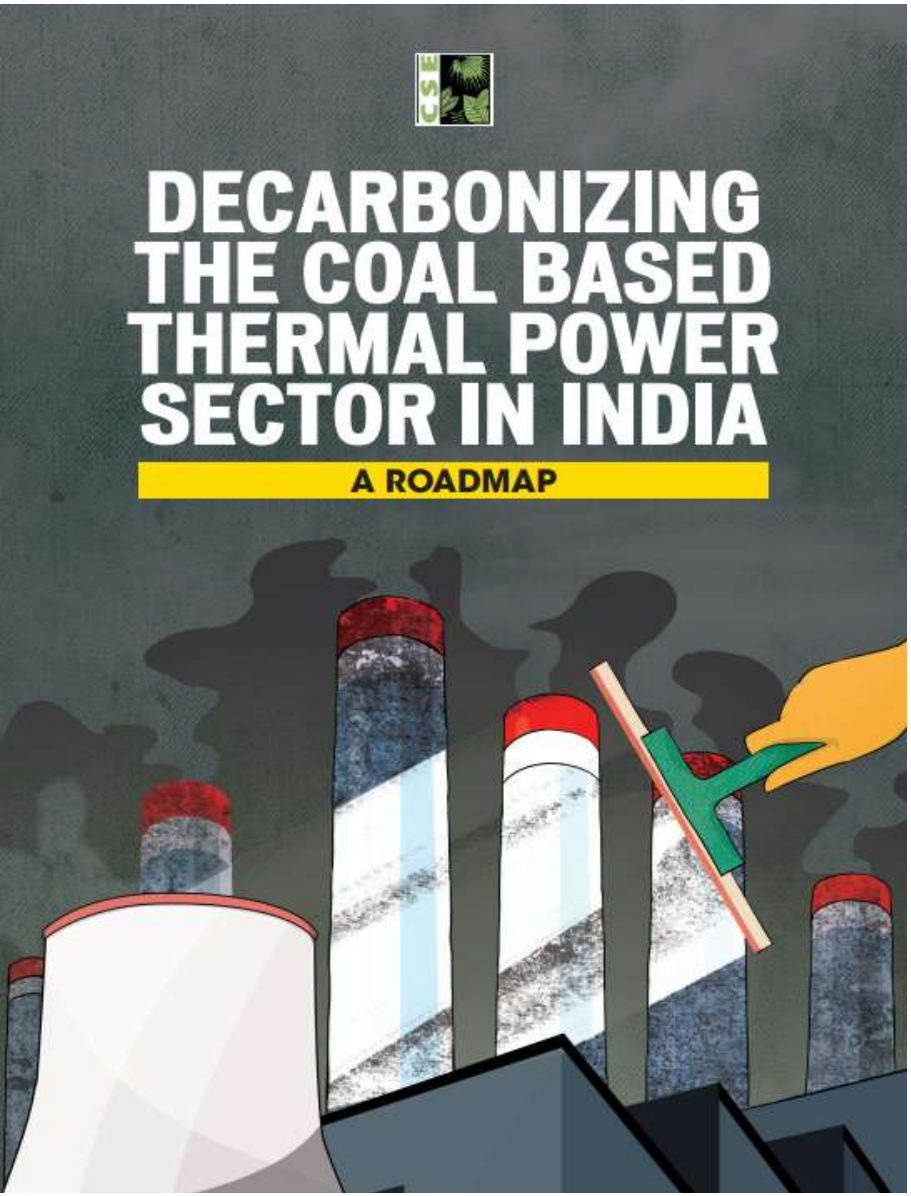


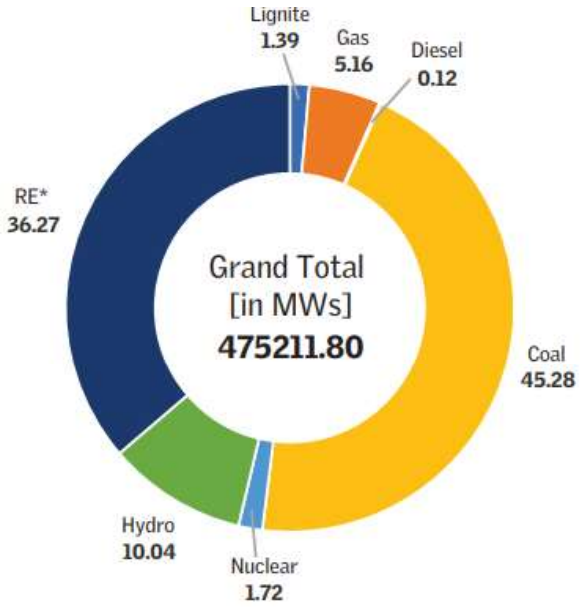
Decarbonizing Coal Based Thermal Power Sector in India

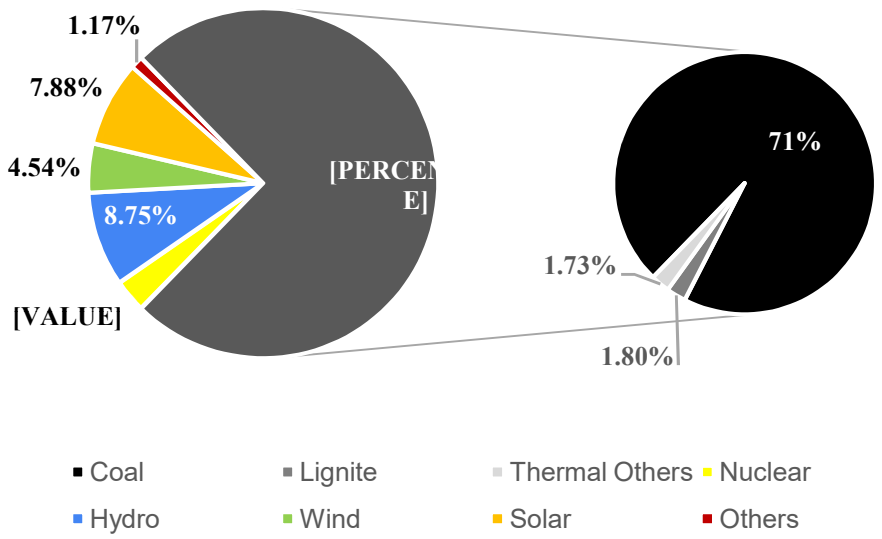
Why Decarbonize Coal Power in India?

- Electricity **contributes 39 percent** of the total country`s emissions as reported to UNFCCC. Most of it is from coal+lignite.
- As of March, 2025, non fossil power capacity is 46.3% but **generation share from renewables (excluding hydro) remains close to 12 per cent only**.
- The **National Electricity Plan envisioned 59% share** of coal+lignite power **in 2026-27** whereas **in 2024-25 (2 years before)** the share still **stands at 73%.**
- It **envisioned 262 GW of coal + lignite capacity** in a high demand scenario by 2031-32, now we have **already announced to build a capacity beyond 280 GW**.
- As of 2022-23, the **average CO2 emission intensity** of our **subcritical fleet** (84% of the fleet) **stands at 1.07 tonne of CO2/MWh**, while **the best sub critical units in India** are **as low as 0.89 tonne of CO2/MWh**.
- According to Electric Power Supply estimates 2022, an **electricity demand growth** of **6.65% annually was estimated until 2031-32** but as per our analysis the electricity **demand growth average has been 9.25% from 2021-25**.

All of the above, just shows that our **reliance on coal power** is not just going to stay **but increase beyond what we had envisioned** a few years ago. Thus making it essential to work towards decarbonizing our coal fleet.

