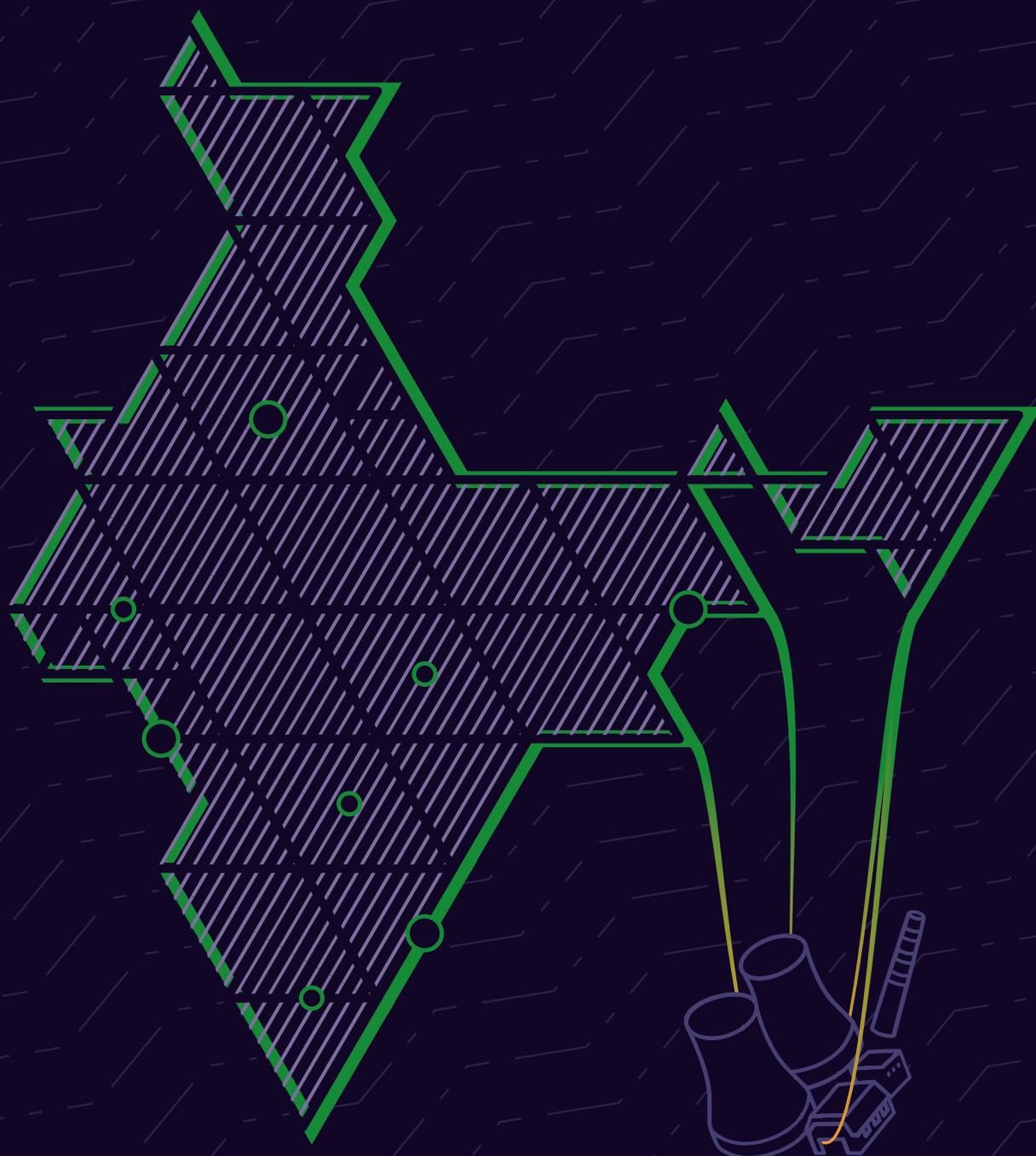


PEAKING COAL?

India's coal power may have already peaked, if it seizes the opportunity.



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Published date

February 2021

Disclaimer

The information in this report is complete and correct to the best of our knowledge, but if you spot an error, please email

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Document design & layout by Wilf Lytton

Executive summary

India's coal-fired generation fell by 5% in 2020, declining further since its historical peak in 2018; there is now an opportunity to ensure it doesn't bounce back as the country recovers from the COVID-19 pandemic.

The impact of India's nationwide COVID-19 lockdown on its electricity demand in 2020 may prove to be a watershed moment in India's coal-to-clean electricity transition story. Indeed, it brought coal, India's largest source of electricity, under scrutiny as it took 100% of the brunt of the fall in electricity demand in the last year.

In this report, historical electricity generation data from the Central Electricity Authority (CEA) of India is analysed to understand how power generation in 2020 was different from previous years. Indian government forecasts from Optimal Generation Capacity Mix for 2029-30 (OGCM) report and 13th National Electricity Plan (NEP13) were studied to understand the Indian government's projections for coal, wind and solar generation up to 2030 and how coal-fired generation forecasts may be impacted due to demand shock from COVID-19. This report also considers how India's coal capacity could change in the next decade amid falling Plant Load Factor and decreasing financial viability of new plants.

