POWER PERSPECTIVES

An initiative by Prayas (Energy Group)

Black Gold, Blind Spots: Data formats for improved management of coal production, supply and generation

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Coal supply is critical to India's power generation, given the sector's continued reliance on coal. Data plays a vital role in assessing supply dynamics and mitigating shortages, yet blind spots persist despite institutional efforts such as periodic reports and data portals. This article aims to bridge these gaps by proposing enhanced data formats and disclosures to improve coal supply monitoring and planning. It outlines data-related recommendations in four critical areas: improving coal supply, optimised resource utilisation, addressing logistics bottlenecks, and improved planning and projections. Addressing these blind spots will help in the efforts to strengthen the coal supply chain, mitigate future power crises, and support a shift from short-term fixes to long-term planning.

1. Introduction

India experienced significant power shortages in April 2022 and September 2023. While the former was driven by the high demand typically seen during the summer months, the latter was an unseasonal power shortage during the monsoons. Such supply disruptions undermine the reliability of the grid and hinder the country's development.

Institutions like the Ministry of Power (MoP) have taken cognisance of this and floated measures to address several sectoral challenges that have been linked to these recent power shortages. This includes steps such as addition of 80 GW of coal-based capacity by 2031-32, with around 9.35 GW already commissioned and more in the construction or pre-construction stages. Large-scale hydroelectric, nuclear, renewable, and energy storage capacities are also being added. A robust national grid continues to be expanded to ensure efficient transfer of power across regions. Key interventions also include reducing partial outages and reviewing non-operational capacity, rescheduling maintenance to the monsoon season, and expediting capacity addition. Surplus power from captive plants is being utilised and traded on energy exchanges.

Although these steps are intended to address and circumvent the challenge of power shortages, they have often been ad hoc responses that have been put in place in the aftermath of power shortages. Ensuring a proactive and prudent approach in addressing the rising demand, and minimising shortages, is necessary given that supply and demand complexities are only going to further compound as the transition continues and weather variability increases. Rigorous tracking of key metrics and continuous monitoring will strengthen the sector's ability to anticipate and manage shortages while enhancing transparency and ensuring accountability in the implementation of institutional measures.

In this context, this article explores a few data formats that can aid in improving data reporting and enhancing disclosure practices for more effective oversight and better decision-making while

addressing the country's growing demand and continued reliance on coal-based generation. This article specifically suggests data formats with regard to measures taken to address the challenges in coal-based generation – like coal shortages, challenges in coal supply logistics, insufficient resource utilisation, and lapses in planning.

2. Gaps in data reporting: An example

In September 2023, the Central Electricity Authority (CEA) introduced the Daily Consumption Gap Report to track supply and demand imbalances of coal consumption in domestic coal-based power plants. This daily aggregate report provided details on the receipt and consumption of coal in domestic coal-based power plants, along with the gap filled by imported coal and by depletion of reserves. Such reporting was a crucial step towards understanding the role of coal supply during shortages. But regular publication of this report began only ex-post, and in the absence of sufficient data metrics, the shortage of domestic coal was assumed to drive the significant power shortages witnessed in April 2022.

In response, MoP issued an advisory to coal-based power plants recommending the blending of imported coal. The first such advisory was issued on 28th April 2022 and the final advisory remained in effect until 15th October 2024 – with repeated renewals and varying import blending requirements being issued during this time period. Earlier iterations of the advisory even included penal action for non-adherence to the blending requirements as stipulated in the applicable MoP notification.

However, this blanket reliance on expensive coal imports was likely misdirected, given that the issue of power shortages does not appear to be driven solely by domestic coal scarcity. For instance, during the electricity shortages of April 2022 (2,148 MU) and August 2023 (841 MU), an estimated 1.48 MT and 0.58 MT of coal would have been required to bridge the gap, assuming a Specific Coal Consumption (SCC) of 0.69 kg/kWh. At the end of these months, vendible coal stocks at mines stood at a substantial 61.93 MT and 48.92 MT, respectively. This indicates that domestic coal was available, but much of it remained at the mine end rather than reaching thermal power plants (TPPs) in a timely manner. Given this, the core challenge appears to be logistical, hinging on ensuring the efficient and timely transportation of coal to TPPs.

