ratle HEP (850 MW)** in J&K, was originally allotted to GVK and was stalled since 2014. It was revived after an MoU was signed amongst NHPC, JKSPDC and PDD, J&K. CCEA clearance for the project was accorded in Jan' 2021. The project is under construction is likely to be commissioned during 2025-26.

f. One private sector hydro project **Maheshwar HEP (400 MW)** in Madhya Pradesh stalled since 2011, PFC application filed in NCLT under Insolvency and Bankrupty

Code (IBC) has been admitted in September'22 and after resolution of same, the construction of this project may start.

g. In **UT of Jammu & Kashmir,** one new hydro project namely Kwar (540 MW) came under construction in this year. The project is likely to be commissioned in 2026-27.

It can be seen that the hydro power is being given its due importance given its niche role in the energy mix. The right framework in which viable projects required from the perspective of maintaining a stable grid and providing power at the time of the day it is required get selected for execution is being promoted.

Arun-3 HEP (900 MW) - Coffer Dam Area Construct

Luhri Stage-1 HEP (210 MW) - Diversion Tunnel Construction

CHAPTER 07

TRANSMISSION SECTOR

The Transmission System in the country has been continuously strengthened with addition of transmission lines and inter-regional capacity as under:

	Addition in Transmission line (ckm)	Addition in Transformation capacity (MVA)
FY 2014-15	22,101	65,554
FY 2015-16	28,114	62,849
FY 2016-17	26,300	81,816
FY 2017-18	23,119	86,193
FY 2018-19	22,437	72,705
FY 2019-20	11,664	68,230
FY 2020-21	16,750	57,575
FY 2021-22	14,895	78,982
FY 2022-23 (Till Dec 2022)	8,079	47,272
Total	**1,73,459**	**6,21,176**

Major Projects commissioned in FY 2022-23

i. TBCB transmission project namely "Transmission System for providing connectivity to RE projects at Bhuj-II (2000 MW) in Gujarat" with an estimated cost of Rs 645 Cr has been completed by Powergrid Bhuj Transmission Ltd in Nov'22.

ii. TBCB transmission project namely "Transmission System for Western Region Strengthening Scheme – 21 (WRSS – 21) Part – A – Transmission System Strengthening for Relieving Over Loadings Observed in Gujarat Intra-State System Due to Re-injections in Bhuj PS" with an estimated cost of Rs 1090 Cr has been completed by WRSS XXI(A) Transco Limited (A subsidiary of Adani Transmission Limited) in Oct'22

iii. TBCB transmission project namely "765 kV System Strengthening Scheme in Eastern Region. ERSS-XVIII", with an estimated cost of Rs 3994 Cr has been commissioned by PGCIL in Aug'2022

iv. Creation of 400/220 kV S/S in NCT of Delhi during 12th Plan Period (Part-A):

   (a) LILO of 1 ckt of 400 kV D/c Bamnauli - Jhatikara line at Dwarka (commissioned by PGCIL in Feb'22) along with 3x500 MVA 400/220kV ICT (commissioned by PGCIL in Mar'22)

   (b) LILO of both ckt of 400 kV D/c Bawana - Mandola line at Maharanibagh commissioned by PGCIL in Mar'22

v. 400 kV D/c Jeerat-Subhashgram transmission line commissioned by PGCIL in Aug'22. With this all the elements of POWERGRID Medinipur- Jeerat Transmission Limited (PMJTL) have been completed in Aug'22

vi. LILO of 400 kV D/c Kishanganj-Darbhanga line at Saharsasubstation commissioned by PGCIL in Apr'22

Transmission Planning for 500 GW of non-fossil fuel by 2030

Continuing to take leadership role in climate change adaption, our Hon'ble Prime Minister of India, in the COP-26 Summit at Glasgow in November 2021, announced that India will bring its non-fossil energy capacity to 500 GW by 2030.

India is moving towards clean energy sources and plans to integrate non-fossil fuel based power generation capacity to the extent of 50% in the installed capacity mix by 2030. The installed electricity generating capacity in the country as on 31st December, 2022, was 410 GW comprising of 174 GW from non-fossil fuel sources, which is about 42% of the total installed electricity generating capacity.

The planned additional transmission system under ISTS for integration of about 537 GW of RE generation capacity by the year 2030 includes 8120 ckm of HVDC Transmission corridors (+800 kV and +350 kV), 25,960 ckm of 765 kV lines, 15,758 ckm of 400 kV lines and 1,052 ckm of 220 kV cables at an estimated cost of Rs 2.44 lakh crores.

The "Transmission System for Integration of over 500 GW RE Capacity by 2030" has been prepared by a Committee headed by CEA. The plan was launched by Hon'ble Union Minister for Power and NRE on 07.12.2022. The plan will provide visibility to the Renewable Energy Developers about the potential generation sites and scale of investment opportunity. Further, it will also provide the Transmission Service Providers the vision of growth opportunity available in the transmission sector along with investment opportunities of about Rs 2.44 lakh crores.

Steps taken for integration of Renewable energy

To facilitate integration of Renewable Energy capacity, following initiatives have been taken:

1. Establishment of Green Energy Corridors (GEC) and Renewable Energy Management Centres (REMCs)

To facilitate integration of large-scale envisaged renewable generation capacity addition in RE resource rich states viz. Rajasthan, Gujarat, Tamil Nadu, Maharashtra, Karnataka, Andhra Pradesh, Himachal Pradesh and Madhya Pradesh, a comprehensive plan comprising transmission as well as control infrastructure was identified as a part of "Green Energy Corridors".

It includes strengthening of Transmission infrastructure at Intra-state and Inter-state level for integration of RE sources to the grid, control infrastructure i.e. Renewable Energy Management Centers (REMC) comprising of forecasting and scheduling of renewable generation to address intermittency and invariability of RE capacity at SLDC/RLDC/ NLDC level.

Inter State Transmission System (ISTS) has been implemented by POWERGRID comprising about 3200 ckm high capacity lines and 6 nos. of substations (765/400/220kV- 1nos, 765/400kV-4 nos, 400/230kV- 1no.) with transformation capacity of about 17,000 MVA. The Inter State Transmission Scheme has been commissioned. Intra State Transmission system is being implemented by the respective State Transmission Utilities (STUs).

13 nos. of REMCs/EMC comprising RE forecasting & RE scheduling systems, integrated with existing SCADA co-located at SLDC/RLDC/NLDC [Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Maharashtra, Madhya Pradesh & Rajasthan, Telangana , South Andaman, SRLDC, WRLDC & NRLDC & NLDC] have been commissioned by POWERGRID.

2. Implementation of Transmission scheme for Ultra Mega Solar Power Parks

A comprehensive transmission scheme for evacuation of about 20,000 MW envisaged ultra mega solar power parks has been evolved. Transmission system for seven (7) solar parks (about 6500 MW) viz. Ananthapur (1500 MW), Pavagada (2050 MW), Rewa (750 MW), Bhadla-III (500 MW), Bhadla-IV (250 MW), Essel (750 MW), Banaskantha (700MW) has been implemented by POWERGRID. It comprises about 1,870 ckm transmission lines and 5 pooling stations with transformation capacity of about 13,500 MVA.

3. Transmission Scheme for Potential Renewable Energy Zones (REZs)

MNRE/SECI had identified potential wind/solar energy zones of 66.5 GWs in various RE rich states. Details are as below:

State	Type	2023- 24	Total (GW)
	Wind (GW)	Solar (GW)	
Rajasthan		20	20
Gujarat	6	10	16
Maharashtra	2	5	7
Madhya Pradesh		5	5
Karnataka	2.5	5	7.5
Andhra Pradesh	3	5	8
Tamil Nadu	3		3
Total	16.5	50	66.5

A comprehensive transmission scheme has been evolved to integrate above potential REZs and the same is being implemented in a phased manner. In addition, transmission system for about 55GW REZ (beyond 66.5GW REZ) (including 13GW at Ladakh) has also been planned which is under various stages of implementation / approval.

4. Transmission System for evacuation of power from Ladakh (13 GW: 9GW Solar & 4GW Wind):

During his speech on 15.08.2020, the Hon'ble Prime Minister announced a project for setting up of 7,500 MW solar parks in Ladakh. Taking this forward, the Ministry of New and Renewable Energy (MNRE) has decided to set up RE projects (solar & wind power) of total 10,000 MW capacity in Ladakh. The Ladakh region is a cold desert with abundant land availability and solar irradiation (one of the highest in the country). Upon MNRE's request, the UT Administration of Ladakh has identified the land for the RE projects. The transmission infrastructure for evacuating power from the large scale RE power project will be required to be constructed. Upon the directions of Ministry of Power (MoP), POWERGRID prepared a Detailed Project Report (DPR) for power evacuation and grid integration of the proposed RE projects in Ladakh. The transmission plan has been drawn up.

An interconnection has been planned from Pang RE project (in Leh) with existing Ladakh grid so as to ensure reliable power supply to the Ladakh region as well as Jammu & Kashmir. In view of the complex terrain and adverse climatic conditions, state-of-the-art Voltage Source Convertor (VSC) based High Voltage Direct Current (HVDC) system and Extra High Voltage Alternating Current (EHVAC) system are proposed to be set up under the scheme.

The total estimated cost of transmission project is Rs. 20,773.70 crore (excluding IDC). The transmission system will be implemented over a period of approx. 5 years, due to extreme climatic conditions & limited working time in Ladakh. Central Government is considering a proposal to provide central grant amounting to 40% of the project cost to reduce the burden of transmission charges on the user of this RE power.

5. Transmission System for evacuation of power from 181.5GW potential Renewable Energy Zones

MNRE/SECI has identified 181.5GW potential Renewable Energy Zones in 8 states with various Hybrid & Solar locations planned as below:

S. No.	STATES / UTs	Wind	Solar	Total	Remarks
1	Rajasthan	15	60	75	45 GW in GIB Zone
2	Andhra Pradesh	18	33	51	

S. No.	STATES / UTs	Wind	Solar	Total	Remarks
3	Karnataka	8	9	17	
4	Tamil Nadu	5		5	Offshore wind
5	Telangana	3	10	13	
6	Madhya Pradesh	2	6	8	
7	Gujarat	5		5	Offshore wind
8	Maharashtra	2	5.5	7.5	
	Total	**58**	**123.5**	**181.5**	

Committee on Transmission Planning for 500 GW non-fossil capacity by 2030 was constituted for planning the associated system and a report has been published in Dec'22 with details of planned transmission system.

6. Transmission System for evacuation of power from 10GW Offshore wind in Gujarat and Tamil Nadu

Govt. of India on 09.06.2022 vide Public Notice has informed following with respect to Offshore wind in Gujarat and Tamil Nadu:

- Bids equivalent to a project capacity of 4.0 GW per year for a period of three years starting with the current FY 22-23 for development off the coast of Tamil Nadu and Gujarat for sale of power through open access / captive / bi-lateral third party sale / merchant sale.
- Subsequently a project capacity of 5 GW will be bid out every year for a period of five years i.e. up till FY 29-30.

In the first phase, 5 GW Offshore wind potential each at Gujarat (CUF - 37%) and Tamil Nadu (CUF - 48%) has been prioritized for implementation. The transmission system for integration of 5 GW Offshore wind potential each at Gujarat and Tamil Nadu has already been identified as part of 500GW Report published by CEA. 220kV / 230kV Submarine cables have been planned for integration of Offshore.

DISTRIBUTION

The finances of most of the distribution companies (DISCOMs) in the country have been under stress for some time. The outbreak of the global pandemic COVID-19 in the country and the consequent nationwide lockdown exacerbated the liquidity problems for the power sector further as revenues of the power distribution companies nosedived as people were unable to pay for the electricity consumed while power supply, being an essential service, had been maintained.

To alleviate the immediate problems in the sector, under the AatmaNirbhar Bharat announcements, the Government announced a liquidity infusion package for the power sector under which the DISCOMs were able to discharge their dues to the CPSU Gencos&Transcos; IPPs, and RE Gencos by availing concessional loans from PFC and REC against State guarantees.

Under the Aatma Nirbhar Bharat liquidity infusion package, the Ministry of Power issued guidelines to the States for availing the benefits of concessional loans from PFC and REC on 14th May, 2020. PFC and REC have advised their loan scheme to States on 16th May, 2020.

Against the Liquidity Infusion package, Rs.1.33 Lakh Cr worth of loans have been sanctioned and Rs. 1,12,456 Cr has already been disbursed/ released till 02-01-2023.

While there are no financial implications to the Government of India arising out of this scheme, it allowed uninterrupted supply of power, thereby minimizing the negative impact of COVID.

Revamped Distribution Sector Scheme:

The Government of India launched the Revamped Distribution Sector Scheme (RDSS) to help DISCOMs improve their operational efficiencies and financial sustainability by providing result-linked financial assistance to DISCOMs to strengthen supply infrastructure based on meeting pre-qualifying criteria and achieving basic minimum benchmarks. RDSS has an outlay of ~INR 3.04 lakh Cr.over 5 years i.e., FY 2021-22 to FY 2025-26. The outlay includes an estimated Government Budgetary Support (GBS) of ~INR 0.98 lakh Cr. The main objectives of RDSS are:

- Reduction of AT&C losses to pan-India levels of 12-15% by FY 2024-25.
- Reduction of ACS-ARR gap to zero by FY 2024-25.
- Improvement in the quality, reliability, and affordability of power supply to consumers through a financially sustainable and operationally efficient distribution sector.
- The scheme shall provide funds for loss reduction works; system strengthing and modernisation. The scheme also provide assistance for prepaid Smart metering for consumers, system metering at feeder and DT level with communicating feature along with associated Advanced Metering Infrastructure (AMI) to be implemented under TOTEX mode (Total expenditure includes both capital and operational expenditure). With smart meters, utilities will be able to better manage their cash flows. Data gathered as part of the two-way communication in a smart metering solution will help utilities to improve their load forecasting, which will help them in optimizing their power procurement thereby reducing the cost of power supply. The direct impact of this feature will be on reducing the ACS-ARR gap and AT&C losses of the DISCOMs.

Loss Reduction works majorly includes replacement of bare conductor with AB cable, HVDS systems, feeder bifurcation etc. Similarly, system strengthening includes creation of new substations, feeders, upgradation of transformation capacity, cables etc. Modernization includes SCADA, DMS, IT/OT, ERP, GIS enabled applications, ADMS etc. to make distributions systems smarter.

A detailed Result Evaluation Framework (REF) under RDSS shall monitor participating DISCOM's progress vis a vis their action plan. The disbursement of grant under RDSS will be linked to meeting pre-qualifying criteria stipulated under the scheme and the score achieved in REF.

To monitor the progress and implementation of the scheme, an inter-ministerial monitoring committee has been constituted under the chairmanship of Secretary (Power). So far, Sixteen (16) meetings of the Monitoring Committee of RDSS have been convened, wherein, Action Plans and DPRs of 46 Discoms (28 States/UTs) have been approved.

The DPRs of Loss Reduction works having total outlay of Rs. **1,19,135** Crores including PMA cost (GBS of Rs. 75,884Crores) for 27 States/UTs namely **Assam, Andhra Pradesh, Arunachal Pradesh, Bihar, Gujarat, Jharkhand, Haryana, Himachal Pradesh, Uttar Pradesh, Uttarakhand, Chhattisgarh, Tripura, Manipur, Madhya Pradesh, Kerala, Tamil Nadu, Gujarat, Jammu & Kashmir, Ladakh, Meghalaya, Mizoram, Rajasthan,Maharashtra, Puducherry, Sikkim, Goa and West Bengal** have been approved by Monitoring Committee of RDSS. Out of total sanctioned, under loss reduction works for 28 approved states, **Rs. 3311.42 crores** has been released as on 09-01-2023 as 5% advance as per the scheme guidelines.

The total sanctioned cost of smart metering works (including PMA cost) for all 27 States/UTs is Rs. **1,35,001** Cr, out of which the GBS component is expected to be **24,908** Cr (including incentive for phase 1). Overall, about **~20 crores** pre-paid consumers smart meters are planned to be deployed in these 26 states. These States also plan to deploy around **~54 Lakh** DT smart meters and ~1.98 Lakh feeder smart meters under RDSS.

A sum of **Rs. 18.73 Crs** has been released as GBS for PMA Cost for loss reduction and smart metering works as on 09-01-2023. Further, a sum of **Rs. 50.01 Crs** has also been released to Nodal Agencies against release of first tranche of Nodal Agency fees as per the scheme guidelines.

NATIONAL SMART GRID MISSION (NSGM)

National Smart Grid Mission (NSGM) was established in 2015 to plan and monitor implementation of policies and programmes related to Smart Grid in India. National Smart Grid Mission envisages transformation of last mile connectivity ecosystems i.e distribution through AMI, micro grids, distributed generation, outage management, power quality improvement, peak load management and EV charging infrastructure etc. The mission encourages DISCOMs for self-sustenance of Smart Grid interventions by adopting innovative financing models.

NSGM scheme was extended till 31st March 2024 with focus on –

- Completing ongoing sanctioned projects,
- Training and capacity building,
- Technical assistance to utilities through SGR-SAT and CBA etc. and
- Handholding of DISCOMs on their Smart Grid/Smart Energy Distribution preparedness, developing smart distribution Roadmaps, establishing new processes for distribution system efficiency & effective improvement, reliability improvement and data analysis etc.
- NSGM shall be a part of an expert committee and shall act as a secretariat of the said committee to recommend a complete framework of smart grid/smart distribution, the outcome of which shall be used to develop 10 Cities across country with Smart distribution grid under the Revamped Distribution Sector Scheme (RDSS).

- **Smart Grid Projects under NSGM**

  Currently, under NSGM, Two (2) projects worth Rs.116.01 Cr. viz. one in Chandigarh (Sub Division No. 5) and one integrated project in 6-towns in Rajasthan for 1.8 lakh consumers are under various stages of implementation. Till December 2022, about 1.52 lakh smart meters have been installed at field in Chandigarh Sub Division 5 and Rajasthan projects.

- **Smart Meter Statistics Dashboards**

  NPMU has in-house developed multiple dashboards on Smart Meters deployment statistics and hosted on NSGM website. The dashboards are being updated on regular basis with inputs from multiple stakeholders viz. Utilities, implementation agencies and manufacturers and shared with MoP on weekly basis. The scheme-wise status on overall progress of smart metering deployments across various schemes as on 31.12.2022 is as under:

Scheme	Sanctioned	Awarded	Installed Till Date	Prepaid Till Date	Meters in Stock
DDUGJY	39,200	39,200	38,400	0	534
IPDS	12,60,818	12,33,516	8,10,250	0	10,610
NSGM	1,79,433	1,79,433	1,51,714	0	23,303
PMDP	6,85,488	6,85,488	1,45,633	0	7,417
SG Pilot	1,56,533	1,56,533	1,56,533	0	0
Utility Owned	89,54,267	89,54,267	40,27,639	13,55,101	4,73,821
Grand Total	**1,12,75,739**	**1,12,48,437**	**53,30,169**	**13,55,101**	**5,15,685**

- **Training and Capacity Building**

NSGM undertakes training and capacity building programs for officials of Utilities/DISCOMs/ Implementers involved in implementation of Smart Grids with 100% funding support.

After COVID situation stabilized, residential training program was resumed with intervention from MoP & NPMU. This year, one (1) residential training program on Smart Grid Applications was organised in November 2022 under NSGM by SGKC, Manesar, POWERGRID wherein 25 officials from 12 Discoms/implementation agencies were trained. Till date, more than 350 participants have been trained in different programs/ initiatives under NSGM.

- **Smart Grid Knowledge Centre**

The Smart Grid Knowledge Centre (SGKC) is a state-of-the-art platform for demonstration and outreach of smart grid technologies. Established by the POWERGRID, with support from the Ministry of Power (MOP) and the National Smart Grid Mission (NSGM), the SGKC showcases smart grid technologies through demonstrations and provides training and capacity building support to power distribution companies.

Now, SGKC is being developed as one of the leading Centres of Excellence (CoE) under MoP guidance to foster partnerships, innovation and entrepreneurship in Smart Grid technologies and create capacities in the power sector.

Disruptions such as COVID-19 have necessitated the need for virtual interfaces to showcase and engage with the industry. A virtual Center of Excellence (COE) also referred as Virtual SGKC (co-existing with the physical SGKC) has therefore been developed to ensure remote access to all SGKC offerings.

The Virtual SGKC platform was launched in March 2022 by the Hon'ble Cabinet Minister (Power, New & Renewable Energy) and can be accessed at https://sgkc.powergrid.in/.

At present, the platform hosts 51 solutions from 34 technology partners in 8 thematic areas spanning across new and advanced technologies such as artificial intelligence, machine learning, blockchain, IOT, etc.

To support SGKC in its next phase of activities, NSGM/ POWERGRID in association with USAID SAREP will take up following activities:

i. Integration of training & conferences into virtual SGKC platform

ii. Establish a physical innovation park

iii. Set up a technology incubation hub

- **Consumer Engagement**

NPMU collaborated with CEEW and shared inputs/ comments on draft questionnaire for survey with smart meter consumer and based on the same questionnaire, the survey was conducted between March and April 2022 and covered ~1,200 prepaid and ~1,500 post-paid consumers from six Indian states with the highest smart meter deployment. These include Assam, Bihar, Haryana, Madhya Pradesh, Rajasthan, and Uttar Pradesh.

The objective of this exercise is to capture consumer experience of using smart prepaid meters with a focus on their perception of benefits from the technology as well as documenting challenges faced.

Based on the consumer's response a survey report on 'Consumer experience and outlook towards smart (prepaid) meters' - Insights from a survey of six states was prepared by CEEW. NPMU also reviewed and shared inputs/comments on the draft report which is under finalisation.

- **Smart Grid Readiness – Self Assessment Tool (SGR-SAT)**

NSGM in association with DFID under PSR program has developed a Smart Grid Readiness – Self Assessment Tool (online). The tool is intended to be used by utilities in drafting their smart grid journey by taking self-assessments and setting targets by learning from peers. The tool has been hosted on POWERGRID server and was demonstrated to Utility professionals during training program at SGKC in November 2022.

- **Investment Analysis Tool for Utility Modernization Projects**

NSGM in association with USAID SPARC team has developed an Investment Analysis Tool (online) for Utility Modernization Projects. This tool enables holistic assessment of financial, environmental and social benefits in utility modernization projects. The tool helps to evaluate the feasibility of the smart grid projects and prioritize investment decisions based on the value proposition accruing to DISCOMs or larger Society. The tool has been hosted on POWERGRID server and was demonstrated to Utility professionals during training program at SGKC in November 2022.

- **Expert Group to Recommend Complete Framework of Smart Grid**

Ministry of Power in September 2022 constituted an Expert Group under the chairmanship of Chairperson CEA to recommend complete framework of Smart Grid with Director NPMU as the convenor. Four (4) meetings of the expert group were held and recommendations were encapsulated. Final report of the expert group was submitted to MoP in December 2022.

- **Unified Billing Solution**

Task force for proposed Unified Billing Solution (UBS) under Revamped Distribution Sector Scheme (RDSS) was constituted by MoP in October 2022 with Director NPMU as the convenor. Two (2) meetings of Task Force were held under the chairmanship of Joint Secretary (Distribution). CDAC has proposed comprehensive solution for development of UBS and the same is under deliberation.

- **Advanced Technology and Standard Development**

NSGM has been actively engaging with BIS, TEC and TSDSI etc. in advanced technology and standard development domain for bringing out best practices and solutions for deployment of Smart Grids

In year 2022-23, NPMU shared communication & interoperability challenges i.r.o. ongoing smart meter implementation in August 2022 with TSDSI for further study and collaboration. After several round of discussions, TSDSI-SGSS facilitated formation of

Technical Study Group: (SI 87) – "Communications Requirements & Recommendations for the Energy Sector" to come up with a feasible solution from an end-to-end point of view which may help in practical and commercial deployments at scale. Initial draft report has been circulated with domain experts for their inputs and review and it is planned to finalize the report by June 2023. NPMU is actively engaged with TSDSI for finalisation of "One M2M use case for Smart Metering/ Smart Grids "

- **Domestic and International Collaboration**

NSGM in association with USAID introduced the concept of Grid Interactive Net Zero Energy Buildings. ZerO-In Dialogue series brought together global thought and industry leaders to the Indian context – looking at buildings as an integral part and the last mile of the future smart grid.

The international collaboration i.e. International Smart Grid Action Network (ISGAN) activities have also been held virtually through-out the year. In April 2022, NPMU actively engaged with DST in planning, co-ordination and hosting of CEM-ISGAN & MI GPFM Joint Side Meeting on "Advancing Clean Power Systems: Concrete Opportunities for Near-term Collaboration and Deliverables for the CEM/MI Ministerial in Pittsburgh".

NPMU presented India's Smart Grid journey with focus on smart grid pilots and its outcomes on global platform virtually, during International Energy Agency (IEA) workshop on smart grid pilots in November 2022.

Energy Accounting in DISCOMS

Amendment in existing Notification: Ministry of Power issued a notification to include all the Electricity Distribution Companies (DISCOMs) under the preview of EC Act. As per the notification (S.O. 3445(E) dated 28th September, 2020), which was formulated in consultation with BEE "All entities have been issued distribution license by State/Joint Electricity Regulatory Commission under the Electricity Act, 2003 (36 of 2003)" are notified as Designated Consumers (DCs). Earlier, the DISCOMs whose annual energy losses were equal to or above 1000 MU were only covered as Designated Consumers.

Regulations for Energy Accounting and Auditing in DISCOMs: Regulations notified by BEE on 7th October, 2021 with the approval of Ministry of Power, under the provisions of Energy Conservation (EC) Act, 2001 for Energy Audit in DISCOMs

Bureau of Energy Efficiency with the approval of Ministry of Power, Government of India had notified an amendment in regulation vide notification dated 31st October, 2022.

POWER SECTOR REFORMS

Amendment to Electricity (Rights of Consumers) Rules, 2020

The Ministry of Power notified Electricity (Rights of Consumers) Rules, 2020 on 31.12.2020 under section 176 of the Electricity Act, 2003. These Rules empower the consumers of electricity and emanate from the conviction that the power systems exist to serve the consumers and the consumers have rights to get the reliable services and quality electricity.

Implementation of these Rules shall ensure that new electricity connections, refunds and other services are given in a time bound manner. Willful disregard to consumer rights will result in levying penalties on service providers. An amendment to Electricity (Rights of Consumers) Rules, 2020 was notified on 29.09.2021 wherein the limit for net metering was increased to 500KW from 10KW.

Another amendment to these Rules was notified 21st April, 2022, to specify the parameters to maintain the reliability of supply by the distribution licensee namely System average interruption duration index (SAIDI) and System average interruption frequency index (SAIFI), customer average interruption duration index (CAIDI), customer average interruption frequency index (CAIFI) and momentary average interruption frequency index (MAIFI).

Further the consumers, who are using the diesel generator sets as essential back up power, shall endeavor to shift to cleaner technology such as renewable energy with battery storage and the like in five years from the date of commencement of these rules or as per the timelines given by the State Commission for such replacement based on the reliability of supply in that city covered under area of supply of the distribution licensee.

Waiver of ISTS Transmission Charges and Losses for Solar & Wind Power

In order to avoid the difficulty of Renewable generators due to delay in Commissioning on account of force measure or delay on 15th January, 2021, the Ministry advised CERC under section 107 of the Electricity Act,2003, for making suitable provisions in the Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020 for extension of waiver of inter-state transmission charges for the electricity generated from solar and wind projects, whose date of Commissioning had been extended by the competent authority.

In continuation to the aforesaid, this Ministry has also issued an order dated 21.06.2021, to extend the waiver of ISTS charges on transmission of electricity generated from solar and wind sources for projects to be commissioned up to 30th June 2025. With a view to encourage the capacity addition in solar, wind, battery storage and pumped storage projects, it was also advised that waiver of ISTS charges shall also be allowed for Hydro Pumped Storage Plant (PSP) and Battery Energy Storage System (BESS) projects with certain conditions.In order to have long-term visibility and certainty in renewable power generation, the Ministry of Power vide order dated 23.11.2021 provided that the inter-state transmission charges shall be increased gradually w.e.f. July, 2025.

Further, addendum orders issued on 01.12.2022 and 06.12.2022 regarding the waiver of inter-state transmission charges on transmission of the electricity generated from solar and wind sources of energy.

Electricity (Late Payment Surcharge and Related Matters) Rules, 2022

Electricity (Late Payment Surcharge and Related Matters) Rules, 2022 were notified on 3.6.2022 in order to give relief to the DISCOMs, as well as electricity consumers and at the same time Generating companies also getting the benefit from assured monthly payments, which will help the whole power sector to become financially viable. It will create a win-win situation to both Discoms and Gencos.

Provision has been made for one-time scheme for liquidation of arrears, enabling DISCOMs to pay total outstanding dues including LPS as on the date of notification, in upto 48 number of monthly instalments. No LPS on past outstanding dues will be applicable in case of timely payment of these instalments.

The DISCOMs will benefit by way of reduced liabilities for Late Payment surcharge, which will ultimately benefit the electricity consumers. DISCOMs will also be benefitted by way of reduction of LPS from 18% to a rate linked to Bank lending rate. If bank rate reduces, the LPS will also reduce, resulting in lower tariff for the consumers. Regulation of power supply is mandated in case of non- maintenance of PSM or continuation of default in payment of outstanding dues. Provision for regulation of short-term, medium–term and long-term access may be in a gradual manner in case of non- payment of dues even after 2.5 months from bill presentation has been made to ensure timely payment of dues.

DISCOMs and consumers interests have been further protected by special provisions for ensuring supply obligation of the Generating Company to maintain sanctity of PPAs, by preventing sale of power by Gencos in Power Market during high market price period instead of to DISCOMs as per PPA. At the same time, it ensures the Generators' viability by allowing them to sell in power market in the event of non-maintenance of PSM and continuous payment default of DISCOMs.

Since implementation of these Rules, as on 11.01.2023, total bills amounting to Rs. 2,28,565 Crores have been settled against total billed amount of Rs. 3,06,954 Crores from May 2022 (excluding EMI Payments against legacy dues and including Disputed Invoices). Against legacy dues of Rs. 1,38,107 Crores as on 03.06.2022, 13 States/ UTs (total outstanding of) have paid installment of Rs 36,958 Crores (6 EMIs). 10 out of these 13 states opted for loans from PFC/ REC (total loan sanctioned of Rs 1,00,303 Crores). Further, 20 States/ UTs reported to have no outstanding dues as on 03.06.2022.

Ministry of Power has circulated the broad framework for implementation of the Rules vide letter dated 11.08.2022 and PFC has been designated as the Nodal Agency for implementation of Rules. Operationalization of rules is being done through an automated process using existing PRAAPTI Portal and Grid India (erstwhile POSOCO) Portal by on boarding DISCOMs on the Portal.

Further in order to streamline the process of monitoring of payments of regular bills of suppliers by the DISCOMS and identifying defaults by the DISCOMs in payment of dues in payment of dues and consequent regulation of access to power as per Rules, Ministry of Power issued Standard Operating Procedure(SOP) vide letter dt 26.08.2022.

Electricity (Promoting Renewable Energy through Green Energy Open Access) Rules, 2022

For unshackling the RE Sector, i.e. to remove barriers in availability and utilisation of RE and to address the issues that have hindered the growth of open access for a long time, Green Open Access Rules, 2022 have been notified on 6.6.2022. The Rules reduces the Open Access limit from 1 MW to 100 kW, which pave the way for small consumers also to purchase RE and there is no limit for Captive Consumers.

A consumer may now demand supply of Green power from DISCOMs. It will allow the Consumers to purchase RE as per their choice. The Rules will streamline the Open Access approval process including timely approval, transparency, simplification. Approval of open access to be granted in 15 days or else it will be deemed to have been approved. The special provisions for cross-subsidy surcharge, additional surcharge, standby charge as well as for banking, will incentivise the consumers to get Green Power at reasonable rates. As per these Rules, the tariff for the green power will be determined by the Appropriate Commission, separately. For promoting Green Hydrogen/Green Ammonia and Waste to Energy Plants, Special concessions are given in the rules. POSOCO has been notified as Central Nodal Agency to set up and operate a single window green energy open access system for renewable energy.

As mandated under these Rules to operationalise green open access, a web portal has been designed and developed by Grid India (erstwhile POSOCO) the Central Nodal Agency, and launched on 11.11.2022. This portal will facilitate as a single platform for submitting and approval of applications for open access. This will ensure faster and easier open access for utilising green energy by all stakeholders. Further, as mandated under these Rules Forum of Regulators has formulated a model regulations on methodology for calculation of open access charges, as well as banking charges.

Electricity (Amendment) Rules, 2022

Ministry of Power has notified amendment to the Electricity Rules, 2005 on 29.12.2022 by adding following new provisions:

i. **Surcharge payable by Consumers seeking Open Access-** Capping the open access surcharge at 20% of average cost of supply which is in line with the tariff policy provision for reducing cross subsidies within the limit of 20%.

ii. **Timely recovery of power purchase costs by Distribution Licensee-** Mandatory provisions of 'fuel and power purchase cost adjustment' arrangement on monthly basis. The Appropriate Commission shall within ninety days of publication of these rules, specify price adjustment formula and such monthly automatic adjustment shall be trued up on annual basis by the Appropriate Commission.

iii. **Subsidy Accounting-** Accounting of due subsidy in accordance with the Standard Operating Procedure issued by the Ministry of Power for the purpose of Section 65 of the Act.

iv. **Resource Adequacy-** SERCs to undertake resource adequacy assessment of distribution licensees periodically in accordance with the guidelines to be issued by the Central Government.

v. **Development of Hydro Power-** Timelines, of 150 days for Hydro electric generation scheme and 90 days for

off-the river pumped storage plant, for taking decision by CEA in the matters of concurrence to the Hydro Power Projects.

vi. **Energy Storage System (ESS)-** The Energy Storage Systems shall be considered as a part of the power system. The Energy Storage System shall be utilised either as independent energy storage system or network asset or in complementary with generation, transmission and distribution. The Energy Storage System shall be accorded status based on its application area i.e. generation, transmission and distribution.

vii. **Implementation of Uniform RE Tariff for Central Pool-** There shall be a different central pool for each of the sectors i.e. wind, solar etc., of the renewable energy sources. The Implementing Agency shall compute the uniform renewable energy tariff for selling of electricity to end procurer by intermediary procurer, on a monthly basis, as per the methodology specified in the Rules. The duration of such central pool shall be for five years and for every five years, a new Central Pool shall be formed.

Distribution of Electricity Licence (Additional Requirements of Capital Adequacy, Creditworthiness and Code of Conduct) (Amendment) Rules, 2022

Amendment to the Distribution of Electricity Licence (Additional Requirements of Capital Adequacy, Creditworthiness and Code of Conduct) Rules, 2005 has been notified on 08.09.2022 by revising provision regarding Minimum Area of Supply. The Rules has been further revised in view of the above Hon'ble Supreme Court's Judgment and the Distribution of Electricity Licence (Additional Requirements of Capital Adequacy, Creditworthiness and Code of Conduct) (Second Amendment) Rules, 2022 has been notified on 28.11.2022.

Developing Energy Storage for RE Expansion-Notification of BESS Guidelines

Keeping in the view the need of large scale RE integration with the grid and achieving a smoother energy transition, Ministry of Power has notified Bidding Guidelines for Procurement and Utilization of Battery Energy Storage Systems on March 11, 2022. Based on the above BESS bidding Guidelines, a pilot project on 1000MWh Battery Energy Storage System (BESS) is under bidding process.

Issuance of Renewable Purchase Obligation (RPO) and Energy Storage Obligation Trajectory till 2029-30

Para 6.4(1) of the Tariff Policy 2016 provides that pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall fix a minimum percentage of the total consumption of electricity in the area of a distribution licensee for purchase of energy from renewable energy sources, taking into account availability of such resources and its impact on retail tariffs. Cost of purchase of renewable energy shall be taken into account while determining tariff by SERCs. Long term growth trajectory of Renewable Purchase Obligations (RPOs) will be prescribed by the Ministry of Power in consultation with MNRE. It further provides that cogeneration from sources other than renewable sources shall not be excluded from the applicability of RPOs."

Accordingly, the Ministry has issued Renewable Purchase Obligation (RPO) and Energy Storage Obligation Trajectory till 2029-30 on 22nd July, 2022. The RPO trajectory mandates for 24.6 % RPO in FY 22-23 and up to 43.3 % in FY 29-30.

Energy Storage Obligation was also introduced for the first time to promote the development of Energy Storage Systems (ESS) in the country.

The Ministry of Power specifies a RPO trajectory uniformly for all the States considering the need for enhancement of RE generation in the overall energy mix. However, the SERCs are free to notify the RPO trajectory in line with the order of Ministry of Power.

The notification of RPO trajectory and ESO trajectory will help in demand creation for uptake of electricity from RE sources and ESS in the country.

Scheme for flexibility in Generation and Scheduling of Thermal/ Hydro Power Stations through bundling with Renewable Energy and Storage Power

The Revised 'Flexibility in Generation and Scheduling of Thermal/ Hydro Power Stations through bundling with Renewable Energy and Storage Power' Scheme was issued by the Ministry of Power on 12th April 2022. The scheme promotes bundling of cheaper RE with costlier Thermal/ Hydro Power within the existing PPA.

The detailed mechanism that was issued earlier has now been revised to comprehensively cover replacement of thermal and Hydro power with standalone renewable energy power or renewable energy combined with battery energy storage systems; so that the distribution licenses can meet their Renewable Purchase Obligation (RPO) within the existing contracted capacity and without facing any additional financial burden. The scheme is a very significant step towards achieving the goal of 500 GW of non-fossil fuel capacity by 2030 and will lead to a faster energy transition in the country.

Trajectory for replacement of Thermal Energy with about 58,000 MU (30,000 MW) of Renewable Energy by 2025-26 has also been issued on 26th May, 2022.

NVVNL, PFCCL and RECPDCL have been nominated as Bid Process Coordinators for establishing/ procuring RE power for replacement on a competitive bid basis, on 17th June 2022.

Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected RE Power Projects for utilisation under scheme for flexibility in Generation and Scheduling of Thermal/ Hydro Power Stations through bundling with Renewable Energy and Storage power issued on 26th August, 2022.

Ease of Doing Business

(a). Reducing Compliance Burden: A total of 61 nos. of burdensome compliance have been reduced during the year 2022 and data uploaded on the Regulatory Compliance Portal of DPIIT.

(b). National Single Window System (NSWS): 20 applications concerning CEA, CTU and POSOCO have been integrated with National Single Window System (NSWS) developed by DPIIT.

ENERGY CONSERVATION

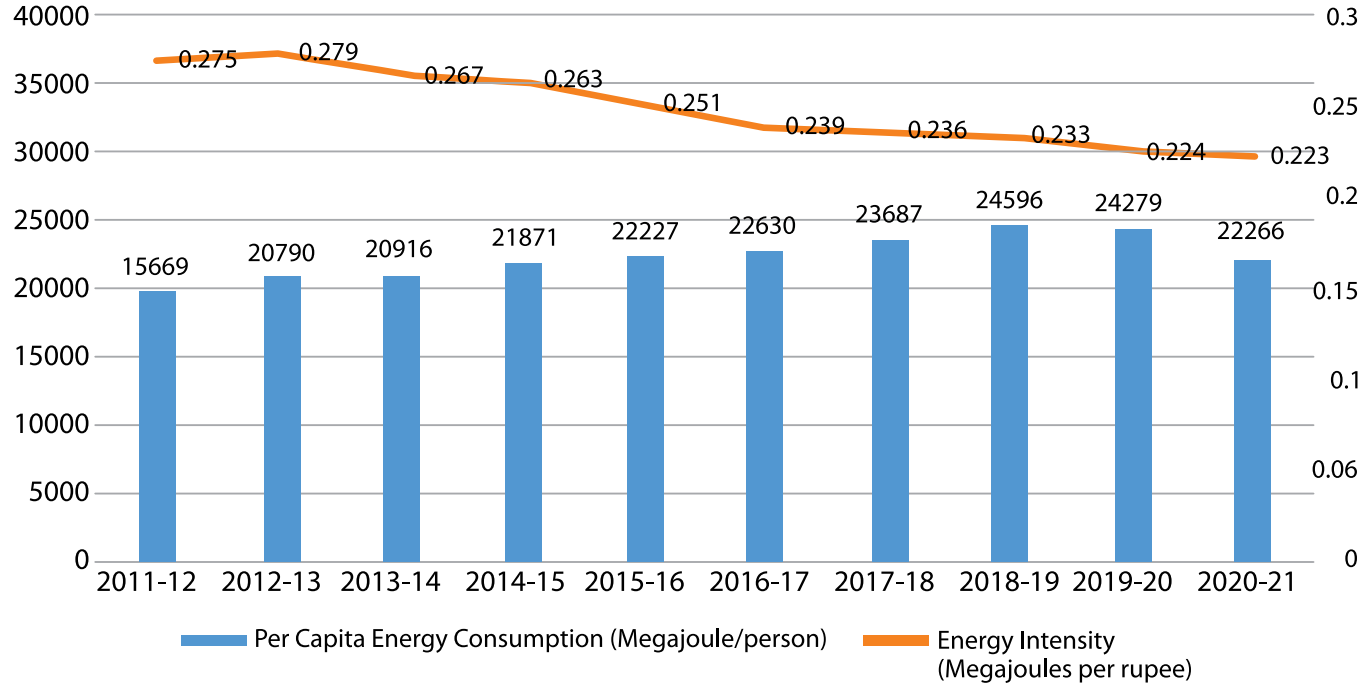
1. India has been witnessing a significant rise in the demand for energy across all the sectors with rapid increase in access, affordability and urbanization. India's development path focusses on the need for rapid economic growth which is an essential precondition to poverty eradication and improved standards for living while at the same time focusing on sustainable growth for maintaining ecological balance. Energy Efficiency is a key element that can contribute towards reducing the energy requirements and the associated environmental implications.

2. The institutional framework in place for pursuing this agenda includes the Energy Conservation Act 2001 (EC Act) and the Bureau of Energy Efficiency (BEE) which is the nodal central statutory body to assist the Government in implementing the provisions of the EC Act. As a regulatory and policy advisory body, the Bureau helps in developing policies and strategies that emphasize self-regulation and market principles to achieve the primary objective of reducing the energy intensity of the Indian Economy. The EC Act also empowers the State Government to facilitate and enforce the efficient use of energy through their respective State Designated Agencies in consultation with BEE. It also empowers the Central Government to specify energy performance standards.

3. India ratified the Paris Agreement on Climate Change in 2016 under which its member countries have given commitments to keep global average temperatures rise below 2-degree C by the end of century. India in its Nationally Determined Contributions (NDCs) had committed that it will reduce the emission intensity of its GDP by 33% to 35% by 2030 from 2005 level.

4. In the recent Conference of Parties (COP -26) at Glasgow, UK, India has pledged that its non-fossil energy capacity will reach 500 GW by 2030, and that it will reduce its total projected carbon emissions by one billion tonnes by 2030. It also pledged that by 2030, India will reduce the carbon intensity of its economy to less than 45 per cent, and by 2070, India will achieve the target of net zero emissions.

5. To achieve these enhanced targets, it would be necessary to continue aggressively with its ongoing interventions and also enhance the existing policy coverage. Ministry of Power and Bureau of Energy Efficiency have been taking various steps for conserving energy through various flagship programmes in the areas of industries, appliances, buildings, transport, agriculture and demand side management etc. in order to fulfil the goals committed in the NDC and foster long term sustainable development. Owing to the various energy efficiency measures taken so far, energy intensity of the country has declined from 0.2787MJ/rupee in 2012 to 0.223MJ/rupee by 2020-21 indicating an efficiency increase of 19%.



Energy Intensity of India in Mega Joule / rupee

Source: Energy Statistics, 2022-(MOSPI)

6. The Beauro of Energy of Efficiency is implementing the following scheme for reducing the emmission intensity of the economy.

I. Standards & Labelling

The key objective of Standards and Labelling (S&L) program is to provide the consumers an informed choice regarding the energy savings and cost saving potential of various energy consuming appliances. S&L scheme covers the star labelling program for 30 appliances out of which, 11 appliances are under mandatory regime and remaining 19 appliances are under voluntary regime. Total 55.6 Crore star labelled products manufactured during the year 2020-21 leading to electricity savings of 61.6 BU and CO_2 emission reduction of 50.16 million tonnes. List of 30 appliances under S&L are given below:

S. No.	Mandatory Appliances	S. No.	Voluntary Appliances
1.	Room Air Conditioners	1.	Induction Motors
2.	Frost Free Refrigerator	2.	Agricultural Pump Sets
3.	Tubular Florescent Lamp	3.	LPG-Stoves
4.	Distribution Transformer	4.	Washing Machine
5.	Room Air Conditioner (Cassette, Floor Standing)	5.	Computer (Notebook/ Laptops)
6.	Direct Cool Refrigerator	6.	Ballast (Electronic/ Magnetic)
7.	Colour TV	7.	Office Equipment (Printer, Copier, Scanner, Multifunctional Display)
8.	Electric Geysers	8.	Diesel Engine Driven Mono-set Pumps, submersible and open-well
9.	Variable Capacity Inverter Air Conditioners	9.	Solid State Inverter
10.	LED Lamps	10.	DG Sets
11.	Ceiling Fans	11	Chillers
		12	Microwave oven
		13	Solar Water Heater
		14	Deep Freezers
		16	Light Commercial Air Conditioners (LCAC)
		16	Air Compressor
		17	Ultra-High-Definition
		18	Television
		19	Li-ion traction batteries
			and Systems
			Tyres

Under Standards and Labelling program, an appliance is selected for star labelling based on the energy savings potential and cost savings that is accrued to the consumers through it. Star rating levels are established on a scale of 1 star to 5 star wherein, 1 star denotes maximum energy consumption (least energy efficient one) among the range and 5 star denoting the least energy consumption (most energy efficient one).

For example, an air conditioner of 1.5 ton capacity having 1 star will consume about 287 units in a month on average. But a 3 star AC for the same usage will consume only 224 units and 5 star will consume 157 units. Therefore, a consumer will save around Rs. 500 on purchase of 3 star AC and Rs. 1000 on 5 star AC on monthly basis. Hence, the additional cost of more efficient model (either 3 star or 5 star) is suitably compensated through electricity cost savings in next 3-4 years thereby benefiting the consumer.

In order to familiarize about the program, the energy efficiency of various models is communicated to consumers in terms of key indicator that is "number of stars" being displayed on the label affixed on the appliance as well as on the packaging. More number of stars on the label represent more savings to the consumer. The same message is being passed to the consumers via the logo "Bachat Ke Sitare, Dost Hamare" and through other media channels.

With the continuous efforts, Standards & Labeling has reached the following milestones during the 2022-23 Financial Year:

(i) Changeover of Star labeling program for Ceiling Fans from Voluntary to Mandatory regime w.e.f. 1st July, 2022.

(ii) Superseding notification and Mandatory implementation for QR code on Refrigerators (Frost free & dual cool) has been made effective from 1st January, 2023.

(iii) The revised energy consumption standard for the Room Air conditioners (Fixed speed & variable speed) has been made effective from 1st July, 2022.

(iv) The revised energy consumption standard for the electric water heater has been made effective from 1st January, 2023.

(v) The revised energy consumption standard for Colour Television has been made effective from 1st July, 2022.

(vi) Extension has been made in the energy consumption standards for Distribution Transformers, Chillers, Washing Machines, Microwave Ovens, Deep Freezers, Light Commercial Air Conditioners and Pumps.

(vii) Implementation of QR code on approval letters to authenticate the credibility of approvals issued by BEE.

(viii) Voluntary implementation of QR code on 28 appliances has been made effective from 14th December,2022.

(ix) e-Ticket raising functionality has been incorporated and made functional with a dedicated phone line to address the queries of manufacturers and other stakeholders. This has simplified the overall issues addressal mechanism under S&L program for appliances.

BEE has done extensive work in creating awareness about the Standards & Labeling Program among the consumers via different media platforms. The awareness activities include the following:

(i) TV commercials & Radio Jingles to encourage consumers to purchase BEE star rated appliances.

(ii) Awareness related information regarding the proper usage of energy efficient appliances via social media handles of BEE.

II. Energy Conservation Building Code (ECBC)

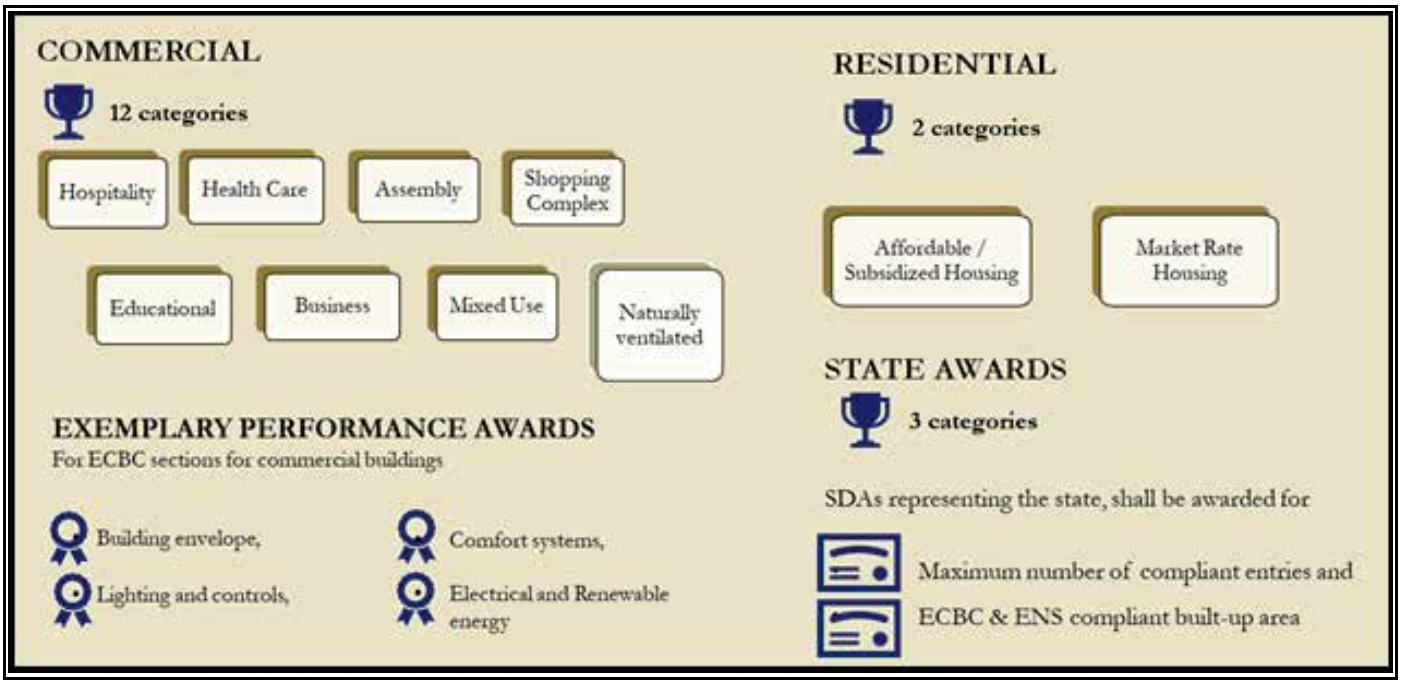
The Energy Conservation Building Code (ECBC) of BEE sets minimum energy performance standards for commercial buildings having a connected load of 100kW or contract demand of 120 KVA and above. While the Central Government has powers under the EC Act, the State Governments have the flexibility to modify the code to suit local or regional needs and notify them.

As on December 2022, 22 States and Union Territories namely, Andaman & Nicobar, Andhra Pradesh, Assam, Arunachal Pradesh, Goa, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Mizoram, Odisha, Punjab, Puducherry, Rajasthan, Sikkim, Telangana, Tripura, Uttarakhand, Uttar Pradesh and West Bengal have notified ECBC for implementation in their respective states. Further, among the above 22 states and UTs, 11 States namely, Andaman & Nicobar Island, Andhra Pradesh, Karnataka, Kerala, Telangana, Punjab, Uttarakhand, West Bengal, Rajasthan, Haryana, Uttar Pradesh have incorporated ECBC in Municipal Bye-laws. About 50 ULBs have been covered under these states for compliance.

In order to promote energy efficient buildings, BEE developed a voluntary Star Rating Programme for commercial buildings which is based on the actual performance of a building, in terms of energy usage in the building over its area expressed in kWh/sq. m/year. This Programme rates buildings on a 1-5 star scale, with 5-Star labeled buildings being the most energy efficient. As on December, 2022 more than 270 buildings have been rated under various categories.

ANGAN 2022 (Augmenting Nature by Green Affordable Nature- Habitat), an International conference of 3 days organized with the support of the Swiss Agency for Development and Cooperation (SDC) under Indo-Swiss Building Energy Efficiency Project (BEEP). More than 500 participants, 50 National and International speakers, 8 thematic sessions, and 5 plenary sessions were conducted. The objective of ANGAN 2022 was to deliberate on various thematic tracks leading India on the road to Net Zero Energy and Low Carbon Buildings.

BEE hosted the first National Energy Efficiency Roadmap for Movement towards Affordable and Natural habitat (NEERMAN) Awards. The objective of NEERMAN Award is to acknowledge and encourage exemplary building designs complying with BEE's Energy Conservation Building Codes. The awards are well designed, offers transparency, and are objective and rigorous. Various categories of NEERMAN award are mentioned in fig.



It is estimated that, India will be adding about 1 billion m2 of new commercial buildings by 2030 (study conducted by USAID) with increased demands of Air conditioning and lighting in the buildings. Based on the anticipated growth it is projected that if the future building stock is made in compliance with Energy Conservation Building Code (ECBC), about 300BU electricity will be saved by 2030 cumulative. It will translate to peak demand reduction of 15 GW and about 250 mtCO2e abatement. With the construction of efficient building it is estimated that Rs. 35,000 crores will be saved.

III. Enhancing energy efficiency in Industries– Implementation of Perform Achieve and Trade (PAT)

The industrial sector is the largest consumer of energy in the country that uses more than half, i.e., 56.22% of the total final energy consumption and therefore, enhancement of energy efficiency is very critical.

Recognizing this, the government under the National Action Plan on Climate Change (NAPCC), the National Mission for Enhanced Energy Efficiency (NMEEE) was launced. The Ministry of Power (MoP) and BEE have been entrusted with the task of implementation of the mission.

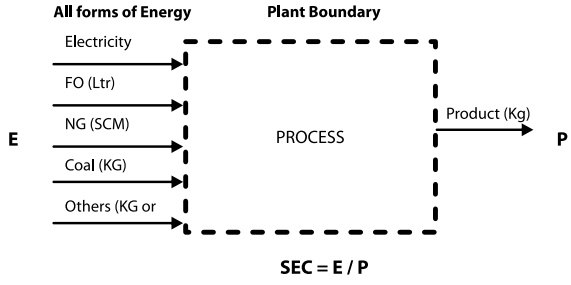
One of the flagship scheme under the mission is Perform, Achieve, and Trade (PAT) Scheme which aims to enhance energy efficiency in energy intensive sectors.

PAT is an energy efficiency improvement scheme to reduce Specific Energy Consumption in energy intensive industries, with an associated market based mechanism to enhance the cost effectiveness of the energy savings by converting the energy saved to a tradeable instrument called Energy Saving Certificates (ESCerts) which can be traded at power exchanges.

Industries those are consuming energy more than the notified threshold level of Annual Energy Consumption annually are covered under PAT, like for Cement sector 30000 Tonnes of Oil Equivalent (TOE), for Iron & Steel it is 20000 TOE and for Textile Sector it is 3000 TOE as Designated Consumers (DCs).

There are 13 energy intensive sectors namely Thermal Power plants, Iron & Steel, Cement, Fertilizer, Aluminium, Textile, Pulp & Paper, Chlor-Alkali, Petroleum Refinery, Petrochemicals, Buildings(Hotel), DISCOMs and Railways have been included under the scheme.

For improving energy efficiency, the DCs are given targets of reducing SEC. The Specific Energy Consumption (SEC) gives the indication of efficient utilization of different sources of energy in a plant operational boundary to produce one unit of product. This is defined as the ratio of total energy input to plant boundary and the quantity of products produced. The SEC of an industry would be calculated based on Gate-to-Gate concept. Schematic of the same is given in the following figure.



While calculating the total energy input to the plant, all energy sources would be converted to a single unit i.e. TOE (tonne of oil equivalent) using standard engineering conversion formula. All forms of energy (Electricity, Solid fuel, Liquid fuel, Gaseous fuel, by-products used as fuel etc.) which are actually consumed for production of output are considered.

Designated Consumers are given target to reduce their SEC over a stipulated period of 3 yeras. Subsequently, a verification is conducted by third party agency to assess their performance. Those DCs who exceeds or perform better than the targets are issued ESCerts that can be traded at Power Exchanges and DCs unable to achieve the target are required to buy ESCerts from Power Exchanges for compliance. Trading of ESCerts takes place at duly approved Power Exchanges by CERC.

Following section shows the process of evaluation of the performance of a DC.

The amount of equivalent ESCerts calculated are as under :

ESCerts = (Target SEC – Achieved SEC) x Baseline Production

For example, a Cement unit having baseline SEC of say 0.1000 toe/tonne with baseline production of 750000 tonne and target SEC 0.0950 toe/tonne.

i) The achieved SEC is 0.0900 then ESCerts gain would be (0.0950 – 0.0900) x 750000 = 3750 nos. of ESCerts gained.

ii) If the achieved SEC is 0.1000 then (0.0950 – 0.1000) x 750000 = (-) 3750 nos. of ESCerts required to be purchased. The (-) sign implies that the DC fall short of its target.

The energy equivalent of one ESCerts is one TOE.

IV. Demand Side Management (DSM)

Demand Side Management (DSM) has been traditionally recognized as one of the major interventions to achieve reduction in energy demands while ensuring continuous development. In recent past, DSM has gained unprecedented importance and has become an integral part of almost all the central and state missions on promotion of Energy Efficiency. DSM interventions have helped utilities not only to reduce the peak electricity demands and but also defer high investments in generation, transmission and distribution networks.

a. Agriculture DSM

In order to tap the energy saving potential, Agriculture Demand Side Management (Ag DSM) program was initiated by BEE with an objective to induce energy efficiency in agriculture sector by creating market-based framework for implementation of few pilot projects and create awareness among end users & other stakeholders for adoption of energy efficient pump sets (EEPS).

MOU was signed between BEE and Indian Council for Agricultural Research (ICAR). More than 500 awareness programmes conducted by KVKs and SDAs with around 15,000 farmers trained.

b. Municipal DSM

Identifying the immense energy saving potential in municipal sector, BEE initiated Municipal Demand Side Management (MuDSM). The basic objective of the project was to improve the overall energy efficiency of the Urban Local Bodies (ULBs), which could lead to substantial savings in the electricity consumption, thereby resulting in cost reduction/savings for the ULBs. 34 capacity building programmes on EE and O&M measures conducted by SDAs with more than 2000 officials from ULBs, UDDs and MCs trained

c. Capacity Building of DISCOMs program

Capacity building and other support is essential for distribution companies (DISCOMs) to implement Demand Side Management programs in their respective areas because of high requirement of electricity which increase the electricity cost and causes power outages by putting pressure on the electricity grid. The major achievements under Capacity Building of DISCOMs program on Demand Side Management scheme till date are as follows.

- DSM regulations have been notified for 24 States and 8 UTs. Remaining states are pursuing to notify their DSM regulations for their respective states.
- On DSM & energy efficiency, 1450 master trainers from senior and middle management officials of DISCOMs have been trained and capacity building of 7650 no. of circle level officials have been trained under this program.
- 69 DSM proposals have been prepared for 53 DISCOMs and submitted to respective DISCOMs for implementation. is estimated that there is a saving potential of 22919 MW and annual saving of about 62696 MU lies with these 28 DISCOMs and investment requirement is about Rs. 44, 994 Crore.

V. Energy Efficiency in Small and Medium Enterprises (SMEs)

With Climate Change, transition towards an energy efficient economy is highly imperative for the manufacturing sector, including Micro, Small and Medium Enterprises (MSMEs), which account for a large part of the world's consumption of resources. The MSME sector occupies a position of prominence in the Indian economy, contributing to more than 45% of the industrial output and 40% of the country's exports in value addition terms.

MSMEs, the critical growth driver of the Indian economy, play an important role in the context of energy-intensive industries. Although their individual energy consumption is rather low, their collective use is considerable. Lack of access to latest technologies make this sector vulnerable to energy security and competitiveness in global market. The poor energy and environmental performance are directly related to the lack of technical capacity in these enterprises to identify, access, adapt and adopt better technologies and operating practices.

BEE has developed Energy Conservation guidelines for more than 25 energy intensive SME sectors. A knowledge portal namely Simplified Digital Hands-on Information on Energy Efficiency in MSMEs (SIDHIEE) was developed. The portal hosts variety of knowledge resources like case studies, best operating practices, details of latest energy efficient technologies etc.

Bureau has also developed more than fifty (50) multimedia tutorials on energy efficient technologies for more than twenty (20) sectors for knowledge transfer and thereby easy adoption of these technologies.

MoU with SIDBI was signed on November, 2022 to promote energy efficiency financing for MSME sector and exploring IoT based solutions, greening MSMEs, capacity building of various stakeholders, etc.

A "National Conclave on Accelerating Energy Efficiency in MSMEs" was organized in December, 2022. Various cluster associations, MSME entrepreneurs and stakeholders discussed and gave inputs for successful implementation of energy efficiency programs in the MSME sector.

National Dissemination workshop was held for Brick sector under Energy and Resource Mapping activity in April. 2022.

VI. Improving Energy Efficiency in Transport Sector

The Government of India, Ministry of Power, issued average fuel consumption standards for cars on 23rd April 2015. The fuel consumption standards are under implementation from April'2017 onwards, and a second set of standards is implemented from 1st April 2022. The norms were amended to notify revised value of average vehicle mass and were notified in Dec 21.

The fuel economy norms for HDVs & L&MCVs notified earlier were applicable to the vehicles complying with BS-IV norms. A correction factor is notified in March 2022 for BS-VI complied vehicles. The correction factor is to be multiplied with the equations for deriving target fuel consumption value mentioned in earlier notification.

Under GO ELECTRIC Campaign, States have conducted 52 webinars, 62 roadshows and several other awareness

activities such as radio jingles, poster / leaflets distribution, awareness through social media platform, street plays, etc. in coordination with Bureau of Energy Efficiency.

Bureau of Energy Efficiency (BEE) under the guidance of Ministry of Power launched Web Portal and Mobile Application, "EV Yatra", on 14th December 2022, the National Energy Conservation Day. The "EV Yatra" web-portal and mobile app are aimed at creating awareness among the EV users and masses at large to promote e-mobility in the country.

VII. Strengthening of State Designated Agencies (SDA) To Promote Efficient Use of Energy and its Conservation

The EC Act mandates creation of a two-tier organization structure to promote the efficient use of energy and its conservation in the country with BEE as the nodal agency at central level and State Designated Agencies (SDAs) as nodal agencies at State / Union Territory (UT) level. Section 15(d) of the EC Act stipulates that the State Government/ UT Administration may designate any agency at the State level to co-ordinate, regulate and enforce the provisions of the Act within the State/UT.

Till date, 36 States/UTs have nominated a SDA in their respective State/UT. These agencies differ from State to State with 16 Nos. Renewable Energy Development Agency, 7 Nos. Power Department, 7 Nos. Electrical Inspectorate, 4 Nos. Distribution Companies, and 2 Nos. Standalone SDA. States of Kerala and Andhra Pradesh have established Stand-Alone SDA.

About 350 demonstration projects mainly in areas of street lighting, water pumping, buildings' retrofitting, and waste heat recovery have been successfully implemented by the SDAs. As on date, replacement of existing conventional appliances viz. lights and fans with energy efficient ones has been completed in more than 6000 nos. of Government schools.

28 SDAs have initiated implementation of EE measures as pilot projects in total 217 Government Hospitals across the country out of which actions have been completed in 100 hospitals.

Two meetings were held under the chairmanship of Hon'ble Union Minister of Power with senior officers of States/UTs and Heads of SDAs to review the progress of States/UTs in the field of energy transition. A need was felt to develop State-specific short-term and long-term action plan in consultation with respective State Governments having aim to document policies, programs, technologies, implementation plan strategies (incentivization, awareness, capacity building, etc.) and monitoring mechanisms (including benchmarking) for energy transition actions for all 36 States/UTs. Accordingly, BEE has initiated the endeavor of the development of State Energy Efficiency Action Plan (SEEAP) of all 36 States/UTs.

BEE has prepared State Energy Efficiency Index 2022 (SEEI 2022) by evaluating efforts and initiatives of all States/UTs in energy efficiency implementation across different demand sectors. The SEEI 2022 has formed the basis for presenting National Energy Conservation Awards 2022 under "State Performance Awards" category.

Financing Initiatives

On 28th Nov 2022, IT portal for BEE's Facilitation Centre was launched which will be a single window for industries seeking energy efficiency financing from 22 registered Financial Institutions

VIII. Revision of National Mission on Enhanced Energy Efficiency (NMEEE) – ROSHANEE

NMEEE has been revised to Road Map of sustainable and Holistic Approach to National Energy Efficiency (ROSHANEE). ROSHANEE has a broader vision and takes into account all the potential areas of energy efficiency in each sector, covering the macro level in policy and further delineating the respective schemes.

To align objectives of the erstwhile NMEEE with the revised goals under the NDCs, the mission is revised with the title Roadmap of Sustainable and Holistic Approach to National Energy Efficiency (ROSHANEE). Mission ROSHANEE has a broader vision and takes into account all the potential areas of energy efficiency in key sectors of the economy, covering the macro level in policy and further delineating the respective schemes. The revised mission includes all existing activities of BEE that have contributed significantly towards enhancing energy efficiency and consequent CO2 mitigation and the activities proposed in future, some of which have been identified and others which need to be explored. Mission ROSHANEE clearly outlines the strategies that needs to be adopted for achieving India's Nationally Determined Contribution commitments made under the Paris Agreement.

During COP 26 held at Glasgow, U.K. in 2021, one of the Panchamrit was that "By 2030, India will reduce the carbon intensity of its economy to less than 45 per cent". In order to achieve the 45% target of emission- intensity reduction, preliminary analysis indicate that absolute emissions by 2030 are required to be limited around 4584 MtCO2e. This means that the overall emissions in the economy would have to be reduced by 3753 MtCO2e (over the baseline scenario of 2005 level) to successfully meet our revised NDC commitment.

The sectoral break-up under the energy efficiency domain to achieve 2030 targets are given below:

Energy Emissions	Target Savings for 45% EI Reduction (in MtCO2e)
Agriculture	33
Commercial	75
Domestic	116*
Municipal	17
Industrial (including MSME)	312
Transport	187

Energy Emissions	Target Savings for 45% EI Reduction (in MtCO2e)
TPP Conversion	
Losses	(86)
AT&C Losses	-
Total	**740**

* In the Domestic sector emission reduction includes contribution due to efficient appliances

The main sectors which will contribute in this regard are Industry, Transport and Buildings which together shares 90% of the estimated emission reduction of 740 MtCo2 to achieve 45% from 2005 level. Therefore, these three sectors are considered focused areas for coordination at the Apex level. Budgetary requirement for activities proposed to be undertaken under the mission ROSHANEE by BEE is estimated as Rs. 10,370 Crores by 2030-31.

Carbon Market

In order to move towards a greener economy, Hon'ble Union Minister of Power and NRE on 22nd October, 2021 announced proposal for National Carbon Market with an objective to involve corporate and private sectors towards energy saving and carbon emission reductions.

Bureau of Energy Efficiency (BEE), under the guidance of the Ministry of Power, and the Ministry of Environment, Forest and Climate Change (MOEFCC) is developing the Indian Carbon Market (ICM). A well-designed, competitive carbon market mechanism can enable the reduction of GHG emissions for a specified target at the least cost, both at the level of each regulated entity, as well as the overall sector and drive faster adoption of clean technologies.

Promoting Energy Efficiency in Cold Chain Sector

BEE with support of World Bank Group, Energy Sector Management Assistance Program (ESMAP) has taken up the project titled "Cold Chain Energy Efficiency in India: Analysis of Energy Efficiency opportunities in Packhouses". The project has analysed the energy efficiency potential for promoting Energy Efficiency in pack-houses in India. The report of the study incorporated comments of the stakeholders such as M/o Agriculture and Farmers Welfare, M/o Food Processing, MOEFCC, NITI Aayog. M/o Power, Department of Commerce and APEDA. BEE has established a technical committee for "Promoting Energy Efficiency in Cold-chain Sector" comprising members from different ministries, academia, think tanks, Manufacturers / Industry Association etc. A technical committee has been consitutted and the guidelines for operation & maintenance and design are being prepared.

Adoption & implementation of District Cooling Systems (DCS) in India

In March 2019, India escalated the opportunities and challenges in cooling to a national priority level through the India Cooling Action Plan (ICAP) developed under the aegis of the Ministry of Environment, Forest & Climate Change (MoEF&CC) with support from the BEE and other line ministries. MoEF&CC has also formed a steering committee and thematic groups on space cooling for the implementation of ICAP. One of ICAPs recommendation for the buildings sector is to promote the use of not-in-kind technologies such as trigeneration system, district cooling, thermal energy storage etc. A Technical Committee for Adoption & implementation of District Cooling Systems in India has been established for enhanced coverage and deployment of energy efficiency and conservation measures in the country comprising members from different ministries, academia, think tanks, Manufacturers / Industry Association etc. The first draft DCs guidelines is prepared and is under finalization.

