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Failure to load: India's power crisis is a coal management crisis

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The timing of it couldn't be worse: India is battling one of its worst power crises in six years while witnessing its hottest summer in more than a century, exposing millions of Indians to severe heatwaves.

While worsening summers indicate the impact of climate change, power cuts result from poor governance, forecasting and planning. The solutions to these issues would need to work on entirely different time scales. While the former requires global cooperation and long-term commitments, the latter can be addressed through better planning by regional and national governments. In neither of these, investing further in coal mines or power plants plays a role.

India's power crisis is neither new nor unpredictable. Yet, despite becoming a recurrent theme, the Centre and other stakeholders in the coal sector continue to invest and push for new coal. The sector's failure is used to further the long-held narrative to open new coal mines and invest in new coal-fired thermal power stations.

Despite these measures, coal continues to fall short of India's power needs. Does this indicate a more significant push to invest in coal mines and coal-based power stations? In this report, we analyze the making of India's power disaster.

Waiting for a crisis

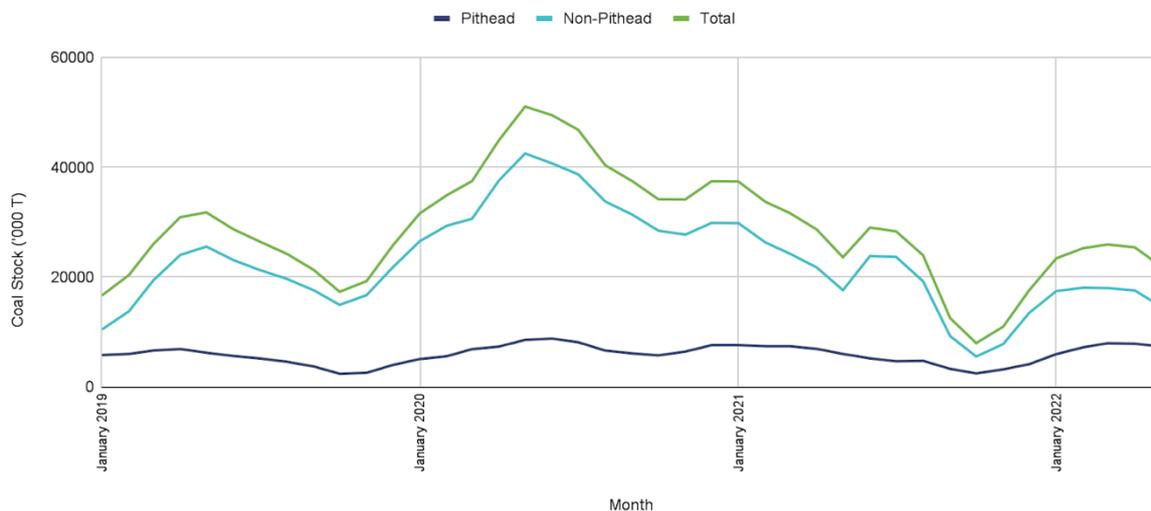
Just seven months back, in October 2021, India faced a power crisis. During this time, power stations were down to just 8 million tonnes of coal¹, sufficient for four days of operation.

¹ Daily Coal Report, National Power Portal (NPP)- <https://npp.gov.in/dailyCoalReports>

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The situation hasn't improved much since then. As of May 2022, non-pithead power stations have only six days of coal left, against the stipulated 20-26 days by the Ministry of Power². On the other hand, pithead power stations have coal stock enough for 13 days of coal stock. While the former are power stations that depend on long-distance transport and imported coal for their coal needs, the latter have their captive transportation systems from the mines directly. The total stock of non-pithead power stations fell to as low as 13.6mt on May 17, 2022, down from the opening stock of the month at 14.7 mt. This amount is sufficient to power the country for only seven days.