The key findings of this report are:

- The historical peak of India's coal-fired generation was seen in 2018. Coal-fired generation fell 5% in 2020 due to significantly reduced annual electricity demand caused by the COVID-19 lockdown and a steady increase in solar generation. This marks the second consecutive annual fall in coal-fired generation, following a 3% decline caused by economic slowdown in 2019. However, coal still remains the dominant source of electricity, generating 71% of India's electricity in 2020.
- Indian government forecasts show coal-fired generation rising in the next decade. But with electricity demand likely to be less than forecast due to COVID-19, this analysis shows that it is possible coal-fired generation will be unchanged from now by 2030, even if electricity demand is increasing at 4-5% per year on an average.

- An analysis of International Energy Agency's (IEA's) new India Vision Case (IVC) from the India Energy Outlook 2021 revealed that the coal-fired generation may plateau even if India pursues higher rates of economic growth. This is consistent with the COVID-19 pathway above. IEA Sustainable Development Scenario (SDS) shows that it is even possible for coal-fired generation to fall by 2030.
- Peaking of coal-fired generation is contingent on India meeting its wind and solar generation targets. India's combined wind and solar generation in 2020 was 118 TWh. This is some way off the government's targets of 274 TWh in FY 2021-22 and 793 TWh in FY 2029-30. India is at an immediate high risk of not meeting its 2022 target.
- India's coal plant load factor (PLF) fell to a record low level of 53% in 2020, while coal-fired generation fell and coal-fired capacity increased. Therefore, the current coal fleet is already running the risk of turning into loss-making stranded assets.
- It is possible that India's on-grid coal capacity will actually peak within the next 5 years, if India delivers on its commitments to close older coal power plants and does not build new coal power plants beyond those currently under construction.

As India recovers from the COVID-19 pandemic shock, the choices it makes for its power sector can make or break its coal-to-clean electricity transition in the next decade. This report makes the following recommendations to ensure that coal-fired generation has already peaked in India:

1. **Focus on removing barriers to ensure wind and solar targets are met**
2. **Moratorium on building new coal power plants**
3. **Incentivise closure of old coal power plants**
4. **Moratorium on new coal mine auctions**

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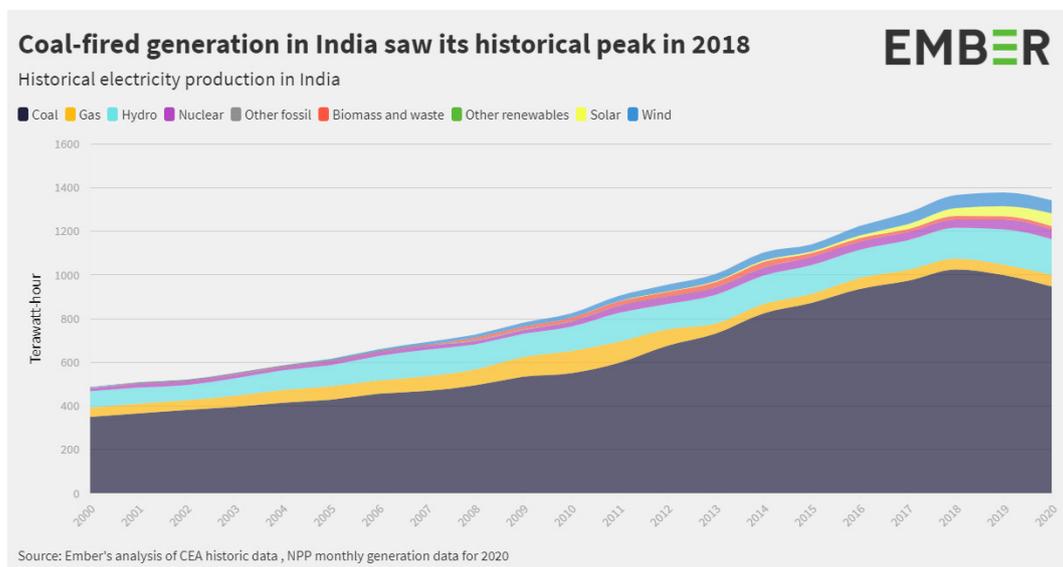
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CHAPTER 1

Coal-fired generation falls for second year in a row

India's coal-fired generation fell by 5% in 2020, and is now 8% below its historical peak in 2018 (Figure 1). 2020 marks the second year in a row that coal-fired generation fell in India; prior to then it had not recorded an annual fall since at least 1990. However, coal still remains the dominant source of electricity, generating 948 TWh (71% of India's electricity mix) in 2020.