IX. Impact of Energy Efficiency Schemes / Programmes is as follows:

- Total Electrical Savings of 239.77 Billion Units and avoided Capacity generation of 74.75 GW
- Electrical savings resulted in cost savings worth INR 1,11,322 Crores and reduction in 189.40 Million tonnes of CO2 emissions.
- Thermal energy savings of 21.40 Million Tonnes of oil equivalent
- Thermal energy savings resulted in cost savings worth INR 40,918 Crores and reduction in 78.56 Millons tonne of CO2 emissions.
- Total Energy savings of 42.00 Millions Tonnes of Oil Equivalent i.e 4.73% of total primary energy supply of the country
- Total cost savings worth INR 1,52,241 crores approximately
- The equivalent reduction in CO2 emissions is around 267.98 million Tonnes

X. Other Activities

- The Ministers of Power have approved documents on ESCO Business Model for Implementing Energy efficiency Projects.
- Steering Committee under the Chairmanship of Secretary(P) constituted for setting up Energy Data Management Unit (EDMU) in BEE comprising of all relevant Line M/Ds.
- The Energy Conservation (Amendment) Bill, 2022 has been passed on December 12, 2022. The Bill seeks to amend the Energy Conservation Act, 2001. The following provisions in the Bill have been included to support to energy transition activities:
  - » Specify minimum share of consumption of non-fossil sources by designated consumers as energy or feedstock;
  - » Specify the carbon credit trading scheme;
  - » Coverage of large residential buildings within the fold of Energy Conservation regime; and Enhance the scope of Energy Conservation Building Code to include sustainability aspects.

XI. Activities under International Cooperation

Clean Energy Ministerial (CEM) Senior Officials Meeting was held in New Delhi from April 6-8, 2022. The meeting brought together CEM delegates from its 29 member governments and saw participation of more than 200 international and 150 national delegates. Identified greater collaboration opportunities between Mission Innovation (on R&D) and CEM (on deployment) agendas.

NATIONAL ENERGY CONSERVATION AWARD

The National Energy Conservation Awards are presented to industry and other establishments every year by the Ministry of Power with the objective of promoting energy conservation among all sectors of economy. These awards recognize and encourage endeavours of industrial units, institutions and establishments in reducing energy consumption by felicitating them with Energy Conservation Awards on the occasion of National Energy Conservation Day, celebrated on 14th December every year.

Ministry of Power celebrated National Energy Conservation Day on 14th December. Hon'ble President of India Smt Droupadi Murmu felicitated winners of the 32nd National Energy Conservation Awards (NECA) and 2nd National Energy Efficiency Innovation Awards (NEEIA). The school children who are the winners of National-Level Painting Competition on Energy Conservation were also given prizes.

On the occasion, the Hon'ble President of India Smt Droupadi Murmu launched 'EV Yatra' web portal and its mobile phone application for encouraging adoption of E-Mobility in the country.

NATIONAL ENERGY EFFICIENCY INNOVATION AWARDS (NEEIA)

BEE under the Ministry of Power has also initiated National Energy Efficiency Innovation Award (NEEIA). It is to recognize "Innovative Energy Efficiency Technologies" and instill a sense of competition to motivate industries & sectors to develop innovative energy efficiency efforts in their units. The online applications were invited from 3 categories; ie: Category A (Industry, Transport, Building) & Category B (Students & Research Scholars). A total of 177 applicants participated for NEEIA 2022.

NATIONAL LEVEL PAINTING COMPETITION

BEE with support from CPSUs organised a State Level Painting Competition 2022 across the country. More than 40 lacs school children participated in 66,000 schools. The paintings were evaluated by the committee of State level Experts/Jury for two groups separately i.e. Group A (5th to 7th Standard) and Group B (8th to 10th Standard). The 1st, 2nd and 3rd prize of state level painting competitions were evaluated by a panel of juries for National level painting prizes.

Category A (5, 6, 7) Award Winning Paintings

Category B (8, 9, 10) Award Winning Paintings

FACILITATING ELECTRIC MOBILITY

Electric mobility will not take off unless charging stations are put up in adequate numbers. In order to facilitate the setting up of charging infrastructure, Ministry of Power issued guidelines on Charging Infrastructure for Electric Vehicles on 13.04.2018 under provisions of the Electricity Act, 2003. It was specified that the charging of battery for use in electric vehicles does not require license under the provisions of the Act.

For facilitating Grid Connectivity and Safety of supply for Charging Stations, CEA has issued amendments to following regulations of Central Electricity Authority (CEA):

a. Central Electricity Authority (Technical Standards for connectivity of the Distributed Generation Resources) Regulations 2019.

b. Central Electricity Authority (measures relating to the Safety and Electric Supply) Regulations 2019.

Ministry of Power along with Ministry of Road Transport and Highways, Ministry of Heavy Industries and NITI Aayog launched a nationwide "Go Electric" Campaign on 19.02.2021 to educate the general public on the benefits of e-mobility, inform the potential EV owners about the Government incentives for EV adoption, generate curiosity and transform the same into demand, discredit misinformation against Electric Vehicles and bring together multiple stakeholders under single platform.

Under GO ELECTRIC Campaign, states have conducted 52 webinars, 62 roadshows and several other awareness activities such as radio jingles, poster / leaflets distribution, awareness through social media platform, street plays, etc. in coordination with Bureau of Energy Efficiency.

The "Charging Infrastructure for Electric Vehicles - Guidelines and Standards" were issued by the Ministry of Power on 14.12.2018 and subsequently revised on 01.10.2019 and 08.06.2020. After careful consideration of progress made and suggestions received from various stakeholders, consolidated revised guidelines were issued by the Ministry of Power on 14.01.2022 to accelerate e-Mobility transition in the country. To promote use of renewable energy for powering public EV charging stations, Ministry of Power issued amendment to the revised guidelines on 07.11.2022. The key features of the "Charging Infrastructure for Electric Vehicles – the revised consolidated Guidelines and Standards" and its amendment are as follows:

Issue	Provisions in Guidelines and Standards
Charger Types	• The guidelines have been made technology agnostic by providing for not only the prevailing international charging standards available in the market but also the new Indian charging standards notified by the Bureau of Indian Standards.
Central Nodal Agency	• Bureau of Energy Efficiency (BEE)
State Nodal Agencies (SNAs)	• 28 State Governments have nominated SNAs for their respective States. • 28 states have notified EV policies out of these 24 policies have been notified while remaining 4 are under discussion phase as of 31st Dec, 2022 .
Tariff for supply of Electricity to Charging Stations	• The tariff for supply of electricity to Public EV Charging Stations has been specified as single part tariff not exceeding the "Average Cost of Supply" till 31st March, 2025. The same tariff shall be applicable for Battery Charging Station (BCS) as well. • The tariff applicable for domestic consumption shall also be applicable for domestic charging.
	• Separate metering arrangement shall be made for PCS so that consumption may be recorded and billed as per applicable tariff for EV charging stations.
Service Charges to EV Owners	• As electricity is being provided at concessional rates and also considering the fact that subsidy is being provided by the Central/State Governments in many cases for setting up Public Charging Stations, the State Government shall fix the ceiling of Service Charges to be charged by such PCS/FCS. • A Committee under Central Electricity Authority (CEA) will periodically recommend to the State Government the ceiling limit of service charges to be levied as above. The Committee shall also recommend "time of the day rate" for service charges as well as the discount to be given for charging during solar hours.
Range Anxiety	• At least one Charging Station should be available in a grid of 3 Km X 3 Km in the cities and at every 25 KM on Highway/Roads. • Owners may charge their EVs at their residence/offices using their existing electricity connections.

Issue	Provisions in Guidelines and Standards
Phase wise Installation	• Phase I (1-3 years) – To target 4 million plus cities and connected Expressways/ important Highways • Phase II (3-5 years) – To target State Capitals, UT headquarters & important connected Highways.
Land at concessional rates for installation of PCS	• To provide for land at promotional rates for setting up the Public Charging Stations, a Revenue Sharing Model has been provided in the guidelines. The revenue sharing model fixes a promotional rate for sharing of revenue between PCS and the Government/Public - Land Owning Agency.
Open Access	• Any Public Charging Station/ Chain of Charging Stations may obtain electricity from any generation company through open access. Open Access shall be provided for this purpose within 15 days of receipt of the application complete in all respect.
Timelines for providing the connection to PCS	• Distribution Company licensee shall release connection for EV Public charging station (PCS) in accordance with the timelines stated in section 4 sub. (11) of the Electricity (Rights of Consumers) Rules 2020. The timelines have also been specified under the guidelines.
Database of Public Charging Stations (PCS) in the country	Bureau of Energy Efficiency has been tasked to create and maintain a national online database through a Web-Portal/Software/Mobile Application for the database of Public Charging Stations throughout the country Stations in consultation with State Nodal Agencies (SNAs).In this regard, mobile application and web-portal, titled 'EV Yatra' was launched by Hon'ble President of India on 14th December 2022. This portal is available at https://evyatra.beeindia.gov.in/
Renewable energy based Public Charging stations	• The public EV charging stations shall have the feature of prepaid collection of service charges with the time of the day rates and discount for solar hours • A Committee under Central Electricity Authority (CEA) has been tasked to periodically recommend the State Government the ceiling limit of service charges to be levied for such public charging stations. Additionally, the Committee shall also recommend time of the day rate for service charges as well as the discount to be given for public EV charging during solar hours.

As per the information received from Bureau of Energy Efficiency (BEE), a total of 5245 Public Charging Stations (PCS) have been installed till 31stDecember 2022 in the country.

Initiatives taken by Ministry of Heavy Industries (MHI)

i. **FAME India Scheme:** FAME India (Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India) Scheme was launched on 1st April 2015, wherein it is intended to support the hybrid / electric vehicle market development and its manufacturing ecosystem to achieve self-sustenance.

Phase 1 of the scheme was launched on 1st April 2015 and was extended from time to time, with the last extension allowed for a period up to 31st March 2019. A total of 520 PCS were sanctioned under the scheme out of which 447 PCS have been installed.

Under Phase II of scheme a total of 2877 Public Charging Stations have been sanctioned for installation in various cities. Further, MHI has also sanctioned 1576 PCS across 16 expressways and 9 highways under the scheme.

Under Phase II of FAME India Scheme, 83 public EV charging stations are currently operational across 12 cities.

Initiatives taken by Ministry of Housing and Urban Affairs (MoHUA)

i. **Amendments issued by Ministry of Housing and Urban Affairs (MBBL 2016):** Ministry of Housing and Urban Affairs has issued amendments in Model Building By-Laws and Urban and Regional Development Plans Formulation and Implementation Guidelines regarding Charging Infrastructure for Electric Vehicles

ii. **Amendments in Urban and Regional Development Plans Formulation and Implementation Guidelines (URDPFI – 2014):** With the purpose of including provisions for establishing Public Charging Stations (PCS) in the regional facilities for re-fueling/recharging of vehicles, amendments are made for addition of norms for charging infrastructure provisions in Development Control Regulations and provide "Charging Infrastructure" in the City Master Plans / Regional Plans.

CHAPTER 12

INTERNATIONAL COOPERATION

International Cooperation Division works for enhancing Cooperation with various countries in the Power Sector. Active interest has been taken in enhancement of Bilateral Cooperation with Bangladesh, Bhutan, Nepal, Sri Lanka, Myanmar, Australia, Denmark, Japan, Germany, Singapore, UK, USA, etc. Multilateral engagements under the umbrellas of Clean Energy Ministerial (CEM), International Energy Agency (IEA), G20 and BRICS were also undertaken.

BILATERAL COOPERATION

COOPERATION WITH NEIGHBOURING COUNTRIES

India, being centrally placed in South Asian region and sharing political boundaries with SAARC countries, namely, Nepal, Bhutan, Bangladesh, Myanmar & Sri Lanka, is playing a major role in promoting and maintaining energy security with these countries for effective utilization of regional resources. This is encouraging mutual cooperation amongst neighboring nations and resource sharing in the region. Country-wise brief status is below:

INDIA – NEPAL

An Agreement on 'Electric Power Trade, Cross-border Transmission Interconnection and Grid Connectivity' between India and Nepal was signed in 2014. Two mechanisms – JWG and JSC have been set up to take the cooperation forward. The 9th JWG/ JSC meetings were held on 23-24 February, 2022.

- **Present Power Transfer:** About 1000MW can be transferred
  - About 350-400MW through 132kV & below radial lines
  - About 600MW of power through Dhalkebar (Nepal) – Muzaffarpur (India) 400kV D/c line (first high-capacity link)
- **Under-Construction Interconnections:** Additional about 1900MW (total about 2900MW)
  - 800MW: Sitamarhi (POWERGRID) – Dhalkebar (Nepal) 400kV D/c (Quad) line (associated with Arun-3 HEP, Nepal): Nepal portion by M/s SAPDC (developer of Arun-3 HEP) and Indian portion by POWERGRID for M/s SAPDC. Expected by Apr 2023.
  - 1000MW: Gorakhpur (India) – New Butwal (Nepal) 400kV D/c (Quad) line: Joint Venture (JV) company of POWERGRID and NEA "BUTWAL - GORAKHPUR CROSS BORDER POWER TRANSMISSION LIMITED" incorporated on 31-08-2022 and its first board meeting was held on 30-09-2022.
    - NIT floated for the transmission packages (line and substation).
    - Technical evaluation bid opened.
    - Proposal for execution of works under Project Management Consultancy (PMC) submitted by POWERGRID to JV company.
- 100MW: Stringing of second circuit of Kataiya (Bihar, India) – Kusaha (Nepal) and Raxaul (Bihar, India) – Parwanipur (Nepal)132kV S/c lines on D/c towers
- **Future Interconnections:**
  (i) Gorakhpur (India) – New Butwal (Nepal) 400kV D/c (Quad) line
  (ii) Stringing of second circuit of Kataiya (Bihar, India)– Kusaha (Nepal) 132kV S/c line on D/c tower
  (iii) Stringing of second circuit of Raxaul (Bihar, India) – Parwanipur (Nepal) 132kV S/c line on D/c tower
  (iv) New Nautanwa (UP, India) – Mainhiya (Nepal) 132kV line
  (v) Nanpara (UP, India) – Kohalpur (Nepal) 132kV line
  (vi) Transmission system of Arun-III HEP
  (vii) Requirement of New Lumki (Nepal) - Bareilly (India) and New Duhabi (Nepal) - New Purnea (India) 400kV interconnections and status of associated hydro generation projects in Nepal
- India – Nepal Interconnection Master Plan

About 308 (282 new) generation projects with total capacity of about 45GW have been identified by Nepal to be commissioned progressively by 2035. A Long-Term Integrated Transmission Plan for transfer of power between India and Nepal was earlier prepared in 2016 by the Joint Technical Team (JTT) in which 11 cross border interconnections between India and Nepal were identified to be taken up progressively upto 2035 timeframe for evacuation of about 24.9GW surplus hydro power from Nepal to India. Apart from this, about 17.5GW from KarnaliChisapani (10800MW), Pancheshwar (3360MW) and Saptakoshi (3400MW) HEPs are also envisaged in future, for which dedicated corridors shall be required.

The requirement of India – Nepal interconnection system upto 2025 timeframe was further reviewed by JTT. As per latest JTT Report (Supplementary Report on Integrated Master Plan for Evacuation of Power from Hydro Projects in Nepal), total 5 nos. India – Nepal 400kV high-capacity interconnections along with strengthening of East – West Power Highway in Nepal are required for transfer of about 7800MW power from Nepal to India upto 2027 timeframe.

INDIA – BHUTAN

There are four major river systems in Bhutan namely Torsa, Wangchu (known as Raidak in India), Sankosh and Manas. All these rivers have large snow fed perennial flows and afford attractive possibilities of hydro-electric development. The demand for electricity in Bhutan is expected to be meager in

the near foreseeable future as compared to the hydro-electric potential. The hydro-electric potential of Bhutan could be harnessed for the mutual benefits of both India and Bhutan.

An agreement concerning co-operation in the field of hydroelectric power was signed between Government of India (GoI) and Royal Government of Bhutan (RGoB) on 28.07.2006.

The present Hydro Power installed capacity of Bhutan is about 2326 MW. Out of this, 2136 MW has been developed, in Inter-Governmental (IG) mode, with Indian Technical and Financial assistance [Projects are funded by the Government of India through MEA].

- Chukha HEP (336 MW) - [60% Grant and 40% Loan]
- Kurichu HEP (60 MW) - [60% Grant and 40% Loan]
- Tala HEP (1020 MW) - [60% Grant and 40% Loan]
- Mangdechhu HEP (720 MW) - [30% Grant and 70% Loan]

The surplus power from these projects is being exported to India at mutually agreed tariff.

Two (2) projects are presently under construction:

- Punatsangchhu-I HEP (1200 MW) in IG Mode - [40% Grant and 60% Loan]
- Punatsangchhu-II HEP (1020 MW) in IG Mode - [30% grant and 70% loan]

» Present Power Transfer: About 1948MW (power allocated to India, including 311MW from unallocated power)

Generation Project	Inst. Cap. (MW)	Power allocated to India (MW) (as on 30-06-2022)	Unallocated share allocated to India (as on 30-06-2022)
Tala	1020	867	
Chukha	336	229	311
Kurichu	60	51	
Mangdechhu	720	489.5	
Dagachu	126	JV of Tata & Bhutan. Power being sold through trader.	
Total	**2262 MW**	**1636.5 MW**	**311 MW**

Present Interconnections:

» Kurichu HEP– Geylephu (Bhutan) –Salakati 132kV S/c line

» Deothang/Motonga – Rangia 132kV S/c line

» Chukha HEP – Birpara 220kV (3 circuits) line

» Tala HEP – Siliguri 400kV 2xD/c line

» Mangdechhu HEP – Alipurduar (via Punatsangchhu) 400kV D/c (Quad) line

» Jigmeling (Bhutan) – Alipurduar 400kV D/c (Quad) line

- The total hydro power projects expected to be commissioned in Bhutan by 2025, 2030 and 2040 are 10000MW, 14000MW and 23500MW respectively. The corresponding demand of Bhutan is expected to be about 800MW, 1400MW and 3000MW respectively.
- **Future Power Transfer:** Total about 4168MW

Generation Project	Inst. Cap. (MW)	Comm. Schedule
Punatsangchu-I	1200	2024-25
Punatsangchu-II	1020	2022-23
Total	**2220**	

INDIA – BANGLADESH

An MoU between the Govt. of India and the Govt. of the People's Republic of Bangladesh on Cooperation in Power Sector was signed on 11th January, 2010. The 20th meeting of the JWG/ JSC was held on 28th and 29th May 2022.

2. Bangladesh is connected with both Eastern and North Eastern Region of India through following links:

   a. **1000 MW** through Baharampur (India) – Bheramara (Bangladesh) 400 kV 2xD/c line along with 2x500MW HVDC Back-to-Back terminal at Bheramara.

   b. **160 MW** through Surajmaninagar (Tripura) – North Comilla (Bangladesh) – South Comilla 400kV D/c radial interconnection (operated at 132kV).

   c. During the Financial Year 2021-22, about 7302 MU energy has been exported to Bangladesh by India. During the Financial Year 2022-23 (upto November 2022), about 5916 MU energy has been exported to Bangladesh by India.

3. Electricity is being exported to Bangladesh from following sources:

Applicant	Generation Source	Quantum (MW)	Period
NVVN	DVC Power	300	01.01.2020 to 31.05. 2033
PTC India Ltd	Sembcorp Energy India Limited Project2, Andhra Pradesh	200	up to 31.05.2033
Sembcorp Gayatri Pvt. Ltd (SGPL)	Sembcorp Energy India Limited Project 2, Andhra Pradesh	250	01.01.2020 to 31.07.2033

Applicant	Generation Source	Quantum (MW)	Period
NVVN	NTPC stations	250	Government to Government mode
NVVN	Tripura State	160	Upto 15.03.2026

- During the Visit of Prime Minister of Bangladesh to India in September 2022, Both the Prime Ministers agreed to expeditiously implement projects to connect the two countries' power grids synchronously, including through the proposed high capacity 765 KV transmission line from Katihar (Bihar) to Bornagar (Assam) through Parbatipur in Bangladesh, to be made through a suitably-structured India-Bangladesh Joint Venture for a Special Purpose Vehicle

4. Commissioning of Unit I of Rampal Maitree Power Project

- The RampalMaitree Power Project (2x660 MW) is being implemented by Bangladesh-India Friendship Power Company (Pvt.) Ltd. (BIFPCL) a joint venture of NTPC Ltd. and Bangladesh Power Development Board (BPDB).
- First unit was synchronized on 22.10.2022 and its COD was on 23rd December, 2022. However, formal communication is awaited from BPDB, Bangladesh. COD of 2nd unit is expected in August, 2023.

INDIA – SRI LANKA

» The 4th meeting of Joint Working Group (JWG) meeting on India-Sri Lanka Cooperation in Power Sector was held on 27th June, 2019 at New Delhi. In the meeting, the Joint Technical Team (JTT) presented a study report on "Interconnection between India and Sri Lanka Electricity Grids". It was decided in the meeting to prepare a Detailed Project Report (DPR) for a HVDC overhead link between Madurai (India) and New Habarana (Sri Lanka) with 2x500MW HVDC terminals based on Voltage Source Converter (VSC) technology. The project may be taken up either as single project of 2x500MW or in two phases with 500MW in phase-1 and additional 500MW in phase-2.

» After finalisation of DPR by JTT, the same would be presented in the forthcoming meeting of JWG.

INDIA – MYANMAR

- An MoU between India and Myanmar on cooperation in the Power sector was signed 19th October, 2016 for a period of 5 years. The same has been extended for 5 more years starting from 19.10.2021.
- Presently, 3 MW of power is supplied to Myanmar via 11kV Moreh(Manipur) –Tamu (Myanmar).
- A number of discussions have taken place to establish high capacity transmission link between Myanmar and India. In the 4th meeting of JWG held on 26-11-2021, Myanmar has requested for drawl of 250 MW through Imphal –Tamu cross-border interconnection along with new 400/230 kV substation at Tamu and Tamu-Kaley 230kV D/c line. The project envisages a HVDC back-to-back station either at Imphal or at Tamu. Both sides agreed to convene a meeting of experts from both sides to discuss and finalize various technical and commercial aspects related to the implementation of Imphal-Tamu cross-border link.
- Thereafter, 5th meeting of JTT-T was held on 18-01-2022, wherein brief scope of works for interconnection link viz. Imphal – Tamu link including 500MW HVDC back-to-back at Tamu end has been agreed.
- Implementation modalities and other issues further deliberated in the JWG& JSC held on 16-17 September 2022. Both sides agreed on technical scope of works of the Imphal-Tamu-Kalay link, taking up of Imphal to Kalay (via Tamu including HVDC) link as single project, and preparation of Detailed Project Report (DPR) of the link by Power Grid Corporation of India Limited (POWERGRID). It was agreed that draft agreement for preparation of DPR by POWERGRID would be sent within one month, and the DPR will be prepared within six months after signing of the agreement.

COOPERATION WITH OTHER COUNTRIES

AUSTRALIA

The India – Australia Energy Dialogue was established following visit of the then Australian Prime Minister Ms. Julia Gillard to India in October, 2012. The Dialogue was institutionalized to discuss areas of mutual interest in energy security and key issues in India and Australia's energy markets, as well as regional and globe trends, and developments in both countries.

2. There are the following five Joint Working Groups (JWGs) under the Dialogue:

- Power - led by Ministry of Power.
- Renewable Energy - led by MNRE.
- Coal and Mines - led by Ministry of Coal.
- Critical Minerals - led by Ministry of Mines.
- Oil and Gas - led by MoPNG.

3. The 4th meeting of the India – Australia Energy Dialogue was held on 15th February, 2022 by VC. The dialogue was co-chaired by Hon'ble Minister for Power and New & Renewable Energy, Mr. R.K. Singh from the Indian side and Hon'ble Minister for Energy and Emissions Reduction, Mr. Angus Taylor from the Australian side.

4. Energy Transition was a major area of discussion in the dialogue and both the Energy Ministers spoke in detail about the ongoing Energy Transition activities in their respective countries with focus on renewables, energy efficiency, storage, EVs, critical minerals, mining etc. The need for Climate Finance was also highlighted by India for meeting the Energy Transition goals of developing countries.

5. With a focus on advancing technology and clean energy transition, the agreed forward action plan includes areas like energy efficiency technologies; grid management; R&D collaboration on flue gas desulphurisation, biomass or hydrogen co-firing, water cycle optimisation, renewables integration, batteries and electric mobility.

6. Further, a delegation led by Hon'ble Minister of Power and NRE visited Australia to participate in the Sydney Energy Forum during 12-15 July, 2022. The following major action points emanated from the visit:

   (i) Collaboration on critical minerals like Lithium, and Solar PV cells and EV battery manufacturing.

   (ii) Collaboration in inter-connection, grid management, oil based to gas based plants, Nickel-Cobalt (Ni-Co) alternative to Lithium-Manganese (Li-Mn), & Carbon Capture (CC) Projects.

   (iii) Collaboration with (CSIRO), Commonwealth Scientific & Industrial Research Organization on repurposing retiring thermal plants, CCUS, etc.

DENMARK

A Memorandum of Understanding (MoU) on Energy Cooperation was signed between the Ministry of Energy, Utilities and Climate, Kingdom Of Denmark and the Ministry of Power, Government of the Republic of India on 5th June, 2020.

2. The areas identified under the MoU include energy planning, forecasting, flexibility in the grid, integration of variable renewable energy, power markets, Consolidation of Grid Codes Ancillary Services, Cross Border Trading of Electricity, Monetization of waste steam from Thermal power plants, Flexibility in operation of power plants for RE integration, emission control from Thermal Power plants, etc.

3. A Joint Working Group has also been established under the MoU for implementation of the identified areas. The following ten areas of cooperation have been identified by the JWG as priority areas:

   (i) Energy planning, modelling and forecasting scenarios in respect of power sector.

   (ii) Integration of variable renewable energy, including eg. Forecasting.

   (iii) Power markets including monitoring tools, etc.

   (iv) Optimizing flexibility of electrical power systems.

   (v) Consolidation of Grid Codes to integrate and operate efficiently variable generation.

   (vi) Ancillary Services.

   (vii) Transfer of technology for emission control from Thermal power plants

   (viii) Monetization of waste steam from thermal power plants.

   (ix) Flexibility in operation of power plants for RE integration.

4. Four meetings of the JWG have been held till date. The last meeting of the JWG was held on 22.09.2022 in Denmark. Discussions of progress and future activities under the Indo-Danish Partnership Programme were held during the meeting. Progress report/ milestones achieved in the last one year under each area of cooperation that were highlighted during the meeting.

5. In order to strengthen collaboration on green technologies and transition under the India – Denmark Green Strategic Partnership, a Sector Expert on Energy Modelling has been deputed to India from Denmark (in March, 2021). The Danish side has also proposed to depute a second Sector Expert dealing with Electricity Markets to be deputed to India. The proposal is under consideration with the Indian side.

GERMANY

The Indo-German Energy Forum (IGEF) has been established in 2006 as an institutionalized energy dialogue with the aim of promoting Indo-German co-operation in the areas of energy security, energy efficiency including energy conservation, renewable energy, investment in energy projects and collaborative research and development taking into account the environmental challenges of sustainable development.

2. The IGEF is co-chaired by the Secretary (Power) from the Indian side and the Parliamentary Secretary, Federal Ministry for Economic Affairs & Energy (BMWi) from the German side. The meetings of the Forum are held alternately in Germany and India. Following four Sub-Groups have been constituted under the Forum:

   (i) Sub Group-I: "Efficiency Enhancement in Fossil Fuel based Power Plants" [co-chaired by AS/ JS (Thermal), MoP]

   (ii) Sub Group-II: "Renewable Energies" [co-chaired by JS, MNRE]

   (iii) Sub Group-III: "Demand side energy efficiency and low carbon growth strategies" [co-chaired by DG, BEE]

   (iv) Sub Group-IV: "Green Energy Grid Integration" [co-chaired by JS (BC), DEA]

3. The last meeting of the IGEF was held on 1st November, 2019 in New Delhi. The Forum finalized the roadmap for future collaboration between the two countries which, inter-alia, include Flexibilisation of existing coal fired power plants, promoting niche markets for Solar Energy, promotion of energy efficiency in buildings through ECBC, building materials and credit lines for financing corresponding measures and RE evacuation through state-of-the-art intra-state and inter-state transmission grid infrastructure.

JAPAN

The cooperation with Japan in the energy sector is steered under the Indo – Japan Energy Dialogue. The Dialogue is led by Ministry of Power. There are four Working Groups under the India – Japan Energy Dialogue namely,

- Electricity & Energy Conservation - led by Joint Secretary, MoP;
- Coal - led by Adviser (Projects), Mo Coal;
- Renewable Energy and Hydrogen - led by Joint Secretary, MNRE;
- Petroleum and Natural Gas - led by Joint Secretary, MoP&NG

2. The last (10th) India – Japan Energy Dialogue was held on 10th December, 2019 in New Delhi. Minister of State (IC) for Power, NRE and Skill Development & Entrepreneurship, Shri R.K Singh, and Minister of Economy, Trade and Industry (METI), Mr. Kajiyama Hiroshi signed a Joint Statement at the conclusion of the meeting.

3. Both Ministers took stock of the work done under the different Working Groups. Both the countries endorsed the importance of working towards sustainable growth for preserving our environment. In addition to following the practices like flexibilization of coal fired thermal plants and ramping up RE sources, the countries agreed to work towards utilizing non-conventional sources like Hydrogen.

4. The last meeting of the working group on Electricity & Power Generation (led by MoP) was held on 5th March, 2020 in New Delhi. Discussions were held on (a) Technical cooperation and (b) Personnel cooperation.

5. The 14th India – Japan Annual Summit was held on 19th March, 2022. A Joint Statement was released after the Summit. Both sides welcomed the launch of the India-Japan Clean Energy Partnership (CEP) for cooperation towards achieving sustainable economic growth and addressing climate change. Implementation of the partnership will be undertaken under the existing 'India-Japan Energy Dialogue', among various stakeholders such as Ministries and organizations involved in this mechanism.

6. The next India – Japan Energy Dialogue is to be held in Japan shortly.

UNITED KINGDOM

An MoU between the Government of the Republic of India and the Government of the United Kingdom of Great Britain and Northern Ireland on "Co-operation in the Energy Sector" was signed on 11th November, 2015.

2. There are two Joint Working Groups under this MoU, one on Power and one on Renewable Energy. The co-chairs of the JWGs are at JS/ AS level. The JWGs report to a Steering Committee led by Secretary (Power) and Secretary (NRE). There are further two Task Forces under the JWG on Power viz. "Utilities of the Future" and "Energy Efficiency" which feed into the JWG meetings.

3. The third UK-India Energy Dialogue took place on 8th October, 2021 by VC. The Dialogue was co-chaired by Hon'ble Minister for Power and NRE, Shri RK Singh from the Indian side and the UK Government was led by Secretary of State for Business, Energy and Industrial Strategy, Hon'ble Mr. Kwasi Kwarteng. During the Energy Dialogue, Hon'ble Ministers endorsed the Forward Action Plan for bilateral and multilateral collaboration.

4. The last meeting of the JWG on Power was held on 4th October, 2021 through VC which was co-chaired by JS (IC), MoP from the Indian side. The JWG took an update of the domestic policies in both the countries. Discussions were held on the COP26: Energy Transition Campaign by UK. It was agreed that both the sides would work together on COP26 as a priority collaboration theme.

5. Ministry of Power also has a Power Sector Reform (PSR) programme with the Department of International Development (DFID), Government of U.K for £10 million Technical Assistance to India. This programme aims to provide a range of support to various central and state agencies, on matters relating to the power sector reform program and support the clean energy goals set out by the Government of India. The following six streams have been identified under the PSR programme:

- Structural and Regulatory Reforms.
- Power Markets.
- Renewable Energy Deployment & Grid Integration.
- Utility Sustainability.
- 24x7 Access and Welfare.
- Impact Initiatives.

6. Further, a new India-UK partnership programme of Technical Assistance Collaboration on Power Sector titled "ASPIRE" Programme (Accelerating Smart Power & Renewable Energy) was agreed. Under the programme, collaboration is on areas such as smart meters, electricity distribution reforms, industrial energy efficiency and

electric mobility. The programme mainly focuses on the following themes:

» Theme 1: Electricity distribution sector.

» Theme 2: Energy Efficiency, includes 2 sub-themes:

- Industrial Energy Efficiency
- Electric mobility charging infrastructure

UNITED STATES OF AMERICA

The cooperation between India and the US in the Power sector is under the umbrella of Indo - US Energy Dialogue. The Dialogue was launched in May, 2005 and has the following objectives:

- To enhance mutual energy security,
- Promote increased energy trade and investment,
- Facilitate the deployment of clean energy technologies.

2. The Dialogue has been renamed as US – India Strategic Clean Energy Partnership (SCEP). The Ministerial meeting of the US – India SCEP is co-chaired by Hon'ble Minister of Petroleum and Natural Gas and the US Secretary of Energy. Currently the US – India SCEP has the following pillars:

S. No.	Pillar	Nodal Ministry on the Indian side
1.	Responsible Oil & Gas	Ministry of Petroleum & Natural Gas
2.	Emerging Fuels and Technologies	Ministry of Petroleum & Natural Gas
3.	Power & Energy Efficiency	Ministry of Power
4.	Renewable Energy	Ministry of New & Renewable Energy
5.	Sustainable Growth	NITI Aayog

3. Secretary of Energy Jennifer Granholm and Indian Minister of Petroleum and Natural Gas Hardeep Singh Puri, held the second ministerial meeting of the U.S.-India Strategic Clean Energy Partnership (SCEP) on 7th October, 2022.

4. The Ministers reiterated their commitment to accelerating a just and sustainable energy transition. Both sides identified the importance of private sector engagement to facilitate investment, inform policy, and accelerate technology deployment. To that end, Ministers agreed to continue convening public-private tasks forces on hydrogen and biofuels, and announced the launch of a new Energy Storage Task Force to support large-scale integration of renewable energy needed to support the clean energy transition.

5. The "Power and Energy Efficiency" pillar (led by MoP) is tasked with work to improve reliability, resilience, flexibility, affordability, and sustainability of the power system. To align the work of the pillar with the newly revitalized U.S.-India Strategic Clean Energy Partnership (SCEP), both the sides have agreed to the following high-level priorities:

Priority 1: Modernize power system infrastructure and strengthen electricity systems for a more reliable, secure, efficient, affordable, and cleaner energy supply, including through flexibilization utilizing available resources, implementation of smart grids, grid integration of renewables, energy storage, distributed energy resources, ancillary services, and enhanced digitization and cybersecurity.

Priority 2: Support reform of the distribution sector through new business models, increased private sector participation, incubation and deployment of smart distribution technologies, and strengthening of institutions.

Priority 3: Promote energy efficiency and conservation, including in buildings, appliances, and the industrial sector; promote use of information and communication technologies (ICT) in energy efficiency.

Priority 4: Support power market transformation and technology deployment by improving the investment climate, including through improved procurement practices, ease of doing business, new business models, regulatory oversight, and private sector engagement.

Priority 5: Promote industrial decarbonization, including in sectors like steel and cement, through electrification, energy efficiency, and emerging technologies.

7. The last meeting of the pillar was held on 4th October, 2022 by video conference. The key achievements under the Power and EE pillar were highlighted and a way forward was also agreed to.

MULTILATERAL COOPERATION:

BRICS

A Memorandum of Mutual Understanding in energy saving and energy efficiency among the ministries and governmental agencies of BRICS, responsible for energy and energy efficiency was signed in November, 2015.

China had the BRICS presidency for the year 2022. The Meeting of BRICS Ministers of Energy was held on 22nd September, 2022 by VC. Hon'ble Minister of State for Power and Heavy Industries, Shri Krishan Pal Gurjar participated in the Energy Minister's meeting of BRICS member countries. Emphasis were laid on the need for maintaining security and stability in BRICS energy supply and in the wider global energy markets, and together play a constructive role in promoting the recovery and sustainable development of the energy sector.

The BRICS Energy Ministers committed to working together to advance green and low carbon energy transition and to promote energy transitions as befitting respective national

conditions, development imperatives and working towards respective carbon neutrality goals by using all energy sources more efficiently.

G20

India has assumed the Presidency of the G20 from 1st December, 2022. India's G20 Presidency aims to share, collaborate and build on the sense of trusteeship amongst the member countries in achieving clean energy transition while progressing towards a more equitable, shared and inclusive growth. Under the Energy Transition Working Group the Indian Presidency will build upon the efforts and outcomes of previous presidencies, which have successfully advanced the cause of global cooperation in clean energy transition and have made it central to the agenda of sustainable economic development. Under India's G20 Presidency, the priority areas for the Energy Transitions Working Group (ETWG) shall be the following:

» Energy Transition through Addressing Technology Gaps.

» Low- Cost finance for Energy Transitions.

» Energy Security and Diversified Supply Chain.

» Energy Efficiency, Industrial low carbon Transitions and Responsible Consumption.

» Fuels for Future (3Fs).

» Universal Access to clean energy and just, affordable, and inclusive energy transition pathways.

CLEAN ENERGY MINISTERIAL (CEM)

Clean Energy Ministerial (CEM) is a high-level global forum created since 2009, to share lessons learnt and best practices, and to encourage the transition to a global clean energy economy. There are 26 participating members in the CEM. Poland and New Zealand are currently in the process of joining the CEM.

The CEM is focused on three global climate and energy policy goals:

- Improve energy efficiency worldwide.
- Enhance clean energy supply.
- Expand clean energy access.

India is a founding member of the CEM, and hosted the Ministerial meeting in 2013 and co-leads and participates across several work-streams. India currently leads on five CEM work-streams as follows:

- 21st Century Power Partnership (21CPP) Initiative
- International Smart Grid Action Network (ISGAN) Initiative
- Super-efficient Equipment and Appliance Deployment (SEAD) Initiative
- Advanced Cooling Challenge (ACC)
- Power System Flexibility Campaign (PSF)

Also, India is part of following initiatives and campaigns of CEM:

- Multi-lateral Solar and Wind Working Group Initiative
- Electric Vehicles Initiative (EVI)
- Energy Management Working Group (EMWG) Initiative
- Carbon Capture, Utilization and Storage Initiative (CCUS)
- Hydrogen Initiative (H2I)
- Clean Energy Solutions Center Initiative
- Accelerating the adoption of Distributed Generation in Strategic Regions Campaign
- Long-term Energy Scenarios for the Clean Energy Transition (LTES) campaign
- EV30@30 Campaign
- Energy Management Campaign

India will host the 14th Clean Energy Ministerial (CEM14) on 21st July, 2023. As per tradition, India hosted the CEM Senior Energy Officials' Meeting (SEOM) on 6th - 8th April, 2022 bringing together CEM delegates ahead of CEM-13 organized by USA in Pittsburgh from 21st - 23rd September. The SEOM provided a unique opportunity for delegates to connect over key priorities for the CEM and identify key actions in the near and longer term. As hosts, it also provided India an opportunity to share with the members a view of its clean energy transition plans.

International Energy Agency

The International Energy Agency (IEA) is an autonomous organization which was set up in response to the 1973-74 oil crisis. The oil crisis was the result of an embargo imposed on the USA by OPEC in retaliation for the US decision to support Israel during the Arab-Israel war. The nodal Ministry dealing with IEA in the Government of India is the Ministry of Power.

2. India has been a partner country until March 30, 2017 and cooperation with IEA has been through the Joint Statement and joint schedule of actions, agreed during the IEA Ministerial every two years. On 30th March 2017, India announced the activation of "Association" status with the International Energy Agency (IEA).

3. A Framework for a Strategic Partnership was signed between India and IEA Members on 27.01.2021. The

contents of the Strategic Partnership will be jointly decided by the IEA Members and India, including a phased increase in benefits and responsibilities for India as an IEA Strategic Partner, and building on existing areas of work within Association and the Clean Energy Transition Programme (CETP).

BIMSTEC

The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) is a regional organization that was established on 06 June 1997 with the signing of the Bangkok Declaration. It is made up of Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka and Thailand.

Ministry of Power will be hosting the 1st Governing Board meeting of BIMSTEC Energy Centre and the 2nd BIMSTEC Grid Interconnection Coordination Committee (BGICC) meeting at Bengaluru in February, 2023.

CHAPTER 13

POWER DEVELOPMENT IN NORTH EASTERN REGION

In order to strengthen transmission, sub-transmission and distribution system of North Eastern Region and Sikkim, following two Schemes had been approved by the Government of India:

(i) 'North Eastern Region Power System Improvement Project (NERPSIP): 'North Eastern Region Power System Improvement Project (NERPSIP) for Six (6) States (Assam, Manipur, Meghalaya, Mizoram, Tripura and Nagaland) for strengthening of the Intra-State Transmission and Distribution Systems (33kV and above)' was approved by Government of India in December, 2014 at an estimated cost of Rs. 5111.33 crore with estimated completion time of December 2018. The cost was subsequently revised to Rs. 6700 crore with revised completion time of December, 2021. The scheme is funded by Government of India with 50% of project cost funded by loan from World Bank. The project is implemented by POWERGRID. During the year 2022-23 (till December 2022), total 68 nos. of sanctioned elements (lines and substations) have been completed leading to completion of 407 elements out of sanctioned 446 elements. Rs. 4387.39 crore has been spent by POWERGRID in the project till December, 2022.

(ii) Comprehensive Scheme for strengthening of Transmission & Distribution in Arunachal Pradesh and Sikkim: Comprehensive Scheme for Strengthening of Transmission & Distribution Systems in Arunachal Pradesh and Sikkim' was approved by Government of India in October 2014 at an estimated cost of Rs.4754.42 crore with estimated completion time of December 2018. The cost has been subsequently revised to Rs.9129.32 crore, with completion time of December 2021 for awarded scope of work (204 elements) and March, 2024 for unawarded packages (88 elements). The project is entirely funded by the Government of India. The project is implemented by POWERGRID. During the year 2022-23 (till December, 2022), total 39 nos of sanctioned elements (lines and substations) have been completed leading to completion of 111 elements out of sanctioned 292 elements. Rs. 4791.76 crore has been spent by POWERGRID in the project till December, 2022.

CENTRAL SECTOR PROJECTS

NHPC Projects (Hydro)

(i) **Subansiri Lower HEP (8x250 = 2000 MW),** Arunachal Pradesh The project is located in the districts Lower Subansiri/Dhemaji in Arunachal Pradesh/Assam on river Subansiri. The project schedule commissioning of the project in January, 2012. The was Techno-Economically cleared by CEA on 13.01.2003. The CCEA clearance was accorded on 09.09.2003 for an estimated cost of Rs. 6285.33 crores with the schedule commissioning of the project in September, 2010. The design energy is 7421.59 Gwh. The anticipated cost of the project is Rs. 19992.43 crores at January-2020 price level.

The Project envisages construction of concrete gravity dam, horse shoe type head race tunnels, circular steel lined pressure shaft and surface power house having Francis turbine driven 8 nos. generating sets of 250 MW each.

Project is in advance stage of construction and likely to be commissioned during by 2023-24.

(ii) **Teesta-VI HEP (4x125=500 MW), Sikkim**

The project is located in South Sikkim district of Sikkim state on river Teesta. The project was Techno-Economically cleared by CEA on 27.12.2006 to M/s Lanco Teesta Hydro Power Ltd (LTHPL), at an estimated cost of Rs. 3283.08 Crs. The project envisages construction of 23.5m high Barrage, 2 nos. of HRT of 9.5m diameter and 11.8 Km long, 4 nos. Pressure shaft each of 5.40m dia and Power House to generate 2441 MU.

Major Civil works were awarded to M/s Lanco Infrastructure Ltd in March, 2007 and E&M works to M/s Alstom Projects, India in April, 2009. Since April 2014 till March 2020, project was stalled due to financial crunch with the developer.

During the year 2018, the Corporate Insolvency Resolution Process (CIRP) was initiated vide order dated 16.03.2018 of Hon'ble NCLT, Hyderabad Bench. In the Bidding process, NHPC emerged as successful bidder for acquisition of LTHPL. Subsequently, the investment proposal for an estimated cost of Rs. 5748.04 crore (Jul'18 PL), which includes Bid amount of Rs. 907 crore for acquisition of LTHPL; was approved by the CCEA on 08.03.2019 for investment, acquisition of M/s LTHPL and execution of balance works of Teesta-VI HE Project by NHPC.

Taking over along with all assets and documents as 'Going concern' completed on 09.10.2019.

The remaining works of the project were re-awarded by NHPC during the year 2020 and till December; 22 about 48% physical progress achieved. The project is likely to be commissioned by 2025-26.

(iii) **Rangit-IV HEP (3x40=120 MW), Sikkim**

The project is located in West Sikkim district of Sikkim state on river Rangit. The project was Techno-Economically cleared by CEA on 06.07.2007 to M/s Jal Power Corp. Ltd (JPCL), at an estimated cost of Rs. 726.16 Crs with the design energy is 513 Gwh. The revised cost of the project as vetted by CEA is Rs. 943.20.60 crores at October-2019 price level. The project envisages construction of 44m high and 112.95m long Dam, 1

no. of HRT of 6.40m diameter and 6.453 Km long, Surge Shaft 16m dia and 57m height,1 no. Pressure shaft of 5.50m dia and 241m long.

Major Civil works were awarded to M/s Coastal Project Pvt. Ltd in Nov, 2007 and E&M works to M/s Andritz, India in Aug, 2009. About 50% projects works were completed till Oct, 2013. Since Nov. 2013, project was stalled due to financial crunched with the developer. The project Lenders file application in court of Hon'ble National Company Law Tribunal (NCLT), on 24th April, 2018.

Hon'ble NCLT approved the NHPC resolution plan vide order dated 24.12.2020. MoP on 30.03.2021 conveyed investment approval for acquisition of JPCL by NHPC and construction of balance works. On 31.03.21, NHPC took over JPCL.

Status of Award of various packages:

» **HM Package:** For Execution of balance works, HM package LOT-II awarded on 28.06.2021.

» **E&M Package (7 Packages):** For execution of balance works, E&M II awarded BOP items on 08.07.2021. Balance six packages of E&M works are in various stages of tendering process.

» **Civil Package:** For execution of balance civil works, Civil Package Lot-I awarded on 27.08.2021.

Now, construction of project is going on all fronts and as on 31st December, 22 the total expenditure done by NHPC is about Rs. 400 crore with estimated project cost of Rs. 938.29 crore (at Oct'2019 PL)

The project is slated for commissioning by 2024-2025.

STATE SECTOR PROJECTS

i) Lower Kopli HEP (2x55 + 2x2.5 + 1x5 = 120 MW), Assam

The project is located in Dima Hasao District in northern region of Assam State on Kopli at Longku. The project was Techno- Economically cleared by CEA on 24.05.2016 to M/s Assam Power generation Corporation Ltd. (APGCL) at an estimated cost of Rs. 1115.91 crores with the schedule commissioning in 2023-24. The revised cost of the project is Rs. 1847.07 crores with likely commissioning in 2024-25 (June 2024). The delay of the start in construction work is due to forest clearance/ handing over of forest land for Package-2 of the project. The design energy of the project is 469.58 MU. The project envisages construction of concrete gravity Dam of 66 meter high and 335 meter long, one no. of HRT of 7m Dia and 3641.22 meter long, Surge Shaft of 25 m diameter and 51.5 meter height, one no. of Pressure Shaft of 6.1 m diameter and 451.20 meter long.

All civil major packages were awarded to M/s L&T on 05.08.2020 and the work has started from 1st Sep, 2021. The work of Electro-Mechanical is awarded to M/s Andritz Hydro Pvt Ltd. on 09.09.2021. Till December'22 about 36% physical progress has been achieved and the project is slated for commissioning by 2024-25.

PRIVATE SECTOR PROJECTS

i) Bhasmey HEP (3x17=51 MW), Sikkim

The project is located in East Sikkim district of Sikkim state on river Rangpo/Teesta. The project was Techno-Economically cleared by CEA on 24.12.2008 to M/s Gati Infrastructure Pvt. Ltd (GIPL), at an estimated cost of Rs. 408.50 Crs with the schedule commissioning of the project in June, 2012. The design energy is 244.10 Gwh. The revised cost of the project is Rs. 746.01 crores at Mar., 2018 price level. The project envisages construction of 42m high and 150m long Barrage, 1 no. of HRT of 5.0m diameter and 5.463 Km long, Surge Shaft 13m dia and 97.5m height, Pressure shaft of 3.4m dia and 465m length.

Major Civil works were awarded to M/s Simplex Infrastructure Ltd in April, 2010. About 30% projects works were completed till Aug., 2016. Since September, 2016, project is stalled due to financial crunch with the developer.

ii) Rangit-II HEP (2x33=66 MW), Sikkim

The project is located in West Sikkim district of Sikkim state on river Rimbi. The project was approved by State Govt. on 15.04.2008 to M/s Sikkim Hydro Power Ventures Ltd (SHPVL), at an estimated cost of Rs. 496.44 Crs with the schedule commissioning of the project in the year 2017-18. The design energy is 272 Gwh. The project envisages construction of 47m high and 145m long Dam, 1 no. of HRT of 2.9m diameter and 4.745 Km long, Surge Shaft 10m dia and 65.5m height, 1 no. Pressure shaft of 1.7m dia and 592m long.

Major Civil works were awarded to M/s Coastal Project Pvt. Ltd in Dec, 2011 and E&M works to M/s Gammon India Ltd. in Mar., 2012. About 30% projects works were completed till Nov, 2017. Since Dec. 2017, project was stalled due to financial crunch with the developer. The project is in NCLT since 30th July, 2020.

iii) Panan HEP (4x75=300 MW), Sikkim

The project is located in North Sikkim district of Sikkim state on river Toling Chu/Rangyong Chu. The project was Techno- Economically cleared by CEA on 07.03.2011 to M/s Himgiri Hydro Energy Pvt. Ltd (HHEPL), at an estimated cost of Rs. 1833.05 Crs with the schedule commissioning of the project in July, 2015. The design energy is 1147.82 Gwh. The revised cost of the project is Rs. 2615.00 crores at 2018 price level. The project envisages construction of 115m high and 126m long Dam, 1 no. of HRT of 6.0m diameter and 9.549 Km long, Surge Shaft 15m dia and 102m height, 2 nos. Pressure shaft of 3.4/2.4m dia and 707.40241m long.

Major Civil works were awarded to M/s Essar Project (India) Ltd in Feb, 2014 and E&M works yet to be awarded. About 5% projects works were completed till date.

Construction works is held up. Issue of construction of bridge on Mantham Lake for accessibility of site is resolved with the State Govt. of Sikkim and it is now under construction with estimated to be completed by mid 23. About 48 months will be required for completion of the project after restart of works.

Power projects being developed by NEEPCO in the NE Region are as under:

PROJECTS UNDER CONSTRUCTION:

As of now, there are no project (s) of NEEPCO under construction.

FUTURE PROJECTS PLANNED BY NEEPCO ON OWNERSHIP BASIS:

S. No.	Name of the Project	State	Installed Capacity (MW)
Hydro			
1.	Wah Umiam St-III HEP	Meghalaya	85
2.	Wah Umiam St-I HEP		50
3.	Wah Umiam St-II HEP		100
4.	Nafra HEP	Arunachal Pradesh	120
5.	New Melling HEP		90
6.	Naying HEP		1000
7.	Hirong HEP		500
	Total		**1945**

FUTURE PROJECTS PLANNED BY NEEPCO THROUGH JOINT VENTURE BASIS:

S. No.	Name of the Project	State	Installed Capacity (MW)
Hydro			
1.	Kurung HEP	Arunachal Pradesh	330
2.	Siang Upper St-II HEP#	Arunachal Pradesh	3750
TOTAL			**4080**

Note: MoP vide Letter dated 18th Nov'15 communicated its decision to put on hold the works on Siang upper Stage II project till a decision is taken regarding implementation of Siang Upper St-I & St-II HEPs in single stage or two stages. As indicated by MoP on 22.12.2021

Siang Upper HEP is to be developed in single stage with an installed capacity of 10,000 MW in joint venture between NHPC and NEEPCO.

In order to review the stalled projects in various parts of the country, especially in Arunachal Pradesh, Hon'ble Minister of Power & NRE had approved the basin wise division of projects in Arunachal Pradesh for development by the hydro CPSUs viz., NHPC, SJVNL, THDCIL & NEEPCO. NHPC has been allocated 3 projects of aggregate capacity 6680 MW, SJVNL has been allocated 5 projects of aggregate capacity 5097 MW, THDCIL is allocated 2 projects of aggregate capacity 2950 MW, NEEPCO with 17 projects with aggregate capacity of 4988 MW. 2 projects with aggregate capacity of 12700 MW are intended to be developed by NHPC and NEEPCO in JV mode.

NHPC including its subsidiaries, have been operating 24 power stations with installed capacity of 7071.2 MW. Out of these, 3 power stations with total installed capacity of 675 MW are located in North-East region. NHPC has commissioned 105 MW Loktak Power Station in the year 1983 in Manipur. Subsequently, it has commissioned 60 MW Rangit Power station in the year 2000 and 510 MW Teesta-V in the year 2008 both in Sikkim. These Power Stations have generated 62892 MU since commissioning. In addition to this, NHPC has also commissioned two Projects namely 4 MW Kambang and 6 MW Sippi HE Projects on turnkey / Deposit basis.

In addition to above, NHPC is implementing 2000 MW Subansiri Lower HE Project on Subansiri river, a tributary to Brahmaputra on the border of Arunachal Pradesh and Assam. The Project is scheduled to be commissioned in March'24 and as on 31.12.2022 84% of Physical work is completed and 85% of financial progress has been achieved. NHPC has also revived two stalled hydro Projects, 500 MW Teesta-VI and 120 MW Rangit-IV both in Sikkim by acquiring the Projects through NCLT route. With the construction of above Projects, besides power generation the surrounding area has also been benefitted by development of infrastructure, education, medical facilities and employment avenues. Further, the local population in the vicinity of Projects gets benefitted from NHPC's CSR schemes.

A brief summary of these Power Stations / Projects are as under:

NHPC POWER STATION IN OPERATION IN NORTH EAST REGION

S. No.	POWER STATION	INSTALLED CAPACITY (MW)	ANNUAL DESIGN ENERGY (MU)	Installed Capacity (MW)
MANIPUR (105 MW)				
1.	LOKTAK	105 (3X35)	448	1983
SIKKIM (570 MW)				
1.	RANGIT	60 (3X20)	338.61	2000
2.	TEESTA-V	510 (3X170)	2573	2008
POWER STATION UNDER OPERATION (03 nos.)			**675**	**3359.61**

NHPC PROJECTS UNDER CONSTRUCTION IN NORTH EAST REGION

S. No.	PROJECT	STATE/DISTRICT	INSTALLED CAPACITY (MW)	ANNUAL DESIGN ENERGY (MU)	LIKELY COMPLETION
UNDER CONSTRUCTION - ON ITS OWN					
1.	SUBANSIRI LOWER (NHPC OWN)	Arunachal Pradesh (Lower Subansiri) Assam (Dhimaji)	2000	7421.59	FY 2023-24
UNDER CONSTRUCTION - THROUGH SUBSIDIARIES					
1.	TEESTA-VI (through TLHCL 100% subsidiary of NHPC)	Sikkim / South Sikkim	2400.00	FY 2025-26	2400.00
2.	Rangit-IV (through JCL 100% subsidiary of NHPC)	Sikkim / West Sikkim	507.88	FY 2024-25	507.88
PROJECTS UNDER CONSTRUCTI ON (03 nos)			**2620**	**10334.59**	**10329.47**

NHPC PROJECTS UNDER CLEARANCE IN NORTH EAST REGION

S. No.	PROJECT	STATE/ DISTRICT	INSTALLED CAPACITY (MW)	ANNUAL DESIGN ENERGY (MU)	REMARKS
1.	Dibang MPP (Completion period-108 months)	Arunachal Pradesh (Lower Dibang Valley)	2880	11222.61	PIB in its meeting held on 11.10.2022 recommended the proposal for implementation of Project. Minutes issued on 28.10.2022. CCEA note is under advanced stage of approval.
2.	Teesta-IV (Completion period-74 months)	Sikkim/ North Sikkim	520	2251.89	FC (St-II) is pending for want of Compliance under FRA 2006. PIB Memo at Apr'21 PL circulated by MoP. PIB memo incorporating reply to comments of appraising departments submitted to MoP on 08.04.2022. PIB/ CCEA date can be ascertained after obtaining consent from remaining 3 GPUs by State Government.
PROJECTS UNDER CLEARENCES (03 nos)			**3400**	**13474.5**	

PROSPECTIVE PROJECTS TO BE TAKEN OVER BY NHPC IN NORTH EAST REGION

S. No.	STATE	PROJECT	INSTALLED CAPACITY (MW)	REMARKS
1.	Arunachal Pradesh	Subansiri Middle (Kamla)	1800	NHPC vide email dated 15.07.2022 submitted Due Diligence Report to the committee. Evaluation Committee has given recommendation for Subansiri Middle HEP to be taken over by NHPC Ltd.
2.	Arunachal Pradesh	Subansiri Upper	1800	NHPC vide email dated 21.09.2022 submitted due diligence report to evaluation committee. Evaluation Committee has given recommendation for Subansiri Upper HEP to be taken over by NHPC Ltd.

S. No.	STATE	PROJECT	INSTALLED CAPACITY (MW)	REMARKS
3.	Arunachal Pradesh	Siang Lower (Possible JV with NEEPCO)	2700	PFR of Upper Siang is in process which may impact the project parameter of Siang lower HEP, hence techno-commercial aspects are uncertain at this stage and shall only be firmed after fixing the parameters of Upper Siang.
4.	Arunachal Pradesh	Upper Siang (Possible JV with NEEPCO)	10000	PIB Meeting held on 14.07.21. MoM issued on 12.08.21. PIB will reconsider investment sanction on submission of Confirmations/ clarifications by NHPC & Govt. of Manipur.
TOTAL			16300	

SJVNL is exploring opportunities in the North-Eastern region for development of hydro projects. Recently, Govt. of India vide letter dated 22.12.2021 identified SJVN for development of five hydro projects namely 3097 MW Etalin, 680 MW Attunli,500 MW Emini, 400 MW Mihumdon and 420 MW Amulin HEPs totaling 5097 MW capacity in Dibang basin in Arunachal Pradesh. MoUs for these projects shall be signed soon with Govt. of Arunachal Pradesh. Recently, Govt. of Arunachal Pradesh approved allotment of 3 Nos. of HE Projects namely Emini (500 MW), Mihumdon (400 MW) and Amulin (420 MW) HEPs to SJVNL.

NTPC Limited

NTPC's Bongaigaon Thermal Power Station in Assam, with a capacity of 750MW(3x250 MW), supplies power to the North Eastern Region.

CHAPTER 14

CENTRAL ELECTRICITY AUTHORITY (CEA)

1. Constitution of the CEA

The Central Electricity Authority (CEA) is a statutory organization constituted under Section 3(1) of the repealed Electricity (Supply) Act, 1948 and continued under Section 70 of the Electricity Act, 2003. It was established as a part –time body in the year 1951 and made a full- time body in the year 1975.

As per section 70(3) of the Electricity Act, 2003, the Authority shall consist of not more than 14 members, including its Chairperson of whom not more than 8 shall be full-time Members to be appointed by the Central Government. The CEA is headed by a Chairperson who, as the Chief Executive of the Authority, oversees largely the development of Power Sector in the country. A Secretary, appointed by the Authority with the approval of the Central Government under section 72 of Electricity Act 2003, assists the Chairperson in discharging CEA's statutory functions. The Secretary also assists him in all matters pertaining to administration and technical including Human Resource Development and Techno-Economic Appraisal and concurrence of power projects etc. Presently, there and six wings namely Planning, Hydro, Thermal, Grid Operation & Distribution, Economic&Commercial and Power System each headed by a Member of the Authority. Besides, there are also two CPES Cadre posts of Principal Chief Engineer (PCE) in the HA Grade. Under each Member, there are technical divisions, each headed by an officer of the rank of Chief Engineer. CEA has its Headquarters in New Delhi. In addition, CEA has offices located in various parts of the country. The CEA is responsible for overall power sector planning, coordination, according concurrence to hydro-electric schemes, promote & assist in timely completion of projects, specifying of technical standards, safety requirements, Grid Standards as well as conditions for installation of meters applicable to the Power Sector of the country. The CEA advises the Central Government on the National Electricity Policy and formulates the Perspective Plans for development of the electricity system. It also advises the Central and State Governments as well as the Electricity Regulatory Commissions on all technical matters relating to generation, transmission and distribution of electricity. It also has the mandate to collect, record and make public, data related to all segments of the electricity sector, carry out investigations and promote research.

2. Functions of CEA

The Functions and duties of the Authority are delineated under section 73 of the Electricity Act, 2003. Besides, the CEA has to discharge various other functions as well under Sections 3, 8, 34, 53, 55 and 177 of the Act. As per Section 73 of the Electricity Act, 2003, the Central Electricity Authority shall perform such functions and duties as the Central Government may prescribe or direct, and in particular to –

a. Advise the Central Government on the matters relating to National Electricity Policy, formulate short-term and perspective plans for development of the electricity system and coordinate the activities of the planning agencies for the optimal utilization of resources to subserve the interests of the national economy and to provide reliable and affordable electricity to all consumers;

b. Specify the technical standards for construction of electrical plants, electric lines and connectivity to the grid;

c. Specify the safety requirements for construction, operation and maintenance of electrical plants and electric lines;

d. Specify the grid standards for operation and maintenance of transmission lines;

e. Specify the conditions for installation of meters for transmission and supply of electricity;

f. Promote and assist in the timely completion of schemes and projects for improving and augmenting the electricity system

g. Promote measures for advancing the skills of persons engaged in electricity industry;

h. Advise Central Government on any matter on which its advice is sought or make recommendation to that Government on any matter if, in the opinion of the Authority, the recommendation would help in improving the generation, transmission, trading, distribution and utilization of electricity;

i. Collect and record the data concerning the generation, transmission, trading, distribution and utilization of electricity and carry out studies relating to cost, efficiency, competitiveness and such like matters;

j. Make public from time to time the information secured under this Act, and provide for the publication of reports and investigations;

k. Promote research in the matters affecting generation, transmission, distribution and trading of electricity;

l. Carry out, or cause to be carried out, any investigation for the purpose of generating or transmitting or distributing electricity

m. Advise any State Government, licensees or the generating companies on such matters which shall enable them to operate and maintain the electricity system under their ownership or control

in an improved manner and where necessary, in coordination with any other Government, licensee or the generating company-owing or having the control of another electricity system;

n. Advise the appropriate Government and the appropriate Commission on all technical matters relating to generation, transmission and distribution of electricity; and

o. Discharge such other functions as may be provided under this Act

In addition to above functions and duties, CEA has to perform the following functions in terms of the under-mentioned section of the Electricity Act, 2003:-

Section 3-National Electricity Policy and Plan

1. The Central Government shall, from time to time, prepare the National Electricity Policy and Tariff Policy, in consultation with the State Governments and the Authority for development of the Power System based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy;
2. The Central Government shall publish the National Electricity Policy and Tariff Policy from time to time;
3. The Central Government may, from time to time, in consultation with the State Governments and the Authority, review or revise the National Electricity Policy and the Tariff Policy referred to in sub-section(1).
4. The Authority shall prepare a National Electricity Plan in accordance with the National Electricity Policy and notify such plan once in five years;

   PROVIDED that the Authority while preparing the National Electricity Plan shall publish the draft National Electricity Plan and invite suggestion and objections thereon from licensees, generating companies and the public within such time as may be prescribed;

PROVIDED FURTHER that the Authority shall

   a. Notify the Plan after obtaining the approval of the Central Government;

   b. Revise the Plan incorporating therein directions, if any, given by the Central Government while granting approval under clause (a);

5. The Authority may review or revise the National Electricity plan in accordance with the National Electricity Policy.

Section 8-Hydro –Electricity Generation

1. Any generating company intending to set up a hydro generating station shall prepare and submit to the Authority for its concurrence, a scheme estimated to involve a capital expenditure exceeding such sum, as may be fixed by the Central Government, from time to time, by notification.
2. The Authority shall, before concurring in any scheme submitted to it under sub-section (1) have particular regard to, whether or not in its opinion:

   a) The proposed river-works will prejudice the prospects for the best ultimate development of the river or its tributaries for power generation, consistent with the requirements of drinking water, irrigation, navigation, flood control or other public purposes, and for this purpose the Authority shall satisfy itself, after consultation with the State Government, the Central Government, or such other agencies as it may deem appropriate, that an adequate study has been made of the optimum location of dams and other river-works;

   b) The proposed scheme meets, the norms regarding dam design and safety

3. Where a multi-purpose scheme for the development of any river in any region is in operation, the State Government and the Generating Company shall coordinate their activities with the activities of the persons responsible for such scheme in so far as they are interrelated.

Section 34- Grid Standards

Every transmission licensee shall comply with such technical standards, of operation and maintenance of transmission lines, in accordance with the Grid Standards, as may be specified by the Authority.

Section53- Provision Relating to Safety and Electricity Supply

The Authority may, in consultation with the State Governments, Specify suitable measures for:-

a. Protecting the public (including the person engaged in the generation, transmission or distribution or trading) from dangers arising from the generation, transmission or distribution or trading of electricity, or use of electricity supplied or installation, maintenance or use of any electric line or electrical plant;

b. Eliminating or reducing the risks of personal injury to any person, or damage to property of any person or interference with use of such property;

c. Prohibiting the supply or transmission of Electricity except by means of a system which conforms to the specification as may be specified;

d. Giving a notice in the specified form to the appropriate Commission and the Electrical Inspector, of accidents and failures of supplies or transmission of electricity;

e. Keeping by a generating company or licensee the maps, plans and sections relating to supply or transmission of electricity;

f. Inspection of maps, plans and sections by any person authorized by it or by Electrical Inspector or by any person on payment of specified fee;

g. Specifying action to be taken in relation to any electric line or electrical plant, or any electrical appliance under the control of a consumer for the purpose of eliminating or reducing the risk of personal injury or damage to property or interference with its use.

Section 55- Use etc. of meters

1) No licensee shall supply electricity, after the expiry of two years from the appointed date, except through installation of a correct meter in accordance with the regulations to be made in this behalf by the Authority;

Provided that the licensee may require the consumer to give him security for the price of meter and enter into an agreement for the hire thereof, unless the consumer elects to purchase a meter;

Provided further that the State Commission may, by notification, extend the said period of two years for a class or classes of persons or for such areas as may be specified in that notification.

2) for proper accounting and audit in the generation, transmission and distribution or trading of electricity, the Authority may direct the installation of meters, by a generating company or licensee at such stages of generation, transmission or distribution or trading of electricity and at such locations of generation, transmission or distribution or trading, as it may deem necessary.

3) If a person makes default in complying with the provisions contained in this section or the regulations made under subsection (1), the appropriate Commission may make such orders as it thinks fit for requiring the default to be made good by the generating company or licensee or by any officer of a company or other association or any other person who is responsible for its default

Section 177- Powers of the Authority to make Regulations.

1. The Authority may by notification, make regulations consistent with this Act and the rules generally to carry out the provisions of this Act.

2. In particular and without prejudice to the generality of the power conferred in sub-section(1), such regulations may provide for all or any of the following matters, namely:

a. The Grid Standards under section-34.

b. Suitable measures relating to safety and electricity supply under section-53;

c. The installation and operation of meters under section 55;

d. The rules of procedure for transaction of business under sub-section(9) of section-70;

e. The technical standards for construction of electrical plants and electric lines and connectivity to the grid under clause (b) of section-73;

f. The form and manner in which and the time at which the State Government and licensees shall furnish statistics, returns or other information under section-74

g. Any other matter which is to be, or may be, specified;

3. All regulations made by the Authority under this Act shall be subject to the conditions of previous publication.

Framing and Amendments of the CEA Regulations under Section 177 of the Electricity Act, 2003:

The Central Electricity Authority has been vested with the powers to make Regulations under Section 177 of the Electricity Act, 2003. The status of the notification of principle regulations and their subsequent amendments since the enactment of the Electricity Act, 2003, is as under:

A. Notified Principal Regulations

The following are the principle regulations already been framed and notified by the Authority during previous years since the enactment of the Electricity Act, 2003:

Sl. No.	Regulation	Notified on
1	CEA (Installation & Operation of Meters), Regulations 2006	22.03.2006
2	Central Electricity Authority (Procedure for Transaction of Business) Regulations, 2006	22.8.2006
3	Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulation, 2007	09.03.2007
4	Central Electricity Authority (Furnishing of Statistics, Returns & Information) Regulation, 2007	19.04.2007
5	Central Electricity Authority (Grid Standards) Regulation, 2010	26.06.2010
6	Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulations, 2010	24.09.2010
7	Central Electricity Authority (Safety requirements for construction, operation and maintenance of electrical plants and electric lines) Regulations, 2011	14.02.2011
8	Central Electricity Authority (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013	07.10.2013

Sl. No.	Regulation	Notified on
9	Central Electricity Authority (Technical Standards for Communication Systems in Power Systems) Regulations, 2020	27.02.2020
10	Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022*	27.12.2022

B. Notified/Proposed to be notified Amendments in the Principal Regulations:

The regulations are regularly reviewed and amended by the Authority as per the requirements of various stakeholders in the power sector including general public at large. The amendments notified/proposed to be notified by the Authority during previous years since the enactment of the Electricity Act, 2003 are as under:

Sl. No.	Regulation	Notified on
1	Central Electricity Authority (Installation and Operation of meters) (Amendment) Regulations 2010—**1st Amendment**	26.06.2010
2	Central Electricity Authority (Technical Standards for Connectivity to the Grid) Amendment Regulations, 2013—**1st Amendment**	15.10.2013
3	Central Electricity Authority (Installation and Operation of meters) (Amendment) Regulations 2014---**2nd Amendment**	03.12.2014
4	Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Amendment Regulations, 2015—**1st Amendment**	07.04.2015
5	1st Amendment to Central Electricity Authority (Measures relating to Safety and Electricity Supply) Amendment Regulations, 2015	13.04.2015
6	2ndAmendment to Central Electricity Authority (Measures relating to Safety and Electric Supply) Amendment Regulations, 2018	01.03.2018
7	Central Electricity Authority (Technical Standards for Connectivity below 33 kV) (First amendment) Regulations, 2019—**1st Amendment**	08.02.2019
8	Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2019—**2nd Amendment**	08.02.2019
9	3rdAmendment to Central Electricity Authority (Measures relating to Safety and Electric Supply) (Amendment) Regulations, 2019.	28.06.2019
10	3rd Amendment to the Central Electricity Authority (Installation and Operation of Meters) (Amendment) Regulations, 2019	23.12.2019
11	Central Electricity Authority (Installation and Operation of Meters) (Amendment) Regulations, 2022.	28.02.2022
12	Central Electricity Authority (Safety Requirements for Construction, Operation and Maintenance of Electrical Plants and Electric Lines) (Amendment) Regulations, 2022-**1st Amendment**	16.11.2022

C. Proposed to be notified Amendments in the Principal Regulations/New Regulations:

Sl. No.	Regulation	Notified on
1.	Draft Central Electricity Authority (Flexible operation of thermal power plants) Regulations, 2022-**New Regulation**	To be notified
2.	Draft Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2022-**Comprehensive Review of earlier Regulation notified in 2010**	To be notified
3.	Draft Central Electricity Authority (Furnishing of Statistics, Returns and Information) Regulations, 2007-**1st Amendment**	To be notified

Market Monitoring Cell, CEA:

A Dedicated Market Monitoring Cell has been in operation in CEA since April, 2019 for carrying out an in-depth analysis of variation of volume and price of electricity discovered under various types of contracts being executed through Power Exchanges under Short Term Power Market Segment. Market Monitoring Cell of Central Electricity Authority is preparing monthly and annual reports on power market transactions since April, 2019 and these reports are available on CEA's website.