Thus, reporting and monitoring of key metrics is crucial towards identifying gaps, ensuring targeted responses, and minimising shortages. Unfortunately, despite the advantages it offers, data reporting and tracking are lacking on several fronts. For instance, the publication of this Daily Consumption Gap Report was stopped in mid-November 2024. Despite the improved coal supply, continuous monitoring remains essential to track consumption gaps proactively and prevent future shortages. On similar lines, several other measures that have been rolled out to prevent shortages can also be further strengthened by improved data reporting.

3. Improvements in data reporting: Strengthening transparency and accountability

Electricity shortages are not only anathema to the state, but also are significant obstacles towards the country's developmental goals. Several wide-ranging measures are underway to prevent coal shortages in order to minimise electricity shortage. These range across steps aimed at enhancing coal supply, optimising resource utilisation, addressing logistics bottlenecks and improving planning. The following sections propose data formats to supplement some of these

interventions. These formats are will improve understanding of progress and impacts of these measures, while ensuring transparency and accountability.

3.1. Improving coal supply

The Ministry of Coal (MoC) has undertaken several initiatives to enhance coal production and reduce reliance on imports. The National Coal Portal tracks the coal production data on a daily basis. In addition to this the MoC regularly publishes various periodic reports such as the monthly Statistical Report, tracking parameters related to coal production.

In this context, as a measure to improve and streamline procedures related to coal mining, MoC launched the Single Window Clearance System (SWCS) in 2021. This system provides a unified platform for obtaining all necessary clearances and approvals required to operationalise coal mines as well as augmentation of coal production in the country through a single gateway.

Given India's continued reliance on coal in the power sector, it is crucial to understand both actual and anticipated coal production trends across different regions. The availability of coal has a cascading impact on the entire supply chain, making it essential to track the progress of applications under this initiative. This, in turn, serves as a key planning metric and provides insights into the status of mines in the pipeline. Format 1 provides a structured approach to record this data, supporting these efforts effectively.

Format 1: Project status under SWCS

For each mine on a monthly basis:			
Applicant Name		Name of the entity	…
Date of Application		In dd-mm-yyyy	…
Name of Mine		Name of the coal mine for which clearance is being applied	…
Location		The geographical location of the coal mine, including the state, district, and any relevant coordinates or site details	…
Capacity		In MTPA	…
Terms of Reference	Date of Application	In dd-mm-yyyy	…
	Status of Application	Returned in Present Form/ Recommended/ deferred for additional information etc.	…
	Date of Issuance	In dd-mm-yyyy	…
	Duration of Validity	The time period for which the issuance remains valid	…
Environmental Clearance	Date of Application	In dd-mm-yyyy	…
	Status of Application	Returned in Present Form/ Recommended/ deferred for additional information etc.	…
	Date of Issuance	In dd-mm-yyyy	…
	Duration of Validity	The time period for which the issuance remains valid	…

Forest Clearance	Date of Application	In dd-mm-yyyy	…
	Status of Application	Returned in Present Form/ Recommended/ deferred for additional information etc.	…
	Date of Issuance	In dd-mm-yyyy	…
	Duration of Validity	The time period for which the issuance remains valid	…
Mining Developer cum Operator (MDO)		Name of the MDO (if applicable)	…
Commercial Operation Date (COD)		Actual or Anticipated COD, in dd-mm-yyyy	…

Since 2017, coal linkages have been allocated to thermal power plants in accordance with the Scheme for Harnessing and Allocating Koyala (Coal) Transparently in India (SHAKTI). The scheme aimed to allocate coal linkages to thermal power plants through a transparent and objective process. The Cabinet has recently approved a revised SHAKTI policy for coal allocation to the power sector, introducing significant changes to enhance transparency and flexibility in coal linkage allocations. This amendment aims to simplify the linkage allocation process while encouraging the establishment of new thermal power projects, particularly those near coal mines.