Coal Stock Position at pithead and non-pithead Power Stations ('000 T)



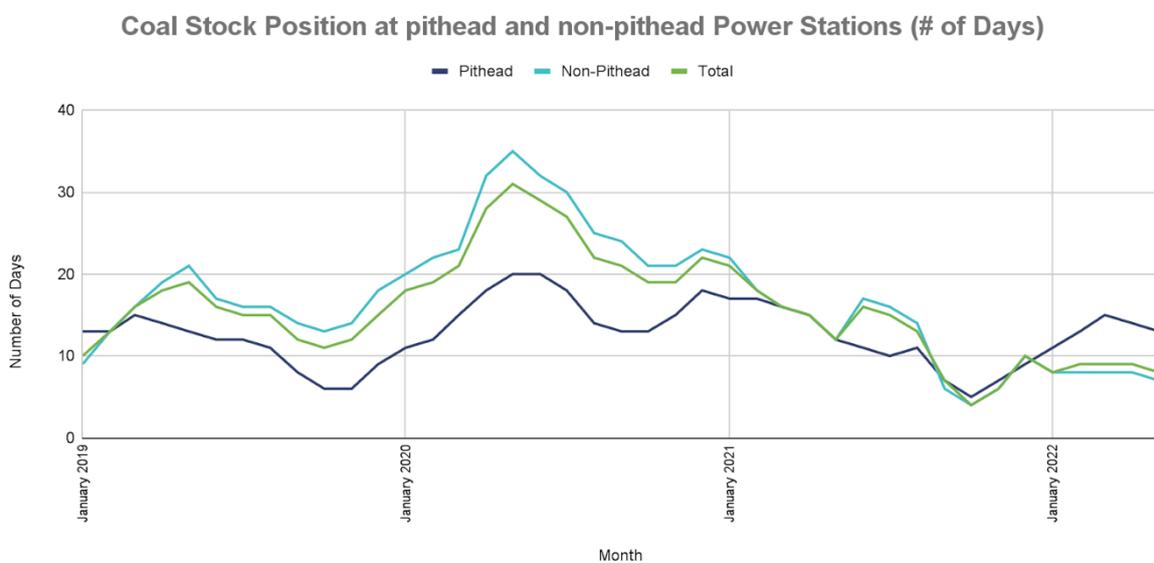
However, the current situation is not something that started in the recent past. The graphs above show that since May 2020, coal stock at power stations has been reducing consistently, barring a few months in between. The primary reason for the power crisis last year was the inaction of power plant operators to stock adequate coal before the onset of the southwest monsoon. The timing is crucial as the monsoon floods coal mines, hampering their production and transport to power stations.

When the country was loosening its corona-induced restrictions on commercial and industrial activities in June 2021, the coal stock at non-pithead power stations was 17.6 MT. However, as hot and humid summers added to the demand, power stations were not

² <https://economictimes.indiatimes.com/industry/energy/power/gencos-may-face-action-over-low-coal-stock/articleshow/91582371.cms?from=mdr>

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able to keep up with their stipulated stock requirements. In July-August 2021, coal stocks were reduced to just 5.5 mt at non-pithead power stations, enough to last the country just four days and led to the power crisis last year. Similar to last year, a lower pre-monsoon coal stock at power stations indicates the possibility of another power crisis in July-August 2022.



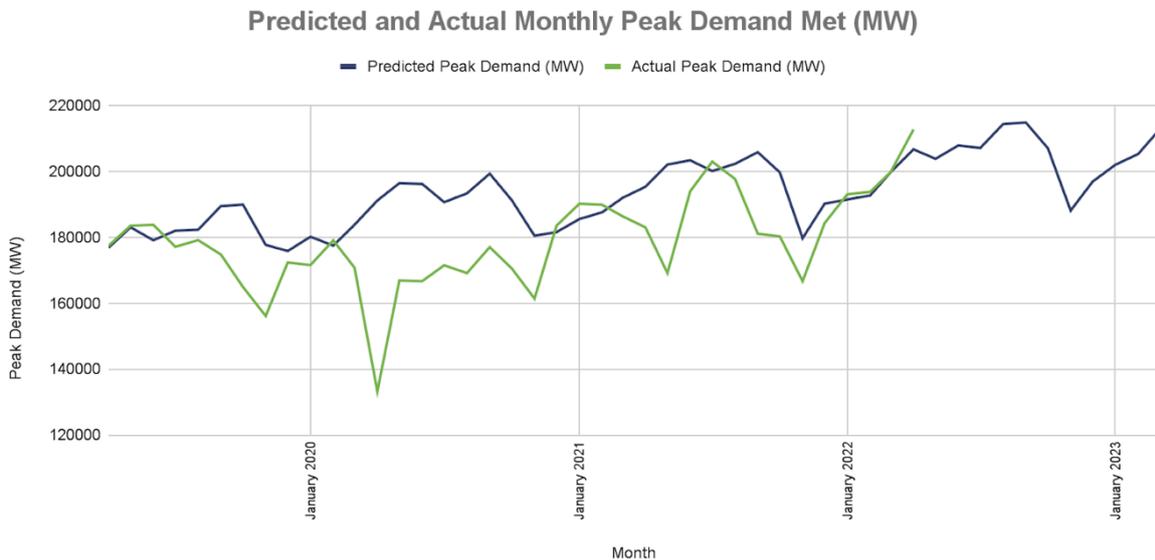
Since October 2021, power stations have seen a slight build-up of stocks. However, it never reached the normative stock requirement for non-pithead power stations (i.e. non-pithead power stations constitute a cumulative capacity of 164 GW).