CHAPTER 15

CENTRAL ELECTRICITY REGULATORY COMMISSION

1. INTRODUCTION

The Central Electricity Regulatory Commission (CERC), an independent statutory body with quasi-judicial powers, was constituted on 25th July, 1998 under the Electricity Regulatory Commissions Act, 1998 and has been continued under the Electricity Act, 2003. The Commission consists of a Chairperson, three full time Members and the Chairperson of the Central Electricity Authority as Ex-Officio Member.

2. FUNCTIONS OF CERC

As entrusted by Section 79 (I) of the Electricity Act, 2003, the Commission has the responsibility to discharge the following functions:

a. to regulate the tariff of generating companies owned or controlled by the Central Government;

b. to regulate the tariff of generating companies other than those owned or controlled by the Central Government specified in clause (a), if such generating companies enter into or otherwise have a composite scheme for generation and sale of electricity in more than one State;

c. to regulate the inter-State transmission of electricity;

d. to determine tariff for inter-State transmission of electricity;

e. to issue licenses to persons to function as transmission licensee and electricity trader with respect to their inter-State operations;

f. to adjudicate upon disputes involving generating companies or transmission licensee in regard to matters connected with clauses (a) to (d) above and to refer any dispute for arbitration;

g. to levy fees for the purposes of this Act;

h. to specify Grid Code having regard to Grid Standards;

i. to specify and enforce the standards with respect to quality, continuity and reliability of service by licensees;

j. to fix the trading margin in the inter-State trading of electricity, if considered necessary;

k. to discharge such other functions as may be assigned under this Act.

Section 79(2) of the Electricity Act 2003 lays the onus on CERC to advise the Central Government on matters such as:

a. formulation of National Electricity Policy and Tariff Policy;

b. promotion of competition, efficiency and economy in the activities of the electricity industry;

c. promotion of investment in electricity industry

d. any other matter referred to the Central Commission by the Central Government

3. MAJOR ACTIVITIES DURING THE YEAR 2022-23 (UPTO 31 December 2022)

A. Major Regulations Notified

a. **Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022**

The Commission, on 7th June 2022, notified Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022. The said Regulation consists of broadly three sections viz. Connectivity, General Network Access (GNA) and Temporary GNA (T-GNA). The salient features of the same are as follows:

Connectivity:

i. Generators, Standalone ESS, RE power park developers may seek connectivity to ISTS subject to minimum capacity of 50MW. Generating station may get connected to Intra-State & Inter-State Transmission system.

ii. CTU shall carry out system studies as specified in the CEA Technical Standards and shall intimate in-principle grant of Connectivity within 30 days in case it can be accommodated in existing system and within 60 days, in case augmentation is required for grant Connectivity.

iii. Connectivity is not transferable except in case of REGS, subject to condition that Connectivity granted to a parent company may be utilised by its subsidiary and vice versa. In case of REGS, Connectivity can be split in parts, after COD of such part. Connectivity Grantee has to inform installed capacity of each part to the CTU.

iv. Connectivity grantee can relinquish, in full or in part, the Connectivity with a notice of 30 days to CTU. On relinquishment, their Bank Guarantees shall be encashed to the extent of corresponding ATS and terminal bay(s), construction of which has already been awarded.

General Network Access (GNA)

Each State shall have a General Network Access (GNA) to ISTS. Additional GNA may be sought by States as per their requirement. Any drawal beyond GNA shall be with additional charges and the GNA once granted shall remain valid until relinquished.

Following entities shall be eligible to apply for GNA or for enhancement of quantum of GNA:

i. State Transmission Utility on behalf of intra-State entities including distribution licensees;

ii. A drawee entity connected to intra-State transmission system;

iii. A distribution licensee or a Bulk consumer, seeking to connect to ISTS, directly, with a load of 50 MW and above;

iv. Trading licensees engaged in cross border trade of electricity in terms of the Cross Border Regulations;

v. Transmission licensee connected to ISTS for drawal of auxiliary power

Temporary GNA (T-GNA)

i. Temporary General Network Access (T-GNA) is open access to ISTS granted to an eligible buyer or an entity on behalf of buyer for a time period of one block up to eleven months.

ii. The access to the T-GNA grantee may be provided over the surplus capacity on the existing inter-State transmission system after allocating the quantum for GNA.

iii. The application for grant of T-GNA may be applied under two categories viz. bilateral and collective transactions. Bilateral transaction is sub-categorized into Advance application and Exigency application for grant of T-GNA.

b. **The Central Electricity Regulatory Commission (Terms and Conditions for**

Renewable Energy Certificates for Renewable Energy Generation) Regulations, 2022

The Central Electricity Regulatory Commission (CERC) has notified Central Electricity Regulatory Commission (Terms and Conditions for Renewable Energy Certificates for Renewable Energy Generation) Regulations, 2022. The objective of these regulations is to provide enabling regulatory provisions for terms and conditions for accreditation, registration, issuance and exchange of Renewable Energy Certificate (REC). The Regulations inter alia seek to simplify the process of accreditation, registration and issuance of Certificates. Regulations also expand the scope of exchange of Certificates through electricity traders in addition to the Power Exchanges. The Regulations introduce Certificate multiplier to encourage new and high cost renewable energy technologies.

These regulations came into force with effect from 05.12.2022.

c. **Central Electricity Regulatory Commission (Terms and Conditions for Dealing in Energy Savings Certificates) (First Amendment) Regulations, 2022.**

Ministry of Power notified the Energy Conservation (Amendment) Rules, 2022 on 30.08.2022 to further amend the Energy Conservation Rules, 2012 (the principal rules), wherein it has included the definition for floor price of ESCerts and specification for the floor price. Accordingly, BEE requested CERC to suitably modify / make necessary amendments in the CERC (Terms and Conditions for Dealing in Energy Savings Certificates) Regulations, 2016 in order to determine and fix a floor price for Energy Saving Certificate (ESCerts). In view of the same, the Commission notified the Central Electricity Regulatory Commission (Terms and Conditions for Dealing in Energy Savings Certificates) (First Amendment) Regulations, 2022 on 7th December 2022.

B. Procedures

a. **Detailed Procedure for Connectivity and GNA under Regulation 39.1 of the Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022.**

The Commission vide order dated 14.10.2022, approved the Detailed Procedure for Connectivity and GNA' under Regulation 39.1 of the Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022. This detailed procedure shall inter alia apply to the processing of applications made by the applicants for Grant of Connectivity and/or General Network Access (GNA) to the Inter-State Transmission System (ISTS), received by the Central Transmission Utility (CTU) or any other actions in accordance with GNA Regulations.

b. **Detailed Procedure for calculations of specific metrics for Key Performance Indicators" under Regulation 32 of the Central Electricity Regulatory Commission (Fees and Charges of Regional Load Despatch Centre and other related matters) Regulations, 2019**

The Commission vide order dated 20.05.2022, approved the Detailed Procedure for calculations of specific metrics for Key Performance Indicators" under Regulation 32 of the Central Electricity

Regulatory Commission (Fees and Charges of Regional Load Despatch Centre and other related matters) Regulations, 2019. This Procedure shall be applicable to RLDCs and NLDC for the control period from 1st April 2019 to 31st March 2024. The objective of this Procedure is to lay down the detailed explanation of the KPIs, specify annual targets, performance measurement, proofs of achievement and mapping of performance into marks.

c. **Guidelines for Registration and Filing Application for Establishing and Operating Over the Counter (OTC) Platform, 2022**

The Commission notified the Central Electricity Regulatory Commission (Power Market

Regulations) 2021 on 15th February, 2021 which came into effect from 15th August, 2021. Part-6 of PMR 2021 specifies the provisions relating to the Over the Counter (OTC) Platform. Clause (1) of Regulation 44 of PMR 2021 requires the Commission to notify the guidelines for registration and filing application for establishing and operating OTC Platform. In pursuance of the aforesaid provisions of PMR 2021, the Commission prepared the Guidelines for Registration and Filing Application for Establishing and Operating Over the Counter (OTC) Platform.

d. **Procedure for "Short Term Open Access in inter-State Transmission System through National Open Access Registry (NOAR)" under Regulation 4 of the Central Electricity Regulatory Commission (Open Access in inter-State Transmission) (Fifth Amendment) Regulations, 2018**

The Commission, on 1st April 2022, notified Procedure for "Short Term Open Access in inter-State Transmission System through National Open Access Registry (NOAR)" under Regulation 4 of the Central Electricity Regulatory Commission (Open Access in inter-State Transmission) (Fifth Amendment) Regulations, 2018.

National Open Access Registry (NOAR) shall be a common electronic platform for facilitating the short term open access (STOA) in inter-State transmission system (ISTS) and shall:

i. provide a single point electronic interface for all the stakeholders, availing short term open access in inter-State transmission system including short term customers, state distribution utilities, state/central/ IPP generators, trading licensees, Power Exchanges, National Load Despatch Centre (NLDC), Regional Load Despatch Centres (RLDCs), State Load Despatch Centres (SLDCs) and Regional Power Committees (RPCs);

ii. automate the administration of the short-term open access in inter-State transmission system;

iii. act as a repository of information related to short term open access in inter-State transmission and facilitate market monitoring by the Market Monitoring Cell (MMC) of CERC;

iv. exchange data with the scheduling software applications of the RLDCs and SLDCs and exchange data with STOA application software of SLDCs, if any;

v. interface with the Power Exchange(s) for data exchange and validation of standing clearance to facilitate processing of transactions through the Power Exchange(s);

vi. provide audit trail of the STOA applications and standing clearances, dash board facility summarizing at any point of time, the details of the applications made for short term open access to RLDCs or SLDCs, applications approved or rejected by RLDCs or SLDCs and applications pending with RLDCs or SLDCs;

vii. be the platform for conducting e-bidding for congestion management as per regulations;

viii. provide a payment gateway for making payments related to STOA transactions and STOA disbursement, facilitate financial accounting and tracking of the STOA transactions and reconciliation of such payments; Procedure for STOA in inter-state Transmission through National Open Access Registry (NOAR)

ix. provide facility to generate MIS reports for NLDC, RLDCs and SLDCs; and

x. undertake any other function, as assigned by the Central Commission from time to time.

C. Inter-State Trading License

By the end of 2021-22, there are 43 inter-state trading licensees. Out of these, about 29 licensees have undertaken either short-term or both short- & long-term trading, while about 4 licensees have undertaken only long-term trading of electricity during 2021-22. These trading licensees undertake bilateral contracts for both buyers and sellers, separately for Round the Clock (RTC) period, peak period and other than RTC & Peak periods. The volume of electricity transacted through trading licensees under bilateral trade has increased from 26.72 BU in 2009-10 to 39.47 BU in 2021-22. During the FY 2022-23 (up to November 2022), the total volume of

electricity transacted through trading licensees is 24.08 BU (provisional).

D. Power Exchange Business

Two power exchanges, namely Indian Energy Exchange Ltd. (IEX) and Power Exchange of India Ltd. (PXIL), established in 2008 and are in operation for 14 years. A third power exchange, namely Hindustan Power Exchange Ltd. (HPX) was granted approval to operate by the Commission through Order dated 27.06.2022. These Power Exchanges are functioning and providing trading platform for day-ahead market, term-ahead market, Green day-ahead market, Green Term-ahead market, real-time market, Renewable Energy Certificates and Energy Saving Certificates. Volume of electricity transacted on power exchanges has grown from 7.19 BU in 2009-10 to 101.45 BU in 2021-22. During the FY 2022-23 (up to November 2022), the total volume of electricity transacted through Power Exchanges is 66.07 BU (provisional). The number of participants in power exchanges has also grown with over 5500 open access consumers across various states.

Vide Orders dated 24.02.2022 and 05.04.2022, the Commission approved introduction of Hydropower contracts in Green Term-Ahead Market contracts on IEX and PXIL, to facilitate Hydropower Purchase Obligation (HPO) compliance of obligated entities.

The Commission, vide Orders dated 07.06.2022 and 30.12.2022, approved longer duration contracts (for delivery up to 3 months) on the power exchange, in both Term Ahead Market and Green Term Ahead Market. These include Daily Contracts, Weekly Contracts, Monthly contracts and Any Day Single Sided contracts.

E. Power Market Monitoring

A well-functioning electricity market requires an effective market monitoring process. As part of the electricity market monitoring process, the Central Electricity Regulatory Commission (CERC) has been preparing two reports. These are:

a. **Monthly report on short-term transactions of electricity in India** with the objective:

   i. To observe the trends in volume and price of the short-term transactions (contract period of less than one year) of electricity

   ii. To analyse competition among the market players, and

   iii. To disseminate all relevant market information.

   Here "short term transaction of electricity" refers to contracts of less than one-year period for electricity transferred under bilateral transactions through inter-state Trading Licensees (only inter-State part) and directly by the Distribution Licensees, through Power Exchanges and Deviation Settlement Mechanism (DSM).

b. **Annual Report on the Short-term Power Market in India:** As regular practice CERC has brought out the Report on Short-term Power Market in India for the year 2021-22. The report mainly analyses the trends in short-term transactions of electricity, analysis of open access consumers on power exchanges, major sellers and buyers of electricity through trading licensees and power exchanges, effects of congestion on volume of electricity traded through exchanges, trading margins charged by trading licensees, cross border trade of electricity, trading of Renewable Energy Certificates on Power exchanges and tariff of long term sources of power for various distribution companies. The volume of short-term transaction of electricity was 186.75 BU in 2021-22. During the FY 2022-23 (upto November 2022), the total volume of short-term transaction electricity transacted through trading licensees is 127.44 BU (provisional).

c. During late March 2022, significantly high prices were discovered at the power exchangesdue to unprecedented high demand without commensurate increase in supply. The Commission felt the need to intervene to protect the consumers and the market's credibility. Vide Order dated 01.04.2022, the Commission directed the power exchanges to re-design the software so that members can submit their bids in the price range of Rs.0/kWh to Rs.12/kWh in DAM and RTM initially, which was later extended to all other market segments.

F. Draft Regulations / Discussion Papers

i. Draft Central Electricity Regulatory Commission (Terms and Conditions of Tariff) (Third Amendment) Regulations, 2022.

ii. Draft Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) (First Amendment) Regulations, 2022.

iii. Draft Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2022.

iv. Draft Central Electricity Regulatory Commission (Conduct of Business) Regulations, 2022.

v. Staff Paper on "Power Market Pricing"

vi. Staff Paper on the "Blending of imported coal with domestic coal to mitigate the domestic coal shortage".

vii. Staff Paper on the "Methodology for Computing 'Deterrent Charges' for maintaining lower coal stock by coal based thermal generating stations"

viii. Staff Paper on the "Methodology for Computing the Escalation Rates for Imported Coal for Payment on Monthly Basis"

JOINT ELECTRICITY REGULATORY COMMISSION

(For the State of Goa & Union Territories)

In exercise of the powers conferred by Section 83 of the Electricity Act, 2003, the Central Government constituted a two-member (including Chairperson) Joint Electricity Regulatory Commission for all Union Territories except Delhi to be known as 'Joint Electricity Regulatory Commission for Union Territories' with Headquarter at Delhi as notified vide notification no. 23/52/2003 – R&R dated 2nd May, 2005. Later with the joining of the State of Goa, the Commission came to be known as 'Joint Electricity Regulatory Commission for the State of Goa and Union Territories' as notified vide notification no. 23/52/2003 – R&R (Vol. II) on 30th May, 2008. The Joint Electricity Regulatory Commission for the State of Goa and Union Territories started functioning with effect from August 2008. The office of the Commission is presently located at rented premises in the district town of Gurgaon, Haryana.

1. As per the Electricity Act, 2003, the Commission is vested with the responsibility of discharging the following functions in respect of the territories under its jurisdiction:

a) Determine the tariff for generation, supply, transmission, and wheeling of electricity, wholesale, bulk or retail, as the case may be;

b) Regulate electricity purchase and procurement process of distribution licensees including the price at which electricity shall be procured from the generating companies or licensees or from other sources through agreements for the purchase of power for distribution and supply within the State/Union Territories;

c) Facilitate intra-state transmission and wheeling of electricity;

d) Issue licenses to persons seeking to act as transmission licensees, distribution licensees and electricity traders with respect to their operations within the State/ Union Territories;

e) Promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person and also specify guidelines for purchase of electricity from such sources uptoa minimum percentage of the total consumption of electricity in the area of a distribution licensee;

f) Adjudicate upon the disputes between the licensees and generating companies and to refer any dispute for arbitration;

g) Levy fee for the purposes specified under this Act;

h) Specify State Grid Code consistent with the Indian Electricity Grid Code (IEGC) specified by the Central Electricity Regulatory Commission;

i) Specify or enforce standards with respect to quality, continuity, and reliability of service by licensees;

j) Fix the trading margin in the intra-State trading of electricity, if considered necessary;

k) Approval of Power Purchase Agreements, and

l) Discharge such other functions as may be assigned to it under the Act.

2. The Commission shall advise the State/ Union Territory Government on all or any of the following matters, namely:-

a) promotion of competition, efficiency, and economy in activities of the electricity industry;

b) promotion of investment in the electricity industry;

c) reorganization and restructuring of the electricity industry in the State/ UTs

d) matters concerning the generation, transmission, distribution, and trading of electricity or any other matter referred to the Joint Commission by that Government.

2.1 The Commission shall ensure transparency while exercising its powers and discharging its functions.

2.2 In the discharge of its functions, the Joint Commission shall be guided by the Electricity Act, 2003, the National Electricity Policy, National Electricity Plan, and Tariff Policy.

The Joint Electricity Regulatory Commission is committed to fulfill its mandate for creating an efficient and economically viable electricity system in the State of Goa & the Union Territories, balancing the interests of all stakeholders while fulfilling its primary responsibility to ensure the reliable supply of power at affordable rates and shall be guided by the principles of transparency, accountability, equitability, and participation in the discharge of its functions, to safeguard the interests of the licensees and generating companies in the State of Goa & Union Territories and to give a fair deal to consumers at the same time.

2.3 To achieve the above, the Commission aims to:

a) Promote competition, efficiency, and economy in the activities of the Electricity Industry within the State of Goa & Union Territories;

b) Regulate effectively the power purchase and procurement process of the distribution licensees for the sale, distribution, and supply of electricity within the State of Goa & Union Territories;

c) Encourage cogeneration and use of energy generated from Renewable Sources;

d) Ensure Consumer satisfaction and create a mechanism to redress complaints immediately;

e) Introduce openaccess & reduce the cross-subsidy;

f) Improve access to information for all Stakeholders.

3. Notification/Amendment of Regulations

The following Regulations have been notified/amended in the FY 2021-22 and FY 2022-23 (upto 30.11.2022) keeping in view the latest developments in the power sector: -

1. Joint Electricity Regulatory Commission for the State of Goa & Union Territories (Procurement of Renewable Energy) (Fourth Amendment), Regulations 2022 notified on 24.03.2022.

FY 2022-23 (upto 30.11.2022)

1. Joint Electricity Regulatory Commission for the State of Goa and Union Territories (Connectivity and Open Access in Intra- State Transmission and Distribution) (Second Amendment) Regulations, 2022. notified on 06.05.2022.

2. Joint Electricity Regulatory Commission for the State of Goa & Union Territories (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2019 has been extended for one year with effect from 24th July2022 to 23rd July 2023 or till the notification of the new Terms and Conditions for Tariff Determination from Renewable Energy Sources Regulations, whichever is earlier vide Commission's Order dated 23rd August2022 in the exercise of powers conferred under JERC (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2019.

4. Approval of Business Plan for the 3rd Control Period (FY 2022-23 to FY 2024-25)

Business Plan Orders for all the distribution licensees and transmission licensees under the jurisdiction of the Commission for the 3rd control period i.e., FY 2022-23 to FY 2024-25 were issued during FY 2021-22(except for Chandigarh), the details for which are as under:

S.No	Petitioner	Particulars of Petition	Date of Order
1.	ED-Goa	Approval of Business Plan for Multi-Year Control Period from FY 2022-23 to FY 2024-25	31.03.2022
2.	ED-Daman & Diu	Approval of Business Plan for MYT Control Period from FY 2022-23 to FY 2024-25	31.03.2022
3.	DNHPDCL	Approval of Business Plan for MYT Control Period from FY 2022-23 to FY 2024-25	31.03.2022
4.	ED-Puducherry	Approval of Business Plan for 3rd MYT Control Period from FY 2022- 23 to FY 2024-25	31.03.2022
5.	ED-DNH (Transmission)	Approval of Business Plan for MYT Control Period from FY 2022-23 to FY 2024-25	31.03.2022
6.	ED-Lakshadweep	Approval of Business Plan for MYT Control Period from FY 2022-23 to FY 2024-25	31.03.2022
7.	ED-Chandigarh	Approval of Business Plan for MYT Control Period from FY 2022-23 to FY 2024-25	11.07.2022

5. Annual Revenue Requirement for 3rd MYT Control Period (FY 2022-23 to FY 2024-25)and Tariff determination for FY 2022-23

During the year, the Commission issued Tariff Orders comprising truing up for previous years, Annual Performance Review for FY 2021-22 and revision of Annual Revenue Requirement (ARR), and determination of tariff for the generation, transmission and distribution utilities under its jurisdiction for FY 2022-23.

Tariff Orders for all utilities except for Chandigarh and Andaman & Nicobar Islands for FY 2022-23 were issued within the timeframe. The delay in the issue of Tariff Orders for the U.T of Chandigarh and U.T of Andaman & Nicobar was a cascading effect of the delay in filing of tariff petitions by these licensees.

The details of the Tariff Orders issued are as under: -

	State/UT	Date of Order
i.	DNH Power Distribution Corporation Limited	31.03.2022
i.	Daman & Diu	31.03.2022
ii.	Dadra & Nagar Haveli (Transmission)	31.03.2022
iii.	Goa	31.03.2022
v.	Lakshadweep	31.03.2022
vi.	Puducherry	31.03.2022
vii.	Puducherry Power Corporation Limited	31.03.2022
i.	Chandigarh	11.07.2022
ii.	Andaman & Nicobar Islands	01.08.2022

6. Major Targets likely to be achieved upto 31st March 2023

1. Generation, Transmission, and Distribution ARR/Tariff Orders (Nine in numbers) for FY 2023-24 are likely to be issued for all the six distribution utilities under the jurisdiction of JERC namely Andaman & Nicobar Islands, Chandigarh, DNHDD Power Distribution Corporation Limited, Puducherry, Lakshadweep and the State of Goa, one Generation Company namely Puducherry Power Corporation Limited (PPCL) and one Transmission Company namely Dadra & Nagar Haveli (Transmission).
2. Generic Tariff Order for Renewable Energy Sources for FY 2023-24 is expected to be issued in March/April 2023.
3. Commission intends to engage the Institutional Consultants through the publishing of Bids on the GeM portal for discharging its various functions under Electricity Act, 2003, as follows: -
   - i) For the assignment of ARR and tariff determination of FY 2023-24
   - ii) For the assignment of drafting and finalization of JERC (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2022 and Updation/Amendment to the JERC (Solar PV Grid Interactive System Based on Net Metering) Regulations, 2019
   - iii) For the assignment of Formulating guidelines and standard bid documents for procurement of power from DG stations in the Islands of Lakshadweep and Andaman & Nicobar

APPELLATE TRIBUNAL FOR ELECTRICITY (APTEL)

Physical and Financial Progress

1. The Appellate Tribunal for Electricity (APTEL) has been set up under the provisions of the Electricity Act., 2003 (Section 110) and was established on 13th May, 2005. The Tribunal started functioning w.e.f. 21st July, 2005. Presently, the Tribunal is located at 7th Floor, Core-4, SCOPE Complex, Lodhi Road, New Delhi-110003.

2. APTEL is headed by a Chairperson who is a retired Judge of Hon'ble Supreme Court or a retired Chief Justice of a High Court. In addition to the Chairperson, APTEL has one Judicial Member, two Technical Members Electricity and one Technical Member P&NG. Hon'ble Justice Ramesh Ranganathan former Hon'ble Chief Justice of High Court of Uttarakhand is the Chairperson of the Tribunal w.e.f. 02.12.2022. The position of Judicial Member is lying vacant w.e.f. 04.12.2022 after Hon'ble Mr. Justice R.K. Gauba, former Judge of Delhi High Court demitted the office w.e.f 03.12.2022. Shri Sandesh Kumar Sharma is the Technical Member of Electricity and Shri Ashutosh Karnatak is the Technical Member (P&NG) of this Tribunal.

3. Besides Electricity matters, the Tribunal has also been conferred jurisdiction under the Petroleum and Natural Gas Regulatory Board Act, 2006 to hear appeals against the orders/decisions of the Petroleum and Natural Gas Regulatory Board set up under the Act.

4. Currently, Ms. Madhulika Choudhary, Additional District and Sessions Judge of Uttar Pradesh Higher Judicial Services is Head of the Department as Registrar of the Tribunal w.e.f. 27.04.2021.

5. APTEL hears and disposes of appeals filed against the orders of the Central Electricity Regulatory Commission, State Electricity Regulatory Commissions, Joint Commissions and Adjudicating Officers. Subsequent to the setting up of APTEL, the appeals on the subject pending in the High Courts of all States were also transferred to this Tribunal.

6. Any person aggrieved by an order made by an adjudicating officer under the Electricity Act, 2003 (except under section 127) or an order made by the Appropriate Commission under this Act may prefer an appeal to the Appellate Tribunal for Electricity. Any person appealing against the order of the adjudicating officer levying any penalty shall, while filing the appeal, deposit the fee as prescribed by Appellate Tribunal for Electricity. Every appeal shall be filed within a period of 45 days from the date on which a copy of the order made by the adjudicating officer or the Appropriate Commission is received by the aggrieved person (Section 111).

7. Proceedings are conducted in two Courts, each Court consisting of one Judicial Member and a Technical Member.

8. As on 31st December, 2022, 6221 appeals/petitions/ matters etc. have been filed. Out of which, 4056 have been disposed off. Number of pending matters as on 31.12.2022 is 2165 including Appeals, Interim Applications, Original Petitions, Review Petitions, Revision Petitions, Execution Petitions & Contempt Petitions etc.

9. The website of the Tribunal (www.aptel.gov.in) is providing easy access to the daily cases lists and judgments/orders.

CHAPTER 17

NTPC LIMITED

1. INTRODUCTION

NTPC Limited, a Maharatna Company of the Government of India, is the largest power generator in India with comprehensive in-house capabilities in project construction and operations of power stationsNTPC has an authorized share capital of Rupees 16,600 Crore, while the paid-up capital is Rupees 9,696.67 Crore. As on 31st December,2022, 51.1% equity is held by the Government of India.

NTPC's Vision is "To be the world's leading power company, energizing India's growth" and Mission is to "Provide reliable power and related solutions in an economical, efficient and environment friendly manner, driven by innovation and agility".

Core Values of NTPC are as below:

- Integrity,
- Customer Focus,
- Organizational Pride,
- Mutual Respect and Trust,
- Innovation and Learning and
- Total Quality and Safety.

In short, it is referred to as "ICOMIT".

Over the years, NTPC has attained a global stature. In the Platts Top 250 Global Energy Companies for 2022, NTPC has been ranked as 1stglobally in the category of Independent Power Producer and Energy Traders.

2. OPERATIONAL PERFORMANCE HIGHLIGHTS

2.1 During Apr- Dec 2022, Gross generation from NTPC stations, excluding joint ventures and subsidiaries is 254.6 BU while that including JV and subsidiaries is295BUs. During this period, NTPC coal-based stations achieved a PLF of 74.45 % with 92.23 % availability (DC %).

2.2 During Apr- Dec 2022, six NTPC coal stations achieved more than 85 % PLF, viz. Korba (90.69%), Singrauli (90.48%), Vindhyachal (89.92%), Rihand (89.21%), Talcher Kaniha (87.72%) & Kanti (85.12%). During Jan-March 2023 expected Gross generation from NTPC Stations, excluding joint ventures and subsidiaries is 93.5 BU. Overall NTPC coal-based stations may achieve PLF of 77 % in FY 2022-23.

2.3 As on 31stDec'2022,the installed capacity of NTPC group is 70,884 MW (including 12,615 MW under JVs & Subsidiaries). Details of NTPC's installed capacity are placed at Annexure-I.

2.4 NPGCL Unit -3 (660 MW) , Durgapur PP-III (20 MW), Kawas Solar (56 MW), Kayamkulam Floating Solar (70 MW), Fatehgarh Solar (96.32 MW), Ramagundam Floating Solar (20 MW), Gandhar Solar (10 MW) and Auraiya Solar (20 MW), Shambhu Ki Burj-I Solar (250 MW), Shambhu Ki Burj-II Solar (150 MW), Ettayapuram Solar (230 MW), Devikot Solar (240 MW), Nokhra Solar (150 MW) and Solapur Solar (10 MW) have started commercial operation in the current financial year.

NTPC also acquired Jhabua Power Limited (600 MW) under NCLT route

3. COMMERCIAL PERFORMANCE

3.1. Billing and Realization: During the 2022-23, till 31stDecember,2022, NTPC has realized INR 1,12,093 Crores while the billing was done for INR 1,15,507 Crores. As part of the payment security mechanism, Letter of Credit (LC) of the amount equal to 105% of the average monthly billing is being maintained by most of the beneficiaries.

3.2. Customer Relationship Management: Customer focus is one of the core values of NTPC and it has been central to NTPC's commercial philosophy. Customer Relationship Management (CRM) is one of the key initiatives undertaken to strengthen the relationship with customers. Under CRM, regular structured interactions with customers take place for getting feedbacks from the customers and understanding their expectations. Based on these interactions, NTPC identifies potential areas of cooperation and provides various support services like distribution loss reduction, sharing of best practices, Power Plant performance improvement, Commercial aspects of power business etc. to the customers. Further, NTPC offers training programs to the representatives of beneficiary companies through Power Management Institute (PMI) and officials of DISCOMs are availing such programs at PMI. NTPC is also sponsoring officials of beneficiaries / DISCOMs for pursuing the PGDM program in NTPC School of Business (NSB). In the year 2021-22, NTPC has sponsored 10 officials of beneficiaries / DISCOMs and in the current year (2022-23) also NTPC has sponsored 10 officials for pursuing the PGDM program in NTPC School of Business (NSB).

3.3. Participation in Power Market: Real Time Market (RTM) has been introduced w.e.f. June 01, 2020, which provides an opportunity to generators to sell the on-bar surplus power and the Discoms to meet any incremental power requirement.

During the period from April-December2022, NTPC sold around 290 MU Un-Requisitioned Surplus (URS) Power in the Power Exchange through the Day Ahead Market (DAM & GDAM) and Real Time Market (RTM). The gains from this sale have been shared with the beneficiaries in line with provisions under the Tariff Policy/ CERC Regulation.

3.4. Security Constrained Economic Dispatch (SCED): NTPC stations are participating in the Security Constrained Economic Dispatch (SCED) mechanism, which is under implementation by CERC on pilot basis starting from 1st April2019. This pilot has been extended till further orders. Total system saving under the mechanism in FY 2021-22 was INR 529 Cr., out of which INR 214 Cr was shared with DISCOMs. Total SCED gain shared with DISCOM FY 2022-23 (Apr 22 to June-22) was INR. 48 Cr.

4. FINANCIAL PERFORMANCE

NTPC has been maintaining sound financial performance and audit of accounts is being done on annual basis. As per the limited review of quarterly accounts by Audit, during April- September 2022, NTPC recorded a total income of INR 82,537 Cr (Rupees Eighty Two Thousand Five Hundred and Thirty Seven Crore) and Net Profit After Tax of INR 7,048 Cr (Rupees Seven Thousand Forty Eight Crore), as compared to total income of INR 58,153 Cr (Rupees Fifty Eight Thousand One Hundred and Fifty Three Crore) and net Profit After Tax of INR 6,418 Cr (Rupees Six Thousand Four Hundred and Eighteen Crore) during the period April-September 2021 respectively.

5. GROWTH

NTPC hasprepared its Corporate Plan for a time horizon till 2032, which lays the broad roadmap for NTPC's growth.Under this plan, NTPC has targeted an installed capacity of 130 GW by 2032. Renewable energy is one of the central focus areas in this roadmap and NTPC has a target to achieve 60 GW of renewable power capacity by 2032.

5.1. Capacity Addition Program: Construction work is in progress for 18,253 MW capacity (as on 31st Dec2022) in 31 projects including Joint Ventures & Subsidiaries. Details placed at Annexure-II.

5.2. Growth through Joint Ventures/ Subsidiaries: NTPC has formed 19 Joint Venture and 11 Subsidiary companies for pursuing growth. Details of these companies are placed at Annexure-III.

5.3. Initiatives for Capacity Addition in neighboring Countries

Bangladesh: NTPC has formed a joint venture company called Bangladesh India Friendship Power Company Limited (BIFPCL), which is a 50:50 Joint Venture company of NTPC and Bangladesh Power Development Board (BPDB) to set up a coal-based power plant. This JV Company is setting up a 1,320 MW coal-based power project in Bangladesh at Rampal (Khulna). Project construction work is in progress. Unit 1 of the project has been synchronized with the grid on 15.08.2022. 72 Hrs. continuous trial run of the unit 1 has been completed on 22.12.2022.

Sri Lanka: Trincomalee Power Company Ltd. (TPCL) is a joint venture Company between NTPC Ltd. and Ceylon Electricity Board, Sri Lanka (CEB) incorporated in Sri Lanka on 26thSeptember,2011. NTPC and CEB each hold 50% equity share capital of the Company. TPCL shall develop 50MW (extendable to 100 MW) solar power project at Sampur. Project Agreements of Sampur solar project are under finalization.

Further, a Joint Venture & Shareholders' Agreement (JVSHA) for incorporating a new JV company in Sri Lanka has been signed between NTPC and CEB 006Fn 25thOctober,2019, with an objective to develop 300MW LNG Power Project at Kerawalapitiya.

NTPC is also exploring business opportunities in Bangladesh, Myanmar, Vietnam, Cambodia, Oman, Qatar, Morocco, UAE, Mozambique, Malawi, Kenya, Uzbekistan and Israel for capacity addition.

Other Global Initiatives

NTPC is also executing Project Management Consultancy (PMC) assignments for setting up of solar projects totaling to 6520 MW under the aegis of ISA in Cuba (1150 MW), Togo (250 MW), Mali (500 MW), Malawi (100 MW), Niger (50 MW), Ethiopia (410 MW),Venezuela (2000 MW), Zambia (100 MW), Nicaragua (100 MW), Democratic Republic of Congo (1000 MW), Guinea Bissau (60 MW) and Paraguay (500 MW).

Further, in pursuit for enhancing global footprints, NTPC has signed MoUs with EDF France, INTER RAO Russia and is actively looking for bankable opportunities abroad.

5.4. Renewable Energy:

With a renewed focus on RE NTPC has made a roadmap which envisages RE capacity addition of 60 GW by 2032. 'NTPC Renewable Energy Limited' a wholly owned subsidiary of NTPC Limited was incorporated on 7thDec, 2020, for this purpose. The brief status of NTPC's initiatives in renewable space, as on 31stDec 2022 is given below:

I. NTPC Group owned Projects

a) NTPC Group has already commissioned 3154 MW of RE projects under EPC mode (NTPC: 2962 MW, JV/Subsidiary: 192 MW) and 5083 MW of Solar projects under Developer Mode.

b) NTPC has won 7502 MW RE projects, so far, under Competitive Bidding (TBCB) including 3,682 MW through Viability Gap Funding (VGF) based bidding under the CPSU Scheme.

c) In addition, 4.7 GW RE capacity is under implementation by NTPC Group while another 7.3 GW is under tendering.

d) Two largest floating solar projects in the country have been commissioned at Ramagundam (100 MW)and Kayamkulam (92 MW). Total floating

solar portfolio of NTPC as on 31st December 2022 is 262 MW.

e) Development of UMREPP:

- As per new guidelines of UMREPP issued by MNRE on 15thJune,2020, NTPC Group is exploring tie ups with States/ other organizations for around 36 GW capacity.
- The largest Solar Park of 4.75 GW under Ultra Mega Renewable Energy Power Park (UMREPP) scheme has been sanctioned by MNRE to NTPC RE Ltd. This park is being developed at Khavda in Gujarat.

f) Green Hydrogen Initiatives:

- Green Hydrogen Mobility Project at Leh, Ladakh: All contracts are awarded.
- Green Hydrogen blending in PNG network at NTPC Kawas, Gujarat: The project was commissioned on 02.01.2023.

II. **Projects under Developer Mode:** 5083 MW under operation, 890 MW under implementation and 770 MW is under tendering

5.5. Nuclear Power

- NTPC Limited had formed a JV company with Nuclear Power Corporation of India Limited (NPCIL) with equity holding 49% and 51% respectively to set up Nuclear Power Projects. This JV Company named "Anushakti Vidyut Nigam Limited"(ASHVINI) was incorporated on 27.01.2011. This JV company is now in the process of restructuring with equity participation to be in ratio of 50:50 along with other changes in the JV agreement to comply with Atomic Energy act requirements.

  a) Two projects based on PHWR technology have been identified for transfer from NPCIL to JV company(ASHVINI), Chutka Madhya Pradesh Atomic Power Project (CMPAPP 2x700 MW) and Mahi Banswara Rajasthan Atomic Power Project (MBRAPP 4x700 MW) in the meeting dated 11th August 2022 chaired by Hon'ble Minister for Power, New & renewable Energy. A task force of Joint Secretary (ER) DAE and Joint Secretary (Thermal) MOP has been formed for finalizing the modalities for asset transfer.

  b) A joint task force was also formed with members from BARC & NTPC to work on finalization of design, development & deployment for Indian SMR (Small Modular Reactor). The report has been submitted to Atomic Energy commission. NTPC is also in the process of selection of coal sites for SMR installation as per criteria.

5.6. Strategic Diversification

To strengthen its competitive advantage in power generation business, NTPC has diversified its portfolio to areas such as coal mining, consultancy, power trading etc.

- **Development of Captive Coal Mines:** As a part of NTPC's fuel security strategies in terms of quantity, quality & sizing, NTPC has undertaken development of 7 coal blocks with rated annual peak production capacity of 71 MTPA (Million Metric Tons per Annum). In addition to thePakri-Barwadih, Dulanga & Talaipalli mines, NTPC has also made Chatti-Bariatu,Talaipalli South (extension) and Talaipalli West pit operationalin FY2022-23. Coal production from these mines in the current financial year till 31st Dec2022 stands at 14.55 MMT, which is 51% more than that of previous year.

  Other three mines are under various stages of development. Growth of coal production from NTPC's captive mines in current financial year has helped in partially offsetting import of coal.

- **Consultancy:** Set up in the year 1989, NTPC Consultancy has been offering services related to power sector in India and abroad in the areas like Owner's Engineer Services, Lender's Engineer Services, Project Management & Construction Supervision, Complete O&M , Renovation & Modernization, Quality Assurance, Inspection services, Customized Training & IT related Services, ERP, Procurement, Recruitment, FGD/ De-NOx installations, PMC of Renewable energy Projects (Ground-mounted and Floating Solar projects) , coal mining, Biomass cofiring etc.

  During the current financial year (upto Dec 22), NTPC Consultancy has secured 84 work/ job orders worth Rs. 56.04 Crores.

- **Power trading:** NTPC's 100% wholly owned subsidiary NTPC Vidyut Vyapar Nigam Limited (NVVN) is involved in power trading.In the current financial year, till 31st December 2022, it has traded 22313 MU (provisional). This includes 4017 MU (provisional) traded under solar & thermal bundled power, 2457 MU under bilateral trade, 10019 MU through Power Exchange and 5820 MU traded under Cross Border Power Trading (including power transacted for NEA in Power exchange). NVVN has also traded 360 MU of Renewable Energy Certificates (RECs) till 31st December 2022 in Power exchange.

6. TECHNOLOGY INITIATIVES

NTPC has pioneered the adoption of several new technologies including floating solar PV, regenerative battery charger, Early Warning System for hydro stations, Geo-Polymer based construction material, IOT sensor-based monitoring along with diagnostic and predictive analysis tools for critical motors etc. Further,

technologies like implementing Advance Process Control (APC) for flexible operation of thermal units and Supercritical technology have also been successfully implemented. To reduce water usage, first Air-cooled condenser of Unit-1 of North Karanpura Super Thermal Power project has been commissioned and ACC for remaining units at North Karanpura Super Thermal Power project and Patratu Super Thermal Power Project are under implementation.Further, complete dry ash handling system including Dry bottom ash handling and ash mound is under implementation at Patratu Super Thermal Power Project.

In line with the Government's National Biomass Mission, NTPC has initiated blending of biomass-based fuels with coal. NTPC has developed capability to co-fire 10% biomass in the existing coal fired stations. After successfully demonstrating at Dadri, the Company has started commercial scale biomass co-firing at its existing coal-based stations.Further NTPC is exploring possibilities to co-fire biomass beyond 20%, ammonia up to 100%,and methanol up to 30%.For this, a MOU has been signed with GE Power India Limited. Design provisions are being made in new thermal power project for additional space for 10-20% Carbon capture and biomass cofiring up-to 20%. Thiswill help in decarbonizing power from coal fired power plant and resolve issue of crop residue burning by farmers.

Further, MoU has been signed with Gas turbine OEMs for co-firing of hydrogen in existing gas turbine plant.

NTPC is promoting 'Make in India' initiatives to reduce import. NTPC has taken various steps for Atmanirbhar Bharat and taken steps to indigenize various equipment which are being imported currently for FGD and develop Indian vendors for manufacturing these equipments.

Unit-1 of Barh STPP, which was delayed due to multiple contractual issues, has been successfully commissioned without any help from Original Equipment Manufacturer/Supplier (OEM/OES).It is worth noting that Barh-1 Boiler is a unique Boiler (T-pass Boiler, Steam to Steam, two independent water-steam circuits).

7. NTPC ENERGY TECHNOLOGY RESEARCH ALLIANCE

NETRA (NTPC Energy Technology Research Alliance) is DSIR recognized in-house Research & Development set up of NTPC Ltd. It envisions "Delivering sustainable technology solutions through applied research and provide advanced scientific services for power sector". At NETRA, focus is both on in-house technology development as well as collaborative research. It has networked with various prestigious national and international institutions to harness the specialized knowledge and expertise lying with those institutes, viz. National Institutes such as IIT Delhi, Bombay, Madras, Kanpur, Kharagpur, Dhanbad, IISc-Bangalore, RGIPT-Amethi, CSIR laboratories. It has also collaborated with international institutions such as NETL-USA, Curtin University-Australia; DLR-Germany and ISE-Germany etc.

NETRA works broadly in following two verticals, with a focus on applied research delivering "either process and/or product or plant of scientific solution" as the product.

7.1. Vertical 1: Technology Projects

- **Carbon Capture, Utilization and Storage (CCUS):** It is an important area for CO2 abatement in India where coal is the prime source of energy. NETRA is working on various technology projects for CCUS described as under.

  a) 10 TPD Flue Gas CO2 to Methanol Demo Plant at NTPC, Vindhyachal

     (i) 20TPD Carbon Capture Block: Commissioned.

     (ii) 2 TPD Hydrogen Generation Block: Under development

     (iii) 10 TPD Methanol Synthesis Block: Under development

  b) 10 TPD Flue Gas CO_2 to Ethanol Plant (Gen-4) Demo Plant

  c) Mapping of CO_2 Storage Potential in Cat-1 Fields -with NCOE-CCUS-IITB

  d) CO_2 based Carbonated Coarse Aggregate Project - with CSIR-CBRI

  e) Indigenous catalyst development (CO_2 to Methanol) Project- with IIP Dehradun,

- **Green Hydrogen:** Presently, NETRA is undertaking following R&D projects in the domain of Hydrogen.

  a) Green Hydrogen Grid Design & development – at NETRA

  b) H_2 generation through High Temperature Steam Electrolyzer – at NETRA

  c) Metal Hydride based H2 compression and storage– with IIT Guwahati

  d) Hydrogen generation through Sea Water Electrolysis – with RGIPT, Amethi,

- **Water Technologies:** NETRA is working on various technologies in parallel to assess their efficacy for water purification and further utilization for Hydrogen generation. Ongoing projects in this domain are as below:

  a) Water purification through Electro Dialysis Reversal– with CSMCRI, Bhavnagar- Commissioned

  b) Water purification using Non-Thermal Forward Osmosis (NTFO) – at NTPC Mauda

  c) Electro Coagulation based silica reduction in water– at NTPC Solapur

d) Activated Filter Media (AFM) as Tertiary treatment for STP at NTPC Dadri

- **Waste to Energy:** Presently, NETRA is undertaking following R&D projects in the domain of Waste to Energy.

  a) MSW-RDF enhanced steam gasification to Green Hydrogen/ Hydrocarbon/ Power – at NETRA-Commissioned

  b) 10 TPD Torrefied Biomass Pellet Production plant

- **Ash Technologies:** NETRA has been continuously working to convert ash as marketable asset or products and has demonstrated use of ash in Geo-polymer roads, paver blocks etc. NETRA has taken up a project to take the initiative forward, through a Fly Ash based FALG Aggregate Plant at NTPC Korba

- Apart from the above technology projects, NETRA works in various other fields. Few of such ongoing R&D Projects includes Boiler tube internal 'Oxide Layer' thickness measurement and AC Micro Grid with 4 MWp PV & 1 MWhr Li-Battery Storage.

7.2. Vertical 2: Advanced Scientific Services

NETRA provides a wide range of advanced scientific services in following domains:

- **Metallurgy** – Failure analysis for identifying root cause of failure to prevent future possible occurrences.
- **Nondestructive Evaluation** – Health assessment and residual life assessment of critical components. In-situ Boiler Tube internal oxide layer detection technology is one such example.
- **Robotics & Drones** – Robotic inspection system for in accessing unreachable zones/ space such as water-wall crawler & LTSH inspection system.
- **CFD based solutions** – Computational fluid dynamics-based solutions to the flow related problems in the areas of Flue gas path, APH, ESP and CW sump and combustion modelling of boiler.
- **Chemistry** – Corrosion analysis, resin analysis, formulation of COC (cycle of concentration) improvement, TOC (Total Organic Carbon) load determination, acid cleaning of boiler tubes etc. are also offered by NETRA to support power stations across the country.

8. SUSTAINABLE DEVELOPMENT

NTPC has been pioneer in adopting technology and practicesthat promote environmental management, social responsibility and economic performance (triple bottom line approach). The philosophy of sustainability is embedded in all aspects of NTPC's business activities.

8.1. **Efficiency management:** 'Center for Power Efficiency and Environmental Protection' (CenPEEP), was set up to reduce Greenhouse Gas (GHG) emissions through efficiency improvement. Currently, it is working for improvement of efficiency and reliability through introduction of new technologies and practices. On-line performance monitoring tools are used for identifying the performance gaps and planning suitable improvement actions. Implementation of action plans during unit overhauls and opportunity shutdowns is closely monitored. Parametric Optimization at part loads has been identified as a thrust area including optimization of number of running auxiliaries, sliding pressure operation, excess air optimization etc.

8.2. **Energy Conservation:** NTPC continues its commitment towards energy conservation through proper monitoring of power consumption of major equipment and by maintaining good operation & maintenance practices. A dedicated group CEETEM – Centre for Energy Efficient Technology & Energy Management, conducts regular Energy audits to identify potential improvement areas and implementation of actions.

- During the current FY (up to 31st Dec' 2022), Mandatory Energy Audits (MEA) have been conducted at 04 stations. During Q4 FY'23, MEAs have been planned at 02 more stations.

- Water balance audit has been completed at 5 stations. During Q4 FY'23 2 more audits have been planned.

8.3. **Environment Management:** NTPC has been proactive in addressing environmental concerns since inception. Environment Management has been identified as a thrust area to achieve excellence. NTPC has adopted sound Environment Management practices and advanced environment protection system to minimize impact of power generation on environment.

All NTPC Stations are equipped with advanced Environmental Protection and Pollution Control Systems such as High Efficiency Electrostatic Precipitators in its coal-based units. Ash Water Re-Circulation Systems (AWRS), Liquid Waste Treatment Plant (LWTP) and Sewage Treatment Plant (STP) are available in most of the Power Stations. NTPC has taken proactive approach of making all its power stations operate with ZLD (Zero Liquid Discharge) progressively. By adopting above measures, NTPC has been able to conserve water while following the principle of "3 R's" (Reduce, Recycle and Reuse).

For reduction of SOx emission, NTPC has installed & commissioned Flue Gas Desulphurization (FGD) units at U#13 Vindhyachal Stage -V (500 MW), Unit#5 Dadri-490 MW, Unit#6 Unchahar-500MW and Dry Sorbent Injection (DSI) in Dadri (4X210MW). Construction work of FGD at various stations and projects (~60 GW capacity) is in progress and at some stations it is in advance stage of completion.

Keeping commitment to environment and safety, NTPC has embarked upon to the more advanced, safer and compact in-situ Chlorine-di-oxide generation system from earlier practice of Gas chlorination system through a comprehensive policy change for its entire fleet of existing as well as upcoming power stations.

Most of NTPC stations have been ISO 14001 certified by reputed National/ International certifying agencies. NTPC has installed continuous Ambient Air Quality Monitoring Systems (AAQMS) to monitor air quality ,Continuous Emission Monitoring System(CEMS) to monitor emissions of SO2, NOX, and PM and Effluent Quality Monitoring System(EQMS) for monitoring of treated effluents in all its stations on real time basis with online real-time basis access to the regulators.

NTPC has already planted more than 37 Million trees since inception. During FY'23 (till Dec'22) 7.65 lac saplings have been planted and planning a total of 10 lac saplings by March2023. This includes saplings planted through Miyawaki plantation technology. Biomass production in Miyawaki is 16 times higher than the conventional plantation, thus it creates more efficient carbon sink.

8.4. **Corporate Social Responsibility (CSR):** With a view to have a greater strategic orientation with more connect with stakeholders and an outcome centric approach NTPC, as responsible corporate citizen, is engaged in various CSR activities for community development and environment sustainability since its inception. The objective of NTPC's CSR is the inclusive growth of the neighbourhood areas of its power plants.

NTPC takes up CSR activities in line with CSR provisions of Companies Act, 2013 and its rules. Activities are in-line with Schedule VII of the Companies Act 2013 and NTPC CSR Policy.

CSR activities taken up are focused in the areas of education, health, sanitation, and drinking water. NTPC also takes up activities in other areas such as rural infrastructure, skill development, support to physically challenged and environmental sustainability, augmenting Government efforts and schemes for inclusive growth. NTPC's CSR activities benefit about 500 villages and touch the lives of about 14 lakh people every year.

NTPC is also supporting the transformation of Aspirational districts, a flagship initiative of the Government of India through its CSR initiatives by the stations/projects located in and near the aspirational districts of Aurangabad, Baran, Chatra, Godda, Hazaribagh, Korba, Maldah, Murshidabad, Muzzafarpur, Sahebganj, Singrauli, Sonebhadra and Vishakhapatnam.

Some of the other major CSR initiatives undertaken are:

Health care

- Financial support of Rs. 80 crore each in FY 2022-23 & 2021-22 was provided to PM CARES Fund for COVID-19 and other services/Activities.
- Support for Cancer Screening Program to Govt. of Bihar and Tata Memorial Cancer Hospital for four Districts of Bihar.
- Support provided for Infrastructure creation and medical equipment installation at National Cancer Institute Nagpur, AIIMS Patna, AIIMS Bhubaneshwar and King George Hospital, Lucknow
- Support committed for Setting up of Tele-Recording Room at AIIMS, New Delhi.
- Establishment of Integrated Muscular Dystrophy Rehabilitation Centre "Manav Mandir" at Solan, Himachal Pradesh.
- Financial Support to L V Prasad Eye Institute (LVPEI) for the construction of operation room complex at MTC Campus, Bhubaneswar.
- Mobile Health Clinics (MCH) operational at various locations providing healthcare to underserved areas.
- Directly Observed Treatment cum Designated Microscopy Centre (DOTs cum DMC) with Mobile ambulance facilities being operated through NTPC Foundation at 9 NTPC hospitals under Revised National Tuberculosis Control Programme (RNCTP) that cater to villages adjoining NTPC stations.
- Disability Rehabilitation Centre (DRC) run by NTPC Foundation at NTPC Tanda, Rihand, Korba, Dadri, Bongaigaon and Farakka established in collaboration with National Institute of Locomotor Disabilities(NILD), under the Ministry of Social Justice and Empowerment, Government of India benefitting physically challenged persons from adjoining villages with Surgical corrections, serving aids & appliances.

Water & Sanitation

- NTPC supported the Government of India's Swachh Bharat Abhiyan, a nation-wide cleanliness campaign by the Government of India, by making available more than 24,000 toilets in about 16000 schools covering 650 blocks in 83 districts spread over 17 states.
- Revived MSW Plant at Varanasi & Pilot Project done for Mechanized Sweeping, Collection & transportation of MSW. Varanasi jumped from 428th ranking in 2014 to 21st rank in 2022 in

Swachh Survekshan rankings 2022. Varanasi has secured 2nd rank among the cleanest cities along the banks of the river Ganga.

- NTPC ensures access to potable drinking water to community through installation of hand pumps, piped drinking water, RO water plants, Water ATMs in public locations.
- NTPC has taken initiatives of rejuvenation of ponds located in the vicinity of many of its Plants with an objective to improve ground water table.

Education, Infrastructure Development and Sports

- Girl Empowerment Mission (GEM) flagship program of NTPC aims at empowerment/ upliftment of girl children through various interventions to make girls self-reliant and confident in all walks of life. Free education is provided for around 180 girl students admitted to different NTPC Township Schools. In the year 2022, GEM workshop has been conducted through NTPC Foundation at 33 NTPC Projects / stations/ JV & subsidiaries where around 2400 girls have participated. Till date approximately 4700 girls have benefitted from GEM Program.
- "NTPC Utkarsh" offers merit scholarships to encourage and motivate students who are pursuing secondary, high school, engineering, and medical science studies through NTPC Foundation.
- NTPC is supporting education in rural areas by augmenting and strengthening school infrastructure including additional classrooms, science labs, libraries, kitchen sheds, providing assets like furniture, computers, separate toilets for girls and boys, water coolers, filters etc. NTPC also ensures the right to education of children from the underprivileged sections of society by providing them with scholarships, study material, & uniforms etc.
- Development of School infrastructure in the existing school at Govindnagar, Paliya Pipariya, Block Bankhedi, Hoshangabad, MP.
- Financial Support to Shree Ramakrishna Ashrama, M. Rampur, Kalahandi for construction of an English Medium School and for creation of assets.
- Financial Support for Development, Renovation and Advancement project of GHSS Munderi, District Kannur, Kerala
- Facilities for Tribal school in Chapki, Distt Sonebhadra
- Infrastructure augmentation by providing 2500 benches/desks in 50 Govt. Schools at Supaul, Bihar.
- NTPC also has a Policy on Improving Learning Outcomes & Quality of Education for children studying in Government Schools of its project-affected villages.
- Providing IT education through NTPC Foundation to physically & visually challenged students at ICT Centre established at Devi Ahilyabai Vishwa Vidhyalaya, Indore.
- Installation of LED based Solar Street Lights in Gorakhpur, Ambedkar Nagar
- NTPC provides support to Archery sport in India. In Asia Cup 2022 at Sharjah Indian Archers bagged 10 medals (05 Gold, 03 Silver & 02 Bronze). The Indian archers have won Seven gold medals and one bronze medal in the world cup held at Paris. The best ever performances by Indian Archers in Olympics & Paralympic Games in Tokyo 2020. In Paralympic Games, Won Bronze medal. Also, in World Archery Championship held at USA, won 3 Silver medals.
- NTPC Foundation has signed an MOU with National Sports Development Fund to support Archery Sport in the country at the grassroot level including Intermediate/Elite Levels for five (05) Years.
- Infrastructure support to NTPC-SAI Water Sports Centre at Koldam, Himachal Pradesh for promoting Kayaking, Rowing and Canoeing water sports.

Women Empowerment

- Providing skill & livelihood generation training to around 1250 No. of women through NTPC Foundation in collaboration with Apparel Made ups & Home Furnishing Sector Council.
- Providing skill development & livelihood generation training by setting up of 200 Units of Automatic Agarbatti Machines and training of 400 no. of women through NTPC Foundation.
- NTPC is supporting cultivation of mushroom and creating sustainable livelihoods through Oyster mushroom cultivation near Aurangabad
- NTPC has supported Udyan Care at Jaipur, Rajasthan for the higher education and rehabilitation of orphan and abandoned girls.
- NTPC has conducted various training on embroidery, dress designing, cutting, stitching, tailoring (including providing sewing machines), beautician, food preservation & processing, nursing etc. to women from various villages located in its vicinity.

Skill Development

- NTPC has adopted 18 No. ITIs and set up 8 new ITIs at various locations.

- NTPC is supporting "Skill India Mission" of GoI through an MoU with NSDC for various employment linked skill development programs for 30000 rural youth including 8000 youth of J&K.
- NTPC has provided various capacity building training programmes, exposure visits and provided hand holding through experts to the farmers of villages in its vicinity on various techniques of crop/animal productivity such as use of drip irrigation to produce more crop per drop, in improving milk yield through improving breed through artificial insemination, cultivation of nutrient rich and rapidly growing fodder crops etc.
- NTPC makes youth entrepreneurial, enterprising, and employable by providing them with training in electrical appliances repairing, mobile set repairing, motor rewinding, welding, car driving including obtaining LMV driving license, computer training, etc.

Disaster Relief

- Financial support to Uttarakhand State Disaster Management Authority (USDMA) for undertaking reconstruction and restoration of Govt. schools and Govt. health centers in various districts of Uttarakhand
- NTPC is supporting the redevelopment of Kedarnath town, Uttarakhand and its surrounding areas devastated during natural calamity of 2013.
- NTPC is supporting for setting up of disaster management control room at Bilaspur, Chhattisgarh

CSR efforts of NTPC has been conferred with various awards, some of the awards are as given below:

- FICCI Special Jury Commendation Awards in 2022 in the category- Environmental Sustainability.
- SHRM HR Excellence Award - 2022" in the category "Excellence in Community Impact"
- Runner up II in PSU 2 for the project "Girl Empowerment Mission" by AIMA in 2022.
- Kalinga CSR Award in 2022 towards excellence in Best CSR Practices.
- IHW Council CSR Health Impact Gold Awards in 2022 in the category "Swachh Bharat Impact".
- Ranked 1st in CSR in 2022 in the prestigious "12th edition ED India Corporate Governance & Sustainability Vision Summit & Awards" organized by Indian Chamber of Commerce (ICC).
- Received Special Recognition in the category of Excellence in Waste Management in 2022 in "ASSOCHAM CSR and Sustainability Awards".
- CII-ITC Sustainability award 2021 for Excellence in Corporate Social Responsibility.

8.5. Rehabilitation & Resettlement (R&R)

NTPC is committed to help the families affected/ displaced due to acquisition of required land, by respective State Govt./ Authorities. NTPC has been making efforts to improve the socio-economic status of the Project Affected Families (PAFs). In line with its social objectives, the Company has focused on effective Rehabilitation and Resettlement (R&R) of PAFs and on Community Development (CD) works, in and around its projects.

Post enactment of 'The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCT LARR Act, 2013) by the Govt. of India, NTPC revised its R&R Policy to incorporate the R&R entitlements as per The RFCT LARR Act, 2013. This R&R Policy of NTPC also have the NTPC's good practices / guidelines on facilities to be extended for Project Affected Families (PAFs).

NTPC takes measures for R&R of PAFs as per its R&R Policy/ Govt. Guidelines/ extant LA Act provisions with the objective that the PAFs will improve or at least regain their previous standards of living. As per the Policy and in line with provisions of RFCT LARR Act 2013, a Social Impact Assessment (SIA)/ Census Survey will also have to be conducted by the Appropriate Govt. to collect detailed demographic details of the area which shall form the basis for the preparation of 'Rehabilitation and Resettlement (R&R) Plan/ Scheme'. Apart from the R&R Plan formulated in line with RFCT LARR Act, need based Community Development (CD) activities are also included for contributing to socio-economic development of the people/ development of area in project vicinity.

R&R Plan expenditure is a part of capital cost of the project and the Plan is implemented in a time bound manner to complete its implementation by the time the project is commissioned. On completion of the R&R Plan implementation, a Social Impact Evaluation (SIE) is conducted by a professional agency to know the efficacy of R&R Plan implementation for future learnings and appropriate interventions.

R&R/ Community Development activities are being implemented at the new Greenfield / Brownfield Thermal projects at Darlipali, Gadarwara, Khargone, Telangana, Lara, North-Karanpura, Solapur, Tanda-II, Barh, Barauni, Meja, Kanti, NPGC Nabinagar, BRBCL Nabinagar, Patratu, Hydro project at Tapovan Vishnugad, Rammam-III and Coal Mining Projects at Pakri-Barwadih, Chatti-Bariatu, Kerendari, Dulanga and Talaipalli. These activities are taken up under the approved R&R Plans, and also on case-to-case basis requirement for specific projects to cater local requirements / stakeholders' request. The interventions are also focused on the improvement

in Social Development Indicators (SDIs) of the project affected villages.

Areas for Community Development activities:

1. **Drinking water –** Planning and implementation of activities for access to drinking water to ensure 100% coverage of all project-affected villages of NTPC projects is being undertaken. NTPC has formulated "NTPC Jal Jyoti Mission" – a Policy on Drinking Water for ensuring safe drinking water and rejuvenation of ponds in its project-affected villages.

2. **Capacity building / Skill up gradation –** Need based trainings are being conducted to enhance the skills of affected persons for increasing their employability & livelihood. Trainings to farmers on modern farming practices are also being imparted.

3. **Education –** Infrastructure created for Medical College cum Hospital at Sundargarh District (Odisha) has been handed over to the State Government which will be running the hospital. Academic Session have commenced for MBBS courses by the State Government through NEET f0r year 2022-23.

   Construction of Engineering College at Shivpuri (Madhya Pradesh) had been completed and its Academic Sessions have already commenced. Construction of major components of Hydro Engineering College at Bilaspur (HP) is almost final while its Academic Sessions had already started majorly at the Govt. Engineering College Campus at Nagrota Bagwan.

4. **Health -** For the benefit of project affected families and neighboring population, 'Mobile Health Clinics', Medical camps and dispensaries are being operated for comprehensive health coverage of PAFs at various projects. NTPC has also formulated a Policy on Maternal and Child Health Care to provide 650 days of antenatal/prenatal & postnatal preventive health care to expectant & new mother and newborn babies.

9. CORPORATE GOVERNANCE

As a good corporate citizen, NTPC is committed to sound corporate practices based on conscience, openness, fairness, professionalism and accountability besides building confidence in its various stakeholders, thereby paving the way for long term success. NTPC firmly believes that sound Corporate Governance is critical for enhancing and retaining investor trust. We are committed to meet our performance goals with ethics and good governance. NTPC is constantly striving to adopt emerging best practices in corporate governance. It is our endeavor to achieve higher standards and provide oversight and guidance to management in strategy implementation and risk management and fulfilment of stated goals and objectives. NTPC is adhering to the best recognized corporate governance practices and continuously benchmarking itself against each such practice in our endeavor to meet the expectations of the stakeholders. The Company has complied with all the requirements of SEBI LODR, Companies Act, 2013 and Guidelines on Corporate Governance for Central Public Sector Enterprises issued by Department of Public Enterprises, Ministry of Heavy Industries and Public Enterprises, Government of India, except requirement regarding requisite number of Independent director.

10. SAFETY

Safety is a part of NTPC's core values. Occupational Health and safety at workplace are prime concern of NTPC Management and utmost importance is given to provide safe working environment and to inculcate safety awareness among the employees. NTPC recognizes that all accidents are preventable. Therefore, safety is always at the forefront of all the activities. The objective is to provide safe working environment and strive for zero incidents at work. The safety policy is supported by safety rules and procedures and are applicable for all business activities carried out by NTPC. NTPC also strives for setting safety standards beyond regulations and other legal requirements.

NTPC has 3-tier structure for Occupational Health and Safety management, namely at Stations/Projects, at Regional Head Quarters and at Corporate Centre. NTPC Management Information System (MIS) on safety is strengthened through continuous coordination and communication at all levels and is closely monitored by top management. At corporate level, Corporate Safety Department is headed by Executive Director (ED, SSEA) and is responsible for making Guidelines/Procedures/ Standards etc. and their review and implementation.

Cross-functional safety task forces are functional at all projects/stations to monitor unsafe working conditions at site and their rectification. For strict compliance and enforcement of safety norms and practices by the contractors, safety clauses are included in General Conditions of Contract/ Erection Condition of Contract.

CLIMS (Contract Labor Information Management System) has been implemented for gate pass system for contract workers. StandardizedSafety training and medical examination of contract worker has been made mandatory for processing gate pass in CLIMS. Requirement of medical examinations are made as per form-V of OSH Rules. 128 employees have undergone International General Certificate Course from NEBOSH, UK.

Technical documents for clearly defining roles and responsibilities are available across NTPC for Operation & Maintenance. Most of the NTPC stations are certified with OHSAS-18001/IS0-45001. Apart from this random

surprise checks are being conducted by senior NTPC officials to check the effectiveness of safety system implementation.

To mitigate the On-site emergencies at all operating stations, effective engineering controls are provided to indicate and handle emergency situations. Detailed emergency plans have been developed and responsibilities are assigned to each concerned to handle the emergency situations. Mock drills are regularly conducted at all plants covering scenarios like chlorine leakage, fire, terrorist attack etc. For Mock drills, agencies like NDRF and SDRF have been associated at many of the stations.

NTPC's efforts have won many safety awards and laurels to the company's units from reputed institutions, namely Ministry of Labour & Employment-Government of India, British Safety Council, National Safety Council-Mumbai, Institution of Engineers, CII as well as awards from State Governments.

11. RISK MANAGEMENT

Risk management scenario has become challenging with increasing regulatory compliance and emerging business risks. Cyber security risk and ongoing pandemic have made the business even more challenging. Therefore, to have a focused approach on risk management and to ensure decision-making is aligned with the organization's long-term objectives, NTPC has an elaborate Enterprise Risk Management framework in place. Ensuring compliance with the Companies Act and SEBI (LODR) Regulations, NTPC has implemented an elaborate Enterprise Risk Management framework for following:

- To finalize risk assessment under the risk management framework,
- Monitor and review risk management plan/ framework, as approved by the Board
- Informing the Board about the risk assessed and action required to be take/ already taken for mitigating the risks on quarterly basis.
- Take up other matter, as directed by the Board from time to time.

"Risk Management Committee (RMC)" committee comprising of Functional Directors and Independent Director and Chief Risk Officer(CRO), has been entrusted with the responsibility to identify& review the risks and formulate action plans and strategies to mitigate them on short term as well as long term basis. The RMC meets regularly to deliberate on strategies. Risks are monitored through reporting of Key Risk Indicators (KRIs).

12. BUSINESS EXCELLENCE

NTPC has developed and adopted 'NTPC Business Excellence Model' on the lines of globally accepted Performance Excellence frameworks such as the Malcolm Baldrige Performance Excellence framework, the European Foundation for Quality Management (EFQM) Excellence Model, Deming, and ITC sustainability model. The model captures all facets of business including environment, sustainability, governance, safety, stakeholder engagement, digitization and training & development.

During the current financial year assessment of 2 stations have been completed and the remaining 22 stations will be assessed by January 31, 2023.

Contemporary "Total Quality Management" (TQM) concepts and techniques like ISO, Quality Circles (QC), Professional Circles (PC), 5S, Suggestion Scheme etc. have been deployed across the organization. NTPC stations have adopted "Integrated Management System" as per ISO. NTPC Quality Circle teams have participated in Regional & National Chapters of "Quality Circle Forum of India" conventions & won many appreciations in different categories. NTPC encourages competition amongst its different Quality Circles and the best Quality Circle team is sponsored to participate in International Quality Control Circle Convention. QC Team "Abhyudaya" of NTPC-Unchahar won the highest recognition of Gold award in the recently concluded International Convention of Quality Control Circles -2022 held at Jakarta, Indonesia.

