

ENERGY SECURITY IN INDIA:  
DEMAND AND SUPPLY OF COAL  
& ITS PERSPECTIVE



# ENERGY SECURITY

## Definition

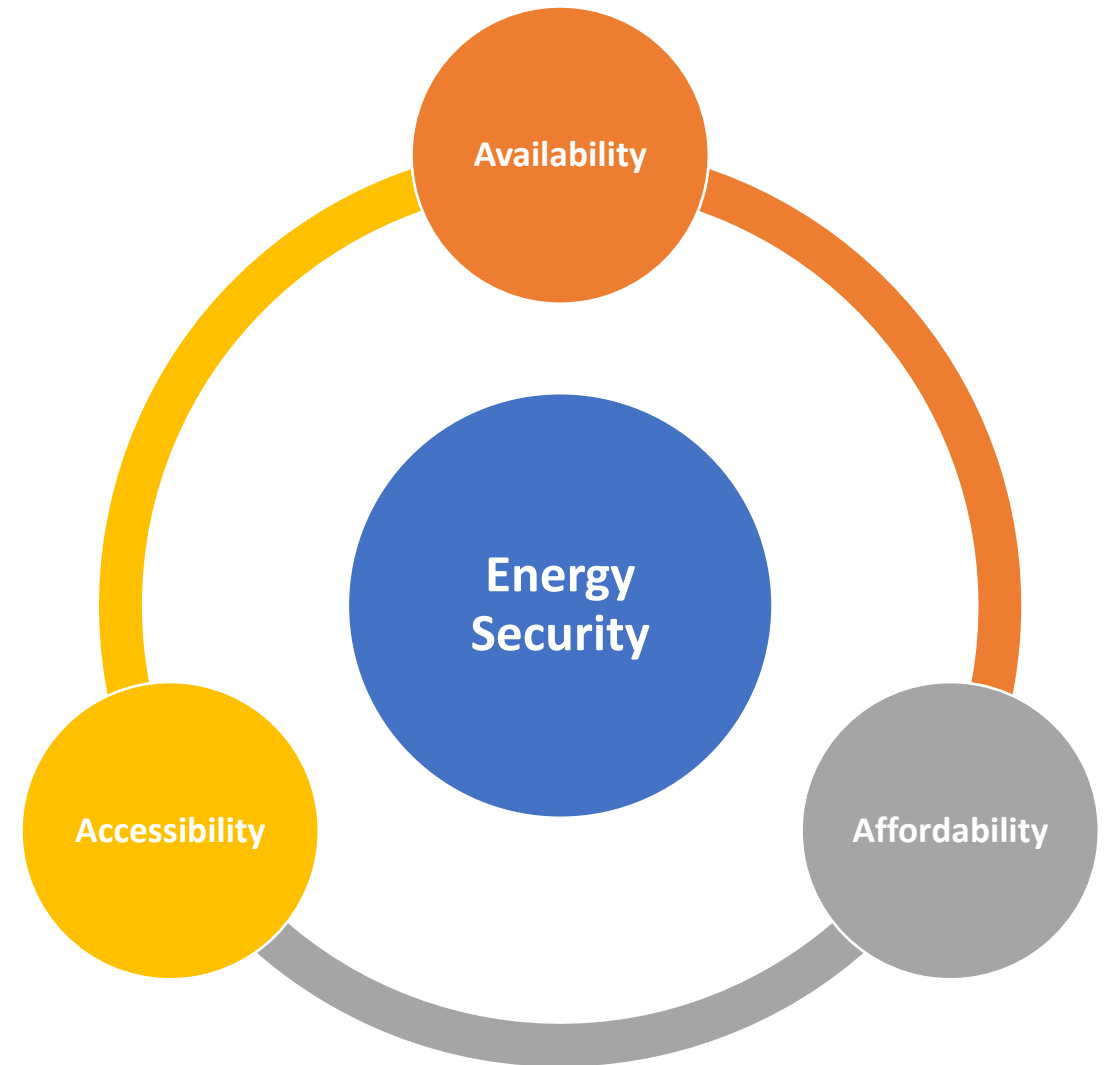
### Energy Security is;

- ❑ Unrestricted access to diverse and plentiful energy sources,
- ❑ Free from dependence on a narrow range of options or specific geographic areas,
- ❑ With a supply resilient enough to endure external disruptions and a degree of energy self-sufficiency.

