



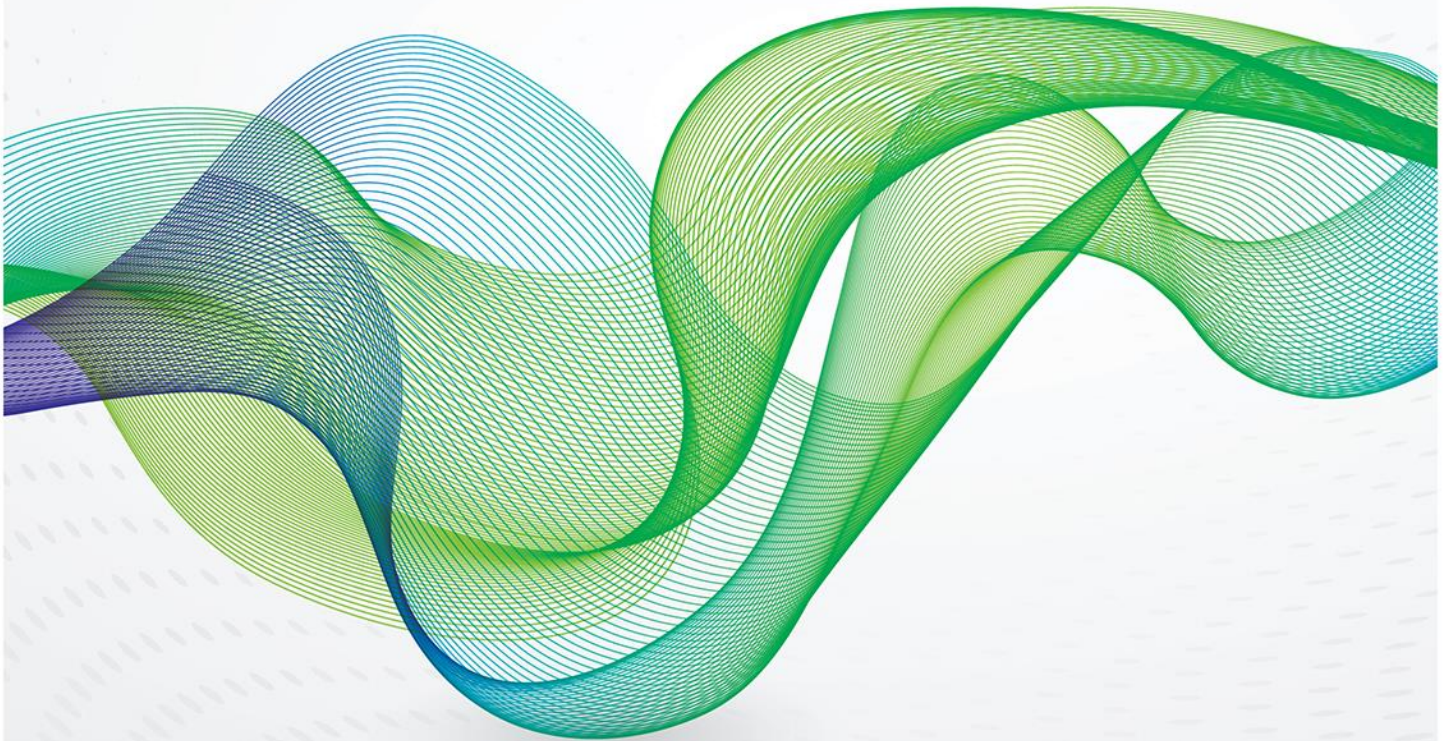
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Indian Steam Coal Imports: The Great Equation



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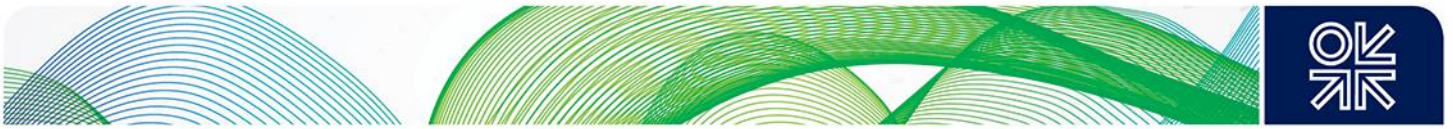
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Executive Summary

Since 2012, Indian steam coal imports have more than doubled, reaching 168 million metric tons (Mt) in the fiscal year 2014–15 (FY2015), making India the world's second-largest coal importer after China. With the decline of Chinese import demand since 2014, India has been considered by many to be the last bastion of significant coal import growth. However, India's government has announced its intention to cease steam coal imports by the end of 2017. Given the general consensus that India's coal demand will remain robust, these two diverging positions are thus based on differing perceptions of future coal production in India.

In considering the 'coal equation' of supply and demand in relation to India's coal policy, this report seeks to answer two key questions:

- What is the future role of India in the global steam coal trade?
- Could India significantly decrease its steam coal imports, and if so under what conditions?

To answer these questions, the report analyzes the major drivers of future coal demand and particularly focuses on the power sector, given its overwhelming share of coal demand (70 per cent in FY2015). It also looks at the reforms currently underway in the mining sector and their potential to make the sector more efficient, thus facilitating the dramatic growth that will be required in production. The analysis is supplemented by quantitative assessments of steam coal supply and demand to FY2020. The results of these assessments indicate that the government is likely to reach its self-sufficiency goal, but this will be towards the end of the decade rather than in the next two to three years as desired. In order to achieve this goal and cease coal imports, India's government will specifically need to address constraints relating to the low quality of Indian coal, in addition to resolving problems linked with transportation and land acquisition. The main findings of this report are summarized below.

High cost of steam coal imports for the economy

In a country where electricity and coal shortages are recurrent, imports help to secure supplies. However, steam coal imports in India have come at a high cost for power utilities, state distribution companies, and the economy at large. While international coal prices have declined significantly since the middle of 2011, the price of coal imports into India surged after 2011 due to a change in pricing regulation in Indonesia, its main steam coal supplier. While Indian power utilities built power plants based on low Indonesian coal prices, the alignment of Indonesian coal prices with international coal prices, for both existing and new contracts, derailed this strategy and forced the power utilities to renegotiate their contracts with state distribution companies. This transferred the losses of the power plants to state distribution companies, which were unable or unwilling to pass through the cost to end-user customers. The increase in imported coal prices was exacerbated by the depreciation of the rupee. The coal import bill consequently jumped from \$9.1 billion in FY2011 to \$16.5 billion in FY2012, and it has remained elevated since then. In FY2015, surging coal imports erased the 18 per cent decline in import prices observed that year and have seen the coal import bill reach \$17.1 billion. While this represents only 3.8 per cent of India's trade balance, it adds an important financial dimension to security of supply.

Import growth has occurred due to a rising shortfall between demand and indigenous coal supply. Demand increased significantly over the last five years, driven by a massive increase in coal-based power capacity, which almost doubled from 84 GW at the end of March 2010 to 165 GW at the end of March 2015. Despite significant coal reserves, domestic production was not able to keep pace with this tremendous increase and rose by only 15 per cent during the same period. As a result, imports of steam coal by the power sector surged from 25 Mt in FY2010 to 91 Mt in FY2015. Today, 17 per cent of coal supplies to the sector are dependent on foreign suppliers, thus exposing this vital sector –



responsible for meeting 76 per cent of India's electricity supply – to the volatility of international prices and to changes in trade policy in supplying countries.

Coal demand to remain robust despite massive growth in renewables

India's energy demand is expected to increase significantly, driven by a growing economy, urbanization and demographic trends, and Prime Minister Narendra Modi's commitment to provide '24/7 electricity for all' by the end of this decade. The low cost of coal compared with natural gas and its abundance in India make it a preferred energy source for strategic industries such as power, steel, and cement. Coal requirements by the power sector will continue growing, given large thermal coal-based capacity additions coupled with the expected increase in power demand. Even with global pressures on environmental concerns and a call to move away from coal, coal-based generation will remain strategic for the Indian power generation sector in order to serve India's rising energy needs.

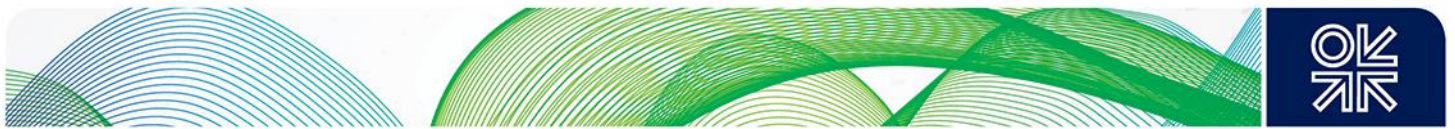
While coal consumption will continue growing, the share of coal in the power mix is expected to decline to 55 per cent by 2040, but it will nevertheless remain large relative to other energy sources. The successful development of renewable energy sources (a target of 175 GW of new capacity by FY2022) will lower India's dependence on coal-fuelled electricity. New renewable power capacities, when fully developed, have the potential to reduce the need for 70 GW of coal-based capacity, saving about 250–300 million tons of coal and avoiding around 500 Mt of CO₂ emissions. Energy-saving measures on the demand side are expected to further reduce the growth of power demand. Reduction of electricity transmission and distribution losses, which currently account for more than 21 per cent of electricity generation, also offer significant potential for energy savings.

Improvements in the coal fleet's energy efficiency will further reduce coal consumption per unit of electricity generated. While its first supercritical power plant only came into service at the end of 2010, the installed power capacity of supercritical plants now accounts for 16 per cent of the coal fleet. More than half of the power plants currently under construction are based on this technology, and all plants built during the 13th Five-Year Plan (2017–22) will be supercritical plants. Coal consumption per unit will also be reduced by an environmental regulation adopted in 2012 and reinforced in January 2014, according to which power stations located more than 750 km (500 km from June 2016) away from coal mines, and those located in sensitive and urban areas, are required to use coal containing not more than 34 per cent of ash.

Due both to the financial difficulties encountered by state distribution companies and the power crisis in general, the growth in electricity demand may also be lower than expected. Distribution companies across all states had incurred accumulated losses of \$46 billion in FY2013 due to the provision of below-cost electricity. They are so indebted that they are unable, despite recurrent blackouts and load-shedding, to sign new long-term offtake commitments with power producers. In turn, the utilization rate of power plants has deteriorated (less than 65 per cent in FY2015 for coal-based power plants, falling to 61 per cent in the first half of FY2016), leading to financial losses for power producers. The situation has led to a vicious circle in which power developers cannot pay their fuel costs to Coal India Limited (CIL), commission new assets, or repay their debt to lenders. Thermal power capacity additions are expected to slow down when the current plants under construction are commissioned, as power utilities focus on improving power plant utilization rather than investing in 'stranded' assets.

The government has initiated reforms of the power distribution sector and revision of the national tariff policy to make the sector viable and introduce more competition and transparency. However, the financial weakness of state distribution companies can only be addressed gradually with tariff increases and, because electricity policy lies primarily under their purview, the full cooperation of state governments. These issues mean that power plants are likely to continue to remain underutilized and power plant projects at the very early stages of construction are likely to be postponed or even cancelled.

The scenarios discussed in this paper are based on an analysis of coal-based capacity build-up, as announced by power producers, and assumptions on plant utilization. They take into account an



improvement in the average efficiency of the power fleet, thanks to the commissioning of supercritical plants, and improvements in the quality of coal. Steam coal demand by power utilities and the non-regulated sector amounts to 1,035 Mt by FY2020 in the 'low plant load factors' scenario (around 65 per cent, dropping marginally lower in FY2016 and FY2017), while it reaches 1,090 Mt by FY2020 in the 'Improved Plant Load Factors' scenario (Plant Load Factor, or PLF, gradually recovering to 70 per cent) compared with 754 Mt in FY2015. This corresponds to Compound Annual Growth Rates (CAGRs) ranging from 6.6 to 7.7 per cent over the period, respectively.

An ambitious but not impossible target for Indian coal production

Faced with surging imports and the adverse effect of the coal import bill on the economy, the new government (elected in May 2014) has announced plans to increase domestic coal production dramatically and address the coal shortage issue. It has asked CIL, the state-owned company responsible for supplying 80 per cent of domestic production, to double its output to 1 billion tons. Production from other mines, operated by public and private companies, is expected to reach 500 million tons by the same date, thus taking India's total coal output to 1.5 billion tons by 2020 compared with 612 Mt in FY2015. These targets are challenging given the weak performance of coal mining companies in the past few years, the difficulty in land acquisition for mining, environmental and forest clearance issues, and transportation bottlenecks. But the government has introduced major reforms in the coal mining sector to encourage competition and boost efficiency. The Coal Mines (Special Provisions) Bill, adopted by parliament in March 2015, together with the adoption of the 'Mining Law' (Mines and Minerals [Development and Regulation] Amendment Act 2015), has opened up the sector to domestic and foreign companies for commercial mining, thus ending 40 years of state monopoly on coal sales. It has also introduced the possibility of allocating (using auctions) coal blocks for captive mining in a transparent and effective manner. These new laws were adopted after the Supreme Court in September 2014 cancelled the allocation of 204 coal blocks, out of a total of 218 allocated since 1993, on the grounds that the allocation process was arbitrary and illegal.

The government has taken a progressive and strategic approach to open up the sector. First, it is re-allocating coal blocks to domestic private and public companies with a specified end-use (captive mining). In the first three months of 2015, 29 mines were auctioned and 38 mines were allotted, totalling 67 blocks (three additional mines were awarded in August 2015 and a further eight to ten blocks are to be auctioned within the next few months). The revenues for the state governments, from royalty and auction proceeds from the mines auctioned to private companies in the first two rounds, total an estimated \$33 billion over the next 30 years, surpassing the Comptroller and Auditor General's earlier estimates of losses of \$30 billion incurred due to allocations without auctions. In a second phase, the government will auction coal blocks for commercial mining, whereby state-owned and standalone private and foreign companies will be allowed to mine and sell coal without any end-use restrictions. Auctions for commercial mining are expected to start in FY2016.

In response to the billion-ton target, CIL has developed a comprehensive mine-wise plan, focusing on the development of large opencast mines with modern mechanized equipment, and will seek foreign expertise to raise coal output. The central government has provided assistance to clear the hurdles (mentioned above) that have stalled these mining and infrastructure projects in the past.

As its attempt to reform the land acquisition law failed to achieve a consensus in parliament, CIL has been working directly with state governments on a case-by-case basis to facilitate the acquisition of land needed for the mining and transportation of coal. The federal government has also expedited environmental and forest clearances for new mines by instituting the fast-tracking and real-time monitoring of mine-by-mine progress. Regulations have also been relaxed for capacity expansion of existing mines which have passed environmental assessment. Furthermore, the federal government has fast-tracked the construction of three critical railway lines to remove evacuation bottlenecks and facilitate the matching of supply with demand. Joint ventures between CIL, Indian Railways, and the coal-bearing states have been set up to finance and expedite the construction of these lines. The first of these, which had been stalled for years, is expected to start in June 2016.



Already, there are visible indications that Indian coal production is entering a new phase of growth. After healthy growth of 7 per cent in FY2015, CIL's production increased 9 per cent in the first half of FY2016. Singareni Collieries Company Limited (SCCL), the only other state-owned hard-coal mining company in the country, increased its production by 14 per cent during the same period. However, there are still barriers to be overcome, especially state-level administrative procedures that have delayed the re-commissioning of newly allocated coal blocks.

In the assessments of future coal production, this report has factored in the active role taken by the central government to assist coal miners in resolving the hurdles that have prevented production growth. It has also taken into account the time necessary to ramp up production and factored in the many hurdles that persist, such as the absence of a consensus on the land acquisition ordinance and the administrative hurdles that delayed the production of newly allocated coal blocks. This report presents two scenarios for coal production. Overall, the new 'business-as-usual' assessment, which assumes that the growth of CIL's production will continue but also takes into account some delay in the ramp-up of newly allocated coal blocks for captive mining, steam coal production reaches 996 Mt by FY2020. In the more optimistic assessment, the 'roadmap', which considers that CIL will achieve its mine-wise plan to produce 908 Mt by FY2020 and assumes a more rapid ramp-up of coal blocks production, steam coal production reaches 1,178 Mt by FY2020.

Towards steam coal self-sufficiency

Under these assumptions, Indian coal imports would plateau in the short term before declining sharply by the end of the decade. While Indian steam coal imports have increased at a steep rate over the past three years, FY2016 may be a turning point for the coal sector in India, marked by a slowdown in the pace of growth, or even a slight decline, of steam coal imports. Government policy to reduce steam coal imports has been boosted by the environment ministry's Expert Appraisal Committee (EAC), which in October 2015 recommended the easing of the restriction on maximum permissible ash content for imported coal (which has been stricter than for domestic coal). As this report shows, this will enable the import of higher (calorific value) grades of coal, thus allowing the same amount of electricity to be produced with less imported coal.

The report presents two scenarios assessing steam coal imports. In the first scenario, steam coal imports are expected to continue increasing in FY2016, by 14 per cent to 192 Mt (a much lower growth than in previous years), before gradually declining to 41 Mt at the end of the decade. The overall dependence on steam coal imports would fall to only 4 per cent in FY2020. In the second scenario, steam coal imports decline slightly in FY2016 (down 5 per cent to 160 Mt) and sharply from FY2017 (to only 38 Mt in FY2019). Projected steam coal production exceeds demand in FY2020, which means that India would be fully self-sufficient in steam coal and would only need to import coking coal.

Both scenarios indicate that the government is likely to achieve its self-sufficiency goal, although towards the end of the decade rather than in the announced time-frame.

One prerequisite of these outcomes is the simultaneous development of transportation infrastructure, in particular three key rail lines from major mines to customers, and also rail lines from the mines to the ports given the large number of coal-fired power plants located in coastal areas.

However, these import projections need to be strongly qualified by a set of constraints which need to be addressed in order for steam coal imports to be ended:

- Some power plants were designed and built to be operated on imported coal only – that is, on high-quality coal (low ash content). In the short term, in the absence of the required quality in India, these plants will continue burning imported coal. This is reinforced by the existence of long-term contracts with foreign suppliers or participation of Indian companies in mining activities overseas. This means that a certain level of steam coal imports (which was around 40 Mt in FY2015) will still be needed in the short/medium term. In the longer term, it could be eliminated with the procurement of better quality domestic coal, either washed coal or coal produced in



underground mines – which is better quality than current coal production which comes mainly from opencast mines.

- New regulations, adopted in 2012 and reinforced in 2014, limiting the use and transportation of coal with high ash content, and the inadequate availability of such coal from indigenous sources, requires the blending of imported coal of low ash content. This issue can be overcome with the washing of coal, and coal miners have responded to the new regulation by building new washeries. However, in the short term, the capacity of existing washeries is limited and low-ash coal has to be imported to comply with environmental regulations.
- The commercial optimization of fuel supply at power and industrial plants in coastal locations also favours imported coal in view of constraints on transport logistics and declining import prices. This commercial strategy may limit the fall in coal imports because their price is currently at an historic low (due to global oversupply) and Indian steam coal buyers arbitrage between domestic and imported coal. With import demand in major countries, especially China, falling in line with lower economic growth and stringent environmental measures, the rebalancing of the market does not appear likely in the short term, despite cuts in production. The competition between domestic coal and imported coal (for certain grades of coal and some customers: for instance those who rely on e-auction sales, which are sold with a premium of 40 to 60 per cent on regulated prices) is a new phenomenon, as Indian coal prices have been much lower than imported prices so far.