Power Sector : Capacity & Generation Mix

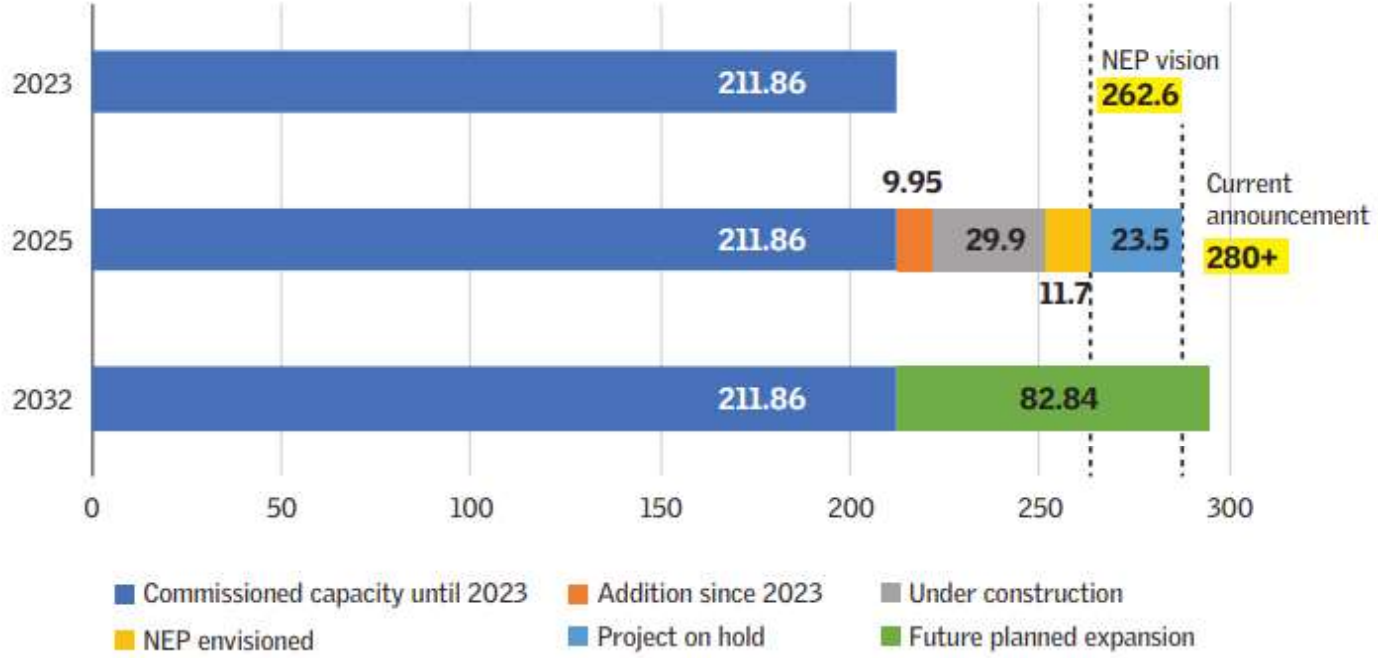




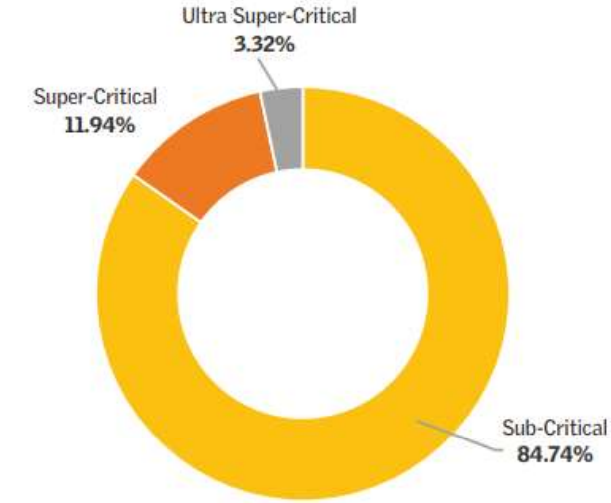
As of March 2025, Coal+lignite **capacity** share is **46.6 %** while **generation** share for FY 2024-25 is **75%**

Source: MoP´s National Power Portal Data

Coal Power: Current Fleet & Future Expansion



Source: CSE analysis on basis of multiple policy documents



Source: CO2 database, version 19

- **Young coal fleet** – 57 % below 15 years. Although 23.5% of sub critical fleet are above 30 years.
- **Fleet Ownership Share**: Centre (31.8 %), State (32.8 %), Private (35.4 %). **Almost 1/3rd Split**
- **Fleet Avg. Efficiency**: Subcritical (32.5%), Supercritical (35.4%), Ultra-supercritical (36.4%)

Thermal Power Sector: Unit wise assessment - CSE analysis

- CSE's report analyzed the CEA CO2 data from 2022 -23 that includes **603 coal and lignite** power units.
- CSE analysed their performance based on **technology, carbon intensity, efficiency, station heat rate** and ownership to identify top and least performing units across the fleet.
- All thermal units operating at a **Plant Load Factor (PLF) above 50 per cent** have been analysed to identify the 20 top-performing units based on CO2 emissions and station heat rate.
    - 136 units excluded in analysis: **PLF<50 percent means frequent closure and restarting resulting** in a higher heat rate.
- India's subcritical thermal power plant fleet is vast accordingly **divided into two categories**:
    - units with less than 250 MW capacity and
    - units with equal to or greater than 250 MW

Thermal Power Sector: Unit wise assessment - CSE analysis

- ***Subcritical category (less than 250 MW)***
  - JSW Energy's Torangallu IMP units are the best performing despite being above the age of 25 years. These units use a blend of coal with oil and therefore aren't the best example. **(0.74 tonne/MWh)**
  - Among the best-performing coal units, **NTPC's KORBA STPS in Chhattisgarh** stands out as the units are almost 40 years old. **(0.97 tonne/MWh)**

- ***Subcritical category (250 MW or above)***
  - **Tata Power's Trombay units** operate beyond 40 years and has an emission factor of 0.89 with sector-leading efficiency figures across the country. However, they use imported coal.
  - **K_Gudem New by TSGENCO** achieving the category`s leading efficiency with low auxiliary consumption percentage even after using domestic coal. (0.91 tonne/MWh)
  - **Budge Budge units** operated by **CESC** are above 25 years and achieve a low emission factor. **(0.93 tonne/MWh)**

Thermal Power Sector: Unit wise assessment - CSE analysis

Table 10(a): Best-performing subcritical units with capacity >= 250 MW (in terms of emission factor and SHR

Name	Unit no.	Company	Sector	Age	Fuel and average GCV	Capa-city	Emi-ssion factor (tonne/ MWh)	PLF (per cent)	SHR (kcal/ kWh)	Effi-ciency (per cent)	Auxiliary consum-ption (per cent)	Net genera-tion (GWh)	CO_2 emi-ssions (MT)
Torangallu Ext*	1	JSW Energy Ltd	Private	15.3	Coal (5,000; 6,000)	300	0.87	54.0	2,425.1	35.5	7.6	1,418.9	1.23
Trombay Coal*	1	Tata Power	Private	40.5	Coal (4,000; 4,500)	500	0.89	57.2	2,495.6	34.5	6.1	2,507.0	2.24
Trombay Coal*	2	Tata Power	Private	14.9	Coal (4,000; 4,500)	250	0.90	62.6	2,524.5	34.1	7.1	1,372.0	1.24
K_Gudem New	4	TSGENCO	State	13.1	Coal (3500; 4000)	500	0.91	78.8	2,404.0	35.8	5.2	3,452.2	3.15
Haldia	2	Haldia Energy Ltd	Private	9.5	Coal (3,000; 3,500)	300	0.92	74.0	2,416.2	35.6	5.1	1,945.0	1.78
Tamnar TPP	1	OP Jindal	Private	10.4	Coal (2,000; 3,000)	600	0.92	59.1	2,433.0	35.3	5.3	3,108.9	2.86
Korba STPS	7	NTPC	Centre	13.6	Coal (3,000, 3,500)	500	0.92	78.9	2,427.7	35.4	5.2	3,455.1	3.18
Budge Budge	1	CESC	Private	26.9	Coal (3,500;	250	0.93	69.6	2,437.7	35.3	7.9	1,523.9	1.41