Previously, updates on the implementation status of the SHAKTI scheme were included in Monthly Reports to the Cabinet until September 2022; however, these updates have since been discontinued. Given the changes in the policy, growing pipeline of new coal-based capacity and the continued relevance of linkage provisions, ensuring greater transparency in this area becomes crucial. To address this need and identify systemic issues in the process, Format 2 offers a structured framework for capturing and reporting information related to coal linkage allocations under the revised SHAKTI scheme.

Format 2: Summary status of linkages under the revised SHAKTI Scheme

For each month:			
Window-I (Coal at notified prices) Coal Linkages to Central Sector Thermal Power Projects	List of TPPs granted linkages	List of the TPPs to which linkage has been granted at notified prices	…
	Capacity of each TPP with linkage granted	Capacity of the TPPs to which linkage has been granted, in MW	…
	Quantity of linkage granted	Quantity of coal linkage granted to each TPP, in MT	…
	Quality of linkage granted	Estimated grade of each linkage granted, in kcal/kg	…
Window-I (Coal at notified prices)	States/agency authorized by group of states with earmarked linkages	List of the states/agencies authorized by group of states with earmarked linkages	…

Coal linkages to be earmarked to States and to an agency authorized by group of States	Quantity of linkages earmarked	Quantity of coal linkage earmarked for each state, in MT	…
	Quantity of linkages granted	Quantity of earmarked linkage that has been granted to capacity within the states through tariff-based bidding, in MT	…
	Quantity of linkages lapsed	Quantity of earmarked linkage for each state that has lapsed as no tariff-based bidding was undertaken by the states, in MT	…
	Quality of linkage granted	Estimated grade of earmarked linkage that has been granted to capacity within the states through tariff-based bidding, in kcal/kg	…
Window-II (Coal at a premium over notified price)	List of Auctions	List of coal linkage auction rounds conducted in the month	…
	Number of bid winners	Total number of successful bidders who were awarded coal linkages	…
	Capacity of the bid winners	Capacity of each TPP which won linkages, in MW	…
	Winning bid	The final bid price successful bidder, in ₹/MT	…
	Quantity of linkage booked	Quantity of coal linkage secured by successful bidders in a given auction round, in MT	…
	Quality of linkage booked	Estimated grade of each linkage awarded in a given auction round, in kcal/kg	…
	Duration of the linkage	Duration for which the linkage has been granted, in months	…

In addition to coal supply, transportation of coal from the mines to the thermal power plants is an important link in the coal supply chain. It has significant impacts on the cost and efficiency of power generation. The MoC has introduced coal linkage rationalisation as a policy initiative to minimise the transportation distance between coal mines and consumers. This effort aims to alleviate pressure on transportation infrastructure, ease evacuation constraints, lower the landed cost of coal, and ultimately reduce the cost of power generation.

Rationalisation of linkages will have an impact on coal costs. The cost of fuel in most instances, is directly passed on to the consumers through their electricity tariffs. Thus, given the impact on the consumer, it is essential to make sufficient data regarding linkage rationalisation of domestic coal available in the public domain. Reporting as outlined in Format 3 can be considered towards this end.