## Energy Security in India

- ❑ Union Budget 2024-25 supports this transition, **allocating Rs. 19,100 crores** to the Ministry of New and Renewable Energy.
- ❑ **2030: Meet 50% of its electricity needs from renewable sources** and install 500 gigawatts of renewable energy capacity.
- ❑ **2047:** Become energy self-sufficient by eliminating reliance on energy imports.
- ❑ **2070:** Reach net-zero emissions.

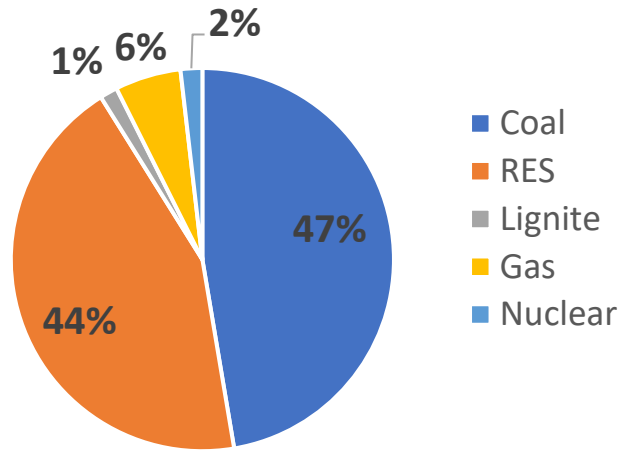
Source: <https://mospi.gov.in/>



# INDIAN ENERGY MIX

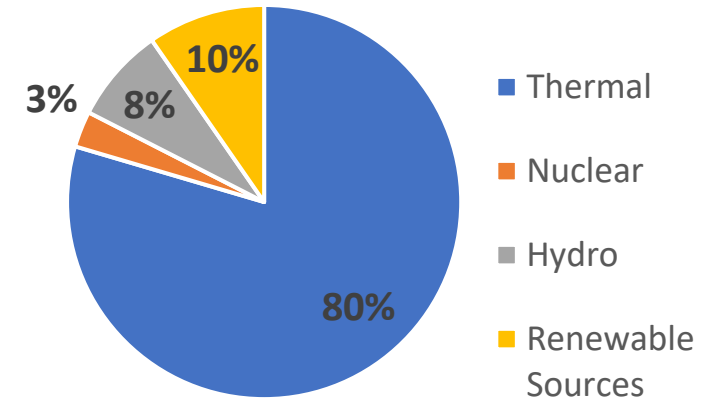
## Installed Capacity and Power Generation

Installed Capacity (as on June 30, 2024)



- ❑ The **total installed capacity** of power generation is **~446 GW**
- ❑ The **installed capacity for coal-based power** generation is **~211 GW** which is **around 47.30%** of the total capacity
- ❑ The **installed capacity of renewable** is **~195 GW** which is **43.70%** of total capacity

Power Generation from July 1, 2023, to June 30, 2024



- ❑ The total power generation is **1717.47 BU**.
- ❑ Power generation from **Thermal sources** was **1366.39 BU** which is around **80% of the total generation**.
- ❑ The total power generation through **Renewable sources** was **165.89 BU** which is around **10% of the total generation**.