13. HUMAN RESOURCE DEVELOPMENT:

NTPC takes pride in its highly motivated and trained Human Resource that has contributed its best to bring NTPC to its present height. The total employee strength of NTPC stands at 16,970 as on 31st December 2022 (excluding Trainees).

13.1. Induction Plans: Several initiatives have been taken to ensure a robust talent pipeline to meet the increasing requirement of manpower for the Company's growth program. Considering the significant capacity addition plan, Executive Trainees, Experienced Engineers, Diploma & ITI Trainees are recruited & continuous efforts have been made to effectively utilize the manpower by rationalization.

Further, hiring is being done in diversified and niche areas such as Mining, Hydro, Safety, IT, Renewable Energy etc. to attract experienced talent depending upon the business requirement. To meet the short term and project specific manpower requirements, NTPC has also started to engage fixed term employees.

13.2. Training & Development: Learning is one of our Core-Values. Recognizing the need for capability building for current and future roles, NTPC has set up a comprehensive training infrastructure comprising Power Management Institute (PMI) at the apex level, Regional Learning Institutes, Employee Development Centers (EDCs) at the stations and simulator training

facilities. NTPC also sponsors employees to external training facilities. During the year 2022, 831 employees were exposed to external training within India. The training imparted is based on Training Need Analysis (TNA) and is in tune with emerging needs and challenges.

PMI also provides training to power professionals from India and other developing countries. During the current Financial Year (up to December 2022), NTPC has logged a total of 242656 man-days also considering the internal e-learning portal (E-Guru) and long duration e-learning programs, namely, GPI-Learn and Future Skills courses.

To ensure training interventions are even more focused and targeted, the following initiatives have been taken:

- Assigning GPiLearn modules, Safety modules and Location Management Instructions (LMI) based on area and location to Operation and Maintenance executives (numbering around 6115).
- Imparting job-rotation facilitation training (called Samarth training) to those rotated to different areas in Maintenance and Operation and those rotated to C&M through standardized modules.211 executives have been covered under Samarth training in 2022.
- Training to those, assessed as needing development in one or more of the pre-identified managerial competencies, in the Competency, Potential and Value assessment undertaken for them through reputed 3rdparty. 251Executives have been covered under such Competency Development programs in 2022.
- Certification Programs in the domain of Renewable Energy, courses namely Solar Thermal Technology, carbon capture utilization and Sequestration, Energy Storage in association with IIT- Bombay was conducted online for 178 employees during the year 2022.Certification Programme on Wind Energy Course was conducted in association with NIWE, Chennai, 39 participants certified. Energy Transition Certification course in association with IIMCalcutta, Carbon Trading and Markets with the support of IITKanpur was conducted, 60 executives have been certified.
- NDT Certification Courses in collaboration with TWI(UK) were conducted. These coursesare Phased Array Ultrasonic Testing (PAUT), Radiography Testing & FilmInterpretation, NewCertified Level II Welding Inspector Course, total 64 executives certified till December 2022.
- Around753executives have been given Simulator training in 2022.
- Around 1240 employees have been certified through Institution of Occupational Safety and Health (UK)
- The NEBOSH International General Certificate in Occupational Health and Safety (IGC) certificate was conducted and certified approximately 105 employees till December 2022.
- Customized online certification program on Supply Chain Management for 46 executives with IIT Delhi.

During 2022, the batches that underwent or are currently undergoing one year induction training include – All girls Batch (35 ETs), Engineering ET-2021 (710 ETs), IT Discipline Batch (18 ETs), HR Discipline Batch (25 ETs), Finance Batch (13 ETs) and Mining Batch (26 ETs).

Capacity Building Programme was organized for CSR/ R&R, Safety Fixed Term Executives and lateral entry of HR Executives in different batches during 2022. 24 executives have attended the training programs being offered by DPE as a part of their RDC (Research, Development and Consultancies) Scheme and DEA as a part of their capacity building programs.

Access to new age digital courses like AI, IoT, Block Chain etc. which is the future of work, on the NASSCOM-MeITY FutureSkills platform has been provided to all executives. 105 courses have been completed Future-Skills courses. Cyber security awareness Programme conducted with the support from IIT-Madras. Certification course on Cyber Security, covering different projects / stations, was completed for 2 batches (57 Nos) with the support from NPTI. Advanced Cyber security course for Electrical and C&I was conducted (194 participants).

With a view to leverage Virtual Reality (VR) immersive technology for learning, 450minutes VR content has been developed and Train the Trainer programs (11 Nos) have been delivered to facilitate leveraging of VR for training. 1142 outsourced employees and 1033 operators have been trained using VR.

Focusing on holistic well-being, besides standalone programs on Yoga, Pranayam, meditation etc., 24*7 online Employee Assistance program, named Snehal, was operative throughout the 2022 for all employees and their families. This includes unlimited phone/video/ chat/e-counselling.

To further promote diversity and inclusion, gender sensitization programs and special programs for women employees,spouses of male employees and Internal Compliant Committee members were delivered.

14. SUPPORT TO THE SECTOR

NTPC has extended its services for the development of Indian Power Sector in several programs of

the Government of India through NSM, DDUGJY, SAUBHAGYA and NSDF. Some of the highlights of NTPC's role in India's power sector development are as below:

14.1. National Solar Mission (NSM)

NTPC had been entrusted to develop 15 GW Solar PV through NSM Phase-II in three tranches from 2014-15 to 2018-19, where NTPC would be the facilitator/ trader between DISCOMS and the project developers. NTPC would purchase power from the developers and sell it to the DISCOMS. As advised by MNRE target under National Solar Mission (NSM) Phase-II has been revised from 15 GW to 3 GW, under which 3 GW Solar PV capacity has been commissioned under Developer Mode.

14.2. DDUGJY and SAUBHAGYA

NTPC has been entrusted with Rural Electrification work in 15 districts of Odisha under 12th plan DDUGJY (DeenDayal Upadhyay Gram Jyoti Yojana) and SAUBHAGYA (Pradhan Mantri Sahaj Bijli Har Ghar Yojana) schemes of GoI.

All the works have been completed in these districts by Jan'2022. Electrification works have been done in 16547 villages covering about 8.5 lakh households including 98 no of 33/11 KV substation augmentation.Closure reports of all the 15 districts have been submitted & approved by REC.

14.3. National Skill Development Fund (NSDF)

NTPC is supporting the skills development initiative of the Government of India, in line with SKILL INDIA MISSION, by partnering with the Central and State governments. NTPC has entered into two tripartite MOUs with National Skill Development Fund (NSDF) and National Skill Development Corporation (NSDC) under Ministry of Skill Development & Entrepreneurship (MSDE). NTPC has provided funds to NSDF as per provisions of the MOU and NSDC with the support of NSDF has executed skill development programs at various locations. Under the initiative, NTPC has supported skill development programs for 30,000 youth in different market linked vocational skills for various sectors like services, manufacturing industry etc.

15. AWARDS AND ACCOLADES

NTPC has been consistently recognized by local & international bodies in the fields of Productivity, Environment and Safety. Major awards and rankings received by NTPC during the period 2022-23 are as under:

1. NTPC Limited received the "SHRM HR Excellence Awards 2022" on 23.11.2022 at New Delhi for the following categories: "Excellence in Developing Leaders of Tomorrow" and "Excellence in Community Impact".
2. NTPC has been recognized as one of the "Most Preferred Workplaces of 2022" in the premier edition of "Most Preferred Workplaces 2022" organized by Team Marksmen in association with India Today at a function held in Mumbai on 1st July, 2022.
3. NTPC Ltd, India's largest Integrated energy producer, has been conferred with the "Asia's Best Employer Brand Award 2022" at the 13th Edition of "ASIA'S BEST EMPLOYER BRAND AWARDS 2022" held in Singapore.
4. NTPC Ltd has been recognized as one of the "Top Organizations with Best Workplace Practices" at the Times Ascent Presents 21st Edition of ASIA PACIFIC HRM CONGRESS held on 20th September, 2022, at Bengaluru.
5. NTPC Limited was declared as the "Dream Employer of the Year" at the 30th session of World HRD Congress held at Mumbai on 23.03.2022.
6. ET Ascent recognized NTPC Ltd as a Star of the Industry for Excellence and Leadership on 22.12.2022 at New Delhi. NTPC was recognized for Excellence and Leadership in the category "Dream Company To Work For".
7. NTPC was recognized in June 2022 by the GPTW Institute as "India's Best Employers Among Nation-Builders 2022" and one of "India's Best Workplaces in Energy, Oil & Gas".
8. India's largest integrated energy producer, NTPC Ltd. was bestowed with the 'India's Best Workplaces in Manufacturing 2022 – Top 30' recognition by the Great Place to Work Institute.

Annexure-I

LIST OF NTPC COMMISSIONED STATIONS / PROJECTS (as on 31.12.2022)

I. COAL BASED STATIONS

S N	Station	State	Capacity (MW)
1	Barauni	Bihar	720
2	Barh	Bihar	1980
3	Bongaigaon	Assam	750
4	Dadri	Uttar Pradesh	1820
5	Darlipalli	Odisha	1600
6	Farakka	West Bengal	2100
7	Gadarwara	Madhya Pradesh	1600
8	Kahalgaon	Bihar	2340
9	Khargone	Madhya Pradesh	1320
10	Korba	Chhattisgarh	2600
11	Kudgi	Karnataka	2400
12	Lara	Chhattisgarh	1600
13	Mouda	Maharashtra	2320
14	Ramagundam	Telangana	2600
15	Rihand	Uttar Pradesh	3000
16	Simhadri	Andhra Pradesh	2000
17	Singrauli	Uttar Pradesh	2000
18	Sipat	Chhattisgarh	2980
19	Solapur	Maharashtra	1320
20	Talcher Kaniha	Odisha	3000
21	Tanda	Uttar Pradesh	1760
22	Unchahar	Uttar Pradesh	1550
23	Kanti	Bihar	390
24	Nabinagar Super Thermal	Bihar	1980
25	Vindhyachal	Madhya Pradesh	4760
	Total (Gas/Liquid)		**50490**

II. COMBINED CYCLE GAS/LIQUID FUEL BASED STATIONS

S N	STATIONS	State	Capacity (MW)
1	Anta	Rajasthan	419
2	Auraiya	Uttar Pradesh	663
3	Dadri	Uttar Pradesh	830
4	Faridabad	Haryana	432
5	Jhanor Gandhar	Gujrat	656
6	Kawas	Gujrat	657
7	Kayamkulam	Kerala	360
	Total (Gas/Liquid)		**4,017**

III. HYDRO BASED STATIONS

S N	Project	State	Capacity (MW)
1	Koldam	Himachal Pradesh	800
	Total (Hydro)		**800**

IV. RENEWABLE STATIONS

S N	Station	State	Capacity (MW)
1	Singrauli Small Hydro	Uttar Pradesh	8
2	Anantapur Solar	Andhra Pradesh	250
3	Port Blair Solar	Andaman and Nicobar	5
4	Bhadla Solar	Rajasthan	260
5	Dadri Solar	Uttar Pradesh	5
6	Faridabad Solar	Haryana	5
7	Mandsaur Solar	Madhya Pradesh	250
8	Rajgarh Solar	Madhya Pradesh	50
9	Ramagundam Solar	Telangana	10
10	Singrauli Solar	Uttar Pradesh	15
11	Talcher Kaniha Solar	Orissa	10
12	Unchahar Solar	Uttar Pradesh	10
13	Rojmal Wind	Gujarat	50
14	Bilhaur Solar	Uttar Pradesh	225
15	Auraiya Solar	Uttar Pradesh	20
16	Simhadri Floating Solar	Andhra Pradesh	25
17	Jetsar Solar	Rajasthan	160
18	Ramagundam Floating Solar	Telangana	100
19	Fatehgarh Solar	Rajasthan	296
20	Kawas Solar	Gujarat	56
21	Kayamkulam Floating Solar	Kerala	92
22	Auraiya Floating Solar	Uttar Pradesh	20
23	Sambhu Ki Burj Solar-I	Rajasthan	250
24	Sambhu Ki Burj Solar-II	Rajasthan	150
25	Devikot Solar-I & II	Rajasthan	240
26	Gandhar Solar	Gujarat	10
27	Ettayapuram Solar	Tamil Nadu	230
28	Nokhra Solar	Rajasthan	150
29	Solapur Solar	Maharashtra	10
	Total (Renewable)		**2,962**

V. POWER STATIONS UNDER JOINT VENTURES AND SUBSIDIARIES

S N	STATIONS	State	Capacity (MW)
	Coal Based Stations		
1	Bhilai (NSPCL)	Chhattisgarh	574
2	Jhajjar (APCPL)	Haryana	1,500
3	Rourkela (NSPCL)	Odisha	370
4	Vallur (NTECL)	Tamil Nadu	1,500
5	Durgapur (NSPCL)	West Bengal	140
6	Meja (MUNPL)	Uttar Pradesh	1,320
7	Jhabua (JPL)	Madhya Pradesh	600
8	Nabinagar (BRBCL)	Bihar	1000
	Total (Coal)		**7,004**

S N	STATIONS	State	Capacity (MW)
	Gas Based Stations		
1	Ratnagiri (RGPPL)	Maharashtra	1,967
2	Assam Gas (NEEPCO)	Assam	291
3	Agartala Gas (NEEPCO)	Tripura	135
4	Tripura Gas (NEEPCO)	Tripura	101
	Total (Gas)		**2,494**
	Hydro Stations		
1	Tehri HPP (THDC)	Uttarakhand	1,000
2	Koteshwar HPP (THDC)	Uttarakhand	400
3	Ranganadi HEP (NEEPCO)	Arunachal	405
4	Doyang HEP (NEEPCO)	Nagaland	75
5	Pare HEP (NEEPCO)	Arunachal	110
6	Tuirial HEP (NEEPCO)	Mizoram	60
7	Kopili HEP (NEEPCO)	Assam	200
8	Kopili Stage-IIHEP(NEEPCO)	Assam	25
9	Khanong HEP (NEEPCO)	Assam	50
10	Kameng HEP (NEEPCO)	Arunachal	600
	Total (Hydro)		**2,925**
	Renewable Stations		
1	Dhukwan SHP (THDC)	Uttar Pradesh	24
2	Patan Wind(THDC)	Gujarat	50
3	Devbhumi Dwarka Wind (THDC)	Gujarat	63
4	Tripura Solar (NEEPCO)	Tripura	5
5	Kasaragod Solar (THDC)	Kerala	50
	Total (Renewable)		**192**
	Total (Under JVs & Subsidiaries)		**12,615**
	GRAND TOTAL (I+II+III+IV+V)		**70,884**

Annexure-II

DETAILS OF ONGOING PROJECTS

I. COAL BASED STATIONS

S N	Project	Type	State	Capacity (MW)
1.	Barh-I	Coal	Bihar	1,320
2.	North Karanpura	Coal	Jharkhand	1,980
3.	Telangana	Coal	Telangana	1,600
4.	Talcher-III	Coal	Odisha	1,320
5.	PVUNL Patratu	Coal	Jharkhand	2,400
6.	NSPCL Durgapur III	Coal	West Bengal	20
7.	BIFPCL Khulna, Bangladesh	Coal	Bangladesh	1,320
8.	THDC Khurja	Coal	Uttar Pradesh	1,320
9.	Lata Tapovan #	Hydro	Uttarakhand	171
10.	Tapovan Vishnugad *	Hydro	Uttarakhand	520
11.	Rammam	Hydro	West Bengal	120
12.	THDC Tehri PSP	Hydro	Uttarakhand	1,000
13.	THDC Vishnugadh Pipalkoti	Hydro	Uttarakhand	444
14.	Rihand	Solar	Uttar Pradesh	20
15.	Nokhra	Solar	Rajasthan	150
16.	Jhanor	Solar	Gujarat	10
17.	Anta Solar	Solar	Rajasthan	90
18.	Solapur Solar	Solar	Maharashtra	13
19.	Nokh	Solar	Rajasthan	735
20.	Shambhu Ki Burj	Solar	Rajasthan	150
21.	Chattargarh	Solar	Rajasthan	150
22.	Bhensada	Solar	Rajasthan	320
23.	GVUNL-I (Amreshwar 200MW)	Solar	Gujarat	200
24.	GVUNL-II(Limbdi 60MW, Mithapur 60MW, Mesanka 30MW)	Solar	Gujarat	150
25.	Dayapar (Wind)	Wind	Gujarat	150
26.	Dayapar (Wind)	Wind	Gujarat	200
27.	Land & EHV Transmission	Solar	Rajasthan	500
28.	Shajapur	Solar	MP	325
29.	Solar BOS	Solar	Various States	300
30.	Khavda	RES	Gujarat	1255
	Total			**18,253**

Work has been stopped since 08.05.2014 as per Hon'ble Supreme Court order dated 07.05.2014.

* Work has stopped since 05.01.2023 as per order of ADM Chamoli.

Annexure-III

NTPC Group – Joint Ventures and Subsidiaries

Sl. No.	Name of the JV/Subsidiary Co. (Incorporated on)	Equity Holding as on 31st December 2022	Area (s) of Operation/Status
Joint Ventures /Subsidiaries for Capacity Addition			
1	NTPC-SAIL Power Company Pvt. Ltd. (NSPCL) (08.02.1999)	• NTPC- 50% • Steel Authority of India Limited (SAIL)-50%	The company owns and operates captive power plants for SAIL at Durgapur (140 MW), Rourkela (370 MW) & Bhilai (74 MW) and Bhilai PP-III (2X250 MW), which is supplying power to SAIL, Chhattisgarh, Dadra & Nagar Haveli and Daman & Diu. NSPCL present installed capacity is 1084 MW. NSPCL is constructing new Coal based capacity at Durgapur PP-III (1 x 20 MW).
2	NTPC Tamil Nadu Energy Company Limited (23.05.2003)	• NTPC-50% • TANGEDCO-50%	The Joint Venture Company between NTPC and Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO) was formed to set up a coal-based power station of 1,500 MW (3 X 500 MW) capacity, at Vallur, using Ennore port infrastructure facilities. All three units are under commercial operation.
3	Bhartiya Rail Bijlee Company Ltd. (22.11.2007)	• NTPC 74% • Indian Railways-26%	This Subsidiary Company was formed to undertake various activities related to setting up a 1,000 MW coal based thermal power plant (4x250 MW) at Nabinagar, District-Aurangabad, Bihar. All four Units are under commercial operation.
4	Patratu Vidyut Utpadan Nigam Ltd (15.10.2015)	• NTPC-74% • Jharkhand Bijli Vitran Nigam Limited - 26%	This Subsidiary Company was incorporated to improve performance of existing capacity and further capacity expansion of 4000 MW in two phases at Patratu. PVUNL is developing thermal power project of 2400 MW (3 X 800 MW) in Phase-I. EPC package has been awarded to BHEL & construction activities are under progress.Banhardih coal block has been allocated to PVUNL for captive use.
5	Meja Urja Nigam Private Ltd. (02.04.2008)	• NTPC-50% • Uttar Pradesh Rajya Vidyut Utpadan Nigam (UPRVUNL) -50%	This Joint Venture Company was formed to set-up a power plant of 1,320 MW (2x660 MW) at Meja Tehsil of Allahabad district in the state of Uttar Pradesh. Both units have started commercial operation.
6	Aravali Power Company Private Ltd. (21.12.2006)	• NTPC-50% • Indraprastha Power Generation Company Limited(IPGCL)-25% • Haryana Power Generation Corporation Limited (HPGCL)-25%	APCPL has setup Indira Gandhi Super Thermal Power Station of 1,500 MW (3x500 MW) in District Jhajjar, Haryana. All three units are under commercial operation.

7	Ratnagiri Gas and Power Pvt. Ltd. (RGPPL) (08.07.2005)	• NTPC - 86.49%, • MSEB Holding Co.- 13.51%	This company was formed, as a joint venture among NTPC, GAIL, MSEB Holding Co. Ltd. and Indian financial institutions for taking over and operating gas based Dabhol Power Project along with LNG terminal. All the three Power Blocks with a combined capacity of 1,967.08 MW (after re-rating) were commissioned in May 2009. Subsequently, LNG business was separated under new JV by name Konkan LNG Limited (KLL) with mirror shareholding. On 31.12.2020, NTPC Ltd. has executed agreement for a Composite Resolution Plan with Lenders of RGPPL, wherein outstanding debt liabilities of RGPPL have been settled through One Time Settlement (OTS) by NTPC As a part of the Resolution Plan, 35.47 % of Lenders Equity in RGPPL have been transferred to NTPC. Further, NTPC has executed Share Purchase Agreements with GAIL (India) Limited on 23 February 2021, for purchase of GAIL's share (25.51%) in Ratnagiri Gas and Power Pvt. Ltd. (RGPPL) and sale of NTPC's share (14.82%) in Konkan LNG Ltd. (KLL) to GAIL With this transaction, NTPC has fully exited KLL and now NTPC shareholding in RGPPL is 86.49%.
8	Trincomalee Power Company Limited (TPCL) (26.09.2011)	• NTPC-50% • CEB Sri Lanka-50%	TPCL was formed for setting up 2X250 MW coal-based power plant in Sampur, Trincomalee in Sri Lanka. On request from GoSL, proposal modified for putting up 300 MW LNG project at Kerawalapitiya & 50 MW solar PV project at Trincomalee. Joint Venture and Shareholder Agreement (JVSHA) between NTPC Ltd. and Ceylon Electricity Board (CEB) was signed on 25.10.2019 for a new 50:50 Joint Venture (JV) Company, for 300 MW LNG Power Project at Kerawalapitiya. A 50 MW solar PV power project (Extendable to 100 MW) at Trincomalee will be developed by the TPCL (existing JV) for which JVSHA Signed with CEB on 11.03.2022.Provisional approval for 50 MW (Phase I) Project was issued by Sri Lanka Sustainable Energy Authority on 01.08.2022. The planning and development activities of the solar project are under progress.
9	Bangladesh India Friendship Power Company (Pvt.) Limited (31.10.2012)	• NT • gladesh-50%	This Joint Venture Company was formed to undertake the development, implementation, operation and maintenance of the project in Bangladesh on a build, own and operate basis. The company is currently implementing a 1,320 MW (2X660 MW) coal-based power project at Khulna, Bangladesh. M/s BHEL was selected as the EPC agency through international competitive bidding to execute the project. Unit-1 was synchronized with grid on 15.08.2022.72 hours continuous trial run of the Unit 1 has been completed on 22.12.2022.

10	Anushakti Vidyut Nigam Limited (27.01.2011)	• NTPC-49% • NPCIL- 51%	This JV company was incorporated between NTPC Ltd. and Nuclear Power Corporation of India Ltd. (NPCIL) for setting up nuclear power project(s). Department of Atomic Energy has permitted joint venture of two CPSEs to set up Nuclear Power Project, with amendment in definition of Government Company under Atomic Energy (Amendment) Act, 2015. A joint team of MoP and DAE has been formed to explore transfer of Nuclear projects from NPCIL to ASHVINI.
11	THDC India Limited (12.07.1988)	• NTPC-74.496% • Govt. of UP- 25.504%	THDC India Limited was a joint venture of the Government of India (74.496%) and the Government of Uttar Pradesh (25.504%) and is a Mini-Ratna Category-I, Central Public Sector Enterprise. NTPC executed a Share Purchase Agreement with GoI on 25.03.2020 and acquisition of 74.496% equity stake in THDCIL was completed on 27.03.2020. With this acquisition, THDCIL has become a subsidiary of NTPC. Presently, THDCIL has 1,587 MW under Operation and 2,764MW under various stages of construction. THDC Limited, has created a 74:26 subsidiary company (namely TUSCO Limited) with UPNEDA for implementing 2000MW UMREPP (600 MW capacity of Solar Park, each at Jhansi and Lalitpur District and 800 MW at Chitrakoot District) in the state of Uttar Pradesh.
12	North Eastern Electric Power Corporation Limited (NEEPCO) (02.04.1976	NTPC-100%	North Eastern Electric Power Corporation Limited ("NEEPCO") is a Mini-Ratna Category-I Central Public Sector Enterprise. NEEPCO is primarily engaged in the business of generation and sale of electricity in the north-eastern region of India. NTPC executed a Share Purchase Agreement with GoI on 25.03.2020 and acquisition of 100% GOI equity stake in NEEPCO was completed on 27.03.2020. With this acquisition, NEEPCO has become a wholly owned subsidiary of NTPC. NEEPCO operates 8 Hydro,3 Thermal (Gas) and 1 Solar power stations with a combined installed capacity of 2,057 MW.
13	NTPC Renewable Energy Ltd. (07.10.2020)	NTPC-100%	NTPC Renewable Energy Limited (NTPC RE), a wholly owned subsidiary of NTPC was incorporated on 07.10.2020 with a target to accelerate the RE capacity addition plan of 60 GW by 2032.
14	Jhabua Power Limited (05.09.2022)	NTPC – 50 % Secured Financial Creditors – 50%	NTPC acquired Jhabua Power Limited (JPL) on 05.09.2022 through NCLT route. JPL is now a 50:50 JV of NTPC and Secured Financial Creditors & has an operational thermal power capacity of 1 x 600 MW located in Madhya Pradesh.
15	NTPC Green Energy Ltd. (07.04.2022)	NTPC-100%	NTPC incorporated a wholly owned subsidiary, in the name of NTPC Green Energy Limited (NGEL) on 7th April '2022 for pursuing green/ sustainable energy business.

Joint Ventures / Subsidiaries — Forward Integration			
1	NTPC Electric Supply Co. Ltd. (21.08.2002)	NTPC-100%	NTPC Electric Supply Company Ltd. (NESCL), a wholly owned subsidiary, transferred and vested all its operations, with effect from April 1, 2015, to NTPC Limited. To explore new business opportunities, NESCL is looking for power distribution in UTs/State Discoms.
2	NTPC Vidyut Vyapar Nigam Limited (01.11.2002)	NTPC-100%	NTPC Vidyut Vyapar Nigam Ltd. (NVVN), a wholly owned subsidiary, was incorporated on 1st Nov 2002, is engaged in the business of Power trading. NVVN has a trading License under Category-I (highest category). NVVN has been designated as the nodal agency for cross border trading of power with Bangladesh, Bhutan, and Nepal.
Joint Ventures / Subsidiaries — Strategic Alliance			
1	International Coal Ventures Pvt. Ltd. (20.05.2009)	• NTPC-0.27%, • RINL-24.80%, • SAIL- 49.59, • NMDC-24.80%, • CIL-0.54%	International Coal Ventures Pvt. Ltd. (ICVL), a Joint Venture Company was incorporated on 20.05.2009 under the name 'International Coal Ventures Private Limited' in association with Steel Authority of India Limited (SAIL), Coal India Limited (CIL), Rashtriya Ispat Nigam Limited (RINL), NMDC Limited (NMDC). In view of lack of suitable commercially viable opportunities for thermal coal, NTPC has decided to exit from ICVL.
2	CIL NTPC URJA PRIVATE LIMITED (27.04.2010)	• NTPC-50% • CIL-50%	CIL NTPC Urja Pvt. Ltd. (CNUPL) is a 50:50 JV incorporated between NTPC Ltd. and Coal India Ltd. for undertaking the development, operation & maintenance of Brahmini and Chichro Patsimal coal blocks in Jharkhand and integrated coal-based power plants. MoC vide its communication dated 14.06.2011, de-allocated Brahmini & Chichro-Patsimal coal blocks from the JV Company. New business opportunities are being explored.
3	PTC India Ltd	• NTPC- 4.05% • NHPC- 4.05% • PFC – 4.05% • PGCIL- 4.05%	PTC India Ltd was incorporated in 1999 as Power Trading Company and is a listed Company. The company is engaged in the business of trading activities that includes long term trading of power generated from large power projects as well as short term trading in India.
Joint Ventures / Subsidiaries — Strategic Diversification			
1	Hindustan Urvarak & Rasayan Limited (HURL) (15.06.2016)	• NTPC -29.67% • CIL - 29.67 % • IOCL-29.67% • FCIL- 7.33% (non-cash) • HFCL- 3.66% (non-cash)	HURL was incorporated on 15.06.2016, under the guidance of Government of India for revival of Gorakhpur & Sindri fertilizer plants of Fertilizer Corporation of India Limited (FCIL) and Barauni fertilizer plant of Hindustan Fertilizer Corporation Limited (HFCL), as a joint venture company of NTPC, Coal India Limited (CIL), Indian Oil Corporation (IOCL), FCIL and HFCL. Gorakhpur plant has started Commercial production on 3rd May 2022.

2	Transformer & Electricals Kerala Ltd. (09.12.1963)	• NTPC- 44.60% • Govt. of Kerala- 54.56% • Others- 0.84%	NTPC Ltd. joined hands with the Government of Kerala (GoK) for strategic acquisition of 44.60% stake in TELK in 2007. TELK manufactures and repairs high-voltage transformers and associated equipment. Due to changes in the business environment, NTPC Board has accorded in-principle approval for withdrawal of NTPC from TELK on 28.04.2016. MoP through letter dated 25th January 2017 has given approval for NTPC's Exit from TELK.
3	NTPC BHEL Power Projects Private Ltd. (28.04.2008)	• NTPC-50% • BHEL-50%	NTPC BHEL Power Projects Pvt. Ltd. (NBPPL) is a joint venture company formed between NTPC and BHEL for taking up activities of Engineering, Procurement and Construction (EPC) of power plants and manufacturing of equipment. Due to changes in the business environment, both the promoters have decided to wind up the JVC. In 2018, both Promoters had approached respective Ministries to exit from NBPPL/ closure of NBPPL. NBPPL is presently doing EPC work at NTPC Unchahar.
4	BF-NTPC Energy Systems Ltd. (19.06.2008)	• NTPC-49%, • Bharat Forge Ltd.-51%	BF-NTPC Energy Systems Ltd. (BFNESL) a joint venture company formed between NTPC and Bharat Forge Ltd. to manufacture castings, forgings, fittings, and high-pressure piping required for power projects and other industries. Due to changes in business scenario, it has been decided to wind up the Company. Activities for winding up are in progress.
Joint Ventures / Subsidiaries — Service Business			
1	Utility Powertech Ltd. (23.11.1995)	• NTPC-50%, • Reliance Infrastructure Ltd. - 50%	Utility Powertech Ltd. (UPL) is a joint venture company of NTPC and Reliance Infrastructure Limited formed to take up assignments of construction, erection and supervision of business in power sector and other sectors like O&M services, Residual Life Assessment Studies, non-conventional projects etc.
2	NTPC GE Power Services Private Limited (NGSL) (27.09.1999)	• NTPC- 50% • GE Power Systems- 50%	NTPC GE Power Services Private Limited (NGSL), earlier known as NTPC Alstom Power Services Private Limited, is a joint venture company of NTPC and GE Power Systems. NGSL operates and takes up Renovation & Modernization (R & M), refurbishment of power plants and business assignments in area of FGD, Ash Utilization, Plant O&M and RE.
3	National High-Power Test Laboratory (Private) Ltd. (22.05.2009)	• NTPC- 20% • NHPC- 20% • PGCIL- 20% • DVC- 20% • CPRI- 20%	National High-Power Test Laboratory Pvt. Ltd. (NHPTL) is a JV Company formed in association with NHPC Limited, Power Grid Corporation of India Limited, Damodar Valley Corporation and Central Power Research Institute. The Company was incorporated on 22.05.2009 for setting up facility for short-circuit testing of transformers and other electrical equipment. The laboratory is located at Bina, Madhya Pradesh and has started Commercial operations w.e.f 01.07.17.

4	Energy Efficiency Services Ltd. (10.12.2009)	• NTPC- 33.33% • PGCIL- 33.33% • PFC- 17.65% • REC- 15.68%	Energy Efficiency Services Ltd. (EESL) is a joint venture company formed with Power Finance Corporation Ltd., Power Grid Corporation of India Ltd., and Rural Electrification Corporation Ltd., for implementation of Energy Efficiency projects and to promote energy conservation and supplement climate change mitigation efforts. The Company is taking up different energy efficiency improvement related works like replacement of bulbs, Street Light National Program (SLNP), Smart Metering & other new business areas like Electric Vehicle (EV), Electric Charging Infrastructure etc. POWERGRID has infused equity of Rs. 407.49 Cr. in Sep'21. Thus, NTPC Equity has reduced from 47.15 % to 33.33 %.
Joint Ventures / Subsidiaries — Mining Business			
1	NTPC Mining Limited (29.08.2019)	NTPC-100%	A wholly owned subsidiary Company has been incorporated on 29.08.2019 for hiving-off of coal mining business of NTPC in the name of 'NTPC Mining Limited'(NML). Transfer of Coal mines to NML is under consideration by the Ministry of Coal.
Joint Ventures / Subsidiaries —Waste Management			
1	NTPC EDMC Waste Solutions Private Limited (01.06.2020)	• NTPC -74% • East Delhi Municipal Corporation (EDMC) -26%	NTPC EDMC Waste Solutions Pvt. Ltd (NEWS) was incorporated on 01.06.2020 to develop & operate Integrated Waste Management & Energy Generation facility in NCT, Delhi. However, due to non-availability of clear land site and Power Purchase Agreement, Waste to energy project could not be taken forward. NTPC has taken up with EDMC to buy out EDMC's stake in JVC.

NHPC

NHPC was incorporated on November 7, 1975 as a private limited company under the name "National Hydroelectric Power Corporation private Ltd". NHPC was converted to Public limited company w.e.f. April, 2, 1986. The name of the company was changed to its present name "NHPC Limited" in 2008.

NHPC is a Schedule-'A' Enterprise and a Mini Ratna company with 70.95% ownership of Government of India. With an Authorized share capital of ₹15,000 crore and an investment base of ₹ 72168 crore (as on 30.09.2022), NHPC is ranked as the premier organization in the country for development of Hydropower. NHPC is an ISO-9001:2015, ISO - 14001:2015 and ISO - 45001:2018 certified company.

PROJECT PORTFOLIO

POWER STATIONS UNDER OPERATION	**24 nos.**	**7071.20 MW**
HYDRO POWER STATIONS	**22 nos.**	**6971.20 MW**
NHPC OWN	20 nos.	5451.20 MW
JOINT VENTURE / SUBSIDIARY	02 nos.	1520 MW
OTHER RENEWAL PROJECTS	**02 nos.**	**100 MW**
WIND POWER PROJECT, JAISALMER	01 no.	50 MW
SOLAR POWER PROJECT, TAMIL NADU	01 no.	50 MW
PROJECTS UNDER CONSTRUCTION	**14 nos**	**7627 MW**
NHPC OWN (HYDRO)	02 nos	2800 MW
NHPC OWN (SOLAR)	04 nos	1040 MW
JOINT VENTURE / SUBSIDIARY (HYDRO)	06 nos	3634 MW
JOINT VENTURE / SUBSIDIARY (SOLAR)	02 no.	153 MW
PROJECTS UNDER CLEARANCES	**07 nos**	**7052 MW**
HYDRO (NHPC OWN)	04 nos	5756 MW
HYDRO (JOINT VENTURE)	02 no.	996 MW
SOLAR (JOINT VENTURE)	01 no.	300 MW
PROJECTS UNDER SURVEY & INVESTIGATION	**03 nos.**	**1130 MW**
HYDROPROJECTS	03 nos.	1130 MW
NEW INITIATIVES		
HYDRO PROJECTS (IN NEPAL)	03 nos.	1680 MW
HYDRO PROJECTS IN ARUNACHAL PRADESH	04 nos.	17120 MW
PUMP STORAGE	12 nos.	13195 MW

NIMMO BAZGO POWER STATION, UT OF LADAKH

SALAL POWER STATION, UT OF J&K

FINANCIAL PERFORMANCE

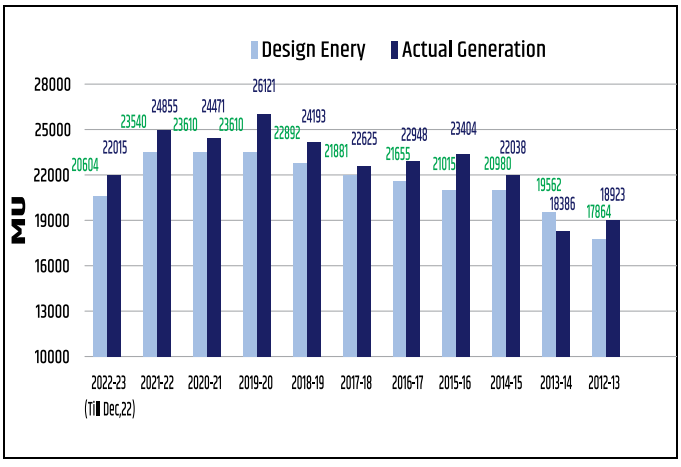
During FY 2022-23, NHPC registered the highest ever half yearly Standalone Profit after Tax (PAT) of ₹ 2483 crore against Standalone PAT of ₹ 2217 crore for the corresponding previous half year. There has been a 12% jump in Standalone Net profit in the first half of the current financial year compared to previous year.

OPERATIONAL PERFORMANCE

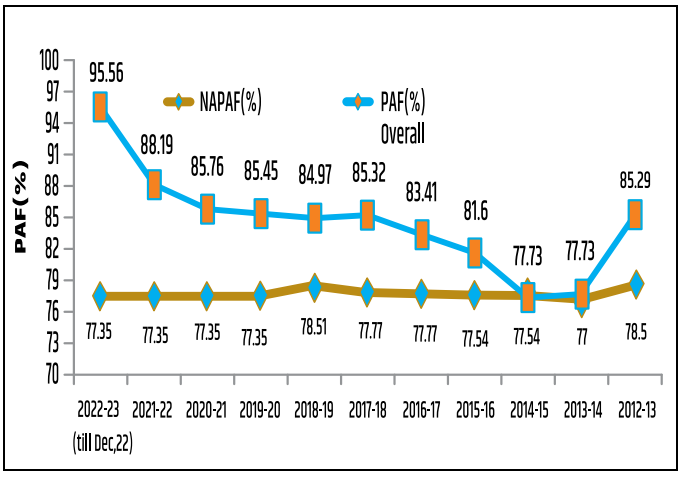
During 2022-23 (till Dec 2022) NHPC has achieved cumulative generation of 22015 MU against design energy of 20604 MU for the said period. NHPC Power Stations generated highest ever monthly generation of 3648 MUs during July 2022 and highest ever daily generation of 125.93 MUs has been achieved on 30.07.2022. NHPC has achieved Highest ever Quarterly Overall Generation of 10138.26 MU in Q2 of FY 2022-23. NHPC also achieved highest ever monthly overall PAF of 100.52 % in Aug'2022.

The actual Generation of all NHPC Power Stations w.r.t. their Design Energy and PAF during last during last ten years are as under:

ACTUAL GENERATION



PLANT AVAILABILITY FACTOR (PAF) %



SUBANSIRI LOWER, ASSAM / ARUNACHAL PRADESH

RECENT HIGHLIGHTS

- Hon'ble Prime Minister of India, Shri Narendra Modi laid the foundation stones of 540 MW Kwar Hydroelectric and 850 MW Ratle Hydroelectric Projects in UT of Jammu and Kashmir on 24.04.2022.
- Hon'ble Prime Minister inaugurated the Government Hydro Engineering College at Bandla in Bilaspur district of Himachal Pradesh on 05.10.2022, which is also being funded by NHPC under CSR.
- Cabinet Committee on Economic Affairs (CCEA) chaired by the Hon'ble Prime Minister of India accorded investment approval to the 540 MW Kwar Hydroelectric Project, UT of J&K on 27.04.2022. The Project is being implemented by CVPPPL (a Joint venture of NHPC Ltd. & JKSPDC) in district Kishtwar of J&K. The Project is scheduled to be completed in 54 months at an estimated cost of ₹ 4526.12 crore.
- NHPC has awarded EPC contracts for development of 1000 MW grid connected Solar PV projects (600 MW, 100 MW & 300 MW in Gujarat, Andhra Pradesh and Rajasthan respectively) under tranche-III of CPSU scheme Phase-II on 12.05.2022.
- Government of India on 12.07.2022 accorded investment approval of ₹ 973 crore for pre-construction activities of Sawalkot HE Project (1856 MW), UT of J&K.
- MoUs for Development of "Pilot Green Hydrogen Technologies" in District Leh and District Kargil of UT of Ladakh were signed on 14.07.2022. These two Pilot projects will create roadmap for future development of Green Hydrogen & subsequent reduction of the carbon emission in transportation / heating sector.
- An MOU was signed between NHPC and Damodar Valley Corporation (DVC) to "Explore Formation of Joint Venture Company (JVC) for Exploring and Setting up Hydropower and Pump Storage Projects" on 20.07.2022 at NHPC Corporate Office Faridabad, Haryana.
- PIB recommended the proposal of implementation of Dibang Multipurpose Project (2880 MW) Arunachal Pradesh by NHPC Ltd. in its meeting held on 11.10.2022 for consideration of CCEA with estimated cost of ₹ 31,876.39 crore at May '21 price level including grant of ₹6159.40 crore towards flood moderation component & ₹ 556.15 crore for Enabling Infrastructure (i.e. roads / bridges).
- NHPC paid a final dividend of ₹ 356.34 crore to Government of India for the F.Y. 2021-22 and the dividend payout bank advice was presented to Shri R. K. Singh, Hon'ble Union Minister of Power, New and Renewable Energy on 21.10.2022. For the FY-2021-22, total dividend of ₹ 1289.95 crore was paid to Govt. of India and total dividend comes to ₹ 1.81 per equity share.
- Excavation of both Diversion Tunnels-I & II of Ratle HEP (850 MW), UT of J&K have been successfully done after completion of benching excavation of Diversion Tunnel-II on 29.11.2022.
- NHPC as an Intermediary Procurer awarded 320 MW ISTS connected Solar PV Power project to M/s Avaada Energy Pvt. Ltd at Bikaner, Rajasthan with a trading margin 07 Paise / unit. Project has been successfully commissioned after commissioning of the last part capacity of 54.40 MW on 10.12 2022. Part commissioning of 265.6 of said project had been achieved during Sep'2022.

- Monetization of free cash (consisting Return on Equity, revenue from Secondary Energy and Capacity incentive) of Uri-I Power Station, UT of J&K for 10 years has been completed. M/s State Bank of India has emerged as successful bidder with total monetization proceeds of ₹ 1876.37 crore at discount rate of 7.65% p.a. The Bank has conveyed its sanction for the said monetization facility on 31.12.2022
- NHPC has recorded the Highest ever Quarter-I Standalone Profit after Tax (PAT) of ₹ 1050 crore for FY-2022-23 against PAT of ₹ 912 crore for the corresponding previous quarter.
- MOU signed between NHPC and Investment Board Nepal (IBN) regarding the development of 750 MW West Seti and 450 MW SR-6 Hydroelectric Projects in Nepal on 18.08.2022 in Kathmandu, Nepal. The development of these projects will boost NHPC's credentials as a global hydropower player. MoU was also signed between NHPC Limited and PTC India Limited for sale of power to be generated from upcoming West Seti & Seti River-6 Projects in Nepal on 30.08.2022.
- NHPC Renewable Energy Limited (a wholly owned subsidiary of NHPC Limited) signed MOU with Govt. of Rajasthan on 24.08.2022 at New Delhi for "Development of 10,000 MW Ultra Mega Renewable Energy Power Park" in the State of Rajasthan.
- Implementation Agreement for 500 MW Dugar Hydroelectric Project located in Chamba District, Himachal Pradesh was signed between NHPC Limited and Government of Himachal Pradesh on 26.08.2022 at Shimla.
- NHPC Limited signed an MOU with BEL on 23rd August 2022 for "Setting up of Giga Watt Scale Vertically Integrated Solar Manufacturing Unit at Bengaluru or any suitable location in the nearby vicinity jointly by NHPC and BEL".

KISHENGANGA POWER STATION, UT OF J&K

CHUTAK POWER STATION, UT OF LADAKH

INDIRASAGAR POWER STATION, MADHYA PRADESH

OMKARESHWAR POWER STATION, MADHYA PRADESH

AWARDS AND RECOGNITIONS

- Gold Shield for 'Excellence in Financial Reporting' awarded by the Institute of Chartered Accountants of India (ICAI) for FY 2020-21 in the category "Infrastructure & Construction Sector-Turnover equal to or more than ₹500 crore". NHPC also won the Certificate of Merit for the 'Best Presented Annual Report' from the South Asian Federation of Accountants (SAFA) in the Category "Public Sector Entities".

- NHPC has been awarded 'Second Prize' under 'Rajbhasha Kirti Puruskar' in Region 'A' by Ministry of Home Affairs, Govt. of India, for the year 2021-22 under 'Rajbhasha Kirti Puruskar' scheme.
- NHPC was conferred with "PSU developer of the year" Award in Gold Category by EQ International during EQ's PV Invest Tech India Conference &Awards at New Delhi.
- NHPC was declared 'Winner' in category of 'Best Implementation of Dam Rehabilitation Project' at the Water Digest Water Awards, 2021- 2022.
- NHPC has been conferred with 'AEOHD Occupational Health Excellence Award – Public Sector' in recognition of its exemplary contribution in the field of Environmental & Occupational Health (ENOCH) by AEOHD (Association of Environmental & Occupational Health, Delhi).
- NHPC's 510 MW Teesta-V Power Station has been conferred with the prestigious Blue Planet Prize by International Hydropower Association (IHA), a London based non-profit membership association operating in 120 countries.
- NHPC bagged Gold Medal for best presented annual report for FY 20-21 (Infrastructure & Construction Sector category) at South Asian Federation of Accountants Awards 2021 at Kathmandu, Nepal on 18th December 2022.

PARBATI STAGE-II, HIMACHAL PRADESH

CHAMERA-I, HIMACHAL PRADESH

CHAPTER 19

POWER GRID CORPORATION OF INDIA LIMITED (POWERGRID)

POWERGRID: An Overview

Power Grid Corporation of India Limited (POWERGRID), is a Schedule 'A', 'Maharatna' Public Sector Enterprise of Govt. of India which was incorporated on 23rd Oct 1989 under the Company Act, 1956. POWERGRID is a listed Company, with 51.34% holding of Government of India and the balance is held by Institutional Investors and public. The Corporation is responsible for development of inter-State transmission system in the country for evacuation of power from central sector projects & IPPs, system- strengthening scheme and for implementation of transmission projects assigned to it. As per Electricity Act 2003, POWERGRID was notified, the Central Transmission Utility (CTU) of the country. As per the Government of India directives, CTUIL has been notified as 100 % subsidiary of POWERGRID w.e.f. 01.04.2021. CTUIL is responsible for undertaking transmission of electricity through inter-State transmission system and discharge all functions of supervision, planning and coordination, related to development of an efficient, economical and reliable inter-State Transmission System. Central Transmission Utility (CTU) is the nodal agency for processing & grant of Connectivity, Medium Term Open Access (MTOA) and Long Term Access (LTA) to the applicants.

POWERGRID is engaged in bulk transmission of Power through its (765/400/220/132kV) Extra High Voltage AC and (±800/±500/±320 kV) Extra High Voltage DC transmission network. POWERGRID, being one of the largest transmission utilities in the world, is playing a strategic role in the development of Indian power sector and has proved its capabilities through timely execution of large & critical transmission projects.

POWERGRID owns & operates a transmission network of around **1,73,790 circuit kilometer (ckm)** of transmission lines (mainly 400 kV & above AC and HVDC lines) and power transformation capacity of around **4,93,000** Mega Volt Amperes (MVA) with **270 substations** as on 31st December 2022, spread over the length and breadth of the country. As on 31st December, 2022 POWERGRID's inter-regional transfer capacity in National Grid is **97,290MW** out of all India inter-regional transfer capacity of 112,250 MW. POWERGRID added **1,353 ckm, 5 Substations and 18,585 MVA of Transformation capacity** in FY 2022-23 (upto December 2022). POWERGRID has been rated **"Excellent"** on its performance in terms of MoU with Ministry of Power with a score of **95.96** in FY 2021-22.

POWERGRID is certified for Integrated Management System as per Publicly Available Specification, **PAS 99:2012** integrating requirements of **ISO 9001:2015** (Quality Management System), **ISO 14001:2015** (Environment Management System) and **ISO 45001:2018** (Occupational Health & Safety Management System). Apart from above, POWERGRID Corporate office is also certified for **ISO 50001:2018** for effective Energy Management System and **ISO 27001:2013** for Information Security Management System. All the Establishments of the POWERGRID have been audited for its Social accountability systems & certification for Social Accountability Standard, **SA 8000:2014**.

FINANCIAL PERFORMANCE

During FY 2022-23 (April - September 2022), POWERGRID recorded total income of ₹ 22,518 crore and a net profit of ₹ 7,451 crore (excluding Exceptional Item), on consolidated basis. As on 30th September 2022, Gross Fixed Assets of the company are ₹ 2,67,256 crore, on consolidated basis.

During FY 2022-23, Capital Expenditure (CAPEX) of over ₹ 5,440 crore has been achieved till 31st December 2022 out of targeted CAPEX of about ₹ 8,800 crore, for implementation of various projects and anticipated to achieve CAPEX target for the year.

OPERATIONAL PERFORMANCE

During FY 2022-23 (upto 31st December, 2022), POWERGRID has once again displayed its capability in consistently maintaining its gigantic transmission network with an availability of **99.81%**, comparable with the best international standards, through best Operation and Maintenance practices.

For increased efficiency and transparency in operation of POWERGRID transmission system, transmission assets are being remotely monitored & operated from "National Transmission Asset Management Centre" located at Manesar, Gurugram. As on 31st December, 2022, POWERGRID is operating its **267 sub-stations** remotely through control centres.

Enhancing in-house capabilities - 125MVAR, 400kV Bus reactor-III tripped at Ballia S/s which was repaired in-house within a record time of 25 days leading to a saving of direct cost of ₹ 1.5 Cr. Site repair of 765/400kV 500MVA Transformer was carried out at 765 kV Ranchi S/S of POWERGRID. This resulted in saving of time as well as cost of transportation to OEM works.

For the first time in India, 765 kV RIP bushing in 765 kV Reactor was charged at Satna substation, which is very useful in avoiding catastrophic failures of Transformers and Reactors.

Some of the digital initiatives for Asset Management by POWERGRID are as below:

- **Development of Asset Management Dashboard UDAAAN (Unique Digital Analysis of Assets and Network):** Dashboard ensures a single window access to all key performance indicators (KPIs) by integrating data stored at various locations thus enabling bird's eye geospatial view of asset management system across the organisation. Current features which have been integrated in the dash board include monitoring of KPI, progress of various maintenance activities, inventory detail, asset health of transformer & Reactor, daily operational data such as tripping breakdown details,

overloaded transmission lines and transformers, deep dive into outage & maintenance record, mal operation analysis and weather forecast.

- **Integration of AI/ ML based defect identification in PG-DARPAN:** An image processing-based module (capability of 150 photographs /minute) using AI/ ML techniques has been developed to automate the process of defect identification in Transmission line. Module has helped in optimizing efforts of manpower and shift focus from defect identification to defect rectification.
- **POWERGRID Asset Life Management System (PALMS V2.0):** The application is an in-house Asset Health Indexing Software for assessing real-time risk-based health indexing of POWERGRID transformers and reactors equipped with most advanced diagnostic methods based on various international standards, company's own experience in interpreting test results. This tool also includes Risk-based Severity assessment, Age assessment through Furan Values etc.
- **Computer based Relay Setting Management:** POWERGRID has over 25,000 numerical relays. Using Intelligent Process Solution (IPS) software, a centralized database of the relays has been created. POWERGRID network and relay settings have been uploaded on IPS, enabling the user to view all the setting values, firmware details, etc. of complete relay asset base. Further, complete POWERGRID network has been modelled in CAPE software tool (Computer Aided Protection Engineer).

COMMERCIAL PERFORMANCE

During the FY 2022-23, till 31st December,2022 POWERGRID has realized ₹ 30,003 crore (85.91%) including previous outstanding, against the ₹ 34,925 crore of total bills raised. The benefits under Electricity (Late Payment Surcharge and other related matter) Rule 2022, one-time dispensation for liquidation of past outstanding dues, are being extended to DISCOMs and 6 nos. of DISCOMs have opted for instalment payments for their outstanding transmission charges.

ACQUISITION OF SPVS / INCORPORATION OF JV & SUBSIDIARIES

- **POWERGRID Acquired Four SPVs through Tariff Based Competitive Bidding (TBCB)**

  POWERGRID acquired four TBCB SPVs viz. POWERGRID Narela Transmission Limited, POWERGRID Gomti Yamuna Transmission Limited, POWERGRID Neemuch Transmission Limited and POWERGRID ER-NER Transmission Limited.

- **Incorporation of Butwal-Gorakhpur Cross Border Power Transmission Limited - JV Company**

  Butwal-Gorakhpur Cross Border Power Transmission Limited (a 50:50 JV Company of POWERGRID & Nepal Electricity Authority) has been incorporated on 31st August, 2022 for implementation of Indian portion of Butwal-Gorakhpur 400kV Cross-Border Interconnection power transmission line, one of the prestigious projects of Indo-Nepal co-operation.

TRANSMISSION INFRASTRUCTURE (INTER STATE & INTRA STATE) ADDITION

POWERGRID added **1,353 ckm, 5 Substations and 18,585 MVA of transformation capacity** in FY 2022-23 (upto December 2022) in the Inter and Intra state Transmission System.

POWERGRID has commissioned some of the important projects including Bhuj – II Transmission System, Bhind Guna Transmission System, NR-XXXVII System Strengthening Scheme in Northern Region, ERSS – XVIII (Medinipur Jeerat Transmission System) ERSS XXIII (Kishanganj – Darbhanga) and Transmission for RE connectivity at Rajasthan during the year.

Jauljivi 400/220 kV (GIS) Substation, Uttarakhand was commissioned by POWERGRID

POWERGRID CONTRIBUTION TOWARDS RENEWABLE ENERGY INTEGRATION

POWERGRID has implemented various transmission schemes to facilitate integration of large-scale renewable generation capacity addition in various RE resource rich states.

Rajasthan:

During the year, under Phase-I, 8.9 GW of solar power from Rajasthan, POWERGRID has developed inter-state transmission system for evacuation of power from various complexes such as Bhadla- 3.55 GW, Fatehgarh- 3.5 GW and Bikaner-1.85 GW. 3 sub-stations at Fatehgarh, Bhadla & Khetri, 1872 circuit kms of EHV transmission lines and 12,500 MVA transformation capacity have been added to the Inter State Transmission System.

Under Phase -II, POWERGRID is implementing Transmission system for evacuation of Power from Solar Energy Zones in Rajasthan (8.1GW) (Part A, Part B, Part C, Part D, Part F & Part G) and Transmission System for Providing connectivity to RE projects at Bikaner (PG), Fatehgarh-II & Bhadla–II in Rajasthan is also under advance stages of completion.

Hon'ble President of India dedicated Transmission System built by POWERGRID for evacuation of 8.9 GW of solar power in Rajasthan

Gujarat:

765/400/220kV Bhuj-II Pooling Station (PS) and LILO of 765kV Bhuj PS – Lakadia D/c line at Bhuj-II (PS) was dedicated to the Nation by Hon'ble Prime Minister on 28.08.2022, which facilitates evacuation of renewable energy generation from Western Gujarat.

Hon'ble Prime Minister of India dedicated Transmission System built by POWERGRID for evacuation of renewable energy in Gujarat

Renewable Energy Management Centre (REMC) in the state of Telangana, and Energy Management Center in South Andaman has been completed during the year. With this 12 nos. REMCs and 1 no. Energy Management Centre (EMC) are under operational.

TECHNOLOGY DEVELOPMENT

As a step towards indigenisation & improving operational efficiency, substation Inspection Robot in collaboration with IIT Kanpur is being developed to facilitate automation of routine inspection of switchyard equipment as well as data driven decision process using Artificial Intelligence /Machine Learning (AI/ML) techniques.

POWERGRID has been granted its first patent for 'Smart Socket and Smart Home Energy Manager' which has been developed in collaboration with IIT Kharagpur.

A virtual Smart Grid Knowledge Centre (SKGC) for capacity building and virtual Innovation Portal for new technological intervention towards distribution system efficiency has been launched and can be accessed by anyone anytime through portal.

POWERGRID Advanced Research and Technology Centre (PARTeC) focusses on harnessing new technologies, process improvements etc., with an aim to enhance efficiency, security with sustainability in power transmission. The facility is also extended to other stakeholders for dynamic testing of relays utilising one of the largest Real-time Simulation facility in the country.

CYBER SECURITY

The Ministry of Power has assigned POWERGRID the responsibility of sectoral Computer Emergency Response Team (CERT) for the Transmission Sector. All the establishments of POWERGRID are certified for ISO27001 Information Security Management System. POWERGRID conducts extensive training programs for employees and participated in programs and simulations organized by Computer Emergency Response Team (CERT-In) and National Critical Information Infrastructure Protection Center (NCIIPC).

POWERGRID in association with Indian Institute of Science (IISc), Bengaluru is setting up a Centre of Excellence (CoE) in Cybersecurity in Transmission and Grid operation at IISc Bengaluru. This long-term collaborative effort will facilitate continuous research, monitoring, development and demonstration focussed on Cybersecurity in association with academia and industry towards cyber resilient transmission system.

An MoU has also been signed with Electronics Corporation of India Ltd. (ECIL) for establishment of Security Operations Centre at Manesar which shall provide a platform to collate, store and analyse cybersecurity logs across various networks of POWERGRID.

LEVERAGING HUMAN CAPITAL TO ACHIEVE EXCELLENCE

POWERGRID endeavours to create organization culture that promotes continuous learning, creativity, sharing and development. The HR processes/systems are designed to acquire, nurture and empower power professionals in line with core values of the company in an equitable, collaborative, healthy, safe environment. As on December 31, 2022, the employee strength of the Company stood at 8,445 which is exclusive of the employees on contract.

POWERGRID Academy of Leadership (PAL) at Manesar imparts a wide range of training and development opportunities for its employees and other stakeholders in India and abroad and has been recognised as Category-I Institution for Training in Transmission by Central Electricity Authority, Ministry of Power, Government of India. During the year, more than 450 training and development programs were organized at PAL, Employee Development Centres at Regions and associated premier educational institutes in India and abroad.

Through "SANDARSHIKA", a portal for Mentoring and Coaching of employees, approximately 4000+ employees are benefited.

During the year, POWERGRID provided following learning courses to its employee:

- 2nd Batch of 50 employees for Artificial Intelligence / Machine Learning course from IIIT-Bangalore.
- 15 employees sponsored for M.Tech program in POWER System and reliability by NIT Jalandhar.

- 5 employees sponsored for 15 months PGDM program by NTPC School of Business.
- Advanced Management Program for Senior Executives at ISB Hyderabad.

In house e-learning modules:

POWERGRID has developed 111 e-Learning modules related to different business verticals and 9 refresher courses related to various company domains benefiting around 7450 employees. In addition to above, POWERGRID has hosted 7 modules related to Power transmission for GOI's ambitious "Mission Karmayogi" Programme. The tie-ups have been made with Ministry of IT & Electronics, GoI and IT Industry body NASSCOM for their Future Skills PRIME portal which provides access to all employees in POWERGRID.

Leveraging its people's capabilities and infrastructure available at PAL for capacity development of Power sector, POWERGRID has taken following initiatives for stakeholder development:

- 950+ apprentices have been engaged in different trades as per the Apprentice Act.
- 350+ contract staff has been imparted training under RPL (Recognition of Prior Learning) certification.
- An MoU signed amongst National Skill Development Corporation (NSDC), National Skill Development Fund (NSDF), Power Sector Skill Council (PSSC) & POWERGRID for Skill development training of 6000 unemployed youth in power Sector. At present, 4500+ trainees are undergoing training across 22 locations in India.
- Under Capacity Building and Institutional Strengthening - North Eastern Region Power System Improvement Project (CBIS-NERPSIP), POWERGRID is undertaking Capacity Building and Institutional Strengthening program for State Power Utilities in 6 (six) states (Assam, Meghalaya, Mizoram, Manipur, Nagaland, Tripura) and Capacity Building under Comprehensive Scheme in 2 (Two) States (Arunachal Pradesh & Sikkim)).

RECRUITMENT

POWERGRID is undertaking direct recruitment in Mission Mode as per the directives of Government of India for engineering graduates, diploma engineers, HR & other professionals. The data for vacancies are being uploaded regularly on Vacancy Status Portal of DoPT. The appointment letters are being issued to candidates during Rozgar melas.

MANAGEMENT OF ENVIRONMENTAL AND SOCIAL ISSUES

POWERGRID has taken several initiatives towards sustainable development in line with the Government of India initiatives. **POWERGRID has committed itself to achieve 50% of its electricity consumption from non-fossil sources by year 2025.** In this regard, POWERGRID has planned large scale solar PV plants in vacant land at some of its premises. First of such plant is to be established in Nagda, Distt. Ujjain (M.P.) having 85 MWp capacity In addition, POWERGRID has installed 8.2 MWp of rooftop Solar PV systems at 120 locations and further Installation of 6.3 MWp is in process of implementation.

POWERGRID has also committed itself to achieve 50% water recharging of its total consumption by year 2027. For this, provision for Rainwater Harvesting made mandatory for all Installations for conservation and recharging of ground water.

POWERGRID is also taking up various initiatives towards reducing carbon footprints. Some of them include:

- Digital Substations: Green field Substations at Halo Mazra (220 kV) & Navsari (400 kV) are being developed as digital substations wherein use of copper cables is reduced to great extent.
- Alternative to "SF6 Gas": Upgradation of 132 kV Badarpur S/s (North East Region) to green substation by using Green gas instead of SF6 is being taken up to explore alternative for SF6, which has a higher global warming potential.
- Massive plantations with suitable indigenous species in and around all substation facilities; more than 7 lakh saplings are planted.
- E-cart / Golf carts in substation premises are being deployed in place of existing petrol / diesel vehicles.

POWERGRID released its **7th biennial Sustainability Report for FY 2019-21** in March 2022 based on internationally acclaimed and accepted Global Reporting Initiative (GRI) Standards (Core) duly validated by independent Accredited Assurance Provider.

CORPORATE SOCIAL RESPONSIBILITY

POWERGRID has been contributing towards improving the quality of life of people through its CSR initiatives in the field of Healthcare, Education, Rural Development, Skill Development programmes, Rural Development, Sanitation, Drinking Water, and Environmental Sustainability etc. as mandated by the Companies Act 2013.

POWERGRID has earmarked ₹ 311.97 Cr. budget under CSR for FY 2022-23. As on 31st December, 2022, POWERGRID has approved a total of 97 number of CSR projects amounting to ₹ 147.29 Cr. These CSR initiatives are directed towards various thrust areas with major allocation in Education (₹ 11.63 Cr.), Healthcare and Nutrition (₹ 113.16 Crore), Rural Development (₹ 1.59 Crore), Sanitation & Drinking Water (₹ 3.06 Cr.), Skill Development (₹ 14.0 Cr.), and others (₹ 3.86 Cr.), etc.

DPE Guidelines on Common theme for FY 2022-2023 is "Health & Nutrition" and POWERGRID has accorded approval for various projects in "Health & Nutrition" amounting to ₹ 113.16 Crore.

As on 31.12.2022, around 222 CSR projects are under implementation across various locations of the country.

POWERGRID is undertaking various integrated development initiatives in aspirational districts allocated by Government of India.

POWERGRID has undertaken establishment of 9 Vishram Sadan in various part of country. Out of which 4 are operational at AIIMS (Delhi), KGMU (Lucknow), IGIMS (Patna), DMCH (Darbhanga) & GMCH (Guwahati). Further, 1 is ready for handing over at Sir Sayajirao General (SSG) Hospital, Vadodara and balance 3 are under construction at RIMS, Ranchi, NIMHANS, Bengaluru, Medical College and Hospital complex, Berhampur Odisha.

During the year to combat COVID-19 pandemic, POWERGRID has provided Financial Assistance for procurement of 10 nos. Neonatal Ventilators and ABG Machines for District Hospitals at Mewat, Faridabad and Gurugram, in Haryana.

Further, various Medical Health Camps were organised at various parts of the country under "Azadi Ka Amrit Mahotsav".

OTHER ACITIVITIES:

BUSINESS DEVELOPMENT

POWERGRID is providing consultancy services to various national and international clients. It has footprints in 23 countries and currently executing 16 consultancy projects in Bangladesh, Nepal, Uganda, Moldova & Fiji.

During the year, under International business, POWERGRID bagged new consultancy assignment in Moldova and Nepal. Some of the major assignments during the year include:

- Incorporation of Joint Venture with NEA (Nepal Electricity Authority) at 50:50 equities for implementation of Development of Indian portion of 400 kV Gorakhpur (India) – Butwal (Nepal) Transmission Line & bays at Gorakhpur end.
- For the first time, POWERGRID has won project under exclusive funding from Millennium Challenge Corporation, USA and European Investment Bank (EIB).
- Transmission Project in Kenya on PPP Model: Private Investment Proposal (PIP) proposal submitted to KETRACO, PPP Directorate and Ministry of Energy, Kenya jointly with Africa-50.
- Transmission Project in Tanzania on PPP Model: A Cooperation Agreement signed with Africa50 to implement transmission system in Tanzania.

Under domestic consultancy, POWERGRID is providing consultancy to various state utilities, DISCOMs, CPSEs and Renewable Energy developers etc. POWERGRID bagged 26 numbers of projects during the FY 2022-23 (upto 31st December 2022)

POWERGRID is taking up the construction of Transmission System for Private players, which include:

- Implementation of Transmission Evacuation system for Renewable Energy projects at Kurnool District (Andhra Pradesh) for Greenko Energies.
- Implementation of Transmission line from ISTS Jan Khambaliyan Pooling station to Reliance Industries Limited, Jamnagar facilities.

POWERGRID is providing consultancy to Madhya Pradesh Power Transmission Company Limited (MPPTCL) and Odisha Power Transmission Corporation Limited (OPTCL) for establishment of State Transmission Asset Management System (STAMS).

CONTRIBUTING TO DISTRIBUTION REFORMS

POWERGRID is implementing infrastructure in distribution system under flagship schemes of Govt. of India. such as DDUGJY, Saubhagya and PMDP. At present, carrying out village electrification strengthening work in UTs of J&K & Ladakh and Intra- State Transmission works at 220&132 kV voltage level under PMDP-2015 scheme in UT of J&K.

During the FY 2022-23 (up to Dec'22) Electrification infrastructure of 59 villages have been created. In addition, 2 nos. 33kV Substations were also completed under PMDP scheme. Electrification works of 150 nos. villages & 6 nos. 33 kV Substation are anticipated to be completed till 31st March 2023. Under Intra-State transmission work, 1 no. 132 kV GIS substation and 1 no 132 kV UG cable in Kashmir has been completed. 1 No. 220/66 kV Substation in Jammu has been commissioned.

Under Revamped Distribution Sector Scheme (RDSS), POWERGRID has signed MoU with Madhya Gujarat Vij Company Limited and Uttar Gujarat Vij Company Limited for installation of about 65-70 lakh smart meters.

POWERGRID's EFFORTS TOWARDS DEVELOPMENT OF NORTH EASTERN REGION (NER)

Government of India has sanctioned Intra State power transmission and distribution schemes for North Eastern States. These schemes intend to create reliable state power grid and improve its connectivity to the upcoming load centers and thus extend benefits of grid connected power to all categories of end consumers in NER States.

POWERGRID has been assigned to undertake implementation of following intra state transmission schemes.

- North Eastern Region Power System Improvement Project (NERPSIP) for Six (6) States (Assam, Manipur, Meghalaya, Mizoram, Tripura and Nagaland) for strengthening of the Intra-State Transmission and Distribution Systems (33kV and above).
- Comprehensive Scheme for Strengthening of Transmission and Distribution System in Arunachal Pradesh and Sikkim

Under NERPSIP, 407 elements out of 446 elements have been completed till Dec'22 and work is in progress in the balance elements. Under Comprehensive Scheme for Strengthening

of Transmission and Distribution System in Arunachal Pradesh and Sikkim, 111 elements out of 292 elements have been completed till Dec'22 and balance works are under progress.

POWERGRID is also constructing new transmission lines, extension/ upgradation of existing substations, augmentation of transformation capacity, re-conductoring of transmission lines etc. in NER states under Inter State transmission System (ISTS) projects allocated by GoI, through Regulated Tariff Mechanism (RTM). These schemes will strengthen the North-Eastern Grid, improve the quality of power and will reduce transmission losses.

ASSISTANCE TO STATES

POWERGRID is providing support to state utilities for uninterrupted power supply. In this endeavour, during the year, support was extended to the state of Gujarat for restoration of lines, by deploying Emergency Restoration System. In addition, POWERGRID manpower was deployed to man the substations in the state of Maharashtra and Union Territory of Puducherry during the strike called by their employees.

TELECOM BUSINESS

POWERGRID diversified its business into telecommunications as a Telecom Infrastructure and Service Provider, owning a PAN-India optic fiber network on its EHV Transmission lines. POWERGRID holds Unified License with service authorizations for National Long Distance (NLD) and Internet Service Provider (ISP) Category-A along with the IP-I Registration and International Long-Distance service authorisation issued by DoT.

During the year upto 31st Dec'22, 5891 Km of Optical Fibre Cable (OFC) network has been added with cumulative establishment of 80,000 kms of optical Fibre Cable network. POWERGRID is providing nationwide services like managed lease lines, Internet Leased line, Tower co-location, MPLS based IP-VPN, SD-WAN, DDoS, DNS etc. in all parts of the country with its PAN India high capacity network and also implementing various Govt. projects viz. National Knowledge Network (NKN) project and Bharatnet project.

POWERGRID has its reach of telecom network across the country including remotest locations such as Leh, J&K, NER etc. This has led to one step forward towards Digital India's flagship program driven by Government of India with a vision to transform India into a digitally empowered society and knowledge economy.

During the year, POWERGRID's Telecom network expanded from 17 Terabytes per second (TBps) to 27 TBps.