Coal stock at power stations has been reducing since February 2022. This gave regulators at least three months to prepare and avoid the coal crunch at power stations, especially when the peak season was around the corner, even as per CEA's own estimates (as illustrated in the graph below). Regulators also know that monsoons impact coal mining and transport, which would result in lower supply at a time of peak demand.

The data presented above, all compiled from official sources, indicate the need to plan for coal transportation well in advance and coal power plants are in no position to address even a minor spike in power demand, leaving millions of people without power or increasing short term power prices for distribution companies considerably. As argued above, current coal stocks at power plants stand at 13.5 mt at pithead power stations and

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20.7 mt cumulatively at all power stations across the country. The Central Electricity Authority of India (CEA) predicts an even more significant peak demand in August 2022 at 214 GW. In addition, the average energy demand could also increase to more than what it is in the month of May 2022 to 1,33,426 MUs. If coal stocks are not replenished to adequate levels before this year's monsoon, the country might be heading towards yet another power crisis in July-August 2022.

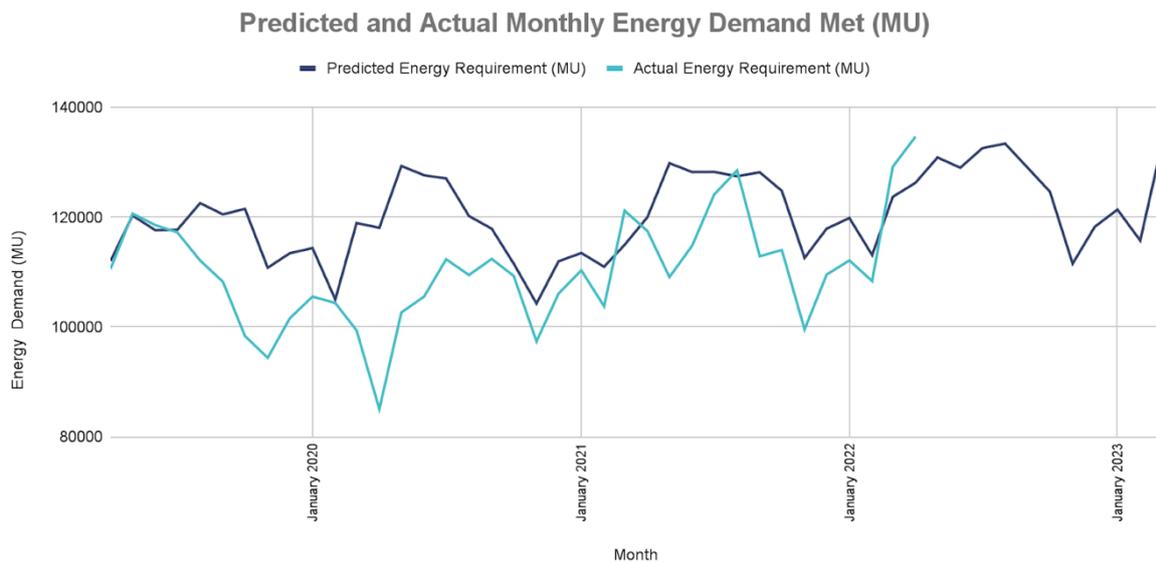


Coal availability and dispatch

The energy requirement for March 2022, as forecasted by the CEA in its [LGBR report](#) for 2022-23, was 1,23,713 million units (MUs). However, the actual consumption was 1,29,187 mu, 4% higher than the estimated demand. Similarly, in April, the predicted requirement was 1,26,283 MUs, while the actual consumption was 1,34,701 MUs. This shows a severe underestimation of the demand and that the regulators did not account for the extra demand during summers.