FIGURE 1



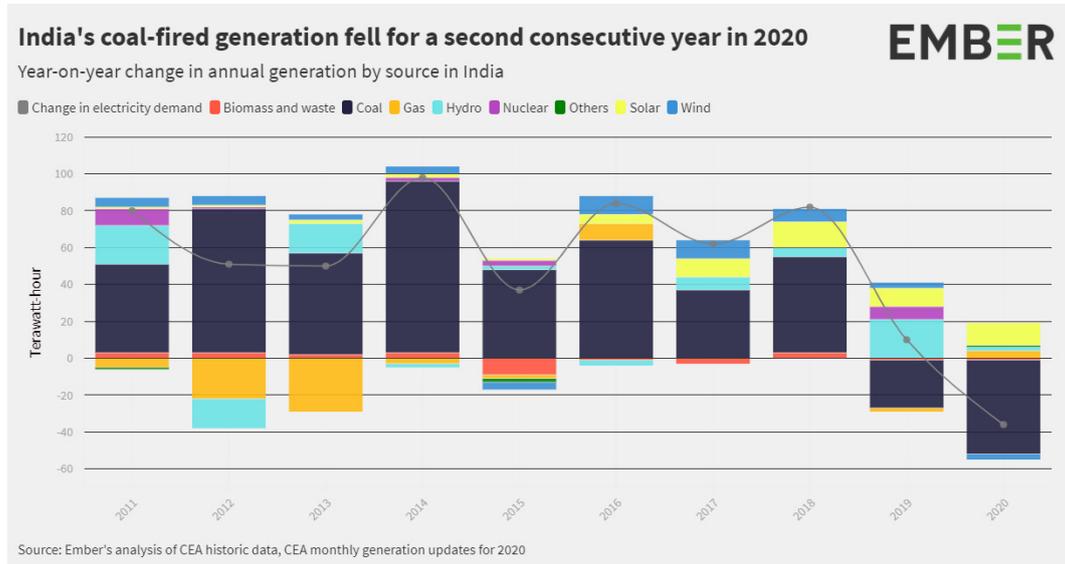
Coal-fired generation fell in 2020 as electricity demand fell and solar generation picked up (Figure 2). Coal fell by 51 TWh (5%) in 2020, which was caused in part by a 36 TWh (3%) fall in electricity demand and a 12 TWh (26%) rise in solar generation. All other sources of generation were broadly unchanged. The fall in electricity demand was primarily caused by the nationwide lockdown from March until June, aimed at containing the COVID-19 pandemic.¹

In 2019, the 26 TWh (3%) fall in coal-fired generation was caused by a confluence of factors. Firstly, a broader economic slowdown led to a weak electricity demand growth of 12 TWh (1%).

1. IEA (2020a), *Global Energy Review 2020*, IEA, Paris.

Secondly, a strong monsoon season resulted in India recording a relatively high hydropower generation.² Finally, new nuclear, wind and solar capacity installation resulted in improved generation from these sources.

FIGURE 2



The electricity demand has begun to pick up once again. Both December 2020 and January 2021 saw a 4% year-on-year increase which resulted in monthly demands of 114 TWh and 118 TWh respectively. This led to monthly coal-fired generations of 88 TWh (a 6% year-on-year rise) in December 2020 and 90 TWh in January (a 3% year-on-year rise). Coal rose because the increase in wind and solar generation was too small to meet that increase in electricity demand.

2. Friedlingstein, P. et al. (2019), [Global Carbon Budget 2019](https://doi.org/10.5194/essd-11-1783-2019). Earth Sys. Science Data. 11, 1783 –1838. <https://doi.org/10.5194/essd-11-1783-2019>.

CHAPTER 2

Has coal-fired generation peaked in India?

COVID-19 demand shock means it's possible coal power has already hit its peak - if India delivers on its wind and solar targets.

Electricity demand still may be 11% below previous forecasts in 2025. The impact of short-term demand shock due to COVID-19 on India's mid-term power sector growth trends was explored in a recent report from The Energy and Resources Institute (TERI) titled 'Bending The Curve'.³ The impact of short-term demand shock was significant enough for TERI to provide a downward revision of projections for India's mid-term electricity demand growth. This report builds upon TERI's analysis to estimate the impact of the demand shock on the electricity mix.

The 'Bending the Curve' report provided a framework for forecasting sectoral electricity demand and presented electricity demand projections for three different economic scenarios to 2025. These scenarios are summarized in Table 1 below:

TABLE 1

Assumptions	V-shaped (optimistic)	Baseline scenario	L-shaped (pessimistic)
Economy (GVA) contraction in 2020	-5.5%	-6.4%	-7.4%
Growth (GVA) rebound in 2021	9%	7.9%	6.6%
Industry and service sector growth trend from 2021	15 - 20% higher than pre-COVID trend	Settle into pre-COVID growth trend	15 - 20% lower than pre-COVID trend
Change in electricity demand in 2025 (compared to pre-COVID forecast)	-6%	-11%	-16%

3. Spencer, T. (2020), *Bending the Curve: 2025 Forecasts for Electricity Demand by Sector and State in the Light of the COVID-19 Epidemic*, The Energy and Resources Institute.

In this report, the baseline estimate of 11% drop in electricity demand below the pre-COVID trend by 2025 is considered-red. This scenario assumes that the Indian economy sees a strong growth rebound in 2021, with agriculture, industry and service sectors subsequently settling into their pre-COVID growth trends. However, it is necessary to acknowledge that the post-COVID-19 electricity demand will likely depend upon a lot of uncertain economic factors. The impact of structural changes to economic organization (e.g., work-from-home, supply-chain reorganization, online retail etc.) on electricity demand is still unknown. Furthermore, if there is another lockdown to respond to COVID-19, it may change the electricity demand and these forecasts would have to be revised again.