Greater interaction between the Indian and global steam coal markets

India is also reforming its coal market to introduce more competition and transparency. The government intends to auction Fuel Supply Agreements (FSAs) to the non-regulated sector which will allow Indian coal prices to be set by the market rather than being determined by CIL. In theory, they should thus align with international coal prices. However, the government will need to assess the evolution of the global steam coal market carefully in preparing its reform policy. In the oversupplied global market, foreign suppliers in distressed situations may undercut their supplies in order to find outlets for their coal cargoes. This could lead to a price war between domestic and foreign suppliers, as was observed in the Chinese coal market in 2013/2014.

As India is likely to reduce its steam coal imports significantly and rapidly, the impact on the already depressed international coal market will be profound. International coal exporters must also factor in another setback: India will not be the growth engine for imported coal that it was widely expected to be at the beginning of this decade, when Indian steam coal imports were forecasted to increase dramatically. Instead, the market should expect additional output cuts in coal-exporting countries and persistently low international prices, which will in turn be increasingly dependent on India's energy policy and CIL's monthly production.



1. Introduction

Since 2010 India's coal imports¹ have tripled, thus making India the world's second-largest coal importer after China. In the future, India is widely seen as the next engine of growth in the international steam coal trade at a time when China's coal imports are declining. Most commodity analysts project that India will overtake China as the world's top coal importer as soon as 2015, faster than previously expected.²

On the demand side, coal is of strategic importance for the country, accounting for 56 per cent of the primary commercial energy supply and 76 per cent of power generation.³ The price of steam coal in India is less than alternative fuels such as diesel or natural gas/LNG. Coal demand is therefore expected to continue increasing significantly, driven by the needs of a growing economy, urbanization, and demography, and reinforced by Prime Minister Narendra Modi's commitment to eradicate poverty and provide 24/7 electricity for all by 2019.

On the supply side, despite significant coal reserves, domestic coal production, dominated by state-owned Coal India Limited (CIL), has not been able to cope with increasing demand from the power sector, leading to recurrent fuel shortages and electricity blackouts. Under the 'captive coal mine' policy introduced in 1993, a large number of captive coal blocks, with reserves constituting some 40 gigatons (Gt), were allocated during the period 1993–2011, but the production from these mines has been well short of expectations. In September 2014, in a move adding uncertainty to their future contribution to domestic production, the Indian Supreme Court cancelled the allocation of 204 coal blocks, out of a total of 218 allocated since 1993, on the grounds that the allocation process was arbitrary and illegal.

Surging coal imports, in particular by the vital power sector, has reinforced the focus on energy security. Moreover, the coal import bill is an additional burden to the Indian trade balance, adding a financial dimension to energy security. It is in this challenging context that the new government has announced its willingness to cease steam coal imports, which according to the Minister of State for Power, Coal & New and Renewable Energy 'could be eliminated within two or three years'.⁴ The ambition is to double CIL's coal production to 1 Gt by FY2020⁵ and that from other producers, including coal blocks, now under re-allocation in a transparent manner, to 500 Mt.

The success of this new coal policy is of great significance, not only for energy security in India, but also for the world's coal-exporting countries and, ultimately, coal-consuming countries, as the trends in Indian coal imports will influence future international coal prices. The announced targets are certainly challenging in the face of the many hurdles that the Indian coal sector faces, in particular the delays in environmental approval for coal mines, the difficulty of acquiring new lands for mining, the congestion of the railway network, and the issue of coal and power sector reforms in general.

This report investigates whether India is going to be the next engine of growth for the global steam coal trade or, on the contrary, if India might fully cease its steam coal imports, as announced by the government. It analyzes the potential future impact on India's coal balance of recent reforms and measures taken by India's government (elected in May 2014) to reduce India's steam coal⁶ imports –

¹ 'Total coal imports' refers to coking coal and steam coal (also referred to non-coking coal in Indian statistics).

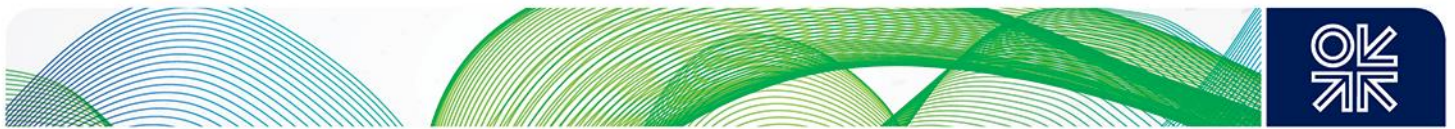
² Reuters, 'India to eclipse China as top coal importer in 2015', 20 May 2015, <http://in.reuters.com/article/2015/05/20/india-china-coal-idINKBN0051CD20150520>

³ Coal Controllor's Organisation (CCO), Coal Statistics 2013-2014, April 2015, Ministry of Coal, http://coal.nic.in/sites/upload_files/coal/files/coalupload/coaldir13-14.pdf

⁴ Reuters, 'Piyush Goyal Says Possible to Stop Imports of Thermal Coal in 2-3 Years', 12 November 2014, <http://profit.ndtv.com/news/industry-papers/article-piyush-goyal-says-possible-to-stop-imports-of-thermal-coal-in-2-3-years-692265>

⁵ Fiscal year: from 1 April to end of March (FY2020: from 1 April 2019 to end of March 2020).

⁶ The report focuses only on steam coal (used as fuel in the power sector and other industries), although coking coal (used as raw material in the iron and steel industry) is also mentioned when relevant.



and even cease them in the next two or three years – whilst simultaneously basing its economic development strategy heavily on coal.

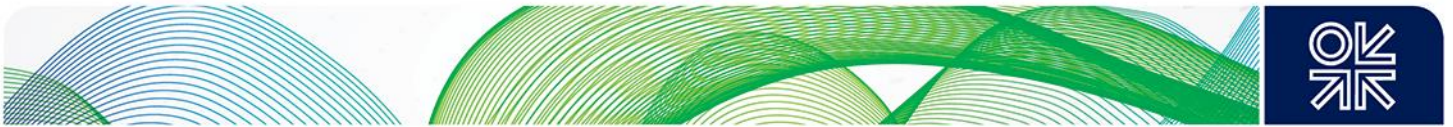
Chapter 2 opens the report with a review of the evolution of India's coal imports and their impact on the economy and on India's security of supply. The report then goes on to analyze the two key determinants of future coal imports in the country: supply and demand.

Chapter 3 is dedicated to the demand side of the equation. It assesses how steam coal demand will be impacted by India's new energy policy targets, in particular its ambitious goal for renewables, and the renewed growth in economic activity. Sections 3.1 and 3.2 investigate the main technical, economic, and financial challenges faced by the coal-based power sector. Section 3.3 explains how coal prices are differentiated according to different customers and routes of supply. It also analyzes the proposed reforms for coal fuel supply agreements (FSAs). Section 3.4 provides an assessment of coal demand by FY2020, mainly focusing on the power sector.

Chapter 4 looks at the supply side. It reviews how the government, as well as CIL, are attempting to address the challenges that have historically prevented significant growth in coal production. CIL's roadmap to 1 Gt of coal production by FY2020 is analyzed, as are the major steps taken by the company and the government towards this ambitious target (Sections 4.2 and 4.3). The new legislative environment for coal mining and the first auctions and allotments of coal blocks are reviewed in Section 4.4, before the chapter ends with the presentation of two assessments of coal production in FY2020 (under rather different assumptions) in Section 4.5.

Chapter 5 discusses what the outcome of these supply and demand trends could be on Indian steam coal imports in the short (FY2016) and medium term (FY2020). Section 5.1 presents the results of the scenarios for coal steam imports. Section 5.2 discusses the main barriers that could prevent India from attaining self-sufficiency in coal production.

Chapter 6 contains concluding remarks on future coal imports in India and their impact on the international coal market.



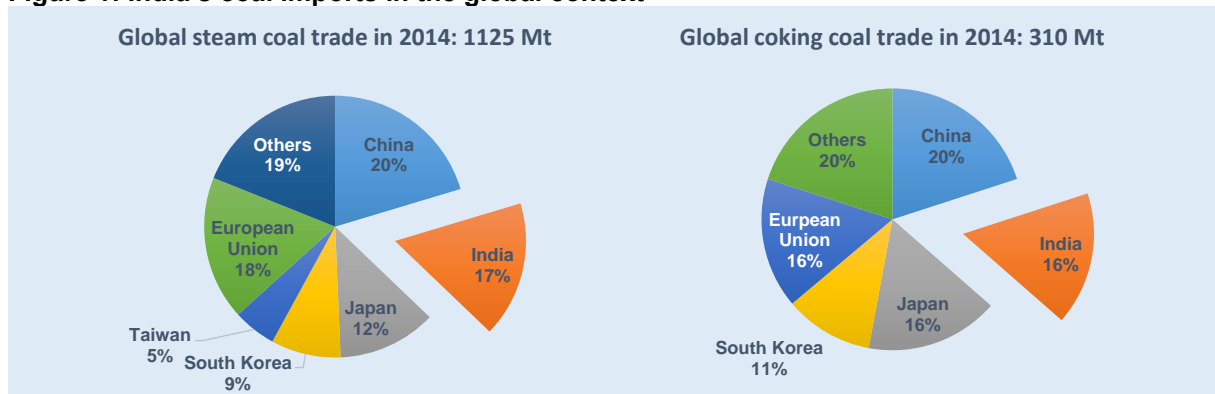
2. Rising coal imports and national concerns

2.1 The recent surge of Indian coal imports

2.1.1 Growing import dependence

India's total coal imports have increased tenfold since FY2004 – from 21.7 Mt to 212.1 Mt in FY2015.⁷ India now ranks second in global coal import demand, having outpaced Japan in 2014, and accounts for 16.7 per cent of total coal imports.

Figure 1: India's coal imports in the global context

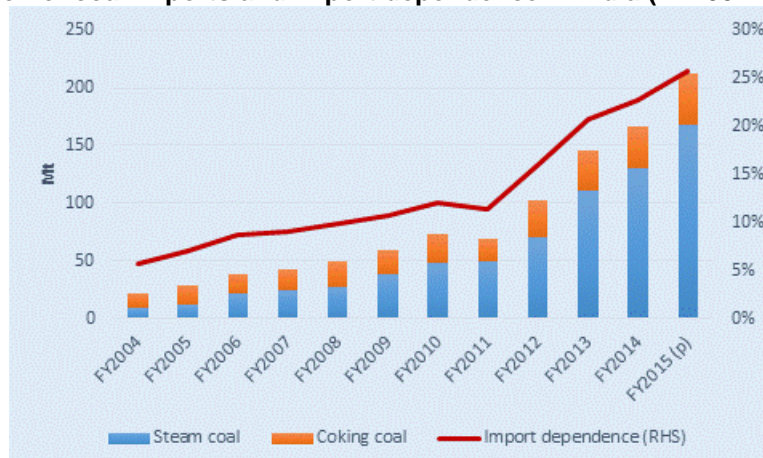


Note: Calendar year.

Source: Australian Government, Resources and Energy Quarterly, September 2015.

Recent trends show an increasing dependence on coal imports, which have surged since FY2012. As seen in Figure 2, import dependence (measured as the share of total imports in total supply of hard coal⁸) increased from 11.5 per cent in FY2011 to 25.7 per cent in FY2015.

Figure 2: Evolution of coal imports and import dependence in India (FY2004–FY2015)



Note: Import dependence is calculated as the share of imports in total supply of hard coal, calculated as the sum of domestic hard coal production and imports. Data are not adjusted for different calorific values of coal, particularly between domestic and imported coal. In such an adjustment, the share of imports in total domestic supply would be higher as imported coal has a higher calorific value than Indian coal.

Source: Coal Controller's Organisation, October 2015.

⁷ Coal Controller's Organisation (CCO), Provisional Coal Statistics, October 2015, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/Provisional_Coal_Statistics_2014-15.pdf

⁸ Hard coal: coking coal and steam coal, excludes lignite.



Since the 1980s, India has imported coking coal due to inadequate domestic reserves of the required quality. Coking coal imports, mainly from Australia, totalled 44 Mt in FY2015. However, an important feature of the trend in imports has been the sharp rise in the purchase of steam coal since the beginning of this decade. Steam coal now accounts for 79 per cent of Indian coal imports compared with 42 per cent in FY2005. Steam coal imports rose considerably in FY2015, surging by 30 per cent to 168.4 Mt as demand increased faster than available domestic supplies. Coal consumption rose by an estimated 11 per cent, but Indian coal production increased by only 8 per cent.

Due to recurrent shortages, coal (both coking and steam coal) has been placed under open general licence and can be freely imported by the end-users themselves, according to their needs and based on their commercial prudence. Over the years, the government has reduced the import duty on coal imports, and in the Union Budget for FY2015 it rationalized the import duty for all types of coal and coke to 2.5 per cent.

Box 1: Data on coal imports in India

Coal data for India used in this report comes from official figures published by the Ministry of Coal (MoC), the Ministry of Power (MoP), the Central Statistics Office (CSO), the Central Electricity Authority (CEA), and the Ministry of Commerce & Industry (MoCI), as well as from statements by the Minister of State for Power, Coal & New and Renewable Energy (MPCNRE) in the Lok Sabha (the lower house of parliament).

As far as coal imports are concerned, apart from official data published by the MoCI, there is monthly data published by mjunction, an online trader, based on information from shipping companies, ports, and other sources. The data quoted above is official and differs from that published by mjunction, which estimated Indian coal imports at 242.4 Mt in FY2015⁹ compared with the official figure of 212.1 Mt. The difficulty in accurately assessing coal imports in India stems not only from different estimations but also the huge difference in calorific values between domestically produced and imported coal.

2.1.2 A surge in steam coal imports in FY2015

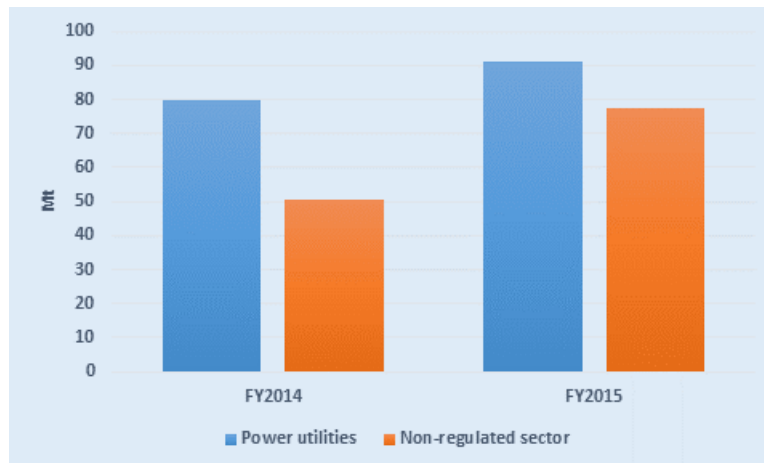
Steam coal is imported by power utilities¹⁰ (regulated sector) and also by captive power plants, cement, aluminium, and other industries (non-regulated sector).

⁹ Reuters, 'Coal imports jump 34 percent in 2014/15', 14 April 2015, <http://in.reuters.com/article/2015/04/14/india-coal-imports-idINKBN0N50ZM20150414>

¹⁰ The power sector includes two segments: the regulated power utilities sector, which includes central, state, and private / Independent Power Producer power plants, and sells power at regulated tariffs; and the non-regulated sector, which includes captive power plants (CPP) developed by industrial and commercial users for their own consumption. Other industrial consumers (steel, cement, paper, etc.) also belong to the non-regulated sector.



Figure 3: Steam coal imports by power utilities and the non-regulated sector, FY2015 vs. FY2014



Sources: Coal Controller's Organisation; Central Electricity Authority.

While the sharp rise of steam coal imports in FY2015 was mainly explained by the growing gap between domestic coal production and demand, specific factors also contributed to it. In 2014, in order to reduce the gap between domestic supply and demand by power utilities, the government requested that CIL reduce its e-auction sales¹¹ and prioritize deliveries to the power utilities sector. In response, CIL's supplies to power utilities increased by 8.9 per cent (31.6 Mt) to reach 385.4 Mt in FY2015.¹² Despite that, power utilities increased their imports by 14 per cent to 91 Mt. The dramatically low level of coal stocks at power plants forced power utilities to increase their imports to rebuild coal stocks. At the end of June 2014, the number of thermal power plants (TPPs) with a critical coal stock position (less than seven days) was 42 out of 100 plants.¹³ In order to replenish stocks during the monsoon season and meet domestic power demand, power utilities ramped up imports during the months when they traditionally decline – between July and September 2014. Coal stock rebuilding in the last quarter of FY2015 also raised coal imports and allowed the number of TPPs with a critical stock position to come down to 12 at the end of March 2015, when stocks at TPPs totalled 26.1 Mt.¹⁴

In contrast, domestic coal dispatches (actual sales) were limited by transportation constraints leading to rising stockpiles at pithead and lower availability of domestic coal. While CIL's output grew by 7 per cent in FY2015, its dispatches grew only 3.8 per cent to 489 Mt. CIL's coal stocks at pithead rose by 5 Mt in FY2015 despite the shortfall in coal supply. Coal stocks at ports also increased significantly (totalling 12 Mt at the end of March 2015) due to a lack of railcars to move coal from the ports to the consuming plants. This issue is currently being addressed by the government and CIL through investments in new transportation railways and the optimization of coal contracts between CIL and power plants.

2.1.3 Power supplies are increasingly dependent on imports

Steam coal imports by power utilities have been increasing dramatically over the last few years due to a combination of surging demand and relatively stagnant domestic production. The demand surge has been primarily driven by the rapid increase in installed coal-based power capacity, mainly by

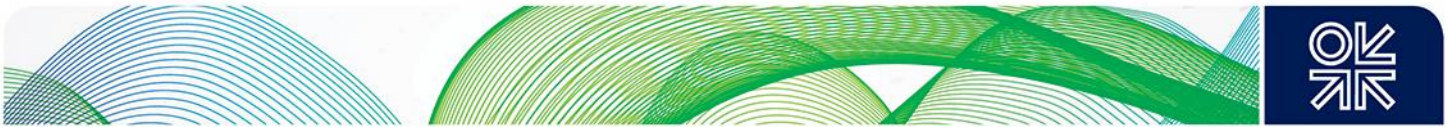
¹¹ Part of CIL's production is sold through e-auctions to the non-regulated sector (45 Mt in FY2015), in addition to sales sold under contracts (Fuel Supply Agreements). See Sections 3.3 for a discussion on e-auction sales and prices.