CREA's analysis shows that if the gap between predicted and actual energy requirements were to be filled, only about 9 MT of additional coal was required for March and April 2022. This is approximately 14% of the normative stock requirement at power stations.

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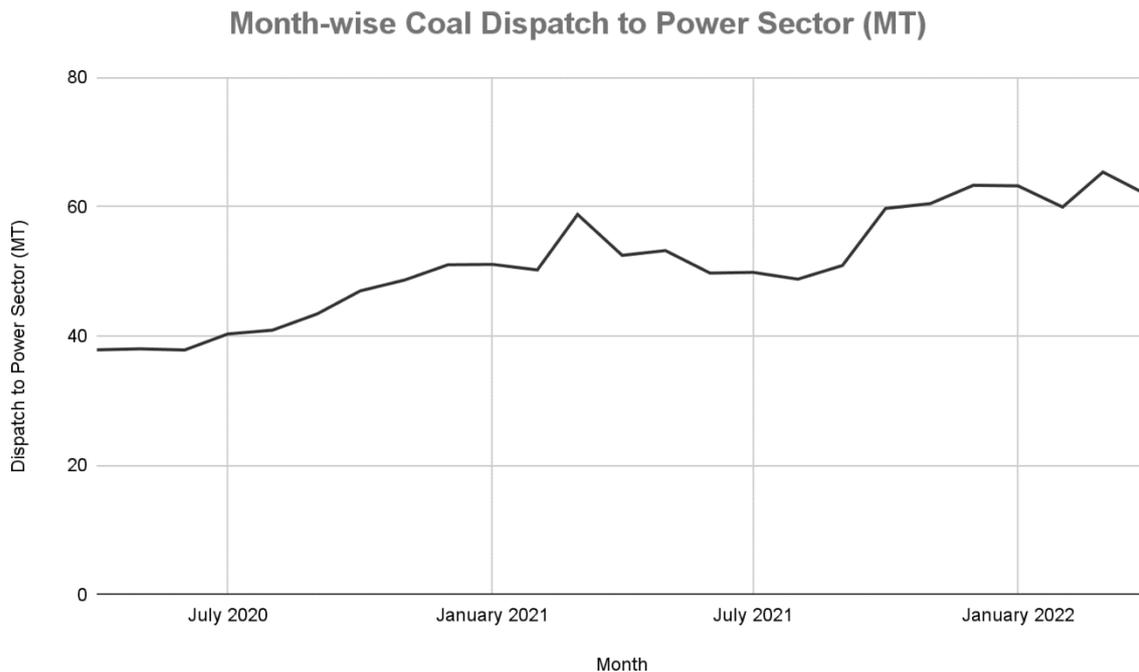
If the coal stock at power stations were maintained as stipulated, the country would have well sailed through this power crisis, even accounting for the extra demand from heatwaves. These trends show that thermal power stations were not adequately stocked despite adequate coal mining. India's coal production was 777.26 MT in FY22 against 716.08 MT in FY21, an increase of 8.54% Year on Year (YoY), recording the highest ever production in India's coal history.

**Table: Company-wise production of raw coal during last ten years
[Quantity in Million Tonnes]**

Company	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
CIL	431.32	435.84	452.2	462.41	494.23	538.75	554.14	567.37	606.89	602.13	596.22	622.64
SCCL	51.33	52.21	53.19	50.47	52.54	60.38	61.34	62.01	64.4	64.04	50.58	65.02
Others/Captive	50.04	51.9	51.01	52.88	62.41	40.09	42.39	46.03	57.43	64.7	69.29	89.60
Total	532.69	539.95	556.4	565.77	609.18	639.23	657.87	675.4	728.72	730.87	716.08	777.26

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Total Dispatch by CIL & SCCL in FY22 was 727.43 MT against 623.01 MT in FY21, increasing 16.76% YoY. The dispatch to the power sector from the two miners increased to 592.98 MT in FY22 from 483.91 MT in FY21, a growth of 22.54%.



According to data compiled from various sources, India had a total mineable capacity of over 1,500 million tonnes as of 2021. The total production stood at 777.26 MT in FY 21-22, approximately just half of its production capacity. Therefore, if there was a real coal shortage, coal companies had the simple option of simply increasing production.