BOX 1

Forecasts used in the analysis

Most of India's electricity sector targets today are informed by two key government reports published by Central Electricity Authority of India (CEA): 'Optimal Generation Capacity Mix for 2029-30' (OGCM) and '13th National Electricity Plan' (NEP13).

OGCM, published in January 2020, is the Indian government's most recent long-term electricity demand modelling report which optimised long-term power sector development for least cost and presented forecasts for FY 2029-30.⁴ NEP13 is India's five-year national electricity plan which was published in January 2018 and adopted a "sustainable development" modelling approach where renewable energy sources, hydro, nuclear and gas were prioritised over coal.⁵ NEP13 set out the country's electricity sector targets for FY 2021-22, with a forward looking forecast for FY 2026-27.⁶ Since both these reports are guiding mid- to long-term targets of India, this analysis studies forecasts from both NEP13 and OGCM.

Outside the CEA projections, the IEA's Sustainable Development Scenario (SDS) and India Vision Case (IVC) forecasts taken from India Energy Outlook 2021 report were considered. IEA IVC assumes an optimistic stance on India's speed of economic recovery, long-term growth, and the prospects for a fuller implementation of stated energy policy ambitions. IEA SDS works backwards from specific international climate, clean air and energy access goals and assumes a combination of actions necessary to achieve them.⁷ In the current report, electricity data available from both these IEA scenarios have been harmonized with the CEA's historical electricity data to account for differences between both the datasets and analysed to provide a comparison with CEA forecasts.

-
4. CEA (2020), *Report on Optimal Generation Capacity Mix for 2029-30*.
 5. Modelling done in NEP13 proposed additional coal power plants to be built only after considering the committed capacity addition from hydro, nuclear, gas and RES, to meet the projected demand. (See pg. 5.3 and 5.13, [CEA \(2018\)](#))
 6. CEA (2018), *13th National Electricity Plan*.
 7. IEA (2021), *India Energy Outlook 2021*, IEA, Paris.

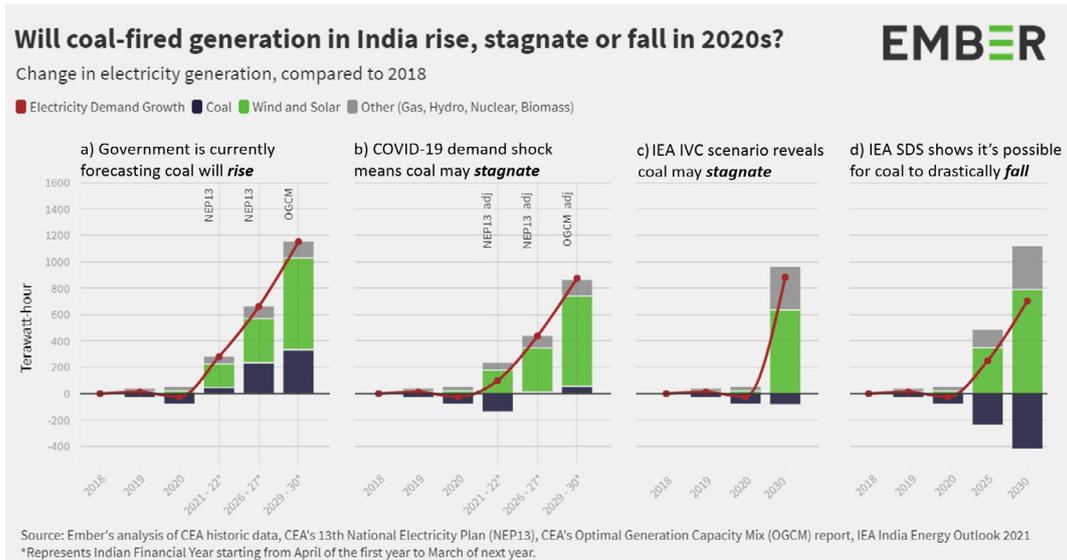
The Indian government is expecting coal-fired generation to rise this decade, with electricity demand growth outpacing the rise in wind and solar (Figure 3a). OGCM forecasts show a strong growth in electricity demand of 1152 TWh between 2018 and FY 2029-30. These projections show that 60% of this demand growth will be met by wind and solar generation while coal-fired generation accounts for about 29%.

Coal-fired generation may not change considerably from 2018 by 2030, if electricity demand is structurally impacted by COVID-19 (Figure 3b). While the exact long-term impact on these projections depends upon various uncertain macroeconomic factors, this report shows that a 11% drop in projected electricity demand due to the COVID-19 shock will lead to an electricity demand growth of 875 TWh between 2018 and FY 2029-30. This would mean an average increase in electricity demand of 4-5% every year till 2030. If India delivers on its own wind and solar generation targets in the next 10 years, this will lead to a relatively small increase of 52 TWh in coal-fired generation by FY 2029-30.