¹² CIL, 2014-15 Annual Report and Accounts, August 2015,

[https://www.coalindia.in/DesktopModules/DocumentList/documents/Annual_Report_&_Accounts_2014-15_Shareholder_version_03082015\(1\).pdf](https://www.coalindia.in/DesktopModules/DocumentList/documents/Annual_Report_&_Accounts_2014-15_Shareholder_version_03082015(1).pdf)

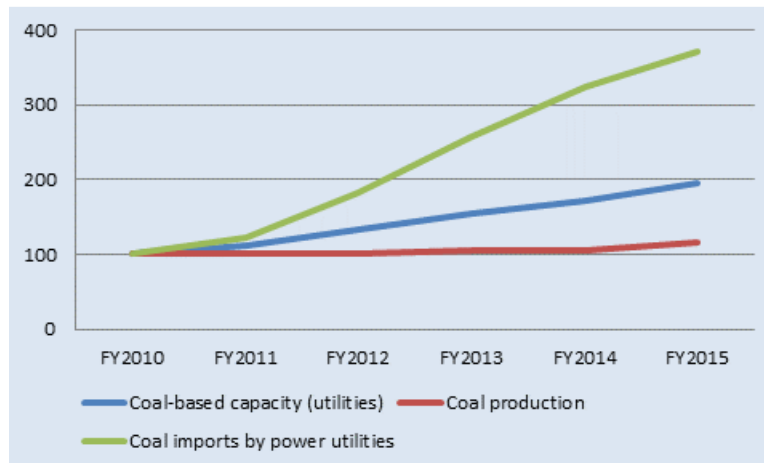
¹³ CEA, Daily Coal Report, June 2014, <http://www.cea.nic.in/reports/daily/coal/2014/June/30.pdf>

¹⁴ CEA, Daily Coal Report, March 2015, <http://www.cea.nic.in/reports/daily/coal/2015/March/31.pdf>



private developers. The Electricity Act of 2003 liberalized power generation to allow anybody to set up a power plant as long as they could raise the necessary finance, obtain the necessary permissions, and get access to fuel, land, and water. This led to a surge of power projects. Coal-based power capacity went up from 84 GW in March 2010 to 165 GW in March 2015, a 95 per cent increase, while production increased by only 15 per cent during the same period (see detailed historical data in Annexes 1 and 2). As a result, imports of steam coal by the power utilities sector surged from 25 Mt in FY2010 to 91 Mt in FY2015.

Figure 4: Coal-based power capacity, coal production, and coal imports by power utilities (FY2010=100)



Source: Author's calculations based on CEA and MoC data.

Coal imports by power utilities now account for 17 per cent of their coal consumption compared with 7 per cent in FY2010. This dependence puts this vital sector under pressure as coal is a global bulk commodity the price and availability of which is determined on the international market and denominated in US dollars.

Box 2: Determination of coal import needs by the power utilities sector

The power utilities sector is a key priority in national policy. This sector, which accounts for 66 per cent of coal demand, is regulated to keep power tariffs low, provide power supplies to all, and ensure industrial competitiveness. Due to coal shortages, as well as environmental standards on the transportation of coal, power utilities import coal and blend it with domestic coal to achieve the required quality. In addition, some power plants were designed to be wholly based on imported coal (mega power plants in coastal areas). Each year, the Central Electricity Authority (CEA) determines the quantity of coal needed to be imported by power utilities. Import clearance by the MoP is important for power utilities that blend domestic and imported coal as they can pass through the possible higher cost to consumers (state distribution companies). To assess import requirements, the CEA estimates total coal requirements based on the projected electricity generation for the year and then estimates the availability of domestic coal for power utilities based on production from the three sources of domestic supplies to the sector (CIL, Singareni Collieries Company Limited [SCCL], and captive blocks). Import requirements are derived by calculating the difference between the estimated demand for blending purposes and available domestic production. Imports by power plants designed on imported coal are treated separately. The shortfall of domestic coal is then converted into an import requirement taking into account the higher calorific value of imported coal. This means that less imported coal is actually needed than the estimated shortfall in Indian coal equivalent quality. For instance, in FY2015, the shortfall of domestic coal was estimated at 81 Mt, leading to a planned import requirement of 54 Mt. In addition, requirements by power plants designed on imported coal were estimated at 40 Mt, leading to a total planned import requirement of 94 Mt. Power utilities

actually imported 91.2 Mt, with their demand mainly driven by blending needs (48.5 Mt) to cover coal shortage and meet environmental regulations. The new regulations, which limit the transportation of coal with ash content above 34 per cent, have led more power plants to blend imported coal, pending the commissioning of new washeries.

Table 1: Coal consumption and imports by power utilities

	Steam coal	Imports by power utilities			Purpose of imports by power utilities	
	Coal consumption by power utilities (Mt)	Planned (Mt)	Actual (Mt)	% of coal imports in total consumption	Blending (Mt) Actual and (Target)	Power plants designed on imported coal (Mt) Actual and (Target)
FY2010	367.3	28.7	24.6	7%	20.2 (25.7)	4.4 (3)
FY2011	386.6	44	30.3	8%	21.8 (35)	8.5 (9)
FY2012	417.6	55	44.9	11%	27 (35)	17.9 (20)
FY2013	464.5	70	63.2	14%	31.5 (46)	31.7 (24)
FY2014	486.4	82	80.1	16%	36.9 (50)	43.2 (32)
FY2015 (prov.)	531.5	94	91.2	17%	48.5 (54)	42.7 (40)

Sources: CEA; Ministry of Coal; Ministry of Power; Author's calculations.

So far, imports have been less than the estimated requirements for the year, mainly due to the higher cost of imported coal compared with CIL's prices and, as a result, the higher cost of power generation. Due to their weak financial situation, state distribution companies (Discoms) are reluctant to buy costlier power despite recurrent power shortfalls and load-shedding. Given transportation costs and congestion of the railway system, this is particularly the case for power utilities located far away from ports. The other reasons for this discrepancy include: technical limitation of boiler design to blend imported coal; port capacity constraints and congestion; and electricity generated on imported coal not getting scheduled in merit order operation for power merchant plants, resulting in sub-optimal utilization of plant capacity.¹⁵

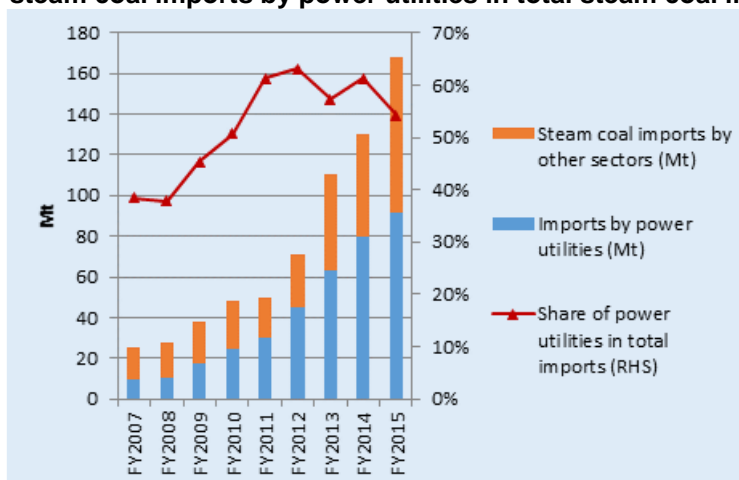
2.1.4 Steam coal imports driven by the power sector, but recently by other sectors too

The non-regulated sector (sponge iron, captive power plants, cement, etc.) dramatically increased its steam coal imports in FY2015 – by 54 per cent to 77 Mt – due to increasing demand and the reduction of CIL's e-auction coal sales – 45 Mt compared with 58 Mt in FY2014 – forcing non-regulated users to resort to the international market. The move was also explained by strategic commercial considerations, as the low price of international coal made it less expensive than CIL's sales of high-grade coal to the non-regulated sector or industrial plants located far away from mines.

Overall, power utilities were taking a larger share of total steam coal imports, reaching 61 per cent in FY2014. In FY2015, it declined to 54 per cent in view of the surging imports by the non-regulated sector.

¹⁵ Lok Sabha, Ministry of Power, Fuel supply, Answer to question N° 5004, 23 April 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=16840>

Figure 5: Share of steam coal imports by power utilities in total steam coal imports



Sources: Ministry of Coal; CEA; Ministry of Power.

2.1.5 Indonesia is the leading supplier, but the share of other suppliers is growing

India traditionally relies on Indonesia and South Africa for steam coal imports. Indonesia accounted for 78 per cent of steam coal imports in FY2014, South Africa supplied 15 per cent, and Australia 4 per cent. Imported coal is of better quality than domestic supplies: it has a lower ash content, generally not exceeding 15 per cent, as compared to up to 50 per cent for indigenous coal. Similarly, imported steam coal generally has a higher energy content, with a gross calorific value (GCV) ranging from 4,900 to 6,500 kcal/kg compared to 3,400 to 5,200 kcal/kg for most indigenous coal. Indonesia mainly exports low-rank coal, the bulk of which has a calorific value in the 3,600–4,200 gross-as-received (GAR) range, whereas typical Australian or South African coals have a 5,800 (GAR) calorific value or higher. Using higher calorific value coal means that less coal is needed to produce the same amount of electricity or industrial output, and therefore less pollutants and CO₂ are emitted. Lower-rank coal, mainly from Indonesia, is sold at a discount to higher grades. Indonesian coal is used for blending with domestic coal to help reduce ash content or as a direct replacement for Indian domestic coals.

With the global coal market remaining oversupplied, coal prices decreased significantly during FY2015. Prices of low-rank Indonesian coal fell 13 per cent while higher grade South African and Australian coal fell 13 and 18 per cent respectively. Higher-grade coal therefore became more competitive than Indonesian low-rank coal. As such, power generators shifted to higher calorific value coal to compensate for the shortfall of domestic coal. Imports of bituminous coal (above 5,831 kcal/kg in Indian trade classification) jumped from 5 Mt in FY2014 to 18.7 Mt in FY2015. Indonesia's share of the Indian market fell to 70 per cent in FY2015 while imports from South Africa increased by 54 per cent and imports from Australia doubled. Furthermore, the stabilization of the rupee in 2014 meant that Indian buyers were in a stronger position to exploit falling international coal prices, which had reached their lowest level in four years.

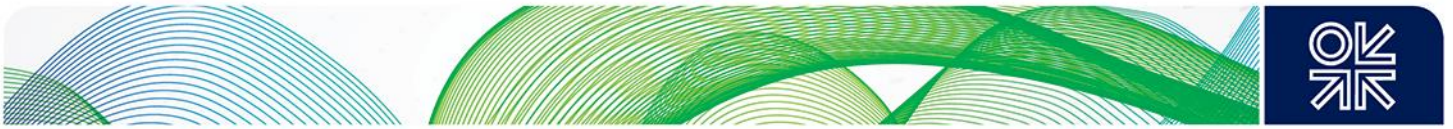
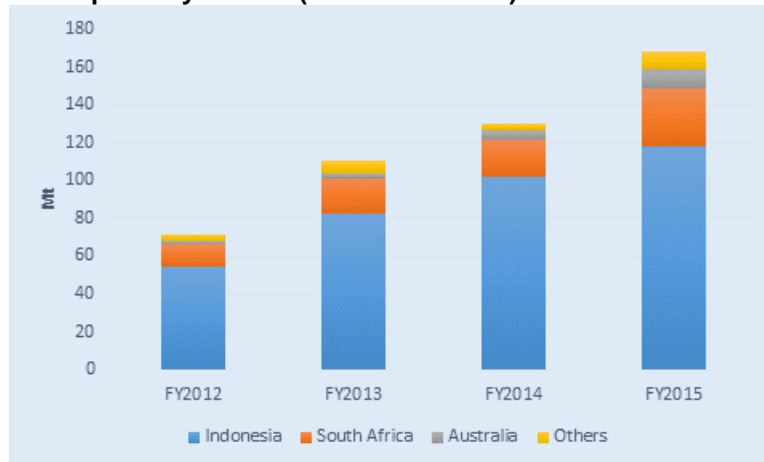


Figure 6: Steam coal imports by source (FY2012–FY2015)



Source: Coal Controller’s Organisation.

A new recommendation by the environment ministry’s Expert Appraisal Committee (EAC) in October 2015 will further reinforce the trend towards higher calorific value coal at the expense of Indonesian coal (see Box 3). The recommendation will help power utilities to reduce the cost of generation and, because less imported coal will be needed to produce the same amount of electricity, it will also sustain the government policy of reducing steam coal imports.

Box 3: Imported coal with 25 per cent ash content allowed

In October 2015, the environment ministry’s EAC recommended that the restriction on maximum ash content of imported coal may be increased up to 25 per cent, from the previous 12 per cent limit set in 2013, and that environment impact assessments be carried out accordingly.¹⁶ The decision to permit an increased ash allowance is aimed at helping domestic thermal power plants to use higher-grade coal and bring down the cost of generation.

The recommendation by the EAC comes against the backdrop of recent claims by the Indian Association of Power Producers (APP) that the environment ministry’s decision of 2013 has triggered problems for coastal, import-based projects as they are unable to utilize high-grade bituminous steam coal available from Australia, South Africa, Russia, and Colombia. Instead, these thermal power plants are forced to use Indonesian coal, which is characterized by low ash content but lower calorific value and high moisture content (34–40 per cent), which results in reduced efficiency and increased coal consumption per unit of electricity produced. On the contrary, thermal coal from other countries has higher calorific values than Indonesian coal but generally higher ash content. For instance, typical steam coal exports from Australia’s New South Wales and Queensland regions generally have energy content, above 5,500 kcal/kg, but they also have high ash content (22 per cent) and a sulphur range of 0.7–0.8 per cent. The APP therefore requested a revision of the limit on ash content of imported coal to help thermal power plants perform efficiently and lower their generation costs.

The EAC decision will clearly help power utilities that blend imported coal with domestic coal to decrease the cost of their power generation as the price of high calorific value coal has decreased more sharply than the price of Indonesian low calorific coal (on an energy equivalence basis). It will also help power utilities to reduce their coal imports as less coal will be needed to generate the same amount of power. This will sustain the government policy to reduce steam coal imports.

¹⁶ Indian Express, Coal with increased ash content, panel gives go ahead for imports, 8 October 2015, <http://indianexpress.com/article/business/business-others/coal-with-increased-ash-content-panel-gives-go-ahead-for-imports/#sthash.dTshpffp.dpuf>



Clear environmental impact assessments will also be needed. Last year, Beijing took the opposite course when the Chinese National Development Reform Commission implemented a ban on the sale and import of low-grade coal with high ash and sulphur content (Coal business regulatory approach, Order N° 13, 6 August 2014). The directive, which has been applied since 1 January 2015, bans import and sales of coal with low calorific values, high ash and sulphur content (with different thresholds applied to lignite and bituminous coal), and coal transported inland beyond 600 km from either a port or a mine. The decision was triggered by China's increasing air pollution problems. It should be noted, however, that the Chinese restrictions on ash content are less stringent than the 25 per cent endorsed by the Indian EAC (with thresholds of 30 per cent and 40 per cent depending on the quality of coal when coal is consumed at the port) except for three target regions, Beijing-Tianjin-Hebei, the Pearl River Delta, and the Yangtze River Delta, where the regulation restricts coal with ash above 16 per cent and sulphur above 1 per cent.¹⁷ Just as in India, the Chinese regulation is different for coal transported across the country and coal consumed near the import terminals.

2.2 Macro/microeconomic dimensions of coal imports

Coal imports increase the availability of coal in India and enable a reduction of coal and power shortages. However, the surge in coal imports had become a major source of concern, especially in light of the widening of the current account deficit (CAD) from FY2012 to FY2014, the depletion of foreign exchange reserves, and pressure on the exchange rates. Other problems associated with dependence on imports include the volatility of imported coal prices and changes in supply nations' export policies, which are both seen as a threat to critical and secured supply of the power industry.¹⁸

2.2.1 Impact on the current account deficit

At the macroeconomic level, the increase in coal imports has been increasingly viewed as a source of vulnerability for the Indian economy.¹⁹ In relation to the total imports by India (\$448 billion in FY2015), the value of coal imports remains modest (3.8 per cent), but the large-scale import of fossil fuels, including coal, has had an adverse impact on Indian economy. India's current account has been consistently in deficit over the last 10 years, and the deficit widened after 2011, partly due to increasing oil prices but also rising coal imports. The sharp depreciation of the rupee against the US dollar, from the middle of 2011 to 2013, also significantly raised the cost of imported energy. The trade deficit narrowed in FY2014 and further improved in FY2015 thanks to falling oil and energy prices, among other factors.²⁰

The coal import bill jumped from \$9.1 billion in FY2011 to \$16.5 billion in FY2012 due both to surging imports and coal prices as well as the rupee depreciation. It has remained elevated since then, despite the fall in coal prices, and amounted to \$17.1 billion in FY2015, an increase of 12 per cent over FY2014. The corresponding amount in rupees increased by 13.2 per cent to INR 1,045 billion.

¹⁷ See OIES, China's coal market : Can Beijing tame King Coal, CL1, December 2014, <http://www.oxfordenergy.org/2014/12/chinas-coal-market-can-beijing-tame-king-coal-2/>

¹⁸ Anand M.R., Prasad D.N, Recent trends in production and import of coal in India, Ministry of Coal Occasional Working paper Series No. 1, 13 October 2013 http://www.coal.nic.in/sites/upload_files/coal/files/coalupload/wp101014.pdf

¹⁹ Anand M.R., Prasad D.N, Recent trends in production and import of coal in India, Ministry of Coal Occasional Working paper Series No. 1, 13 October 2013 http://www.coal.nic.in/sites/upload_files/coal/files/coalupload/wp101014.pdf

²⁰ The country's crude oil import bill fell to \$112 billion in FY2015 from \$143 billion in FY2014 due to lower prices.

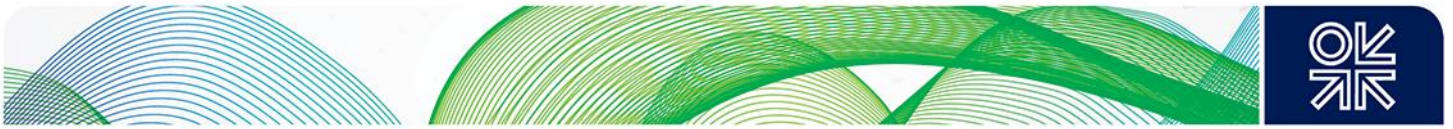
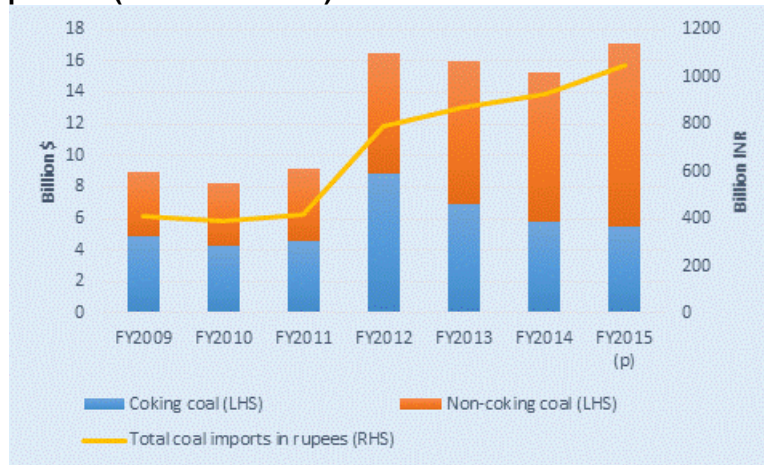


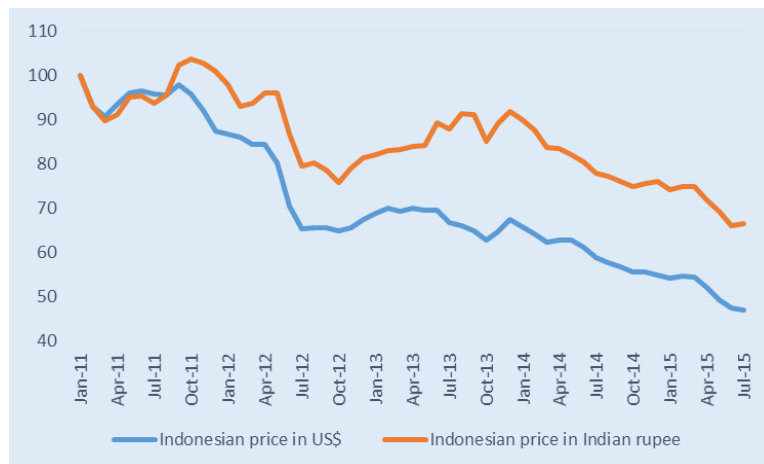
Figure 7: Coal import bill (FY2009–FY2015)



Source: Author’s calculations from Ministry of Commerce & Industry databank.