The vendible/dispatchable coal stock at CIL & SCCL mines was 65.35 MT as of March 31 2022, against 104.39 MT in FY 21. This shows that despite coal stock at mines being depleted over the years, it is still viable to support coal-based power stations across the country for about a month.

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Table: Company-wise dispatch of raw coal during last ten years [Quantity in Million Tonnes]

Company	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
CIL	423.78	432.62	464.54	470.92	488.86	534.08	542.98	580.01	607.95	581.23	573.63	661.89
SCCL	50.05	51.39	52.03	47.89	52.66	58.69	60.79	64.62	67.67	62.47	48.51	65.53
Others/Captive	49.64	51.29	50.57	53.25	62.25	39.67	42.21	45.37	57.17	63.07	68.75	90.72
Total	523.47	535.30	567.14	572.06	603.77	632.44	645.98	690.00	732.79	706.77	690.89	818.14

The coal vision document by Coal India Limited notes that the total capacity of mines allocated/ auctioned to Coal India Limited as of 2017 was about 1,000 MTPA at then rated capacity, showing higher mining capacity than the current demand. Of the 300 mines that CIL operates today, it produces more than 75% of coal from just 37 mines where the production was increased by 34% in April 2022 amid the increasing demand, showing faster mining ramp-up capacity by concentrating on just a few efficient already operational mines.

Taking coal where it needs to be

The overall coal production increased by 22.5% in FY22, enough to cater to increased demand from the power sector. At about 57% share of overall coal transport, the Indian Railways is the leading mode of transport for coal by CIL and SCCL. Road transport comes second with 26%, MGR (or the merry-go-round system) accounts for 15% while the remaining 2% is transported using conveyor belts.

- Some 411.95 MT of coal was dispatched by CIL & SCCL through rail in FY22 against 368.03 MT in FY 21 showing a growth of 11.94%.
- Transportation of coal through rail was lower in March 2022 against March 2021 by 6.19% MoM dropping to 37.64 from 40.13 MT for the month

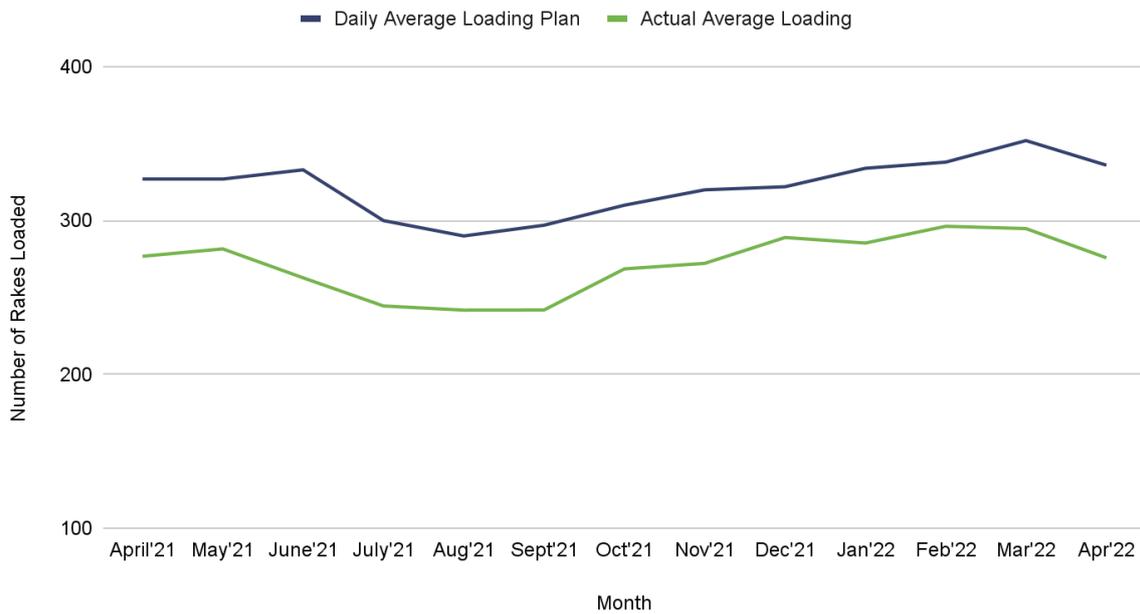
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- Road transport of coal increased by nearly 50%, from 191.53MT to 128.07 MT this financial year. In March this year, coal supply by road increased by 42% compared to last month – indicating that power stations near mines were getting stocked up.
- The MGR system saw a slight decrease of 0.59%, from 111.39 MT to 112.05 mt in FY21.
- Coal supplied through conveyor belts decreased from 11.67 mt last financial year to 10.78 MT in FY 21, a decrease of 7.59%.