Table 9(b): Least-performing subcritical units with capacity <250 MW (only coal) (in terms of emission factor and SHR)

Name	Unit no.	Company	Sector	Age	Fuel and avg. GCV	Capacity	Emi-ssion factor (tonne/ MWh)	PLF (per cent)	SHR (kcal/ kWh)	Efficiency (per cent)	Auxiliary consumption (per cent)	Net genera-tion (GWh)	CO_2 emi-ssions (MT)
Chakabura TPP	2	ACB India Ltd	Private	10.4	Coal (2,000; 3,000)	30	1.36	64.3	3,580.5	24.0	13.5	168.8	0.23
Kheda II	4	MAHAGENCO	State	23.6	Coal (3,000; 3,500)	210	1.30	50.8	3,410.8	25.2	11.3	934.0	1.22
Niwari TPP	2	BLA Power Ltd	Private	5.2	Coal (3,000; 3,500)	45	1.30	55.4	3,433.0	25.0	12.3	218.2	0.28
Kheda II	3	MAHAGENCO	State	24.2	Coal (3,000; 3,500)	210	1.29	63.2	3,407.6	25.2	10.6	1,162.0	1.50
Korba-West	2	CSEB	State	40.4	Coal (3,500; 4,000)	210	1.24	65.7	3,263.7	26.3	10.5	1,209.0	1.50
Ratija TPP	2	SCPL LTD	Private	7.7	Coal (2,000; 3,000)	50	1.23	56.0	3,251.1	26.4	11.9	245.4	0.30
Koradi	6	MAHAGENCO	State	42.4	Coal (3,000; 3,500)	210	1.22	63.4	3,160.6	27.2	11.5	1,167.0	1.42
North Chennai	1	TNEB	State	29.8	Coal (3,000; 3,500)	210	1.20	50.0	3,100.1	27.7	10.4	920.5	1.11
Sanjay	1	MPGPCL	State	31.4	Coal (3,500;	210	1.18	59.4	3,098.9	27.7	9.9	1,093.0	1.29

Thermal Power Sector: Unit wise assessment - CSE analysis

- ***Supercritical***
  - The best-performing coal power unit is operated by **Nabha Power Ltd at Rajpura** with an emission factor of **0.84 tonne/MWh**.
  - All top 20 supercritical units, barring one, use domestic coal for their operations and yet post emission factors below **0.9 tonne/MWh**.
  - Among the least performing, young units operating at a high PLF post emission factor above **1 tonne/MWh. (MAHAGENCO's Koradi, RRVUNL's Chhabra).**

- ***Ultra-supercritical***
  - Majority share of the under-construction fleet of coal power plants belong to the ultra-supercritical technology.
  - The Ministry of Heavy Industry benchmarks efficiency of this technology at 42 per cent.
  - **NTPC's KUDGI Unit# 1 and 2** are the top-performing units. (**0.83 tonne/MWh)**
  - **TATA Power's Mundra units** have an equivalent emission factor but their PLF is below 50 percent.

Thermal Power Sector: Unit wise assessment - CSE analysis

Table 12: Performance of ultra-supercritical units (in terms of emission factor and SHR)

Name	Unit no.	System (company)	Sector	Age	Fuel and average GCV	Capa-city	Emi-ssion factor (tonne/ MWh)	PLF (per cent)	SHR (kcal/ kWh)	Effi-ciency (per cent)	Auxiliary consumption (per cent)	Net generation (GWh)	CO_2 emissions (MT)
Mundra UMPP	2	TATA Power	Private	12.0	Coal (5,000; 6,000)	800	0.83	27.3	2,323.7	37.0	8.4	1,911.57	1.59
Kudgi	1	NTPC	Centre	7.6	Coal (3,000; 3,500)	800	0.83	56.9	2,206.2	39.0	5.8	3,990.42	3.31
Kudgi	2	NTPC	Centre	7.4	Coal, (3,000; 3,500)	800	0.83	50.3	2,209.1	38.9	6.1	3,527.02	2.93
Mundra UMPP	5	TATA Power	Private	11.4	Coal (5,000; 6,000)	800	0.83	43.8	2,332.8	36.9	8.4	3,072.07	2.56
Mundra UMPP	1	TATA Power	Private	12.4	Coal (5,000; 6,000)	800	0.83	50.9	2,334.8	36.8	8.4	3,566.68	2.97
Mundra UMPP	3	TATA Power	Private	11.8	Coal (5,000; 6000)	800	0.84	31.3	2,348.8	36.6	8.4	2,194.60	1.84
Kudgi	3	NTPC	Centre	6.4	Coal (3,000; 3,500)	800	0.85	44.7	2,271.9	37.8	6.2	3,129.43	2.67
K_GUDEM NEW	1	TSGENCO	State	5.6	Coal (4,000; 4,500)	800	0.86	57.3	2,257.1	38.1	4.7	4,013.00	3.45
Darlipalli STPP St-I	1	NTPC	Centre	4.6	Coal (2,000; 3,000)	800	0.86	69.0	2,271.4	37.9	6.1	4,833.56	4.18

Thermal Power Sector: Company wise assessment - CSE analysis

- **NTPC** leads the sector with 26.6 per cent of total generation and an emission factor of 0.97 tonne/MWh (aligns with the national average emission factor)
- Tata Power, Adani Power, Reliance Power and OP Jindal have average emission factors below 0.93 tonne/MWh.
- Other Central companies like DVC and NLC had an average emission intensity of 1.03 tonne/MWh and 1.33 tonne/MWh respectively.
- Rajpura TPP run by Nabha Power Ltd- lowest auxiliary consumption percentage across the entire sector, i.e. 4.62 per cent- emission factor of 0.84–0.85 tonne/MWh.
- Among state generation corporations, **Telangana's TSGENCO** leads the way with lowest emission factor of 1 tonne/MWh. Several of their units feature in our best performing lists.
- **Maharashtra's MAHAGENCO** has the largest fleet, with an average emission factor of 1.17 tonne/MWh.

Policy Issues impacting Decarbonization

- Report highlights the policy issues impacting the sector with redressal needed to ensure decarbonization.