# IMPORTANCE OF COAL IN INDIAN ENERGY MIX

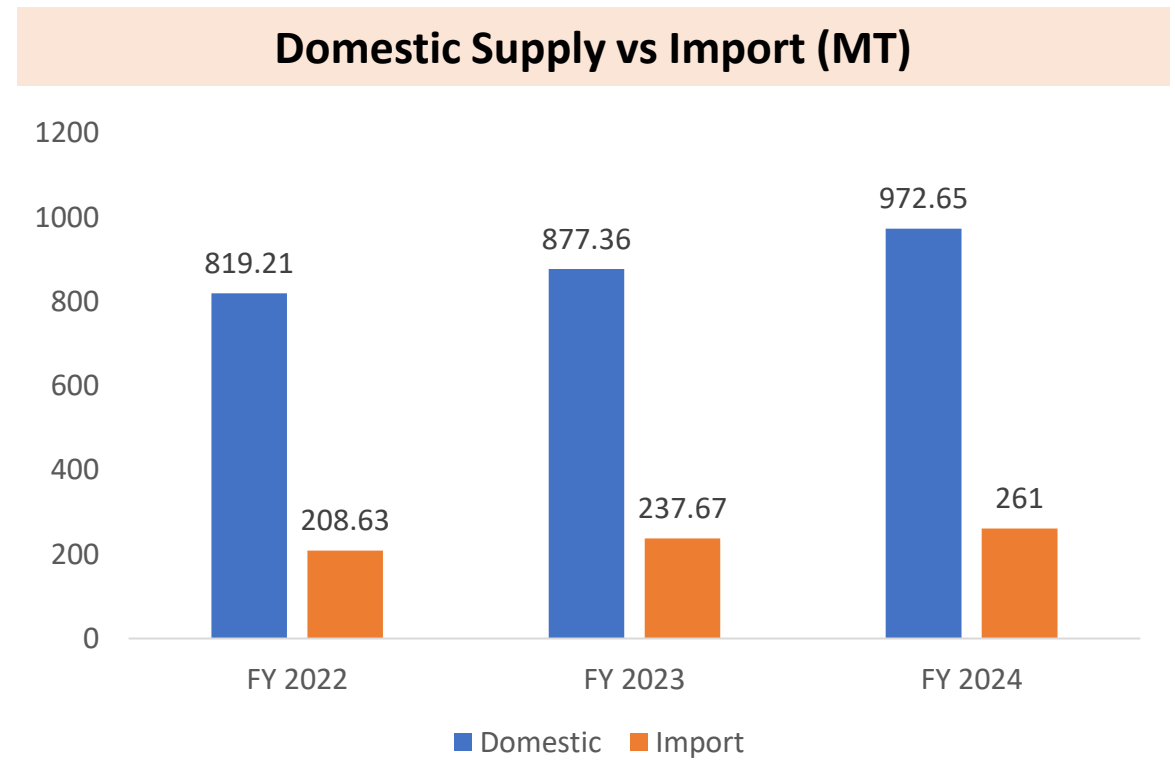
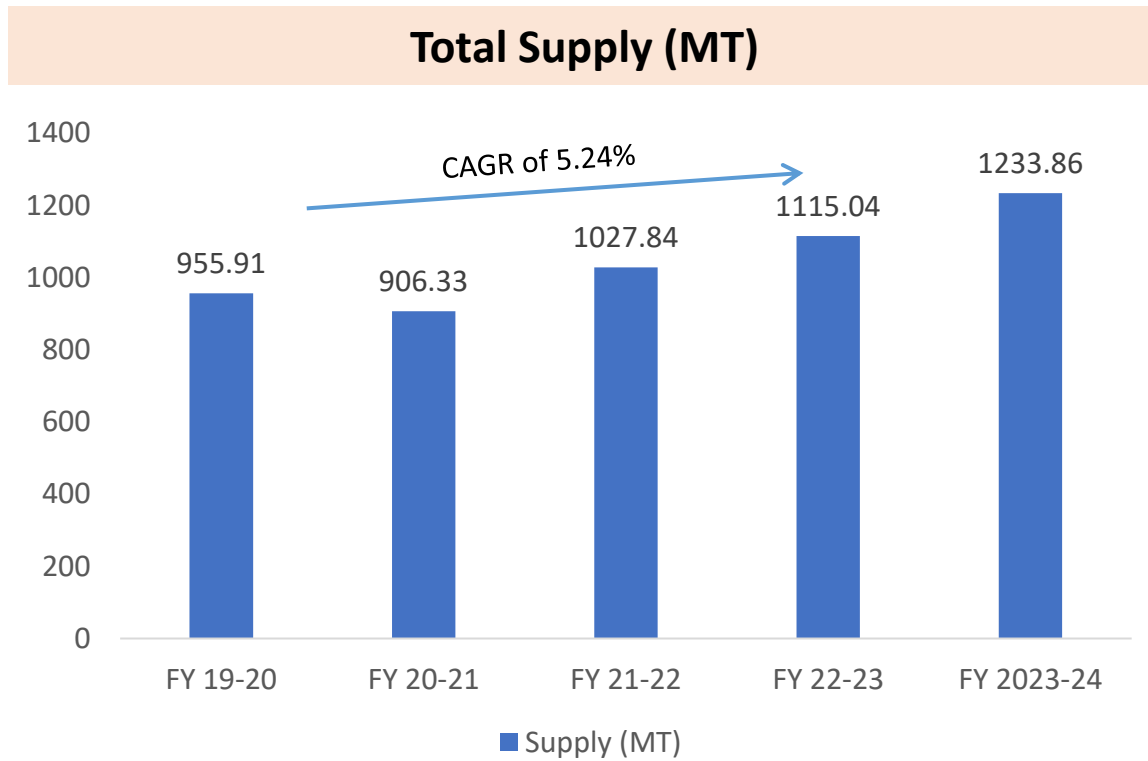
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- Thermal power, primarily coal-fuelled, has consistently accounted for **~80% of India's total power generation.**
- Despite growth in renewable energy, thermal power will still account for 47% of power generation by 2030 and 27% by 2047, with Coal **demand projected to reach 1443 MT by 2030 and 1861 MT by 2047.**

The coal sector also remains integral to India's growth, contributing to economic prosperity, employment, and social well-being.