Format 3: Impact of coal linkage rationalisation

For each instance of domestic coal linkage rationalisation:		
Date	In dd-mm-yyyy	…
Coal Company	Name of the coal company/subsidiary involved	…

Coal Block/Siding		Name of the coal block or railway siding from which coal is allocated	…
Quantity of coal		In MT	…
Mode of transport	Pre Rationalisation	Method used to transport coal from the source to the destination (such as rail, sea, road, multi-modal, etc.)	…
	Post Rationalisation	Change in mode of transportation, if any (such as rail, sea, road, multi-modal, etc.)	…
Destination	Pre Rationalisation	Designated thermal power plant or facility	…
	Post Rationalisation	New designated thermal power plant or facility	…
Transportation Cost	Pre Rationalisation	Costs incurred for transporting coal from the source to the destination, in ₹/MT	…
	Post Rationalisation	New costs incurred for transporting coal from the source to the destination, in ₹/MT	…

The Ministry of Coal has been publishing Monthly Statistical Reports on its website since April 2020. This is a significant resource towards ensuring transparency in the coal sector. The data formats suggested, in Format 1 and Format 3, should be included in the MoC's Monthly Statistical Report to ensure comprehensive data reporting. The data disclosures suggested in Format 1 are similar to the reporting already being carried out by the CEA for thermal power plants in the pipeline as part of the monthly thermal Broad Status Report.

Additionally, to understand the cumulative impact of linkage rationalisation, summary reporting on an annual basis should be provided in the Coal Directory. This summary report should include subsidiary-wise details of aggregated annual cost-savings on account of linkage rationalisation. Reporting of information related to the SHAKTI scheme may be reinstated as part of the monthly Reports to the Cabinet and the format of such reporting could be revised as suggested in Format 2.

3.2. Optimised resource utilisation

Towards understanding the performance of thermal generation, the MoP used to publish the Thermal Performance Review Report periodically, which included plant-wise reporting on operational details. The last such report was published in 2018. Optimal utilisation of existent resources, including thermal capacity, plays a key role in minimising shortages. While reporting on plant-wise operational details remains absent, MoP has taken some steps towards this by reviewing the schedule of planned maintenance and non-operational capacity, assessing outages, and requiring flexibilisation in the operation of thermal power plants.

In accordance with MoP's Electricity (Late Payment Surcharge and Related Matters) (Amendment) Rules 2024, generators are required to offer power which has been declared available but not scheduled (i.e., un-requisitioned surplus (URS) power) in the power exchange, at a price not exceeding 120% of the Electricity Regulatory Commission (ERC) determined/adopted energy charges plus transmission charges. If a generator fails to do so, the URS power not offered on the power exchange (against the declared capacity) will not be considered available for the

computation of fixed charges. Since such fixed charges are passed on to the consumer through their tariffs, accountability with regards to the aforementioned MoP Rules becomes crucial.

To facilitate the monitoring of such sale of URS power, data tracking the treatment of un-requisitioned capacity, separately across Solar and Non-solar hours as declared by the respective Regional Load Despatch Centres, should be considered, as suggested in Format 4. Notably, some state entities, including the Maharashtra State Electricity Distribution Company Limited (MSEDCL), have already begun reporting this information in a limited form as part of its monthly Fuel Adjustment Cost (FAC) disclosures.

Format 4: Tracking of URS sale for each generating unit

For each generating station on a monthly basis aggregated across time blocks:				
For each generating station averaged across solar and non-solar hours on a monthly basis:			Solar Hours	Non-solar Hours
Average Contracted Capacity	The total power generation capacity committed under power purchase agreements (PPAs) between the generator and buyers, in MW	A	…	…
Declared Capacity	The power generation capacity declared by the generator as available for despatch, in MW	B	…	…
Scheduled Capacity	The portion of the declared capacity that has been scheduled, in MW	C	…	…
Un-requisitioned capacity	The portion of the declared capacity that remains unscheduled or unutilised by buyers, in MW	D = B – C	…	…
Capacity offered for sale	The amount of un-requisitioned capacity made available for sale in the power exchange, in MW	E	…	…
Offer Price	The price offered on power exchanges for the un-requisitioned capacity, in ₹/kWh	F	…	…
Capacity sold	The actual quantity of un-requisitioned power successfully sold in the power market, in MW	G	…	…

Generators or Load Dispatch Centres are best placed to report such data as suggested in Format 4, on a monthly or quarterly basis. Respective ERCs should mandate generators and/or SLDCs to make such data public through amendments in the requisite tariff regulations – given the impact on the generator's finances and consumer tariffs. The regulated entities should also be required to report the same on their websites.