- Key policy measures analyzed in the report are:
  - Power Purchase Agreements (PPAs)
  - Merit Order Dispatch
  - Demand forecasting
  - Flexibilization
  - Renovation & Modernization (R&M)
  - Biomass cofiring
  - Coal Cess

Policy Issues: Power Purchase Agreements(PPAs)

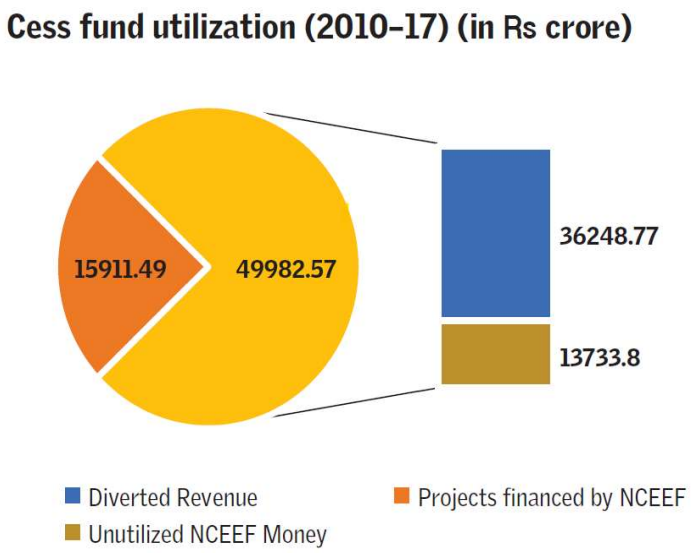
- India's Power Purchase Agreements (PPAs) have historically ensured revenue security for thermal power producers and financing confidence for investors.
- Long-term contracts, often lasting 25+ years, have created rigidities in the power sector.
- These legacy PPAs tie DISCOMs into paying fixed costs regardless of plant's operational efficiency, emission factor and the need of actual demand.
- PPAs lack support clauses to aid a thermal power plant while they undergo R&M, forcing units to run inefficient units.
- New units within a TPPs are harmonized within existing PPAs, extending the current issue to under construction thermal fleet.

Policy Issues: Merit Order Dispatch

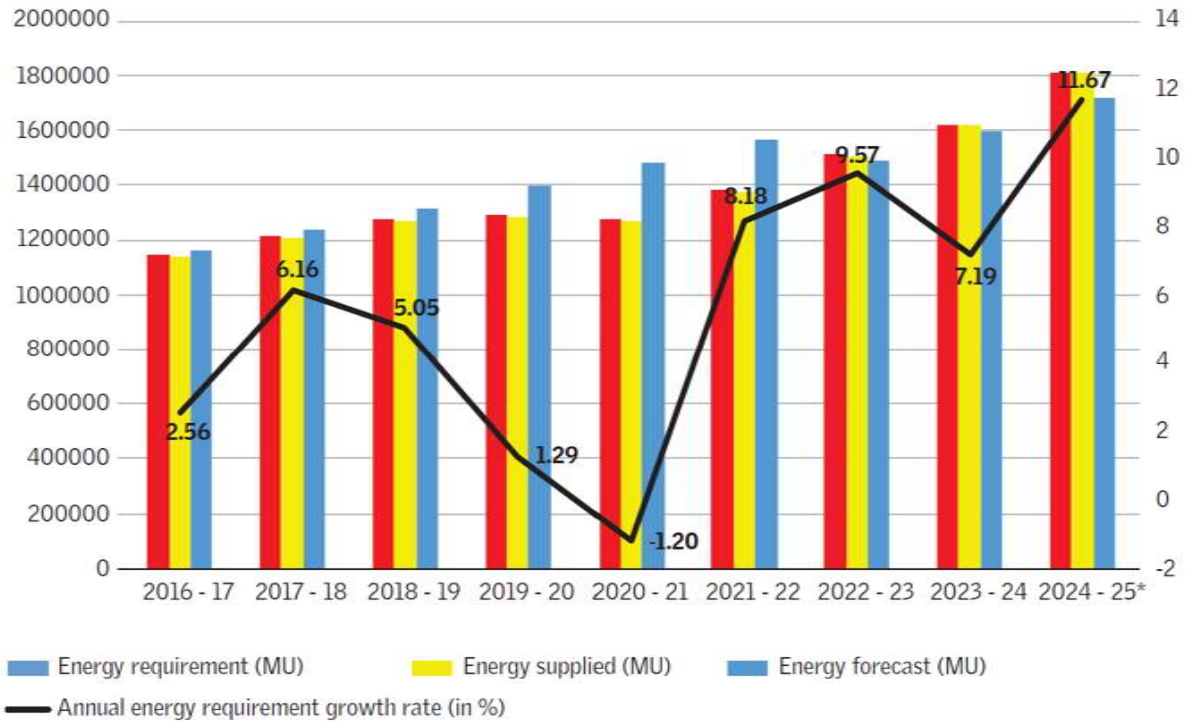
- India's MOD system prioritizes power generation from the lowest-cost sources.
- The current policy benefits pithead coal plants but overlooks environmental performance.
- The policy invariably affects newly constructed supercritical and ultra-supercritical power plants.
- Current criteria- making electricity affordable but creates a negative externality through higher GHG emissions.
- MOD excludes environmental costs, missing an opportunity to incentivize cleaner energy. South Korea's Environmental MOD (eMOD), a good case to study.

Policy Issues: Coal cess

- Introduced in 2010, the coal produced or imported is charged as an indirect tax with Rs. 400/per tonne.
- Between 2010 and 2017, only **24%** of the total ₹65,894.06 crore collected was utilized for its intended purpose.
- As GST revenues have grown, coal's share within the total revenue has been declining — projected to be **5.13%** in FY 2024–25.
- Between 2026 and 2032, coal production is estimated to generate an additional **₹3,97,600 crore** through the cess.



Policy Issues: Demand forecasting



- The official estimated growth for electricity requirement was 6 percent. However, since 2021, India's electricity demand has grown at an average of 9.25 percent per year.
- Electricity demand has regularly breached the forecasted estimates of National Electricity Plan, with current demand already breaching the 2026-27 estimates.

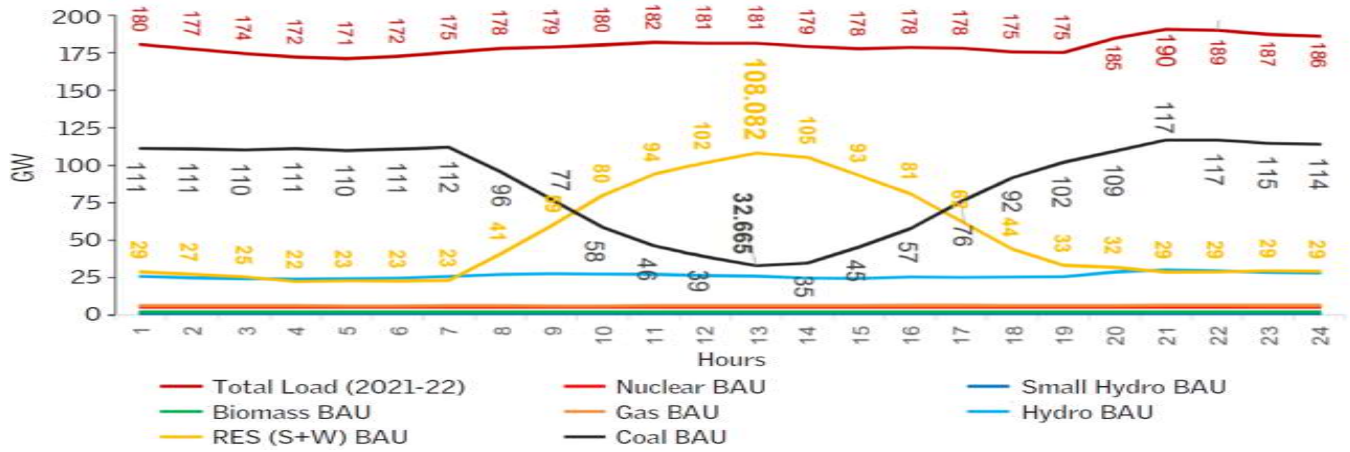
Policy Issues: Demand forecasting

- The GRID India's forecast figures for electricity is experiencing vast levels of fluctuations between lean and peak demand.

- We estimated the fluctuation by analyzing weekly reports over the past three years and provided a monthly average.
- The rising demand has lead to a consistent fall in the system load factor indicating an high volume of unused electricity in the grid.