IEA IVC shows it's possible for coal-fired generation to plateau even if India pursues higher rates of economic growth (Figure 3c). IEA IVC assumes that India pursues structural reforms that successfully raise its long-term economic growth while meeting potential key energy sector targets to the extent possible. It assumes that - like the COVID-adjusted pathway above - electricity demand doesn't rise as aggressively as the Indian government projections suggest, which means coal-fired generation isn't expected to rise. Indeed, it assumes an increase in gas generation which, if realised, would mean coal would even fall slightly.

It's even possible coal will fall this decade, if India wants it to (Figure 3d). IEA SDS scenario assumes only a little more wind and solar than OGCM, but more efficiency so that electricity demand rises by slightly less than the COVID-adjusted pathway above. It also assumes more investment into gas, nuclear and hydro. Under such a scenario, coal-fired generation in 2030 would fall significantly by 416 TWh from 2018's peak.

FIGURE 3



However, coal peaking is dependent on wind and solar meeting expectations. The Indian government has big plans for wind and solar in the next 10 years, but will it be able to meet them? While wind and solar generation grew steadily in the last decade, the scale of growth which the Indian government is targeting in the next decade is massive. NEP13 projects that wind and solar combined would provide 274 TWh in FY 2021-22, while OGCM pegs wind and solar generation in FY 2029-30 at 793 TWh. These targets are still some way off the combined wind and solar generation in 2020 which stood at 118 TWh.

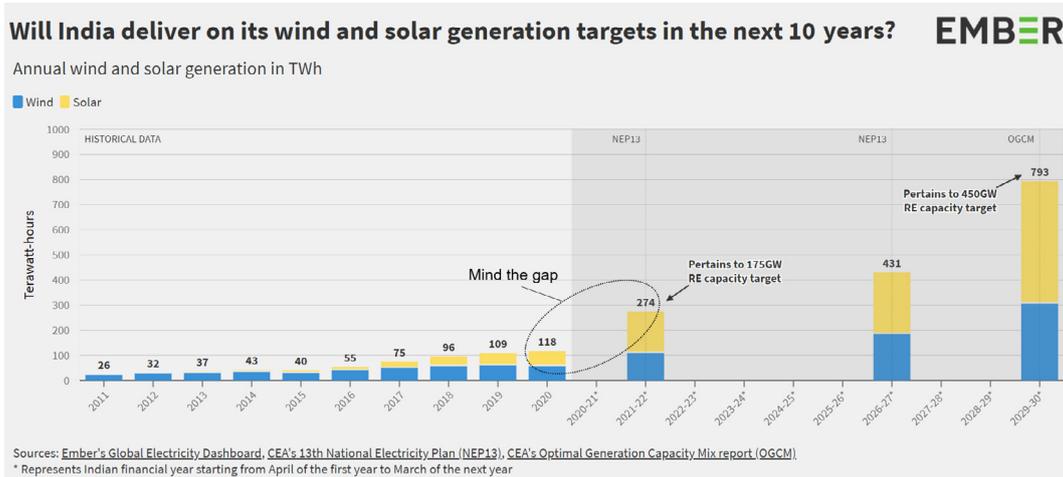
These generation targets correspond to the installed renewable capacity targets of 175GW by 2022 and 450GW by 2030 set out by the government.⁸ In a recent G20 summit, PM Modi even reiterated India's commitment to achieving these targets. However, this would require a massive scale up of wind and solar. Solar would need to go from 36GW now to 100GW by 2022 and 280GW by 2030. Wind would have to grow from 38GW to 60GW in 2022 and 140GW by 2030.

The last few years, however, saw small additions to wind and solar capacity. The CEA installed capacity data for wind and solar shows that 2020 has been a bad year as wind and solar grew by only 1GW and 3GW respectively. This means that India has two years to add 64GW of new solar capacity (about three times its growth in the last three years combined) and 22GW of new wind capacity (about two times its growth in the last three years combined).

8. Business Today (2020), 'India exceeding Paris targets; to achieve 450 GW renewable energy by 2030: PM Modi at G20 summit'. Published on: 22 November 2020. Accessed on: 21 January 2021. Available at: <https://www.businesstoday.in/current/economy-politics/india-exceeding-paris-targets-to-achieve-450-gw-renewable-energy-by-2030-pm-modi-at-g20-summit/story/422691.html>

This further substantiates the observations made by IEA in their ‘Renewables 2020’ report that found that the wind and solar capacity additions in India are lagging.^{9,10}

FIGURE 4



Achieving the 450GW of installed renewable energy capacity is absolutely critical for India. If this target is met, and if electricity demand doesn't sky-rocket post-COVID, then it's possible that India has already seen the peak of coal.