The Indian rupee fell by 32 per cent against the US dollar between July 2011 and September 2013, before stabilizing at around INR 62–64/\$. This depreciation almost entirely erased the 26 per cent drop in Indonesian coal prices observed during the same period. In contrast, the relative stabilization of the rupee in 2014 allowed Indian coal importers to benefit from the drop in coal prices registered that year.

Figure 8: Impact of exchange rate on imported coal prices
100=January 2011



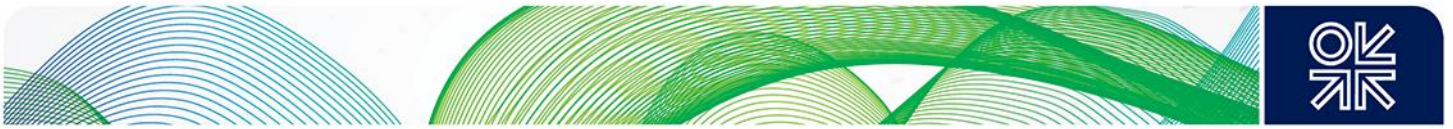
Source: Author’s calculations from McCloskey and x-rates.com.

2.2.2 Volatility of coal prices and changes in foreign export policy

The high degree of import dependence is also a matter of concern at the microeconomic level for end-users, particularly in the vital power sector, due to the uncertainties arising from the volatility in import prices and changes in export policies in supplying countries.²¹

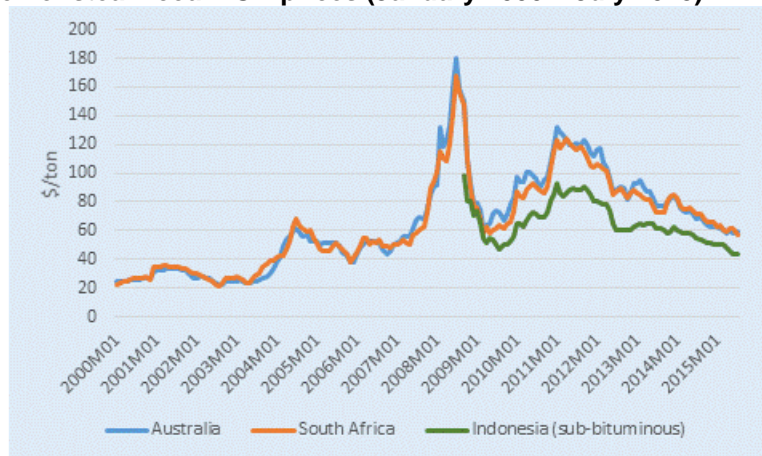
The price of imported coal has been highly volatile over the past 10 years. After reaching record highs in July 2008 and at the beginning of 2011, the price of coal has been trending downwards since. The

²¹ Anand M.R., Prasad D.N, Recent trends in production and import of coal in India, Ministry of Coal Occasional Working paper Series No. 1, 13 October 2013 http://www.coal.nic.in/sites/upload_files/coal/files/coalupload/wp101014.pdf



FOB²² price of steam coal exported from Indonesia (4,900 kcal/kg) has fallen by half in the past four years, from \$92/t in January 2011 to \$43.4/t in July 2015. Though there were brief spikes, international steam coal prices declined under the combined effect of slow growth in international trade (particularly Chinese import demand), the expansion of coal supply in traditional supplying countries (especially in Australia) and new suppliers (Mozambique), and the US shale gas revolution, which pushed US coal mining companies to turn to the overseas market. In the short term, international coal supply is expected to remain abundant and prices subdued. In the medium term, international coal suppliers are expected to reduce their coal production in reaction to the low-price environment and prices are expected to recover somewhat, although not to the level seen in 2011. Therefore, the current low level of imported coal prices cannot be taken for granted in the long term, whilst at the same time there are major uncertainties on future levels, which could also be influenced by the level of Indian imports.

Figure 9: Evolution of steam coal FOB prices (January 2000 – July 2015)



Note: Australia FOB Newcastle – 6,700 kcal/kg beginning year 2011, 6,300 kcal/kg for period 2002–10, and 6,667 kcal/kg before 2002; South Africa FOB Richards Bay – 6,000 kcal/kg beginning year 2006, 6,200 kcal/kg during 2002–05, and 6,390 kcal/kg before 2002; Indonesia FOB Southeast Kalimantan – sub-bituminous coal, 4,900 kcal/kg Net-as-received (NAR).

Sources: World Bank; McCloskey

India was already hurt by the rise in coal prices in 2009/10, when China suddenly emerged as a key importing country and the market turned from oversupply to tightness. Despite its decreasing imports, China's influence on global coal prices is still determinant. In 2014/15, it played in favour of coal buyers because the overcapacity on the Chinese coal market reduced its import demand and consequently international coal prices.²³

As India learnt to its cost with changes in the Indonesian export policy, changes in the regulatory regime in exporting countries also impact the price and availability of coal. Indonesia's vast coal reserves had attracted large investments by Indian companies, such as Tata Power, Adani Power, and Reliance Power, who bought assets in the country to fuel their ultra-mega power plants (UMPP) projects in India, while others, such as Lanco Infratech, have long-term agreements with miners and traders in the country. But in September 2011 Indonesia adopted a new pricing regulation that aligned its export price on international benchmark prices for all new and existing contracts. The sudden doubling of the Indonesian coal price raised the cost of generation for Indian power utilities and thus upset the economics of UMPPs being set up by Tata Power and Reliance Power. The power companies won competitive bids for power supply based on a price of Indonesian coal of \$24/t, while

²² FOB: Free on Board (does not include maritime transportation cost).

²³ See OIES (2014), 'China's coal market: Can Beijing tame "King coal"?', December 2014, <http://www.oxfordenergy.org/2014/12/chinas-coal-market-can-beijing-tame-king-coal-2/>



the new benchmark price at the end of 2011 was closer to \$60/t. Since there were no provisions for passing through increased fuel costs in their power purchase agreements²⁴ (PPAs), this led both to lengthy renegotiations of contracts and losses for power generators. Finally, the UMMPs were allowed to increase power rates due to the rise in Indonesian coal prices.

As India depends on Indonesian coal to a large extent to provide coal at an affordable price to key consuming sectors, any change in Indonesian coal policy may hurt Indian buyers. Although Indonesia is the world's largest steam coal exporter, the government has tried several times to limit coal exports to feed its growing domestic demand. In 2009, the Indonesian government established a Domestic Market Obligation (DMO) scheme to guarantee coal supply to the domestic market. Since 2014, the government has also tried to curb production to counter weak prices and the oversupply in the global market. Some Indonesian mines have already closed due to weak market conditions and falling prices; with increasing domestic demand for coal, there is an expected upward price pressure in the medium term, though the market remains oversupplied in the short term. While a cap on coal production has not yet been adopted in view of weak international market demand, newly introduced rules in the coal industry (such as a 'listed exporter'²⁵ status and the obligation to use letters of credit for all export deals) may limit coal exports. In addition, and in order to boost mining revenues, Indonesia plans to raise coal royalties due by holders of Mining Business Permits (IUPs) to 7–13.5 per cent from 3–7 per cent previously, depending on the coal grades.

Delivered coal prices in India are also impacted by exchange rates, as seen in Figure 8, as well as by maritime transportation costs and bunker prices. Maritime transportation costs are currently extremely low but their future levels are very uncertain. For instance, the typical freight rate from Indonesia to Indian eastern coast ports was \$8.5/t at the beginning of 2014, but it had collapsed to \$4–5/t in the first half of 2015. Shipping costs have been at a record low, with the Baltic Dry Index²⁶ falling to its lowest level since 1986 at the beginning of 2015 and remaining at low levels since. Coal freight costs on the South Africa–India route have declined from \$15/t in 2014 to \$8–10/t. Apart from falling crude oil prices, the drop in the index is caused by an oversupply of dry bulkers combined with weak demand for dry bulks, mainly explained by slower import demand of raw materials in China.

2.2.3 Security and independence of supply

In addition to economic concerns associated with coal imports, reducing the dependence on imported coal is also rooted in considerations of energy security. For a large economy and large coal reserve holder such as India, maintaining coal self-reliance and security is viewed as a strategic need in its own right.²⁷ This is particularly crucial as power generation relies on coal for 76 per cent of total supplies.

Moreover, India is increasingly dependent on imported fuels to satisfy its requirements. Its import dependence reached 43 per cent of commercial energy supply in FY2014 from 40 per cent in FY2010. India's dependence on foreign crude oil is very high, with 83 per cent of its crude oil requirements met by imports in FY2014.

²⁴ Power price under PPAs with Discoms are determined after rate-based bidding and approved by the state regulator (see Box 6).

²⁵ A government list of companies which hold coal export licences.

²⁶ The Baltic Exchange's main dry bulk index is calculated from average daily earnings of Capesize, Panamax, Supramax, and Handysize vessels.

²⁷ Anand M.R., Prasad D.N (2013), op.cit. Anand M.R., Prasad D.N, Recent trends in production and import of coal in India, Ministry of Coal Occasional Working paper Series No. 1, 13 October 2013
http://www.coal.nic.in/sites/upload_files/coal/files/coalupload/wp101014.pdf



Table 2: Energy import dependence in FY2010 and FY2014

	Total primary energy supply	Net imports	Import dependence (%)
Crude oil (Mt)			
FY2010	193	159.3	83%
FY2014	227	189.2	83%
Natural gas (bcm)			
FY2010	55.67	9.15	16%
FY2014	47.67	13.03	27%
Coal (excl. lignite) (Mt)			
FY2010	602.9	70.8	12%
FY2014	732	166.3	23%
Total commercial energy sources (Mtoe)			
FY2010	507.2	200.8	40%
FY2014	596.4	257.2	43%

Source: Central Statistics Office, 2015.

In a business-as-usual scenario, the government has estimated that the energy import bill of around \$150 billion would double to \$300 billion by 2030.²⁸ That this could be a major bottleneck to sustaining economic growth has not been missed by the government, and Prime Minister Narendra Modi has announced an ambitious roadmap for India's energy self-sufficiency aiming at reducing energy imports by 10 per cent by 2022 and by a further 50 per cent by 2030. In addition to energy conservation measures, the roadmap focuses on developing domestic energy production and encouraging alternate energy sources to fossil fuels.

2.2.4 The new policy is a turnaround from past policies which 'built' import demand

A certain amount of demand for imported coal was built-in and encouraged by previous energy/power policies and strategies.

During the 10th and 11th Five-Year Plans (FYPs), one of the strategies adopted for increasing the power generation capacity involved setting up UMPPs and large coal power plants in coastal areas. Some of these projects were based on imported coal and their boilers designed to burn coal of higher calorific value and lower ash content than other domestic plants. Furthermore, in view of the shortages of coal and/or transportation bottlenecks, the Central Electricity Authority (CEA) in 2011 recommended that all new coal-based projects be designed for a blend of domestic and imported coal up to a blending ratio of 30 per cent.²⁹

In response to coal shortages, the previous government adopted a strategy aimed at acquiring coal mines and assets overseas, mainly in Mozambique, Indonesia, South Africa, and Australia. A joint venture company, ICVL³⁰ (International Coal Ventures Private Limited), was accordingly formed in 2009 for securing coal assets overseas and thus ensure supply of imported metallurgical coal and high-quality steam coal. A number of Indian ventures, members of ICVL or private companies, have expanded into international coal markets since then. However, the interest in acquiring overseas assets has declined over the past year with a refocus on domestic resources. Simultaneously, with the gap between the global and domestic price of coal narrowing, the financial viability and returns on investments from overseas projects are also being squeezed.

²⁸ Livemint.com, 'NITI Aayog making a blueprint to tackle India's energy woes', 8 April 2015,

<http://www.livemint.com/Politics/x5rDmnYkkY4IAuJVCEnBsI/NITI-Aayog-making-a-blueprint-to-tackle-Indias-energy-woes.html>

²⁹ National Thermal Power Corp. (NTPC), Blending of imported/high grade coal with domestic coal,

<http://www.eecpowerindia.com/codelibrary/ckeditor/ckfinder/userfiles/files/Blending%20of%20Imported%20%26%20Domestic%20Coals%20-%20Mr%20I%20K%20Rajdeva.pdf>

³⁰ ICVL is owned by Steel Authority of India (SAIL), CIL, Rashtriya Ispat Nigam Ltd (RINL), National Mineral Development Corp. (NMDC) and NTPC, <http://icvl.in/aboutus.php?tag=company-aboutus>



Box 4: Overseas investment

CIL was one of the five members of ICVL, but in February 2015 its board decided to withdraw from ICVL citing a conflict of interest.³¹ Over the past few years, CIL had earmarked \$5.46 billion of its total free cash flow to acquire and develop coal assets overseas.³² Its experience in Mozambique, where the company explored two concessions in the Tete region, has revealed the high risks involved in developing mineral assets in foreign countries and uncertainties over their quality. In July 2015, the company relinquished part of its exploratory assets in Tete after disappointing exploratory results. Besides Mozambique, CIL's other overseas acquisitions which failed to take off at the negotiations stage over the past few years include assets of Peabody Energy in the US and PT Dian Swastatika Sentosa in Indonesia.

ICVL and Tata Steel Limited acquired 65 per cent stake of the Benga coking coal mine (also in Mozambique) from Rio Tinto in July 2014 for \$50 million. The mine, however, has started incurring losses due to low prices of coking coal and high mining and transportation costs.³³

While CIL is withdrawing from overseas activity, there is still interest from Indian companies for overseas investment, led by Adani's investment in Australia.

In Queensland, Adani is aiming to build the Carmichael Mine and a port expansion at Abbot Point. Estimated to be worth about \$12 billion, the Carmichael project is the largest (60 mtpa – million tons per annum) of nine super-mines proposed for the Galilee Basin, one of Australia's richest coal reserves. The company has invested \$900 million so far in the Australian mine, and in May 2011 it acquired the Abbot Point Coal Terminal in North Queensland for \$1.8 billion. The mine, approved in 2014, was again given the green light by the Australian federal government in October 2015, two months after the previous approval was challenged by a federal court. However, despite major contracts awarded to develop the mine, financial issues strengthen doubts about the viability of the project since the National Australia Bank announced it would not fund the mine.³⁴ Adani remains highly committed to the development of the Carmichael Mine and the associated North Galilee Basin Rail Project.³⁵

Adani has also acquired assets in Indonesia, where it holds a mine at Bunyu in East Kalimantan with reserves estimated at 269 Mt and peak production capacity of 7 mtpa.

Other companies which acquired assets in overseas markets at the beginning of the decade include Tata Power, Essar Energy, Jindal Steel and Power, Reliance, GVK Power and Infrastructure, and Lanco Infratech.³⁶ Recently, Reliance decided to sell its three mines in Indonesia to focus its coal mining activity in India.³⁷

In April 2015, SCCL announced its intention to acquire majority stakes in coal mines in Australia, Indonesia, South Africa, and Mozambique and floated a global expression of interest (EoI).³⁸ The company is looking for mines with annual production capacities of at least 2 Mt and reserves of at

³¹ The coal age, CIL Withdraws from ICVL, 26 March 2015, <http://www.coalage.com/news/world-news/4309-cil-withdraws-from-icvl.html#.VRyl4PmsXul>

³² Mining Weekly, CIL shifts overseas funding to domestic markets, 28 July 2015, <http://www.miningweekly.com/article/cil-shifts-overseas-funding-to-domestic-markets-2015-07-28>

³³ 4-traders.com, 'Mozambique mine eating into assets of ICVL, Tata's', 13 April 2015, <http://www.4-traders.com/TATA-STEEL-LIMITED-9058836/news/MOZAMBIQUE-MINE-EATING-INTO-ASSETS-OF-ICVL-TATAS-20193549/>

³⁴ BBC, 'Adani's Australian coal prospects in doubt', 9 August 2015, <http://www.bbc.com/news/world-australia-33815059>

³⁵ Australian Financial Review, Adani granted approval for Carmichael mine, 15 October 2015, <http://www.afr.com/business/mining/adani-granted-approval-for-carmichael-mine-20151015-gk9wz5>

³⁶ See http://www.sourcewatch.org/index.php/Indian_company_investments_in_overseas_coal_mines

³⁷ Money Control, 'Reliance Power to sell off three Indonesian coal mines', 1 October 2015, www.moneycontrol.com/news/business/reliance-power-to-sell-off-three-indonesian-coal-mines-3354861.html?utm_source=ref_article

³⁸ 4-traders.com, 'Singareni eyes coal mines abroad', 11 April 2015, <http://www.4-traders.com/COAL-INDIA-LTD-9060008/news/Coal-India--Singareni-eyes-coal-mines-abroad-20181100/>



least 50 Mt. SCCL aims at increasing its supplies and becoming the sole supplier to any planned power plants or other coal-consuming projects in the Telangana state.

Should steam coal imports in India cease completely, the projects are at risk of becoming stranded due to the oversupplied global market.