MoU/Agreements were signed with SEBs and Utilities including UPPTCL, BSPTCL, DVC, Manipur, J&K and GED for utilization of ~10,000 km of Optical fiber for Network Expansion.

POWERGRID is exploring new business opportunities through its Wholly Owned Subsidiary – POWERGRID TELESERVICES LIMITED:

- **Data Centre Business:** Data Centre Services with a 1000 rack Data Centre on pilot basis is being established at Manesar substation in first phase. CERC approved use of ISTS substation land at Manesar for undertaking Data Centre business on rental basis.
- **International Long Distance (ILD) Services:** Telecom Services are proposed to be extended to neighbouring countries including Bangladesh, Bhutan, Nepal and Myanmar.

MAJOR AWARDS AND ACCOLADES

- 24th Platts Global Energy Awards - Corporate Impact Award - Critical Response category. POWERGRID has been recognized for its contribution on providing immediate help to children in distress situations who have lost their parents or primary caregivers as a result of communal, caste, ethnic and terrorist violence.
- CSR World Leader 2022 and International CSR Excellence Award 2022 by The Green Organization, London, UK.
- Dun & Bradstreet PSU and Government Summit 2022 awarded POWERGRID in the Power Transmission (Central PSUs) category
- Dun & Bradstreet India's Top 500 Companies 2022 in Power Transmission & Distribution sector.
- Ministry of MSME recognized POWERGRID for highest procurement (% wise), from women MSEs, amongst Maharatna CPSEs during FY 2021-22
- POWERGRID has been ranked 1st in Services Sectors across categories Gross Block, Value Addition, Net Profit, Net Worth, Dividend Declaration, and Contribution to the Central Exchequer in the Public Enterprises Survey 2021-2022 by the Department of Public Enterprises.
- Recognized as Top 100 Best Companies to Work for in India 2022 by GPTW India with unique distinction as the only PSU in Top 100.

CHAPTER 20

POWER FINANCE CORPORATION LTD.

1.0. OVERVIEW OF PFC

1.1. Introduction

PFC was incorporated on July 16, 1986, as part of Government of India's initiative to enhance funding of power projects in India, with an objective to provide financial resources and encourage flow of investments to the power and associated sectors. PFC commenced its lending activity in 1988. It was declared a Public Financial Institution (PFI), under Section-4A of Companies Act, in 1990.

PFC is a Schedule-A, Maharatna CPSE in the Financial Services Sector, under the administrative control of the Ministry of Power, with 55.99% shareholding by the Government of India as on 31.12.2022. Its Registered and Corporate Offices are in New Delhi. The Corporation has been conferred with the status of 'Maharatna' by Government of India on 12th October, 2021. This new recognition will enable PFC to offer competitive financing for the power sector, which will go a long way in making available affordable & reliable 'Power For All 24x7'. The enhanced powers that come with Maharatna Status will also help PFC in pushing the Government's agenda of funding under the National Infrastructure Pipeline, national commitment of 40% green energy by 2032 and effective monitoring and implementation of the New Revamped Distribution Sector Scheme with an outlay of more than Rs.3 Lakh crore. RBI has re-classified PFC from a 'Loan Company' to an 'Infrastructure Finance Company' (IFC) on July 28, 2010 which enabled PFC to be operationally more flexible and effectively capitalize on available financing opportunities.

Today, Power Finance Corporation Limited (PFC) group is the largest Financial Company in Indian Power Sector. PFC is a Non-Banking Financial Company which provides innovative fund and non-fund based support for the overall development of Indian Power Sector. PFC is the largest CPSE in terms of the balance sheet size. PFC is also the largest Infrastructure Finance Company in India and largest Govt owned NBFC on consolidated basis.

With a vision to power India's next phase of development, PFC has been at the forefront of flagship Government projects, powering the nation's ascent to the world stage. By leveraging its expertise in financing the power sector and prudently deploying resources, PFC has evolved with the changing policy dynamics to emerge as a dominant market leader.

1.2. Products & Services

PFC plays a strategic role in the initiatives of the GoI for the development of the power sector in India and works with GoI agencies, state governments, power sector utilities, other power sector intermediaries and private sector clients for the development and implementation of policies and for structural and procedural reforms in the power sector in India.

PFC offers a bouquet of innovative fund-based and non-fund based products for its clientele in the power, infrastructure and logistics sectors. Some of the fund-based products include; Project Term Loans, Corporate Loans, Buyer's Line of Credit, Debt Refinancing, Short Term & Medium Term Loans, etc. and non-fund based products like Deferred Payment Guarantee, LoC, LoU, Guarantee for Performance of Contract / Obligations with regard to FSA, etc. PFC also provides various fee-based technical, advisory and consultancy services for power sector projects through its 100% owned subsidiary, namely, PFC Consulting Limited.

PFC has introduced market-friendly policies to attract green projects. The Company has introduced online screening of solar and wind proposals to expedite the appraisal process and to capture more business in the sector. Further, PFC's specialised focus, coupled with over three decades of expertise in funding the power sector, enables it to provide customised solutions based on the financial profile of its clients, as well as the nation's fiscal health.

PFC has well established relationships with the Govt. of India, and State governments, regulatory authorities, major power sector organizations, Central and State power utilities, as well as private sector power project developers.

1.3. Association with Government of India

PFC is actively involved in implementation of various Govt. of India's flagship Programs for the power sector. PFC is the nodal agency along with REC for the new Revamped Distribution Sector Scheme (RDSS) with an outlay of more than Rs. 3 Lakh Crores. PFC is also the Nodal agency for implementation of UMPPs and the "Integrated Power Development Scheme" (IPDS) and as a Bid Process Coordinator for the 'Independent Transmission Projects' and implementation partner of Capacity Building under R-APDRP.

1.4. Subsidiaries and Joint Ventures

During FY 2018-19, PFC had acquired 52.63% of total paid up equity shareholding in REC and thus became the holding company and a promoter of REC. The acquisition promoted increased efficiencies in the processes and policies across both the institutions and helped create public value by offering better loan products to the power sector. The convergence between these entities as a combined group would also help the power sector reap benefits from a decentralized outreach of REC and a professional project finance expertise of PFC. Further, the ensuing diversification of assets of the group, as well

as portfolio risk, would help in resolution of stressed power sector assets of the group in a better and co-ordinated manner.

PFC Consulting Limited (PFCCL) is a Subsidiary of PFC which provides various fee-based technical, advisory and consultancy services for power sector projects.

PFC is also one of the Promoters of Energy Efficiency Services Limited (EESL), which is implementing one of the world's largest energy efficiency portfolio. PFC is also an equity shareholder in PTC India Limited (PTC) which is involved in power trading and related activities.

PFC has also invested Rs.3.22 crores in the equity share capital of Power Exchange India Ltd. (PXIL), which is 6.64% of the paid-up equity capital. PXIL is India's first institutionally promoted Power Exchange that provides innovative and credible solutions to transform the Indian Power Markets. PXIL, provides nation-wide, electronic Exchange for trading of power and handles power trading and transmission clearance, simultaneously, it provides transparent, neutral and efficient electronic platform. PXIL offers various products such as Day Ahead, Day Ahead Contingency, Any Day, Intra Day and Weekly Contracts. PXIL provides trading platform for Renewable Energy Certificates. Due to erosion of Net Worth of PXIL, PFC has provided the entire investment amount of `3.22 crore as provision for diminution in the value of investment in its books.

1.5. Expansion and Diversification Strategy

In order to sustain the growth momentum, PFC has diversified into funding infrastructure projects in irrigation, waste to energy and water treatment sectors and also into new and emerging sectors like e-mobility, utility scale energy storage etc.

Taking the initiative forward, PFC has recently sanctioned financial assistance to projects in infrastructure sectors including metro rail, petroleum refining, bio ethanol manufacturing and nuclear energy. With PFC's growing balance sheet size, diversification into newer infrastructure areas is expected to gather steam in the coming years. Being a leading lender in India, PFC is well-positioned to wholeheartedly support creation of more assets for production of renewable power.

In order to provide Non-INR Loans to Indian Entities, PFC is also in the process of setting up a subsidiary in GIFT City, Gujarat. There are significant advantages and dispensations in Resource Mobilization and Taxation which can be leveraged through this subsidiary.

As a corporate strategy, PFC has set up a subsidiary – PFC Consulting Limited – and several other business units, such as power exchanges, to strengthen its preparedness for addressing future challenges. PFC has aligned its lending policy for the renewable energy sector with the prevailing business environment to expand its market share. PFC is committed to become the most preferred financial institution in the country across Power, Energy & Infrastructure sectors, while helping achieve India's vision of Net Zero.

2.0. PFC'S STRENGTHS

2.1 Memorandum of Understanding with Govt. of India

PFC has been signing MoU with the Govt. of India since 1993-94 and has consistently been rated 'Excellent' based on MOU targets in respect of various performance parameters. ('Very Good' in FY 2004-05 & FY 2019-20).

2.2 Favorable Credit Rating and Access to Various Cost-competitive Sources of Funds

Our primary sources of funds include equity capital, internal resources, and domestic and foreign currency borrowings. Excellence in performance is also reflected in consistently obtaining the highest Credit Rating from domestic rating agencies and investment grade rating from international credit rating agencies.

PFC Credit Ratings		
Rating Agency	**Long Term borrowings**	**Short Term Borrowings**
Domestic Rating		
CRISIL	'AAA'	`A1+' (Highest Rating)
ICRA	'AAA'	'A1+' (Highest Rating)
CARE	'AAA'	'A1+' (Highest Rating)
International Rating (at par with 'Sovereign' rating)		
Moody's	Baa3	
FITCH	BBB(-)	

We believe that our financial strength and favorable credit ratings facilitate access to various cost competitive funding options. Our borrowings reflect various sources, maturities and currencies; and include bonds, term loans and commercial paper.

2.3 Effective Resource Mobilization

PFC raises the funds through market borrowings of various maturities and currencies. PFC accesses domestic debt markets through various sources which include Public / Private Placement of Long Term Taxable Bonds, Long Term Infrastructure Bonds, Tax Free Bonds, Rupee Term Loans, Commercial papers, etc. PFC also raises its funds from international market through ECBs and Loans from Bilateral and Multilateral Agencies.

2.4 Experienced and Committed Human Capital

PFC has an experienced, qualified and committed management and employee base. Many of PFC's employees, particularly senior management, have worked with PFC for significantly long periods. PFC has an efficient and lean organizational structure relative to the size of its operations and profitability. PFC's personnel Policies are aimed towards recruiting

talented employees and facilitating their integration into the Company and encouraging the development of their skills.

PFC's management has significant experience in the power sector and the financial services industry, which has enabled it to develop a comprehensive and effective project appraisal process, implement a stringent risk management framework, identify specific requirements of power sector projects and offer comprehensive financing solutions and advisory assistance to such projects.

2.5 High Net Worth

Most projects in the Power Sector are highly capital intensive and are large size projects, which require considerable amount of financial resources. Considering the RBI regulatory regime, lending towards each such project is dependent upon the total permissible exposure in respect of the specific borrower. Since PFC has considerably high net worth, it is able to take significant exposure in projects of each borrower. This, in turn, leads to an early financial closure leading to faster capacity addition.

2.6 Robust Appraisal Methodology

Over the years, PFC has developed extensive knowledge of, and experience in the Indian power sector, and has comprehensive credit appraisal policies and procedures, which enable PFC to effectively appraise and extend financial assistance to various power sector projects. PFC follows a systematic institutional and project appraisal process to assess and mitigate project and credit risk. PFC's internal processes and credit review mechanisms reduce the number of defaults on loans and contribute to profitability. PFC believes that its comprehensive credit appraisal and project monitoring processes also result in strong collection and recovery.

2.7 ISO Certification

During the period under review, PFC applied for certificate under ISO 45001:2018 along with existing ISO 9001:2015, both these certifications together form Integrated Management System (IMS). The existing ISO 9001:2015 certification was valid upto 08.01.2022. As a result, PFC's ISO 9001:2015 certification was recertified on 09.01.2022 with validity upto 08.01.2025, whereas ISO 45001:2018 certification was certified on 16.07.2022 having validity till 15.07.2025.

3.0 PERFORMANCE HIGHLIGHTS

3.1 PFC has been a profit-making enterprise right since inception and has registered impressive growth in its net profit every year. The net profit of the company during the half year ended 30.09.2022 is Rs. 5,108 Cr..

3.2 Stage III Assets:

Stage III Assets: Net Stage III Loan Assets (>90 days overdue) are 4,939 Cr. which is 1.31 % of the total Loan Assets as on 30.09.2022.

3.3 PFC's financial performance for the last 2 years based on Ind AS Financials are as under: WW

Particulars	2020-21	2021-22	Upto 30-Sept-2022
Profit before tax	10,207	12,228	6,210
Profit after tax	8,444	10,022	5,108
Dividend (Interim + final)	2,640	3,168	1,386

4.0 AWARDS & ACCOLADES

I. FORTUNE India has ranked PFC 34th Amongst largest 500 Indian Companies as per FORTUNE India 2022 Rankings

II. PFC has received "RAJBHASHA KIRTI PURUSKAR" FIRST PRIZE for year 2020-21 for implementation of Official Language.

III. Power Finance Corporation Ltd. (PFC) was awarded the prestigious South Asian Federation of Accountants (SAFA) Gold Award in Best Presented Accounts / Annual Report Awards (BPA) for the financial year 2020-21 in 'Public Sector Entities' category.

IV. During the year, PFC has been conferred the ICAI (Institute of Chartered Accountants of India) Silver award for excellence in financial reporting for the financial year 2020-21 in 'Public Sector Entities' category.

V. "Green Urja Energy Efficiency Award" was conferred to PFC by ELETS for being the Best Renewable Energy Financing Institution.

VI. PFC has been rated 2nd in the "Swachhta Ranking" by New Delhi Municipal Council in the category of Offices in NDMC area.

5.0 OPERATIONAL HIGHLIGHTS

PFC sanctioned loans amounting to `51,616 Crore during fiscal 2021-22 to State, Central, Private and Joint Sector entities. An amount of `51,242 Crore was disbursed during the same period. The loan assets as at 30.09.2022 stand at ` 3,76, 696 Crore.

6.0 RESOURCE MOBILISATION

6.1 Domestic

PFC mobilized funds amounting to Rs. 38,229.20 crore from the domestic market during FY 2022-23 till 31.12.2022. Out of the above, Rs. 24,991.90 crore was raised through issue of taxable bonds in the nature of debentures, Rs. 1,637.30 crore through Capital Gain Bonds (excluding allotment of Lot – 2 of Dec 2022) and Rs. 11,600 crore through long term and short term loans.

6.2 External

PFC diversified its borrowing through tapping international market. During FY 22-23 till 31.12.2022, PFC raised foreign currency equivalent to USD 885 million (eq. INR 7290.75 crores)

7.0 NEW BUSINESS INITIATIVES

PFC has modified its Memorandum of Association (MoA) to fund schemes related to e-vehicles, charging infrastructure, electrical and electro mechanical systems of large projects like lift irrigation, sewage treatment plants, smart cities etc. Recently, PFC has also received approval to fund infrastructure projects and accordingly, modified its MoA to fund infrastructure projects.

PFC has provided financial assistance to projects such as metro rail, petroleum refining, desalination plant, bio ethanol manufacturing and nuclear energy. PFC is also looking forward for funding other infrastructure projects such as ports, airports, roads, etc.

In support of GoI's vision towards Net Zero, PFC has funded Electric four Wheelers and electric cargo vehicles by providing financial assistance of ~Rs.630 cr for deployment of 5000 (4 Wheelers) and 1000 (3 Wheelers) primarily in Delhi- NCR to Gensol Engineering Limited which will operate the EVs as fleet owner.

In order to ameliorate the cash flows in the Power Sector and to introduce payment discipline among Discoms, Ministry of Power (MoP) on 3rd June 2022 has notified 'Electricity (Late Payment Surcharge and Related Matter) Rules, 2022'. Accordingly, PFC has formulated a policy for providing financial assistance to State DISCOMs for clearance of Outstanding Dues of Suppliers under LPS Rules. However, due to timing gap between receipts of over dues from Discoms and servicing of debt by 'Supplier', there is a perceived risk of defaults by 'Supplier'. Taking above into consideration PFC has also formulated a policy to bridge the timing gap between receipt of over dues from Discoms & servicing of obligations by the 'Supplier'

8.0 RISK MANAGEMENT

As a part of Risk Management, the Corporation has to manage various risks associated with its business. For managing such risk, PFC has an integrated risk management framework which identifies the risk(s) impacting PFC and the appropriate measures to mitigate the same. The risks are monitored at various levels throughout the Corporation. Departmental heads are responsible for monitoring and periodically reviewing the risk profile of their respective function. A Risk Management Sub Committee (RMSC) has been formulated which comprises of Executive Director level members. Inputs against identified risks are obtained from various departments and the status of the risks is submitted to the RMSC. The RMSC reviews the various risks and provides guidance / corrective action wherever required. The Board Level Risk Management Committee (BLRMC) comprising of Board level members are then appraised on the key risks associated with the business, its root causes and measures taken to mitigate the same. The minutes of the BLRMC are then submitted to the Board of Directors.

Further, to monitor some key risk associated with the lending business, PFC has constituted separate committee(s). To monitor the liquidity and interest rate risk, PFC has an Asset Liability Management Committee (ALCO) headed by Director (Finance). The Asset Liability Management framework includes periodic analysis of long term liquidity profile of asset receipts and debt service obligations. Such analysis is carried out on a periodic basis in various time buckets and is being used for critical decisions regarding the time, volume and maturity profile of the borrowings and creation of mix of assets and liabilities in terms of time period (short, medium and long-term) and in terms of fixed and floating interest rates.

The Company has put in place a Board approved "Policy for Management of Risks on Foreign Currency Borrowings" to manage and hedge risks associated with foreign currency borrowings which prescribes the structure and organization for management of associated risks.

The Company enters into various derivative transactions viz. principal only swaps, options and forward contracts for hedging the exchange rate risk. As per extant policy, a system for reporting and monitoring of risks is in place wherein Committee for Management of Risks on Foreign Currency Borrowings, consisting of senior executives of the Company, monitors the foreign currency exchange rate. These derivative transactions are done for hedging purpose and not for trading or speculative purpose. The policy lays down the appropriate systems and controls

to identify, measure and monitoring the currency risk for reporting to the Management

Further, in line with RBI's directions, PFC has appointed Chief Risk Officer (CRO) to implement the Risk Management Framework. The CRO directly reports to the Chairman & Managing Director. The CRO is majorly concerned with controlling credit risk, liquidity risk, market risk, operational risk besides reputational risk, strategic risk and legal risk. Further, CRO is also involved in the process of identification, assessment, monitoring and mitigation of risks.

9.0 INSTITUTIONAL DEVELOPMENT OF BORROWERS

9.1 Categorisation of Power Utilities By PFC (as on 31st December 2022)

For purposes of funding, PFC classifies State Power Generation and Transmission utilities into A++, A+, A, B, C and Non-responsive categories. The categorisation (biannually) of State Power Generation and Transmission utilities is arrived based on the evaluation of utility's performance against specific parameters covering operational & financial performance including regulatory environment, generation of audited accounts, etc. as per PFC categorization policy.

With regards to Power Distribution utilities (including SEBs / utilities with integrated operations), PFC Categorisation policy provides for adoption of MoP's Integrated Ratings by aligning such ratings/gradings with PFC's standard categories of A+, A, B, C and D. From 10th Integrated Ratings onwards, Private Power Distribution utilities and Power departments are also covered in the Integrated Rating exercise.

The categorisation enables PFC to determine pricing of loans and stipulation of security to the power utilities. As on 31st December 2022, 161 utilities were categorized with 14 as 'A++', 44 as "A+", 40 as "A", 15 as "B", 44 as "C", 1 as "D" and 3 as "Non-Responsive".

9.2 Ministry of Power's Integrated Rating Framework For Power Distribution Utilities

Ministry of Power, as part of its various initiatives, developed an Integrated Rating Methodology covering the Power Distribution Utilities keeping in view of the poor financial health of the Power Distribution Utilities due to multifarious factors.

The objective of the integrated rating is to rate all utilities in power distribution sector on the basis of their performance and their ability to sustain the performance level. The methodology adopted attempts to objectively adjudge the performance of distribution utilities against various parameters broadly classified under i) Financial Sustainability parameters ii) Performance Excellence Parameters and iii) External Environment parameters. The evaluation of certain parameters would cover current levels of performance as well as relative improvement from year to year. The Financial Sustainability parameters viz. ACS-ARR Gap (Cash Adjusted), Days Payable to Gencos & Transcos, DSCR (cash adjusted), etc. carry weightage of 75% and the Performance Excellence parameters viz. Billing Efficiency, Collection Efficiency, etc. carry weightage of 13%. External Environment parameters relating to Subsidy Realised (Last 3 FYs), Loss Takeover by State Government, Government Dues, tariff cycle timelines, etc. have been assigned weightage of 12%.

The methodology provides for assigning specific disincentive marks for certain non-compliances viz. audit qualifications, tariff cycle delays, uncovered revenue gap, regulatory assets, etc. Further, there are red card metrices such as auditor's adverse opinion, non-availability of audited accounts and default to banks/FIs which result in ineligibility for A+, A grades. The negative marks for such parameters give necessary depth to rating methodology.

From 10th Integrated Ratings onwards, the exercise covers all state distribution utilities (including SEBs/ utilities with integrated operations), private distribution utilities and Power Departments. The integrated rating is carried out on an annual basis by independent agency. McKinsey & Co., Inc. has been appointed as the consultant for carrying out the Integrated Rating exercise. PFC has been nominated by MoP as the nodal agency for coordinating the activities relating to integrated rating of power distribution utilities including appointment of independent agencies.

So far, ten Annual Integrated Ratings have been approved by Ministry of Power with the last i.e. Tenth Annual Integrated Ratings covering 71 power distribution utilities including state & private sector discoms and state power departments having been released in August 2022.

The Eleventh Integrated Rating exercise for rating year FY 2021-22 is in progress.

9.3 Annual Performance Report of State Power Utilities

PFC has been publishing the Report on Performance of State Power Utilities (SPUs) annually. The Report covers State Power Utilities in all states and UTs and major private distribution companies, offering a comprehensive insight into the Indian power sector. The Report for FY 2020-21 covering 117 utilities was released by Hon'ble Cabinet Minister of Power and New & Renewable Energy at the Conference of Power and

New & Renewable Energy Ministers of States & UTs in October 2022. The Report publishes key financial and operational parameters e.g. profitability, gap between average cost of supply and average realization (Rs./kwh), net worth, borrowings, receivables, payables, AT&C losses (%) and energy consumption pattern of the sector at utility, state and national level. New parameters – Cash Adjusted Gap and DSCR (Cash Adjusted) – have been added in this edition to analyse the performance of distribution utilities on cash basis. The Report is part of PFC's effort to provide a reliable database on the performance of state power utilities — offering critical inputs for policy interventions and monitoring the progress of various GoI schemes in the power sector. The Report for FY 2021-22 is under compilation

10.0 FINANCING TO GENERATION PROJECTS

10.1 Renewable Energy Projects

PFC seeks to encourage the energy transition to renewable energy sources by financing loans at competitive rates through schemes and policies tailored for renewable energy projects. A dedicated Unit to appraise Solar and Wind projects has been established, to provide focused attention and faster turnaround timelines. Of disbursements to generation projects, 44% was to non-fossil fuel based projects, during FY 2021-22. By end of FY 2021-22, loans to renewable energy projects, comprised 9.85% of PFC's total loan assets (Rs 20,167 crores to non-large hydro projects and Rs 16,610 crore of large hydro projects).

Renewable capacity in the country needs significant augmentation for overall systems to have optimal energy mix. During FY 2022-23 as on 31st December, 2022, the Company has sanctioned Rs. 6,925 Crore and disbursed an amount of Rs. 5090 crore. The cumulative financial support provided by the Company for renewable energy schemes is Rs. 69,365 crore out of which Rs. 42,088 crore has been disbursed till 31st December, 2022.

10.2 Conventional Projects (Thermal & Large Hydro)

Thermal power generation comprises a major proportion of India's installed capacity. During FY 2022-23 as on 31st December, 2022, the Company has sanctioned Rs. 9,729 crore and disbursed an amount of Rs. 9,078 crore. The cumulative financial support provided by the Company for thermal generation schemes is Rs. 3,56,483 crore out of which Rs. 2,97,670 crore has been disbursed till 31st December, 2022.

Hydro generation capacity in the country needs significant augmentation for overall systems to have optimal energy mix. During FY 2022-23 as on 31st December, 2022, the Company has sanctioned Rs. 1,767 Crore and disbursed an amount of Rs. 941 crore. The cumulative financial support provided by the Company for hydro generation schemes is Rs. 87,781 Crore out of which Rs. 42,928 Crore has been disbursed till 31st December, 2022.

11.0 RENOVATION, MODERNISATION AND LIFE EXTENSION

11.1 Conventional Projects

During FY 2022-23 as on 31st December, 2022, the Company has sanctioned Rs.2311 Crore and disbursed an amount of Rs. 233 Crore against R&M of thermal and hydro projects. The cumulative financial support provided by the Company for R&M of thermal and hydro generation schemes is Rs. 27,061 Crore out of which Rs. 12,950 Crore has been disbursed till 31st December, 2022.

12.0 MEMORANDUM OF UNDERSTANDING WITH GOVT. OF INDIA

For the Financial Year 2022-23, Memorandum of Undertaking (MoU) has been signed between PFC and the Ministry of Power.

13.0 HUMAN RESOURCE MANAGEMENT AND TRAINING

13.1 Human Resource Management

The company has put in place effective human resource acquisition and maintenance function, which is benchmarked with best corporate practices designed to meet the organizational needs. This apart from other strategic interventions leads to an effective management of Human Resources thereby ensuring high level of productivity.

The Industrial Relations within the organization has been very cordial and harmonious with the employees committing themselves entirely to the objectives of the organization. There was no mandays lost during the year under review. The attrition rate for the period from 1st April 2022 to 31st December 2022 is less than 1%.

13.2 Welfare Measure

The Corporation follows good management practices. The employees of the company have access to the Top Management officials thereby contributing effectively in the management and growth of the Corporation.

The commitment of the workforce is ensured through an effective package of welfare measures which include comprehensive insurance, medical facilities and other amenities which lead to a healthy workforce.

13.3 Human Resource Development & Training

During FY 2022-23 (up to 31st December 2022), the focus on conducting in-house programs was maintained to ensure specific skill development in line with the corporate goals. Customized training programs like Workshop on AML, KYC, CFT, General Management Programs for executives, Exposure Norms & Capital requirements for NBFCs, Fraud Monitoring & Recovery Aspects of Loan Assets, Stressed Asset Management with Focus on IBC, Implementation of ISO 45001: 2018 - OHS Standards, Orientation Program for Newly joined executives, Pump Storage for Hydro Projects, Outbound Experiential Learning for Women Employees, Awareness Workshop on Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal) Act, 2013, Conduct, Discipline & Appeal (CDA) Rules of PFC, Office Etiquette, Filling of Property Return, CDA Rules & PIDPI, etc. were organized along with other need-based programs.

As on 31st December 2022, 14 Nos. of In-house training programs were organized by PFC for its employees. A total of 1470 man-days were achieved through conducting various in-house programs and by sponsoring PFC employees to the programs organized by other training agencies.

13.4 Training & Capacity Building Process under RDSS

PFC has been entrusted with the task of training and capacity building under Revamped Distribution Sector Scheme (RDSS) by Ministry of Power. Initially, PFC has engaged NPTI for imparting training to the employees of state power utilities, under the scheme. Over 5000 DISCOM officials across India have been trained on aspects of Smart metering and AMI through 141 training programs held under RDSS.

Additionally, PFC is also collaborating with multilateral agencies and premier educational institutions for training of Discom personnel on various other topics, which is under advanced stages of consideration. PFC is also coordinating with PSSC for enhancing the capacity and employability skills of unemployed youth to meet the growing demand in the power sector.

14. CORPORATE SOCIAL RESPONSIBILITY (CSR) AND SUSTAINABLE DEVELOPMENT (SD):

PFC through its CSR initiative is undertaking projects for sustainable development focusing on the thrust areas mentioned in its CSR policy such as ensuring environmental sustainability, skill development leading to employment for unemployed youth belonging to weaker sections of society, basic education, health, sanitation, drinking water etc. PFC through its CSR initiatives is working for upliftment of women and supporting persons with disabilities. PFC is implementing CSR projects across the country covering remote and backward area.

During the unprecedented time of Covid-19 pandemic, PFC supported various districts in Rajasthan (provided Covid-19 relief measures in Kota district amounting to Rs.0.50 crore & Medical Infrastructure in District Hospital in Pratapgarh district amounting to Rs 0.51 crore), Uttar Pradesh (provided Oxygen Concentrators in Covid care centres in Siddharthnagar district amounting to Rs.0.55 crore) and Manipur (provided Medical Infrastructure in Covid care centres, CHCs, PHCs in Churachandpur district amounting to Rs.1.74 crore). PFC till date has contributed Rs.300 crore to PM CARES Fund.

14.1 CSR Expenditure:

For the FY 2022-23, PFC earmarked a budget of Rs.178.58 crore (i.e. 2% of the average stand-alone PBT of the three immediately preceding financial years as per Companies Act, 2013). PFC sanctioned projects worth Rs.159.66 crore (including Rs. 10.71 crore being carried forward from previous years) under CSR activities till 31st Dec 2022.

14.2 Major initiatives:

14.2.1 Health and Response to COVID 19 Pandemic: PFC has contributed Rs.50 Crore to PM CARES Funds in FY 2022-23. PFC has also sanctioned health related project of Rs. 22.09 crore. These projects aims to provide medical equipment like CT scan, tomography scanner, ambulances etc. to different reputed hospitals in India. Some of the projects are to be implemented in North East region.

14.2.2 Environment Sustainability: During FY 2022-23, PFC also focused on taking up projects related to Environment Sustainability. PFC sanctioned Rs 30.37 crore for construction of State of Art Building for Interdisciplinary Centre for Energy Research (ICER) in IISc Bengaluru which aims at supporting various research based activity that can lead to sustainability in Energy Sector.

14.2.3 Skill Development /Basic Education:

During FY 2022-23, PFC sanctioned Rs 13.85 crore for Upgradation of Education and conducting Skill development & Livelihood projects. These include construction of hostel building for Tribal students in Dadar and Nagar Haveli, livelihood programme for training of 500 women on oyster mushroom cultivation and skill development of 1000 nos. of youth belonging to under privileged sections in power sector.

14.2.4 List of major Projects sanctioned during FY 2022-23:

- Contribution of Rs.50 Crore to PM CARES fund set up by the Central Government as part of preventive initiatives against COVID 19 Pandemic
- Providing necessary medical equipment in Sreevalsam Institute of Medical Sciences (SIMS) Hospital in Malappuram District, Kerala amounting to Rs.0.97 crore
- Construction of G+1 Hostel building in 'Vanvasi Kalyan Ashram" premises in Khanvel, Silvassa amounting to Rs.4.77 crore
- Providing necessary medical equipment in Dr. Hedgewar Institute of Medical Sciences and Research (DHIMSR) Hospital in Amravati District, Maharashtra amounting to Rs.1.91 crore
- Procurement of Advance life support (ALS) ambulances and other mobility support vehicles for medical educational institutions of the Health Department, Govt. of Manipur, amounting to Rs.2.79 crore
- Development of AFC Complex at Lungleng, Aizwal District, Mizoram amounting to Rs.5.47 crore
- Supply, installation and commissioning of 50 nos. of Water ATM (WATM) in 50 locations of Basti region of Uttar Pradesh amounting to Rs.3.97 crore
- Construction of Emergency Response Centre (ERC)' building near Badrish Lake in Badrinath town amounting to Rs.17.58 crore
- Construction of State of Art Building for Interdisciplinary Centre for Energy Research (ICER), IISc Bengaluru, Karnataka' through IISc Bengaluru amounting to Rs.30.37 crore.
- Project for creating sustainable livelihood opportunities for 500 women through oyster mushroom cultivation, marketing and branding, through District Administration Aurangabad amounting to Rs.7.05 crore
- Providing additional rooms, toilets and drinking water facility in Primary Health Centers (PHC), Schools, Anganwadis and construction of Gram Panchayat Building in selected Mandals in Suryapet District, Telangana through District Collector, Suryapet amounting to Rs.5.77 crore
- Supply, Installation and Commissioning of 64 Slice Computed Tomography Scanner with 5-year warranty in MNJ Institute of Oncology & Regional Cancer Centre (MNJ), Hyderabad through MNJ, Hyderabad amounting to Rs.5.00 crore.
- Providing skill development training to 1000 nos. of persons belonging to under privileged sections of the society in various locations in India amounting to Rs.2.02 crore.
- Procurement of CT scan machine at Naga Hospital Authority Kohima amounting to Rs.3.55 crore.

15.0 PFC CONSULTING LTD (PFCCL), A WHOLLY OWNED SUBSIDIARY OF PFC

15.1 PFC Consulting Ltd (PFCCL) was incorporated on March 25, 2008 as a wholly owned subsidiary of Power Finance Corporation Limited to provide consultancy services to the Power Sector. PFCCL commenced its business on April 25, 2008.

PFCCL provides consultancy and advisory services for power sector projects. It provides fee-based services to state power utilities, power distribution licensees, IPPs, public sector undertakings and SERCs. PFCCL acts as a bid process coordinator for ITP scheme projects.

PFCCL also provides consultancy services related to bid process coordination for power procurement preparation of detailed project reports; transaction advisory services and project management consultancy. Besides others, it provides consultancy services for renewable and non-conventional energy schemes as well as services related to various GoI schemes.

Under the Ministry of Power's initiative for the development of Ultra Mega Power Projects (UMPPs) each having a capacity of about 4000 MW each, So far 4 UMPPs have been transferred to successful bidders.

PFCCL is also acting as a Bid Process Coordinator for development of Independent Transmission Projects (ITPs). So far 33 ITPs have been transferred to successful bidders.

PFCCL is also one of the implementing partners of the Govt's initiative of privatization of distribution companies operating in the Union Territories. PFCCL has also developed PRAAPTI Portal and has successfully upgraded the same as per the provisions of LPS Rules 2022. PFCCL is also playing a key role in assisting MoP in development of Special Manufacturing Zone, auction of coal linkages as per the provisions of SHAKTI policy etc.

15.2 Services Offered

- **Smart Solutions:** Smart solutions to improve

performance & processes, productivity & pro-active planning.

- **Policy formulation support:** Support to Government/ Regulators for formulation of Policies, Regulatory framework and Guidelines & SBDs.
- **Transaction Advisory:** End-to-End solution in Transaction Advisory Services across different areas in power sector.
- **Project Development:** Project Development & implementation of various GoI initiatives.
- **PMA/PMC:** Project management & change agents focusing on revamped solutions & aiming for loss reduction.
- **Other Services:** Strategy, Tariff Support, fund mobilization and other aspect of power sector.

15.3 Footprints

Till date, consultancy services have been rendered for 77 Clients spread across 27 States/UTs namely Arunachal Pradesh, Andhra Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Goa, Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Puducherry, Punjab, Rajasthan, Telangana, Tripura, Uttar Pradesh, Manipur, Uttarakhand, Sikkim and West Bengal. The total number of assignments undertaken as on date is 168. The profile of clients is as below:

Clients	No.
States Utilities	42
Licensees/ Municipal Bodies/IPPs/JVs	13
Public Sector Undertakings	9
State Governments	8
Regulatory Commissions	3
Central Govt. Departments/Ministries	2
Total	77

REC LIMITED

1. REC Limited (REC) was incorporated as a Company under the Companies Act, in the year 1969 with the main objective of financing rural electrification schemes in the country. The mandate/object clause of REC was expanded from time to time and in 2022, it was again expanded to tap emerging business opportunities in the Logistics & Infrastructure sector. In the year 1992, REC was notified as a Public Financial Institution under Section 4A of the Companies Act, 1956 (corresponding Section 2(72) of the Companies Act, 2013). In the year 1998, REC was registered as a Non-Banking Financial Company (NBFC) under Section 45 IA of the RBI Act, 1934. The Government of India upgraded REC as a Schedule "A" PSU in the year 2001. REC was granted Mini Ratna Grade-I Status in the year 2002 and thereafter conferred with "Navratna Status" in May, 2008. REC has also been categorized as an Infrastructure Finance Company (IFC) by Reserve Bank of India (RBI) in September 2010. The equity shares of REC are listed on the National Stock Exchange of India Limited (NSE) and BSE Limited (BSE) since March, 2008. REC was conferred with "Maharatna Status" on September 21, 2022 by the Department of Public Enterprises (DPE), Ministry of Finance, Government of India.

REC is a premier financial institution for development of Power Sector in the country, with the objective of financing schemes for extending and improving the rural electricity infrastructure. REC finances projects in the complete power sector value chain, encompassing generation, transmission, and distribution segments. REC provides financial assistance to State Governments, Central/State Power Utilities, Independent Power Producers and Private Sector Utilities, which are critical to the projected addition of installed capacity in the country. The Registered Office of REC is located at New Delhi and its Corporate Office is in Gurugram, Haryana with Regional Offices in 22 States across the country, in addition to a Training Institute viz. REC Institute of Power Management & Training (RECIPMT) at Hyderabad. REC also has one wholly owned subsidiary REC Power Development and Consultancy Limited (RECPDCL), involved in significant work in the fields of smart metering, Distribution Infrastructure Projects, TBCB and Transmission Projects and in the field of consultancy, etc.

REC as nodal agency has played an active role in implementing various schemes and programmes of Government of India, in the recent past, to improve the financial and operational performance of distribution companies (DISCOMs). The policy framework of Government to support distribution sector includes initiatives like Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY), Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA), Ujwal DISCOM Assurance Yojana (UDAY), Integrated Power Development Scheme (IPDS), National Electricity Fund (NEF), Liquidity Infusion Scheme (LIS) etc., to name a few.

Further, REC is currently a nodal agency (along with PFC) for Revamped Distribution Sector Scheme (RDSS), for revamping the distribution sector which has been struggling for long with various financial & operational issues. Besides, REC assists Ministry of Power in monitoring of the Ujjwal Discom Assurance Yojana (UDAY), Power for All and Late Payment Surcharge (LPS) scheme.

2. Highlights of Performance (during 2021-22)

2.1 The highlights of performance of REC Limited for the financial year 2021-22 are given below: -

(₹ in crore)

Particulars	Amount
Loans Sanctioned	54,421.76
Disbursements	64,150.21
Subsidy under DDUGJY (including DDG component) & SAUBHAGYA	5,317.66
Recoveries (including interest)	91,681.72
Resource Mobilization	73,962.93
Profit before Tax	12,424.90
Profit after Tax	10,045.92
Net Worth	50,985.60
Dividend (Interim + Final)	3,021.62
Business per employee*	354.16

*(Business per employee = Disbursements + Recoveries / No. of Employees as on March 31, 2022)

2.2 Memorandum of Understanding:

The rating of performance of REC in terms of Memorandum of Understanding (MoU) signed with the Power Finance Corporation (PFC) for the financial year 2021-22 from Department of Public Enterprises is awaited.

2.3 Share Capital:

As on December 31, 2022, the Authorised share Capital of the Company was ₹5,000 crore consisting of 500 crore equity shares of ₹10/- each.

During the financial year 2022-23, REC has issued bonus shares in the ratio of 1:3 i.e. one (1) bonus equity share of ₹10/- each fully paid-up for every three (3) existing equity shares of ₹10/- each fully paid-up, by capitalizing a sum of ₹6,58,30,60,000 out of the sum standing to the credit of its 'Securities Premium Account'. After the allotment of the bonus shares and as on December 31,

2022, the paid up share capital of the Company is increased to ₹2,633.22 crore, consisting of 2,63,32,24,000 equity shares of ₹10/- each from ₹1,974.92 crore.

As on December 31, 2022, Power Finance Corporation Limited (PFC) held 1,38,59,93,662 equity shares i.e. 52.63 % of the paid up equity share capital of the Company and is the holding Company of REC Limited.

2.4 Mobilization of Funds:

The total market Borrowing Programme of the Company for the financial year 2022-23 is projected as ₹85,000 crore and against the same the Company has mobilized ₹58,935.35 crore up to December 31, 2022 and the anticipated mobilization of funds for remaining part of the year is ₹26,064.65 crore.

The domestic debt instruments of REC continued to enjoy "AAA" rating, the highest rating assigned by CRISIL, CARE, India Ratings & Research and ICRA - credit rating agencies. Further, REC enjoys international credit ratings at par with sovereign ratings of "Baa3" and "BBB-" respectively from Moody's and Fitch, the International Credit Rating Agencies.

3. Progress made during the financial year 2022-23 (upto December 31, 2022) & anticipated targets to be achieved during the remaining period of the year i.e. upto March 31, 2023:

3.1 Sanctions:

REC has sanctioned financial assistance as detailed below to various State & Private Sector Power entities:

(₹ in crore)

Sl. No	Particulars	FY 2022-23	
		Achievements from April 1, 2022 to December 31, 2022	Anticipated targets from January 1, 2023 to March 31, 2023
1	Transmission & Distribution (including DDUGJY)	19,381.42	6,625
2	Generation Projects	38,782.51	4,111
3	Renewable Energy	21,021.11	2,529
4	Infrastructure and Logistics	-	40,103.55
5	SLTTL – COVID 19 & UDAY Limit Relaxation	-	-
6	Medium Term Loan, Short Term Loan, Late Payment Surcharge, Revolving Bill Payment Facility & Special Loan, etc.	98,149.49	600
	Total	**1,77,334.53**	**53,968.55**

3.2 Disbursements:

The details of Disbursements are as below:

(₹ in crore)

Sl. No	Particulars	FY 2022-23	
		Achievements from April 1, 2022 to December 31, 2022	Anticipated targets from January 1, 2023 to March 31, 2023
1	Transmission	2,338.41	22,318
2	Distribution	29,664.34	
3	Generation	15,240.02	
4	Renewable	9,334.98	
5	Short Term Loan	2,329.00	
6	Power Infrastructure	1,000.00	
	Total	**59,906.75**	**22,318**

3.3 REC Performance Highlights:

Sl. No	Financial Parameters	Unit	FY 2022-23		
			Achievement as at September 30, 2022 (Annualised)	MoU targets for the year 2022-23	% Achievement
1.	Revenue from Operations	₹ crore	38,907	43,420	90
2.	EBTDA as a percentage of Income	%	32.86	37.00	89
3.	Return on Net Worth	%	19.37	21.05	92
4.	Asset Turnover Ratio	%	9.16	11.59	79
5.	Return on Capital Employed	%	10.53	12.24	86
6.	Net NPA Ratio/ Loan Assets	%	1.29	1.33	Within Limits

*Being a Listed CPSU, the desired financial data as on December 31, 2022, is under finalisation and are further subject to the approval of the Board of the Directors of the Company.

3.4 Sanctions under National Electricity Fund:

NEF Scheme provides interest subsidy to State Power Utilities, Distribution Companies (DISCOMs) based on achievement of pre-defined reform parameters against the interest paid on loans availed by them – both in public and private sector, for capital investment in distribution sector.

Budgetary outlay was envisaged at ₹8,466 crore, which was planned to be released over 14 years w.e.f. FY 2012-13 up to FY 2027-28, would cover payment of interest-subsidy to the borrowers, service charges to the nodal agency, payment to independent evaluators and other incidental charges.

Under NEF, interest subsidy spread over 14 years, for loan approved during financial years 2012-13 & 2013-14 against the sanction of 920 projects with loan component of ₹23,973 crore for 24 DISCOMs in 14 States and ₹20,486 crore loan has been released till December 2022.

Ministry of Power has released so far ₹1448.15 crore of interest subsidy to the State Power Utilities based on evaluation i.e., Reduction of AT&C losses and Revenue Gap as carried out by Independent Evaluator and Nodal Agency till March 31, 2022.

For the year 2022-23, the Budget Estimates (BE) was approved by the Ministry of Power amounting to ₹583 Crore and against the said targeted BE, the achievement for release of subsidy from April 01, 2022 to December 31, 2022 and anticipated target from January 01, 2023 to March 31, 2023 to the State DISCOMS are as under:

(₹ in crore)

Information for the period	Amount
Subsidy approved by Steering Committee and released to the State Discoms from April 1, 2022 to December 31, 2022	394
Anticipated subsidy to be approved by Steering Committee and likely to be released to the State Discoms from January 1, 2023 to March 31, 2023	189
Total	**583**

3.5 Project Monitoring:

REC has a well-established Project Monitoring Department that carries-out regular site visits and monitoring of REC funded under construction as well as commissioned Generation, Renewable, T&D and Irrigation projects to assess the status of implementation of under-construction projects or the performance of commissioned projects. REC has duly approved Project Monitoring Guidelines & the projects are identified by Project Monitoring Department at the beginning of the financial year based on their criticality/performance in consultation with all Operating Divisions & Regional/State Offices and approval is taken from the competent authority. The project list is reviewed quarterly. In addition to it, if there is urgent requirement of monitoring of any project which is not in approved list, the same is also monitored by the Project Monitoring Department.

In FY 2022-23, 31 nos. of projects (28 under-construction and 3 commissioned) have been identified for monitoring involving sanctioned cost of ₹1,27,635 crore. Against the target, total 26 nos. of projects have been monitored till December 31, 2022 having sanctioned cost of ₹71,764 crore. The balance 5 projects will be monitored till March 31, 2023.

Category wise breakup of target and monitored projects is as below:

Category	Under-Construction		Commissioned		Total	
	Target	Achievement	Target	Achievement	Target	Achievement
Thermal Generation	10	8	2	4	12	12
Hydro Electric Generation	3	2	0	0	3	2
Transmission & Distribution	4	2	0	0	4	2
Renewable Energy	4	6	1	3	5	9
Irrigation	6	1	0	0	6	1
Coal Block	1	0	0	0	1	0
Total	**28**	**19**	**3**	**7**	**31**	**26**

3.6 Awards:

During the year 2022-23 (till December 31, 2022), REC has been accorded 'Platinum' recognition at the prestigious Titan Business Awards in two categories i.e, Financial Services and Fastest-growing Company of the year. REC Ltd has been awarded as the 'Best PSU' in the Financial Services category and also as the 'Best Navratna' by Dun & Bradstreet for FY21-22. REC bagged the 'Best Public Sector IT Project ' award at the Technology Excellence Awards, 2022. Further, REC has also been recognized as one of the 'Best Brands' of 2022 by The Economic Times from a pool of 140 brands across the country. Recently, REC has been declared the winner of "The Golden Peacock Award for Excellence in Corporate Governance" for the year 2022 by the Institute of Directors (IoD). This award is regarded as benchmark of Corporate Excellence worldwide.

4. Subsidiary Company - REC Power Development and Consultancy Limited (RECPDCL)

REC Power Development and Consultancy Limited (RECPDCL) is a wholly owned subsidiary of REC Limited and an ISO 9001:2008 (Quality Management System), ISO 14001:2004 (Environmental Management System), OHSAS 18001:2007 (Occupational Health & Safety) certified company.

RECPDCL is providing consultancy and fee based services in the areas of rural electrification, AT&C Loss reduction strategies, IT implementation work including setting up of Data Centre, Customer care centre, etc. with GIS integration, Implementation of Smart Grid Projects covering Smart Metering with AMI, Construction of Solar PV Plants, SCADA implementation, MRI/AMR based meter reading & billing works, DPR preparation & Project Management Consultancy for Power Distribution projects, Strengthening works of Power Distribution, Energy Efficiency projects and Quality & Quantitative Surveillance/ Inspections of the works executed.

RECPDCL is rendering expert consultancy services to power utilities across the country i.e. in 48 Distribution Companies (DISCOMs)/Power Department and 5 Co-operative societies in 25 States and 5 UTs.

Progress of work done/achievement during the current year 2022-23 (Upto December 31, 2022)

During the current financial year 2022-23 (upto December 31, 2022), RECPDCL has been working on its ongoing project related to:

A. Revamped Distribution Sector Scheme (RDSS):

a) During the financial year, RECPDCL has undertaken new assignments and has been appointed as PMA for preparation of Action plan and DPR by the states namely: (i) Arunachal Pradesh (ii) Meghalaya (iii) Chhattisgarh (iv) Telangana (v) Goa (vi) Puducherry (vii) Jammu & Kashmir (viii) Andaman & Nicobar (ix) Ladakh (x) Manipur and (xi) West Bengal.

b) RECPDCL is carrying out the works of PMA under Revamped Reformed Based Result linked Distribution Sector Scheme by MSEDCL through competitive bidding.

c) Project Implementing Agency (PIA) projects:

RECPDCL has been awarded as Project Implementation Agency (PIA) for implementation of Smart metering project in different DISCOMs:

i. AMI implementation of 23.66 lakh smart meters in Paschim Gujarat Vij Company Limited (PGVCL)

RECPDCL has been awarded the work of installation of 23.66 lakh Smart Meters in PGVCL under RDSS Scheme. Tender for appointment of AMISP has already been floated and Technical

and Financial bid evaluation is under process.

ii. AMI implementation of 17.35 lakh smart meters in Dakshin Gujarat Vij Company Limited (DGVCL)

RECPDCL has been awarded the work of installation of 17.35 lakh Smart Meters in DGVCL under RDSS Scheme. Tender for appointment of AMISP has already been floated and Technical and Financial bid evaluation is under process.

iii. AMI implementation of 17 lakh smart meters in Kerala State Electricity Board Limited (KSEBL)

RECPDCL has been awarded the work of installation of 17 lakh Smart Meters in KSEBL under RDSS Scheme. Tender for appointment of AMISP has been finalised.

iv. Other PIA projects:

IT Implementation Works in GED, Goa under RAPDRP Part-A

B. Project Implementing Agency (PIA) for other projects:

Project Implementing Agency (PIA) for other projects namely (i) Implementation of urban distribution infrastructure in Jammu& Kashmir under urban schemes [IPDS, PMDP (Package A&B) and R-APDRP part-B] (ii) Installation of 1.27 lakhs Smart Meters in Jammu & Srinagar towns under PMDP (U) Scheme. (iii) Installation of Smart meters for 3.0 Lakhs consumers in UT of Jammu & Kashmir on DBFOOT basis, Lot-A (iv) Installation of Smart meters for 2.5 Lakhs consumers in UT of Jammu & Kashmir on DBFOOT basis, Lot-B (v) Smart Metering Implementation for 60,000 Consumers in UT of Ladakh. (vi) Handholding support to power Dept. Ladakh. (vii) National feeder Monitoring system for monitoring of all distribution feeders across the country at central level.

C. Consultancy services for Energy Audit and analytical support for fiscal improvement of UP DISCOM

RECPDCL has been awarded the work for providing Consultancy services for Energy Audit and analytical support for fiscal improvement of UP DISCOM floated by UPPCL.

D. RQM & Other works:

- RQM works in Rajasthan
- Review of capitalization of assets for DERC
- Project Management Consultant (PMC) & Annual Maintenance Consultant (AMC) for M/s Energy Efficiency Services Limited (EESL) under Street Lighting National Programme (SLNP) Project in the States of Rajasthan, Chhattisgarh, Jharkhand, Punjab, Chandigarh, Maharashtra and Uttar Pradesh.
- Power Management System for HPPC in UHBVN and DHBVN
- PMA Services under PMDP(U) & PMDP(R) for JPDCL & KPDCL in UT of J&K.

E. Project Management Agency (PMA) Projects:

- PMA for implementation of Advanced Metering Infrastructure (AMI), SCADA & Distribution Transformer Monitoring Unit (DTMU) for CED under National Smart Grid Mission.
- PMA Services under DDUGJY KPDCL of Kashmir.
- Consultancy Services for assisting and supporting in Project Management to MSEDCL under RDSS scheme.
- Further, RECPDCL is also providing consultancy services under various other state/central sponsored schemes which are (i) PMA Services for implementation of High Voltage Distribution System (HVDS)by installation of new DTr and using AB Cable in semi urban and rural areas in different districts of West Bengal, (ii) Preparation of DPR and Project procurement strategy document (PPSD) i.r.o. HVDS & GIS in 13 district and UG cabling works at 6 town under distribution network strengthening & grid modernization projects of WBSEDCL with financial assistance from world bank, (iii) PMA for OH to UG works in 4 Divisions of BESCOM, (iv) PMA services for PMDP (Rural & Urban) for JPDCL and KPDCL in UT of J&K
- PMA Services for implementation of UPPDNRP (Uttar Pradesh Power Distribution Network Rehabilitation Project), ADB Funded, LT Bare conductor to LTABC Conversion, in all 19 Districts of MVVNL, Lucknow in habitations having population 1000 and above
- PMA for implementation of Advanced Metering Infrastructure (AMI), SCADA & Distribution Transformer Monitoring Unit (DTMU) for CED under National Smart Grid Mission;
- Further, RECPDCL is also providing consultancy services under various other state/central sponsored schemes, which are PMA services for PMDP (Rural & Urban) for JPDCL, KPDCL & LPDD in UT of J&K and UT-Ladakh.

New Assignments:

During the current financial year 2022-23, the Company has undertaken following new assignments:

i. Implementation of End-to-End Revenue Management System and Customer Call Center for UT of Ladakh.

ii. Implementation of Smart metering works for 7.28 lakhs consumers under RDSS in KPDCL.

Tariff Based Competitive Bidding (TBCB) Projects

Pursuant to amalgamation of RECTPCL with RECPDCL, the company (RECPDCL) is acting as Bid Process Coordinator (BPC), for selection of developer as Transmission Service Provider (TSP) through Tariff Based Competitive Bidding Process. In order to initiate development of each transmission project, RECPDCL incorporates a project specific Special Purpose Vehicle (SPV) as Wholly Owned Subsidiary Company and after the selection of successful bidder through Tariff Based Competitive Bidding Process notified for transmission projects. The respective project specific SPV along with all its assets and liabilities is transferred to the successful bidder.

During the current financial year 2022-23 (up to December 31, 2022), the bid process of the following transmission projects have been completed:

Sl. No	Name of Transmission Project	Name of project Specific SPV	Remarks
INTER-STATE			
1	Transmission system for evacuation of power from RE projects in Rajgarh (2500 MW) SEZ in Madhya Pradesh	Rajgarh Transmission Limited	Project specific SPV transferred to M/s G R Infraprojects Limited on on May 30, 2022.
2	Transmission system for evacuation of power from Neemuch SEZ	Neemuch Transmission Limited Transmission Limited	Project specific SPV transferred to M/s Power Grid Corporation of India Limited on August 24, 2022.
3	System Strengthening Scheme for Eastern and North Eastern Regions	ER-NER Transmission Limited	Project specific SPV transferred to M/s Power Grid Corporation of India Limited on October 10, 2022.
4	Transmission Scheme for Solar Energy Zone in Gadag (1500 MW), Karnataka: Part A-Phase-II	Gadag II-A Transmission Limited	Project specific SPV transferred to M/s ReNew Transmission Ventures Private Limited on November 18, 2022.

During the current financial year 2022-23 (up to December 31, 2022), the bid process of the following Inter-State transmission projects is under progress:

Sl. No	Name of Transmission Project	Name of project Specific SPV	Bidding Status
INTER-STATE			
1	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part A, Gujarat.	Khavda-II A Transmission Limited	Expected to conclude during 2022-23
2	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part B, Gujarat.	Khavda-II B Transmission Limited	
3	Transmission scheme for evacuation of 4.5 GW RE injection at Khavda P.S. under Phase-II – Part C, Gujarat.	Khavda-II C Transmission Limited	
4	Transmission Network Expansion in Gujarat associated with integration of RE projects from Khavda potential RE zone	Khavda RE Transmission Limited	
5	Transmission scheme for injection beyond 3 GW RE power at Khavda PS1 (KPS1)	KPS1 Transmission Limited	
6	Establishment of Khavda Pooling Station-2 (KPS2) in Khavda RE Park	KPS2 Transmission Limited	
7	Establishment of Khavda Pooling Station-3 (KPS3) in Khavda RE Park	KPS3 Transmission Limited	

Sl. No	Name of Transmission Project	Name of project Specific SPV	Bidding Status
8	Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part C1	Ramgarh II Transmission Limited	
9	Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part D	Sikar Khetri Transmission Limited	
10	Transmission system for evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part F	Beawar Transmission Limited	
11	ISTS Network Expansion scheme in Western Region & Southern Region for export of surplus power during high RE scenario in Southern Region	WRSR Power Transmission Limited	
12	Inter-regional ER-WR Interconnection	ERWR Power Transmission Limited	
13	Transmission system for evacuation of power from Luhri Stage-I HEP	Luhri Power Transmission Limited	
INTRA-STATE			
14	Development of Intra-State works in M.P. Through tariff Based Competitive Bidding Package-I	MP Power Transmission Package-I Limited	Expected to conclude during 2022-23

The bidding process of following Inter-State as well as Intra-State transmission projects shall be initiated in this financial year which are expected to be concluded in FY 2023-24:

Sl. No	Name of Transmission Project
Inter-State	
1.	North Eastern Region Expansion Scheme-XVI (NERES-XVI)
2.	Transmission Scheme for Solar Energy Zone in Bidar (2500 MW), Karnataka
Intra-State	
3.	Meerut Shamli Transmission System

Till date, RECPDCL has successfully concluded the bidding process for total 42 Nos transmission projects (37 Nos. Inter –State and 05 Nos Intra-State) having estimated project cost of ₹54,996 crore.

In addition to above, RECPDCL is also acting as Bid Process Coordinator in following projects for selection of Solar Power Developers (SPDs) under Scheme for flexibility in Generation and Scheduling of Thermal/ Hydro Power Stations through bundling with Renewable Energy and Storage Power notified by Ministry of Power, GoI,

Sl. No	Name of RE Bundling Projects	Procurer	Remarks
INTER-STATE			
1	Selection of Solar Power Developers for setting up of 500 MW ISTS-Connected Solar PV Power Projects in India under Tariff-based Competitive Bidding	DVC	Expected to conclude during 2023-24
2	Selection of Solar Power Developers for setting up of 1250 MW ISTS-Connected Solar PV Power Projects in India under Tariff-based Competitive Bidding-Tranche-I.	NTPC Limited	

Transmission Project in Kashmir

The above mentioned transmission project in Kashmir region has been commissioned on October 25, 2021 and put on operation. The project is first of its kind in Kashmir region in terms of technology and will act as a milestone to ensure 24x7 uninterrupted quality power supply to the people of Kashmir.

The project is situated in the industrial area of Pulwama district and therefore, it will act as a catalyst to the industrial growth by making uninterrupted power supply which will ultimately generate employment and will prosperity to people of Kashmir.

Transmission Project in Nagrota in Jammu

Construction of transmission project in Jammu region is under progress and it is expected to make the project operational by financial year 22-23. At present, ordering of all major equipment has been completed and major civil works are under progress.

Upon completion of the project, this will enable increased interconnectivity between all the transmission sub-station of the State Grid and will subsequently result in ensuring 24x7 uninterrupted power supply in the region.

Transmission Projects in Ladakh:

In order to complete the transmission projects in Ladakh within minimum possible timeframe, these have been divided into various packages as detailed below:

Sl. No	Name of Projects	Package Details
Transmission Line		
1	Construction of 220 kV S/C Transmission line on D/C towers (Phyang – Diskit)	Package-01 Phyang to North Pullu
		Package-02 North Pullu to Diskit
2	Construction of 220 kV S/C Transmission line on D/C towers (Drass-Padum)	Package-03 Drass to Kochik
		Package-04 Kochik to Rangdum
		Package-05 Rangdum to Padum
	Sub-station	
3	Construction of 220/33 kV, 50 MVA Grid Substations at Diskit with bay extension at Phyang (existing) SStn	Construction of 220/33 kV, 50 MVA Grid Substations at Diskit with bay extension at Phyang (existing) SStn
4	Construction of 220/33 kV, 50 MVA Grid Substations at Padum with bay extension at Drass (existing) SStn	Construction of 220/33 kV, 50 MVA Grid Substations at Padum with bay extension at Drass (existing) SStn

All above mentioned projects are aimed to be completed by October 2023 and all efforts are being made to achieve the target. At present, routes of Transmission Line have almost been finalized, ordering of major material such as tower structures, conductor, GIS equipment etc. have been completed and engineering activities are being performed at full swing.

Upon completion of the projects, people of Nubra and Zanskar valley of Ladakh region will be benefited through availability of round the clock uninterrupted quality power supply throughout the year. The transmission projects would also help the Defence establishment strategically in the valley. Furthermore, with the grid power, there are ample scope for mushrooming of MSMEs, Tourism, Commercial and other economic activities leading to overall socio-economic development in the region.

Further, RECPDCL (erstwhile RECTPCL) under the guidance of Ministry of Power, Government of India has developed online web platform and Mobile App for better Transparency & Accountability as detailed below:

Urja Mitra: Urja Mitra is an initiative of Ministry of Power, Government of India which provides Outage Management and Notification Platform for disseminating the outage information to power distribution consumers across India through SMS/ email/push notifications. It also provides Pan-India integrated Mobile Application for Android and iOS platforms to enable citizen to access outage information for Distribution Companies. Power Consumers can also inform about power outage in their area through mobile app.

As on December 31, 2022, data of around 23 crore Rural/Urban/Mixed feeder consumers of 52 DISCOMs have already been linked on web portal and the application is live in 49 DISCOMs with consumer base of approximately 21.52 crore. Around 635 crore SMS have been sent to the consumers.

Tarang (Transmission App for Real Time Monitoring & Growth): - Tarang monitors the progress of transmission system in the country, both Intra State and Inter State Transmission Projects through Tariff Based Competitive Bidding (TBCB) as well as Regulated Tariff Mechanism. Tarang also shows the prospective upcoming Intra-State as well as Inter - State Projects along with NITs being floated by different Transmission Utilities Pan-India. Tarang provides advance information of upcoming transmission projects approved by Empowered Committee on Transmission helping bidders to gear up future transmission projects.

11 kV Rural Feeder Monitoring Scheme: RECPDCL (erstwhile RECTPCL) has been appointed as the nodal agency for "11 KV Rural Feeder Monitoring Scheme". The scheme aims to enable monitoring of energy input/ power supply at feeder level and also to give an accurate picture of power supply in rural area of country to ensure achievement of "24x7 Power for All". Under the scheme, the distribution parameters viz. Power supply hours, outage, voltage, Current & PF, are captured. This scheme targets to develop a self-sustained, independent, web based automated system by installing Modem/DCUs for almost 82 thousand rural, agricultural and mixed (agriculture rural) feeders across country by acquiring various essential parameters of all the outgoing 11kV rural feeders and such 66/33 kV incoming feeders from where 11kV rural feeders are emanating and making the information available online for all stakeholders. Under the scheme, meter data of rural feeders is sent to central Meter Data Acquisition System (MDAS) for analysis and the same is then integrated with National Power Portal (NPP) to make it available for use of all stakeholders. These reports are useful in decision support for betterment of rural power supply status. Further, the system will be integrated with the upcoming National Feeder Monitoring System.

National Feeder Monitoring System: RECPDCL has been entrusted as the PIA for implementation of Centralized IT Solution for Feeder Monitoring System under "National Feeder Monitoring System (NFMS), that is an automated Web-based System for Monitoring the 33/22/11 kV Distribution Feeders by integrating data from various DISCOM's OT & IT systems such as MDMS & data logging systems with essential power parameters and status of all outgoing all Outgoing Feeders i.e. 33/22/11 kV from Distribution Substations to make the information available to the Ministry and RECPDCL as well as DISCOM officials on near Real-Time basis. Further, the system aims to establish Central platform for monitoring of all Feeders across the country which shall be further integrated to NPP and other legacy system as per the requirement. All data shall be fed through M2M online mechanism instead of manual intervention.

RECPDCL continued to do profitable business in the financial year 2022-23 and earned total revenue of ₹58.46 crore and profit before tax of ₹26.54 crore till September 30, 2022. The financial data as on December 31, 2022 is under finalisation and are further subject to the approval of the Board of the Directors.

5. Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY)

The Hon'ble President of India sanctioned the launch/ implementation of Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY), an integrated scheme covering all aspects of rural power distribution which was conveyed by the Ministry of Power on December 3, 2014. Under the scheme, 60% of the project cost (85% for special States) is provided as grant by Government of India and additional grant upto 15% (5% for Special Category States) was provided by Government of India on achievement of prescribed milestones. All erstwhile RE schemes (including Rajiv Gandhi Grameen Vidyutikaran Yojana) were subsumed into DDUGJY. REC Limited was designated as the Nodal Agency for operationalization of DDUGJY. The DDUGJY scheme (including RE) has been completed and closed on March 31, 2022.

5.1 Sanction of projects

5.1.1 DDUGJY (RE component):

Under erstwhile Rural Electrification (RE) programme, as on March 31, 2022, cumulatively 1,365 nos. of Projects Sanctioned with a cost of ₹66,367 crore. The closure cost of these projects is ₹66,066 crore.

5.1.2 DDUGJY (New):

As on March 31, 2022, cumulatively 3794 nos. of projects sanctioned with a cost of ₹48,657 crore. The closure cost of these projects is ₹43,832 crore.

5.1.3 DDUGJY (Addl. Infra Projects)

An amount of ₹14,179 crore has been sanctioned to 20 States for creation of additional infrastructure exclusively for Households covered under SAUBHAGYA on the requests of State.

5.2 Cumulative Achievement (as on March 31, 2022)

5.2.1 DDUGJY (RE component):

As on March 31, 2022, cumulatively Government of India grant of ₹53,797 crore has been released to the States. The physical progress is as below:

- 2,942 Sub-stations (Incl. augmentation of 2,054 Sub-Stations) commissioned
- 10.25 Lakh Distribution Transformers commissioned
- 8.00 Lakh CKm of LT Lines erected
- 4.78 Lakh CKm 11KV Lines erected
- 0.16 Lakh Ckm 33 & 66 KV HT Lines erected

5.2.2 DDUGJY (New):

As on March 31, 2022, cumulatively Government of India Grant of ₹24,855 crore has been released to the States. The physical progress is as below:

- 4,048 Sub-stations (including augmentation of 2,131 Sub-stations) commissioned
- 3.99 Lakh Distribution Transformers commissioned
- 1.41 Lakh CKms of new 11 KV line erected
- 3.27 Lakh CKms of LT Lines erected
- 0.25 Lakh CKms of HT Lines (33 & 66 KV Lines) erected
- 1.13 Lakh CKms of 11 KV Feeders segregated
- Energy Meters in 187.94 Lakh consumer premises, 2.32 Lakh Distribution Transformers & 0.14 Lakh 11 KV Feeders installed

5.2.3 DDUGJY (Additional infrastructure):

As on March 31, 2022, cumulatively GoI Grant of ₹7,216.4 crore has been released to the States. The physical progress is as below:

- 241 Sub-stations (including augmentation of 225 Sub-stations) commissioned
- 2.22 Lakh Distribution Transformers commissioned
- 0.63 Lakh CKms of new 11 KV line erected
- 2.04 Lakh CKms of LT Lines erected
- 0.000734 Lakh CKms of HT Lines (33 & 66 KV Lines) erected

6. SAUBHAGYA- Pradhan Mantri Sahaj Bijli Har Ghar Yojana

The Hon'ble Prime Minister launched Saubhagya scheme on September 25, 2017 to achieve universal household electrification covering every village and every district in the country. Universal household electrification requires creation of electricity access through last mile connectivity. Scheme outlay is ₹16,320 crore including Gross Budgetary Support of ₹12,320 crore.

The Saubhagya scheme has been completed & closed on March 31, 2022.

6.1 Cumulative Financial Progress:

- Projects worth ₹13,979 crore has been sanctioned and these projects are completed & closed at approved Closure Cost of ₹9,246.22 crore.
- ₹5,753.77 crore of GoI grant has been released to States/DISCOMS.

6.2 Cumulative Physical Progress:

Ministry of Power along with the active support and cooperation of States/Power Utilities and other stakeholders, provided electricity connections to 286.13 lakh households during SAUBHAGYA period under various schemes viz. DDUGJY-RE, DDUGJY-New, SAUBHAGYA, PMDP, State Schemes etc. States have reported that all willing households identified under SAUBHAGYA have been electrified.

7. Revamped Distribution Sector Scheme (RDSS)

7.1 Overview: REC and PFC are the nodal agencies for the Reforms-based and Results-linked, Revamped Distribution Sector Scheme, notified by Government of India vide OM dated July 20, 2021, with an outlay of ₹3,03,758 crore and estimated GBS from Central Government of ₹97,631 crore. REC, as Nodal Agency, has been assigned 19 States/Union Territories (UTs) for overseeing and monitoring of implementation of the Scheme, namely Assam, Meghalaya, Arunachal Pradesh, Chhattisgarh, J&K, Ladakh, Goa, Tamil Nadu, Karnataka, Bihar, Rajasthan, Uttar Pradesh, West Bengal, Andaman Nicobar, Sikkim, Mizoram, Manipur, Nagaland and Tripura. The remaining States/UTs have been assigned to PFC. The Scheme allows the States to adopt customized reform measures and plan infrastructure works to meet specific needs of the State with the approval of the Government of India.

7.2 Objectives:

a) to improve the quality, reliability and affordability of power supply to consumers through a financially sustainable and operationally efficient Distribution Sector,

b) to reduce the AT&C losses to pan-India levels of 12-15% by 2024-25, and

c) to reduce the ACS-ARR gap to zero by 2024-25

7.3 Components:

Part A – Metering & Distribution Infrastructure Works:

Component– I: Prepaid Smart Metering

Component– II: System Metering and upgradation of the Distribution Infrastructure

Component– III: Project Management

Part B – Training & Capacity Building and other Enabling & Supporting Activities:

Ongoing approved projects: Projects sanctioned under PMDP 2015 in the erstwhile State of Jammu & Kashmir have been subsumed in RDSS.