9. IEA (2020b), [Renewables 2020 - Wind](#).

10. IEA (2020c), [Renewables 2020 - Solar PV](#).

CHAPTER 3

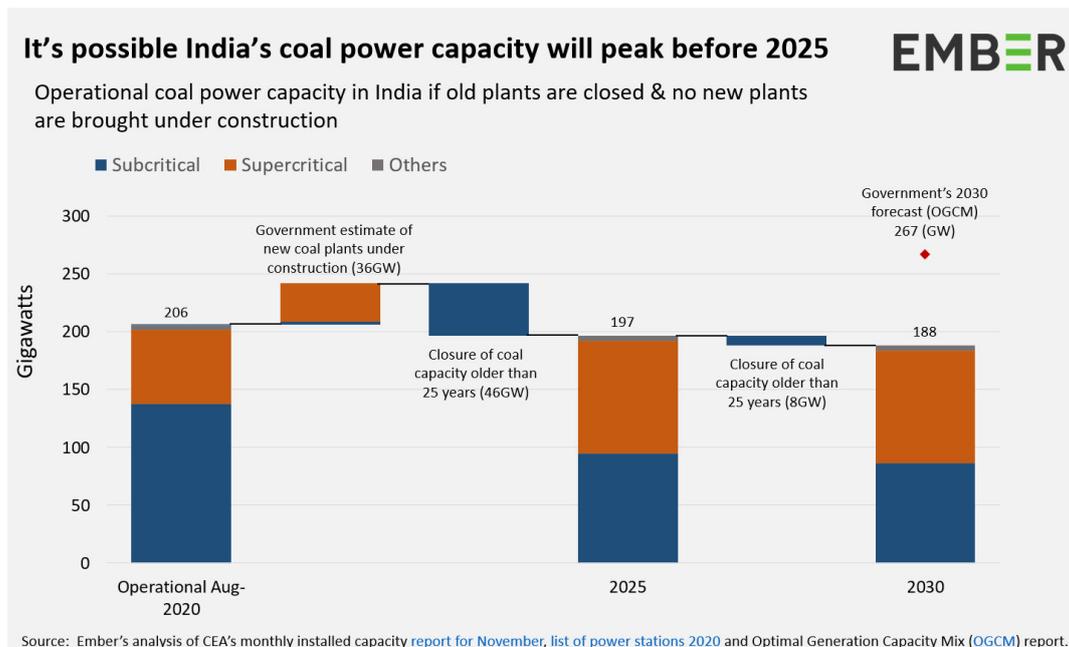
If coal-fired generation can peak, then can coal power capacity also peak?

India's coal plant load factor (PLF) fell to record low levels in 2020, as coal-fired generation fell and coal capacity continued to rise. In 2020, PLF (coal and lignite) averaged 53%,¹¹ a significant fall from 62% in FY 2015-16.¹² PLF is a key indicator of plant profitability – the less a plant runs, the less revenue it makes. If coal-fired generation doesn't rise in the future, building new coal power plants would only open them up to the risk of turning into loss-making stranded assets.

It is possible that India's on-grid coal capacity will actually peak within the next five years (Figure 5). However, there are two main factors that determine this:

- India delivering on its plans set out in NEP13 to close plants older than 25 years, and;
- India not building new coal power plants beyond those currently under construction.

FIGURE 5



11. Based on data from CEA monthly generation reports for 2020. Available at: <https://npp.gov.in/monthlyGenerationReportsAct>.

12. Ministry of Power (2020), [Power Sector at a Glance](#), Govt. of India. Accessed on: 01 February 2021.

If this happens, India's coal power capacity, which currently stands at 206GW, will fall to 188GW by the turn of the decade. This would be significantly less than the OGCM projection of 267GW of coal power capacity by 2030. These two factors are expanded upon in the sections below.

a. Retirement of plants older than 25 years:

By 2030, 54GW of the current coal fleet would be older than 25 years and could be considered for retirement (Figure 6). The Indian government, in its commitment to sustainable clean electricity development in NEP13, set out that coal power plants older than 25 years will have outlived their utility and hence would be considered for retirement along with plants without space for installation of Flue Gas Desulphurization (FGD) systems.¹³ Currently, about 38GW of coal plants are older than 25 years. This figure will rise to about 46GW by 2025 and about 54GW by 2030. Going by the current recommendation on retirement of old thermal coal units, more than a quarter of the current coal-fired capacity will be up for closure by 2030. This entire 54GW to be shut down by 2030 would be sub-critical coal power plants which are traditionally the dirtiest of all the coal plants.