3.3. Addressing logistics bottleneck

As discussed in Section 2, logistics constraints had a significant role to play in the electricity shortages of the recent past. While this issue has been recognised and various measures are being implemented, their effectiveness can be further enhanced by improving transparency, accountability, and data reporting. Previously, the SEVA Portal provided a detailed view of coal transportation from source to destination. With its discontinuation, the National Coal Portal carries siding-wise details regarding rakes but key parameters about coal transported – such as quantity, quality, and mode of transport from source mine to destination power plant – are missing, leaving room for further improvement in reporting.

To enhance the comprehensiveness of this tracking, the data on the National Coal Portal should be supplemented by additional information including the quantity of coal despatched as well as the destination of the rakes. A more detailed data format as suggested in Format 5 can better capture these details. Additionally, coal is increasingly being transported through multi-modal arrangements such as Rail-Sea-Rail (RSR) and Road-cum-Rail (RCR) modes. It is essential that detailed information regarding these transport modes is also captured and made publicly available to ensure holistic visibility into coal logistics.

Format 5: Details regarding rakes for coal supply

For each project on a monthly basis:		
Coal Company	Name of the coal company/subsidiary	…
Siding	The name of the specific railway siding used for loading coal	…
Mode of allotment	FSA[1] / MoU[2] / Bridge linkage / spot e-auction / special forward e-auction for power / exclusive e-auction for non-power / special spot e-auction / self-consumption	…
Quantity	In MT	…
Quality	In kcal/kg	…
Destination	Final receiving location, such as a thermal power plant or designated facility	…
Mode of transport	Mode of transportation including multi-modal transport like Rail-Sea-Rail (RSR), Road-cum-Rail (RCR) etc.	…
Rakes Supplied (if applicable)	In units	…
Rakes Loaded (if applicable)	In units	…

Note: [1] *FSA stands for Fuel Supply Agreement*
[2] *MoU stands for Memorandum of Understanding*

To improve strained logistics, the MoC and the Ministry of Railways are co-ordinating development of 13 railway lines. Additionally, 67 First Mile Connectivity (FMC) projects are being developed to enable ~1 BT of mechanised coal handling. A dedicated sub-group, comprising all relevant stakeholder ministries, has also been formed to coordinate rake supply based on coal availability.

Understanding the progress of these initiatives is critical to analysing the outlook for coal supply in the country. However, there is insufficient data in the public domain for assessment of the progress of these initiatives and the sufficiency of railway infrastructure. The progress of these infrastructure expansion projects can be tracked as shown in Format 6.

Format 6: Monitoring of ongoing railway infrastructure projects for enhanced coal supply

For every generating station/unit on an annual basis:		
Name of the Project	The official name of the railway infrastructure project undertaken	…
Commercial Operation Date (COD)	Actual or Anticipated COD, in dd-mm-yyyy	…
Source	The starting point of the railway infrastructure project, such as a coal mine, siding, or loading station	…

Destination	The endpoint of the railway infrastructure project, such as a thermal power plant, unloading station, or designated facility	…
Corridor length	In km	…
Total Cost	The estimated or actual total expenditure for the railway infrastructure project, including construction, land acquisition, and associated costs	…
Current Status	The present stage of the railway infrastructure project, such as Planning, Under Construction, Partially Completed, or Completed	…

The MoC should report data, suggested in Format 5 and Format 6, on the National Coal Portal, further enhancing the existing data reporting on the platform. Additionally, the inter-ministerial sub-group should also be required to publish updates on the progress of railway projects for coal transportation on the MoC's website.