7.4 Funding pattern:

The release of funds under the scheme will be linked to achievement of results and reforms laid down under an evaluation framework as under:

Part A: Metering & Distribution Infrastructure Works

Component– I: Prepaid Smart metering solutions, including at consumer, DT, and feeder level including integration of existing infrastructure, will be funded through GBS as under:

- for DISCOMs in "Other than notified Special Category States", a fixed amount of ₹900 per consumer meter or 15% of the cost per consumer meter worked out for the whole project, whichever is lower.
- for DISCOMs in "notified Special Category States", a fixed amount of ₹1,350 per consumer meter or 22.5% of the cost per consumer meter worked out for the whole project, whichever is lower.

The Scheme is also providing incentives for deployment of prepaid Smart meters within the targeted timeline of December 2023.

Component–II: Distribution Infrastructure works, including SCADA, DMS, AB cables, feeder segregation etc. maximum financial assistance to be funded through GBS will be as under:

- for DISCOMs in "Other than Special Category States", up to 60% of the approved project cost, and
- for DISCOMs in "Special Category States", up to 90% of the approved project cost.

Part-B: Training & Capacity Building and other Enabling & Supporting Activities:

- 100% of the approved project cost will be eligible for funding through GBS

7.4.1 Projects sanctioned under RDSS with Outlay

The proposal of 16 states out of 19 states under REC i.e. Assam, Bihar, Chhattisgarh, Goa, Manipur, Mizoram, Meghalaya, Jammu & Kashmir, Tamil Nadu, Rajasthan, Sikkim, Tripura, Uttar Pradesh, Ladakh, Arunachal Pradesh and West Bengal have been approved by the monitoring committee and Sanction letters are issued to the corresponding DISCOMs.

Sl. No	State	Discom	Smart Metering works - sanctioned amount		Loss reduction work - sanctioned amount		Loss Reduction – Advance Release		GBS for PMA charges
			Project Cost incl PMA	GBS for Project Cost incl PMA	Project cost including PMA	GBS for Project cost including PMA	Amount released	Date of release	
1	Arunachal Pradesh	Arunachal PD	183.56	41.997	799.99	719.991			
2	Assam	APDCL	3677.48	836.704	2,609.1	2,348.190	115.6700	09.05.2022	
3	Bihar	NBPDCL	968.08	146.842	3,299.65	1,979.790	97.5300	17.11.2022	
		SBPDCL	1053.14	159.738	3,781.4	2,268.840	111.7700	17.11.2022	
	Bihar Total		**2,021.22**	**306.58**	**7,081.05**	**4,248.630**	**209.3000**		
4	Chhattisgarh	CSPDCL	4,105.31	622.704	3,597.55	2,158.530	106.3314	17.10.2022	
5	Goa	GOA –PD	469.17	71.16	247.08	148.248			
6	Jammu & Kashmir	JPDCL	549.544	125.7203	2,285.29	2,056.761	101.9678	30.08.2022	2.2185
		KPDCL	514.072	117.6105	2,350.27	2,115.243	104.8163	30.08.2022	3.3813
	J&K Total		**1,063.616**	**243.3308**	**4,635.56**	**4,172.004**	**206.7841**		**5.5998**
7	Ladakh	Ladakh PDD	Not sanctioned under RDSS	697.36	627.624				
8	Manipur	MSPDCL	121.157	27.7172	400.98	360.882	17.7773	06.10.2022	
9	Meghalaya	MeECL	309.55	70.817	796.5	716.850	35.3124	30.08.2022	
10	Mizoram	Mizoram PD	181.611	41.55	237.33	213.597	10.5219	19.09.2022	
11	Rajasthan	JdVVNL	2,888.15	438.474	3,279.15	1,967.490	96.9207	17.10.2022	
		AVVNL	3,676.85	557.244	2,327.8	1,396.680	68.8020	17.10.2022	
		JVVNL	3,149.81	478.062	3,305.37	1,983.222	97.7100	17.10.2022	
	Rajasthan Total		**9,714.81**	**1,473.78**	**8,912.32**	**5,347.392**	**263.4327**		
12	Sikkim	Sikkim PD	97.44	22.295	263.61	237.249			
13	Tamil Nadu	TANGEDCO	19,235.36	2,917.646	9,066.27	5,439.762	267.9700	06.05.2022	
14	Tripura	TSECL	318.548	72.8699	484.56	436.104	21.4830	06.10.2022	
15	Uttar Pradesh	PuVVNL	4,956.25	751.772	4,611.94	2,767.164	136.3100	04.05.2022	
		PVVNL	4,965.45	753.16	3,454.06	2,072.436	102.0900	04.05.2022	
		MVVNL	5,028.14	762.674	4,227.8	2,536.680	124.9600	04.05.2022	
		DVVNL	3,676.83	557.704	3,828.14	2,296.884	113.1500	04.05.2022	
		KESCO	329.63	49.998	624.15	374.490	18.4500	04.05.2022	
	Uttar Pradesh Total		**18,956.3**	**2,875.308**	**16,746.1**	**10,047.654**	**494.9600**		
16	West Bengal	WBSEDCL	12,670.46	1,921.874	7,222.57	4,333.542			
	Discom-wise Total		**60,455.13**	**11,546.34**	**63,797.92**	**41,556.25**	**1,749.54**		**5.60**

*Additionally Nagaland was approved in 16th MC held on December 22, 2022, however minutes for the same are awaited.

7.4.2 Cumulative Achievement under RDSS (as on December 31, 2022)

Though, a few of the utilities have placed the LoAs for implementation of Loss Reduction Works, while a number of bids are live and under approval for other DISCOMs. However, as even the works wherein award has been placed are under survey currently, so physical progress upto December 2022 is NIL. Also, the Guidelines of RDSS allow for coverage of Smart Meters installed after January 1, 2020 under RDSS subject to fulfilment of a few conditions. While the ongoing works in a number of states are covered under RDSS, e.g., as per available details after January 1, 2020 ~12 lakhs meters are installed in Bihar, 67000 meters in Assam, 115500 meters in J&K and 478160 meters in Uttar Pradesh etc., however as the demand from DISCOMs for release of grant under RDSS against these works is yet to be received, so their coverage under RDSS grant is yet to be formalized.

7.4.3 Achievement during April 1, 2022 to December 31, 2022 under RDSS:

The proposal of 10 States i.e. Bihar, Chhattisgarh, Goa, Manipur, Mizoram, Sikkim, Tripura, Ladakh, Arunachal Pradesh and West Bengal were approved by Monitoring Committee, overall ~₹60,455 crore sanctioned under Smart metering works and ~₹63,798 crore sanctioned under loss reduction works, however there has been no physical progress while an amount of ~₹1,750 crore was released to the DISCOMs.

7.4.4 Anticipated achievement during the remaining period of the year i.e., from January 1, 2023 to March 31, 2023

Based on the current tendering status, it is expected that physical progress may be achieved for distribution infrastructure works amounting to ~₹100 crore, while the financial releases in favour of the DISCOMs are expected to be ~₹2,000 crore.

7.5 Promoting the use of advanced technologies in Power Distribution Sector:

RDSS lays special emphasis on leveraging advanced technologies to analyse data generated through Information Technology (IT)/ Operational Technology (OT) devices including system meters and prepaid smart meters, to materialize the envisaged goal i.e., introducing advanced technologies like AI/ML in power distribution by leveraging partnerships and consultations.

REC plays a role as designated agency to select DISCOMs and identify key intervention areas, empanelling incubator(s) to select TSP (Technology Service Provider) through a competitive screening process, and establishing governance mechanisms for the pilot projects and their scale-up. A competition named "Powerthon" was launched by Hon'ble Union Cabinet Minister of Power and Renewable Energy on 7th February 2022, to select Technology Solutions Providers (TSPs), across problem statements submitted by willing DISCOMs.

The key objective of Powerthon-2022 is to create a forum for the participation of TSPs, start-ups, educational institutions, research institute, equipment manufacturers, state power utilities and other state and central power sector entities, brief them on the current challenges faced across the power distribution sector and primarily invite applications from TSPs to participate in Powerthon-2022. Herein, the TSPs can showcase their technology driven solutions based on advanced emerging technologies like AI/ML, Blockchain etc. to solve the complex problems.

Achievement:-

A total of 206 applications were received from start-ups and non-start-ups TSPs, across 9 nine identified problem/challenge areas. For evaluation of applications, sub-committee (representation from REC, SINE, PWC, E&Y and DISCOMs nodal officers) was formulated to assist the expert committee chaired by Executive Director, PMD RECL. After detailed deliberations, 37 TSPs have been recommended for carrying out the Proof of Concept for one month. Details are as below:-

Sl. No	Problem Statement	No of Test Beds/ Pilot	Total Application Received	Application selected after Expert committee approval
1	Power Purchase Cost Optimization	1	14	2 (ST-2, NS-0)
2	Demand/Load Forecasting	5	42	9 (ST-5, NS-4)
3	Asset Inspection	2	15	5 (ST-3, NS-2)
4	Consumer Experience Enhancement	2	17	2 (ST-2, NS-0)
5	AT & C Loss Reduction	6	45	9 (ST-6, NS-3)
6	Prediction of DT failure	2	23	4 (ST-2, NS-2)

Sl. No	Problem Statement	No of Test Beds/ Pilot	Total Application Received	Application selected after Expert committee approval
7	Energy Theft Detection	1	19	1 (ST-0, NS-1)
8	RE Integration		2	17 3 (ST-1, NS-2)
9	Vegetation management	1	14	2 (ST-2, NS-0)
	Total	**22**	**206**	**37 (ST23,NS14)**

Above 37 TSPs submitted their Proof of Concept report in July 2022 and detailed evaluation, 18 POC are approved for Pilot stage, which will be carried out in 4 months' time. The Selection criteria were (a) Suitability of solution, (b) testing result in POC, (c) opinion of DISCOMs/ SINE. Pilot is nearing completion and final evaluation is under process.

Evaluation of Distribution Companies in Consumer and Operational parameters:

Consumer Service Rating of DISCOMs (CSR-D).

Context and Objective:

The Ministry of Power has a consumer centric approach with the goal of supplying round-the-clock high quality and reliable power to all consumers. The Hon'ble Union Cabinet Minister of Power and Renewable Energy has always maintained that the electricity institutions and power systems exist to serve the consumers, and the consumers have the right to get reliable services and quality electricity.

In this context, a 'Consumer Service Rating of DISCOMs' to measure the ease of living with respect to electricity is envisaged to be developed with the following objectives:

- To create a minimum set of parameters related to quality and reliability of electricity supply and consumer service
- Track performance of DISCOMs across these aspects over a period of time
- Develop a spirit of healthy competition amongst DISCOMs to enhance consumer experience
- Nudge the DISCOMs to assess the gap areas and promote inter-se learning

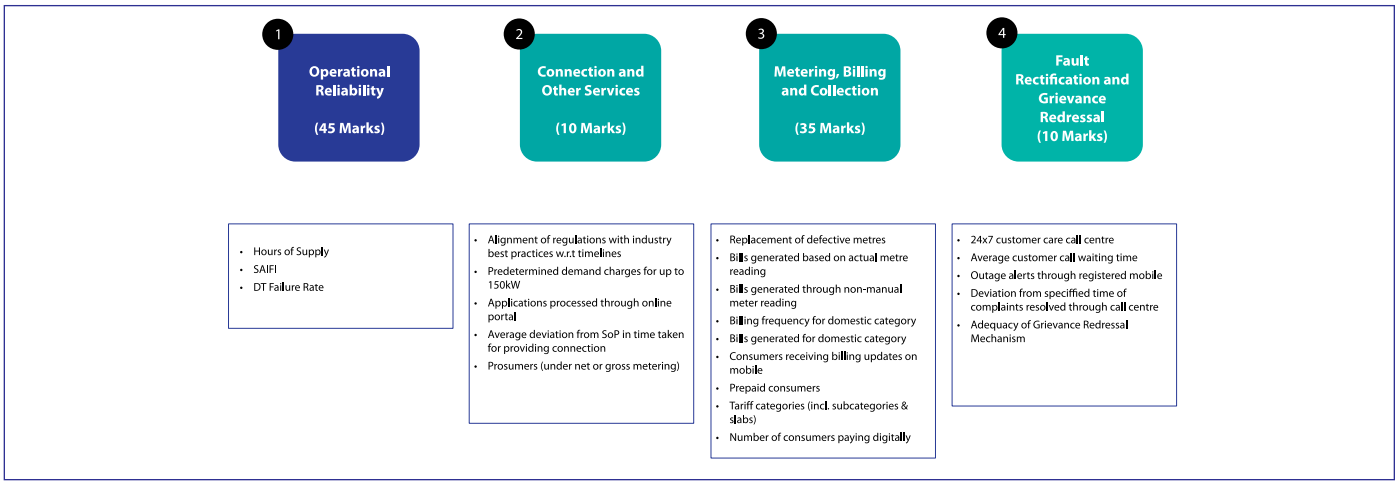
This exercise will enable the DISCOMs to introspect their performance across various service parameters, undertake a comparative performance assessment with peer DISCOMs and take corrective measures.

Achievements:-

The Hon'ble Union Cabinet Minister of Power and Renewable Energy, Sh. R. K. Singh, launched the first ever Consumer Services Rating of DISCOMs (CSRD) for the FY 2020-21, in the Review Planning and Monitoring (RPM) Meeting with States and State Power Utilities held on August 5, 2022 at New Delhi.

Methodology:-

The DISCOM Consumer Service Rating has been developed across four key dimensions which are central to enhancing level of consumer services. This includes operational reliability; connection and other services; metering, billing, collection linked services; fault rectification and grievance redressal. Across all these dimensions, key performance indicators have been shown in the figure below:



Result Areas and Weightages:

- Operational reliability (45% weightage) – This will help assess the reliability of electricity supply. The parameters include hours of supply, SAIFI, and DT failure rate. Considering its importance, 45% weightage has been given to it.
- Consumer service (55% weightage) – The key parameters include connection & other services; metering, billing and collection linked services; fault rectification and grievance redressal. Because of the large number of services, which are important from a consumer point of view, higher weightage i.e. 55% is assigned to these parameters.

  After detailed discussion with all stakeholders especially DISCOMs in public and private domain, data was collected and verified with evidences and field visit. Total 60 DISCOMs are being graded in this exercise out of 70 DISCOMs (10 DISCOMs either didn't participated or data/evidences were insufficient).

  The DISCOMs have been assigned grades across the above parameters as per quantitative grading.10 DISCOMs have been assigned "E" grade (4 DISCOMs did not participate and 6 DISCOMs did not provide requisite data for the exercise). The report is available on the REC's website (https://recindia.nic.in/consumer-service-rating-of-discoms)

8. Renewable Energy Projects

Under the Renewable Energy, REC has sanctioned loan assistance of ₹21,021.11 crore to 19 projects with installed generation capacity aggregating 5,888 MW and 2,350 E-Buses, which includes private & state sector projects of various technologies viz. Wind, Solar, E-Mobility, Airport Infrastructure, Solar Park Infrastructure, Pumped Storage Project, Bio Gas etc. The disbursement achieved during the year 2022-23 (up to December 31, 2022) was ₹9,334.98 crore.

9. North Eastern States

During the financial year 2022-23 (upto December 31, 2022), REC has sanctioned loan assistance of ₹750.90 crore. Further, an amount of ₹213.94 crore was disbursed to North Eastern states during the period from April 1, 2022 to December 31, 2022.

10. International Cooperation and Development (IC&D)

REC has two lines of ODA credit with JICA, Japan and both of them have been fully drawn. Under JICA-I & II ODA loans with cumulative amount of JPY 16,949.38 million (around ₹820.12 Crore) and JPY 11,809.48 million (around ₹640.64 Crore) respectively have been drawn.

REC has 5 lines of ODA (Official Development Assistance) credit with KfW, Germany. Out of which, three of them have aggregate amount of EUR 240 million for financing energy efficient programs in Andhra Pradesh & Telangana, HVDS projects in Haryana and Renewable projects in the country, had been fully drawn. In Fiscal 2019, REC had entered into a 4th loan agreement with KfW for financial assistance of USD 228 million for re-financing renewable energy projects, which has also been fully drawn.

REC has entered into 5th credit line of credit with KfW Development Bank for availing ODA term loan of USD 169.5 Million under Indo-German Bilateral Partnership in accordance with the approval granted by Department of Economic Affairs, Ministry of Finance, Government of India for part financing of innovative Solar PV Technology based generation Projects in India.

11. Training activities at REC Institute of Power Management & Training, Hyderabad

A. Progress made during the current year from April 1, 2022 to December 31, 2022

11.1 REC Institute of Power Management and Training (RECIPMT) earlier known as Central Institute for Rural Electrification was established at Hyderabad in 1979 under the aegis of Rural Electrification Corporation to cater to the training and development needs of engineers and managers of Power Sector organisations. The programmes are conducted on the state-of-art subjects of Power Generation, Transmission, Distribution and Renewable energy sources.

11.2 International Programmes under Sponsorship of ITEC Scheme of Ministry of External Affairs, Government of India

RECIPMT has organised 3 Classroom Programmes for executives of International Power Sector Organisations on (1) "Concept to Commissioning of Solar Power Plants (4 Weeks duration)", (2) "Certificate Course in Power Distribution Management (6 Weeks duration)" & (3) "Best Practices in Power Distribution Sector (4 Weeks duration)" Sponsored by Ministry of External Affairs, Government of India under Indian Technical and Economic Cooperation (ITEC) scheme. 56 Power Sector executives from ALGERIA, AZERBAIJAN, BANGLADESH, BHUTAN, CAMEROON, COTE D'IVOIRE, ERITREA, ETHIOPIA, FIJI, IRAQ, MALDIVES, MYANMAR, NIGER, OMAN, SOUTH SUDAN, SRILANKA, SUDAN, TAJIKISTAN, TANZANIA, TUNISIA, UGANDA, and ZIMBABWE countries participated in the programs.

11.3 Regular National Programmes

RECIPMT has organised 3 Online Webinars each of 3 day duration for the executives of various Power

Utilities on different topics such as Open Access & Power Trading, Smart Meters, AMI & Technologies, Distribution Loss Reduction and Pilferage of Electricity – issues, challenges & Remedies. 4 Classroom Programmes each of 4 day duration on Concept to commissioning of solar power plants-on grid & off grid, Design, Construction & Quality Control of EHV Substations & Lines, Power Transformer -Testing, Commissioning, Protection & Maintenance, Smart Meters, AMI & System Integration Technologies was conducted. A total number of 50 participants attended the above programmes.

11.4 REC Sponsored Programmes

a. 3 day Classroom Trainings on "Electrical Safety":

RECIPMT has organised 60 batches and trained 1,511 Executives on "Electrical Safety". Each batch is of 3 day duration for Power Utilities like MSEDCL JDVVNL, HPSEBL, APSPDCL, APCPDCL, AVVNL, MPMKVVCL, Dept. of GOA, PSPCL, APEPDCL, MESCOM, TANGEDCO, SBPDCL, TANTRASCO, TSGENCO, BESCOM, TSSPDCL, etc.

b. 3 day Classroom Trainings on "Best Practices in Power Utility":

RECIPMT has organised 53 batches and trained 1,061 Participants on "Best Practices in Power Utilities". Each batch is of 3 day duration for Power Utilities like JVVNL, MSEDCL JDVVNL, APSPDCL, APCPDCL, AVVNL, Dept. of GOA, PSPCL, APEPDCL, TANGEDCO, TANTRASCO, BESCOM, BEST, TSNPDCL, UPPTCL, PDTC & CESC etc.

c. 2 Day Online Training on "Techno-Commercial Improvement of DISCOM's Performance"

RECIPMT has organised 35 batches of 2-day webinars on "Techno-Commercial Improvement of DISCOM's Performance" and trained 876 executives of Power Sector DISCOMs i.e. APCPDCL, APEPDCL, TSSPDCL, KSEB, MSEDCL, HPSEB, GETRI, KESCo, MPMKVVCL, BESCOM, MPPKVVCL, BEST, etc.

d. Customised Programmes:

RECIPMT has organised Classroom training programs each of 3 Day duration on Power Transformers - Testing, Commissioning, Protection And Maintenance, Operation, Maintenance & Protection of 33/11 KV Sub-station and 33 KV Lines, Distribution Transformers - Operation And Maintenance Practices For Failure Minimization, O&M of Distribution Transformer, Operation, Maintenance & Protection of 33/11 KV Sub-station and 33 KV Lines, AT&C Loss Reduction, Regulatory, Distribution Transformers - Operation And Maintenance Practices For Failure Minimization at different locations of J&K PDD including Kargil, Leh/Ladakh. Total 234 participants trained.

e. In-house Training Programmes:

RECIPMT also organised 4 Online Webinars each of 2 day duration for the employees of REC. The topics covered are Sustainability of Power Sector -Electricity Act Amendments and its impact, Techno Commercial Improvement of DISCOM Performance, Goods & Services tax (GST), Purchase Procedure& E-Procurement through GeM and 4 Classroom Programmes each of 3 day duration for the employees of REC on Organizational Behaviour Skills towards Managing Change in Power Sector, RDS Scheme and Smart Metering Technologies & Applications, Loan Documentation, Enterprise Resource Planning (ERP). 87 Employees have taken part in these programmes.

In all from April 1, 2022 to December 31, 2022, RECIPMT coordinated/organised 178 programmes and trained 3,875 employees of various power utilities including REC in-house employees as details given below:

Sl. No	Type of Programmes	No. of programmes conducted	No. of Participants trained	No. of Man days
MEA Sponsored				
1.	International Training Programme (4 weeks and 6 weeks duration) classroom programmes	03	56	1,736
REC Sponsored				
2.	3-Day Classroom program on "Electrical Safety for Power Utilities	60	1,511	4,533
3.	3 Day Classroom Program on "Best Practices for Power Utilities	53	1,061	3,183
4.	2-Day Webinar on "Techno-Commercial improvement of DISCOM's"	35	876	1,752

Sl. No	Type of Programmes	No. of programmes conducted	No. of Participants trained	No. of Man days
National Programmes				
5.	4-Days Duration Classroom programme	4	19	76
6.	3-Days Online Webinar	3	31	93
In-House Training Programmes (for REC employees)				
7.	3-Days Duration Classroom programme	4	33	99
8.	2-Days Online Webinar	4	54	108
Customised Programmes				
	Classroom Programme	**12**	**234**	**702**
	Grand Total	**178**	**3875**	**12,282**

B. Anticipated targets to be achieved during the remaining period of the year i.e. from January 1, 2023 to March 31, 2023.

Sl. No	Type of Programmes	No. of programmes	Estimated No. of Participants
MEA, GoI Sponsored International Training Programmes			
1.	International Training Programme 4 weeks - Classroom Training Mode	1	20
2.	International Training Programme 3 weeks – Online webinar	1	20
In- House Training Programmes			
3.	Classroom Training Programme – 3 Days Duration	1	15
4.	Online Webinar Training Programme – 2 Days Duration	1	15
National Programmes			
5.	Classroom Training Programme – 4 Days Duration	6	80
6.	Online Webinar Training Programme – 2 Days Duration	12	195
REC Sponsored			
7.	3 Day Classroom Program on "Best Practices for Power Utilities"	7	139
8.	2-Day Webinar on "Techno-Commercial improvement of DISCOM's"	25	624
	Grand Total	**54**	**1,108**

12. Sustainable projects under Corporate Social Responsibility initiative by REC:

12.1 Progress made during the financial year 2022-23 (Up to December 31, 2022):

In line with the REC Corporate Social Responsibility Policy, Board of Directors, REC, has approved budgetary allocation of 202.65 crore for CSR activities for the financial year 2022-23. In pursuance of the Policy, REC has undertaken Sustainable projects under Corporate Social Responsibility initiatives in project mode. While identifying CSR initiatives REC has adopted an integrated approach to address the community, societal and environmental concerns.

12.2 Major CSR projects undertaken :

- Setting up of about 2000 nos. of solar street lights in rural and tribal areas of Nashik district (Maharashtra) and Bilaspur district (Himachal Pradesh) ;
- Procurement, installation & commissioning of Neuro navigation (Cranial + Spinal) machine' at Neurosurgery Dept., SMS Hospital, Jaipur, Rajasthan;
- Construction of 12 kms road from Yaingangpokpi to Laikoiching in Ukhrul and Kangpokpi district, Manipur;
- Procurement of 15 nos. of ambulances to be run in tribal areas of 11 districts in Madhya Pradesh;
- Construction of REC Motorsports Race Track and Sports Complex at Lengpui, Mamit district of Mizoram;
- Distribution of aids & assistive devices to persons with special abilities by conducting camps in 25 locations in various districts in India;
- Procurement, operation and maintenance of 10 nos. of mobile health clinics for primary health care services for a period of three years in Bhojpur district, Bihar;

- Construction of 2 hostel tower (G+9) with furniture, fixtures, landscaping, external lighting & approach road for post graduate students and installation of grid connected 100kWp roof top solar PV Panel under School of Medical Research and Technology on IIT, Kanpur campus;
- Broad basing of Sports (Athletics & Boxing) and promotion of excellence in sports in India;
- Construction of 4 nos. community hall / centre in 4 villages of Patan and Nainwa block of Bundi district, Rajasthan;
- Strengthening cancer screening and basic cancer care services in 14 districts of Bihar;
- Construction of 140 bedded home - A home for the homeless sick, destitute, unknown & elderly people in Dadikar, Alwar, Rajasthan;
- Transformation of health & school education by providing nursing training, infrastructure support in district hospital, strengthen hospital staff to improve maternal & child health care, procurement of generators, infrastructure development in government school building, teacher training etc. in Kiphire, Nagaland;
- Providing job oriented skill development training to about 2500 under privileged persons at various locations;
- Operation of innovative mobile school for imparting free education to 462 children of migrant construction labourers in Gurugram, Haryana and Hardoi, Uttar Pradesh;
- Providing better health facilities to leprosy affected and under privileged by constructing and equipping operation theatre and maternity block in Leprosy hospitals situated at Champa-Chhattisgarh, Faizabad-Uttar Pradesh and Vadathorasalur-Tamil Nadu;
- Establishment of biodiversity and wildlife conservation laboratory and training center in Kashmir, Srinagar and Ladakh; and
- Survey and repair/rectification work of toilets constructed during 2014-15 under Swachh Vidyalaya Abhiyan (SVA) by REC in 6 states Uttar Pradesh, Bihar, Rajasthan, Telangana, Punjab and Madhya Pradesh.

12.3 Anticipated targets to be achieved during remaining period of the year up to March 31, 2023:

REC is expected to incur the CSR expenditure allocated for financial year 2022-23 by the year end.

CHAPTER 22

NORTH EASTERN ELECTRIC POWER CORPORATION (NEEPCO) LTD.

The North Eastern Electric Power Corporation (NEEPCO) Ltd, a schedule A - Mini Ratna (Category-I) CPSE with an authorized share capital of Rs. 5000.00 Crore, was incorporated on 2nd April 1976 as a wholly owned Government of India Enterprise under the Ministry of Power to plan, promote, investigate, survey, design, construct, generate, operate and maintain hydro, thermal and solar power stations. NTPC Limited, a 'Maharatna CPSE under the Ministry of Power, acquired 100% equity stake of NEEPCO on 25.03.2020. At present, NEEPCO's total installed capacity is 2057 MW, out of which 1525 MW is in Hydro, 527 MW in Thermal and 5 MWp in Solar Sectors.

GENERATION PERFORMANCE (April 2022 to December 2022)

Generation: 7085 MU	PAF (Hydro): 86.19%	PAF (Thermal): 76.38 %

GENERATION PROJECTION (January 2023 to March 2023):

Thermal Stations: 670 MU	Hydro Stations: 505 MU	Solar Station: 1.5 MU

PROVISIONAL FINANCIAL PERFORMANCE (April 2022 to March 2023)

Particulars	Amount (Rs. In Cr.)	Remarks
Revenue from operation (Rs. In Crore)	4203.74	The statement is prepared considering actual xpenditure/ income upto September 2022 & estimated income/ expenditure for the period from October 2022 to March 2023
Total income (Rs. In Crore)	4208.88	
Profit before Tax (Rs. In Crore)	504.44	
Gross operating margin (Rs. In Crore)	1851.21	
Profit after Tax (Rs. In Crore)	262.45	
Net Block (Rs. In Crore)	12163.64	
Sales Turnover / Net Block (%)	34.56	
Share Capital (Paid up) (Rs. In Crore)	3609.81	

BRIEF STATUS OF PROJECT(S) UNDER CONSTRUCTION:

Presently NEEPCO does not have any under construction Project.

FUTURE PROJECTS:

(A) Already Allotted Projects:

Wah Umiam St-III HEP (85 MW), Meghalaya: CEA conveyed accord of appraisal to the Detailed Project Report (DPR) on 26.07.21. Environment Action Committee (EAC), Govt. of India, recommended for grant of Environmental Clearance subject to Stage-I Forest Clearance (FC-I). All formalities for Forest Clearance, compensatory afforestation land acquisition, etc are under process at concerned departments of Govt. of Meghalaya.

Wah Umiam St-I HEP (50 MW), & Wah Umiam St-II HEP (100 MW), Meghalaya: MOA for these Projects were signed with the State Government on 25.10.22. Updation of PFR is in process.

Nafra HEP (120 MW), Arunachal Pradesh: NEEPCO signed MoA with Arunachal Pradesh on 14.08.2021. Preparation of tender documents for Civil Works are in advance stage of completion.

New Melling HEP (90 MW), Arunachal Pradesh: NEEPCO signed MoA with Arunachal Pradesh on 14.08.2021. Viability of the project with a capacity of 180 MW could be established after extending the domain of the project further downstream. Proposal has been taken up with State Govt. on NEEPCO's taking over of the downstream Mago Chu HEP project for development of New Melling HEP with the revised domain.

Kurung HEP (330 MW), Arunachal Pradesh: The MoA was signed on 27.01.2015 for development of the project in Joint Venture with Govt. of Arunachal Pradesh. Pre-Investment approval for Phase-I activities obtained in Sept 2022.Tender for Detailed Topographic and Hydrographic Survey floated on 21.12.2022 through GEM portal.

(B) Projects indicated for Allotment:

The Ministry of Power, GoI vide letter dated 22.12.2021 indicated 17 (Seventeen) stalled Hydro Projects in Arunachal Pradesh for possible development by NEEPCO. The brief status of the indicated projects is as below:

(I) Hydro Electric Schemes with TEC by CEA

- **Tato-II HE Project (700 MW), Heo HE Project (240 MW) & Tato-I HE Project (186 MW):** Recommendations of the Evaluation Committee constituted by the Govt. of India for facilitating taking over of stalled HEPs by CPSUs was received for the project on 30.11.2022. Revised SOP for handing /taking over of the project as per resolution of the meeting chaired by the Secretary (Power), GoI on 14.12.2012 is being prepared by the State Government.
- **Tawang-I HE Project (600 MW) & Tawang-II HE Project (640 MW):** MoA between NHPC and NEEPCO was signed on 12.05.2022 for handing/taking over of the project. Consent letter (NOC) from Govt of Arunachal Pradesh for handing/taking over the projects is awaited. Revised DPR for Tawang-II HEP with reduced installed IC of 640 MW is under preparation.
- **Naying HE Project (1000 MW):** In line with the FAC resolution, action has been initiated to reduce the requirement of forest land for the project by reconfiguration of hydraulic structures. MoA is being

revised by the State Govt. as per decision of the meeting chaired by the Secretary (Power), GoI on 14.12.2022

» **Nafra HE Project (120 MW):** Examination of Technical and Financial aspect of the project by a two-member Expert Committee has been completed. Vetting of RCE through a CERC empaneled agency has been completed.

» **Hirong HE Project (500 MW):** MoA is being revised by the State Govt. as per decision of the meeting held on 14.12.2022. Optimization study is being carried out.

» **Talong Londa HE Project (225 MW):** Due diligence study is on the verge of completion and viability of the project is being evaluated. RCE shall be examined by a Committee of Experts.

» **Dibbin HE Project (120 MW):** Preliminary study on technical, cost and tariff aspects have been completed. Cost and tariff have been found to be much on higher side.

(II) Hydro Electric Schemes with TEC by State Government

» Phanchung HE Project (56 MW), Saskangrong HE Project (45 MW), Par HE Project (52 MW), Simang-I HE Project (67 MW), Simang-II HE Project (66 MW) and Khuitam HE Project (66 MW) shall be taken up in second phase in view of high cost and tariff.

(III) Hydro Electric Schemes without TEC

» **Pauk HE Project (145 MW):** Due Diligence has been completed and proposal shall be submitted to High-powered Evaluation Committee constituted by the Government.

In addition to the above, the MOP, GoI has indicated the. 2700 MW Siang Lower and 10000 MW Upper Siang HEPs for joint development by NHPC and NEEPCO.

(C) 196 MW Ujh Multipurpose HE Project, Kathua (J&K) :

Ministry of Power, GOI nominated NEEPCO to the Ministry of Jal Shakti as the executing agency. Technical Appraisal Committee clearance for an installed capacity of 89.5 MW has been accorded. EFC Memo initiated by Ministry of Jal Shakti has been circulated by MoP on 18.05.2022.

(D) Pumped Storage Project (PSP):

As per the directions of Hon'ble Minister of Power and New & Renewable Energy in the meeting dated 11.03.2022, NEEPCO studied eight potential PSP sites in Mizoram/Assam/Manipur and identified Leiva Lui (1500 MW), Nghasih (400 MW), Tuiphai Lui (1650 MW) in the State of Mizoram to be technically viable. PFR preparation works for the same is under progress.

NEEPCO has carried out detailed study envisaging utilization of existing reservoirs, as a result of which the following 2(two) PSPs have been identified:

a) **Kopili PSP (320 MW):** Draft PFR has been submitted by Consultant. The viability of the project is being assessed on the basis of the PFR.

b) **Panyor PSP (660 MW):** PFR completed. Works for DPR preparation under progress

(E) Floating Solar Project (FSP):

a) **Floating Solar Project (FSP) at Kopili HPS, Assam:** The pre-feasibility study for installation of floating solar power project on Umrangso reservoir of Kopili HPS have been completed. The CUF of the project is expected to be around 15.78% at DC

b) **Floating Solar Project at Umiam Lake, Meghalaya:** For taking up the feasibility and detail analysis, and to prepare a Detailed Project Report (DPR), NOC has been received from the Govt. of Meghalaya.

c) **Acquisition of Solar Power Project:** NEEPCO has started the process of acquiring stressed solar projects in the country. Hiring of one of the big four consultants for selection of assets and transaction advisory assistance is under progress.

COMMERCIAL PERFORMANCE (2021-22)

Total billing against sale of power during the year 2022-23 (till December 2022) is Rs 3468.23 Crore. However, only Rs 3219.33 Crore (including rebate allowed amounting to Rs 21.98 Crore) has been received from the beneficiaries up to the month of December 2022. Further, total outstanding dues above 45 days as on December 2022 is 231.154 Crore which includes Rs 152.78 Crore against Tripura.

CSR ACTIVITIES:

Over the years, NEEPCO has undertaken CSR activities on Health and Sanitation, Promotion of Education, Entrepreneurship Development Program, Rural Development and Swachh Bharat Abhiyan for all round development of the people residing in and around its operational areas. NEEPCO has been awarded the prestigious National CSR Awards 2020 by Ministry of Corporate Affairs, Govt of India for its commendable CSR Activities in the Aspirational District of Ribhoi in Meghalaya.

CHAPTER 23

GRID CONTROLLER OF INDIA LIMITED (GRID-INDIA) (erstwhile POSOCO)

GRID-INDIA Overview

'Power System Operation' is a mission critical function of national importance for smooth evacuation of power from generating stations and supply to the end consumers in the electricity supply value chain. System operators ensure the power balance in the interconnected power system on a real time basis in a secure

and reliable manner. Power System Operation involves taking care of the overall reliability ,security, economy and efficiency of the power system.

GRID-INDIA has the onerous responsibility of operating the All India synchronous grid, one of the largest and most complex in the world, ensuring reliability and security. India is ranked third in terms of electricity generation, electricity consumption, installed generation capacity and size of transmission system in the world. The power sector in India has seen a transformationalchangewithprogressivepoli cy-levelreforms and effective implementation of the same in the recent years. GRID-INDIA, through its National Load Despatch Centre (NLDC) and five (5) Regional Load Despatch Centres (RLDCs), facilitates the inter-state transmission of power to utilities across India ultimately reaching to over 1.38 billion people. GRID-INDIA also administers India's wholesale electricity market through coordination with thousands of entities every day for balancing demand and generation every 15 minutes in line with the regulations of Central Electricity Regulatory Commission (CERC).

The functions of GRID-INDIA have been evolving with the Integration of power systems, increase in electrical energy demand, growth in the economy and changes in technology, regulations, market design, administration and management of the power system. GRID-INDIA is a knowledge based organization and is fulfilling various other functions assigned by the Govt. of India, from time to time. GRID-INDIA is facilitating and enabling power sector reforms by Ministry of Power, regular feedback is given to the Central Electricity Regulatory Commission, Central Electricity Authority and Central Transmission Utility on design & operational aspects pertaining to Power System and Power Market Operation.

GRID-INDIA is committed to ensuring Integrated Operation of Regional and National Power Systems to facilitate transfer of electric power within and across the regions and trans-national exchange of power with Reliability, Security and Economy. It ensures independent system operation and provides level playing field to all stakeholders.

Operational Highlights

The tremendous pace of expansion of the generation, trans-mission and distribution in terms of higher voltages, large footprint and new technologies has strengthened the Indian power grid supporting the Government of India's vision on attaining'Powerforall'.GRID-INDIA has continued to advance grid operations and market design initiatives to prepare Indian grid for the future. Theoperationalhighlightsfor2022-23 (Upto December) are asfollows:

Particulars	2022-23 (till Dec)	2021-22 (till Dec)	% Variation	Highest ever
All India Energy Met (BU)	1138	1030	10.5	4722 MU on 10th June 2022
All India Highest Demand Met (GW)	211.8	201	5.4	211.8 GW on 10th June 2022
All India Hydro Generation (BU)	148	126	17.5	877 MU on 30th August 2022
All India Thermal Generation (Coal & Lignite) (BU)	892	816	9.3	3586 MU on 27th April 2022
All India Wind Generation (BU)	58	58	0.0	555 MU on 22nd May 2022
All India Solar Generation (BU)	68	51	33.3	306 MU on 5th June 2022
Energy facilitated through inter-regional exchange (BU)	176	172	2.3	-
Cross border interchange (Export) (MU)	7058	6803	3.7	-
Cross border interchange (Import) (MU)	7831	7252	8.0	-
Energy approved through Short Term Open Access (BU)	123	121	1.65	-

Achievements

Frequency Profile

During 2022-23 (till December), Frequency remained within Indian Electricity Grid Code (IEGC) band of 49.90-50.05 Hz for 72% of time. Frequency remained within the IEGC band for highest 87.7% of time on 10th June 2022. On most of the days, average frequency was close to the national reference frequency of 50 Hz.

Automatic Generation Control (AGC)

AGC in India was operationalized in January, 2018 on a pilot basis for the first time. GRID-INDIA has been making consistent efforts and coordinating with various stake holders for full scale roll out of AGC pan India. Hon'ble Cabinet Minister of Power and New & Renewable Energy, Government of India dedicated the Automatic Generation Control (AGC) to the nation on 03rdJanuary, 2022. As on date, 66 power plants with total capacity of 64 GW have been integrated with AGC at national level and are continuously operating 24x7. Efforts are underway to bring Solar and Battery Energy Storage Systems (BESS) under AGC as pilot projects in near future. Rigorous testing and quality assurance process has been adopted before introducing this automatic control and to add any new generators under AGC. The pan-India AGC project, shall enable efficiency and grid security in the India power system, making it ready to handle the 500 GW of renewables targeted by 2030.

Security Constrained Economic Despatch (SCED)

Based on Govt. of India Policy framework and Regulatory directions, to optimize the national resources a Pilot on Security Constrained Economic Despatch (SCED) in ISGS Pan India was implemented w.e.f. 1st April 2019. The pilot was implemented by GRID-INDIA for all the thermal ISGS that are regional entities and whose tariff is determined or adopted by the Central Commission for their full capacity honouring the existing scheduling practices prescribed in the Grid Code. A robust, integrated SCED software application was developed in-house, which runs every 15 minutes on 24x7 basis to optimize the all-India variable cost of generation, while fulfilling grid security constraints. As on date, around 50 plants with ≈50 GW capacity are operational under SCED.

The draft Grid Code notified by CERC in June 2022 has provisions for Security Constrained Unit Commitment (SCUC) too in addition to SCED.

The cumulative reduction (savings) upto December 2022 (since Apr'19) in total production costs/variable charges due to SCED generators is approx. ₹ 2547 Crore (exc. Heat compensation).

Development of Ancillary Services

Ancillary services are one of the four essential pillars of market design; the other three being scheduling & despatch, imbalance handling and congestion management. The regulatory framework for ancillary services was introduced for the first time in India in 2015 and implemented in April 2016. Ancillary services have gained increased importance in today's restructured power systems to ensure reliable operation of the grid. RRAS has addressed the congestion management issues and optimization at regional &pan-India level, helped in achieving better frequency control, and facilitating integration of renewables by supporting in balancing. The Ancillary Services Regulation 2022 has been notified by CERC wherein provisions for deployment of Secondary Reserve Ancillary Services (SRAS) and Tertiary Reserve Ancillary Services (TRAS) have been mentioned. The detailed Procedure for SRAS has been operationalized w.e.f. 5th December 2022 and the provisions pertaining to TRAS in the aforesaid Regulations are likely to be implemented shortly.

National Open Access Registry (NOAR)

NOAR has been successfully running live from 1st May 2022. NOAR has been designed as an integrated single window electronic platform accessible to all stakeholders including open access participants, traders, power exchanges, national/regional/state load dispatch centres for electronic processing of short-term open access application thereby automating the administration of the short-term open access in inter-state transmission system.

NLDC operated by GRID-INDIA has been designated as the nodal agency for implementation and operation of NOAR. NOAR is the key to facilitate faster electricity markets and enable integration of Renewable Energy (RE) resources into the grid. It enables seamless market participation by the open access consumer with easier and faster access to the short-term electricity market, comprising of about 10% of all India demand.

NOAR is part of the Ministry of Power, Government of India's initiative and the required regulatory framework has been notified by the CERC through operationalization of the 5th Amendment Regulation of Open Access in inter- State Transmission.

Green Energy Open Access

Ministry of Power has notified Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 on 06.06.2022 in order to further accelerate the ambitious renewable energy programmes, with the objective of ensuring access to affordable, reliable, sustainable and green energy for all. Union Minister of Power & New and Renewable Energy launched the Green Energy Open Access portal on 11th November 2022. The portal provides a transparent, simplified, uniform and streamlined procedure for granting open access to green energy that would be key to facilitating deepening of electricity markets and enabling integration of Renewable Energy (RE) resources into the grid. The portal may be accessed at https://greenopenaccess.in/.

Renewable Energy Management Centres (REMCs)

13 number of Renewable Energy Management Centres (REMCs) co-located with the State Load Despatch Centres (SLDCs) in Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Madhya Pradesh, Gujarat, Rajasthan, Telangana & Andaman and in RLDCs at Bengaluru, Mumbai and New Delhi and at the NLDC, Delhi has been commissioned. As on December 2022, ≈ 95 GW of renewable (53 GW Solar and 42 GW Wind) is being monitored through the REMCs. REMCs serve as dedicated RE management system to facilitate safe & secure grid operation in the area of responsibility. REMCs are equipped with Forecasting and Scheduling Tool & Real Time

Monitoring of RE generation which enables safe, secure and optimal operations of the overall grid.

Renewable Energy Certificate Mechanism

Renewable Energy Certificate (REC) Mechanism is a market-based instrument in India for promotion of RE sources. It was introduced in India in November 2010. REC Mechanism provides a means to address the dispersed availability of renewable energy sources across various States in the Country and separates the 'green' component from the 'electricity' component and facilitates meeting of the Renewable Purchase Obligation (RPO) by the obligated entities.

The REC Regulations, 2022 has been notified by CERC on 9th May 2022 and the same has been operationalized w.e.f. 5th December 2022. A Revamped REC Web portal has been launched by GRID-INDIA on 5th December 2022 to implement the new REC Mechanism framework.

Energy Efficiency and Perform, Achieve and Trade (PAT) Scheme

To promote energy efficiency in the large-scale energy intensive industries, MoP, Govt. of India has launched Perform, Achieve and Trade (PAT) scheme under National Mission for Enhanced Energy Efficiency (NMEEE). MoP has notified Energy Conservation Amendment Rules, 2022 vide notification dated 30th August 2022, wherein the floor price for ESCert has been introduced and notified that Energy Savings Certificates issued shall remain valid till these energy saving certificates are sold.

Renewable Purchase Obligation (RPO)

MoP vide order dated 29.01.2021 notified RPO Trajectory, that also includes long-term trajectory for Hydro Power Obligation (HPO). MoP, in July 2022, notified long term growth RPO trajectory for FY 2022-23 onwards till 2029-30, wherein Wind RPO trajectory is also notified which shall be met only by energy produced from Wind power projects commissioned after 31st March 2022. The Energy Storage Obligation is also notified by MoP from FY 2023-24 to FY 2029-30 to promote Energy storage.

Pilot Projects of Standalone Battery Energy Storage Systems (BESS)

The availability of adequate Energy Storage Systems (BESS, hydro pump storage plants etc.) is essential in order to support the ambitious goal of achieving 500 GW renewable energy target of India by 2030. Subsequent to the approval from Govt. of India, Solar Energy Corporation of India Limited (SECI), a CPSU under MNRE, invited proposals for setting up of ISTS-connected Pilot Projects of Standalone BESS, for an aggregate storage capacity of 1000 MWh (500 MW x 2 hrs) under Global Competitive Bidding. Request for Selection (RfS) document for this projects under Tariff-Based Global Competitive Bidding (ESS-I) has been issued under the Standard Bidding Guidelines. The successful bidder/bidders shall have to sign the Battery Energy Storage Purchase Agreements (BESPA).

Going forward, India plans to use energy storage system under following business cases:

- Renewable energy along with the energy storage system.
- Energy storage system as grid element to maximize the use of transmission system and strengthening grid stability and also to save investment in the augmentation of transmission infrastructure.
- Storage as an asset for balancing services and flexible operation. The system operator i.e. load dispatchers (RLDCs and SLDCs) may use storage system for frequency control and balancing services to manage the inherent uncertainty/variations in the load due to un-generation.
- Storage for distribution system i.e. it may be placed at the load centre to manage its peak load and other obligations.
- As a merchant capacity by the energy storage system developer and sell in the power market.
- Any other future business models as a combination of the above.

Participation in Policy & Regulatory Reforms

GRID-INDIA actively supported Ministry of Power in the various policy and legislative processes.Attheregulatorylevel too, GRID-INDIA has been associated with introduction of Green Energy Open Access, NationalOpenAccessRegistry,Gate Closure, Real Time Markets, pilot on five-minute schedulingand settlement, Security Constrained Economic Despatch, Sharing of Inter-State Transmission Charges and Losses etc.

Grid Resilience

The impact of climate change leading to adverse weather condition sand/or natural disasters in many pockets as well as the increasing number of high impact low probability incidents bring about a need for making the system more resilient. GRID-INDIA-NLDC as the Nodal Agency for Disaster Management in Power Sector coordinated for preventive measures and quick restoration during natural calamities such as extremely severe Cyclone Mandous in December 2022 & very severe cyclonic storm Sitrang in October 2022.

Institution Building and Strengthening

Human capital management and building sustainable institutions is a key priority area for GRID-INDIA. Employees are encouraged to learn new skills, take up more responsibilities and be unfazed in the face of challenges. As part of the GRID-INDIA's emphasis on development of human capital, employees now have greater access to upgrade themselves through online training platforms as well as training conducted by in-house and external trainers. GRID-INDIA is also collaborating with the State Load Despatch Centres in various functional areas, leading to knowledge sharing and overall development of the sector. GRID-INDIA

is well-positioned to lead the transition to greater renewable energy penetration in the Indian power sector, given our quality resources, experience and technical knowhow.

Corporate Social Responsibility

Every year GRID-INDIA carries out CSR activities in compliance of the provisions of the Companies Act, 2013. An amount equivalent to 2% of average of previous three years net profit of the company is allocated on the CSR activities. During FY 2022-23, an amount of Rs.107.09 lakh has been allocated towards taking up CSR activities. Following activities are under implementation, under CSR, during FY 2022-23:

- Design of prosthetic hand for below-elbow disabilities
- Supply of Medial equipment and other healthcare Infrastructure items in Govt. hospital/Polyclinic/ Maternity home/ Maternity & Child Welfare Centre
- Organizing camps for providing aids and assistive devices to Persons with Disabilities in one of the Aspirational Districts identified by NITI Aayog Activities promoting Swachch Bharat Abhiyan/ SwchchtaPakhwada/ Swasthya/Contribution to Swachch Bharat Kosh
- Capacity Building in the field of Computer education
- Annual Maintenance charges towards Water ATMs provided at Safdarjung Hospital, New Delhi under CSR activity of FY 2019-20
- Supply of medical equipment's in the Govt. Hospitals in the rural areas of Karnataka to be utilized towards COVID-19 related activities
- Promoting research and studies related to Power Systems in the engineering institutions to encourage excellence in the area

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CHAPTER 24

SJVN

1.0 About SJVN

SJVN Limited, a Mini Ratna, Category-I and Schedule – 'A' CPSE under administrative control of Ministry of Power, Govt. of India, was incorporated on May 24, 1988 as a joint venture of Government of India (GoI) and Government of Himachal Pradesh (GoHP) to plan, promote, develop all forms of power, both renewable as well as non-renewable and all ancillary activities related thereto, in India and abroad.

GoI through an Initial Public Offer (IPO) of SJVN in the month of May, 2010 offered 10.03% of its share to public and financial institutions. Present equity share holding of GoI, GoHP and Public is 59.92%, 26.85% and 13.23% respectively. The authorized capital of SJVN is Rs. 7,000 crore and paid-up capital is Rs. 3930 crore.

Beginning with construction of India's largest 1500 MW Nathpa Jhakri Hydro Power Station in Himachal Pradesh, SJVN is presently implementing Hydroelectric Projects in Himachal Pradesh, Uttarakhand, Arunachal Pradesh, Mizoram, Maharashtra and Odisa in India besides neighbouring country of Nepal. Apart from hydro power, SJVN has also ventured into thermal power, wind power, solar power, power transmission and power trading. Nathpa Jhakri HPS and Rampur HPS started commercial operation in May, 2004 and in December, 2014 respectively. During FY 2022-23, NJHPS and RHPS have generated 6512 MUs and 1820 MUs respectively up to 31.12.2022.

SJVN forayed in to other forms of power and commissioned 47.6 MW Khirvire Wind Power Project in Maharashtra in May, 2014; 5.6 MW Charanaka Solar Power Project in Gujarat in March, 2017, 50 MW Sadla Wind Power Project during FY 2019-20 and 75 MW Parasan Solar Power Plant in November, 2022. From all these projects, 140 MU energy has been generated up to 31.12.2022 during FY 2022-23.

Presently, SJVN has a total of sixty seven power projects having 44378 MW total capacity and three transmission lines of 340 km. Out of this, 2092 MW (7 power projects) & one transmission line of 86 km are under operation, 3851 MW (10 power projects) & two transmission lines of 254 km are under construction and 38436 MW (50 power projects) are under investment approval, pre-construction and survey & investigation stages.

SJVN has paid a total dividend of Rs. 668.07 crore for FY 2022-23. The year wise details of dividend paid in last three years is given as under:

Year	GoI	GoHP	Public	Total
2019-20	518.06	232.10	114.40	864.56
2020-21	518.06	232.10	114.40	864.56
2021-22	400.32	179.35	88.40	668.07

2.0 Progress Made During 2022-23

The Progress made during the year 2022-23 up to 31.12.2022 is as under:

Description	Actual Achievement up to 31.12.22 during the FY22-23	Tentative projections of gross generation during period 01.01.23 –31.03.23	Total projected gross energy generation up to end of Mar 23	Target proposed in for FY 2022-23
Hydro Power (MUs)	8332	953	9285	9285
Wind Power (MUs)	120	30	150	150
Solar Power (MUs)	20	45	65	65
Total	8472	1028	9500	9500

3.0 Achievements and Awards

- Hon'ble President of India, Smt. Droupadi Murmu, laid foundation stone of SJVN's 1000 MW Bikaner Solar Power Project on 03.01.2023.
- Govt. of Nepal has allotted Arun 4 HEP to SJVN and MoU signed in Lumbini, Nepal in the benign presence of Prime Minister of India Sh. Narendra Modi and Prime Minister of Nepal Sh. Sher Bahadur Deuba.
- Commissioning of 75 MW Parasan Solar Power Plant in November, 2022 in Uttar Pradesh.
- CCEA has accorded investment approval to 382 MW Sunni Dam HEP with a project cost of Rs. 2614.51 crore on 04.01.2023.
- SJVN Limited has received First Prize in Swachhta Pakhwada Award 2022.
- SJVN has been conferred with 13th CIDC Vishwakarma Awards 2022 in the categories of 'Corona Warriors Award' and 'Partners in Progress.
- SJVN has been conferred with Global CSR Excellence and Leadership Award by World CSR Congress under the category of "Best COVID-19 solution for community care".

4.0 Financial Parameters of SJVN

The financial performance of SJVN for the last five financial years is as under:

Description	2021-22	2020-21	2019-20	2018-19	2017-18
Total income	2625.54	3213.07	3095.24	2908.99	2587.07
Profit after tax	977.52	1633.04	1557.43	1364.29	1224.88
Dividend	668.07	864.56	864.56	844.91	864.56
Other (equity) Reserves and Surplus	9198.81	8832.04	8104.51	7308.98	6764.91

5.0 Future Plan for Capacity Addition

SJVN has drawn a comprehensive capacity addition plan to emerge as a major contributor in power generation with a vision of installed capacity of 5000 MW by 2023-24, 25000 MW by 2029-30 and 50000 MW by 2039-40.

In next five years (i.e. up to FY 2027-28), capacity addition plans of SJVN are as under:

- Capacity addition of 12110 MW cmprising of 1662 MW Hydro, 9128 MW Solar and 1320 MW Thermal project.
- Commissioning of 217 km, 400kV double circuit transmission line for evacuation of power from Arun-3 Project in Nepal up to Dhalkebar (in Nepal) and 37 km, 220 kV transmission line for evacuation of power of Naitwar Mori HEP from Mori (Uttarakhand) to Snail (Himachal Pradesh).
- Further, another nineteen hydroelectric projects and ten Pump Storage Plants are under various stages of survey & investigation/ pre-construction which are expected to come into construction in coming years.

6.0 Current Project Portfolio

SJVN has currently a portfolio of sixty seven power projects and three transmission lines (TL) in India and abroad as per details given below:

S. N.	Project	Location	Capacity (MW)
Projects under operation			
1	Nathpa Jhakri HPS	Himachal Pradesh (H.P.)	1500
2	Rampur HPS	H.P.	412
3	Khirvire Wind PP	Maharashtra	47.6
4	Charanka Solar PP	Gujarat	5.6
5	Sadla Wind PP	Gujarat	50
6	Solar PV PP at NJHPS	H.P.	1.3
7	Parasan Solar PP	Uttar Pradesh (U.P.)	75
8	400 kV Transmissio9n Line (CPTC-JV-26% share)	Sursand (Nepal border) to Muzaffarpur (Bihar)	86 km
	Sub-Total		**2092 + 86 km T/L**
Projects under construction			
9	Arun - 3 HEP	Nepal	900
10	Naitwar Mori HEP	Uttarakhand	60
11	Luhri HEP Stage-1	HP	210
12	Dhaulasidh HEP	HP	66
13	Buxar Thermal PP	Bihar	1320
14	Bagodara Solar Power Project	Gujarat	70
15	CPSU Scheme: Bikaner Solar Power Project (SPP)	Rajasthan	1000
16	Gujrai SPP	U.P.	50
17	Gurhah SPP	U.P.	75
18	Raghanesda SPP	Gujarat	100
19	Sunni Dam HEP	H.P.	382 km
20	Omkareshwar Floating SPP	M.P.	90 km
21	Arun-3 Transmission Line		217 km
22	Mori Snail Transmission Line	Uttarakhand / HP	37 km
	Sub-Total		**4323 MW + 254 km T/L (2 Nos.)**
Projects under pre-construction			
23	Lower Arun HEP	Nepal	669
24	Jakhol Sankri HEP	Uttarakhand	44
25	BREDA SPP	Bihar	200
26	PSPCL SPP	Punjab	100
27	BBMB Floating SPP	HP	15
28	BBMB Ground Mounted SPP	HP+Punjab	18
29	GUVNL Phase-XIII Solar Power Project	Gujarat	100
30	GUVNL Phase-XIV Solar Power Project	Gujarat	160
31	Maharashtra SPP	Maharashtra	200
32	Bhanjal and Kadh SPP	HP	20
33	Fatehpur SPP	HP	20
34	Kolar SPP	HP	30
35	Rajgir SPP	HP	13
36	Thaplan SPP	HP	112
	Sub-total		**1701**

Projects under survey & investigation			
37	Luhri Stage-II HEP	HP	172
38	Jangi Thopan Powari HEP	HP	804
39	Purthi HEP	HP	234
40	Bardang HEP	HP	175
41	Reoli Dugli HEP	HP	456
42	Sach Khas HEP	HP	287
43	Tandi- Rashil HEP	HP	268
44	Devsari HEP	Uttarakhand	194
45	Arun-4 HEP	Nepal	490
46	Kaza SPP	HP	880
47	Kinnaur SPP	HP	400
48	Renewable Energy Project / Parks	Rajasthan	10000
49	Floating solar power projects -Assam	Assam	1000
50	Floating solar power projects	Maharashtra	105
51	Choo Small HEP	HP	3.5
52	Tindi Small	HP	4.4
53	Omkareshwar Phase-II Floating SP	MP	83
54	Hydro Power Project	Odisa	1000
55	Solar Power Project	Odisa	2000
	Sub-Total		**18556**
Projects in Arunachal Pradesh			
56	Etalin HEP	AP	3097
57	Attunli HEP	AP	680
58	Emini HEP	AP	500
59	Amulin HEP	AP	420
60	Mihumdon HEP	AP	400
	Sub-Total		5097
Pump Storage Projects (PSPs)			
61	Chera Khad	HP	500
62	Dhurmu	HP	1600
63	Sadda	HP	220
64	Purthi & Sach Khas PSP	HP	190
65	Kolmondapada	Maharashtra	800
66	Sidgarh	Maharashtra	1500
67	Chornai	Maharashtra	2000
68	Baitarni	Maharashtra	1800
69	Jalvara	Maharashtra	2000
70	Daizo Lui	Mizoram	2000
	Sub-Total		**12610**
	Total		**44378**

7.0 Industrial Relations

Regular interactions are held with the representatives of various Associations/ Unions. The thrust area for discussions is related to policies as well as issues concerning enhancing production, efficiency and improving organizational climate. The above actions of the Management paved the way for cordial and better employee-employer relations & cordial industrial relations were maintained during the year. Recreational, cultural and sports activities are being organized on different occasions for improving inter – personal relations and also to bring out the talent of employees and their family members.

8.0 Environment

SJVN is aware of its obligation to conserve and protect the environment. SJVN strictly adheres to all policies and guidelines of the Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India (GoI) concerning identification and mitigation of environmental impacts of projects. To achieve sustainable development, an Environment Management Plan is prepared and suitable measures are adopted to negate any adverse impact on the environment and ecology during construction and operation stages.

All the legal requirements related to emission and waste generation are being complied by the company and compliance reports are periodically submitted to concerned authorities such as MoEF&CC, SPCB, etc. Environment monitoring of projects is carried out regularly by the regulatory authorities as well as SJVN through its internal monitoring mechanism or by NABL accredited labs.

At present SJVN has two hydro power stations, viz., Nathpa Jhakri Hydropower Station (NJHPS) (1500 MW) and Rampur Hydropower Station (RHPS) (412 MW) under operation wherein Environment management measures such as Catchment Area Treatment (CAT), Compensatory Afforestation (CA), Muck Management, Restoration of muck disposal sites, quarry sites and construction areas, Green belt development, Biodiversity Management, Fisheries Management, etc. are undertaken after thorough EIA studies at SJVN. Environment Management System at SJVN projects are IS/ISO 14001:2015 compliant, while the Quality Management systems are IS/ ISO 9001:2015 compliant. SJVN has adopted an Environment Policy that reaffirms its commitment towards sustainable power generation and transmission with utmost care for the environment. Further, SJVN becomes the first CPSE to implement ISO 31000:2018 - risk management system.

SJVN is also executing Naitwar Mori HEP in Uttarakhand, Luhri HEP-I, Dhaulasidh HEP in Himachal Pradesh beside 1320 MW Buxar Thermal Power plant in Bihar. These projects are strictly complying with all the environment conditions and management measure mentioned in EIA/EMP report. Further, a Bio-Diversity Park adjacent to Corporate Head Quarters building is being developed.

9.0 Corporate Social Responsibility and Sustainability (CSR)

SJVN being a responsible corporate citizen has been implementing CSR programs integral to its core business activities. The CSR programs are focused on inclusive growth of the societies in and around its operational areas. In accordance with The Companies Act, 2013 and Companies (Corporate Social Responsibility Policy) Rules, 2014, SJVN has constituted a committee of Directors on CSR and also framed and adopted its CSR and Sustainability Policy. As per the Act and the guidelines set out, SJVN allocates a minimum of 2% of the average net profits made during the three immediately preceding financial years for CSR activities.

SJVN has been consistently spending much more than the statutory requirement on CSR. The CSR & Sustainability Budget Plan for FY 2022-23 of SJVN has been approved with a budget outlay of Rs.53.23 crore against the statutory requirement of only Rs.36.46 Crore, considering the need to uplift and support the vulnerable groups of society. The major CSR activities carried out by SJVN under different verticals are detailed below:

9.1 Health and hygiene:

- SJVN provides free medical services through 14 Mobile Medical Units (MMUs) in the states of Himachal Pradesh, Uttrakhand, Bihar and Maharashtra. So far more than 11.50 lakh persons have been benefitted.
- SJVN has adopted aspirational district Chamba (HP) for carrying out theme based CSR works and so far an amount of Rs. 7.03 crore has been spent. The projects amounting to Rs.2.25 crore have been sanctioned for the FY 22-23.
- In addition to above, 11 Specialized/ multi-specialized medical camps and 600 ayurvedic health awareness camps are being organized.

9.2 Education and Skill development programs: The following programs are being undertaken under this head:

- Short term (2-3 months) trainings to 250 candidates through HIMCON in the projects areas and training for 75 kins and dependents of army personnel.
- Training on latest farming/ seeding techniques in association with agricultural universities like CSK Himachal Pradesh Krishi Vishwa Vidyalaya, Palampur.
- 25 candidates have been nominated for getting vocational trainings in Govt. ITIs. Besides the tuition fees, a stipend of Rs.2000/- per month is given to these sponsored students.
- SJVN is providing financial support of Rs. 1 crore each to Eight ITIs of H.P. out of which work in 4 ITIs has been completed and in remaining ITIs the work is under progress. So far Rs.7.50 crore has been released to respective ITIs.
- SJVN is providing financial support of Rs. 5.57 Lakh for setting up 04 Gyan Kendra (Libraries) in Distt. Kullu. Construction of School building at Nathpa, Distt. Kinnaur, H.P. at a cost of Rs.4.02 Crore.
- Pathology lab of MC Shimla has been re-established with financial implication of Rs.25.26 lakhs at Shimla.
- Skill development programs for 200 candidates through CIDC is under progress. Skill training to 60 candidates through RCED is completed.
- Silver Jublee Merit Scholarship scheme.

9.3 Sustainable Development: The following activities are being carried out by SJVN under this head:

- Water supply scheme at village Neether (HP) with tentative financial implication of Rs.8.00 Crore is under implementation.
- State Level Energy Conservation Painting Competition for school students was organized in H.P with tentative financial implication of Rs.30.00 lakhs.

9.4 Preservation & promotion of culture and sports:

- MOU was signed with Shree KedarnathUtthan Charitable Trust (UK) for Rs.11.99 crore towards Lake Front Development (Sheshnetra Lake) and for providing financial support of Rs.10.00 crore for Pilgrim Accommodation Block at Kedarnath Dham.
- SJVN was sanctioned Rs. 5.00 crore in the year 2021 to Sardar Vallabbhai Patel Rashtriya Ekta Trust (SVPRET), Gandhinagar, Gujarat for integrated development of Kevadia, Gujarat for various CSR theme based projects. So far an amount of Rs.4.90 Crore has been released. MOU with GoH.P. has been signed for development of following cultural Heritage sites; (i) Sapni Fort, Village Sapni, Sangla Valley, Kinnaur, (ii) Parshu Ram Temple Complex, Nirmand, Tehsil Anni, District Kullu, (iii) Kalka-Shimla heritage Railway.
- Financial assistance of Rs.1.50 Crore was provided to Special Olympics Bharat for National Health Fest for Divyangjan Players under Azadika Amrut Mahotsav. Special medical screening camps were organized for persons with Intellectual and Developmental Disability (PWIDD).

9.5 SJVN Empowering Weaker Sections of Society:

- SJVN is running "Women and Child Development scheme" under which the Below Poverty Line (BPL) women residing in Project Affected Areas of SJVN are extended for a financial benefit of Rs.10,000/- and in addition a gift pack worth Rs.1000/- consisting of nutritional food items, soaps and other hygiene related items is also given.
- SJVN is extending financial support of Rs.6.65 Crore to the School/ Home for speech, hearing and visually impaired children at Dhalli (HP).

- SJVN has extended financial support of Rs.1.37 Crore construction / furnishing of Ground floor of Research and Rehabilitation Centre for differently abled and deprived sections of the society at village Vijaypur, Distt. Bilaspur (HP).

9.6 Assistance to the victims of natural disasters/ calamities/ pandemic contributions towards Relief Funds:

- SJVN Foundation has contributed Rs.12.00 Crore to PM CARES Fund for various healthcare related activities and to combat COVID-19.
- Financial support of Rs.8.00 Crore has been sanctioned for construction of fodder/wood storage sheds which got destroyed in fire for the 3579 families in the four blocks namely Mori, Purola, Naugaon and Chinyalisaur (Uttarakhand). So far Rs.8.00 Crore has been released and 1684 sheds have been constructed.
- Financial assistance of Rs.3.00 Crore has been sanctioned to Vishranti in VMRI Palampur for construction of 100 bedded Senior Citizen Home. The work is under progress and so far Rs.2.00 Crore has been released.

10. Rehabilitation and Resettlement in SJVN

SJVN, being conscious of its responsibilities towards society, is committed to execute and operate power projects in a socially responsible manner by adopting generous Resettlement & Rehabilitation measures for the benefit of project affected families (PAFs) and by investing in socio¬economic development of communities so as to continually minimize potential negative impacts as well as to establish sustainable positive impact of projects on them.

Well before any project is taken up for execution, Social Impact Assessment (SIA) study is carried out to ensure that the potential socio-economic benefits accrued from the project outweigh the project cost and adverse social impact. Public consultation meetings with the stakeholders are held by the project authorities to make them aware of developmental facilities and their benefits to the society. Subsequently, the R&R plan is devised based on conclusive findings derived from socio economic survey carried out by an independent expert agency. The R&R plan devised so and approved, essentially prescribes mitigation measures for reconstruction and regeneration of economic well being of the PAFs.

The R&R plans have been successfully implemented in 1500 MW Nathpa Jhakri Hydro Power Station (NJHPS) HP and 412 MW Rampur Hydro Power Station (Rampur HPS) HP. The R&R Plan is under implementation in Naitwar Mori HEP and Luhri Stage-I HEP. In Dhaulasidh HEP, the R&R Plan has been approved. In Sunni Dam HEP, the R&R Plan is under approval by GoHP.

Hon'ble President of India, Smt. Droupadi Murmu, laid foundation stone of SJVN's 1000 MW Bikaner Solar Power Project on 03.01.2023.

MoU for development of 490 MW Arun-4 Hydro Electric Project in Nepal has been signed in Lumbini, Nepal in the benign presence of Prime Minister of India Sh. Narendra Modi and Prime Minister of Nepal Sh. Sher Bahadur Deuba.

Chairman & Managing Director, SJVN presented with Token of Appreciation in recognition of valuable contribution for the development of Energy Sector in Nepal.

In the august presence of Hon'ble Chief Minister of Madhya Pradesh Sh. Shivraj Singh Chouhan, Power Purchase Agreement for 90 MW Floating Solar Project (FSP) at Omkareshwar, Madhya Pradesh was signed in Bhopal.

Sh. Nand Lal Sharma, Chairman & Managing Director, SJVN Limited received First Prize in Swachhta Pakhwada Award 2022.

CHAPTER 25

THDC INDIA LTD

THDC India Limited is a leading profit making Public Sector Enterprise registered in July'1988 under the Companies Act, 1956. THDCIL was conferred 'Mini Ratna–Category-I status in Oct'2009 and up-graded to Schedule 'A' PSU in July'2010 by the Govt. of India.

The Equity of company was earlier shared between Govt. of India and GoUP in the ratio of 75:25. Pursuant to Strategic Sale, the Share Purchase Agreement was executed between NTPC Limited and President of India on 25th March'2020, for acquisition of legal and beneficial ownership of equity held by the President of India in THDC India Limited. After Strategic Sale, Equity in THDC India Limited is shared between NTPC Limited and Government of UP in a ratio of 74.5% and 25.5%.

The Authorized Share Capital of the Company is ₹ 4000 Cr and paid-up capital as on 31st Dec'2022 is ₹ 3665.88 Cr. THDCIL started earning profits from first year (2006-07) of commercial operation of its maiden project i.e. Tehri HPP (1000 MW) and THDCIL is a consistently profit-making company since then.