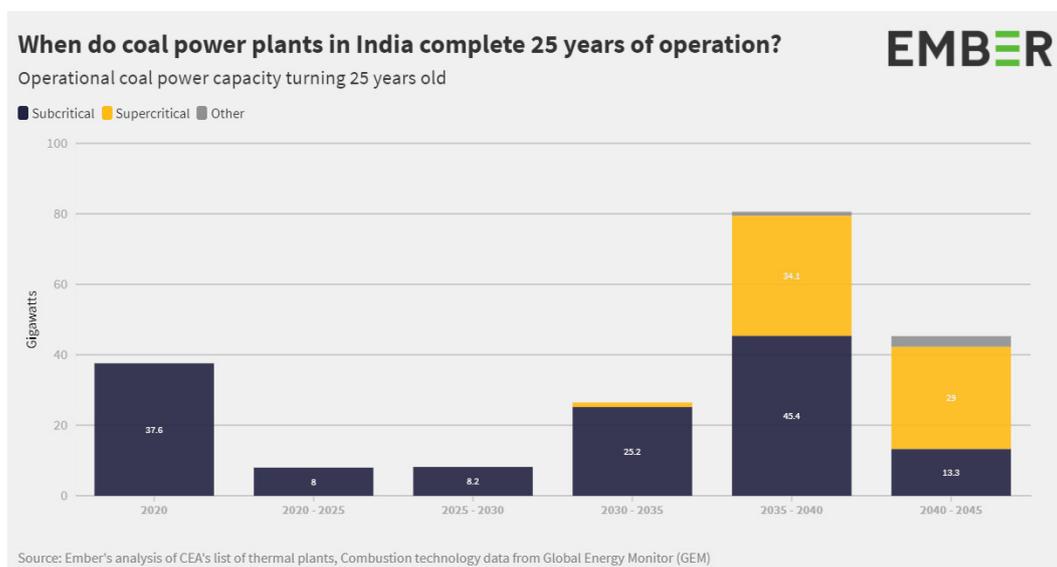
Moreover, a recent report by Climate Risk Horizons showed that India may be able to actually save up to ₹53,000 crores (~US \$7.2 billion) in the next 5 years by lowering the retirement threshold to 20 years.¹⁴ These savings would come in the form of avoided FGD and low NOx Burner retrofit costs as well as lower power purchase costs through replacement with renewable electricity. The government's requirement that older plants be retrofitted with emission control systems is already resulting in revenue losses to DISCOMs¹⁵ and could potentially be a death knell for older plants for whom this may be financially unviable. With the wide-ranging benefits of closing older coal plants now becoming more apparent, it is critical for India, at the very least, delivers on its commitments to retire existing coal plants older than 25 years.

13. See section 5.6.5 and pg. 5.12 in NEP13, [CEA \(2018\)](#).

14. Fernandes, A., and Sharma, H. (2020), [The 3Rs of Discom Recovery: Retirement, Renewables & Rationalisation](#). Climate Risk Horizons.

15. Pachouri, R. and Saxena, A. (2020), [Emissions Control in Thermal Power Stations](#). TERI, New Delhi.

FIGURE 6



b. No new coal plants should be brought under construction:

Government estimates from August 2020 suggest that only 36GW of new coal power plants are currently under construction. OGCM report set an on-grid coal capacity target of 267GW by 2030 – an increase of about 61GW from 2020.¹⁶ As per the information tabled in the Indian Parliament (see Table-2), as of August 31, 2020, India already has about 60GW of new coal-fired power plants under construction. However, due to various financial, political and technological reasons, about 24GW of this has been deemed unviable and categorized as “stressed.” Therefore, currently 36GW of new coal power plants are under construction.¹⁷

It is also interesting to note almost all of the 36GW currently deemed viable comes from public sector projects while the 23GW of the stressed coal power plants come from the private sector. This indicates that there are simply not many takers in the private sector for new coal power plant projects anymore in India. This supports the findings of a recent Institute for Energy Economics and Financial Analysis (IEEFA) report which suggested that in recent years, private investors have been increasingly reluctant to invest in the Indian coal infrastructure.¹⁸

16. See OGCM, [CEA \(2020\)](#).

17. Pillai, V. (2020), 'Over 33 GW of supercritical capacity in the making', T&D India. Published on: September 29, 2020. Accessed: 20 January 2021 . Available at: <http://www.tndia.com/33-gw-supercritical-capacity-making/>.

18. Buckley, T. (2020), [Who would still fund a new coal power plant in India](#), IEEFA.

TABLE 2

Coal-fired power plants: As of August 31, 2020

Capacity in MW

	Central	State	Private	Total
Under Construction (A)	18,320	17,760	23,730	59,810
Of which "stressed" (B)	500	0	23,205	23,705
Viable (A – B)	17,820	17,760	525	36,105
Of which supercritical	16,820	16,580	0	33,400

Source: [Pillai \(2020\)](#)

This data is consistent with the data available from Global Energy Monitor (GEM) whose January 2021 update showed 37 GW of non-captive coal power plants currently under construction. India's pre-construction pipeline of coal power plants also shrunk by half from 60 GW in 2018 to 29 GW in 2020. Additionally, only 2.8GW and 1.4GW of coal power capacity was newly proposed in 2019 and 2020 respectively.^{19,20} This suggests that building a new coal power plant is now getting increasingly difficult in India.