- Coal is the **largest contributor to railway freight**, making up nearly 49% of total freight income, contributing Rs. 82,275 Crore in FY23.
- The sector **contributes over Rs. 70,000 Crore annually to government** revenues through royalties, GST, and other levies.
- The sector **sustains livelihoods for thousands of families** by providing significant employment, with over 2,40,000 employees in Coal India Ltd. and its subsidiaries alone, plus over 65,000 contractual workers.

# CURRENT SCENARIO OF COAL SUPPLY



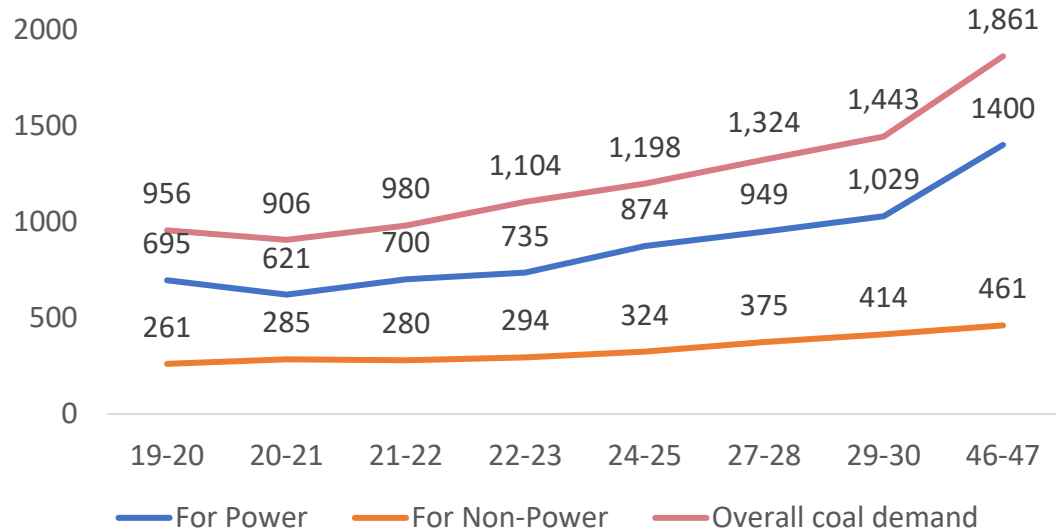
❑ The projected demand for FY 2023-24 was around 1196 MT whereas the actual supply was 1233.86 MT

❑ The contribution of imports to the total supply of coal was only 21% in FY 2024

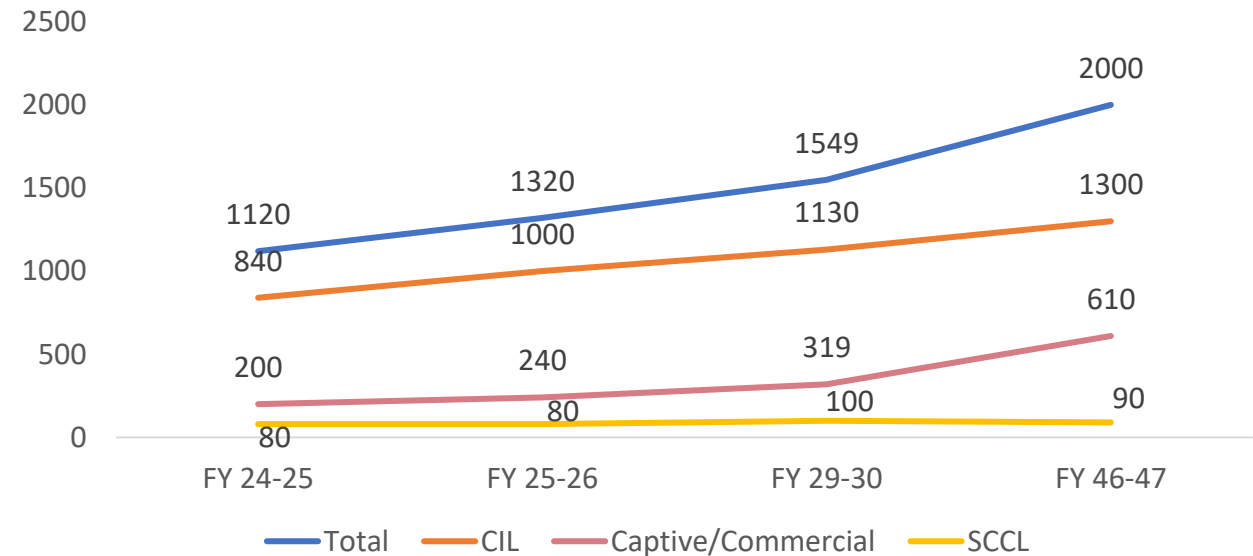
❑ The **domestic supply of coal grew by around 11%** from FY 2023 to FY 2024 whereas **imports grew by around 10%** only during the same period.