THDCIL was constituted with the sole objective to develop, operate & maintain the 2400 MW Tehri Hydro Power Complex (Tehri HPP-1000 MW, Tehri PSP-1000 MW and Koteshwar HEP-400 MW) and other Hydro projects. THDCIL has expanded its horizons and fully diversified in all types of conventional and non-conventional forms of energy.

Current Project Portfolio

Presently, THDCIL has a portfolio of 10 projects (Hydro, Thermal, Wind & Solar), totaling to an installed capacity of 4,516 MW, which includes 1587 MW operational and balance under various stages of development/implementation. In addition, a number of Projects in the country are in the business development stage.

S. N.	Name of Project	Installed Capacity	Location
A.	**Operational Plant**		
1.	Tehri Dam & Hydro Power Project,	1000 MW	Uttarakhand
2.	Koteshwar Hydro Electric Project, Uttarakhand	400 MW	Uttarakhand
3.	Patan Wind Power Project,	50 MW	Gujarat
4.	DevbhumiDwarka Wind Power Project, Gujarat	63 MW	Gujarat
5.	Dhukwan Small Hydro Project,	24 MW	Uttar Pradesh
6.	Kasaragod Solar Power Project,	50 MW	Kerala
B.	**Under construction Project**		
7.	Tehri Pumped Storage Plant	1,000 MW	Uttarakhand
8.	Vishnugad Pipalkoti Hydro Electric Project	444 MW	Uttarakhand
9.	Khurja Super Thermal Power Project	1,320 MW	Uttar Pradesh
10.	Amelia Coal Mine	5.6 MTPA	Madhya Pradesh
C.	**Project under DPR preparation**		
11.	Bokang Bailing HEP	165 MW	Uttarakhand

Global Performance (as per performance indicators):

The corporation has grown into a multi-Project organisation, with projects spread over various states of India as well as other countries.

2585 MW Sankosh Storage Project and 180 MW Bunakha HEP in Bhutan : Under India-Bhutan Co-operation in Hydro Power Sector development, MOP allotted in Bhutan two Projects namely Sankosh Storage Project (2585 MW) for updation of DPR and Bunakha HEP (180 MW) for updation of DPR as well as subsequent implementation on Intergovernmental Authority Model/JV with Bhutanese PSUs. DPR of both the projects have been submitted.

1305 MW capacity Suusamyr-Kokomeren HPP (Kyrgyzstan): THDCIL has expressed its interest to develop Suusamyr-Kokomeren HPP and further requested Kyrgyz Authorities to provide specific data and details for enabling THDCIL to prepare plan for site specific studies and preparation of cost estimate for preparation of DPR of the project. On receipt of data, proposal for signing of MoU with Kyrgyz Authorities shall be framed and put up before THDCIL's Board of Directors and concerned departments / Ministries of GoI for its approval.

50 MW Solar Power Project in Ghana: THDCIL has expressed its interest to Ghanaian Government for development of 50 MW Ground Mounted Solar Power Project in Ghana in 22.04.2022. Response from Ghanaian side is awaited.

OPERATIONAL PERFORMANCE

THDCIL,at present,is generating power from Tehri HPP, Koteshwar HEP, Dhukwan SHEP, Patan wind powerplant, Dwarka wind power plantand Kasargod Solar Power plant with total installed capacity of 1587 MW.

During the year 2021-22THDCIL has generated 4670.81 MU which is more than previous year generation i.e. 4565.38 MU and THDCIL generated total 3753.69 MU energy upto Dec-22 during current year 2022-23.

FINANCIAL PERFORMANCE

The total Revenuefrom operation of THDCIL during the Financial Year 2021-22 is Rs.1921.49 Cr. THDCIL has earned a total comprehensive income of Rs.896.92 Cr. during the

Financial Year 2020-21. The Net Worth of the company as on 31st March 2022 is Rs.10306.15 Cr.as against Rs.9917.43 Cr. as on 31st March 2021.

COMMERCIAL PERFORMANCE

A revenue of approx. Rs. 1474.28 Cr. (94.26%) has been realized from the beneficiaries in the financial year 2022-23 till 31st Dec-2022 against the energy sales of Rs. 1564.05 Cr.

Future Vision of the Company:

Present installed capacity of THDCIL is 1587 MW having three Hydro, two Wind and one Solar Power Plant. THDCIL envisaged to add 2764 MW up to 2024-25 with anticipated commissioning of its three under construction power projects namely Tehri PSP (4x250 MW), Vishnugad Pipalkoti HEP (4x111 MW) and Khurja STPP (2x660 MW). The installed capacity of THDCIL is envisaged to be 4351 MW by the end of year 2024-25.

In addition to the above projects, 01 Hydro project-Bokang Bailing HEP (BBHEP) on river Dhauliganga (a tributary of Kali / Sarda river) in District Pithoragarh (Uttrakhand) with a proposed installed capacity of 165 MW is under development. The work of preparation of DPR of the Project is in progress.

THDCIL is exploring faster development of hydro sector in Uttarakhand through a Joint Venture Company of 'THDCIL' and 'UJVN' (a PSU of GoUK). GoUK has accorded clearance for formation of JV Company.

Ministry of Power, GOI, has indicated two Hydroelectric projects (Kalai-II 1200 MW and Demwe-Lower 1750 MW) to THDCIL in Lohit Basin in Arunachal Pradesh for carrying due diligence to take up these projects.

MoP has indicated 10 Pumped Storage Projects with probable installed capacity (IC) of 12555 MW to THDCIL in the state of Uttarakhand, Maharashtra, Tamil Nadu and Kerala to take up the matter with the concerned State Governments, carry out suitable analysis and prepare the evaluation reports expeditiously. For preparation of pre-feasibility report a consultant has already been appointed.

THDCIL is developing 2000 MW Solar Power Parks in State of Uttar Pradesh, Jhansi (600 MW), Lalitpur (600 MW) and Chitrakoot (800 MW)] through a joint venture Company namely 'TUSCO Ltd' between 'THDCIL' and 'UPNEDA' (a Unit/ Agency of Govt. of U.P).

An MoU has been signed between THDCIL and RRECL in Apr'2022 for development of 10,000 MW Ultra Mega Renewable Energy Parks in the Rajasthan state. The RE parks will be developed through a SPV in the form of a JV company between THDCIL and RRECL (Rajasthan Renewable Energy Corporation Limited).

THDCIL endeavours to undertake projects and participate in Govt. of India's National Hydrogen Mission. Accordingly, a pilot project of 'Green Hydrogen' with 1 MW capacity (Electrolyser & Fuel-cell based micro-grid system) is under process for implemented at THDCIL Office Complex, Rishikesh (Uttarakhand).

Further with an objective to explore future possibilities of energy generation from Renewable Sources, Energy Efficiency and Environmental Technologies an MoU has been signed between THDCIL and IREDA on 03rd Dec'2021 to collaborate in the field of renewable energy for a period of 5 years.

THDCIL is endeavouring to grab implementation of RE Projects through Tariff based Competitive bidding. For this, 14 Nos. Solar Power EPC Contractors has been empanelled with THDCIL and looking for suitable opportunity to participate in the bidding process.

THDCIL is also in process of implementing a Pilot Project for Carbon capture at Khurja STPP (2x660MW) with a newly emerging cost-effective Carbon capture technology. Based on outcome of this pilot project, the capacity shall be scaled up which shall help in removing majority of carbon-based emission (CO_2, etc) from exhaust gases.

MoP has also indicated the States of Uttarakhand, Uttar Pradesh, Chhattisgarh, Kerala and Maharashtra for exploring Potential Floating Solar Power capacities and to take up the matter with the concerned State Governments, carry out suitable analysis & prepare the evaluation reports. Accordingly, THDCIL has commenced exploring the potential sites in the concerned states.

THDCIL have one Grid connected Roof Top Solar Power Plant of 500 KWp capacity at THDCIL premises, Rishikesh since year 2017. Another Grid connected Roof Top Solar Power Plant of 500 KWp capacity is planned to be installed at THDCIL, Rishikesh.

THDCIL is also in the process of obtaining Power Trading licence for trading of electricity.

Awards received by THDCIL during the years:

THDCIL has been conferred with Power Generation Award from Govt of Uttarakhand in Quality Convention 2022 in September'2022.

THDCIL has been conferred with the award of CEO with HR orientation by World HRD Congress on 22 March'2022. The award is an acknowledgement of exemplary HR initiatives taken by THDCIL.

PROGRESS OF ONGOING PROJECTS

Tehri Pump Storage Plant (PSP) (4X250 MW)

Based on the principle of recycling of water, 4 reversible Turbines of 250 MW each will convert the off-peak energy to peak Energy.

Erection of EM equipment in Machine Hall for all 4 Units is in progress in full swing. Testing and pre-commissioning activities of all 04 Generator Step Up (GSU) Transformers has already been completed and erection work of GIS-GIB is also complete.

In HM works, fabrication of all Penstock steel liners is complete.

The 1st Unit of the Project is planned to be commissioned bymid of the year 2023.

VishnugadPipakoti HEP (4X111 MW)

VishnugadPipalkoti HEP is a run-of-the-river schemeon river Alaknanda in district Chamoli, Uttarakhand.

On completion, the project will make a power capacity addition of 444 MW to the Northern Region.

The work at all fronts is progressing in full swing and the 1st Unit of the Project is expected to be commissioned byOct'2024.

Khurja STPP (2X660 MW)

The work at all fronts is progressing in full swing and the 1st Unit of the Project is expected to be commissioned by Feb-2024.

Amelia Coal Mine

To meet fuel requirement of the Khurja STPP, Ministry of Coal, GoI has issued Allotment Order of Amelia Coal Mine to THDCIL on 17th Jan-17.

All major clearances have been accorded in FY 2021-22 viz. Grant of transfer of EnvironmentClearance on 03.08.21,Grant of Mining Lease of Amelia Coal Block on 16.08.21, Consent to Establish on 14.10.21,Possession of 178.13 Ha Revenue landin coal mine area, Possession of Govt. Land (14.29 Ha) and Private Land (11.54 Ha) for Coal Evacuation Corridor and Railway Siding.

MDO has been appointed and the Amelia Coal Mine has been opened on 17.11.2022.

CHAPTER 26

DAMODAR VALLEY CORPORATION (DVC)

INTRODUCTION:

Conceived on lines of the Tennessee Valley Authority (TVA) of the United States, Damodar Valley Corporation (DVC) became the first multipurpose river valley project of independent India and came into existence on 7th July 1948 by an Act of the Central Legislature keeping in view the integrated development of the Damodar Valley region in the States of Bihar (presently Jharkhand) and West Bengal. Inception of DVC turned the mighty river Damodar from "River of sorrow" to "River of fortune". DVC over the years have contributed immensely towards social upliftment and economic wellbeing of the people residing in the valley area.

DVC presently is a Statutory Body under the Ministry of Power. It is a major integrated power utility in the Eastern Region of the country, playing a key role in the unified development of the Damodar Valley basin. The main functions of DVC are generation, transmission and distribution of electricity. Its subsidiary activities are flood control, irrigation, soil conservation & afforestation, industrial, economic and other development of the Damodar Valley area.

DVC has stepped into its 75th year on 7th July'2022 and as such the year is being marked by yearlong celebration in line with AmritMahotsav of GoI. Different seminars as well as social/cultural events are being organized by DVC from time to time.

INSTALLED CAPACITY:

The thermal power generation capacity of DVC at present is 6540 MW & Hydel Power Generation Capacity is 147.2 MW and Solar Generation Capacity is 3.923 MWp as below: -

Power Station	Jharkhand	West Bengal	Total
Thermal	Bokaro: 500 MW (1x500 MW)	Durgapur Steel: 1000 MW (2x500 MW)	6540 MW
	Chandrapura: 500 MW (2x250MW)	Mejia: 2340 MW (4x210 MW, 2x250 MW, 2x500 MW)	
	Koderma: 1000 MW (2x500MW)	Raghunathpur: 1200 MW (2x600MW)	
Hydel	Panchet: 80 MW (2x40 MW)	Maithon: 63.2 MW (2x20 MW, 1x23.2 MW)	147.2 MW
	Tilaiya: 4 MW (2x2 MW)		
Solar	1.264 MWp	2.659 MWp	3.923 MWp
Total Capacity: 6691.123 MW			

Note: Durgapur TPS U#4 (210 MW) has been decommissioned w.e.f. 29.08.2022

GENERATION & POWER SUPPLY POSITION:

Performance of Thermal Units (6540 MW) & Hydel Units (147.2 MW):

DVC Units	FY 2021-22 (Apr'21 to Mar'22)	FY 22-23		FY 22-23	
		FY 2022-23 (till Dec'22)	Expected (Jan'23-Mar'23)	CEA Target	Expected (Apr'22- Mar'23)
Thermal Generation (MU)	40,775	31,727	10,620	41,248	42,347
Thermal PLF	68.96 %	72.24 %	75.18 %	71.06	72.95 %
HydelGeneration (MU)	488.90	207.65	30	290	237.65 *

* Due to less rainfall received in the valley area

NOTABLE MAJOR ACHIEVEMENTS:

Financial:

- Highest ever revenue & PAT: ₹ 231 Billion as Revenue and ₹ 6.3 Billion as PAT(Profit After Tax).
- Reduction in finance cost: Interest rate on STL (Short Term Loan) was reduced by almost 2%. High interest-bearing long-term loan got refinanced at lower interest rate leading to considerable savings on annual interest costs.

Commercial:

- Collection efficiency was nearly 100% throughout the year.
- This year DVC entered11 KV distribution with a target of adding 1500 consumers by 2025.

- To further empower consumers, a new facility for submitting online complaints on commercial issues has been deployed in the Consumer Portal.
- Outstanding dues under liquidation using LPSC Rules 2022 issued by MoP. Current dues also being realized through implementation of the scheme.

Operational:

- DVC is on course of record generation in FY 22-23, which is expected to be in tune of 42.5 Billion Units, and thereby on path to surpass the last year's record. (In FY 21-22 DVC achieved highest ever generation of 41.26 Billion Units)
- Achieved Thermal PLF of 72.24 % in FY 2022-23 (till Dec'22) against All India Thermal PLF of 63.23 % during the same period.
- During FY 2022-23 (till Dec'22) DVC TPSs have ranked 15 times in the "Top Ten Central Sector TPSs in the country", in terms of monthly PLF.
- Koderma TPS U#1 has been continuously running for 335 days since 3rd Feb, 2022 (longest continuously running 500 MW plant in DVC).

Fuel Management:

- Total coal received in DVC TPSs in FY'22-23 (till Dec'22) is 21 MMT (5511 no. rakes) against 18.44 MMT (4095 no. rakes) in corresponding time of previous year.

Renewable Energy:

- MNRE accorded in-principle approval for setting-up 989MW capacity Floating Solar PV Parks at DVC Dam Reservoirs of Maithon, Panchet, Tilaiya and Konar in the State of Jharkhand and West Bengal under UMREPP (Ultra Mega RE Power Parks) scheme of MNRE.
- "Green Valley Renewable Energy Limited (GVREL)", a JV company of DVC and NTPC RE Ltd. has been registered for implementation of Renewable Energy Projects.
- Floating Solar Plants at Raw Water Reservoirs of DVC Thermal Stations: 30 MW cumulative capacity Floating Solar PV Plants at Raw Water reservoirs of Mejia TPS, Raghunathpur TPS and Koderma TPS are at contract finalization.
- Public EV Charging Station was installed at DVC Maithon jointly by DVC and EESL. Process underway for setting-up EV Charging Infrastructure at 05 (Five) locations of DVC.

Capex:

- DVC has achieved 72 % of FY 2022-23 Capex target (i.e. Rs. 1455 Cr. out of Rs. 2010 Cr.) up to December 2022 and expected to achieve 100% target by March 2023.

CAPACITY ADDITION PROGRAMME AND ACHIEVEMENTS:

Following proposed projects of DVC are at various stages of development:

- » Raghunathpur TPS Ph-II (2x660 MW) (revived)
- » Koderma TPS Ph-II (2X800 MW)
- » Durgapur TPS (1X800 MW)
- » Pump Storage Hydro Generating Station Lugu Pahar (1500 MW)
- » Re-purposing of De-Commissioned Thermal Station of DVC at DVC Bokaro TPS (being carried out jointly with World Bank under "JUST Transition" initiatives)

TRANSMISSION & DISTRIBUTION (T&D) SYSTEM:

T&D network of DVC is spread over DVC command area and beyond. It comprises of 35 nos. of EHV Sub-stations, 13 nos. of 33 kV Receiving Sub-stations and 12 nos. switchyards at the Generating Stations. These are connected through 7074CKM (Circuit Kilometres) of EHV transmission lines and 11750 MVA of EHV transformers at various voltage levels and 1538 CKM of 33 & 11 KV lines power distribution.

Renovation and augmentation of age-old control and protection system including related infrastructure of 10 nos. 220 kV substations utilising Power System Development Fund (PSDF) has been completed. Replacement of conductors of old Extra High Voltage (EHV) transmission lines with HTLS and upgradation of further transformation capacity as well as extension of various substations have been taken up to enhance the system stability as well as to take care of growth in power demand. Transformation capacity of 305 MVA has already been added between Apr' and Dec'2022.

Retail Distribution:

Since its inception DVC is engaged in retail supply of electricity to consumers connected at 33 KV and above voltage levels in the DVC command area. In 2022, DVC has entered in Primary Distribution to provide 11 KV power by creating 33/11 KV infrastructure at Kumardhubi, Koderma and BIADA. Detailed Project Report (DPR) has been prepared to develop 11 KV infrastructure at 39 locations to provide power to around 1500 consumers with total envisaged capacity of 975 MVA. To optimize the operational performance of Distribution Grid and higher consumer satisfaction Advanced Distribution Management System (ADMS) has been considered in the DPR. Containerized Substation (E-House) has been considered at 12 locations to minimize the land requirement as well as time for setting up the infrastructure.

ENERGY CONSERVATION:

DVC has been making continuous efforts to induct modern practices in Energy Management System towards sustainable improvement in availability of power with lower consumption of coal, oil, water and auxiliary power along with improvement in efficiency & heat rate. The following practices are followed for efficient energy management in DVC power plants:

- Timely replacement & servicing of BFP recirculation valves is carried out to save energy.
- Analysis of different efficiency parameters like Boiler Efficiency, Turbine cycle Heat Rate, HP Heater performance etc. are regularly carried out and deficit areas are addressed accordingly.
- Necessary measures are regularly taken for combustion optimization, improvement of condenser vacuum, reduction of unburnt carbon, reduction of air leakage from ducts & expansion joints in line with improved O&M practices to optimize system efficiency and Aux. Power Consumption.
- Energy Audits are carried out in DVC TPSs by External Agencies and recommendations are being implemented.

POLLUTION CONTROL MEASURES & COMPLIANCE OF NEW ENVIRONMENTAL NORMS:

- **Installation of De-NOx System:**

  De-NOx burners successfully installed at 7 out of 14 units: a. Mejia TPS U#6 (250 MW), b. Mejia TPS U#7&8 (2X500 MW), c. Koderma TPS U#1 (500 MW), d. Durgapur Steel TPS U#1 (500 MW). Bokaro TPS'A' (500 MW) & f. Raghunathpur TPS U#1 (600 MW) during overhauling of the respective units. Installation of balance units will be made progressively utilizing shutdown opportunities during overhauling of respective units.

- **Installation of Flue Gas De-sulpharisation (FGD):**

  Installation of FGDs at 9 thermal units are under various stages of completion/commissioning.

- **Ash Utilization:**

  DVC is putting more emphasis on utilization of Fly Ash. Dry Fly Ash (DFA) is sold to cement manufacturers and various traders. DFA is also supplied to brick and block manufacturers. DFA utilization from April'2022 to Dec'2022 is 29.10 LMT. Pond ash from DVC is utilized for filling of abandoned mines, low lying areas, construction of roads (mainly in NHAI projects) etc. in compliance of guidelines issued by MoEF& CC. Total ash utilization by DVC is 96.76 LMT, nearly 100% of total ash produced (from Apr'2022 to Dec'2022).

MINING ACTIVITIES:

Tubed Coal Mine:

Tubed coal mine, having mineable reserve of 130 million tonne and peak coal production capacity of 6 million tonnes annually, has been allotted to end use projects Mejia TPS Unit # 7 & 8 and Chandrapura TPS Unit # 8. The land acquisition within coal block was done by the Govt. of India and vested to DVC under provisions of the CBA (A and D) Act 1957. All clearances has been received. Mining activities commenced with effect from 26.09.2022. Coal extraction and despatch is expected to commence in January, 2023.

NON-POWER ACTIVITIES OF DVC:

Flood Control & Developmental activities in Water Resources Management:

Out of originally planned seven storage reservoirs in the Damodar Basin, construction of 04 (four) multi-purpose Dams at Tilaiya (Feb'1953), Konar (Oct'1955), Maithon (Sep'1957) and Panchet (Nov'1959) was completed in first stage. But designed storage levels could not be achieved due to constraints in acquiring required land for Maithon and Panchet reservoirs from the respective State Governments (Govt. of Jharkhand & West Bengal). In the first-phase, total flood reserve capacity planned was 1.51-million-acre feet. But due to non-acquisition of land, flood reserve capacity achieved was only 1.047-million-acre feet, which has further reduced to 0.95-million-acre feet due to progressive siltation as per the latest capacity survey reports. However, even with partial implementation of the scheme, DVC, over the years, has been able to fulfil its primary objective of flood control in the lower valley to a great extent. Further, by judicious operation of reservoirs, all the committed requirements in Damodar Valley area like irrigation, municipal & industrial water supply are fully met, thus achieving efficient water resources management.

Flood Control: During the year under consideration, average actual monsoon rainfall over Barakar and Damodar Catchments w.e.f. June to October 2022 are 753.07 mm and 966.44 mm respectively against the normal rainfall of 1236 mm and 1067 mm respectively, the rainfall deficit being 39.07 % and 9.42 % respectively.

Flood warning from Maithon and Panchet Dam were issued from time to time on receipt of the messages from the Member Secretary, DVRRC (Damodar Valley Reservoir Regulation Committee) and flood release advices were implemented as per the guidelines stipulated in the Modified Flood Warning Memorandum issued by DVC in the year 2022. Flood warnings were also made available in DVC's website for general information to the public at large.

This year, flood has been received & major releases have been made from DVC dams. Maximum 75,000 cusecs (combined) of water was discharged on 05.10.2022.

The reservoir level attained at Maithon & Panchet Dam at the end of the monsoon i.e. on 01.11.2022 was more than the conservation level and were RL. 484.67 ft. (147.73 m) & 416.20 ft. (126.86 m) respectively. No major flood release was required from Tilaiya and Konar reservoirs during this monsoon period.

Irrigation water supply: Operation and maintenance of Durgapur Barrage and Irrigation System was transferred to Govt. of West Bengal in the year 1964 on agency basis but, its ownership still rests with DVC. DVC releases water for irrigation from Maithon & Panchet reservoirs as per the advice of Member Secretary, Damodar Valley Reservoir Regulation Committee based on the indents placed by Govt. of West Bengal for Kharif and Rabi cultivation in the Lower Valley.

Municipal & Industrial (M&I) water supply:

DVC at present supplies water to about 168 agencies (94 nos. in State of Jharkhand and 74 nos.in West Bengal) for M&I purpose. Total allocated quantity for M&I uses in Jharkhand is 645.410 MCM/year (391.395 MGD) and that in West Bengal is 690.210 MCM/year (418.5627 MGD). During the period of 1st January to 31st December 2022, there were no reports from consumers regarding shortfall/scarcity of water.

Water Investigation and Developmental initiatives:

Status of National Hydrology Project (NHP) taken up by DVC as a part of developmental activities in water resources sector is as given below:

Status
DVC was included in the NHP which is grant-in-aid project (for an amount of Rs. 45 Cr. which is revised to 39.89 Cr.) funded by the World Bank, under the aegis of Dept. of Water Resources, River Development & Ganga Rejuvenation (WR, RD & GR). Works as per the Annual Work Plan approved by Department of WR, RD & GR is under progress. Tenure of the project is 8 years i.e. up to 2023-24. • Major works under progress in NHP are: • Supply, installation, testing, commissioning and maintenance of Real Time Data Acquisition System (RTDAS) of DVC: Instruments installation & commissioning for all 83 nos. sites has been completed on 31.01.2021 and the system is operational since 01.02.2021. • Consultancy services for developing flood forecasting & inundation model from 12 km downstream from Durgapur Barrage to Amta (outfall of Damodar River): Final acceptance of Report and developed model- 03.12.2022, Model maintenance period of 30 months has been started from 04.12.2022. • Sedimentation Survey for DVC Reservoirs: Work completed.

ECO-CONSERVATION, AFFORESTATION & SOIL CONSERVATION

Annual Progress Report (2022-23)

Sl. No.	Evaluation Criteria	Unit	Annual Target	Actual Performance						
01	Fisheries		Excellent	Q1 of 22-23 (Apl'22 -Jun'23	Q2 of 22-23 (Jul'22– Sep'23	Q3 of 22-23 (Oct'22- Dec'23)	Accumulative Achievement	Expected Achievement (Jan'23 to Mar'23)	Expected Annual Achievement	Remarks
i)	Spawn production at Maithon	Lakh	700	21.00	605.85	Nil	626.85	73.15	700	
ii)	Fingerlings production		30	Nil	Nil	35.80	35.80	Already Achieved	35.80	
iii)	Pisciculture in water bodies	Nos.	15	Nil	Nil	20	20	Already Achieved	20	
iv)	Distribution of spawn/fingerlings to the villagers as CSR activity	Nos.	1200	Nil	542	135	677	23	700	Due to less & erratic rainfall during the monsoon
02	**Soil Conservation**									
i)	Renovation of water bodies	Nos.	120	Nil	Nil	Nil	Nil	120	120	Administrative approval accorded on 30.12.2022
ii)	Construction of WHS	Nos.	35	Nil	Nil	Nil	Nil	35	35	- do -

Sl. No.	Evaluation Criteria	Unit	Annual Target	Actual Performance						
01	Fisheries		Excellent	Q1 of 22-23 (Apl'22 -Jun'23	Q2 of 22-23 (Jul'22– Sep'23	Q3 of 22-23 (Oct'22- Dec'23)	Accumulative Achievement	Expected Achievement (Jan'23 to Mar'23)	Expected Annual Achievement	Remarks
iii)	Turfing Work of the Old Water Harvesting Structures & RWB	Nos.	155	Nil	Nil	155	155	Already Achieved	155	
iv)	Hydrological and sediment monitoring stations. (No.)	HMS	4	4	4	4	4	Already Achieved	4	
v)	Soil testing of farm land with fertilizer recommendation	No. of samples	1600	400	410	381	1191	409	1600	
vi)	Afforestation in Valley area	Acre	147	147	147	147	147	Already Achieved	147	Maintenance Work

Areas of Operation for Soil Conversation works:

Jharkhand: Hazaribagh, Chatra, Giridih, Dhanbad, Bokaro, Jamtara, Koderma, Ramgarh& Deoghar districts; **West Bengal:** Purulia district

The turfing work of 160 nos. of old Renovated Water Bodies (RWBs) and new Water Harvesting Structures (WHSs) were completed during the Monsoon period. During the transplanting season, these RWBs and WHSs proved to be lifeline for paddy cultivation.

In the current financial year DVC's target is to construct 120 nos. of Old Renovated Water Bodies and 35 nos. of New Rain Water Harvesting Structures, which is expected to be achieved by 31st Mar'2023.

The Soil Conservation Dept of DVC successfully organized 45 days training course on Soil and Water Conservation for the district agriculture officers of the state of Chhattisgarh.

CORPORATE SOCIAL RESPONSIBILITY OF DVC

With the primary objective of the socio-economic upliftment of the community residing within 10 km radius of its major projects, CSR activities of DVC are carried out in 629 villages (West Bengal: 297 villages & Jharkhand: 332 villages) spread over 7 districts of Jharkhand and West Bengal.

Out of the allocated fundof Rs. 12.42 Cr for the Financial year 2022-23, expenditure of Rs 5.08 Cr was made towards education, health, sanitation, sports and culture in addition to creation of community infrastructure like toilet facilities, village roads, community centre, solar streetlight and drinking water facilities till December 2022 and balance is allocated to various identified developmental works.

CHAPTER 27

BHAKRA BEAS MANAGEMENT BOARD

Bhakra Management Board (BMB) was constituted under Section 79 of the Punjab Re-Organization Act, 1966 for the administration, maintenance and operation of Bhakra Nangal Project with effect from 1st October, 1967. The Beas Project Works, after its completion, were transferred by the Government of India from Beas Construction Board (BCB) to BMB as per Section 80 of the Act and Bhakra Management Board was renamed as Bhakra Beas Management Board (BBMB) with effect from 15.5.1976.

FUNCTIONS

Bhakra Beas Management Board is responsible for the administration, operation &maintenance of Bhakra Nangal Project, Beas Satluj Link Project & Beas Dam including Power Houses and a network of transmission lines & grid sub-stations. The functions of Bhakra Beas Management Board are:

- Administration, Operation & Maintenance of Bhakra-Beas Projects.
- The regulation of the supply of water from Bhakra-Beas Projects to the States of Punjab, Haryana and Rajasthan.
- The regulation of the supply of power generated at Bhakra-Beas Projects.
- Any other function as the Central Government may assign after consultation with the Governments of States of Haryana, Punjab & Rajasthan.
- The Govt. of India in the year 1999 has entrusted additional functions of providing & performing engineering and related technical consultancy services in the field of Hydro Electric Projects & Irrigation Projects.
- Ministry of Power has assigned the work of construction and execution of 2X21 MW Baggi Power House to BBMB vide letter No.5-4/1/2019-BBMB dated 22nd October, 2019.

The works being managed by BBMB are broadly grouped as three large multipurpose projects viz. Bhakra Nangal Project, Beas Project Unit-I (BSL Project) and Beas Project Unit-II (Beas Dam).

The Bhakra Nangal project comprises the Bhakra Dam, Bhakra Left Bank & Bhakra Right Bank Power Houses, Nangal Dam, Nangal Hydel Channel, Ganguwal & Kotla Power Houses and associated transmission system. Bhakra Dam, the majestic monument across the river Satluj, is a high straight gravity concrete Dam rising 225.55 meters above the deepest foundation and spanning the gorge over 518.16 meterlength at the top. The Gobind Sagar Lake created by the Dam has 168.35 square kilometer area and a gross storage capacity of 9621 million cubic meters. The two power houses, one on the Left Bank and the other on the Right Bank, have a combined installed capacity of 1397 MW The Ganguwal and Kotla Power Houses fed from Nangal Hydel Channel have an installed capacity of 153.73 MW The Beas Project Unit – I (BSL Project) diverts Beas Water into the Satluj Basin, rushing from a height of 320 meters and generating power at Dehar Power House having an installed capacity of 990 MW This project comprises a diversion dam at Pandoh, 13.1 Km long Pandoh-Baggi Tunnel, 11.8 Km long Sundernagar Hydel Channel, Balancing Reservoir at Sundernagar, 12.35 Km long Sundernagar-Satluj Tunnel, 125 meter High Surge Shaft and 990 MW Dehar Power House. The Beas Dam at Pong is earth-fill (earth core, gravel shell) dam 132.6 meter high with a gross storage capacity of 8579 million cubic meters. The 396 MW Pong Power House is located in the stilling basin downstream of penstock tunnels.

The total installed generating capacity of the BBMB Power Houses is 2936.73 MW as detailed below:-

Power House	Installed Capacity	Mega Watt
Bhakra (Right Bank)	5x157	785
Bhakra (Left Bank)	4x126+1x108	612
Ganguwal	1x27.99+2x24.20	76.39
Kotla	1x28.94+2x24.20	77.34
Dehar	6x165	990
Pong	6x66	396
Total Installed Capacity		2936.73

Total installed capacity of Roof Top Solar Power Plants of BBMB is as under:-

Location	Capacity (kWp)
Jalandhar	125
Jamalpur	130
Narela	20
Delhi	80
Jagadhari	70
Panipat	285.19
Kurukshetra	113.93
Bhiwani	283.24
Hisar	49.50
Chandigarh	175
Ganguwal	100
Nangal	950
Talwara	790
Sangrur	60
Dhulkote	94.13
Samaypur	49.91
Total Installed Capacity	**3375.90**

GENERATION AND TRANSMISSION SYSTEM:

The generation during 2021-22 from BBMB Power Houses has been 9808 Million Units against the target of 9299 Million

Units. i.e5.47% higher than the target. The generation from the BBMB Power Houses for the year 2022-23 (upto 31.12.2022) is 8811.71 Million Units against the target of 8076 Million Units.

The Power House wise plant availability during the year 2021-22 has been:99.6% of Bhakra left Bank (excluding RMU), Bhakra Right Bank 99.99%, Ganguwal 98.97%, Kotla 98.61%, Dehar 99.88% and Pong 88.21%. Overall plant availability of 98.30 % was achieved for the year of 2021-22.

The Powerhouse wise plant availability for the year 2022-23 upto 31.12.2022 is Bhakra Left Bank 99.98% (excluding RMU), Bhakra Right Bank 100 %, Ganguwal 99.73%, Kotla 99.88%, Dehar 97.76% and Pong 95.75%. Overall plant availability upto 31.12.2022 is 98.66%.

The Power generation at BBMB Power Houses is being evacuated through BBMB Power evacuation system running into 3704.71Ckt.Km length of 400 KV, 220 kV, 132 kV and 66 kV transmission lines and 24 Sub-stations. The Bhakra Beas Management Board power evacuation system operates in an integrated manner in the Northern Grid with its transmission network spread over the States of Himachal Pradesh, Punjab, Haryana and Delhi. The system is interconnected with transmission system of PGCIL and the states of Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, Rajasthan, Chandigarh and Delhi. The availability of transmission system during the year 2021-22 has been 99.81%, whereas the Availability of transmission system during 2022-23 upto 31.12.2022 has been 99.75%.

The Power Generation from Roof Top Solar during the year 2021-22 is 2934295kWh. The Power Generation from Roof Top Solar during the year 2022-23 upto 31stDecember, 2022 is 2697092kWh.

IRRIGATION

At the time of partition of India, about 80% of the irrigated area of pre-partition Punjab went to Pakistan leaving India with very meagre irrigation resources. The mighty Bhakra-Nangal and Beas Projects changed the scenario and turned Northern India into Granary of the Nation. The Bhakra Nangal and Beas Projects have not only brought Green Revolution in the States of Punjab, Haryana and Rajasthan, but also White Revolution by way of record production of milk. The States of Punjab, Haryana and Rajasthan are being supplied about 28 million acre feet of water every year.

RENOVATION, MODERNISATION AND UPRATING (RM & U)

Presently, R, M&U of five no. hydro-generating units at Bhakra Left Bank Power House has been taken in hand.

1. In deference to approval of the Board, accorded in its 197th Board meeting held on 24.10.2007 at Chandigarh, Notification of Award for R, M&U works was issued in favour of Consortium led by M/s Sumitomo Corporation, Japan (with other members i.e. M/s Hitachi, Ltd., Japan and M/s VA Tech Hydro GmbH, Austria [now named as M/s Andritz Hydro GmbH, Austria] on 27.10.2007. Subsequently, Agreement for Implementation was signed on 2.11.2007. In pursuance thereof, following Contracts had been signed:-

   a. Off Shore Supply Contract Agreement and On Shore Service Contract Agreement for Turbine Portion between BBMB and M/s Sumitomo Corporation, Japan and between BBMB and M/s Hitachi, Ltd., Japan respectively both on 4.11.2007.

   b. On Shore Supply Contract and On Shore Service Contract Agreements for Generator Portion on 13.11.2007 between BBMB and M/s VA Tech Hydro GmbH, Austria [now named as M/s Andritz Hydro GmbH, Austria]

   c. Agreement for Assignment in respect of On Shore Supply Contract and On Shore Service Contract Agreements for Generator Portion in favour of M/s VA Tech Hydro India Pvt. Ltd. On 21.11.2007 among BBMB, M/s VA Tech Hydro GmbH, Austria and M/s VA Tech Hydro India Pvt. Ltd. [M/s VA Tech Hydro now named as M/s Andritz Hydro]

2. Effective Date of the Contract Agreements for R, M&U works of 5 no. Hydro Power Generating Units was 2nd January, 2008.

3. **First Unit (Unit No. 2):**

   Scheduled date for commencement of RM&U work on the first Unit (Unit No. 2) was 1st January, 2010. But due to discrepancy in the metallurgy of the Runner Crown and Runner Band during inspection at works of M/s Hitachi in Japan, RM&U work commenced by the Consortium on 26th April, 2010 and taken over for operation run on 18th July, 2013. The Unit is running at uprated output of 126 MW.

   Regarding localized cavitations', the modification of runner blade profile through solid piece welding carried out at the site by 10th June, 2016 as per meeting held by the Management with the Consortium on 13th January, 2016 and 02nd March, 2016.

   The modified runner was inspected by the joint team of M/s Hitachi and BBMB on dated 21.11.17 and "No cavitation" has been observed on the modified portion. The modification of runner blade profile through solid piece welding has been approved in the 230th meeting of full Board of BBMB on dated 19.11.2018. BBMB issued TOC of the Unit No. 2 to the consortium on dated 29.11.2018

4. **Second Unit (Unit No. 5):**

   R, M&U works on 2nd Unit (Unit No. 5) commenced by the Consortium on 11th April, 2011 and taken over for operational run on 02.10.2013.The Unit is running with output of 126 MW.

   Based on the report of CPRI, Bangalore, spare new Generator Shaft (as earlier ordered on M/s Andritz Hydro) along with the new spider rim and other related parts ordered on dated 14.10.2016 with M/s Andritz

Hydro GmbH, Austria have been replaced with existing components of Unit No. 5 of Bhakra Left Bank Power House.

The work for the replacement of shaft, spider, rim and other related parts along with various activities had been started on 21.10.2016 and put on commercial run on dated 15.06.2018.M/s Hitachi, Japan proposed to modify the runner blade profile of Unit No. 5 through solid piece welding in situ w.e.f 01.03.2020, but could not be done due to pandemic situation in Indiaand non-arrival of Japanese Nationals. M/s Hitachi specialised team from Japan reached the site on 21.03.2022 to carry out the work of modification of runner blade profile of this Unit which was completed on 09.05.2022. The Unit was commissioned after modification of runner profile on 16.05.22. TOC issued by BBMB for this Unit on 27.06.2022.

5. **Third Unit (Unit No. 4)**

The Unit was taken on R, M & U works on 22.11.2013 and taken over for operational run on 05.08.2015 and is presently running at uprated output of 126 MW. The Unit was taken on Shutdown on 4th April, 2019 and handed over to M/s Hitachi, Japan for modification of runner. The work of modification of Runner blades profile got completed on 18th May, 2019. BBMB issued TOC of the Unit No. 4 to the consortium on dated 23.07.2019.

6. **Fourth Unit (Unit No. 3)**

Unit was taken on shutdown for RM&U works on 1st April, 2019. Due to pandemic situation, the work was halted at site w.e.f. 23.03.2020 and resumed on 04.06.2020, but the work was being done at a snail's pace, due to limited manpower and got delayed due to various lockdowns in 2020-21 and 2021-22.Finally, the Unit was taken on trial run (1st run) on 30.09.2021. The commissioning of the unit was successfully completed on 26.11.2021 and the Unit handed over to BBMB on 09.12.2021after completing 14 days of commercial run. The Unit has been running successfully at an uprated output of 126MW. The TOC of the Unit No. 3 was issued by BBMB on dated 16.03.2022.

7. **Fifth Unit (Unit No. 1)**

The permission to start the work of stator assembly to M/s Andritz Hydro was conveyed by SE/BPHC, Nangal in the month of Nov, 2020 including transfer of material from Neilla Store to site. The work of stator assembly was completed successfully on 13.09.2021. This Unit was handed over to Consortium for carrying out RM&U works on 15.12.2021 but due to leakage in penstock gate, the dismantling of the unit by consortium started after repair of gate by BBMB on 10.01.2022. Due to single crane operator available at site, M/s Hitachi started the dismantling work on 30.03.2022. NDT of Turbine shaft and head cover carried out w.e.f. 26.04.2022 to 29.04.2022. NDT of rotor spider started on 22.04.2022 and completed on 27.04.2022. The assembly of Runner on Generator floor by M/s Hitachi completed on 27.05.2022. Shaft Free achieved on 16.09.2022.The Shaft machining work completed by M/s Andritz Hydro on 29.10.2022. The assembly work of rotor is under progress and the R,M&U work of the Unit is expected to be completed by May,2023.

8. R, M&U works are expected to be completed in May, 2023.

Automation of 220kV Sub Station

BBMB has taken a significant step in automation of Substations in its Transmission System. Fully automated 220 kV Sub Station at Barnala with remote operation from 220 kV Sub Station at Sangrur (40 km from Barnala) were commissioned in October 2018 at a cost of Rs. 1.7 Crore. The Sub Station is now unmanned with Control Room locked up and no staff is deployed in shift duty. The benefits include reduced O&M cost, increased system reliability, reduced downtime, remote monitoring of operations etc.

After the successful completion of the automation of 220kV GSS BBMB Barnala, BBMB took the automation of 220kV substation Hisar, Charkhi-Dadri, Ballabgarh and Samaypur alongwith their remote operation from SLDC complex Chandigarh and 400kV GSS BBMB Bhiwani through M/s Siemens Ltd at the cost of Rs. 12.69 crores vide LOA no. 1826 dated 20.07.2020. 98% of the work has already been completed and the project shall be commissioned by the end of March-2023.

Solar Power Plants

BBMB has successfully commissioned 3375.90 kWp rooftop solar power plants on 71 nos. non-residential buildings of Sub Stations & Power Houses. In addition to this, BBMB has signed a PPA for installation of 15MW floating solar power plant at Nangal Dam Reservoir near village Neilla, Distt. Billaspur, Himachal Pradesh, BBMB with M/s SJVN Green Energy Limited and is likely to be commissioned by April 2024. BBMB has also initiated installation of 18MW Ground Mounted Solar Power Plants at 04 no. different locations at Nangal & Talwara, which is in the final stage and LOI shall be issued shortly. Further, BBMB has also approved ground mounted solar power plant of 10 MW at 400kV GSS Bhiwani&1.5 MW at 220kV GSS Hisar and NIT for the same shall be floated shortly.

NATIONAL HYDROLOGY PROJECT

MOWR, Govt. of India in association with World Bank has initiated, National Hydrology Project (NHP) in India to carry forward the work and objectives of Hydrology Project Phase-II under the NHP. To this effect, BBMB has been allocated Rs. 25.00 Crore for strengthening and expansion of existing Data Acquisition system (DAS), development of alternate models and technology enhancement along with capacity building in the organisation to achieve better results.

Bhakra Beas Management Board (BBMB) has set up Earth Receiving Station (ERS) at Chandigarh for inflow flood

forecasting (i.e. short term 3 days and medium term 7 to 10 days) for optimum utilization of Bhakra and Pong Reservoirs and Canal Network. BBMB has been the 'first mover' in the country under the World Bank funded Hydrology Phase-II project.Under this project, 87 no. Real Time Data Acquisition stations comprising Automatic Rain Gauge Stations, Automatic Full Climate Stations, Snow Water Equivalent, Water Level Recorders etc. and 10 No. Automatic Stage Recorder at Contact Points of Partner states have been installed in the catchment of River Sutlej and Beas by using state of the art technology. In addition to this 6 No. Meteorological stations have also been co-opted with IMD. The schematic arrangement of Real Time Decision Acquisition System involves real time transmission of Hydro meteorological data through INSAT-3D at 1 hour interval to Earth Receiving Station at Chandigarh.

The existing RTDAS Network is being upgraded through two no. contracts. While one contract involving installation of 21 nos. RTDAS stations, is in advance stage of execution, the execution of other contract for installation of 85 nos. stations shall start in near future.

Real Time Data is processed using Rainfall Runoff Model, Hydro Dynamic Model, Flood Model and Water Allocation of MIKE software. The outcome/ scenario generation is further shared on NHP Dashboard.

CHAPTER 28

BUREAU OF ENERGY EFFICIENCY

The Government of India has enacted the Energy Conservation Act 2001, and for implementing various provisions in the EC Act, Bureau of Energy Efficiency (BEE) was operationalised with effect from 1st March 2002. The EC Act provides a legal framework for energy efficiency initiatives in the country. The Act has mandatory and promotional initiatives which broadly relates to Designated Consumers, Standards and Labeling programme for equipment and appliances and Energy Conservation Building Codes (ECBC) for new commercial buildings. The Bureau is spearheading the task of improving the energy efficiency in various sectors of the economy through regulatory and promotional mechanism. Bureau of Energy Efficiency co-ordinates with designated consumers, designated agencies and other organizations recognizes, identifies and utilizes the existing resources and infrastructure, in performing the functions assigned to it under the EC Act.

The Vision of Bureau of Energy Efficiency (BEE): To improve Energy Intensity of Indian Economy thereby contributing towards sustainable development of country.

The Mission of BEE is to develop policy and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act (EC Act), 2001 with the primary objective of reducing energy intensity of the Indian economy. This will be achieved with active participation of all stakeholders, resulting in accelerated and sustained adoption of energy efficiency in all sectors.

The primary objective of BEE is to reduce energy intensity in the Indian economy. In order to translate the objectives into result-oriented action, the broad strategies of BEE include:

- To develop policies and programmes on efficient use of energy and its conservation with the involvement of stakeholders.
- To plan, manage and implement energy conservation programmes as envisaged in the EC Act.
- To assume leadership and provide policy framework and direction to national energy efficiency and conservation efforts and programmes.
- To demonstrate energy efficiency delivery mechanisms, as envisaged in the EC Act, through Private-Public Partnership (PPP).
- To establish systems and procedures to measure, monitor and verify energy efficiency results in individual sectors as well as at the national level.
- To leverage multi-lateral, bi-lateral and private sector support in implementation of programmes and projects on efficient use of energy and its conservation.
- To promote awareness of energy savings and energy conservation.

Functions of BEE

- BEE co-ordinates with designated consumers, designated agencies and other organizations; recognizes, identifies and utilizes the existing resources and infrastructure, in performing the functions assigned to it under the Energy Conservation Act. The EC Act provides for regulatory and pro¬motional functions which are assigned to the organisation.

Regulatory functions

The major regulatory functions of BEE include:

- Develop minimum energy performance standards for equipment and appliances under Standards and Labelling
- Develop minimum energy performance standards for Commercial Buildings
- Develop Energy Consumption Norms for Designated Consumers
- Certify energy managers and energy auditors.
- Accreditation of energy auditors.
- Manner and periodicity of mandatory energy audits.

Promotional functions

The major promotional functions of BEE include:

- Create awareness and disseminate information on energy efficiency and conservation.
- Arrange and organize training of personnel and specialists in the techniques for efficient use of energy and its conservation.
- Strengthen consultancy services in the field of Energy Efficiency.
- Promote research and development.
- Develop testing and certification procedures and promote testing facilities.
- Formulate and facilitate implementation of pilot projects and demonstration projects.

- Promote use of energy efficient processes, equipment, devices and systems.
- Take steps to encourage preferential treatment for use of energy efficient equipment or appliances.
- Promote innovative financing of energy efficiency projects.
- Give financial assistance to institutions for promoting efficient use of energy and its conservation.
- Prepare educational curriculum on efficient use of energy and its conservation.
- Implement international co-operation programmes relating to efficient use of energy and its conservation

PROJECTS AND PROGRAMMES

Bureau of Energy Efficiency has already launched the following voluntary and mandatory Schemes for promoting Energy Efficiency in India, the details of which have been given in Chapter 10 relating to Energy Conservation:

1. National Level Painting Competition
2. National Energy Conservation Award
3. National Energy Efficiency innovation Awards (NEEIA)
4. Standards and Labelling Scheme
5. Energy Conservation Building Code (ECBC)
6. Enhancing efficiency in industries – Implementation of Perform Achieve and Trade (PAT)
7. Demand Side Management (DSM)
8. Energy Efficiency in Small and Medium Enterprises (SMEs)
9. Improving Energy Efficiency in Transport Sector
10. Energy Accounting in DISCOMS
11. Strengthening of State Designated Agencies (SDA) To Promote Efficient Use of Energy and its Conservation.
12. Financing Initiatives.
13. Revision of National Mission on Enhanced Energy Efficiency (NMEEE) - ROSHANEE

CHAPTER 29

CENTRAL POWER RESEARCH INSTITUTE

Back ground

The Central Power Research Institute (CPRI) established by the Government of India in 1960 was re-organised into an Autonomous Society in 1978 to function as a National Power Research Organization and to serve as a National Testing and Certification Authority for the purpose of certification of rating and performance to ensure availability of equipment of adequate quality for the use under conditions prevalent in Indian Power Systems. The affairs of the Society are managed by Governing Council with Secretary to the Government of India, Ministry of Power as its President. The Governing Council has representation from various Ministries of Government of India, Power Utilities, Manufacturers, Academic Institutions etc.

The Institute has it's Head Office and major laboratories at Bengaluru. The Institute has its Units at Bhopal, Hyderabad, Koradi, Noida & Kolkata. Establishment of new unit at Nashik & Raipur is under progress.

The core activities of the Institute are :

- Research & Development
- Testing & Certification
- Consultancy
- Customised Training Programmes
- Vendor Analysis
- Third Party Inspection Services

Accreditations:

- Accredited as per ISO/IEC 17025:2017
- Accredited as per ISO/IEC 17065: 2012
- Member of Short Circuit Testing Liaison (STL) Group
- Corporate Member in DLMS UA (Device Language Message Specification User Association) and UCA IUG (Utility Communication Architecture International User Group)
- ISO 9001:2015 Certification for Research and Consultancy activities
- Accredited by Intertek-ASTA, UK
- Accredited by INMETRO, Brazil for Distribution Transformers
- Association with Underwriters Laboratories (UL) for testing of LV equipment

Important Events:

1) Hon'ble Minister of State for Power and Heavy Industries, Govt. of India Shri. Krishan Pal visited CPRI, Bengaluru, on 12th April 2022 and reviewed the performance of CPRI. Photographs are placed below:

2) Memorandum of Understanding (MOU) was signed between Government of Chhattisgarh and Central Power Research Institute (CPRI) for establishment of Regional Testing Laboratory at Nava Raipur, Chhattisgarh in presence of Honorable Chief Minister of Chhattisgarh, Shri. Bhupesh Baghel at Raipur on 17th August 2022.

3) Shri Alok Kumar, IAS, Secretary (Power) visited CPRI on 8TH November 2022 and reviewed the performance of CPRI. Photographs placed below

Important Consultancy Activities:

- Condition Monitoring/Diagnostic tests (RLA Studies) on Transformers for M/s. KPCL, RTPS
- Comprehensive Energy Audit of M/s. NEEPCO Hydro Power Station
- Earthing Audit study at 400kV Meramundali Substation for M/s. OPTCL, Bhubaneswar
- Corrosion mapping of boiler water wall tubes of Unit # 4, M/s. NTPC Limited, Farakka Super Thermal Power Station (FSTPS), Farakka
- Third party protection audit for Substations of WRTS-I, M/s. Power Grid Corporation of India Ltd., Nagpur.
- Metallurgical Analysis of Failed Economiser Tubes of 210MW for M/s. UPRVUNL, Parichha Thermal Power Station, U.P
- Metallurgical Analysis of Economiser Upper Bank Connecting Coil No.19, Tube No.1 for M/s. MPPGCL, Shri Singaji Thermal Power Project, Dongalia

Important Conference/Webinars/Training Programmes organized:

- **Webinar on "Smart Energy Metering: Testing, standards Communication & Technologies"**

  Webinar on "Smart Energy Metering: Testing, standards Communication & Technologies" was organized by STDS, CPRI, Bhopal through online, on 20th January 2022.

- **"National Conference on High Voltage Engineering and Technology"-** NCHVET 2022

  "National Conference on High Voltage Engineering and Technology"- NCHVET 2022, was organised by UHVRL, CPRI, Hyderabad, through online, on 25th February 2022.

- **Training Programme on "Testing of Static and Smart Energy Meters"**

  Training Programme on "Testing of Static and Smart Energy Meters" was organized by RTL, CPRI, Noida on 29th March 2022.

- **Training Programme for WBSEDCL**

  A Three Weeks Residential Induction Training Programme for Engineers of West Bengal State Electricity Distribution Company Limited, (WBSEDCL), Kolkata was organized by Training Division, CPRI, Bengaluru, at CPRI, Bengaluru, from 20th June to 9th July 2022.

- **Training program on "Energy Efficiency improvements in Cooling Towers"**

  Training program on "Energy Efficiency improvements in Cooling Towers" for Engineers of M/s. JNSTPP, Madhya Pradesh was organized by ERED, CPRI, Bengaluru at Jaypee Nigrie Super Thermal Power Plant, Madhya Pradesh on 26th September 2022.

- **Webinar on "Temperature rise tests on HT and LT Switchgear Panels – Requirements & Interpretations as per latest IEC Standards"**

  Webinar on "Temperature rise tests on HT and LT Switchgear Panels – Requirements & Interpretations as per latest IEC Standards" was organized by Short Circuit Laboratory, CPRI, Bengaluru at CPRI, Bengaluru on 20th December 2022.

Participation in Exhibitions

- **DISTRIBUELEC 2022 Exhibition -** CPRI participated in DISTRIBUELEC 2022, a Power Distribution Show organized by IEEMA at Bangalore International Exhibition Centre, Bengaluru, from 25th to 27th May 2022. The show was inaugurated on 25th May 2022 by Shri A. Namassivayam, Honourable Home Minister & Power Minister of UT of Puducherry. The event showcased products, technologies and services in Power distribution and attracted many decision makers from Utilities and Industry. CPRI displayed its facilities and expertise in a Stall during the exhibition. Photograph is placed below:
- The 9th ELASIA, International Exhibition on Power, Electrical & Lighting - CPRI participated in 9th ELASIA, International Exhibition on Power, Electrical & Lighting organized by M/s. Triune Exhibitors Pvt. Ltd, Bangalore in association with Electrical Consultants' Association of India (ELCA) held at Bangalore International Exhibition Centre, Bangalore, from 24th to 26th June 2022. The event was inaugurated by Chief Guest, Mr. Ashok Kheny, Former Member of the Karnataka Legislative Assembly and Guest of Honour, Mr G. Kumar Naik, I.A.S., Additional Chief Secretary to Government of Karnataka. The event focused on cutting-edge products & services to key Electrical, Electronics, Lightings & Power sector players. CPRI displayed its facilities and expertise in a Stall during the exhibition. Photograph is placed below:

Research & Development (R&D) related activities:

- CPRI is the Coordinating Nodal Agency for selection, initiation, execution, review of Research and Development schemes in India under Ministry of Power (MoP). CPRI has been entrusted with the responsibility of administering the R&D Schemes of MoP, as detailed below:
  - i. R&D Under National Perspective Plan (NPP) Scheme
    - a. Projects by IITs, IISc., NITs, Industries & CPRI
    - b. Project under Uchhatar Avishkar Yojana-I (UAY-I)
    - c. Project under Impacting Research Innovation and Technology-I (IMPRINT-I)
  - ii. Research Scheme on Power (RSoP)
  - iii. In-house Research & Development Scheme (IHRD)

Sponsored Projects by other Ministry/ Department/ Institutions/Organizations etc. are also taken up by CPRI officials.

Tests conducted for Overseas Customers

- Testing and Evaluation of LV Shunt Capacitor of rating 30kvar, 440V , 3 Ø, 50 Hz, MPP type and 30kvar, 525V, 3 Ø, 50 Hz, MPP type was carried out at Capacitors Division, CPRI, Bengaluru for M/s. Electrical Components Sdn. Bhd, Malaysia.
- Type testing on 6/10 (12 kV), 3CX185 Sq.mm, XLPE insulated, PVC Sheathed Cable as per IEC 60502-2 was carried out at Cables & Diagnostics Division, CPRI, Bengaluru for M/s. SQ Wire & Cable Co. Ltd., Bangladesh.
- Inverter testing as per IS 16169/ IEC 62116 and IS 16221-2/IEC 62109-2 was carried out at ERED, CPRI, Bengaluru for M/s. Solar Edge Technologies Pvt. Ltd., Israel.
- Vibration, shock, bump and seismic tests on Electromechanical Auxiliary Relay was carried out at EVRC, CPRI, Bengaluru for M/s. ABB Power Grids Sweden AB, Sweden.
- 1000 hours Tracking and Erosion Test on 38KV Solid Insulated Recloser was carried out at High Voltage Division, CPRI, Bengaluru for M/s. Entec Electric & Electronics Co., Korea.
- Lightning Impulse Voltage withstand test, RIV, Accuracy test, Tan delta test & Power Frequency Voltage withstand tests on 145 kV Potential Transformer was carried out at UHVRL, CPRI, Hyderabad for M/s. Energypac Engineering Ltd., Dhaka, Bangladesh.

Visit of overseas Team to CPRI

- Engr. Sk. Munir Ahmed, Director (Management), Power Cell, Power Division, Ministry of Power, Energy & Mineral Resources, Bangladesh and Mr. MD Yeasin Arafath, Sub - Divisional Engineer, Power Grid Company of Bangladesh Ltd., Bangladesh, visited High Voltage Division, CPRI, Bengaluru for witnessing the Acceptance Test on Disc Insulators on 18th January 2022.
- Mr. Rukshika Pathberiya, M/s. LTL Transformers (Pvt.) Ltd., Sri Lanka visited STDS, CPRI, Bhopal for witnessing Ability to withstand the Dynamic effects of Short Circuit test on 1000kVA, 33/0.415kV, Three phase Distribution Transformer & 400kVA, 33/0.415kV, Three Phase Distribution Transformer from 17th to 21st June 2022.
- Mr. Roberto Amboni & Mr. Dario Castelli, M/s. ABB Ltd., Italy visited Short Circuit Laboratory, CPRI, Bengaluru for witnessing tests on MCCBs as per IEC 60947-2:2016 with latest amendment from 07th to 28th November 2022.

Important projects under implementation:

- » Establishment of Regional Testing Laboratory at Raipur, Chhattisgarh
- » Regional Testing Lab. at Nashik, Maharashtra, Comprising of test facility for Transformer, Energy Meter and Insulating Oil
- » Upgradation of High Power Laboratory from 2500 MVA to 7500 MVA at CPRI, Bengaluru
- » Temperature Rise Test facility (40 kA) at CPRI, Bengaluru
- » Establishment of Cyber Security Test Facilities

CHAPTER 30

NATIONAL POWER TRAINING INSTITUTE

NATIONAL POWER TRAINING INSTITUTE

National Power Training Institute (NPTI), an ISO 9001 & ISO 14001 organization under Ministry of Power, Govt. of India is a National Apex body for Training and Human Resources Development in Power Sector with its Corporate Office at Faridabad. NPTI had been providing its dedicated service for more than five decades. NPTI has trained over 4,28,000 Power Professionals in regular Programs over more than 5 decades. NPTI is the world's leading integrated power training institute. NPTI is the only institute of its kind with a wide geographical spread and covering a wide gamut of academic and training programs in Power Sector. NPTI has been recognized as Cadre training Institute for officers of CEA / Utilities. NPTI's committed faculty is providing excellent training in the Power Sector, which is the most important sector among various infrastructure sectors. A number of training programs for national as-well-as transnational customers have been conducted. These programs have increased the availability of Generation, Transmission & Distribution Systems and decreased Aggregate Technical & Commercial Losses. NPTI has been recognized as Training, Assessment & Certification body by Ministry of Skill Development through Gazette Notification for DDU-GKY.

NPTI operates on an all India basis with manpower strength of 155 including 79 officers through its Eleven Institutes in different zones of the country as per details below:

A. Northern Region

1. NPTI Corporate Office, Faridabad
2. NPTI (Northern Region), Badarpur, New Delhi
3. NPTI (Hydro Power Training Centre), Nangal

B. Southern Region

4. NPTI (Power System Training Institute), Bengaluru
5. NPTI (Hot Line Training Centre), Bengaluru
6. NPTI (Southern Region), Neyveli
7. NPTI, Alappuzha

C. Eastern & North Eastern Region

8. NPTI (Eastern Region), Durgapur
9. NPTI (North Eastern Region), Guwahati

D. Western Region

10. NPTI (Western Region), Nagpur

E. North- Central Region

11. NPTI,Shivpuri

Manpower Training and Academic Programs

NPTI conducts the following industry interfaced academic programs with the objective to create a pool of committed and competent professionals equipped with appropriate technical skills to steer the Indian Power Sector:

- Two Year Master in Business Administration (MBA)
- One Year Post Graduate Diploma Course (PGDC) in Power Plant Engineering
- One Year Post Graduate Diploma Course (PGDC) in Renewable Energy & Grid Interface Technologies
- One Year Post Graduate Diploma Course (PGDC) in
- Smart Grid Technologies
- One Year Post Graduate Diploma Course (PGDC) in Power Management
- One Year Post Diploma Course (PDC) in Power Plant Engineering
- Nine Months Post Graduate Diploma Course (PGDC) in Hydro Power Plant Engg.
- Simulator Training Programs in Thermal, CCGT, Hydro & Load Despatch

In addition to the above, several long-term, medium-term and short-term training programs in the areas of Thermal, Hydro, Transmission & Distribution, Management and Regulatory affairs etc. are being conducted in the various Institutes of NPTI.

Customized training programs for various Power Utilities are also organized round the year. NPTI also conducts various training programs to ensure availability of properly trained personnel covering the syllabus as per Indian Electricity Rules.

NPTI has also been catering to the Training Needs of Power Sector Organizations viz., NHPC, GRID-INDIA, CEA, CESC, DPL, DVC, ECIL, FACT, GAIL, HINDALCO, HPGCL, IFFCO, IOCL, IREDA, KPCL, KRIBHCO, MPPGCL, NALCO, NEEPCO, NFL, NHPC, NLC, JUVNL, NTPC, OHPC, OPGCL, POWERGRID, RRVUNL, SAIL, THDC, UPRVUN, ACC, AEC, APGENCO, BBMB, BHEL, BSES, etc.

Power Training Simulators

NPTI has a 500 MW Thermal Power Plant Training Simulator at Faridabad Institute and 210 MW Thermal Power Plant Training Simulator at Nagpur & Badarpur Institutes for imparting specialized skills to operation personnel across the country. A 430 MW (2x143 MW Gas Turbines and 1x144 MW Steam Turbine) Full Scope Combined Cycle Gas Turbine Replica Simulator commissioned at NPTI Corporate Office, Faridabad is utilised for training CCGT operation personnel. A High-fidelity Load Dispatch Operator Training Simulator replicating the National Grid is also being used to impart training to System Operators at PSTI, Bengaluru. Training is also imparted to Hydro Operation Personnel on the 250 MW Hydro Simulator commissioned at HPTC, Nangal.

Six (6) Multi-functional training Simulators have been established replicating the real-time operation of 210 MW, 500 MW, 800 MW & 9F GE Combined Cycle Power Plant, 250 MW Hydro, SCADA & Smart Grid together with Smart Power Flow Controllers in an Integrated framework of System

comprising Thermal, Hydro, Gas along with Renewables at Faridabad, Durgapur, Bengaluru, Nagpur, Alapuzzha and Shivpuri and training is being imparted.

A 800 MW Supercritical Thermal Simulator has also been commissioned in NPTI, Corporate Office, Faridabad and training is being imparted to Utilities.

Hot Line Training Centre

A facility has been created at NPTI's Hot Line Training Centre, Bengaluru for Live Line Maintenance of Transmission Lines upto 400 kV which enables trained personnel to attend to maintenance requirements without power interruptions. Facilities for water washing of sub-station equipments are also available. This institute is one of its kind in the Asian sub continent.

Placement

Students of Post Graduate Diploma Course and Post Diploma Courses are finding placement in reputed companies like ACB Limited, HPPL, Vedanta Resource Ltd., JSW Energy, IERS, Kreate Energy, MotWane, Utility Powertech Ltd. etc.

Achievements during 1st April 22 to 31st Dec 2022

NPTI provided training to 45032 trainees for total trainee-weeks of 41,085 till 31.12.2022.

Other Important Activities

Training for IAS Officers

NPTI successfully conducted one week Energy module for mid course IAS Officers in LBSNAA Mussoorie which was attended by 49 senior level officers.

Mandatory Foundation Program

In order to provide 360 degree overview of the Power Sector and to develop camaraderie with colleagues and batch mates across the organizations, NPTI has conducted training for two batches of 313 participants from NTPC, NHPC, POWERGRID, PFC, CPRI, BEE.

National Mission on use of Biomass in Thermal Power Plants

Under the aegis of Mission SAMARTH, NPTI has conducted 32 Awareness programs for Farmers, Pellet manufacturer and professionals from Thermal Power Plants so far.

Training and Certification Programs on Cyber Security

NPTI has certified more than 1500 Power Professionals from various Power Sector Organizations in its Basic Level Training & Certification program

Revamped Distribution Sector Scheme (RDSS) Programs

NPTI has been engaged by Ministry of Power for the capacity building of State DISCOMs under RDSS for Smart Meter Implementation and SCADA Systems. Under the RDSS NPTI has conducted 131 programs on Introduction to AMI & role of AMI in reducing AT&C losses covering 4846 participants.

System Operator Certification Examination

NPTI's Power System Training Institute (PSTI) has been conducting Certification of Power System Operators since 2011. Training Courses at NPTI, Corporate Office, Faridabad and Power System Training Institute (PSTI), Bengaluru equip the System operators with necessary inputs to take up the System Operation Certification Exam.

Basic Level On-Line System Operator Certification exams are being conducted since November 2011 every year at various centres across the country. A total of 2207 System Operators were certified against for the Basic Level Certification Examinations. Specialist courses on 'Regulatory Framework in Power Sector', 'Power System Reliability', 'Renewable Energy Sources and Grid Integration', 'Power System Logistics' and 'Power Market Specialist' are being conducted both at Corporate Office, Faridabad and PSTI, Bengaluru. Examinations on all the specialist level subjects are being conducted. On-Line examinations for Specialist Level Certification have been conducted. As many as 409 System Operators were certified.

Induction Training

NPTI has been providing induction training to fresh Graduate Engineers/Executives from various Power Sector Organizations: GRID-INDIA, NHPC, RRUVNL, UJVNL etc.

International Training

NPTI conducted training programs through Indian Technical and Economic Cooperation (ITEC), MEA, Govt. of India. 5 Batches of Engineers from Various Countries have been trained through ITEC Programs. Ten (10) Weeks training on Thermal Power Plant for 2 batches of BEET's of BIFPCL, Bangladesh.

Other Important Activities

- One day National Seminar on Hotline Maintenance of Distribution on System was conducted by NPTI and was attended by more than 200 delegates. The same was inaugurated by Secretary, Ministry of Power.
- National Conference on "Regulatory Framework in Electricity Industry in India- Challenges, Governance & Future Roadmap" at Bhubaneswar (Odisha).
- Training program on Solar PV Installer under DDUGKY
- Capacity Building programs on Energy Conservation at various KGVB's in Uttar Pradesh covering 25151 girls Students.
- Under the aegis of BEE several training Programs for Financial Institutions on Energy Efficiency Financing.
- 14 and 8 weeks Training programs on O&M of Thermal Power Plant conducted for UPVUNL.
- Two days National Conference on Energy transition and Future Challenges of Indian power sector conducted.

- Organized retailer training program on Standard and Labeling for 40 retailers.
- One day work shop on Demand side Management for TPSODL and TPWODL
- Five days Training programs on Solar Power projects conducted for middle level officers from Coal India Ltd.
- NPTI celebrated Bijlee Mahotsav in 22 Districts of India
- Programs on various topics like IoT and sensor technologies for Smart power Utilities, Power System Communications, SCADA and EMS, Best Practices in Modern Switch gear O&M were conducted.
- Programs on Live line maintenance techniques using HotStick Method

Consultancy Services

NPTI is providing Project Management Agency (PMA) services for DDUGJY & IPDS Project Works for NESCO & WESCO Utility areas of OPTCL, Odisha. NPTI has been appointed as Project Management Agency (PMA)/Consultant to provide services for the works of unmetered to metered consumers in rural areas of all districts in PuVNNL, and the work is in progress. Third Party Inspection Works for DTL (Delhi TRANSCO), JVVNL, Jaipur and also for DVVNL, Agra is in progress. NPTI is also doing TPIA works for Jal Jeevan Mission in the state of Tripura.

MOU

MOU has also been signed with NHPC Ltd., WAPCOS, MPERC, IIT Roorkee, IEEMA, BEE, Nephor Research and Technology Labs Pvt. Ltd.

Shri R.K Singh, Hon'ble Power Minister ,Govt. of India, Shri Krishan Pal, Hon'ble Minister of State for Power and Shri Alok Kumar, Secretary (Power) attended the Foundation Day of NPTI.

Shri Alok Kumar, Secretary (Power) inaugurated the International Hostel Shri R.K Singh, Hon'ble Power Minister ,Govt. of India, Shri Krishan Pal, Hon'ble Minister of State for Power and at NPTI, Faridabad.

CHAPTER 31

'PUBLIC GRIEVANCE'

Public Grievance Cell of the Ministry is entrusted with the responsibility of redressal of public grievances. In pursuance of this, a link of CPGRAM/PG online portal of Department of Administrative Reforms & Public Grievances (DPR&PG)has been provided on the website of Ministry of Power. All grievance petitions received in the Ministry are examined and forwarded to the concerned Division/ Organizations for their redressal. As per the guidelines of DAR&PG, the grievances are to be redressed within a period of 30 days.

The Status of Public Grievance Applications:

Name of the Organization	From 01.01.2022 to 31.03.2022			From 01.04.2022 to 31.12.2022			Activities during 01.01.2022 to 21.11.2022
	No. of grievances received	No. of grievance disposed off	Balance Grievance	No. of grievances received	No. of grievance disposed off	Balance Grievance	
Ministry of Power	1035	862	173	3476	3374	112	Monitoring of grievances pending for more than 30 days is being done for timely disposal within the prescribed time limit of 30 days.