19. Shearer, C. et al. (2020), [Boom or Bust 2020](#), Global Energy Monitor.

20. GEM (2020), [Global coal plant tracker, January 2021](#), Global Energy Monitor. Accessed: February 3, 2021.

CHAPTER 4

Ensuring the peak of coal power in India

The findings of this report show that there is now an opportunity to ensure coal-fired generation doesn't bounce back after two years of falling coal. As India recovers from the COVID-19 pandemic shock, the choices it makes for its power sector can make or break its coal-to-clean electricity transition in the next decade. This report makes the following key recommendations:

i. Remove barriers to ensure wind and solar targets are met

The Indian government has set and committed to big wind and solar targets. However, the progress has been slow, and there are many barriers to achieving such a level of growth. In recent times, land acquisition issues and delays in grid integration slowed down wind installations.²¹ Cancellation or renegotiation of existing power purchase agreements (PPAs) by cash-strapped power distribution companies (DISCOMs) to buy cheaper wind and solar power have undermined the sanctity of existing PPAs.²² Lack of consistent state-level policies and reluctance of DISCOMs to invest led India's roof-top solar installations (currently at 5GW) to severely lag behind the 2022 target of 40GW.²³ Further, spending on battery storage, which is crucial to overcome intermittent nature of wind and solar power, also remains low.²⁴ Therefore, for India to meet its own wind and solar targets, a coordinated national policy effort to remove aforementioned barriers to wind and solar growth is absolutely essential.

21. Kaavya Chandrasekaran (2020), 'Land, grid issues slow down commissioning of central wind projects', Economic Times. Accessed: 15 January 2021. Available at: <https://economictimes.indiatimes.com/industry/energy/power/land-grid-issues-slow-down-commissioning-of-central-wind-projects/articleshow/79128989.cms?from=mdr>

22. Pratha Jhavar (2020), '*Renewable energy: It is crucial to honour signed contracts*', DownToEarth. Accessed on 21 January 2021.

23. Rakesh Ranjan (2020), 'India on Pace to Install 65 GW of Solar by 2022, Far Off the 100 GW Goal', Mercom India Research, India. Accessed on 21 January 2021 Available at: <https://mercomindia.com/india-pace-install-solar-2022/>

24. See IEA (2021)

ii. Moratorium on building new coal power plants

If India seizes the opportunity to ensure that coal-fired generation has already peaked in 2018, building new coal power plants would not really be necessary. Moreover, the financial viability of new coal power plants remains dubious as they are unable to attract funding.²⁵ After the current set of plants come online, it's looking less likely that new coal power plants will be built. However, with a large pipeline of consented projects there is considerable uncertainty, which is sending wrong signals over the need for new coal mines. Critically, it is also distracting from stepping up renewables investment. The Philippines announced a moratorium on new greenfield coal power plants to encourage investments in other energy sources in November 2020;²⁶ a similar move in India would help to attract clean investment.

iii. Incentivise closure of old coal power plants

In January 2017, through NEP13, the Indian government set forth a schedule until 2027 to retire on-grid coal-fired plants older than 25 years. In the last few years, pervasive health and environmental issues have also led to commitments from the government around closing older coal plants not meeting emission norms.²⁷ However, India is yet to legislate this. Recent reports on India's Ministry of Power considering allowing retired coal power plants to keep selling power for additional revenue underline the fact that India needs a proper plan to phase out old coal plants.²⁸ This is even more pertinent in light of findings from the Climate Risk Horizon report²⁹ that show that closing coal power plants older than 20 years can not only provide immediate savings to financially stressed DISCOMs, but also yield system-wide financial benefits. Incentivising DISCOMs to retire old coal power plants and repurpose the sites for RE generation and storage, along with conveying a clear intent to penalise any operational old coal plant, would put India in a better position to transition to a cleaner, cheaper electricity sector.

25. Centre for Financial Accountability (2020), [Coal vs Renewables: Financial Analysis 2019](#).

26. Reuters (2020), 'Philippines shuts door on new coal power proposals'. Published: 4 November, 2020, Accessed: 29 January, 2020. Available at: <https://www.reuters.com/article/philippines-energy-idUSL4N2HQ1Z9>.

27. Hans India (2020), 'Old thermal power plants to be shut says Nirmala Sitharaman'. Accessed: 24 January 2021. Available at: <https://www.thehansindia.com/business/old-thermal-power-plants-to-be-shut-says-nirmala-sitharaman-601722>.

28. Reuters (2020), 'India plans to allow relinquished coal-fired plants to sell power, Reuters'. Published: December 6, 2020. Accessed: 23 January 2021. Available at: <https://uk.reuters.com/article/india-power-coal/india-plans-to-allow-relinquished-coal-fired-plants-to-sell-power-idUKL1N2IM03D>.

29. See chapter 3, section (a)

iv. Moratorium on new coal mine auctions

If coal-fired generation has already peaked in 2018, there is no need for new coal mines. With India's current total mining capacity already exceeding the coal demand in 2030 by 15%-20%,³⁰ these new coal mines, if operationalized, will run a real risk of ending up as stranded assets. Proponents suggest that the commercial coal mine auctions would create new jobs. However, private mines are usually more mechanised and don't employ as much as state-owned mines. Furthermore, wind and solar will provide far more investment and jobs than coal does (although not fungible), and coal only serves to crowd this out. The underwhelming response to the recent coal mine auctions where many coal mines received no bids also reflect little appetite for investment in the sector. Therefore, India should consider placing a moratorium on new coal mine auctions to refocus its efforts on its solar transition, rather than coal expansion.

30. Centre for Research on Energy and Clean Air (2020), [*Does India need new coal mines to meet it's 2030 demand?*](#)

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