3.4. Improved planning and projections

Acknowledging that the supply of coal is a multi-sectoral issue, a lot of inter-ministerial efforts are under co-ordination between MoC, MoP, Ministry of Railways and other agencies. To ensure coordinated action and accountability, a list of all such active inter-ministerial efforts should be made a part of the monthly Statistical Report or the Quarterly Report hosted on the MoC's website. Additionally, the minutes of the meetings of such inter-ministerial committees should also be made public on a monthly basis. This is in line with the good practice already being followed for the Standing Linkage Committee (Long-Term).

In addition to planning at this broader level, realistic and comprehensive planning for fuel procurement by the generator, in response to its projected generation from contracted capacity is essential. The need for such broader level planning has already been acknowledged by certain ERCs, such as those in Maharashtra and Gujarat, which require generators to submit a Fuel Utilisation Plan (FUP) alongside their tariff determination petitions. Format 7 is broadly based on the format prescribed by the Maharashtra ERC for FUP reporting. It includes key details such as projected fuel requirements for each unit or station, contingency measures for fuel shortages, and the corresponding impact on variable generation costs.

Format 7: Reporting of fuel utilisation plan by the generating company

For every generating station/unit on an annual basis:				
Station/Unit		Name of the power station or specific unit for which the fuel utilisation plan is prepared	A	…
Fuel Type		Type of fuel planned for use in the power station or unit, such as Coal, or a blend of multiple sources of coal	B	…
Fuel Requirement of the unit		The estimated quantity of fuel required by the power station or unit, in MT	C	…
	Name of Source	Designated mine, coal company or supplier from which the fuel will be	D	…

		procured for the power station or unit		
Details of Contracted Source	Annual Contracted Quantity (ACQ)	ACQ of coal for supply to the power station or unit, in MTPA	E	…
	Variable Cost	In ₹/kWh	F	…
	Estimated Availability	In MTPA	G	…
	Expected Shortage	In MTPA	H	…
Alternate Arrangement in case of Shortage	Name of Alternate Source	Name of an alternative fuel supplier if the primary source is unavailable or insufficient	I	…
	Expected Rate of Alternate Source	In ₹/MT	J	…
	Impact on Variable Cost per unit	In ₹/kWh	K = J – F	…

This commendable practice should be adopted in other jurisdictions, as it enhances fuel planning, ensures fuel sufficiency, and promotes the procurement of least-cost fuel sources based on projections. Implementing such a framework can also help mitigate tariff shocks caused by ad-hoc spot market fuel or power purchases.

Towards further strengthening accountability and enhancing transparency, generators should be mandated to regularly publish their Fuel Utilisation Plans, in line with Format 7, on their websites.

4. Conclusion

As India's energy demand rises, ensuring stable power supply remains a challenge. While measures like boosting coal production, improving logistics, and optimising resources have been introduced to improve supply of coal-based electricity, their effectiveness depends on robust data reporting, transparency, and accountability. Addressing gaps in data availability can enable better planning and accountability, thus avoiding reactive solutions such as last-minute imports or costly power procurement, straining both the sector and consumers.

A data-driven approach is crucial for anticipating supply-demand mismatches, streamlining coal logistics, and improving stakeholder coordination. In this context, structured data reporting becomes even more critical, especially as the Ministry of Coal, in a welcome move, is planning to introduce a Smart Coal Analytics Dashboard. This dashboard is an initiative aimed at enabling real-time monitoring, inventory tracking, optimised logistics, and advanced analytics to support data-driven decision-making across the coal value chain. It is equally important that the data hosted on this dashboard is made available in the public domain to promote transparency, enable informed analysis, and facilitate greater accountability.

Institutionalising better reporting, continuous tracking, and transparency will help shift the sector from short-term fixes to long-term resilience. Such reasoned and planned action from policymakers, regulators, and power producers will be an important step towards enhancing energy security and fostering a more efficient, cost-effective, and sustainable power sector aligned with India's economic and developmental goals. Data that is appropriately reflective of

ground realities will help address the blind spots in planning and management of coal supply for power generation.

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This article is part of an ongoing series called Power Perspectives which provides brief commentaries and analyses of important developments in the Indian power sector, in various states and at the national level.

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