# FUTURE COAL REQUIREMENT

## Overall Projected Coal Demand (MT)



## Overall Projected Coal Production Capacity (MT)

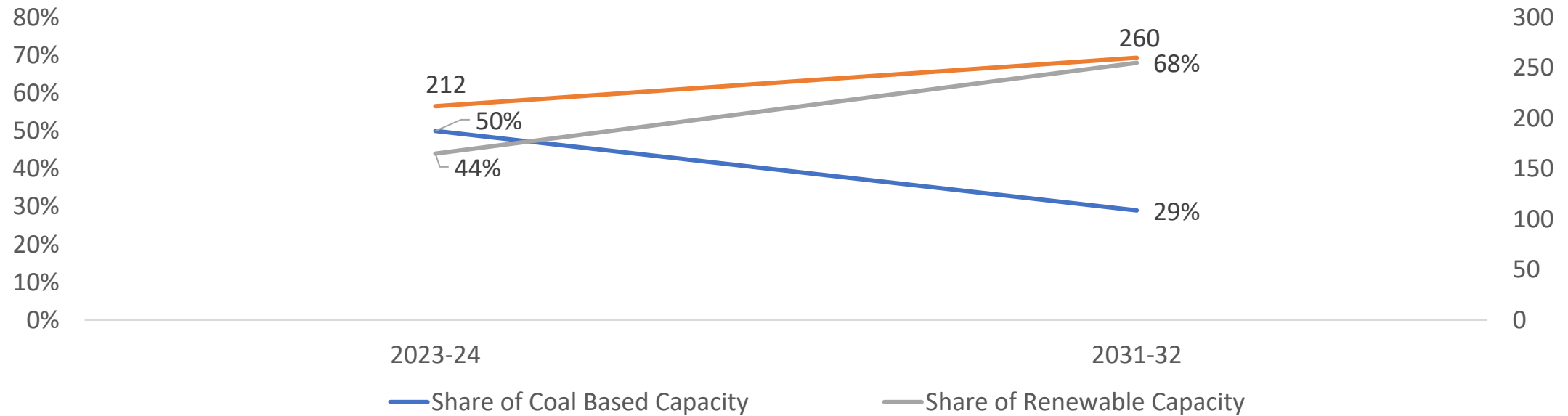


- ❑ India's coal consumption crossed the 1 BT mark in 2022-23 & anticipated to reach 1.8 BT by 2047
- ❑ **Coal consumption will continue to rise in the short term** with a CAGR of 2-4%

- ❑ Coal production reached 997 MT production in 2023-24 with growth of 11.65% from last year
- ❑ Coal production has shown an impressive CAGR of 5.36% from FY19 (729 MT) to FY24 (997 MT)
- ❑ Ministry of Coal is targeting an increased coal production capacity of up to 2 BT by 2047

# POWER DEMAND IN INDIA TILL FY2030

## Reduced share of coal-based capacity in total installed capacity



- ❑ The installed capacity of coal-based power generation in actual terms is expected to increase to around 260 GW by 2031-32
- ❑ The installed **capacity of renewables** in actual terms is **expected to increase to around 596 GW** by 2031-32 from around 195 GW in 2024
- ❑ This indicates that **the share of renewables is expected to increase at a CAGR of 15% whereas the capacity of coal-based power plants is expected to increase at a CAGR of 3%.**
- ❑ Further, in terms of % share in energy mix, coal-based is expected to decrease from around 50% in 2024 to 29% in 2031-32.