The New Coal Distribution Policy (NCDP), adopted in 2007, introduced a system of coal allocation based on the issuance of letters of assurance (LoAs) upon recommendation of the Inter-Ministerial Standing Linkage Committee (Long-Term), or the SLC-LT.³⁹ Earlier, power projects were directly granted coal linkages. The NCDP included a provision envisaging coal imports by CIL to cover its coal supply agreements (Fuel Supply Agreements, known as FSAs or coal linkages) with power plants. Due to coal shortages and increasing number of applicants for FSAs, a presidential directive of July 2013 revised the norms for FSAs to be signed with power companies. The directive stated that for power plants which have been commissioned or will be commissioned during the period from 1 September 2009 to 31 March 2015, with an aggregate capacity of 78,000 MW, CIL will supply 80 per cent of the annual contracted quantity (ACQ) of the FSA commitment. Due to fuel constraints, 65 per cent will be supplied through CIL's own production while the remaining 15 per cent will be supplied through imports. The quantity supplied by CIL from its production will gradually increase from 65 per cent of ACQ until FY2015 to 67 per cent in FY2016 and further to 75 per cent from FY2017. To meet its remaining FSA obligations, CIL will need to import and supply coal to willing thermal coal plants on a cost plus basis, but it is not responsible for the transportation of coal from the port to the plant. Imports, however, are not the sole prerogative of CIL, and the power producers with whom the FSAs have been signed have the right to import coal directly. CIL has appointed Metals and Minerals Trading Corporation (MMTC), a public trading house and import agency, to import coal supply on its behalf.⁴⁰

This has created two different FSA models with varying assured levels of supply for the power utility sector, pre-2009 plants and post-2009 power plants. For power plants commissioned prior to 31 March 2009, the government had decided in 2013 to supply coal for a period of 20 years entirely with domestic coal and with an assured level of 90 per cent of the FSA commitment. For the power plants commissioned after 1 April 2009, the level of assured domestic supply at regulated prices is reduced to 65 per cent. In FY2015, CIL increased its FSA deliveries to all thermal power plants (TPPs) to 386 Mt, compared with commitment of 452 Mt (that is, 85 per cent of its commitments).

Following a long debate on how to allocate the higher costs of imported coal and a proposed coal pooling formula, the government finally decided to pass through the additional cost to the state consumers. However, due to their financial situation, state Discoms are not able to pay or pass through the additional cost.

This policy largely explains the surge in steam coal imports by the power sector registered in the past three years, as CIL only provided 65 per cent of the requirements of the power plants commissioned after March 2009 (this will rise to 67 per cent in FY2016). Likewise, imports of coal by the power sector should 'automatically' decrease (in relative terms) from FY2017, when the quantity delivered by CIL on its own production is increased to 75 per cent by 2017. It also partly explains the fall in utilization of power plants registered in the past two years (see Section 3.2), as state Discoms are

³⁹ So far 177 LoAs have been issued to various power plants including the central/state government sector as well as IPPs covering capacity of 108,000 MW. Out of this capacity, the competent authority in 2013 had approved signing of FSAs in respect of 78,000 MW of capacity from power plants which had been commissioned or were likely to be commissioned by 31.03.2015. The CCEA further directed that coal may also be supplied to specified power plants of 4,660 MW capacity and other similarly placed power plants that did not have any fuel linkage subject to availability of coal. Altogether, these 82,466 MW requires around 430 Mt of coal per year on the basis of 5.2 Mt/MW (i.e. considering an average coal consumption of 0.7 kg/kWh at 85 per cent PLF).

The power projects of the remaining capacity of 30,000 MW are yet to be authorized for signing of FSAs. In view of the negative coal balance reported by CIL's subsidiaries, new linkages/LoAs have not been granted to any of the sectors since 2010.

⁴⁰ In FY2015, CIL planned to import 5 Mt to meet its annual contractual obligations. It actually received orders for only 0.5 Mt. In FY2016, imports by CIL could amount 1.6 Mt.



financially incapable of purchasing additional power based on costlier imported coal because they are unable to raise domestic power tariffs for state consumers (particularly residential and agricultural) due to political factors.

Despite clear signs that imports would surge – the Working Group on Coal and Lignite for the formulation of the 12th FYP reported in November 2011 a projected a gap of 265 Mt between demand and indigenous supply by FY2017, of which 230 Mt was steam coal – there was no comprehensive import policy designed, nor any corrective actions to reduce these imports.⁴¹

Table 3: 12th FYP projected gap between coal demand and indigenous supply

Mt	12th FYP (FY2017)		13th FYP (FY2022)	
	Scenario I (BAU)	Scenario II (Optimistic)	Scenario I (BAU)	Scenario II (Optimistic)
Demand	980.5		1373	
Indigenous supply	715	795	950	1102
Gap	265.5	185.5	423	271

Source: MoC, Working Group on coal and lignite for formulation of the 12th FYP, 2011.

This is suggestive of a circular debt problem. On the one hand, CIL was mandated to import coal to comply with its FSA agreements, and state electricity consumers were required to pay for the additional cost relative to domestic coal. But on the other hand, the high cost of imported coal has led to economic and energy security issues. In addition to the trade deficit issue, the inability of state Discoms to pay for their supplies or sign long-term PPAs with power generators has compromised the security of electricity supply in the country and led to a vicious circle in which power plants have not been able to pay for coal supplies nor repay their debt vis-a-vis their lenders.

In a sharp contrast with previous policies, the new government aims to cease steam coal imports.⁴² This was announced by Piyush Goyal, Minister of State for Power, Coal & New and Renewable Energy, at the World Economic Forum in New Delhi in November 2014. While recalling the goal set for CIL to double its coal production by FY2020, the minister stated his confidence that India might be able to stop steam coal imports within the next three years. The steam coal self-sufficiency policy was reiterated in May 2015, when the minister stated that ‘the growth in coal production would match the growing requirement of electricity, expected to be two trillion units [that is, 2,000 TWh] by 2019’.⁴³ The minister also announced that ‘the declining trend would begin during the current fiscal year [FY2016, from April 2015 to end of March 2016], with thermal coal imports ceasing in about two to two-and-a-half years’ time; the higher calorific coal (coking coal) imports needed for steel plants would be likely to continue’.⁴⁴

The new policy represents a major strategic change in direction for India’s electricity sector. Its success, combined with other reforms in the power sector, may allow the new government to fulfil its main objectives of expanding access to energy while improving energy security and the balance of payments. The road to steam coal independence, however, is a challenging one with major hurdles on both sides of the supply-demand equation.

⁴¹ See Prayas (Energy Group), ‘Largesse that wasn’t: the story of coal shortages in India’, March 2014, http://www.indiaenvironmentportal.org.in/files/file/Coal_Shortages_Report.pdf

⁴² The intention to stop coal imports refers to steam coal, and in priority to steam coal imports by power utilities.

⁴³ Financial Express, ‘India to stop imports of low grade thermal coal in two years, says Piyush Goyal’, 15 May 2015, <http://www.financialexpress.com/article/economy/india-to-stop-imports-of-low-grade-thermal-coal-in-two-years-says-piyush-goyal/72786/>

⁴⁴ Business Line, ‘Thermal coal imports will stop by 2017: Goyal’, 15 May 2015, <http://www.thehindubusinessline.com/economy/thermal-coal-imports-must-be-stopped-goyal/article7209584.ece?ref=relatedNews>



3. Coal demand and the new energy policy

3.1 Coal demand is dominated by the power sector

India's total coal consumption⁴⁵ (hard coal, or 'raw coal' as referred to in Indian statistics, and lignite) has almost doubled in the past 10 years, primarily driven by the needs of the power sector, reaching around 865 Mt in FY2015, up 11 percent from 782 Mt in FY2014.⁴⁶ Steam coal⁴⁷ accounts for 88 per cent, or 760 Mt, of India's coal consumption. Coking coal⁴⁸ (58 Mt) and lignite (47 Mt) make up the balance.

Figure 10: Evolution of total coal consumption (FY2005–FY2015)



Source: Coal Controller's Organisation.

The electricity sector is the largest user of coal in India, with the central generation utility NTPC (National Thermal Power Corporation Limited) being the largest single buyer (75 per cent of NTPC's generation is fuelled by coal). The power sector (utilities and captive power plants) accounts for 69 per cent of India's coal use. Its consumption is estimated at 600 Mt (FY2015), of which 40 Mt is lignite.⁴⁹ Despite the rise in domestic coal production, the sector suffers from chronic coal shortages which previous governments have attempted to address, with little success so far. As mentioned before, the shortages were not due to coal-power capacities, which surged from 84 GW in March 2010 to 165 GW in March 2015 – a 95 per cent increase. During the same period, coal-based power generation increased from 540 TWh in FY2010 to 836 TWh in FY2015, which was an impressive rise of 55 per cent but still left generation lagging behind the growth in capacity.

⁴⁵ In international statistics, 'coal' consumption refers to hard coal plus lignite (for instance in IEA energy balances), as both hard coal and lignite are used in the power sector. In Indian statistics lignite is treated separately. This report relates to hard coal, except for this section.

⁴⁶ Coal Controller's Organisation, Provisional Coal Statistics 2014–2015, October 2015 and CCO, Coal Directory of India 2013–2014, April 2015

⁴⁷ Steam coal: coal used in power stations and industries, excluding as a raw material for the production of iron and steel.

⁴⁸ The figure refers to metallurgical coal only. India produced 57.4 Mt of 'coking coal' in FY2015, of which only 14 Mt was of metallurgical quality. The remaining was used in all sectors, including power plants.

⁴⁹ According to CEA, the power utilities imported 91.2 Mt in FY2015. According to CCO, the power sector (utility + captive) consumed 469.7 Mt of domestic hard coal production and 39.5 Mt of domestic lignite production.



Figure 11: Installed coal power capacities – power utilities (FY1990–FY2015)



Source: CEA.

Figure 12: Electricity generation from coal – power utilities (FY1990–FY2015)

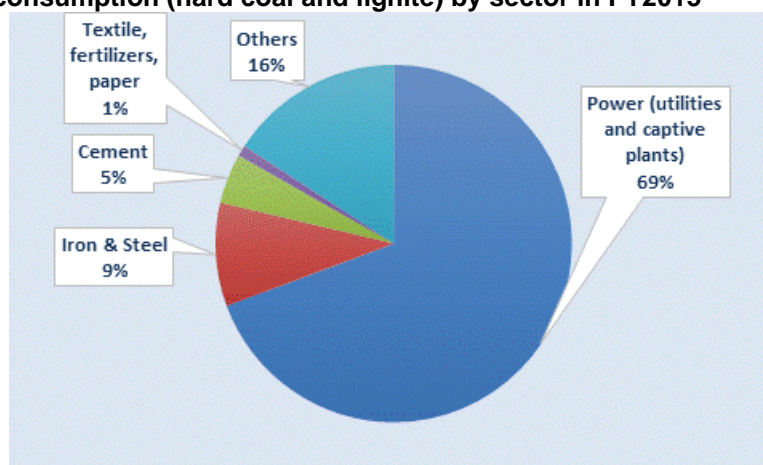


Source: CEA.

The iron and steel industry (including sponge iron) represents 9 per cent of total coal consumption (81 Mt in FY2015), mostly coking coal, of which around 44 Mt was imported. India is the world’s fourth-largest producer of crude steel and produced 83 Mt in 2014. More than half of this came from the Electricity Arc Furnace (EAF) route, using electricity and scrap, and 42 per cent from the Basic Oxygen Furnace (BOF) route, using iron ore and coking coal. India is expected to drive world steel output growth, becoming the second-largest producer and consumer of steel by FY2017. Steel demand is expected to increase on the back of expansions in infrastructure spending and urbanization. As India has limited coking coal resources of high quality, most of the required coking coal will continue to be imported.

The cement industry is the third-largest consumer of coal in the country and accounts for 5 per cent of coal consumption (39 Mt in FY2015, of which two-thirds was imported). India is one of the world’s largest cement producers and consumers (280 Mt in 2014), second only to China, with consumption growth driven primarily by infrastructure and housing developments.

Figure 13: Coal consumption (hard coal and lignite) by sector in FY2015



Note: The breakdown for 'Others' is not specified. However, it includes 84 Mt of imported coal, of which an estimated 34 Mt was consumed by the power sector (based on CEA data on imported coal by the power utilities sector).

Sources: Coal Controller's Organisation, October 2015; Author's estimates.

3.2 Challenges in the coal power sector

Due to the overwhelming share of the power sector in total coal demand, the sector is the key determining factor of future coal demand in India, as in most countries. The sector encounters several environmental, technological, economic, and financial issues that will impact its future development and therefore coal demand in India.

3.2.1 Low quality of Indian coals

The poor quality of Indian coal is a major issue for power companies, and also the environment. First, due to the intrinsic quality of Indian coal and the way it is mined, Indian coal has a high ash content and contains extraneous material such as shale and sandstone. Transport of run-of-mine (ROM) coal is wasteful because the extraneous material and ash are also transported with the coal. The poor and heterogeneous quality of coal products in India has led to disputes between CIL and the power companies which it supplies, especially NTPC, its main customer. In order to resolve this issue, the MoC has directed CIL to ensure 100 per cent supply of crushed coal to the power sector by strengthening the existing infrastructure for crushing coal and also through deploying mobile crushers through outsourcing. Third-party independent sampling has also been adopted and further improved with more independent participation of reputed third-party samplers, to resolve disputes between CIL and its customers and improve the quality of coal supply.⁵⁰

But the major issue is the high ash content and low GCV of Indian coals. ROM coals typically have high ash content (ranging from 30 to 50 per cent) and low calorific values (2,500–5,000 kcal/kg), while moisture content can be high during the monsoon season (up to 20 per cent). The high ash content of Indian coal gives rise to several problems: power plant efficiency is lower because ash hampers heat transmission; plant operation and maintenance are generally more difficult due to corrosion and removal of fly and bottom ash; higher ash content leads to higher pollutant emissions; and lower efficiencies lead to higher CO₂ emissions. As ash (which has no useful heating value) is transported together with coal, the high ash content of Indian coal also increases transportation costs per unit of energy content.

The quality of coal is a determinant factor as coal and ash properties govern critical aspects of boiler design and equipment selections for power plant units. The high ash content of Indian coal requires

⁵⁰ Ministry of Coal, 'Government Opens A New Chapter in Coal Sector ; Process of e-Auction gets Underway', 31 December 2014, <http://pib.nic.in/newsite/mbErel.aspx?reid=114221>



that boilers provide additional residence time for the carbon to burn out and must be around 20 per cent larger than boilers sized for imported lower-ash coal.

Coal beneficiation (coal washing and/or coal blending) is a necessary measure for improving the quality of ROM coal. This is usually done by crushing the coal and putting it in a liquid to separate the lighter coal (low ash content) from the heavier coal (high ash content) and the extraneous material. Washing increases the calorific value of coal and consequently its price. Washing makes coal more suitable for consumers because it provides more consistent quality, increases the energy efficiency of coal combustion boilers, reduces the required size of the power plant, reduces wear and tear because extraneous material has been removed, and reduces the amount of fly ash that is produced. It also makes transportation more efficient. For instance, the freight composition of Indian Railways is 47 per cent coal by tonnage and 44 per cent by net ton-km, and 40–45 per cent of this is mineral content (ash or non-coal). Moving washed coal with half of the mineral content/ash could free up 20 per cent of the railway's freight carrying capacity.

Despite these benefits, very little coal is actually washed in India. The cost of washing (estimated at \$5/ton⁵¹) is too high and cannot be entirely passed through to consumers. Moreover, Indian coals wash poorly due to their high inherent ash content.⁵² Currently, less than 20 per cent of the coal produced is washed, as against the global average of over 50 per cent, and most washed coal is coking coal. The capacity of washeries for steam coal is 100.7 mtpa, of which 13.5 mtpa is in three of CIL's washeries and 87.2 mtpa in 31 private steam coal washeries. Though their utilization rate is low, this is expected to change in the coming years as India plans to make coal washing mandatory as part of its effort to tackle climate change and air pollution.⁵³

Quality and environmental concerns are already causing a shift towards higher utilization of washed coal. As per the directives of MoEF in 2012, power stations located more than 1,000 km away from coal mines, and those located in sensitive and urban areas, are required to use coal containing not more than 34 per cent of ash on a quarterly average basis. According to amendments to the Environment Protection Rules 20/4 (Environment [Protection] Amendment Rules, adopted in January 2014), the distance has been reduced to 750 km from 1 January 2015 and will be further reduced to 500 km from June 2016. Under a January 2015 amendment to the Environment Protection Rules 2014, besides the consumers, coal producers/suppliers are also responsible for ensuring that coal of ash content not exceeding 34 per cent is supplied to the power plants. Also, the central and state pollution control enforcement agencies now have power to act against coal suppliers and power plants which do not comply with the new regulation.

CIL intends to implement the directive by building new washeries, through rationalization of coal linkages (coal agreements) with power plants, and by utilizing washing capacities available in the private sector.⁵⁴ CIL is planning to open 15 new washeries with a total capacity of 93.1 mtpa, and nine of these are for steam coal with a total proposed capacity of 74.5 mtpa. Out of these nine, three are under construction. Beneficiation of steam coal in washeries has been planned on a 'build, operate and maintain' (BOM) basis through global tenders. Furthermore, it has been decided that all new opencast (OC) projects of 2.5 mtpa-capacity and above that are not linked to pithead power stations should be designed with integrated washeries.

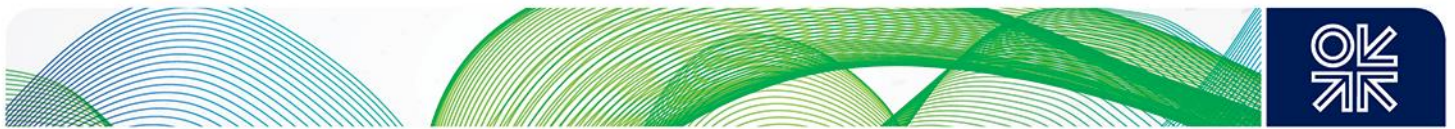
These developments will allow India to increase the efficiency of its thermal coal power fleet, reduce pressure on the railway system, and save coal at the consuming point as less coal will be needed to

⁵¹ IEA, 'Why most coal avoids a bath', 15 July 2014, <http://www.iea.org/ieaenergy/issue6/why-most-coal-avoids-a-bath.html>

⁵² A major part of the ash in Indian coals is finely distributed within the coal's structure, so-called inherent ash: washing such coal to reduce ash content can be only partially successful (IEA, 2014).

⁵³ Economic Times, 'IPCC for phasing out coal, but India plans to make coal washing mandatory', 8 November 2014, http://articles.economictimes.indiatimes.com/2014-11-08/news/55836080_1_coal-washerries-coal-mining-projects-unwashed-coal

⁵⁴ MoC, Meeting of the IMC to formulate a policy on coal rejects allocation for washery reject based power plants – reg, Office memorandum, 7 November 2014.



produce the same level of electricity. However, while beneficiation of coal provides many benefits, it comes at a cost, besides the cost of washing itself.

First, coal and ash discrimination is not perfect, so the result is two fractions with higher and lower calorific value than the original raw coal.⁵⁵ 'Washery by-products' are highly polluting and have a very low calorific value (between 1,000 kcal/kg and 2,200 kcal/kg). Unless a nearby power plant can burn the rejected fraction, part of the coal's energy is lost. While it is difficult to assign a number to that rejection fraction, it tends to range from 5 per cent to 20 per cent. For example, raw coal of 4,000 kcal/kg and 38 per cent ash can produce two fractions: fourth-fifths of the raw coal that now has 4,500 kcal/kg and 30 per cent ash, and the remaining one-fifth with 2,000 kcal/kg and 70 per cent ash. If the poorer fraction is not burned, 10 per cent of the raw coal's energy is lost, which in a country like India is significant considering the coal shortage. In addition, if unburned, this fraction must be disposed of in an environmentally friendly manner, which can be problematic.