Policy Issues: Flexibilization

- Transient nature of RE necessitate use of TPPs in a flexible manner.
- Key technical requirement for flexibilization is that the generating unit's Minimum Power Level should be 40 per cent with global standard for operations at 25 percent.
- India's thermal fleet's minimum technical load is currently 55 percent only.



Pathways for emission reduction

- **Efficiency factors -** CSE's analysis clearly shows a linear correlation between efficiency and emission factor as expected. CSE's analysis with respect to other factors as follow:
  - **Plant load factor (PLF):** Units with higher PLF (>70) show a lower efficiency (less than 30 per cent) with no decline in emission factor. Higher PLF is not always a determinant of higher efficiency and lower emissions.
  - **Gross calorific value (GCV):** 12 subcritical power generation units using domestic coal are meeting the industry's 35 per cent efficiency benchmark, therefore illustrating significant emission reductions are possible without relying on imported fuel.
  - **Technology-** clear trend of higher efficiency and lower emission factor owing to technology.

- **Renovation and modernization (R&M):**
  - Current PPAs offer little incentive for operators to improve efficiency.
  - CEA's policy is limited to smaller units with age >25 years

Pathways for emission reduction

- **Renewable energy:** Flexibilization of existing power generation units is key to incorporating RE into the power-generation mix.

- **Biomass cofiring:** CSE's emission-reduction estimates show maximum scope of emission reduction possible through increased biomass cofiring.

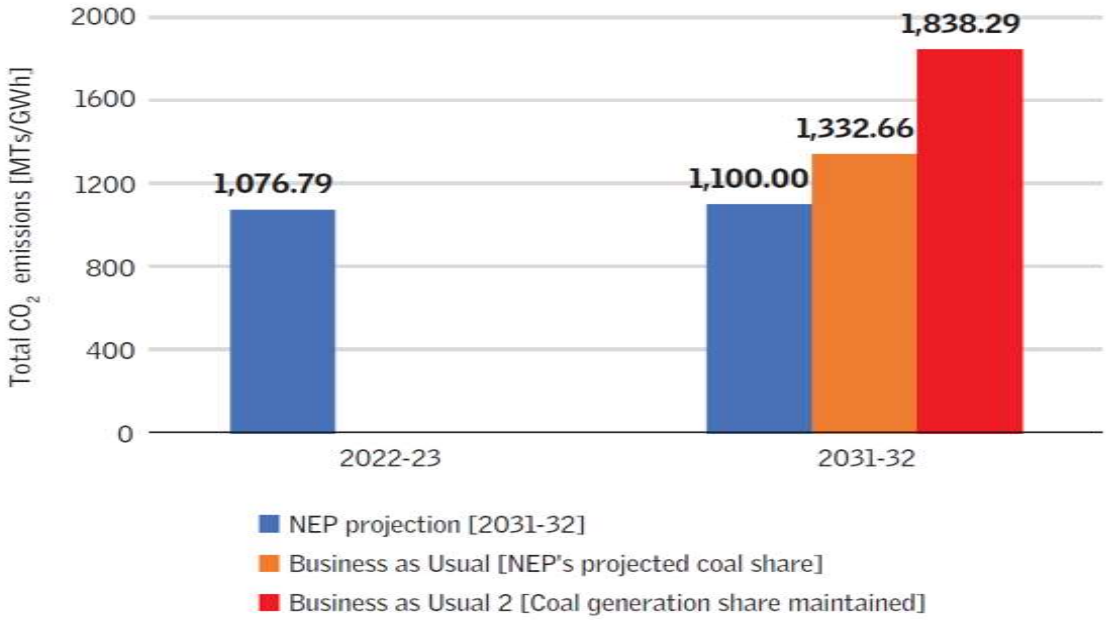
- **Carbon capture utilization and storage (CCUS):** The technology is cost intensive and still needs economic feasibility and government support like given in the US and EU.

Emission reduction: CSE's proposed scenario

- CSE's emission reduction scenarios propose three key steps:
  - Improving efficiency
  - Greater generation production shift towards Supercritical and Ultra Supercritical
  - Biomass Cofiring
- Our estimates are based limited to 2031- 2032 and use NEP date as its baseline.

Emission scenario: Business As Usual

- National Electricity Plan (NEP) projects an average 58 percent PLF of the thermal fleet and the share of coal in total electricity mix to be 50.1 percent by 2031–32.
- Since the NEP, coal share over the past 4 years has never fallen below 70 percent.
- At current emission rates and planned capacity additions, total emissions could reach **1,332.7 MT** by 2031–32, a **23%** rise from 2022–23 levels.
- If coal's share remains unchanged, emissions may rise to **1,838 MT**, a **70%** increase over the baseline.



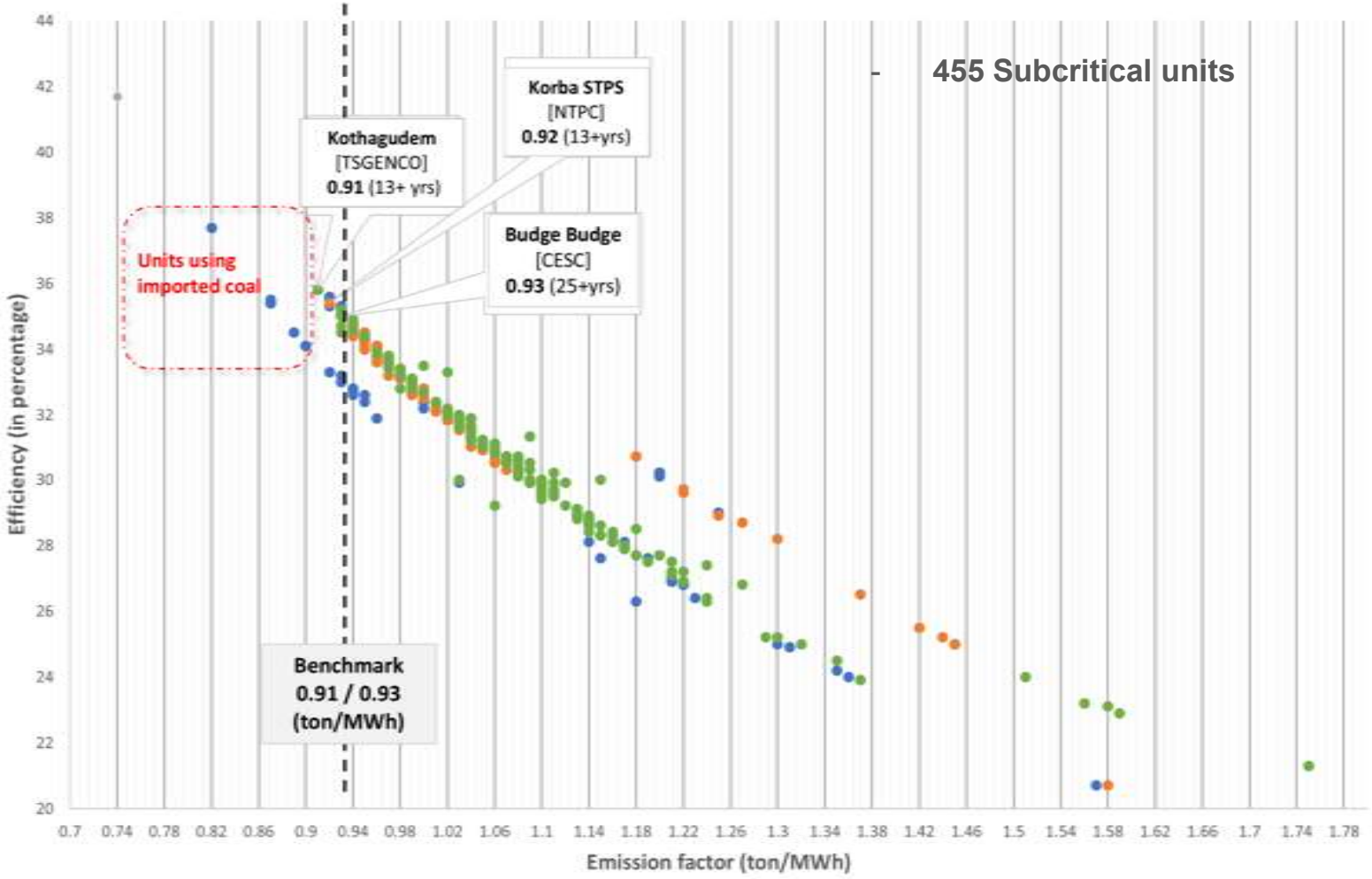
Decarbonization Lever 1: Improving efficiency

- CSE's analysis identified benchmark emission factors for each technology category within the thermal fleet and estimated the total emissions for 2031–32 assuming all units achieve these benchmarks.