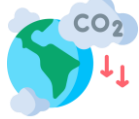


# INDIA'S GLOBAL COMMITMENT IN ENERGY SECURITY

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India's Nationally Determined Contributions (NDCs) for 2030 include:

1



**Emissions Intensity:** Reducing the emissions intensity of its GDP by 45% from 2005 levels

2



**Non-Fossil Fuel Energy:** Increasing the cumulative electric power installed capacity from non-fossil fuel-based energy resources to 50%

3



**Net-Zero Emissions:** Taking a step towards reaching net-zero emissions by 2070

4



**Transition to Cleaner Energy:** Transitioning to cleaner energy from 2021–2030; with the Initiatives of the implementing Tax concessions and incentives such as Production Linked Incentive scheme for promotion of manufacturing and adoption of renewable energy.



# INDIA'S ENERGY TRANSITION THROUGH CARBON CAPTURE

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India has been consistently diversifying its resources through increased adoption of renewables/ clean fuels through mandates such as **ethanol blending and Compressed Bio-Gas (CBG) blending**.



**Carbon capture, utilization, and storage (CCUS)** - Government is planning to launch a CCUS policy by the end of 2024. The country has seven CCUS pilots running with indigenous technology, including one from power generator NTPC at its Vindhyachal plant in Madhya Pradesh.



**National Green Hydrogen Mission 2023-** The Mission will identify and develop regions capable of supporting large scale production and/or utilization of Hydrogen as Green Hydrogen Hubs.



**National Mission on Transformative Mobility & Battery Storage** - The missions shall help India to improve its air quality along with reducing India's oil import dependence and enhance the uptake of renewable energy and storage solutions. Through strategies for transformative mobility and Phased Manufacturing Programmes for EVs, EV Components and Batteries



**Production Linked Incentive (PLI)** schemes aim to strengthen domestic manufacturing capacities in high-efficiency solar cells and modules and advance chemistry cell manufacturing.

# ENERGY TRANSITION INITIATIVES BY MINISTRY OF COAL (1/3)

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## **Coal Gasification**

Cabinet approved Financial Assistance Scheme of Rs. 8,500 Crore to Coal/Lignite Gasification Projects for PSUs/ Private Sector on 24.01.2024.

Ministry of Coal published RFP's on 15.05.24.

Potential Bidders include CIL, BHEL, GAIL SAIL, NLCIL, BPCL, GMDC, JSPL, Thermax, Essar Power etc.



## **CCUS Initiatives**

**CO2 Initiatives:** NTPC has setup first 20 tpd CO2 Capture Plant at Vindhyachal. The Captured CO<sub>2</sub> is regenerated for reuse.

**CO2 utilization initiatives:** 10 tpd CO2 to Green Methanol Plant at NTPC Vindhyachal, 10 tpd CO2 to Generation 4 Ethanol Plant at NTPC's Fossil Fired Power Plant, and Development of CO2 Based Carbonated Aggregates by NTPC

# ENERGY TRANSITION INITIATIVES BY MINISTRY OF COAL (2/3)

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## **Renewables – Solar and Wind Power**

The coal sector aims to achieve a total renewable energy capacity of approximately 9000 MW by 2030

Combined solar capacity installed by CIL, NLCIL, and SCCL is about 1700MW, with an additional 51 MW from windmills



## **Renewables - Green hydrogen & ammonia**

The Ministry of Coal has joined hands with Ministry of New and Renewable Energy to take up projects on Green Ammonia/Hydrogen

CIL has identified surplus land parcels for feasibility study

# ENERGY TRANSITION INITIATIVES BY MINISTRY OF COAL (3/3)

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## **Renewables – Pumped Storage Power**

Initiating Pump Storage Projects (PSP) in de-coaled coal mines to diversify energy sources

Aims to utilize solar energy for hydroelectricity

CIL has identified 24 abandoned mines and other sites for the same



## **Pithead TPPs**

Setting up power plants at pithead is more cost-effective with efficient Super Critical technology and reduced burden for coal logistics

Coal India Ltd (CIL) to establish two pit-head thermal power plants with planned capacity of 1X660 MW and 2X800MW

NLCIL has formulated plans to construct a 3X800 MW pit-head thermal power plant at Talabira in Odisha

# COAL MINISTRY'S SUSTAINABLE SHIFT

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The Ministry of Coal in India has launched initiatives for environmentally responsible mining, emphasizing mine closure, refilling, and afforestation

- ❑ **Structured guidelines for mine closures**, monitored by CMPDI's centralized portal, drive a shift towards environmentally conscious management.
- ❑ **Coal and lignite PSUs showcase environmental responsibility through land reclamation, overburden management, and extensive afforestation** to reduce mining's impact.
- ❑ **Progressive and final mine closures**, featuring **three-tier biological reclamation**, seed ball plantation, and drone seeding, are rigorously implemented and monitored via remote sensing technology.