Therefore, beneficiation must be optimized to allow enough calorific value in the rejects to use them and avoid their wastage. Coal rejects can be used in circulating fluidized bed combustion (CFBC) furnaces for steam and power generation. At present, there are six washery rejects-based power plants in India. The Environment Protection Rules 20/4 are not applicable to the transportation of these rejects, provided they are used in CFBC or any other clean technologies. Currently CIL's washeries generate 1.3 mtpa of coal rejects, though this is expected to increase to 18–19 mtpa after the new washeries are commissioned.⁵⁶ The MoP and CIL have stated they will encourage setting up of washeries along with rejects-based power plants so that the rejects could be consumed in situ, obviating the need to transport them for long distances.⁵⁷

Finally, beneficiation of coal usually uses a lot of water. In addition, the used water is polluted with coal dust, which is harmful to the local environment. To address this issue, the use of dry processes is being considered, and while this may provide better performance, it does so at a higher cost.⁵⁸

Coal blending in the power sector is also used by some power plants for meeting environmental norms as well as sustaining power generation, due to the shortfalls in domestic coal supply and the progressive degradation in coal quality (lower calorific values). High-grade coals from South Africa and Australia have about twice the calorific value and carbon content of Indian coals and ash content typically in the 15–25 per cent range (coal with less than 15 per cent is also available but in lower quantities). Lower-rank Indonesian coal has a lower calorific value than Australian and South African coals, but its ash content is low compared with Indian coal, typically 3 to 6 per cent.

Typically, imported coal is blended with domestic coal up to 15 per cent, subject to feasibility of technical parameters of boiler design and other constraints. The boiler design is the main technical constraint limiting the percentage of blending low-ash coal – the boilers are typically designed for a particular coal specification.⁵⁹ Coal blending may cause technical issues, such as melting of ash in furnace and initiate slag formation; both issues will reduce the efficiency of the plant requiring additional maintenance. The proportion of domestically produced coal and imported coal must therefore be optimized so that the resultant coal blend has the desired composition (ash content, percentage of volatile matters, and gross calorific value). These physical constraints typically impede the use of blending coal in a proportion higher than 30 per cent, despite its environmental benefit and possible commercial interest (in case of lower international prices), or requirements for rationalization

⁵⁵ IEA, 'Why most coal avoids a bath', 15 July 2014, <http://www.iea.org/ieaenergy/issue6/why-most-coal-avoids-a-bath.html>

⁵⁶ MoC, Meeting of the IMC to formulate a policy on coal rejects allocation for washery reject based power plants – reg, Office memorandum, 7 November 2014.

⁵⁷ MoC, *ibid*.

⁵⁸ National Transport Development Policy Committee (NTDPC), Transportation of energy commodities, 2013, http://tripp.iitd.ernet.in/publications/NTDPC/Vol%202002-2/NTDPC%20Vol%2002_Part%202%20Ch%2008.pdf

⁵⁹ The GCV of coal considered for the design of boilers using domestic coal is about 3,300 kcal/kg, with performance guarantees based on this specific coal. Boilers supplied by Bharat Heavy Electricals Limited (BHEL) can provide the rated output with a coal quality variation of about 1,000 kcal/kg (e.g. from 3,000 kcal/kg to 4,000 kcal/kg), thus offering some flexibility. IEA, 'Why most coal avoids a bath', 15 July 2014, <http://www.iea.org/ieaenergy/issue6/why-most-coal-avoids-a-bath.html>



of coal sources. A KPMG study for the Inter-Ministerial Task Force (IMTF) on coal linkage rationalization concluded that higher blending ratios of 50 percent to 100 per cent would require technical changes to the power plant.⁶⁰ In addition, the willingness to cease steam coal imports and increased domestic production may limit the blending of imported coal (see Section 5.2.2).

3.2.2 Low efficiency of the current coal power fleet

Although the Indian coal fleet is relatively young, the average efficiency of India's coal-fired power plants is low: 33.1 per cent (High Heating Value [HHV], gross).⁶¹ India only commissioned its first supercritical plant (efficiency of up to 40 per cent) in December 2010. The majority of India's coal-fired power plants is still based on subcritical technology with efficiencies of 31–33 per cent, although the share of power plants based on supercritical technology is increasing rapidly (16 per cent at the end of March 2015).

In addition to the high share of low-efficiency plants, there are a number of factors which contribute to the low efficiency of Indian coal-based power plants.

The efficiency of a coal-fired power generation unit is broadly proportional to the temperature difference between the internal heat source and the external environment.⁶² The high temperature of cooling water in India's tropical climate reduces the efficiency of power generation plants compared with power plants built in other regions.

But a major factor is the poor quality of Indian coal as seen in the previous section. The lower heat content requires that more coal is burnt for the same electrical output, leading to an increase in specific local emissions of sulphur dioxide (SO₂), nitrogen oxide (NO_x) and particulate matters (PM), and higher CO₂ emissions.

For a number of reasons, primarily the poor quality of coal and the supply shortage, unexpected and unscheduled maintenance outages, and longer commissioning periods for new units, India's coal-fired plants are also prone to low plant load factors (PFL).⁶³ After increasing steadily through the 1990s and 2000s to load factors over 78 per cent, a drop to less than 65 per cent was reported in FY2015, mainly due to the combination of the surge in installed power capacity and the inability of state Discoms to buy more power. Low load factors are another cause of the low efficiency of power plants.

⁶⁰ MoC, Report of the new Inter-Ministerial Task Force (IMTF) on Rationalization of sources of Coal to Power plants, 2 February 2015, [http://www.indiaenvironmentportal.org.in/files/file/Report%20of%20the%20new%20Inter-Ministerial%20Task%20Force%20\(IMTF\)%20on%20Rationalization%20of%20sources%20of%20Coal%20to%20Power%20Sector.pdf](http://www.indiaenvironmentportal.org.in/files/file/Report%20of%20the%20new%20Inter-Ministerial%20Task%20Force%20(IMTF)%20on%20Rationalization%20of%20sources%20of%20Coal%20to%20Power%20Sector.pdf)

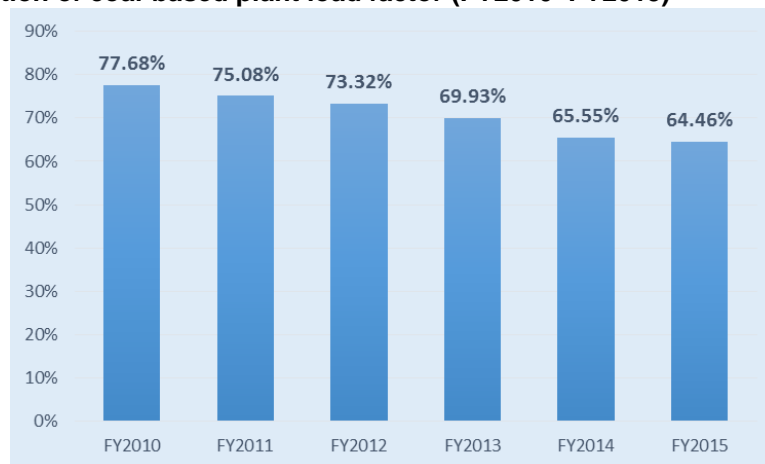
⁶¹ IEA, Energy Technology Perspectives, IEA/OECD, 2014

⁶² IEA, *ibid*

⁶³ IEA, Energy Technology Perspectives, IEA/OECD, 2014.



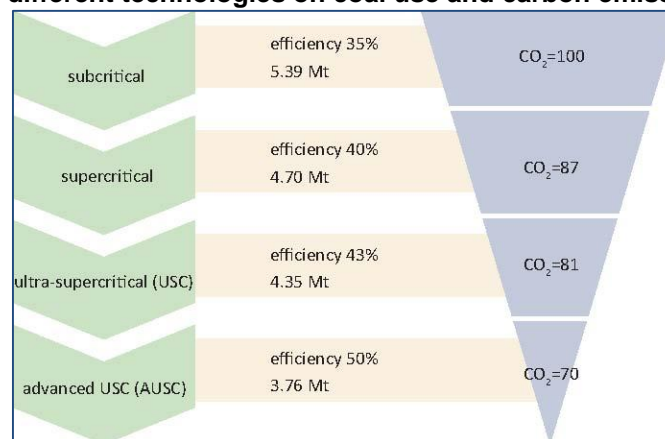
Figure 14: Evolution of coal-based plant load factor (FY2010–FY2015)



Source: CEA, 2015.

The combination of high dependence on coal and inefficient generation means that India’s power generation is highly carbon intensive. India’s power generation (all fuels and technologies) emitted 925 gCO₂/kWh in 2012, well above the global average level (589 gCO₂/kWh), and the carbon intensity of the coal fleet is even worse (1,030 gCO₂/kWh in FY2014).⁶⁴ The power sector therefore presents huge opportunities to reduce CO₂ emissions. Modernizing thermal power plants and reducing the coal usage per unit of electricity generation (kg/kWh) could decrease CO₂ emissions by 13 per cent, and even 30 per cent if advanced ultra-supercritical (AUSC) plants are adopted, as shown in Figure 15.

Figure 15: Effects of different technologies on coal use and carbon emissions



Note: Impact of different steam-cycle conditions on an 800-MW power station boiler burning hard coal and operating at an 80 per cent capacity factor. Such a unit would generate 6 TWh of electricity annually and emit the quantities of CO₂ shown in the figure, depending on its steam-cycle conditions and corresponding efficiency.

Source: Barnes, 2015.

In the Indian context, moving from subcritical to supercritical plants can result in savings of coal usage per unit of electricity generation in the region of 15 per cent (see Annex 4). Therefore, increasing the average efficiency of the coal fleet and using washed coal are two methods that should be given priority in order to reduce India’s CO₂ intensity.

⁶⁴ Lok Sabha, Ministry of Power, Answer to Question No 601, Pollution from thermal power plants, 23 July 2015.



Box 5: Government initiatives to improve the efficiency of coal-fired power plants

The government has already taken major initiatives to improve the efficiency of its coal-fired power plants and to reduce the carbon footprint of the power sector.⁶⁵

Supercritical technology is being adopted to enhance the efficiency of coal fired power generation and reduce the specific coal consumption per kWh. A capacity addition of 24,750 MW based on supercritical technology has already been achieved until the end of March 2015 (16 per cent of the utilities coal fleet). Out of about 84 GW of coal-based power capacity under construction at the beginning of April 2015, about 50 GW is based on supercritical technology.⁶⁶

Supercritical technology has been made mandatory for Ultra Mega Power Projects (UMPPs). In the 13th FYP (2017 and beyond), all coal-fired capacity additions must be through supercritical units.

The shift towards supercritical technology has driven manufacturing capacity addition in this space. Several domestic players have added supercritical manufacturing capacity, either on their own or in joint ventures with global players. Specific boilers are designed to use domestic coal. Going a step further, an advanced ultra-supercritical (AUSC) technology R&D project has been approved by the government at a cost of around \$240 million involving Bharat Heavy Electricals Limited (BHEL), NTPC, and Indira Gandhi Centre for Atomic Research (IGCAR) to achieve higher efficiency, reduce CO₂ emissions, and reduce coal consumption for coal-based power plants. Under the project, BHEL is to develop AUSC equipment which would then be commercialized, thus allowing India to build high-efficiency in-house power plants.

There is a \$25 billion proposed plan to revamp power plants older than 25 years into large/UMMP projects.⁶⁷

Renovation, modernization, and life extension of old thermal power generating units and retirement of old and inefficient thermal generation units, in a phased manner, is being undertaken. A total capacity of 3 GW was retired until the beginning of 2015. The government has issued a policy on automatic transfer of coal linkage in case of scrapping of old units and replacing them with new supercritical plants. A capacity of 32 GW of old units is being progressively retired.

The Ministry of Environment, Forest, and Climate Change (MoEF) has mandated the use of beneficiated coal⁶⁸ with a reduced ash content of 34 per cent (or lower) in power plants located beyond 1,000 km from their coal source, or based in urban, eco-sensitive, or other critically polluted areas. The distance has been reduced to 750 km from 1 January 2015 and will be further reduced to 500 km effective June 2016.

Under the 'National Mission on Enhanced Energy Efficiency', India implemented its 'Perform, Achieve and Trade (PAT)' Mechanism. The scheme is a demand-side trading scheme in energy efficiency certificates – it covers energy-intensive industry sectors which are encouraged to make targeted achievements in energy efficiency over three-year periods. It covers the country's largest industrial and power generation facilities that, in total, cover more than 50 per cent of fossil fuel use in India. The target is to achieve a 4 to 5 per cent reduction of energy consumption of the participating facilities in 2015 (below 2010 levels). Sixty per cent of this is to stem from the power sector and 40 per cent from the industrial sector. Under this scheme, individual targets for improving energy efficiency have been assigned to 144 thermal units.

The government has also doubled the tax (cess) levied on coal production and imports – to INR 200/t.

⁶⁵ Ministry of Power, 'Initiatives to Improve the Efficiency of Coal Based Power Plants', 12 March 2015, <http://pib.nic.in/newsite/PrintRelease.aspx?relid=116893>

⁶⁶ Ministry of Power, CO₂ emissions from thermal power plants, Statement at Rajya Sabha, 27 April 2015

⁶⁷ Bloomberg, 'World's Worst Air Spurs Modi's \$25 Billion Utility Clean-Up Push', 4 May 2015, <http://www.bloomberg.com/news/articles/2015-05-04/world-s-worst-air-spurs-modi-s-25-billion-utility-clean-up-push>

⁶⁸ 'Beneficiated coal' is coal containing higher calorific value but lower ash than the original ash content in the raw coal obtained through physical separation or washing process.



Standards for local pollutants have also been proposed. Of the total pollution from the industrial sector, the coal-based power sector currently accounts for approximately 60 per cent of particulate matter (PM) emissions, 45–50 per cent of sulphur dioxide (SO₂) emissions, 30 per cent of oxide of nitrogen (NO_x) emissions, and more than 80 per cent of mercury (Hg) emissions.⁶⁹ Currently, India only has standards for PM emissions from the power sector. With the aim of tightening emission norms, the MoEF has proposed to tighten norms for emissions of PM and introduce standards for SO₂, NO_x, and mercury and cut water use by coal-based thermal power plants.⁷⁰ The new proposed standards differ for new plants and existing ones according to their vintage. For new plants to be installed from 1 January 2017, the proposed limits are: 30 mg/Nm³ for PM; 100 mg/Nm³ for SO₂; 100 mg/Nm³ for NO_x; and 0.03/Nm³ for Hg. Plants that were established after 2003 will need to meet lower standards, while plants older than 2003 will be required to meet even less stringent norms.

3.2.3 Competition from renewables

In order to generate more electricity from clean energy sources, the government has announced a massive target of 175 GW of renewable-based power generation capacity by 2022 (excluding large hydropower), which is a major increase compared with the 36 GW of installed capacity at the end of March 2015, and the 4 GW added in FY2015. 100 GW of this total is to be solar, 60 GW wind, 10 GW biomass-based power, and 5 GW small hydropower projects. The ambitious target for solar energy is a fivefold increase compared with the previous target of 20 GW set in the National Solar Mission, launched in 2010.

To achieve the solar power target, the government aims at developing ultra-mega solar parks with a combined capacity of 60 GW and 40 GW from roof-top solar projects. At the end of 2014, the government had approved plans for 25 mega solar parks, with a combined capacity of over 20 GW, to be developed in the following five years.⁷¹ The government has also approved 15 GW of grid-connected solar power projects to be added by NTPC. The implementation of the 'Green Energy Corridor Scheme' – aimed at the transmission of renewable energy from generation points to the load centres by creating intra-state and inter-state transmission infrastructure – has also been accelerated, with capital raised from overseas, most recently from Germany.⁷²

Power generation from renewable energy is expected to reach 300 TWh by FY2020 compared with 60 TWh in FY2015. This goal corresponds to the 15 per cent target for power supplies from renewable sources set in India's National Action Plan on Climate Change and represents a significant increase from the 6 per cent share in FY2015.

The government needs to attract \$100 billion of investment to help achieve its ambitious solar goal.⁷³ In a first step, the government is providing \$20 billion as a capital subsidy to promote solar capacity additions in India. In addition, at the first Renewable Energy Global Investors Meet and Expo, 'Re-invest 2015', held in February 2015 and initiated by the government to attract domestic and foreign private investment in renewables, 293 local and foreign companies committed to generate 266 GW of renewable energy over the next five to ten years. The initiative would entail an investment of about \$310–350 billion, potentially making India the world's top investment destination for renewable ventures.

⁶⁹ EPR, 'How to reduce emissions in coal-based power plants', 15 July 2015, <http://www.eprmagazine.com/article.php?ItemId=1209%20&%20CategoryId=5>

⁷⁰ Urbanemissions, 'Thermal Power Plants - Emissions and Health Impacts of India's Coal Expansion', April 2015, <http://www.urbanemissions.info/images/UEI/publications/draft%20Notification%20for%20public%20comments%20for%20the%20Coal%20TPP.pdf>

⁷¹ Climate Action Tracker, Countries: India, 2015, <http://climateactiontracker.org/countries/india.html>

⁷² PVTech, 'India to build green energy corridors', 8 June 2015, http://www.pvtech.org/news/india_to_build_green_energy_corridors

⁷³ Climate policy initiative, 'Three ways to attract domestic institutional investment for renewable energy projects in India', September 2015, <http://climatepolicyinitiative.org/2015/09/10/three-ways-to-attract-domestic-institutional-investment-for-renewable-energy-projects-in-india/>



The government has also encouraged the setting up of solar power projects through targeted policy measures, such as: granting of a subsidy on off-grid applications; provision for a renewable purchase obligation (RPO) for solar in the national tariff policy; concessional import and excise duty exemption; accelerated depreciation and tax holiday; generation-based incentives and facility for bundled power for grid-connected solar power; and priority sector lending. However, concerns remain over the ability of state Discoms to purchase costlier green power on account of their poor finances. The government is attempting to address this issue by revising its national tariff policy and through the launch of a debt restructuring plan for Discoms in partnership with state governments.

The government has proposed an 8 per cent RPO by March 2019 for solar energy, up from the previous target of 3 per cent by FY2022. This is a guideline, however, and the state electricity regulators will eventually stipulate state targets. It has also proposed a renewable generation obligation (RGO) for future coal/lignite project developers, under which developers of coal plants would have to simultaneously develop the equivalent of 10 per cent of the coal plant capacity based on renewable energy sources. Judging by the investment plans of major power utilities in India (NTPC and Adani for instance), this diversification is already in progress.

The government also expects the cost of solar power to continue decreasing. Tariffs of solar electricity have already dropped 60 per cent over the last four years, from INR 14.9/kWh in 2010 to almost INR 5.75/kWh in 2015,⁷⁴ and the government expects a further reduction to below 4.5/kWh.⁷⁵ To achieve this reduction, the government is considering bidding in dollar-denominated tariffs to make solar tariffs more competitive against foreign loans, which are cheaper than those offered by local banks and financial institutions.

A Deutsche Bank report forecasts that solar power capacity will reach 34 GW by 2020 or 5 GW capacity additions per annum, much lower than the government target which requires 15–16 GW capacity addition per annum.⁷⁶ By 2020, however, the report estimates that annual solar capacity additions and investments could surpass those in coal power projects – mainly due to a slowdown in coal plant construction – and reduce coal requirements by 70 Mt, largely impacting the highest-cost power (imported coal).