Technology	Benchmark emission factor (tonne/MWH)
50 per cent of subcritical capacity	0.91
50 per cent of subcritical capacity	0.93
Supercritical and ultra-supercritical	0.83

- Subcritical benchmarks are split equally due to the mix of old and new units.
- Supercritical and ultra-supercritical units share a benchmark due to uncertain future split.

Decarbonization Lever 1: Benchmark units - CSE Analysis



- The largest fleet of TPPs is in the Subcritical category.
- Emission reduction scenarios visualize 50% of the fleet to meet the top benchmark of 0.91.
- For the other 50% of the fleet, scenarios aim to achieve the benchmark of 0.93.

Source: CEA CO2 database, version 19, 2022-23

Decarbonization Lever 1: Benchmark units - CSE Analysis

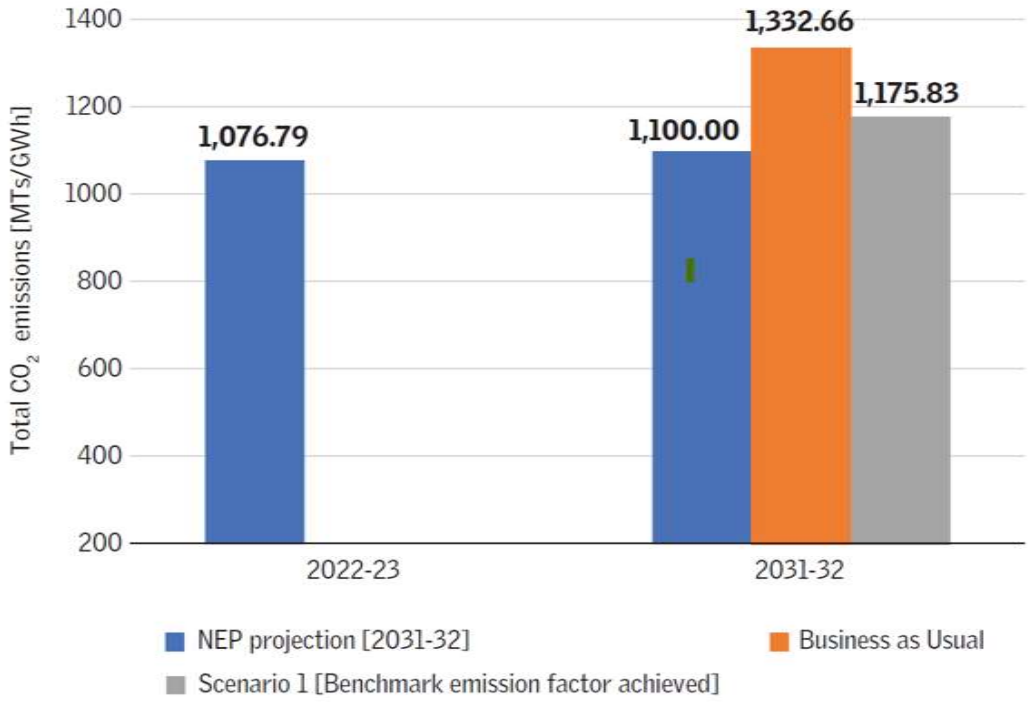
- ***Supercritical category***
  - The best-performing coal power unit is operated by Nabha Power Ltd at Rajpura with an emission factor of 0.84 tonne/MWh.
  - All top 20 supercritical units, barring one, use domestic coal for their operations and yet post emission factors below 0.9 tonne/MWh.

- ***Ultra-supercritical category***
  - Majority share of the under-construction fleet of coal power plants belong to the ultra-supercritical technology.
  - The Ministry of Heavy Industry benchmarks efficiency of this technology at 42 per cent.
  - NTPC's KUDGI Unit# 1 and 2 are the top-performing units.
  - TATA Power's Mundra units post similar emission factor but operate at PLF below 50 percent.

Decarbonization Lever 1: Achieving Benchmark Emission factor

- If all units meet the benchmarked emission factors through R&M, total emissions would be **1,175.83 MT CO_2** (Scenario 1), a reduction of **156.82 MT**, or **11.7%** below BAU levels.
- This reduction equivalent to the **total emissions of the Iron & Steel sector** of India (NC3, 2019).

Graph 26: Decarbonization lever 1—Scenario 1 illustrated (benchmark emission factor)



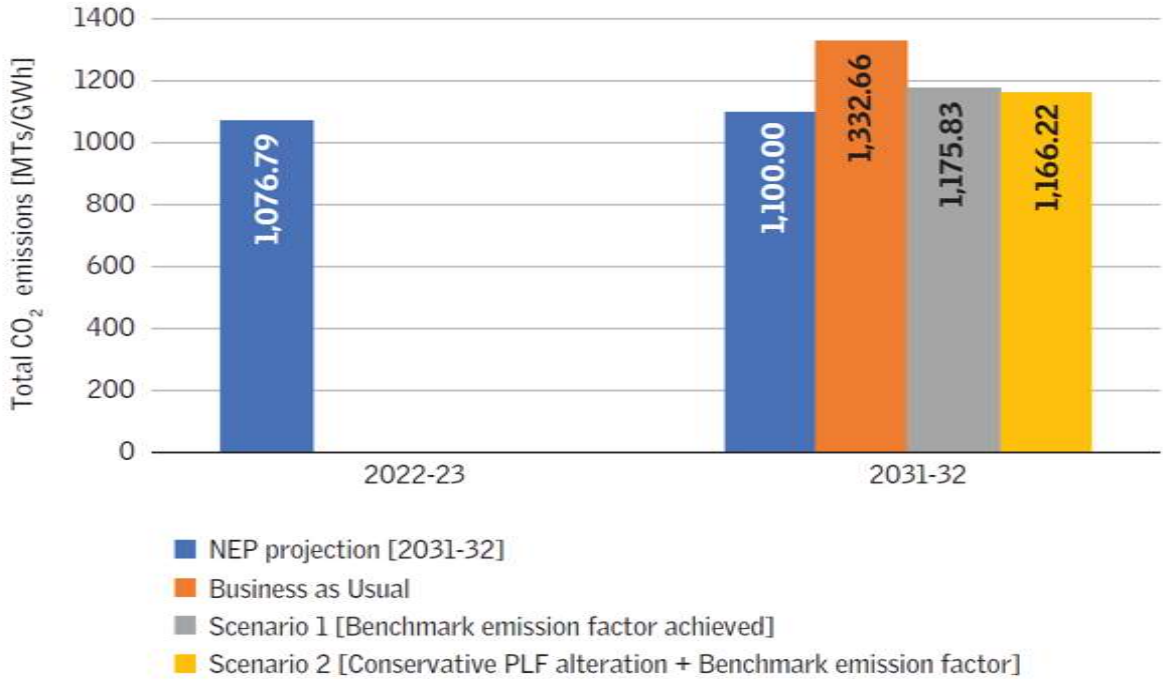
Decarbonization Lever 1: PLF alteration

- NEP estimates a uniform PLF across the entire thermal fleet irrespective of the technology of the unit.
- Our second scenario assumes a larger share of generation comes from supercritical and ultra-supercritical units, with subcritical units covering the remaining demand.
- This scenario considers two variations based on the extent of shift in generation:
  - **First**, a conservative approach where subcritical units continue to play a major role, operating at a PLF of 50%.
  - **Second**, an accelerated approach where supercritical and ultra-supercritical units take on a larger share of generation, operating at a higher PLF of 80%.
- These two options help assess the potential impact of different operational strategies on overall emissions.