Green cover on reclaimed OB dump of JVR OC-II of SCCL



Plantation on Over Burden (OB) of Jamuna OC

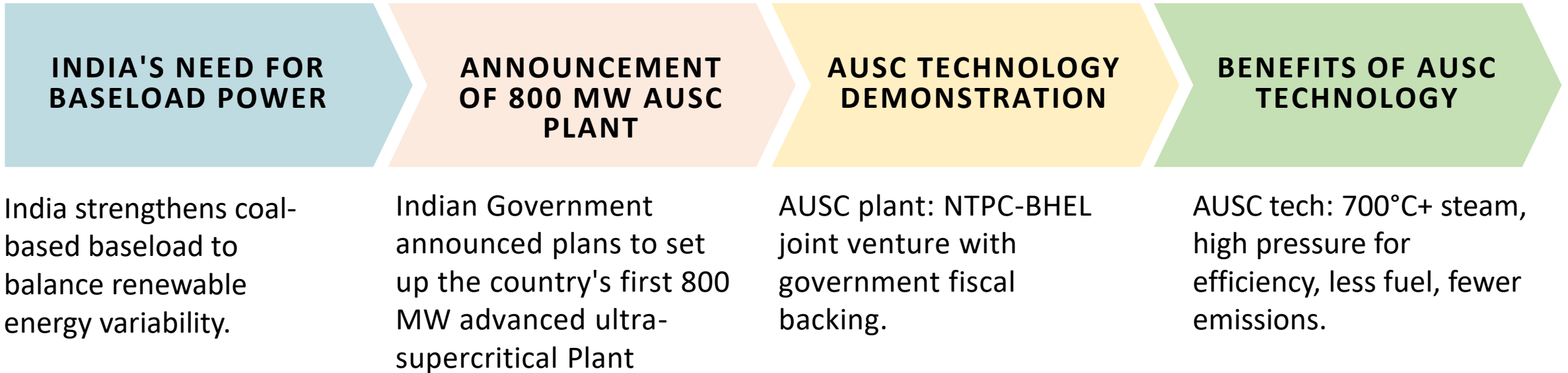


# INDIA'S OTHER KEY INITIATIVES (1/5)

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## 1. AUSC TECHNOLOGY

AUSC technology operates at steam temperatures exceeding 700°C and pressures that reach unprecedented levels, enabling power plants to achieve thermodynamic efficiencies far beyond what was previously possible.



# INDIA'S OTHER KEY INITIATIVES (2/5)

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## 2. SMALL MODULAR REACTOR (SMR)

Smaller, modular nuclear plants with enhanced safety vs. traditional reactors.



### Role in Energy Transition

Carbon-free, reliable complement to renewables for stable, sustainable energy mix.



### Advantages of SMRs

Portable, lower-cost, suitable for remote areas and diverse energy needs.



### Enhanced Safety Features

SMRs incorporate passive safety and inherent features, minimizing meltdown risks and enhancing nuclear power safety.



### Potential Applications

SMRs offer versatility: power generation, heating, desalination, and industrial use, boosting energy security.



## INDIA'S OTHER KEY INITIATIVES (3/5)

### 3. LIFESTYLE FOR ENVIRONMENT (LiFE)

The Government of India launched the **Green Credit Program (GCP)** and **Ecomark Scheme** under the 'LiFE' movement to promote sustainable living and eco-friendly choices..

- 1. Green Credit Program - Launched in 2023** as part of the 100-day package, the Green Credit Program (GCP) promotes eco-friendly actions by businesses, such as **tree plantations, water management, and waste management**. It focuses on restoring degraded forest lands identified by state forest departments. Central and state PSUs can fund these activities through CSR or environmental commitments, earning green credits upon completion. **CIL has identified 100 sites for this initiative.**
- 2. Ecomark Scheme** is labelling of products which will have lesser adverse impacts on the environment, with the objective to encourage the consumers to adopt such products as well as the manufacturers for transitioning to production of Ecomark certified products for promoting sustainability.




# INDIA'S OTHER KEY INITIATIVES (4/5)

## 4. INDIAN CARBON MARKET



India ratified the Paris Agreement in 2016, committing to limit the global average temperature rise to below 2°C by the end of the century




As part of its first **Nationally Determined Contributions (NDCs)**, India pledged to reduce the greenhouse gas (GHG) emission intensity of its economy by 45% by 2030 from 2005 levels.



The country to meet its ambitious climate goals, a robust National Framework for Indian Carbon Market (ICM) through a reliable national carbon credit electronic platform is being developed.