CHAPTER 32

RIGHT TO INFORMATION ACT, 2005

Ministry of Power and all its PSUs and subordinate organizations are linked with 'RTI MIS online portal of DoPT for processing of RTI applications/First Appeals. Under the RTI Act, 2005, the Ministry of Power has designated Under Secretaries/Section Officers as CPIOs and Directors/Deputy Secretaries as First Appellate Authorities. The Annual Return for the period 2021-22 has been uploaded on Central Information Commission website as required u/s 25(3) of the RTI Act, 2005.

The Status of RTI Applications & Appeals in the period of 01.01.2022 to 31.03.2022:

Applications received	Applications disposed off	First Appeals received	First Appeals Disposed off	Second Appeal Received From CIC	Second Appeal Disposed off by CIC	Whether suo-moto disclosures are uploaded on company website
484	400	24	18	Nil	Nil	Yes

The Status of RTI Applications & Appeals in the period of 01.04.2022 to 21.11.2022:

Applications received	Applications disposed off	First Appeals received	First Appeals Disposed off	Second Appeal Received From CIC	Second Appeal Disposed off by CIC	Whether suo-moto disclosures are uploaded on company website
1189	1101	35	35	6	6	Yes

CHAPTER 33.1

OFFICIAL LANGUAGE IMPLEMENTATION

Ministry of Power, its attached office and Public Sector Undertakings, Autonomous Bodies, Board and Institutions under the administrative control of the Ministry continued their efforts in ensuring effective implementation of the Official Language policy of the Government and promoting the progressive use of Hindi in day-to-day activities of the Ministry/Offices.

The Ministry ensured compliance of the Official Language Act, 1963 and the Official Language Rules, 1976 in the Ministry and offices under its administrative control.

In compliance with the Official Language Policy, Hindi fortnight was organised in the Ministry from 14 September, 2022 to 29 September, 2022. Banners were displayed at prominent places to motivate the Officers and staff of the Ministry to make more and more use of Hindi in their routine official work. During this period, Administrative Word and Phrase Competition, Hindi Noting and Drafting Competition, Hindi Typing Competition, Hindi Stenography Competition, Hindi Debate Competition, Hindi Self-Composed Poetry Recitation Competition, Hindi Dictation Competition, Hindi MCQ Competition (in writing), Hindi Essay Writing Competition, Slogan Writing Competition, Official work originally in Hindi (for gazetted officers) and Government work originally in Hindi (for non-gazetted officers/employees) competition were organised for the officers and employees of the Ministry. Officers and staff of the Ministry participated in these competitions with great enthusiasm. To review the progressive use of Hindi in the attached offices, Board, Organisations and Public Sector Undertakings under the administrative control of the Ministry, 06 offices viz. NHPC Parbati-2 and 3, Himachal Pradesh, PGCIL, Navsari, Gujrat & Kankaroli, Rajsamand, Rajasthan, NTPC Koldam, Himachal Pradesh and REC Headquarter, Gurugram. Under Section 3(3) of the Official Language Act, 1963, all documents, reports, letters, notifications etc were issued bilingual. Quarterly progress reports and Annual assessment reports pertaining to progressive use of Hindi were made available to the Department of Official language.

During the year Hindi Advisory Committee meeting was organised on 12.05.2022 under the chairmanship of Hon'ble Minister for Power, New & Renewable Energy, Sh. R.K. Singh, 33 offices of various PSUs under Ministry of Power administrative control were inspected by the Committee of Parliament on Official Language. Joint Director (OL) and Assistant Director (OL) of the Ministry participated in the inspection meetings of the Committee of Parliament on Official Language. During the year, 08 Offices have been notified under the Rule 10(4) of the Official Language Rules, 1976.

During the year till date, three quarterly meetings of Official Language Implementation Committee of the Ministry of Power were organized. Two workshops on Official Language were also organized for the Officials of the Ministry.

CHAPTER 33.2

VIGILANCE ACTIVITIES / DISCIPLINARY CASES

Vigilance wing of Ministry of Power deals with the complaint against officers/officials of the Ministry of Power and Board level officers of the PSUs and other offices under administrative control of the Ministry. All the complaints received in the section are registered in the Ministry/Section through E-office system. After examining the complaints relating to Board level officers of PSUs, reports are submitted to relevant agencies i.e. CVC /PMO/Cabinet Secretariat / DOPT, as the case may be. Further, complaints received from CVC under CVC Act/PIDPI are also handled on priority basis, and reported to CVC within the specified period. Pending complaint cases are also monitored on regular basis.

2. The "Vigilance Awareness Week 2022" was observed in Ministry of Power between **31st October 2022 to 6th November, 2022** with strict adherence to extant Covid-19 prevention guidelines. This year the theme for the Vigilance Awareness Week was **"Corruption free India for a developed Nation".** During the week, banners/posters of Vigilance Awareness Week alongwith slogan on vigilance theme were displayed at all the entrance and other prominent places of the Shram Shakti Bhavan/Nirman Bhavan, New Delhi. The occasion, started with a pledge taking ceremony, where a integrity pledge to maintain integrity and transparency in all spheres of work was administered to the Officers and Staff of the Ministry by Special Secretary & Financial Adviser on 31st October, 2022.

3. During the Vigilance Awareness Week, Essay & Debate Competition for the employees of the Ministry were organized on 2nd November 2022 & 3rd November, 2022 respectively. Painting Competition for the children of employees of the Ministry was also organized on 4th November, 2022. The topic for Essay was **"Transparency and accountability in governance to curb corruption"** and the topic for Debate was **"Role of Youth in eradicating Corruption".** The painting competition theme was **"Corruption"**

Essay Competition for the employees of the Ministry of Power held on 02.11.2022

Debate Competition for the employees of the Ministry of Power held on 03.11.2022

Painting Competition for the children of employees of the Ministry on 04.11.2022

Painting Competition for the children of employees of the Ministry on 04.11.2022

4. Besides, the security arrangements of various installations under Power Sector are reviewed on regular basis. The compliance to the security instructions/advisories received from various agencies from time to time were also ensured through appropriate communications to the concerned authorities for prompt necessary action.

CHAPTER 33.3

ACTIVITIES RELATING TO WOMEN EMPLOYEES

There are 43 women employees in the Ministry of Power. The representation of women employees at various levels in the Ministry of Power as on 01.01.2023 is indicated below :

Group	Total Employees (as on 01.01.2023)	No. of Women Employees	Percentage of overall staff strength
A	67	10	14.92
B	123	21	17.07
C	43	09	20.93
C(MTS)	44	03	6.81
Total	**277**	**43**	**15.16**

Employment of women in various grades in the Ministry of Power is dependent upon the nominations received from DOP&T and the recruiting agencies such as the Union Public Service Commission, Staff Selection Commission etc.

A Complaints Committee exists in the Ministry of Power to look into the complaints of sexual harassment made by the women employees of the Ministry.

CHAPTER 33.4

PERSONS WITH DISABILITIES (PwDs)

Ministry of Power provides reservation for the Persons with Disabilities in appointments in accordance with the instructions issued by Government from time to time. The implementation of the reservation policy for Persons with Disabilities in the Ministry and various organisations under its administrative control is monitored by Director (SC/ST) of the Ministry.

2. The representation of Persons with Disabilities in the Ministry as on 01.01.2023 is as under :

Group	Total Employees (as on 01.01.2022)	Persons with Disabilities Employees				Percentage of Persons with Disabilities employees
		VD	HD	OD	Total	
A	67	0	0	1	1	1.49
B	123	0	0	0	0	0
C	43	0	0	1	1	2.32
C (MTS)	44	1	0	2	3	6.81
Total	**277**	**1**	**0**	**4**	**5**	**1.80**

VD – Visually Disabled (Handicapped), **HD –** Hearing Disabled (Handicapped), **OD –** Orthopedically Disabled (Handicapped)

CHAPTER 33.5

RECREATIONAL ACTIVITIES

Recreation Club, Ministry of Power strives to promote recreational and cultural activities among the employees of the Ministry which help in rejuvenating both body and mind of the employees. This leads to increased productivity at the workplace.

On the eve of 76th Independence Day, a cultural tour to Rishikesh, Uttarakhand was organized for the employees of Ministry of Power along with their family members. A total of 60 people made the most of this opportunity and enjoyed a 3 days stay at Rishikesh. On the first day, the participants visited the Vashistha Gufa, attended Ganga Aarti at Teiveni Ghat. on the second day, the participants visited the Tehri Dam which is the tallest dam in India and the biggest hydroelectric power plant in India. On the third day, the participants celebrated the Independence Day at the THDC Complex in Rishikesh and attended the cultural programme organized by THDC at their complex. The cultural tour was a great success and all the participants were elated at the end of the tour and requested to organize such cultural tours in future as well.

The Ministry gives significant importance to the physical and mental well-being of its employees. The Recreation Club encourages the employees of the Ministry to actively participate in sports activities which helps in inculcating team spirit and helps the employees to lead an active and healthy life.

During the year 2022-23 the employees of the Ministry participated in various Inter-CPSU sporting events organized by the Power Sports Control Board (PSCB) and managed to won 2 Gold, 3 Silver and 8 Bronze Medals:

S. No.	Sporting Event	Medals Won
1.	Carrom	2 Gold, 1 Silver and 2 Bronze
2.	Bridge	1 Silver and 2 Bronze
3.	Chess	1 Silver
4.	Badminton	2 Bronze
5.	**Table Tennis**	**1 Bronze**
6.	**Athletics**	**1 Bronze**

CHAPTER 33.6

WELFARE OF SCHEDULED CASTES, SCHEDULED TRIBES AND OTHER BACKWARD CLASSES

A Reservation Cell has been functioning in the Ministry since the early nineties under the direct control of the Director/DS (SC/ST), who is also the Liaison Officer for Scheduled Castes and Scheduled Tribes. Reservation Cell assists the Liaison Officers for SCs/STs & OBCs. The Cell monitors the implementation of reservation policies of the Government of India in respect of Scheduled Castes, Scheduled Tribes, Other Backward Classes, Persons with Disabilities, Minority Community, Ex-Servicemen and Economically Weaker Section in the Ministry, as well as Autonomous Bodies/CPSUs under the administrative control of the Ministry of Power.

2. The total strength of employees and representation of Scheduled Castes, Scheduled Tribes and Other Backward Classes in the Ministry of Power as on **01.01.2023** is indicated below:

Group	Total number of Employees (as on 01.01.2023)	Representation					
		SCs	SCs %	STs	STs %	OBC	OBC %
Group A	67	17	25.37	1	1.49	5	7.46
Group B	123	32	26.01	4	3.25	29	23.57
Group C	43	10	23.25	2	6.97	6	13.95
GroupC							
(MTS)	44	22	50	1	2.27	7	15.90
TOTAL	277	79	28.51	8	2.88	48	17.32

Welfare of Minorities

The schemes, as recommended by the Government for the welfare of the Minorities from time to time, are implemented, from time to time.

CHAPTER 34

IT & CYBER SECURITY DIVISION, MINISTRY OF POWER

1. Cyber Security in Power Sector

Power Sector is one of the critical infrastructure of the country. Protection of critical information infrastructure and power system equipment from cyber threat is extremely important from the National Security perspective.

Under the direction of Hon'ble Union Minister of Power and New & Renewable Energy, Shri R K Singh, the Central Electricity Authority; a statutory body under Ministry of Power has issued the guideline for the Cyber Security in Power Sector and has been released on 7.10.2021. The Guideline issued under the provision of Section 3(10) on Cyber Security in the "Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2019", is to be adhered by all Power Sector utilities to create a cyber secure eco system.

This is one of the first major steps in power sector that a comprehensive guideline has been formulated for cyber security. The guideline lays down required actions for cyber security preparedness across various utilities in power sector so as to raise the level of cyber security preparedness for power sector.

The Guideline has been prepared after intensive deliberations with stakeholder and inputs from expert agencies in the field of cyber security, such as CERT-In, NCIIPC, NSCS, IIT Kanpur and subsequent deliberations in Ministry of Power as well.

The Guideline has been issued with the objective of creating a cyber secure ecosystem. It lays down a cyber assurance framework, strengthens the regulatory framework, puts in place mechanisms for security threat early warning, vulnerability management and response to security threats, securing remote operations and services, protection and resilience of critical information infrastructure, reducing cyber supply chain risks, encouraging use of open standards, promotion of research and development in cyber security, human resource development in the domain of Cyber Security, Developing effective public private partnerships and information sharing and cooperation.

Guidelines are applicable to all Responsible Entities as well as System Integrators, Equipment Manufacturers, Suppliers/ Vendors, Service Providers, IT Hardware and Software OEMs engaged in the Indian Power Supply System for protection of Control Systems for System Operation and Operation Management, Communication System and Secondary Automation and Tele control technologies.

These Guidelines are mandatory requirements to be met by all stakeholders and lay emphasis on establishing cyber hygiene, training of all IT as well OT Personnel on Cyber Security, designating of Cyber Security Training Institutes as well as Cyber Testing labs in the Country. The Guideline mandates ICT based procurement from identified "Trusted Sources" and identified "Trusted Products" or else the product has to be tested for Malware/Hardware Trojan before deployment for use in power supply system network when system for trusted product and service is in place. It will promote research and development in cyber security and open up market for setting up Cyber Testing Infra in Public as well as Private Sector in the country.

2. National Power Portal (NPP)

NPP is a central hub for the collection and dissemination of information regarding Indian power sector. The NPP facilitates the online capture and input of information from entire power value chain; generation, transmission, and distribution utilities in the country on defined periodicity. It also disseminates power sector information such as operational, capacity, demand, supply, and consumption information through various reports, infographics and statistics for data analysis for generation, transmission and distribution at various level across India, regional and state level for the use of central, state, and private sector entities. NPP also serves as a single source of power sector information. Central Electricity Authority is the nodal agency for NPP.

Salient features of NPP are:

- 24X7 access and availability of Power Sector Data.
- System is designed and developed using open source technologies and hosted on National Data Centre.
- Optimization of cost by maintaining common infrastructure.
- Data collection at Source.
- Minimize manual entry of data.
- To ensure effective and timely collection of Data.
- To ensure data authenticity and accuracy.
- Standardization of Master Data facilitates seamless exchange of information between NPP and respective application systems at utilities as well as integration with other systems.
- Dissemination of information to Apex Bodies, Power Utilities and Public Users through analytical reports/ charts for planning, monitoring and integration with other related sectors.
- Ease of sharing information among the stakeholders.

The NPP Dashboard is designed to distribute analyzed information about the sector through GIS-enabled navigation and visualization charts that display information on capacity,

generation, transmission and distribution. Links of various Apps deployed by Ministry of Power are also available on the portal. The system also facilitates various types of statutory reports required to be published regularly.

Installed Capacity: Captures and displays information on Installed Capacity, Sector-wise Installed Capacity, Category-wise Installed Capacity, Daily Demand (All India).

Transmission: Captures and displays information on Transmission Lines (Annual Achievements), Transformation Capacity (Annual Achievements), Transmission Lines (CKm), Transformation Capacity(MVA).

Urban Distribution: Captures and displays information IT Enabled Towns, Towns where AT&C loss reduced, Connections Released in (SERC timelines), Complaints Redressed in (SERC timelines), Monthly Avg. No. of Interruptions, Monthly Avg. Duration of Interruptions.

Rural Distribution: Captures and displays information about rural power supply.

Access to backend data inputs has been given to States/UTs for further granular analysis for adoption of promotion of data based policy making and decisions.

3. Web Portals and Apps.

Various Web Portals/mobile App have been made available for e-enablement and information dissemination of various schemes/projects of Ministry of Power.

RFMS; (Rural Feeder Monitoring Scheme): complete picture of the entire distribution network in country, PRAAPTI; Payment Ratification And Analysis in Power Procurement for Bringing Transparency in Invoicing of Generators, UJALA; Unnat Jyoti by Affordable LEDs for All, DEEP E-Bidding Portal, TARANG-Transmission APP for Real Time Monitoring and Growth, Vidyut Pravah ; Electricity Price & Availability Highlights, etc.

4. Social Media

Ministry of Power is actively engaging with the citizens various social media platforms for disseminating the achievements and activities carried out by Ministry. Updated information on power sector are regularly posted on these social media platforms.

Ministry of Power has verified accounts on Facebook , Twitter , Youtube, Instagram, PublicApp and has more than 1.93 lakh followers on Facebook and more than 4.92 lakh followers on Twitter respectively.

5. Promotion of Digital Payments

As part of Government of India's focus on promotion of digital payment, Ministry of Power has taken various steps for making payment of electricity bill by consumers across the country through digital means in coordination with States/UTs/DISCOMs in government and private sector. Most of the States/UTs/DISCOMs have on boarded Bharat Bill Payment System (BBPS) for digital payment facilitation. BHIM/UPI and Bharat QR Code for facilitating digital payment of electricity bill are also being promoted on high priority.

"As a result of congruent efforts, total digital transactions achieved by Ministry of Power in current FY 2022-23 (till Jan.2023) is 54.63% of total transaction and amount collected in through digital transaction is 72.35% of total amount collected.

6. eGovernance Initiative:

As part of eGovernance initiative in Ministry of Power, eOffice System has been upgraded to Ver 7.x for speedy processing of efiles and bringing more transparency in the system.

Region-wise Installed Capacity

ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS LOCATED IN THE REGIONS OF MAIN LAND AND ISLANDS

(As on 31.12.2022)

(UTILITIES)

Region	Ownership / Sector	Mode wise breakup									Grand Total
		Thermal					Nuclear	Renewable			
		Coal	Lignite	Gas	Diesel	Total		Hydro	RES* (MNRE)	Total	
Northern Region	State	17885.00	250.00	2878.90	0.00	21013.90	0.00	6008.25	737.00	6745.25	27759.15
	Private	22324.33	1080.00	558.00	0.00	23962.33	0.00	3241.00	30533.31	33774.31	57736.64
	Central	15137.84	250.00	2344.06	0.00	17731.90	1620.00	11502.51	379.00	11881.51	31233.41
	Sub Total	**55347.17**	**1580.00**	**5780.96**	**0.00**	**62708.13**	**1620.00**	**20751.76**	**31649.31**	**52401.07**	**116729.20**
Western Region	State	21290.00	900.00	2849.82	0.00	25039.82	0.00	5446.50	599.98	6046.48	31086.30
	Private	31947.17	500.00	4676.00	0.00	37123.17	0.00	481.00	36222.23	36703.23	73826.40
	Central	21335.92	0.00	3280.67	0.00	24616.59	1840.00	1635.00	666.30	2301.30	28757.89
	Sub Total	**74573.09**	**1400.00**	**10806.49**	**0.00**	**86779.58**	**1840.00**	**7562.50**	**37488.51**	**45051.01**	**133670.59**
Southern Region	State	20592.50	0.00	791.98	159.96	21544.44	0.00	11827.48	621.88	12449.36	33993.80
	Private	13373.50	250.00	5340.24	273.70	19237.45	0.00	0.00	48259.93	48259.93	67497.38
	Central	12239.34	3390.00	359.58	0.00	15988.92	3320.00	0.00	541.90	541.90	19850.82
	Sub Total	**46205.34**	**3640.00**	**6491.80**	**433.66**	**56770.81**	**3320.00**	**11827.48**	**49423.71**	**61251.19**	**121342.00**
Eastern Region	State	6970.00	0.00	80.00	0.00	7050.00	0.00	3550.22	278.11	3828.33	10878.33
	Private	5553.00	0.00	0.00	0.00	5553.00	0.00	209.00	1498.32	1707.32	7260.32
	Central	14516.70	0.00	0.00	0.00	14516.70	0.00	1005.20	10.00	1015.20	15531.90
	Sub Total	**27039.70**	**0.00**	**80.00**	**0.00**	**27119.70**	**0.00**	**4764.42**	**1786.43**	**6550.85**	**33670.55**
"North Eastern Region"	State	0.00	0.00	411.36	36.00	447.36	0.00	422.00	241.25	663.25	1110.60
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	242.51	242.51	242.51
	Central	610.20	0.00	1253.60	0.00	1863.80	0.00	1522.01	30.00	1552.01	3415.81
	Sub Total	**610.20**	**0.00**	**1664.96**	**36.00**	**2311.16**	**0.00**	**1944.01**	**513.76**	**2457.77**	**4768.92**
Islands	State	0.00	0.00	0.00	84.35	84.35	0.00	0.00	5.25	5.25	89.60
	Private	0.00	0.00	0.00	35.19	35.19	0.00	0.00	28.08	28.08	63.27
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.10	5.10	5.10
	Sub Total	**0.00**	**0.00**	**0.00**	**119.54**	**119.54**	**0.00**	**0.00**	**38.43**	**38.43**	**157.97**
ALL INDIA	State	66737.50	1150.00	7012.06	280.31	75179.87	0.00	27254.45	2483.46	29737.91	104917.78
	Private	73198.00	1830.00	10574.24	308.89	85911.14	0.00	3931.00	116784.38	120715.38	206626.52
	Central	63840.00	3640.00	7237.91	0.00	74717.91	6780.00	15664.72	1632.30	17297.02	98794.93
	Total	**203775.50**	**6620.00**	**24824.21**	**589.20**	**235808.91**	**6780.00**	**46850.17**	**120900.15**	**167750.32**	**410339.23**

Figures at decimal may not tally due to rounding off

Abbreviation:- SHP=Small Hydro Project (≤ 25 MW), BP=Biomass Power, U&I=Urban & Industrial Waste Power, RES=Renewable Energy Sources

Note : - 1. RES include SHP, BP, U&I, Solar and Wind Energy. Installed capacity in respect of RES (MNRE) as on 31.12.2022 (As per latest information available with MNRE)

***Break up of RES all India as on 31.12.2022 is given below (in MW) :**

"Small Hydro Power"	Wind Power	Bio-Power		Solar Power	"Total Capacity"
		SCs	SCs %	STs	STs %
4935.65	41929.78	10209.81	522.42	63302.49	120900.15

A.	Capacity	Added	during	Dec, 2022	0 MW
B.	Capacity	Retired	during	Dec, 2022	210 MW
	Durgapur TPS U-4 (210 MW) of Damodar Valley Corporation has been retired and removed from the capacity of Central sector.				
C.	Net Conv. Capacity Added during		Dec, 2022	A-B	-210 MW
D.	Net RES Capacity Added during		Dec, 2022		1388.02 MW
E.	Net Capacity Added during		Dec, 2022	C+D	1178.02 MW

*Off-grid RES Capacity has been included from July-2021 onwards

Sector wise breakup of RES capacity as shown is provisional.

Allocation from central sector stations has been updated till 30.11.2022.

Share of Railway (900 MW) from NABI NAGAR TPP (1000 MW) is included in central sector of Bihar.

Share from private sector generating stations has been updated as per latest information available.

INSTALLED CAPACITY (IN MW) OF POWER UTILITIES IN THE STATES/UTS LOCATED IN NORTHERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 31.12.2022)

State	Ownership / Sector	Mode wise breakup									Grand Total
		Thermal					Nuclear	Renewable			
		Coal	Lignite	Gas	Diesel	Total		Hydro	RES* (MNRE)	Total	
Delhi	State	0.00	0.00	1800.40	0.00	1800.40	0.00	0.00	0.00	0.00	1800.40
	Private	878.22	0.00	108.00	0.00	986.22	0.00	0.00	295.48	295.48	1281.70
	Central	2771.28	0.00	207.01	0.00	2978.29	102.83	723.09	0.00	723.09	3804.21
	Sub-Total	**3649.50**	**0.00**	**2115.41**	**0.00**	**5764.91**	**102.83**	**723.09**	**295.48**	**1018.57**	**6886.31**
Haryana	State	2510.00	0.00	150.00	0.00	2660.00	0.00	200.00	69.30	269.30	2929.30
	Private	4561.78	0.00	0.00	0.00	4561.78	0.00	539.00	1248.75	1787.75	6349.53
	Central	1566.61	0.00	431.59	0.00	1998.20	100.94	1585.62	5.00	1590.62	3689.76
	Sub-Total	**8638.39**	**0.00**	**581.59**	**0.00**	**9219.98**	**100.94**	**2324.62**	**1323.05**	**3647.67**	**12968.59**
Himachal Pradesh	State	0.00	0.00	0.00	0.00	0.00	0.00	805.60	256.61	1062.21	1062.21
	Private	0.00	0.00	0.00	0.00	0.00	0.00	1219.40	810.69	2030.09	2030.09
	Central	144.67	0.00	0.00	0.00	144.67	28.95	1223.88	0.00	1223.88	1397.50
	Sub-Total	**144.67**	**0.00**	**0.00**	**0.00**	**144.67**	**28.95**	**3248.88**	**1067.30**	**4316.18**	**4489.80**
"Jammu & Kashmir and Ladakh"	State	0.00	0.00	175.00	0.00	175.00	0.00	1230.00	137.97	1367.97	1542.97
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	106.20	106.20	106.20
	Central	577.14	0.00	129.07	0.00	706.22	67.98	1091.88	0.00	1091.88	1866.08
	Sub-Total	**577.14**	**0.00**	**304.07**	**0.00**	**881.22**	**67.98**	**2321.88**	**244.17**	**2566.05**	**3515.25**
Punjab	State	1760.00	0.00	150.00	0.00	1910.00	0.00	1243.40	127.80	1371.20	3281.20
	Private	5014.00	0.00	0.00	0.00	5014.00	0.00	288.00	1700.45	1988.45	7002.45
	Central	1440.00	0.00	0.00	0.00	1440.00	196.81	2286.88	0.00	2286.88	3923.69
	Sub-Total	**8214.00**	**0.00**	**150.00**	**0.00**	**8364.00**	**196.81**	**3818.28**	**1828.25**	**5646.53**	**14207.34**
Rajasthan	State	7580.00	250.00	603.50	0.00	8433.50	0.00	433.00	23.85	456.85	8890.35
	Private	2957.00	1080.00	0.00	0.00	4037.00	0.00	104.00	20803.65	20907.65	24944.65
	Central	1210.56	250.00	171.13	0.00	1631.69	556.74	1404.93	344.00	1748.93	3937.36
	Sub-Total	**11747.56**	**1580.00**	**774.63**	**0.00**	**14102.19**	**556.74**	**1941.93**	**21171.50**	**23113.43**	**37772.36**
Uttar Pradesh	State	6035.00	0.00	0.00	0.00	6035.00	0.00	724.10	49.10	773.20	6808.20
	Private	8814.33	0.00	0.00	0.00	8814.33	0.00	842.40	4648.05	5490.45	14304.78
	Central	5538.42	0.00	1029.51	0.00	6567.93	289.48	1857.52	30.00	1887.52	8744.93
	Sub-Total	**20387.75**	**0.00**	**1029.51**	**0.00**	**21417.26**	**289.48**	**3424.02**	**4727.15**	**8151.17**	**29857.91**
Uttarakhand	State	0.00	0.00	0.00	0.00	0.00	0.00	1372.15	72.37	1444.52	1444.52
	Private	99.00	0.00	450.00	0.00	549.00	0.00	248.20	861.35	1109.55	1658.55
	Central	413.30	0.00	69.66	0.00	482.96	31.24	475.54	0.00	475.54	989.74
	Sub-Total	512.30	0.00	519.66	0.00	1031.96	31.24	2095.89	933.72	3029.61	4092.81
Chandigarh	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.69	58.69	58.69
	Central	44.83	0.00	15.03	0.00	59.86	8.01	101.71	0.00	101.71	169.57
	Sub-Total	44.83	0.00	15.03	0.00	59.86	8.01	101.71	58.69	160.40	228.26
Central - Unallocated		1431.03	0.00	291.05	0.00	1722.08	237.03	751.45	0.00	751.45	2710.57
Total (Northern Region)	State	17885.00	250.00	2878.90	0.00	21013.90	0.00	6008.25	737.00	6745.25	27759.15
	Private	22324.33	1080.00	558.00	0.00	23962.33	0.00	3241.00	30533.31	33774.31	57736.64
	Central	15137.84	250.00	2344.06	0.00	17731.90	1620.00	11502.51	379.00	11881.51	31233.41
	Grand Total	**55347.17**	**1580.00**	**5780.96**	**0.00**	**62708.13**	**1620.00**	**20751.76**	**31649.31**	**52401.07**	**116729.20**

INSTALLED CAPACITY (IN MW) OF POWER UTILITIES IN THE STATES/UTS LOCATED IN WESTERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 31.12.2022)

State	Ownership / Sector	Mode wise breakup									Grand Total
		Thermal					Nuclear	Renewable			
		Coal	Lignite	Gas	Diesel	Total		Hydro	RES* (MNRE)	Total	
Goa	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05
	Private	0.00	0.00	48.00	0.00	48.00	0.00	0.00	26.74	26.74	74.74
	Central	492.29	0.00	19.67	0.00	511.96	26.00	2.00	0.00	2.00	539.96
	Sub-Total	**492.29**	**0.00**	**67.67**	**0.00**	**559.96**	**26.00**	**2.00**	**26.79**	**28.79**	**614.75**
Daman & Diu	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.01	41.01	41.01
	Central	164.74	0.00	43.34	0.00	208.08	7.00	0.00	0.00	0.00	215.08
	Sub-Total	**164.74**	**0.00**	**43.34**	**0.00**	**208.08**	**7.00**	**0.00**	**41.01**	**41.01**	**256.09**
Gujarat	State	4510.00	900.00	2177.82	0.00	7587.82	0.00	772.00	92.79	864.79	8452.61
	Private	7144.67	500.00	3985.00	0.00	11629.67	0.00	0.00	18231.39	18231.39	29861.06
	Central	5504.47	0.00	424.00	0.00	5928.47	559.00	0.00	243.30	243.30	6730.77
	Sub-Total	**17159.14**	**1400.00**	**6586.82**	**0.00**	**25145.96**	**559.00**	**772.00**	**18567.48**	**19339.48**	**45044.44**
Madhya Pradesh	State	5400.00	0.00	0.00	0.00	5400.00	0.00	1703.66	107.96	1811.62	7211.62
	Private	6079.00	0.00	75.00	0.00	6154.00	0.00	0.00	5466.57	5466.57	11620.57
	Central	4608.54	0.00	257.00	0.00	4865.54	273.00	1520.00	300.00	1820.00	6958.54
	Sub-Total	16087.54	0.00	332.00	0.00	16419.54	273.00	3223.66	5874.53	9098.19	25790.73
Chhattisgarh	State	1840.00	0.00	0.00	0.00	1840.00	0.00	120.00	11.05	131.05	1971.05
	Private	7667.50	0.00	0.00	0.00	7667.50	0.00	0.00	1284.17	1284.17	8951.67
	Central	2714.35	0.00	0.00	0.00	2714.35	48.00	113.00	0.00	113.00	2875.35
	Sub-Total	**12221.85**	**0.00**	**0.00**	**0.00**	**12221.85**	**48.00**	**233.00**	**1295.22**	**1528.22**	**13798.07**
Maharashtra	State	9540.00	0.00	672.00	0.00	10212.00	0.00	2850.84	388.13	3238.97	13450.97
	Private	10856.00	0.00	568.00	0.00	11424.00	0.00	481.00	11166.89	11647.89	23071.89
	Central	4858.24	0.00	2272.73	0.00	7130.97	690.00	0.00	123.00	123.00	7943.97
	Sub-Total	**25254.24**	**0.00**	**3512.73**	**0.00**	**28766.97**	**690.00**	**3331.84**	**11678.02**	**15009.86**	**44466.83**
Dadra & Nagar Naveli	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	200.00	0.00	0.00	0.00	200.00	0.00	0.00	5.46	5.46	205.46
	Central	222.30	0.00	66.34	0.00	288.64	9.00	0.00	0.00	0.00	297.64
	Sub-Total	**422.30**	**0.00**	**66.34**	**0.00**	**488.64**	**9.00**	**0.00**	**5.46**	**5.46**	**503.10**
Central - Unallocated		2770.99	0.00	197.59	0.00	2968.58	228.00	0.00	0.00	0.00	3196.58
Total (Western Region)	State	21290.00	900.00	2849.82	0.00	25039.82	0.00	5446.50	599.98	6046.48	31086.30
	Private	31947.17	500.00	4676.00	0.00	37123.17	0.00	481.00	36222.23	36703.23	73826.40
	Central	21335.92	0.00	3280.67	0.00	24616.59	1840.00	1635.00	666.30	2301.30	28757.89
	Grand Total	**74573.09**	**1400.00**	**10806.49**	**0.00**	**86779.58**	**1840.00**	**7562.50**	**37488.51**	**45051.01**	**133670.59**

INSTALLED CAPACITY (IN MW) OF POWER UTILITIES IN THE STATES/UTS LOCATED IN SOUTHERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 31.12.2022)

State	Ownership / Sector	Mode wise breakup									Grand Total
		Thermal					Nuclear	Renewable			
		Coal	Lignite	Gas	Diesel	Total		Hydro	RES* (MNRE)	Total	
Andhra Pradesh	State	5010.00	0.00	235.40	0.00	5245.40	0.00	1673.60	56.18	1729.78	6975.18
	Private	3873.88	0.00	3831.32	36.80	7742.00	0.00	0.00	9043.34	9043.34	16785.35
	Central	1547.04	180.23	0.00	0.00	1727.27	127.27	0.00	250.00	250.00	2104.54
	Sub-Total	**10430.92**	**180.23**	**4066.72**	**36.80**	**14714.68**	**127.27**	**1673.60**	**9349.52**	**11023.12**	**25865.07**
Telangana	State	6242.50	0.00	0.00	0.00	6242.50	0.00	2479.93	41.22	2521.15	8763.65
	Private	1389.45	0.00	831.82	0.00	2221.27	0.00	0.00	5039.05	5039.05	7260.32
	Central	1806.85	61.30	0.00	0.00	1868.15	148.73	0.00	10.00	10.00	2026.88
	Sub-Total	**9438.80**	**61.30**	**831.82**	**0.00**	**10331.92**	**148.73**	**2479.93**	**5090.27**	**7570.20**	**18050.85**
Karnataka	State	5020.00	0.00	0.00	0.00	5020.00	0.00	3631.60	193.89	3825.49	8845.49
	Private	2050.00	0.00	0.00	25.20	2075.20	0.00	0.00	16144.21	16144.21	18219.41
	Central	2877.56	471.90	0.00	0.00	3349.46	698.00	0.00	0.00	0.00	4047.46
	Sub-Total	**9947.56**	**471.90**	**0.00**	**25.20**	**10444.66**	**698.00**	**3631.60**	**16338.09**	**19969.69**	**31112.35**
Kerala	State	0.00	0.00	0.00	159.96	159.96	0.00	1864.15	207.90	2072.05	2232.01
	Private	1047.50	0.00	174.00	0.00	1221.50	0.00	0.00	761.96	761.96	1983.46
	Central	1011.50	314.20	359.58	0.00	1685.28	362.00	0.00	50.00	50.00	2097.28
	Sub-Total	**2059.00**	**314.20**	**533.58**	**159.96**	**3066.74**	**362.00**	**1864.15**	**1019.86**	**2884.01**	**6312.75**
Tamil Nadu	State	4320.00	0.00	524.08	0.00	4844.08	0.00	2178.20	122.70	2300.90	7144.98
	Private	5012.67	250.00	503.10	211.70	5977.47	0.00	0.00	17235.84	17235.84	23213.31
	Central	3429.59	1666.57	0.00	0.00	5096.16	1448.00	0.00	231.90	231.90	6776.06
	Sub-Total	**12762.26**	**1916.57**	**1027.18**	**211.70**	**15917.71**	**1448.00**	**2178.20**	**17590.44**	**19768.64**	**37134.35**
NLC	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Central	0.00	166.00	0.00	0.00	166.00	0.00	0.00	0.00	0.00	166.00
	Sub-Total	**0.00**	**166.00**	**0.00**	**0.00**	**166.00**	**0.00**	**0.00**	**0.00**	**0.00**	**166.00**
Puducherry	State	0.00	0.00	32.50	0.00	32.50	0.00	0.00	0.00	0.00	32.50
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.53	35.53	35.53
	Central	140.80	111.80	0.00	0.00	252.60	86.00	0.00	0.00	0.00	338.60
	Sub-Total	**140.80**	**111.80**	**32.50**	**0.00**	**285.10**	**86.00**	**0.00**	**35.53**	**35.53**	**406.63**
Central - Unallocated		1426.00	418.00	0.00	0.00	1844.00	450.00	0.00	0.00	0.00	2294.00
Total (Southern Region)	State	20592.50	0.00	791.98	159.96	21544.44	0.00	11827.48	621.88	12449.36	33993.80
	Private	13373.50	250.00	5340.24	273.70	19237.45	0.00	0.00	48259.93	48259.93	67497.38
	Central	12239.34	3390.00	359.58	0.00	15988.92	3320.00	0.00	541.90	541.90	19850.82
	Grand Total	**46205.34**	**3640.00**	**6491.80**	**433.66**	**56770.81**	**3320.00**	**11827.48**	**49423.71**	**61251.19**	**121342.00**

INSTALLED CAPACITY (IN MW) OF POWER UTILITIES IN THE STATES/UTS LOCATED IN EASTERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 31.12.2022)

State	Ownership / Sector	Mode wise breakup									Grand Total
		Thermal					Nuclear	Renewable			
		Coal	Lignite	Gas	Diesel	Total		Hydro	RES* (MNRE)	Total	
Bihar	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	70.70	70.70	70.70
	Private	700.00	0.00	0.00	0.00	700.00	0.00	0.00	318.90	318.90	1018.90
	Central	6125.71	0.00	0.00	0.00	6125.71	0.00	110.00	0.00	110.00	6235.71
	Sub-Total	**6825.71**	**0.00**	**0.00**	**0.00**	**6825.71**	**0.00**	**110.00**	**389.60**	**499.60**	**7325.31**
Jharkhand	State	420.00	0.00	0.00	0.00	420.00	0.00	130.00	4.05	134.05	554.05
	Private	580.00	0.00	0.00	0.00	580.00	0.00	0.00	99.20	99.20	679.20
	Central	1194.60	0.00	0.00	0.00	1194.60	0.00	61.00	0.00	61.00	1255.60
	Sub-Total	**2194.60**	**0.00**	**0.00**	**0.00**	**2194.60**	**0.00**	**191.00**	**103.25**	**294.25**	**2488.85**
West Bengal	State	4810.00	0.00	80.00	0.00	4890.00	0.00	986.00	121.95	1107.95	5997.95
	Private	2437.00	0.00	0.00	0.00	2437.00	0.00	0.00	484.27	484.27	2921.27
	Central	1336.41	0.00	0.00	0.00	1336.41	0.00	410.00	0.00	410.00	1746.41
	Sub-Total	**8583.41**	**0.00**	**80.00**	**0.00**	**8663.41**	**0.00**	**1396.00**	**606.22**	**2002.22**	**10665.63**
DVC	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Private	150.00	0.00	0.00	0.00	150.00	0.00	0.00	0.00	0.00	150.00
	Central	2876.88	0.00	0.00	0.00	2876.88	0.00	186.20	0.00	186.20	3063.07
	Sub-Total	**3026.88**	**0.00**	**0.00**	**0.00**	**3026.88**	**0.00**	**186.20**	**0.00**	**186.20**	**3213.07**
Odisha	State	1740.00	0.00	0.00	0.00	1740.00	0.00	2074.22	26.30	2100.52	3840.52
	Private	1686.00	0.00	0.00	0.00	1686.00	0.00	0.00	591.26	591.26	2277.26
	Central	1431.85	0.00	0.00	0.00	1431.85	0.00	89.00	10.00	99.00	1530.85
	Sub-Total	**4857.85**	**0.00**	**0.00**	**0.00**	**4857.85**	**0.00**	**2163.22**	**627.56**	**2790.78**	**7648.63**
Sikkim	State	0.00	0.00	0.00	0.00	0.00	0.00	360.00	55.11	415.11	415.11
	Private	0.00	0.00	0.00	0.00	0.00	0.00	209.00	4.69	213.69	213.69
	Central	11.92	0.00	0.00	0.00	11.92	0.00	64.00	0.00	64.00	75.92
	Sub-Total	**11.92**	**0.00**	**0.00**	**0.00**	**11.92**	**0.00**	**633.00**	**59.80**	**692.80**	**704.72**
Central - Unallocated		1539.33	0.00	0.00	0.00	1539.33	0.00	85.01	0.00	85.01	1624.34
Total (Eastern Region)	State	6970.00	0.00	80.00	0.00	7050.00	0.00	3550.22	278.11	3828.33	10878.33
	Private	5553.00	0.00	0.00	0.00	5553.00	0.00	209.00	1498.32	1707.32	7260.32
	Central	14516.70	0.00	0.00	0.00	14516.70	0.00	1005.20	10.00	1015.20	15531.90
	Grand Total	**27039.70**	**0.00**	**80.00**	**0.00**	**27119.70**	**0.00**	**4764.42**	**1786.43**	**6550.85**	**33670.55**

INSTALLED CAPACITY (IN MW) OF POWER UTILITIES IN THE STATES/UTS LOCATED IN NORTH-EASTERN REGION

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 31.12.2022)

State	Ownership / Sector	Mode wise breakup									Grand Total
		Thermal					Nuclear	Renewable			
		Coal	Lignite	Gas	Diesel	Total		Hydro	RES* (MNRE)	Total	
Assam	State	0.00	0.00	306.36	0.00	306.36	0.00	100.00	5.01	105.01	411.37
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	154.03	154.03	154.03
	Central	402.52	0.00	435.56	0.00	838.08	0.00	422.08	25.00	447.08	1285.16
	Sub-Total	**402.52**	**0.00**	**741.92**	**0.00**	**1144.44**	**0.00**	**522.08**	**184.04**	**706.12**	**1850.56**
Arunachal Pradesh	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	109.11	109.11	109.11
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.52	35.52	35.52
	Central	37.05	0.00	46.82	0.00	83.87	0.00	544.55	0.00	544.55	628.42
	Sub-Total	**37.05**	**0.00**	**46.82**	**0.00**	**83.87**	**0.00**	**544.55**	**144.63**	**689.18**	**773.05**
Meghalaya	State	0.00	0.00	0.00	0.00	0.00	0.00	322.00	32.53	354.53	354.53
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.95	17.95	17.95
	Central	0.00	0.00	109.69	0.00	109.69	0.00	95.38	0.00	95.38	205.07
	Sub-Total	**0.00**	**0.00**	**109.69**	**0.00**	**109.69**	**0.00**	**417.38**	**50.48**	**467.86**	**577.55**
Tripura	State	0.00	0.00	105.00	0.00	105.00	0.00	0.00	16.01	16.01	121.01
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.67	11.67	11.67
	Central	0.00	0.00	381.94	0.00	381.94	0.00	68.49	5.00	73.49	455.43
	Sub-Total	**0.00**	**0.00**	**486.94**	**0.00**	**486.94**	**0.00**	**68.49**	**32.68**	**101.17**	**588.11**
Manipur	State	0.00	0.00	0.00	36.00	36.00	0.00	0.00	5.45	5.45	41.45
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.28	12.28	12.28
	Central	15.68	0.00	81.58	0.00	97.26	0.00	87.24	0.00	87.24	184.50
	Sub-Total	**15.68**	**0.00**	**81.58**	**36.00**	**133.26**	**0.00**	**87.24**	**17.73**	**104.97**	**238.23**
Nagaland	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.67	31.67	31.67
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	3.04	3.04
	Central	32.10	0.00	73.93	0.00	106.03	0.00	66.33	0.00	66.33	172.36
	Sub-Total	**32.10**	**0.00**	**73.93**	**0.00**	**106.03**	**0.00**	**66.33**	**34.71**	**101.04**	**207.07**
Mizoram	State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.47	41.47	41.47
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.02	8.02	8.02
	Central	10.35	0.00	60.46	0.00	70.81	0.00	97.94	0.00	97.94	168.75
	Sub-Total	**10.35**	**0.00**	**60.46**	**0.00**	**70.81**	**0.00**	**97.94**	**49.49**	**147.43**	**218.24**
Central - Unallocated		112.50	0.00	63.62	0.00	176.12	0.00	140.00	0.00	140.00	316.12
Total (North-Eastern Region)	State	0.00	0.00	411.36	36.00	447.36	0.00	422.00	241.25	663.25	1110.60
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	242.51	242.51	242.51
	Central	610.20	0.00	1253.60	0.00	1863.80	0.00	1522.01	30.00	1552.01	3415.81
	Grand Total	**610.20**	**0.00**	**1664.96**	**36.00**	**2311.16**	**0.00**	**1944.01**	**513.76**	**2457.77**	**4768.92**

INSTALLED CAPACITY (IN MW) OF POWER UTILITIES IN THE STATES/UTS LOCATED IN ISLANDS

INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES

(As on 31.12.2022)

State	Ownership / Sector	Mode wise breakup									Grand Total
		Thermal					Nuclear	Renewable			
		Coal	Lignite	Gas	Diesel	Total		Hydro	RES* (MNRE)	Total	
Andaman & Nicobar	State	0.00	0.00	0.00	57.52	57.52	0.00	0.00	5.25	5.25	62.77
	Private	0.00	0.00	0.00	35.19	35.19	0.00	0.00	24.81	24.81	60.00
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.10	5.10	5.10
	Sub-Total	**0.00**	**0.00**	**0.00**	**92.71**	**92.71**	**0.00**	**0.00**	**35.16**	**35.16**	**127.87**
Lakshadweep	State	0.00	0.00	0.00	26.83	26.83	0.00	0.00	0.00	0.00	26.83
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.27	3.27	3.27
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sub-Total	**0.00**	**0.00**	**0.00**	**26.83**	**26.83**	**0.00**	**0.00**	**3.27**	**3.27**	**30.10**
Total (Islands)	State	0.00	0.00	0.00	84.35	84.35	0.00	0.00	5.25	5.25	89.60
	Private	0.00	0.00	0.00	35.19	35.19	0.00	0.00	28.08	28.08	63.27
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.10	5.10	5.10
	Grand Total	**0.00**	**0.00**	**0.00**	**119.54**	**119.54**	**0.00**	**0.00**	**38.43**	**38.43**	**157.97**

CHAPTER 36

OFFICE OF THE CHIEF CONTROLLER OF ACCOUNTS

The Secretary (Power) is the Chief Accounting Authority of the Ministry. The office of chief Controller of Accounts functions under overall supervision of Additional Secretary & Finance Adviser. The office is headed by the Chief Controller of accounts with one Controller of accounts and seven Pay & account Officers responsible for making all the payments, expenditure control & banking arrangements, Internal Audit and accounting of all the receipts/payments. Out of these one pay and Accounts office is stationed in Bengaluru. The Principal Accounts Office is responsible for consolidation of monthly Accounts of all the Pay & Accounts Offices and submission of monthly accounts of the Ministry to Controller General of Accounts (CGA), Department of Expenditure, Ministry of Finance, preparation of Appropriation Accounts, Statement of Central Transactions (SCT) and Finance accounts on annual basis for submission to the CGA. It is also responsible for the compilation of various data and generation of reports for submission to Ministry of Power, Ministry of Finance, and CGA etc.

The Office of Chief Controller of Accounts also bring out an annual accounting booklet called Accounts at a Glance which contains details of total transactions (receipts, Expenditure, Investments and Loans) of the Ministry and its various organization. It gives a brief overview of accounting trends. The office is also responsible for preparing the Receipt Budget of the Ministry.

Internal Audit Wing

The Internal Audit Wing facilitates the executive for adoption of sound procedure, rule and regularities and financial propriety of transactions of accounts. This Wing advises DDOs and Grantee Institutions for correct implementation of rules and maintenance of records. The Internal Audit Wing also conducts audit of DeenDayal Upadhyay Gram Jyoti Yojna(DDUGJY), Integrated Power Development Scheme (IPDS), Power System Development Fund (PSDF) and Transmission Line Scheme of J&K, A.P and Sikkim.

Performance of the Internal Audit Wing, during the year 202-23 is as under:-

No. of Units		No. of Paras Raised	No. of Paras Settled	Total No. of Paras Outstanding
Audit Target	Audit Done			
32	20	22	52	653

AUDIT OBSERVATIONS

The Organization-wise Break-up of outstanding Audit Observation & Inspection Reports issued up-to 31/12/2022 is as under:-

Sl.No	Name of organization/Office	No. of Inspection Reports Issued	No. of Paras Outstanding (Including old Paras)
01	Ministry of Power	02	74
02	Central Electrical Authority	16	173
03	Appellate Tribunal for Electricity	01	11
04	Grantee Institutions	09	162
05	Special Audits	13	120
06	RGGVY/DDUGJY Scheme	29	26
07	R-APDRP Scheme	30	30
08	Pay & Accounts Officers	06	47
09	PSDF Scheme	07	07
10	Transmission Line	03	03
	Total	**116**	**653**

STATUS OF OUTSTANDING PARA AS ON 31st Dec, 2022						
Sl.No	Office	Opening Balance as on 1.4.2021	Para Added	Total	Para Settled	Closing Balance as on 31.12.22
	Ministry of Power					
1	MoP USGAD	55	0	55	0	55
2	MoP (FTE/OE)	19	0	19	0	19
	Total of MoP	**74**	**0**	**74**	**0**	**74**

Central Electricity Authority						
1	CEA (HQ)	55	8	63	0	63
2	RPSO, MUMBAI	6	10	16	4	12
3	RPSO, DELHI	5	0	0	0	5
4	RPSO, KOLKATA	3	0	3	0	3
5	RPSO, BANGALORE	8	0	8	0	8
6	RIO, MUMBAI	1	0	1	1	0
7	RIO, N.DELHI	6	0	6	0	6
8	RIO, KOLKATA	7	0	7	0	7
9	RIO, CHENNAI	7	0	7	0	7
10	RIO, SHILONG	3	0	3	0	3
11	NRPC, N.DELHI	18	0	18	7	11
12	WRPC, MUMBAI	8	0	8	0	8
13	SRPC, BANGALORE	9	0	9	7	2
14	ERPC, KOLKATA	20	0	20	0	20
15	NERPC, SHILONG	6	0	6	4	2
16	DEPTT. of CANTEEN	22	0	22	0	22
	Total of CEA	**178**	**18**	**196**	**23**	**173**
Appellate Tribunals For Electricity						
1	ATE (APTEL)	11	0	11	0	11
	GRANTEE INSTITUTIONS					
1	BBMB, NANGAL	4	0	4	0	4
2	JERC, GURGAON	4	0	4	1	3
3	NPTI, FARIDABAD	45	0	45	18	27
4	CPRI, BANGALORE	20	0	20	0	20
5	FOR, DELHI	15	0	15	0	15
6	BEE, N.DELHI	30	0	30	0	30
7	CERC, N.DELHI	37	0	37	0	37
8	CPRI, UHVRL Hyderabad	13	1	14	0	13
9	CPRI Bhopal	12	0	12	0	12
	Total of Grantee	180	1	181	19	162
SPECIAL AUDITS						
1	REC (AG& SP) &RGGVY	5	0	5	0	5
2	BEE (BLY)	1	0	1	0	1
3	BEE (NMEEE)	11	0	11	0	11
4	BBMB (CHANDIGARH)	10	0	10	0	10
5	THDC	5	0	5	0	5
6	NEEPCO SHILONG	10	0	10	0	10
7	PFC (HQ) New Delhi	14	6	20	0	20
8	LOHARINAG PALA	9	0	9	0	9
9	NHPC FARIDABAD	7	0	7	0	7

10	BTPS	1	0	1	0	1
11	NLDC	18	1	19	6	13
12	REC (HQ) New Delhi	22	0	22	0	22
13	NEF (REC) New Delhi	6	0	6	0	6
	Total of Special Audits	**119**	**7**	**126**	**6**	**120**

OFFICE OF CHIEF CONTROLLER OF ACCOUNTS						
Sl.No	**Office**	**Opening Balance**	**Added**	**Total**	**Dropped**	**Closing Balance**
1	Pr.AO ADMIN	12	0	12	0	12
2	Pr.AO A/c	8	0	8	0	8
3	PAO (Sectt.)	16	0	16	6	10
4	PAO (BMCC)	4	0	4	0	4
5	PAO (CEA), N.DELHI	7	0	7	0	7
6	PAO(CEA), BENGALURU	6	0	6	0	6
	Total of O/o CHIEF CONTROLLER OF ACCOUNTS	**53**	**0**	**53**	**6**	**47**

RGGVY/DDUGJY						
Sl.No	**Office**	**Opening Balance**	**Added**	**Total**	**Dropped**	**Closing Balance**
1	RGGVY/DDUGJY	24	0	24	0	24
2	REC Soubhagya (HQ)	2	0	2	0	2
	Total	**26**	**0**	**26**	**0**	**26**

RAPDRP SCHEME						
Sl.No	**Office**	**Opening Balance**	**Added**	**Total**	**Dropped**	**Closing Balance**
1	RAPDRP/IPDS	27	3	30	0	30
	Total	**27**	**3**	**30**	**0**	**30**

PSDF SCHEME						
Sl.No	**Office**	**Opening Balance**	**Added**	**Total**	**Dropped**	**Closing Balance**
1	PSDF	7	0	7	0	7
	Total	**7**	**0**	**7**	**0**	**7**

Transmission Line SCHEME						
Sl.No	**Office**	**Opening Balance**	**Added**	**Total**	**Dropped**	**Closing Balance**
1	Transmission Line (PGCIL- J&K, A.P and Sikkim)	3	0	3	0	3
	Total	**3**	**0**	**3**	**0**	**3**

Consolidated Report of Outstanding Paras (as on 31-12-2022)

Opening Balance as on 01.04.2022

Compliance and Special Audit	620
RGGVY/DDUGJY Scheme (Units)	24
R-APDRP	27
PSDF	7
Transmission Line	3
Total	**683**

Added between 01.04.2022 to 31.12.2022

Compliance and Special Audit	19
RGGVY/DDUGJY Scheme (Units)	0
R-APDRP	3
PSDF	0
Transmission Line	0
Total	**22**

Dropped between 01.04.2022 to 31.12.2022

Compliance and Special Audit	52
RGGVY/DDUGJY Scheme (Units)	0
R-APDRP	0
PSDF	0
Transmission Line	0
Total	**52**

Closing balance as on 31.12.2022

Compliance and Special Audit	587
RGGVY/DDUGJY Scheme (Units)	26
R-APDRP	30
PSDF	7
Transmission Line	3
Total	**653**

CHAPTER 37

AUDIT OBSERVATIONS

Report No. 14/2021

The Report no.14 of 2021 of Comptroller and Auditor General of India (C&AG) on Compliance Audit Observation includes important audit findings noticed as a result of test check of accounts and records of Central Government owned companies and corporations conducted by the officers of the C&AG under Section 143(6) of the Companies Act 2013 or the statutes governing various corporations.

Undue benefit to the contractor

NHPC did not levy penalty of ₹11.61 crore for generation of power lower than the minimum generation guaranteed in the contract agreement resulting in undue benefit to the contractor.

(Para 3.1)

Doubtful recovery of loan and interest

India Infrastrucutre Finance Company Limited, under consortium lending, disbursed a loan of ₹470 crore to Essar Power Gujarat Limited for construction of a thermal power project, without conducting due diligence. Despite commissioning, the project could not be run viably due tonon-supply of coal at the rates agreed upon under the Fuel Supply Agreement and the entire loan asset of India Infrastructure Finance Company Limited turned (April 2018) non- performing asset, for ₹400.49 crore. This has resulted in doubtful recovery of loan amount of ₹400.49crore and interest of ₹269.43 crore as on 31December 2020.

(Para No. 4.1)

Report No. 16/2021

Report No. 16 of 2021 of CAG of India on Union Government (Economic & Service Ministries-Civil) - Compliance Audit Observations includes important audit findings noticed as a result of test check of accounts and records of Economic & Service Ministries/ Departments and their Central Autonomous Bodies (CABs) conducted by the officers of the Comptroller and Auditor General of India under Section 13, Section 14, Section 17, Section 19(2), and Section 20(1) of the Comptroller and Auditor General's (Duties, Powers and Conditions of Service), Act 1971. This report is submitted to the President of India under Article 151 of the Constitution of India.

Power System Development Fund is a public fund and is being maintained in the Public Account under Ministry of Power. National Load Despatch Centre (NLDC), a unit of Power System Operation Corporation, has been designated as the Nodal Agency to carry out the secretariat function for Power System Development Fund. National Load Despatch Centre intimated (December 2018) to Ministry of Power for fund requirement of ₹5,505.61 crore for approved Power System Development funded projects/ schemes for 2018-19. National Load Despatch Centre further suggested (4 February 2019) that the funds may be raised in phased manner to avoid idling of the funds. Ministry of Power raised (March 2019) the funds through private placement but had not taken the cognisation of inputs of National Load Despatch Centre. This had resulted in avoidable raising and parking of idle fund of ₹1,018.12 crore at lower rates of interest resulting in loss to public exchequer by ₹11.17 crore.

(Para 7.1)

Report 33/2022

The Report no. 33 of 2022 of Comptroller and Auditor General of India (C&AG) on Compliance Audit Observation includes important audit findings noticed as a result of test check of accounts and records of Central Government owned companies and corporations conducted by the officers of the C&AG under Section 143(6) of the Companies Act 2013 or the statutes governing various corporations.

Loss due to non-compliance to statutory requirements

Damodar Valley Corporation (DVC) applied (December 2014) for extension of Mining Lease from 1 January 2016 to District Mining Office, Bokaro. The extension of Mining lease was not granted because DVC did not have valid mining plan. DVC awarded (September 2016) the work for deployment of heavy earth moving machineries for removal of overburden and transportation of coal from Bermo Mines to M/s BKB Transport Private Limited (contractor) at a cost of ₹14.11 crore. Office of the Deputy Commissioner cum Magistrate, Bokaro made online challans mandatory for dispatch of ores from 1 November 2016. These online challans could not be generated by DVC as it did not have approved mining plan. Hence, DVC had to stop mining work since august 2017 citing non-transportation of coal for want of online challans. The Corporation paid ₹7.78 crore to the contractor for overburden removal. Thus, awarding of a mining contract for Bermo Mines without having a valid mining lease resulted in loss of ₹7.78 crore towards cost of overburden removal along with loss of 59,850.10 metric tonnes of coal valuing ₹17.95 crore.

(Para 3.1)

Avoidable expenditure of ₹85.35 crore

Nabinagar Power Generating Company Private Limited and Power Grid Corporation of India Limited entered (18 March 2016) into an Implementation Agreement wherein the transmission line was to be commissioned by 30 April 2019. Company however requested (March 2016) Power Grid Corporation of India Limited to commission one transmission line matching with commissioning of the first unit by September 2017. Power Grid Corporation of India Limited completed the transmission line in May 2018 but Nabinagar Power Generating Company could not utilise the

line as Unit 1 was not commissioned by then. Consequently, being a generating Company it had to bear the transmission charges as per Implementation Agreement. Nabinagar Power Generating Company incurred avoidable expenditure of ₹85.35 crore on account of payment of idle transmission charges to Power Grid Corporation of India Limited due to its inability to assess the time required for completion of its power generating units and failure to complete the project in synchronisation with the transmission line.

(Para 3.2)

Loss of ₹13.09 crore by NHPC, Muzaffarpur

NHPC was selected as an executing agency and a tripartite agreement was entered into (31 August 2004) between National Hydroelectric Power Corporation Limited, Rural Development Department, Government of Bihar and Ministry of Rural Development, Government of India to construct/upgrade rural roads in Bihar under the PMGSY. NHPC received fee of ₹127.98 crore during 2008-09 to 2014-15 for the above work. However, Service Tax on the above fee was not deposited by the Company timely on the assumption that services rendered by them as an executing agency for construction and maintenance of road projects in Bihar was free from Service Tax. NHPC suffered loss on account of avoidable payment of interest and penalty of ₹13.09 crore for the period between 2008-09 and 2014-15 due to non-payment of Service Tax within the stipulated time.

(Para 3.3)

Infructuous expenditure on gas conversion

Conversion of Naphtha based Rajiv Gandhi Combined Cycle Power Project of NTPC-Kayamkulam to multi-fuel based Plant which can use Natural Gas or Regasified Liquefied Natural Gas or Naphtha as fuel, without ensuring availability of gas, resulted in infructuous expenditure of ₹17.27 crore.

(Para 3.4)

Report no. 9/2022

Kanti Bijlee Utpadan Nigam Limited

Para no. 1.4.3.1: Delay in completion of major packages

KBUNL awarded 34 packages of Stage II project since March 2010 of which major packages were main plant (including boiler), Coal Handling Plant, and Ash Handling Plant, Switch yard (for power transfer to grid), Railway siding and ash dyke. Audit noted that except the main plant package, none of the other packages were complete and Stage II units were being operated with support facility of Stage I units through contingency arrangement.

Para no.1.4.3.3: Loss of Rs. 121.99 crore due to disallowance of fixed charges by CERC

As per Section 62 of the Electricity Act 2003, CERC shall determine the tariff for electricity generated from a station comprising of capacity charge and energy charge. CERC issues Tariff Regulations for five year period based on which each generating station files tariff petition before CERC demanding year-wise tariff for five years, as per its prevailing/ projected parameters. CERC approved tariff of Stage II units in April 2019 for the period 2017 to 2019.

Para no. 1.4.4.1: Non-realization of 203.81 crore from Grid Corporation of Odisha

Grid Corporation of Odisha Limited, Orissa entered into a power purchase agreement (PPA) with KBUNL (December 2010) for 30 MW of power generated from Stage II units. Grid Corporation of Odisha which is State designated entity requires consent from Odisha Electricity Regulatory Commission (OERC) to procure power under the said PPA.

Audit noted that Grid Corporation of Odisha had never requisitioned for power from KBUNL since commissioning of the Stage II units in 2017.

Para no. 1.4.5.2 : Poor utilization of ash in KBUNL

KBUNL had installed electrostatic precipitator to control emission of fly ash particles generated in the power plant. The fly ash collected was disposed in wet form to ash pond situated outside the plant area. Ministry of Environment, Forest and Climate Change issued notification (September 1999 and revised in November 2009) for utilization of fly ash generated by thermal power plants. Accordingly, KBUNL was required to utilize 100 per cent of fly ash generated since November 2009. Audit noted that the Management was not able to fully utilize the ash generated during 2015-20 (utilization of fly ash ranged between5.25 per cent in 2015-16 and 75.68 per cent in 2019-20).

Damodar Valley Corporation:

Para no. 2.3.3: Avoiding delay in achievement of milestones in development of coal blocks

The DVC was allotted coal block of Khagra-Joydev in March 2015 for its Mejia Thermal Power Station Units 7 and 8. As per the milestones stipulated by Government of India for development of captive coal blocks, the DVC was required to get the approval of Mine Closure Plan and opening Escrow Account in respect of Khagra-Joydev within six months from the date of allotment. Audit observed that instead of preparing a fresh Mine Closure Plan for Khagra-Joydev, the DVC pursued (2015) with Government of India to accept the earlier Mine Closure Plan submitted in the name of DVC-EMTA which was a joint venture company of the DVC with a private party.

Para no. 2.3.5.3 : Deficiency in supervision by DVC

Engine detention charges are levied by Railways in the event of retention of engines beyond the allowed free hours. At Bokaro Thermal Power Station, the job of supervision of loading of coal of required quality and size was done by the DVC. In this regard Audit noted that, during the period 2014-15 to 2019-20, there was deficiency in supervision of loading of coal by DVC and consequently it paid ₹15.14 crore as Engine Detention Charges.

PGCI Limited:

Para no. 3.6.1.1 : Delay in planning of transmission line resulted in generation loss of 1,602.64 MUs

As per notification of CERC dated 26March 2001, in case of reduced generation due to the reasons beyond the control of Generating Company or on account of non-availability of board's transmission lines resulting in spillage of water, the energy charges on account of such spillage shall be payable to the Generating Company. Apportionment of energy charges for such spillage among the beneficiaries shall be in proportion to their shares in saleable capacity of the station.

Para no. 3.6.1.2 : Planning of Transmission System without considering prospective load

The total length of 375 kms.(approx.) of Srinagar Leh Transmission System with underground cable portion of 8.3 kms. Route length was first proposed (2004) by Snow & Avalanche Study Establishment, DRDO due to avalanche prone section. In the revised DPR (2011) prepared by PGCIL, total length of transmission line was revised to 352.3 kms with same underground cable portion of 8.3 kms.

Para no. 3.6.1.3 : Mismatch in the commissioning of Srinagar Leh transmission system with downstream network

For effective utilisation of the Srinagar Leh transmission system and to meet the load of Ladakh region, there was need for a well-integrated interconnection system between 220 kV transmission line and 66 kV transmission systems in the Region. Therefore, the interconnection system was also planned to connect all four substations of PGCIL with 66/11 kV Substations at Drass, Kargil, Khaltsi and Leh.

Para no. 3.6.2.4 : Delay in completion of bay at Alusteng Substation and consequent non-connection with the Transmission Line

The construction of 220 kV line bay at the Grid Station, Alusteng (along with 320 MVA, 220/132 kV and 100 MVA 132/33 kV Grid Substation Alusteng, Srinagar) was allotted to M/s Jyoti Structures Limited, Mumbai at allotted cost of ₹78.50 crore on turnkey basis in May 2008 and the time of completion of the project was 18 months from the date of issuance of Letter of Intent. The project cost was revised to ₹109.83 crore (₹5.54 crore departmental civil works and ₹104.29 crore on turnkey basis) in the year 2012.

EESL ENERGY EFFICIENCY SERVICES LIMITED
A JV of PSUs under the Ministry of Power

GOVERNMENT OF INDIA
MINISTRY OF POWER

CONVERGENCE Convergence Energy Services Limited
A wholly owned subsidiary of EESL

#10SAAL BEMISAAL

National Electric Mobility Dashboard

1820 EV
Deployed/Under Deployment

5.88 M Litres
Savings in fuel consumption

Low Operating Cost

15,751.65 t CO_2
Reduction in Carbon dioxide emissions

2,204.06 kg
Reduction in particulate matter emission

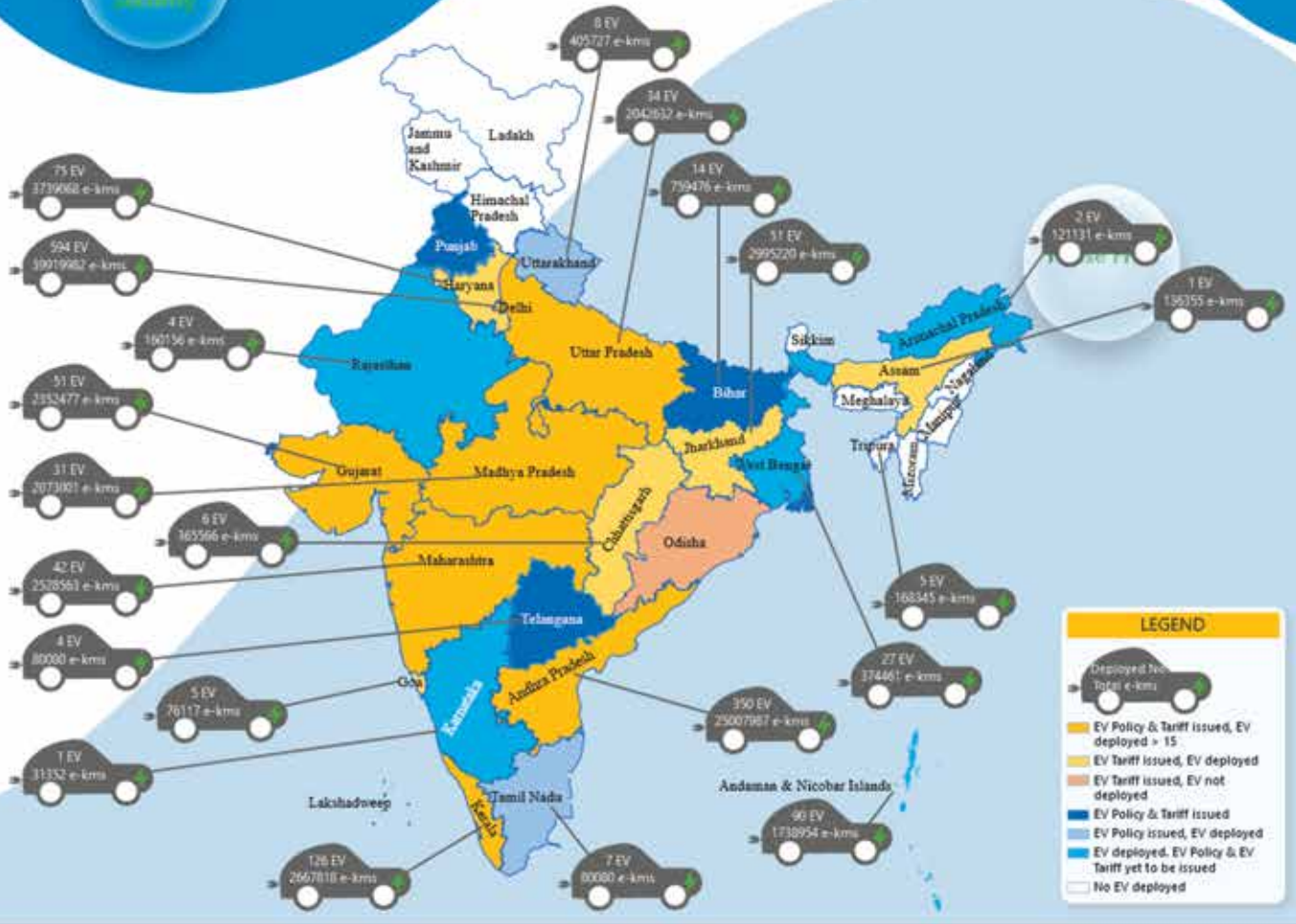
499.59 M INR
Monetary saving on fuel

Total e-Kilometer Covered

88162230

Landmark Milestone of completing 8.5 Cr Green km achieved on 08-Dec-2022.

Enhancing Energy Security



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Ministry of Power

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