Decarbonization Lever 1: Conservative PLF alteration + Benchmark emission factor

- If all units meet the benchmarked emission factors through R&M and operate at the suggested PLFs, total emissions would be **1,166.22 MT CO_2** — a reduction of **166.43 MT**, or **12.5%** below BAU levels. This is **9.6 MT** (0.8%) lower than Scenario 1.

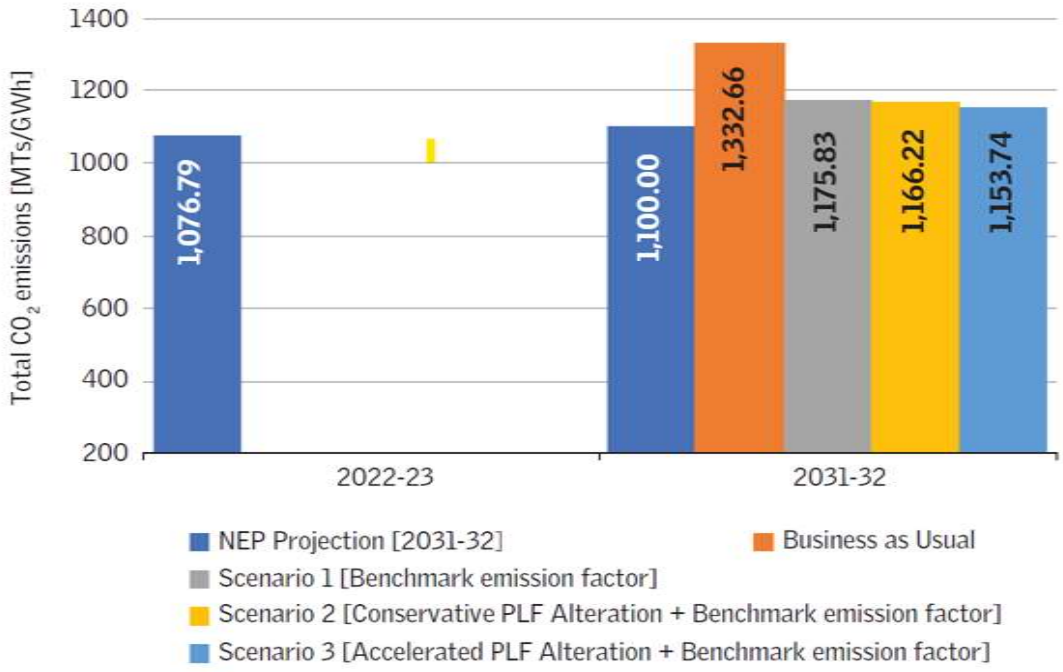
Graph 27: Decarbonization lever 1—Scenario 1 and 2 illustrated (conservative PLF alteration)



Decarbonization Lever 1: Accelerated PLF alteration + Benchmark emission factor

- If all units meet the benchmarked emission factors through R&M and operate at the suggested PLFs, total emissions would be **1,153.74 MT CO_2** — a reduction of **178.91 MT**, or **13.4%** below BAU levels. This is **22.1 MT** (1.8%) lower than Scenario 1.

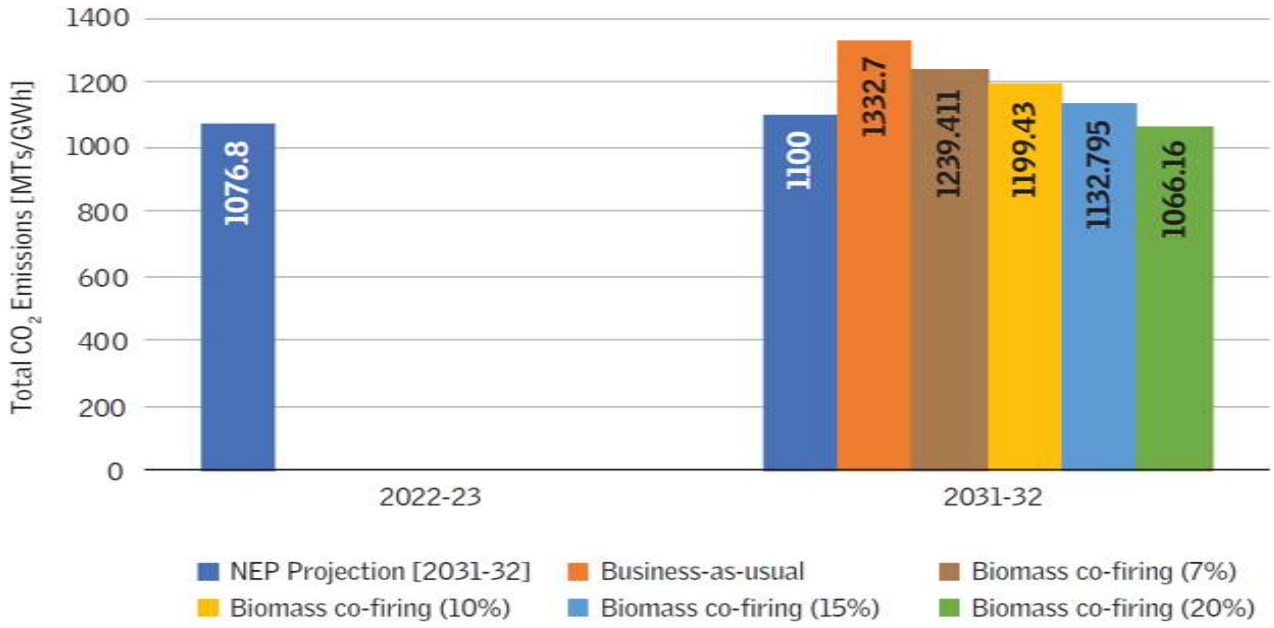
Graph 28: Decarbonization Lever 1: Efficiency improvement scenarios illustrated (in MT CO_2)



Decarbonization Lever 2: Biomass cofiring

- Biomass, being a carbon-neutral fuel, enables a proportional reduction in emissions based on the level of co-firing.
- From FY 2025-26 onwards, CEA mandates TPPs to engage in a minimum of 7 percent cofiring.
- NTPC's Tanda unit has set a benchmark by co-firing 20% biomass with coal, and our emission reduction estimates are based on this level of co-firing.