The framework aims to compliment and support various entities **by pricing their additional actions towards Green House Gas (GHG) emission reduction**, who are **undertaking projects to decarbonize the Indian economy**.

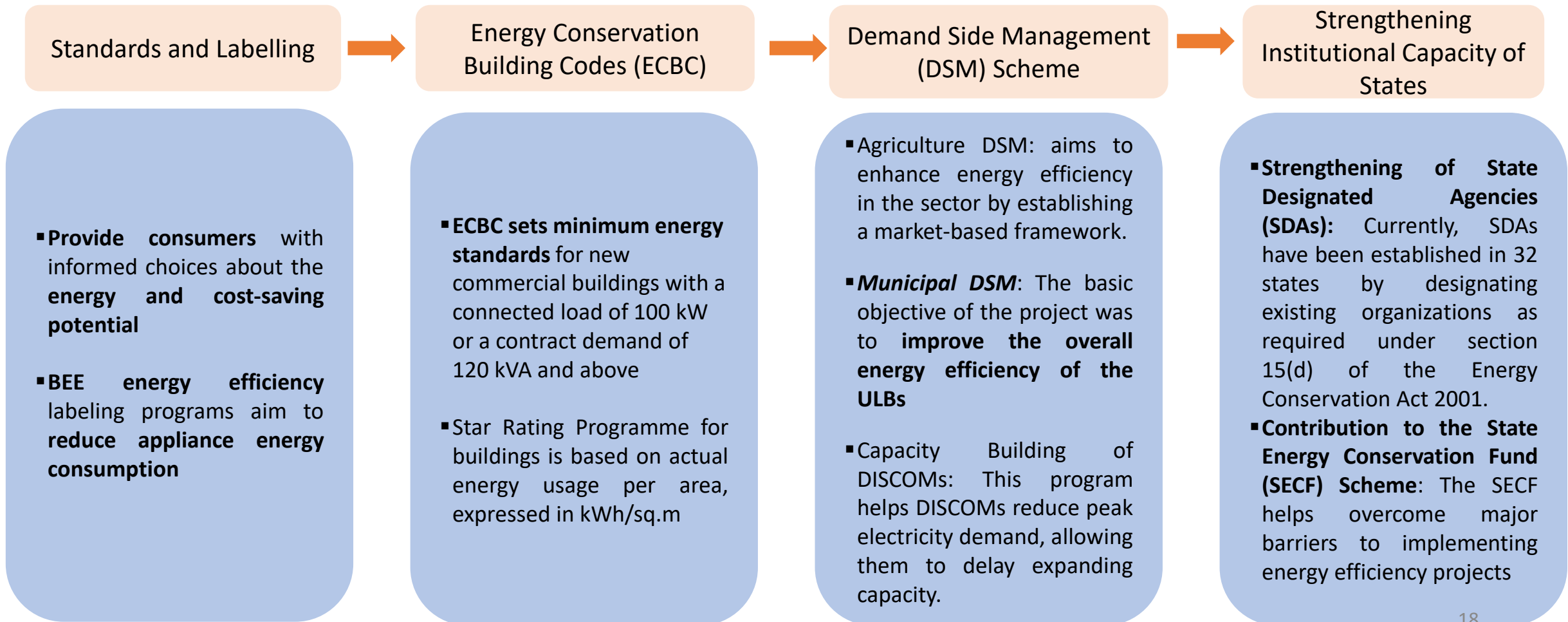


The **Indian Carbon Market Framework** has two key mechanism – **Compliance mechanism** which aims to address the emissions from its **energy use and industrial sectors** and **offset mechanism** to incentivize the voluntary actions from entities for GHG reduction, thus providing a comprehensive approach to decarbonization of the economy.

# INDIA'S OTHER KEY INITIATIVES (5/5)


## 5. ENERGY EFFICIENCY

Ministry of Power, through Bureau of Energy Efficiency (BEE), has initiated a number of energy efficiency initiatives.





## CONCLUSION


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 India's commitment to net zero emissions by 2070 and 50% renewable electricity by 2030 marks a significant milestone in global climate action.

 Despite rapid economic growth and rising CO2 emissions, India's per capita emissions remain low, especially considering historical emissions.

 India is already making substantial progress in its clean energy transition, exceeding its Paris Summit commitments and rapidly expanding renewable energy capacity.

 The country faces near-term challenges, including energy affordability, security risks, and air pollution, but **has policies in place to address these issues.**

 India's climate ambitions are transformational not only for the country but for the entire planet, given its size and potential for growth in a low-carbon manner.

**THANK YOU!**