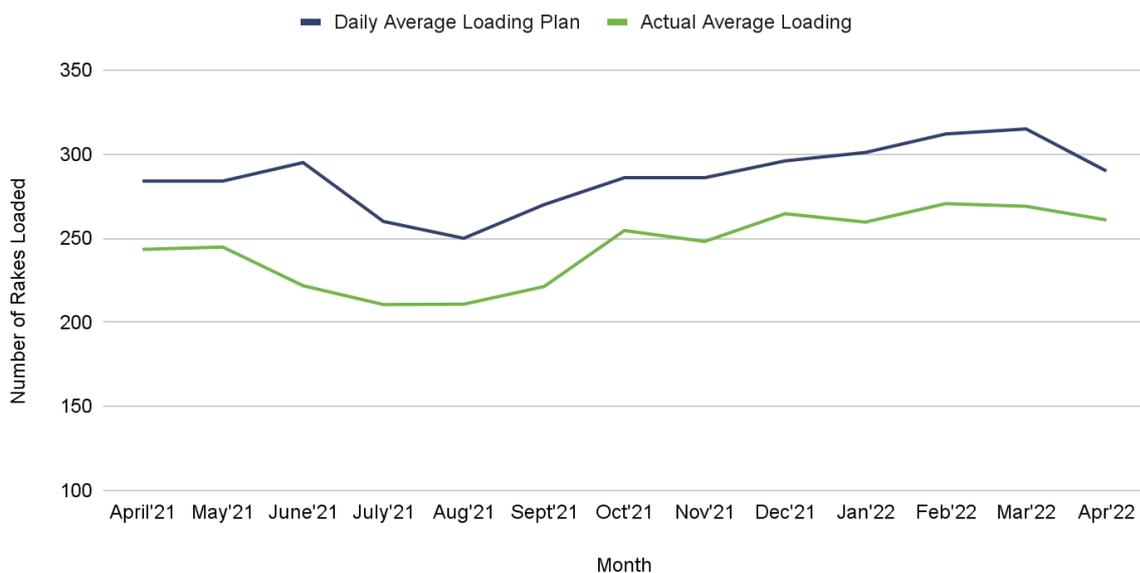
It is evident from the data presented above that coal transportation and management were not sufficient to keep up with increased coal demand from the power sector. The resulting decline of coal stocks at power stations led to more than half-pithead power stations reaching critical stock. In a statement last month, the Indian Railways said: "The railways has increased the number of rakes for the supply of coal to 410 per day in April to expedite the supply of coal to power stations from 305 rakes per day in September". The average number of rakes loaded in March and April 2022 was lower than last year. The highest number of rakes loaded by CIL was 372.5 rakes on March 19, 2021. The data compiled by the Union ministry of coal shows that more than 90% of the rakes loaded in 2021-22 by CIL were destined for the power sector. However, the average loading target for loading the rakes at CIL wasn't met in the past months. The following graphs present the daily average loading plan Vs the actual average daily loading by CIL for all sectors and specifically for the power sector.

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Number of Rakes loaded/Day by CIL- Planned Vs Actual