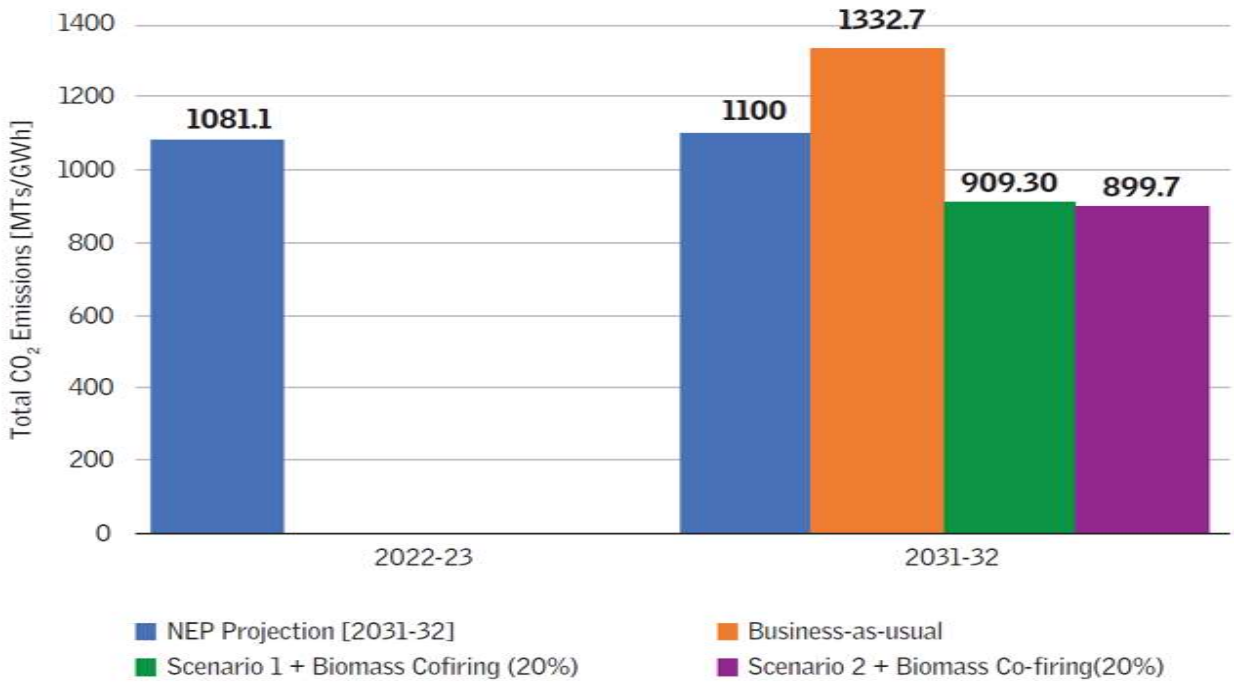
Graph 30: Decarbonization Lever 2 (biomass cofiring) scenarios—Emission-reduction potential



Decarbonization Levers: Combined Scenarios

- An illustration of the emission reduction potential if CSE's recommended pathways are implemented.
- The reduction achieved by these pathways is **higher than the entire emissions of Iron & Steel and Cement sector combined. (157MT + 178 MT, NC3)**

Graph 33: Decarbonization potential: Combined scenarios



Findings of the report

- **Need to accelerate biomass co-firing:**

Obligation for 5% co-firing is still **largely unmet.** Only 68 coal-power plants are engaging in co-firing to varying degrees. The **growing adoption in Delhi-NCR sets a positive precedent**, however, **broader regional adoption is essential**.

- **Rethinking age-based R&M:**

CSE's analysis **shows eight subcritical units over 25 years old rank among top 100** in the country in terms of efficiency and low emission intensity. **49 units under 20 years of age among least performing**.

- **Efficiency gaps across all technologies:**

95 subcritical units <25 years of age operate below national efficiency average. **5 supercritical thermal units** also **operate below subcritical national efficiency average** (32.1 per cent).

- **Merit Order Dispatch incentivizes higher emissions-**

Current system provides no incentive to improve performance. Leads to **benefit plants near coal mines**, **inefficient plants being prioritized for dispatch** and **underutilization of efficient and advanced technology plants**.

Findings of the report

- **Units with efficient technologies are underutilized:**

As of 2022–23, **14 out of 72 supercritical** units (20 %), **8 out of 20 ultra-supercritical units (40 %)** had an annual average **PLF of less than 50 per cent**.

- **Efficiency and emission intensity of plants is not determined only by the quality of coal:**

As of 2022–23, **12 subcritical units using domestic coal meeting** industry's **35% efficiency** benchmark. **166 subcritical units using domestic coal** operating at efficiencies **above 32.1 %** (above **national average** for subcritical units).

- **High emissions, low efficiency of state-owned TPPs:**

State-owned coal power units have **highest average emission factor at 1.06 tons/MWh**, compared to 1.0 tonne/MWh for Centre-owned and 0.84 tonne/MWh for privately owned plants.

- **Diversion of coal cess away from climate action:**

Rs **65.8 thousand crores** were **generated** through Clean Energy Cess during 2010–17, **75.9 %** of it **either diverted or left unutilized**. **3.5 lakh crores generated** between **2017-25**. **Possibility of raising 3.97 lakh crore by 2032.**

Findings of the report

- **Accurate demand forecasting is necessary:**

Demand projected for **2026– 27** has already been **surpassed**, indicating **actual consumption** has significantly **outpaced** the National Electricity Plan **(NEP) estimates**.

- **Flux of peak/lean demand:**

The fluctuation between **peak and lean demand** projections of GRID India, during **2022–25 an average monthly fluctuation of 57.6** % highlight the **growing challenge of predicting demand and for the grid and power plants**.

- **Legacy PPAs a barrier to reform:**

Over 70 per cent of **thermal power** is currently tied to l**ong-term legacy PPAs**, **limiting flexibility** for **integrating RE** and **disincentivizing efficiency improvements**.

- **Lack of incentives for R&M:**

Lack of clauses preventing **financial penalties for non-generation during R&M, lack of cost compensations or other incentives for R&M etc.**

Recommendations: Technical

- **Biomass cofiring-**
  - **Implementation across country** with support of state governments and private players**.**
  - **CSE recommends a push for 20 per cent co firing** as technically proven.

- **Renovation and modernisation:**
  - **Emission target based R&M - Units above a certain PLF should target to meet benchmark**.
  - Making **R&M policy time bound**
  - Asses and **include non-performing younger plants**.
  - The need for a **stand alone budget for R&M support**.

Recommendations : Technical

- **CO2 Emission intensity Targets:**
  - **Sooner or later Power sector will enter CCTS.**
  - Gencos need to set **unit-wise voluntary emission intensity targets**

- **Flexibilization of TPPs:**
  - Guidelines to **minimise impact on emissions,**
  - **Region-wise Identification of units** in regions where RE penetration is high
  - **Unit-wise preparation of budget**.
  - **Quarterly report** for **tracking progress**.

Recommendations : Systemic Changes

- **Upgrading Merit Order Dispatch-**
  - Opportune time to start **incorporating environmental/CO2 intensity based parameters** into dispatch decisions.
  - Will **incentivize cleaner technologies, promote efficiency** and **safeguard from environmental and upcoming carbon costs.**

- **Repurpose coal cess:**
  - With **GST compensation cess deadline approaching,** we must choose to **repurpose this fund for decarbonization.**
  - **Estimated 3.97 lakh crore can be collected and used by 2032.**

Recommendations : Systemic Changes

- **Re-Visit PPAs-**
  - **Shorter tenure for upcoming units** and
  - **non-inclusion of new units within older PPAs of power plants.**
  - **Relaxation on penalties** for non generation
  - Some form of **cost sharing/support measures for R&M in PPAs, considering**
  - **Downward revision of fixed costs for units running beyond lifecycle.**

- **Strengthen Demand Forecasting- Methodologies required that:**
  - are able to **account for country´s evolving growth and green transition**
  - can understand **changing patterns of demand fluctuation**

Thank You