Considering international state-of-the-art capacity factors of solar, wind, and other renewables, the 175 GW of renewables capacity could generate a maximum of around 500 TWh when fully developed, which is unlikely to happen before the 2022 target date. This is equivalent to the production of about 70 GW of coal-based power plants, and it would allow a reduction of around 500 Mt CO₂ as well as saving of 300 Mt of coal.⁷⁷ This indicates how renewables will contribute to expanding power generation and lowering India's dependence on coal-fuelled electricity. However, while renewable power development will slow down the need for additional coal capacities (or allow the retirement of old, inefficient capacities), the growth of power demand means that India will still need large conventional capacities.

⁷⁴ Deutsche Bank, 'Make way for the sun', 19 July 2015, <https://www.db.com/cr/en/docs/Deutsche-Bank-report-Make-way-for-the-Sun.pdf>

⁷⁵ Niti Aayog, Infrastructure: Powering Growth through Connectivity, May 2015, http://niti.gov.in/mgov_file/presentations/infrastructure-slides.pdf

⁷⁶ Deutsche Bank, 'Make way for the sun', 19 July 2015, <https://www.db.com/cr/en/docs/Deutsche-Bank-report-Make-way-for-the-Sun.pdf>

⁷⁷ The calculation is based on a capacity factor of 85 per cent and coal consumption of 4.87 Mt/1,000 MW for old subcritical plants and 4.19 Mt/1,000 MW for new supercritical plants, as per the new norms for coal consumption in TPPs issued on 15 January 2015. The coal saving amounts to 341 Mt in case renewable power capacity replaces old plants (retirement) or 293 Mt if renewable power capacity reduces the need for building new supercritical plants. All results are the maximum achievable.



Table 4: Electricity generation from renewable energy sources

	Capacity - target for FY2022 (GW)	Capacity factors*	Maximum achievable electricity generation (TWh)
Solar	100	25%	219
Wind	60	35%	183.96
Biomass	10	80%	70.08
Small hydro	5	40%	17.52
TOTAL	175		490.56

* State-of-the-art (actual capacity factors may be lower).

Source: Author's calculations.

3.2.4 Economic and financial challenges faced by the power sector

Although significant capacity addition has been achieved during the last five years, India continues to suffer from chronic electricity shortages due to inadequate fuel supplies (of coal and natural gas), power transmission system constraints and, above all, the inability of state Discoms to pay for electricity supplies. This is illustrated by the low plant load factor (PLF) of thermal power plants recorded in recent years, and particularly in FY2015 (Figure 14). This low utilization rate occurred despite chronic blackouts and load-shedding within the country. Low load factors have undermined the financial performance of generating companies, many of which are unviable without power offtake agreements and cannot service their debt.

In addition, despite its increase, installed capacity is inadequate to meet electricity requirements and peak demand. According to the CEA, during FY2015 the peak deficit was 7 MW (4.7 per cent of actual peak demand) and the average energy shortage was about 38 TWh (3.6 per cent of electricity requirements). While these numbers are an improvement compared with past figures, the deficit is actually greater than this official assessment: it should include the 280 million people who still have no access to electricity and the electricity necessary to bring low-consumption states up to the level of demand of the more developed states. In addition, the Indian power supply/demand gap can also be projected by comparing India's per capita electricity consumption with that of the developed countries and with China. India's per capita electricity consumption in FY2015 was 1,010 kWh, compared with 12,947 kWh in the United States, 7,753 in Japan, and 3,475 in China (2012 data).⁷⁸ Raising India's per capita consumption to Chinese levels alone would require power generation to more than triple.

The deficit in electrical power generation is directly related to the shortage of energy resources, which has led to many power plants becoming 'stranded assets' – in the sense that they either are not operating at all or are operating at less than full capacity. In 2014, out of 24,150 MW of Indian power generation capacity connected to the gas grid, 14,305 MW had no supply of domestic gas. The balance capacity of 9,845 MW operated at a sub-optimal level based on the limited quantity of domestic gas in the country and the economic non-viability of expensive LNG imports.

In March 2015, the Cabinet Committee on Economic Affairs (CCEA) approved a new scheme to revive and improve utilization of the stranded gas-based power generation capacity. It adopted a financial mechanism which envisages importing additional spot LNG in FY2016 and 2017 to supply these plants, so that they can generate power up to a targeted PLF selected through a reverse e-bidding process.⁷⁹ Exemptions from taxes and levies and reductions in transportation and regasification charges are included in the scheme to make the cost of power affordable. Financial support to Discoms from the Power System Development Fund is also included.⁸⁰

⁷⁸ IEA, Key world energy statistics 2014, 2015, <http://www.iea.org/publications/freepublications/publication/keyworld2014.pdf>

⁷⁹ Government of India (GOI), Cabinet Committee on Economic Affairs (CCEA), Approval to innovative mechanism for utilization of stranded gas based generation capacity, 25 March 2015, <http://pib.nic.in/newsite/PrintRelease.aspx?relid=117698>

⁸⁰ See Oxford Institute for Energy Studies (OIES), Gas Pricing Reform in India – Implications for the Indian gas landscape, April 2015, <http://www.oxfordenergy.org/2015/04/gas-pricing-reform-in-india-implications-for-the-indian-gas-landscape-2/>



The capacity of the transmission power grid is also inadequate. Grid infrastructure investments have lagged behind investments made in the power generation sector, with the result that many thermal power projects face constraints in evacuation. This limits the possibility to transfer electricity from surplus states to those with acute power shortages and consequently limits growth in power generation. There is insufficient inter-regional transmission capacity between west and the north and between the west and the south. New corridors are planned to increase inter-regional transmission capacity between these regions by the end of 12th FYP.

However, the weakest link in the power sector is at the distribution level, with an abnormal level of electricity losses and the inability of state Discoms to pay for electricity supplies.

Aggregate technical and commercial transportation and distribution (AT&C) losses were estimated by the CEA at 21 per cent of gross electricity generation in FY2015, a figure much higher than the 9 per cent estimated at global level.⁸¹ If AT&C losses were at average global levels, India would have saved 133 TWh (author's calculation based on electricity generation produced by utilities in FY2015). The causes of the high level of losses are multiple and include theft of electricity, lack of metering, and the outdated state of the distribution network. Utilities cannot invest in improving and upgrading the network as they are insolvent. The lack of incentive regulation has also contributed to the deterioration.

In order to reduce AT&C losses, the government has announced its intention to invest in the distribution networks.⁸² Linked with the '24/7 Electricity for All' program, two schemes have been launched: the first, the Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY), was approved in December 2014 with a total outlay of INR 430 billion (\$7 billion) for feeder separation, augmentation of sub-transmission, and distribution networks and metering, including electrification in rural areas; and the second, established in November 2014, the Integrated Power Development Scheme (IPDS), with an outlay of INR 326 billion (\$5 billion), aiming at reducing AT&C losses and improving sub-transmission and distribution networks and metering in urban areas.

The crisis occurring at state level is nothing new. In FY2013, Discoms across all states had incurred accumulated losses of \$46 billion.⁸³ This was due to the provision of below-cost electricity to groups such as agricultural and rural consumers. After realizing the gravity of the situation, in 2012 the government implemented a scheme for financial restructuring of Discoms. However, they have continued to face financial constraints because of the reluctance of state governments to revise tariffs periodically. The average gap between power generation costs and tariffs charged by state Discoms in FY2013 was INR 1.25/kWh or \$23/MWh, making generation economically unviable.⁸⁴ These companies are also often bankrupt due to lax implementation of bill collection, pilferage, and sharing of the subsidy burden on state governments.⁸⁵ Due to the tariff structure, the price realized from the sale of electricity is less than the cost for procuring it, which means most Discoms prefer to undertake load-shedding rather than buy more power, thus creating an artificial lack of demand for power.

The poor financial situation of state Discoms has also lead to delayed or non-payment to power generators for the electricity supplied. In turn, power producers are in a difficult situation and owed CIL around \$1.4 billion at the end of 2014. Discoms' inability to pay for electricity also prevents them from signing long-term PPAs (power purchase agreements) with power producers; thus many power projects are ready for commissioning but unable to find Discoms to sell power to. The construction of

⁸¹ CEA, Growth of Electricity Sector in India from 1947-2015, April 2015, http://www.cea.nic.in/reports/planning/dmlf/growth_2015.pdf

⁸² Times of India, 'India to invest \$4 billion to tackle power theft', 21 November 2014, <http://timesofindia.indiatimes.com/business/india-business/India-to-invest-4-billion-to-tackle-power-theft/articleshow/45227741.cms>

⁸³ Niti Aayog, 'Infrastructure: Powering Growth through Connectivity', May 2015, http://niti.gov.in/mgov_file/presentations/infrastructure-slides.pdf

⁸⁴ CEA, Executive Power Summary September 2015.

⁸⁵ Economic Times, 'India sees lowest plant load factor in 15 years; power capacities operating at 65%', 29 May 2015, http://economictimes.indiatimes.com/articleshow/47463610.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cpsst



28 GW of coal capacity was completed by the end of March 2015, but it has not been commissioned yet as the plants have no fuel supply or power offtake agreements, thus rendering them unviable.⁸⁶

An example of the problem of stranded power plants despite increases in generation capacity can be found in NTPC, the country's largest electricity generator, also considered a top performer. In the last quarter of FY2015, its generation declined 2.1 per cent year on year, and the PLF of its coal-fired plants fell to 82.7 per cent, a fall of six percentage points from a year ago. The company highlighted that the fall in generation was due to lower demand from state electricity boards rather than shortages of coal supply.⁸⁷ This is also illustrated by the rising accumulated coal stocks at power plants (30 Mt at the beginning of July 2015).

Unless Discoms are made financially viable and tariff reforms are pursued by state governments, the central government's 'power for all' commitment for 2019 will face a serious challenge. To make the sector viable and introduce more competition and transparency, the government introduced an amendment of the Electricity Act 2003 (Amendment Bill 2014) in the Lok Sabha in December 2014 and a proposed revision of the power tariff. The Amendment Bill seeks to unbundle distribution companies and introduce multiple supply licencees in the market, thereby introducing retail competition and efficiency in the distribution sector and expanding the role of the private sector at the distribution level. Other proposed amendments cover strengthening of grid safety and security, a Renewable Generation Obligation (RGO) for new coal- and lignite-based thermal generating plants, rationalization of the tariff determination process, performance oversight of Regulatory Commissions, and strict enforcement of distribution utilities' Renewable Purchase Obligations (RPO). At present, the central government's tariff policy is seen as a guide for state regulators, but it is not binding. Under the 2014 Amendment Bill, the provisions of tariff policy are proposed to be made mandatory for the determination of tariff by regulators. A revision of the national tariff, opened for consultation in April 2015, has also been proposed to allow an increase in fuel cost accounting for imported/market-based e-auction coal in the rate structure. According to the amendment, 'in case of reduced quantity of coal supplied by CIL, vis-a-vis the assured quantity of 85 per cent, the higher cost of imported/market-based e-auction coal for making up the shortfall shall be considered for being made a pass-through by CERC/SERCs, on a case-to-case basis, to the extent of shortfall'.⁸⁸

Making Discoms viable and ensuring adequate fuel supplies would allow India to generate an additional 200 TWh without adding any new capacity.⁸⁹ Obviously, the two issues can be solved only gradually and with the participation of state governments.

Box 6: Power tariff regulations

The power tariff is determined under Sections 61 to 64 of the 2003 Electricity Act by the appropriate regulatory commission in line with the provisions of the act and the policies made thereunder.⁹⁰ Whereas the tariff for generation and transmission companies owned or controlled by the central government is regulated by the Central Electricity Regulatory Commission (CERC), the tariff for generation, supply, and transmission within each state is determined by the respective State Electricity Regulatory Commissions. State/Joint Electricity Regulatory Commissions (SERCs/JERCs) notify the terms and conditions of tariff fixation for both public and private distribution licencees. The act provides for guiding principles which the appropriate commission is required to consider for specifying the terms and conditions of tariffs. SERCs are also guided by the tariff policy notified by the

⁸⁶ Geonosis, 'FIS lenders helping developers in coal auctions to avoid bad assets', Volume 2, Issue 4, March 2015.

⁸⁷ Livemint, 'Lack of power demand hits NTPC in Q4', 1 June 2015,

<http://www.livemint.com/Money/Da7HXF37MWKMOX3FVRPWRM/Lack-of-power-demand-hits-NTPC-in-Q4.html>

⁸⁸ Business Standard, 'Power charges: Leeway to be tightened', 17 April 2015, http://www.business-standard.com/article/economy-policy/power-charges-leeway-to-be-tightened-115041400889_1.html

⁸⁹ The figure is based on the coal and gas-fired electricity generation achieved in FY2015 by power utilities (800 TWh and 41 TWh respectively). It takes into account a PLF of 75 per cent for coal plants (instead of 65 per cent) and 60 per cent for gas plants (instead of 21 per cent).

⁹⁰ Lok Sabha, Ministry of Power, Answer to Question No 59, Power tariff, 23 July 2015 and Energy Global, Power tariff regulations and thermal coal demand, 29 July 2013, http://www.energyglobal.com/upstream/special-reports/29072013/Salva_Report_India_power_tariff_regulations_and_thermal_coal_demand_285/



central government while specifying the terms and conditions of a tariff. An amendment to the act has proposed to make these guidelines mandatory.

In contrast with international practice, prices paid by industrial customers are much higher than those paid by domestic users. This is because industrial consumers cross-subsidize residential and agricultural consumers. Average industrial tariffs amounted to INR 6.26/kWh in FY2014 compared to INR 4.08/kWh for domestic users (\$102.6/MWh and 66.9/MWh, respectively).⁹¹ Power tariffs for industrial users are on par with tariffs found in the Netherlands and Poland.

Before 2011, commissions regulated tariffs for power companies, considering a government-specified return on equity or, alternatively, power companies themselves bid certain tariffs for the life of a project or for a contract period. Since January 2011, all power generation projects are awarded based on a competitive bidding process which requires developers to bid a lifetime tariff for a project. The developer bidding the lowest tariff is selected and a power purchase agreement (PPA) is signed with the distribution companies which is approved by the state regulatory commission. A power plant can be built through either the DBFOO (design, build, finance, own, and operate) model⁹² (previously known as Case-1) or Case-2 bidding route. In DBFOO model, land, water, fuel, and other project related clearances are to be obtained by the project developer. In Case-2, these are the responsibilities of the state government, except for fuel procurement, which is the responsibility of the bidder in case of imported fuels. In both cases, the power plant developer can opt for either domestic or imported fuels or, alternatively, have them prescribed by the government.

The tariff bid contains tariff components and escalation rates for the entire contract period, which is typically 25 years. The bid is composed of several components: capacity, energy (fuel and non-fuel), transportation, and fuel handling charges. In turn, these are sub-divided into a capacity charge and an energy (fuel) charge. Variable sub-components can increase biannually with certain escalation rates prescribed by the CERC. However, bidders differentiate by quoting different ratios as scalable and non-scalable sub-components. A bidder quoting 100 per cent of the increase in fuel costs as scalable will be able to pass through the complete fuel cost in the tariff.

3.3 An upcoming major reform: auctions of coal linkages

3.3.1 Four options for domestic coal supplies

Coal in India is supplied in four main ways,⁹³ according to the New Coal Distribution Policy (NCDP) adopted by the government in October 2007:

- **Fuel supply agreements (FSAs) or coal linkages.** Linkages are assured supply commitments from state-owned producers, CIL and Singareni Collieries Company Limited (SCCL), to a company that has an end-use plant and needs fuel to run its operations. FSAs constitute about 82–85 per cent of the total coal which CIL supplies. CIL notifies prices of different grades of coal and supplies coal to its customers under FSAs (see below).
- **E-auctions.** The consumers not covered by FSAs are supplied through e-auctions, wherein about 10 per cent of CIL annual production is offered for sale.⁹⁴ This provides access to coal to consumers who are not able to source coal through FSAs for reasons like seasonality of coal requirement, limited requirement of coal not warranting long-term linkage, and shortage of coal under FSAs. Two e-auction schemes are offered: spot e-auctions for spot procurement of coal;

⁹¹ Lok Sabha, Ministry of Power, Answer to Question No 59, Power tariff, 23 July 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=19191>

⁹² Business Standard, 'Power purchase rules changed', 7 May 2015, http://www.business-standard.com/article/economy-policy/centre-amends-rules-for-power-procurement-by-distribution-licensees-from-coal-based-projects-115050600662_1.html

⁹³ Prayas (Energy Group), Largesse that wasn't: the story of coal shortages in India, March 2014, http://www.indiaenvironmentportal.org.in/files/file/Coal_Shortages_Report.pdf

⁹⁴ In FY2014, CIL sold 58 Mt of coal through e-auctions. In FY2015, CIL cut its e-auction sales, as directed by the government, to increase deliveries to the power utilities sector.



and forward e-auction for consumers who wish to have assured supply over a longer period (one year for instance). The price of coal under e-auctions is market-driven.

- **Captive coal blocks.** The third way of obtaining coal supplies is through owning a captive coal block, coal from which can only be used the block owner. Hence, the cost of coal is just the cost of mining the coal, including taxes paid to the state governments. Following the cancellation of 204 captive coal blocks by the Indian Supreme Court in September 2014, the government has begun re-allocating these blocks through transparent e-auctions (see Section 4.5). The price of coal in that case is the bidding price, and taxes are paid to state governments.
- **Imports.** The fourth source of supply is imports, with prices negotiated between the buyer and the seller and based on prevailing international market prices, adjusted for quality.

Coal can also be obtained using a combination of the four options. For example, a power plant based on a captive mine can get a 'tapering linkage'⁹⁵. Similarly, a power plant with coal linkages less than coal requirements can import coal to make up the shortfall.

Coal is also supplied to power plants under best-effort MoU (Memorandum of Understanding) basis in the case of 'contingent' situations (such as critically low stocks at power plants). In addition, in order to facilitate liquidation of CIL coal stocks unable to reach the market due to logistical constraints, the government has authorized power companies short of coal supplies to lift coal stocks on an 'as is where is' basis, with these companies arranging their own transportation logistics.

3.3.2 Different prices for coal in India

India's coal prices were officially partly deregulated in 2000, potentially allowing coal producers to set their own coal prices based on an escalation formula under a cost-plus approach. However, in the absence of an independent regulator and meaningful competitors the monopolistic status of CIL means that, in practice, CIL sets coal prices in consultation with the MoC by taking into consideration the following factors: production costs, inflation index, capacity of the market to absorb the coal price, demand and supply scenario, landed cost of imported coal, requirement of capital for investments in upcoming projects, and modernization of existing mines for augmentation of production.

In a price revision effective from 27 February 2011, the concept of dual pricing was adopted for the first time by CIL: one price for consumers in the power utilities segment (including IPPs), fertilizers, and defence (regulated sectors) and another one for consumers outside the regulated sector (iron and steel, cement, CPPs, etc.). Prices for the non-regulated sector (except for higher grades) are higher by around 35 per cent relative to the regulated sector.

