India’s coal crisis explained in graphs

-Sunil Dahiya & Shivansh Ghildiyal

The issue of coal shortage has once again been dominating the headlines in India. Despite many pro-coal reforms that India has taken in the past years, the issue of shortage does not seem to be getting resolved and has become a ritual event every year or every other year. Most of the time the coal crunch is eased through imports but in 2021 the country hit a perfect storm situation where extreme weather in India and disrupted coal supplies globally resulted in higher coal prices internationally. The coal power sector, caught between high international coal prices and short stocking of coal by power plants/supply of coal, went into crisis in the later part of September 2021 with many power plants operating with dwindling reserves.

*Here we analyse the probable causes of the crisis using data from Central Electricity Authority (CEA) and Ministry of Coal (MoC).*

**Figure 1: Electricity demand: Peak daily demand (MW) and total daily energy demand (MUs)**
Peak demand and electrical energy demands were higher in 2021 compared to previous years. India’s highest-ever peak demand was on 7th July 2021 at 200.57 GW, which was also the day when maximum energy consumption was reached for any given day at 4568 MUs. The following month, August, also followed with a similar but lower peak both for peak energy demand and energy consumption at 196.2 GW and 4536 MUs, respectively. One could also observe that the demand curves dips through the winter months and starts to steadily pick up and reach peak in summer.

Figure 2: Daily Source-Wise Electricity Generation Since January 2019

Despite the unprecedented demand for electricity in July and August 2021, contribution from coal plants remained lower thanks to higher generation from renewable and hydro sources. This to a large extent helped in meeting the demand and giving a breather to coal power plants.
Despite lower generation from coal-based power plants and higher contributions from renewable energy and hydro generation sources, coal-based power plants are facing a resource crunch with just few days of coal stocks available. Coal-based power plants, which had 50.9 MT (million ton) of coal stocks in April 2020 (31 days of stock) and 28.8 MT (16 days stock) in May 2021, are now facing a crisis when the coal stock at power plants dropped to 8 MT at the end of September 2021. This further reduced to 7.3 MT (just enough for 4 days) at the end of the first week of October 2021.

The severity of the situation appears even worse when the data is seen on a more detailed level. The number of power plants with zero, one, two, three, four, five and more than five days of coal stock available (as on 7th October 2021) were: 16 (16.9 GW), 30 (37.4 GW), 18 (23.5 GW), 19 (29.1 GW), 9 (8.9 GW), 7 (8.7 GW) and 36 (40 GW), respectively.

- The coal stock at power plants was at its peak (50.9 MT) in April 2020, when the pandemic had hit, reducing power demand during the pandemic led to stocking up of coal.
- The coal crunch/crisis faced by power plants over the past few weeks hasn’t been built overnight or even over the past few weeks, instead it is a gradual decline in coal stock at power plants since April 2020 (with minor net additions over November-December 2020 and May-June 2021).
CIL's production varies over different seasons and months and it usually produces maximum coal in March every year (financial year closing) leading to the build-up of good stocks by the country's biggest miner.

The figure also shows that:

- **CIL produced 84 MT in March 2020 and 81 MT in March 2021 ramping up production by approximately 20 MT from previous months.**
- **The lowest monthly production by CIL since January 2020 was observed at 37 MT in August 2020, while it’s procuring between 41-43 MT since May (May-September 2021), approximately half the capacity it produced in the month of March for the past two years.**
- **Coal stock at CIL increased from January-March 2021 and the decline which started in March continued until August, but the opening stock for September 2021 was still higher than the same period the previous year.**
- **Coal dispatch to the power sector by CIL stands at around 40 MT in September 2021 while the opening stock of coal with CIL was 70 MT in September 2021.**

**Figure 5: Monthly coal production by 39 big mines under CIL Vs CIL total production**
Figure 5 is a compilation of coal production data for 39 big mines under CIL compared to CIL's overall production and indicates that:

- 75-83% of CIL's total production since January 2020 has come from these 39 mines which had monthly production in the range of 30-63 MT and were producing 31 MT in September 2021.
- Monthly mining capacity at just these 39 mines can be ramped up by at least 30 MT (based on past production, where the monthly production was ramped up by approximately 15 MT between February-March for both 2020 and 2021. The production can further go up if Piperwar, Karo under CCL and PKOC, RGOC III Extension, JVR OC II and Ramagundam OC I Exp. Ph II under SCCL starts production which did not produce in September 2021).
- Coal production both for the 39 big mines as well as the CIL total was higher for 2021 for the April-August period compared to the same period in 2020.

According to CEA the reasons for the coal shortage at power plants on 7th October 2021 were as following:

- Approximately 14.8 GW capacity out of 166 GW monitored by CEA at 136 power plants had coal shortages due to regulation barriers or outstanding dues.
- 12.3 GW didn’t maintain the coal stock or regulate the supply to their plant resulting in shortage at present.
- 77.4 GW highlights shortage of coal from CIL’s subsidiaries as the reason for lower coal stock at the power plants.
- 14 GW either have bridge linkages or have captive mining facilities.
- 13 GW had issues in transporting coal or unloading constraints.
- 25 GW has no coal shortage and had more than 7 days of coal stock, while 7 GW power generation capacity was receiving coal supply as per payment.
Conclusion

- The country saw an unprecedented demand in the months of July and August 2021, which means that coal power plants would have depleted their coal reserves faster than they anticipated.
- The peak demand as well as energy demand did come down from its peak in July-August 2021 following the seasonal pattern. It’s likely that power companies did not want to stock up coal anticipating the dip in demand due to covid or seasonal dampening of demand. The other reason might be longer monsoons than anticipated which led to further deterioration of coal stock at power plants.
- Coal and lignite-based power generation, even while meeting the highest-ever demand during July-August 2021, was less compared to February-April 2021, primarily due to higher contributions of generation from hydro and renewable energy sources over the period.
- Renewable energy generated 34% more electricity in the month of September 2021 as compared to 2019 for the same period (pre-Covid-19 period).
- Given that CIL’s production has remained consistent since April 2021 and the dispatch to power sector also remained steady with healthy coal stocks remaining with CIL, it’s very unlikely that the current crisis is due to a lack of coal mining or despatch. There is very little evidence on the impacts of heavy rainfall on mining and despatch as well.
- It’s clear that there was steady supply from CIL since September 2020, however there was considerable coal stock reduction at the plant level due to increased demand since January 2021 and lack of efficient planning.

In conclusion, it seems that coal power plants had ample time and indication since January 2021 on how demand would pick up. However, coal stock at the power plants seems to have depleted since September 2020. Given that there was consistent coal production going on in the country, they should have been in a position to offtake coal even before the start of the monsoon. Even though there was a slight increase in coal stock with power plants in May 2021, that proved to be far insufficient given the unprecedented demand the country saw in the months of July and August 2021. This raises a big question on the ability of power companies to understand and project demand in a reasonable manner. It is also very likely that coal plants were expecting another COVID wave in September - October 2021, i.e. reluctant to stock coal.

In addition, CIL might not have been able to organise additional railway rakes within a short time to increase its despatch during the monsoon, but this needs further investigation.

In either case the crisis could have been avoided if there was reasonable prediction on demand and timely uptake of stock by the power companies. Contrary to popular narrative,
this is not a coal crisis or installed coal power capacity crisis but a management crisis. New coal mines and power plants are unlikely to solve the issue, rather high quality power demand projection and strict monitoring of coal stock at power plants would avert such a crisis in the future.