Number of Rakes loaded/Day by CIL for Power Sector- Planned Vs Actual



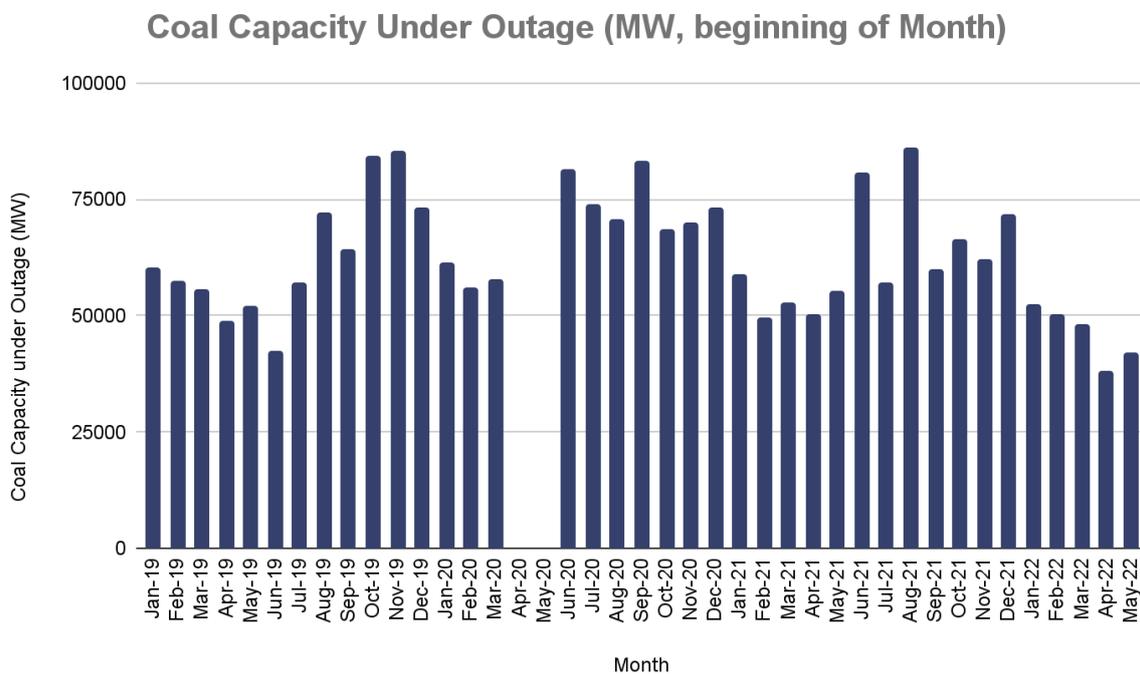
The charts above show that the current power crisis would have been averted if India would have added 50 rakes per day through the railways.

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Power generation capacity isn't a bottleneck

When India hit its peak power demand on April 29, 2022, some 20% - or 41.6 GW out of 210.7 GW – of its coal power generation capacity were facing outages. This number goes up to 58 GW if the failure of gas power stations to meet power demands is included. Out of a total outage of 58 GW, only 6.2 GW was planned as part of the routine maintenance schedule.

Despite these outages, India had enough power plants online to meet the sudden spike in demand. Between January 2019 to May 2022, on average, 60 GW of India's power capacity was under outage (figure below) at the beginning of the month while the peak demand was met almost at all times (barring few, where there were grid stability issues). Such highly inefficient operation of the power generation capacity increases the cost of electricity generation and stranded assets.



*Data for April and May 2020 wasn't available

The figure above also highlights that the power crisis over past years has not been due to a lack of power generation capacity, and the answer to resolving the power crisis in India does not lie in building more coal-fired power stations.



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Way ahead and looming Threats-

- Focus government and private sector attention on effective utilization of existing assets rather than building new ones, mainly coal-fired power stations and new coal mines.
- Ramp up the coal transportation to power stations to build up coal stocks before the monsoon starts by ensuring efficient utilization of railway rakes
- Manage coal mines to ensure adequate supply while protecting stored coal from flooding caused by monsoons.
- Rationalize coal linkages to ensure the shortest distance travelled by railway rakes
- Ensure coal dispatch to power stations that are critical for grid stability and those located in energy-insecure states
- Ensure faster import of coal to coastal power stations on a priority basis
- Run awareness and public outreach campaigns to stabilize the demand by demand-side management and reduce the wastage of electricity and enhance the efficiency of electricity usage by all consumers
- In the long run, India needs to reduce its dependence on dirty fuels of the past and diversify its energy mix by accelerating renewable energy and storage options.

About CREA

The Centre for Research on Energy and Clean Air (CREA) is an independent research organization focused on revealing the trends, causes, and health impacts, as well as the solutions to air pollution. CREA uses scientific data, research and evidence to support the efforts of governments, companies and campaigning organizations worldwide in their efforts to move towards clean energy and clean air, believing that effective research and communication are the key to successful policies, investment decisions and advocacy efforts. CREA was founded in December 2019 in Helsinki and has staff in several Asian and European countries.