Until 2011, Indian coal was priced based on useful heat value (UHV) measures, under which coal was categorized and priced into seven grades in accordance with their heating values. As UHV is not an internationally used measure, it caused difficulty in aligning the price and quality of Indian coal with imported coal, and the pricing system was shifted from UHV to the international norm of using gross calorific value (GCV) at the beginning of 2012. Under the new pricing system, the price of coal is determined for 17 GCV bands (G1 to G17) and the bands are narrower (3,000 kcal/kg) than in the UHV system. The new price system applies uniformly to all CIL's subsidiaries, except Western Coalfields Limited (WCL), whereas prices differed from one subsidiary to another under the previous system. For WCL, there is a 10 per cent add-on above the applicable price for GCV bands due to the higher mining cost in the states in which it operates. CIL last revised coal prices on 27 May 2013, but prices are expected to increase in the medium term in line with rising costs of production.

The following table shows CIL's price applicable to pithead ROM non-coking coal (referred to as steam coal in this report) to the regulated sector (power plants, including IPPs, and fertilizer and defence sectors) and non-regulated sectors (all other end-users, included CPPs). CIL also sells washed coal at the price indicated below for each grade increased by INR 180/t (around \$3/t).

⁹⁵ A tapering linkage is the short-term linkage provided to those coal consumers who have been allocated captive coal blocks for meeting the fuel requirements pending the mines being developed.

Table 5: Pithead run-of-mine coal prices of CIL (prices effective since 27 May 2013)

Grade of coal	GCV Bands (Kcal/Kg)	Power utilities (including IPP), fertilizers, and defence sectors		Other sectors	
		(INR/t)	(\$/t)	(INR/t)	(\$/t)
G1	Exceeding 7000	(a)	(a)	(a)	(a)
G2	Exceeding 6700 and not exceeding 7000	4,870	77	4,870	77
G3	Exceeding 6400 and not exceeding 6700	3,890	62	3,890	62
G4	Exceeding 6100 and not exceeding 6400	3,490	55	3,490	55
G5	Exceeding 5800 and not exceeding 6100	2,800	44	2,800	44
G6	Exceeding 5500 and not exceeding 5800	1,600	25	2,150	34
G7	Exceeding 5200 and not exceeding 5500	1,400	22	1,890	30
G8	Exceeding 4900 and not exceeding 5200	1,250	20	1,690	27
G9	Exceeding 4600 and not exceeding 4900	970	15	1,310	21
G10	Exceeding 4300 and not exceeding 4600	860	14	1,160	18
G11	Exceeding 4000 and not exceeding 4300	700	11	950	15
G12	Exceeding 3700 and not exceeding 4000	660	10	890	14
G13	Exceeding 3400 and not exceeding 3700	610	10	820	13
G14	Exceeding 3100 and not exceeding 3400	550	9	740	12
G15	Exceeding 2800 and not exceeding 3100	510	8	680	11
G16	Exceeding 2500 and not exceeding 2800	450	7	610	10
G17	Exceeding 2200 and not exceeding 2500	400	6	540	9

(a) For coal with a GCV exceeding 7,000 kcal/kg, the price is increased by INR 150/t over the price applicable for G2 coal for every 100 kcal/kg increase.

Source: Ministry of Coal. Data converted in \$ (1 US\$ = INR 63).

On top of CIL notified prices, consumers have to pay royalties (14 per cent *ad valorem*) and other taxes to producing states as well as the 'cess levy'⁹⁶ – which was doubled to INR 200/t in the 2015–16 budget presented in March 2015.

For CIL's e-auctions, the price is market-driven and tends to be 50 to 60 per cent higher than CIL's notified price for the same grade. In FY2015, the government directed CIL to cut its e-auction sales to 25 Mt in order to increase deliveries to the power sector. CIL finally managed to sell 45 Mt (7 per cent of its sales). Due to the reduced volumes of e-auction coal sales in FY2015, prices surged (64 per cent above CIL's average price), forcing some customers to resort to imported coal, the price of which has been declining over FY2015. The MoC removed the cap on CIL's e-auction sales from April 2015, allowing the company to sell about 10 per cent of its annual production via e-auction. One of the key reasons cited by the ministry was the rising pithead stock of CIL.⁹⁷ The removal of the cap is significant for CIL as the company had been proposing an upward revision of notified sales prices since November 2014 but had failed to get it approved by the government.

Table 6: CIL e-auction sales and prices vs. average sales prices

	FY2011	FY2012	FY2013	FY2014	FY2015
Auctions volumes (Mt)	48	51	44	58	45
Average e-auction price (INR/t)	1846	2599	2544	2182	2450
CIL's average sales price (INR/t)	1183	1443	1472	1463	1472
Average e-auction price (\$/t)	41	54	47	36	40
CIL's average sales price (\$/t)	26	30	27	24	24

Sources: CIL; Motilal Oswal, 2015.

The increased volumes of e-auction sales are expected to boost CIL's profitability. Low-grade steam coal for the power sector comprises around 80 per cent of CIL's production. To keep electricity tariffs low, CIL sells this fuel at very thin margins. Therefore, CIL's profit mostly comes from the 10 per cent

⁹⁶ The cess is a tax which applies to coal mined in India as well as imported coal.

⁹⁷ The company's offtake in FY2015 at 489 Mt was lower than its output of 494 Mt, resulting in pithead stock increasing to 53 Mt at the end of FY2015, from 47 Mt at the end of F20Y14, owing to evacuation issues.



e-auction offerings, sales of 5 per cent of high-quality fuel at import-parity price, and supplies to the non-regulated sector at 35 per cent more than the rate for the power sector.⁹⁸ While a small part of overall volumes, e-auction sales contribute 35–40 per cent of CIL’s total Ebitda (earnings before interest, taxes, depreciation, and amortization).

CIL’s sale prices are at a discount to global prices, except for high grade coal, partly due to low calorific value and partly on account of the government directive to keep power tariffs low. While, until recently, the majority of CIL’s coal sales were sold at a price around 50 per cent lower than global prices (on an energy adjusted basis), the fall in international coal prices has narrowed the discount, which nevertheless remains comfortable for low-grade coal. However, the low quality of Indian coal and its high ash content, and the cost of transportation across the country, make some grades of imported coal a more economic option for customers, particularly those located far away from the mines but close to coastal ports. Table 7 compares the prices of delivered coal in India. It shows that for customers of the non-regulated sector located at coastal ports and far away from domestic mines (1,000km), international prices are currently lower than domestic prices.

Table 7: Price comparison between imported and domestic coal (July 2015)

	Indonesian Coal	Domestic coal regulated sector	Domestic coal non-regulated sector	E-auctions
GCV (kcal/kg)	4200	G11 (4000-4300)	G11 (4000-4300)	G11 (4000-4300)
Run-of-Mine prices /CFR (a) prices, inc. Import duty (\$/t)	40.0	11.1	15.1	18.2
Port Handling cost (\$/t)	4.0			
Royalty + other duties + Cess (\$/t)	3.2	6.4	7.5	8.3
Transportation cost from mine to coastal plants (1000 km) (\$/t) + Sizing and handling charges	0.0	25.3	25.3	25.3
Delivered price (\$/t)	47.1	42.8	47.9	51.8

(a) CFR – Cost and Freight.

(b) Assuming e-auction price is 64 per cent higher than CIL’s notified price.

Sources: Ministry of Coal; ICRA; McCloskey; Author’s estimates.

At current depressed international prices and low maritime freight rates, importing coal, which is also of better quality (lower ash content) looks viable for non-regulated users based in the western regions that are far away from the main mines. This development will need to be carefully monitored by the government to avoid a surge in imports by users from the non-regulated sectors.

3.3.3 Auctions of coal linkages

Up to now, coal linkages have been allocated to power plants and other customers upon recommendation of the Inter-Ministerial Standing Linkage Committee Long-Term (SLC-LT). To increase transparency in the coal sector and provide a level playing field for supply of coal to different users, the government intends to auction coal linkages/LoAs through competitive bidding instead of allocating coal through the SLC-LT. In June 2015, the MoC released a draft methodology for the proposed auctions. In a first step, only sales to the non-regulated sector (iron and steel, sponge iron, cement, CPPs) would be auctioned.⁹⁹ This represented 58 Mt, or 12 per cent, of CIL’s sales in FY2015. Going forward, linkages for incremental sales to the power sector, and eventually all linkages, would be allocated through the auction route only. This would be a key move toward market-based pricing.

3.3.3.1 Non-regulated sector

With increasing coal shortages, the non-regulated sector has not received any coal linkage since 2009. It has made up its additional coal requirements through CIL’s e-auctions, captive coal mines,

⁹⁸ Business Line, ‘Delay in price hike hits Coal India profits’, 4 March 2015,

<http://www.thehindubusinessline.com/companies/delay-in-price-hike-hits-coal-india-profits/article6959717.ece>

⁹⁹ MoC, Minutes of the fifth meeting of the Inter-Ministerial Committee for proposed auction of coal linkages/LoAs through competitive bidding held on 04.06.2015, Office Memorandum, 24 June 2015



and imports. For instance, the cement industry imported 27 Mt in FY2015, two-thirds of its coal requirements.¹⁰⁰

In the non-regulated sector, the aim of the reform is therefore to encourage market-based pricing of domestic coal in order to incentivize both coal production and the purchase of domestic coal by the sector. The MoC has stated that because the sectors are not regulated and the price of final products are determined by market forces, there is no justification of providing coal at less than the market price.¹⁰¹ To determine the price to the non-regulated sector, the MoC would adopt the methodology of bidding on volumes at progressively increasing prices set by the auctioneer (supplier-controlled Ascending Market Clearing Auction System, or AMCAS), with the CIL-notified ROM price set as the initial floor price. The FSAs of non-regulated sectors which are expiring/maturing in FY2016 onwards may not be renewed and the coal quantities pertaining to these may be made available for linkage auction. Besides this, 25 per cent of incremental production of CIL during FY2016 over FY2015 and subsequent years may also be auctioned as linkages.¹⁰² Auctions would be conducted by CIL, and the tenure of the linkage would be five years. The final bidding price would be adjusted according to a price adjustment clause taking into account any changes in the cost of production. Despite requests from several industry segments, the MoC has decided against reserving volumes of coal for auctioning to specific coal-consuming sectors as was initially envisaged. Likewise, the latest draft on linkages to the non-regulated sector excludes sales to PSUs and sales to the fertilizer sector.¹⁰³

While the government move would create a level playing field between private players, by aligning the price determination for all consumers, the non-regulated industry has expressed concerns over an increase in the price of their domestic coal supplies,¹⁰⁴ which is likely to be the case under the AMCAS system. Since the methodology is to match the number of bidders with the quantity of coal being bid, it is likely that the final price will be higher than the previous coal linkage price. In addition, in case of higher bid prices, the AMCAS approach may prevent small and financially weaker companies from bidding in the auctions to obtain their coal supplies.¹⁰⁵ To address these issues, the government has decided to earmark 25 per cent incremental coal produced by CIL each year and has also reserved some coal blocks to be auctioned for exclusive use by small- and medium-scale manufacturing plants.

The rationale behind charging market prices for coal auctioned to the non-regulated sector is that it would allow the government to keep coal prices to the regulated sector low, thus ensuring a low power tariff. At the same time, it would not compromise CIL's financial situation and would allow further investment in new mines. However, prices to non-regulated users also need to remain competitive with international coal prices so as not to encourage the non-regulated sector to resort to coal imports, thereby defeating the purpose of coal sector reform. The impact on coal imports will also depend on the quantity of coal that will be available at auction. As mentioned earlier, the non-regulated sector imported 77 Mt of steam coal in FY2015, a jump of 54 per cent over FY2014, due to reduced e-auction sales. A key question therefore is whether the 25 per cent of incremental production of CIL intended to be earmarked for auction of linkage will be sufficient to cover the needs of the sector. The current mismatch between supply and demand may lead to a high price of coal in the auction of coal linkages, reflecting the shortage of coal and not the correct value of coal, a situation which may compromise Indian competitiveness and lead non-regulated consumers located

¹⁰⁰ CCO, Provisional Coal Statistics 2014-2015, Ministry of Coal,

http://coal.nic.in/sites/upload_files/coal/files/webform/notices/Provisional_Coal_Statistics_2014-15.pdf

¹⁰¹ MoC, Minutes of the fifth meeting of the Inter-Ministerial Committee for proposed auction of coal linkages/LoAs through competitive bidding held on 04.06.2015, Office Memorandum, 24 June 2015

¹⁰² MoC, Minutes of the seventh meeting of the Inter-Ministerial Committee for proposed auction of coal linkages/LoAs through competitive bidding held on 24th September, 2015, Office Memorandum, 28 September 2015

¹⁰³ MoC, 28 September 2015, ibid

¹⁰⁴ Business Line, 'Will coal linkage auctions really help the deregulated sector?', 10 June 2015,

<http://www.thehindubusinessline.com/economy/will-coal-linkage-auction-really-help-the-deregulated-sector/article7306238.ece>

¹⁰⁵ Indian Express, 'Small bidders wary of methodology for CIL output auction', 15 June 2015,

<http://indianexpress.com/article/business-others/small-bidders-wary-of-methodology-for-cil-output-auction/#sthash.gG6QrNd9.dpuf>



far from domestic mines to favour coal imports. Auctioning of FSAs to the non-regulated sector is expected to start in June 2016. The timing of the proposed reform is important, and the government will have to take into account both the domestic and global supply-demand balance.

3.3.3.2 Regulated sector

For the regulated sector,¹⁰⁶ the reform aims at eventually replacing all existing and new coal supply contracts through a power tariff-based e-auction model under which the lowest-cost power producer would get coal supplies from CIL.¹⁰⁷

Future coal linkages in the regulated sector, after meeting existing commitments, could be granted through allocating coal linkages to states/Discoms, who in turn would auction these linkages in tariff-based bidding and assign them to the successful bidders.¹⁰⁸ Thus the power tariff would be the sole determinant for awarding coal linkages to the power plants through a transparent auction process. Any escalations in the cost of coal, rail tariff, or any other cost would be a pass-through.

Linkages would be earmarked through various Discoms, based on the demand-supply situation. The linkages would be for long-term periods (seven to 25 years) in order to give stability for planning and investment. CIL could earmark a coalfield/mine area and Indian Railways could ensure coal evacuation infrastructure so as to have more bid certainty and lower tariffs. The MoC has also recommended that Discoms would arrange all the clearances and invite the bid on a plug-and-play basis (that is, after all regulatory clearances have been granted).¹⁰⁹

This new allocation method puts Discoms at the centre of the decision-making process through allocation of coal linkages according to their supply-demand situation instead of allocating coal linkage to power plants on the basis of SLC-LT recommendation. It goes hand in hand with ongoing reform at the distribution level aiming at introducing competition in the sector and allowing multiple suppliers.

In addition, to make coal available for power plants which are stressed or in short supply of coal for the reason that they do not have coal blocks, linkages, or long-term PPAs, the government has earmarked a separate portion within the e-auction quantity to prevent these assets from turning into non-performing assets.¹¹⁰ Two separate e-auction sales were envisaged: first, for PPA holders (long and medium term) by offering a quantity of 5 Mt and for others (short-term PPAs/without PPA) offering a quantity of 5 Mt. The floor price for the e-auction window for PPA holders has been set at CIL notified price plus 20 per cent premium and at CIL notified price plus 40 per cent premium for others.

To begin with, the MoC has decided to test the model for new power plants that were in short supply of coal despite having fuel supply agreements. A first special e-auction sales for 5 Mt took place at the beginning of October 2015 with a floor price at 20 per cent of CIL's notified price. The tepid response by power utilities (only 2.4 Mt sold) led the government to modify the norms of future auctions.¹¹¹ The remaining quantity of around 8.4 Mt up to March 2016 will be offered through forward e-auction and the conditions for participation have been relaxed. There are no requirements for bidders to hold any type of PPAs to be eligible to participate in the forward e-auction. Captive power plants may also be allowed to bid, as one-time exception.

¹⁰⁶ The regulated sector (central, state, and private power plants) gets coal either through linkages from CIL/SCCL or by mining their own captive coal blocks, or through imports.

¹⁰⁷ In the proposed auction methodology, a bidder would be required to quote separate figures for variable charges (escalable and non-escalable) and fixed charges of electricity supplies at the delivery points specified by the Discoms. Taking an average of both the charges, a levelized tariff would be fixed to select bidders and the lowest bidder would be declared as the preferred bidder.

¹⁰⁸ MoC, Minutes of the seventh meeting of the Inter-Ministerial Committee for proposed auction of coal linkages/LoAs through competitive bidding held on 24th September, 2015, Office Memorandum, 28 September 2015

¹⁰⁹ Indian Express, 'Coal Ministry may ask Discoms to get clearances before bidding', 28 June 2015, <http://indianexpress.com/article/business/companies/coal-ministry-may-ask-discoms-to-get-clearances-before-bidding/>

¹¹⁰ MoC, Coal supplies for power projects beyond 30.6.2015, Office Memorandum, 30 June 2015, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/300615.pdf

¹¹¹ DNA India, 'Centre relaxes norms after coal e-auction flops', 19 October 2015, <http://www.dnaindia.com/money/report-centre-relaxes-norms-after-coal-e-auction-flops-2136266>



With current low international coal prices, the premium of 20 per cent and 40 per cent for the power and non-power sectors are higher than prices of imported coal. The depressed global coal market reduces the government's margin of manoeuvrability.

3.3.3.3 A new trading platform

Linked with the introduction of commercial mining in the country, which is expected to begin in FY2016, the government is working on a common coal trading platform¹¹² for CIL as well as private and public companies (see Section 4.4). The electronic platform is likely to be an extension of CIL's e-auctions, where all the coal mined in the country, excluding from coal blocks allocated for captive use, would be traded. The proposed platform could trade CIL's auctioned supplies, the uncontracted output of Public State Undertakings (PSUs), imported coal, and the output of private companies from coal mines that will be auctioned for commercial use.

A common electronic platform will ensure transparent trading and facilitate competition between different sources of domestic supplies (when private coal production takes off) – and also between domestic and imported coal, based on price as opposed to imports based only on fuel shortage.

3.4 Future coal demand: focus on the power sector

3.4.1 Energy reforms and their impact on electricity demand

Several scenarios have been developed to assess India's future energy and electricity demand. While they all foresee a tremendous increase in power demand,¹¹³ most of them were prepared before key government reform initiatives, including the fivefold increase of solar power capacity or doubling of CIL's production, or before the outcome of economic reforms could be assessed.

Despite a slight slowdown in the second quarter of FY2016, India is one of the fastest-growing major economies in the world.¹¹⁴ According to the World Bank, India's economic growth is expected to be 7.5 per cent in 2015, followed by further accelerations to 7.9 per cent in 2016 and 8.0 per cent in 2017.¹¹⁵ The Indian Economic Survey 2015 projects a growth rate of 8–8.5 per cent in FY2016 and in double-digits thereafter.¹¹⁶ There is therefore a need to reassess future energy and electricity demand in view of higher economic growth, the government commitment to give energy access to all, the major push towards urbanization (central planners expect the urbanization rate to reach 60 per cent as early as 2030, from around 30 per cent currently), and the priority given to electrification to ease import dependence. The government has also set energy conservation targets in the new energy policy.

Indian energy policy planners are working towards a growth rate of 8–10 per cent in the next 15 years,¹¹⁷ which would translate into rapid expansion in electricity demand. Specifically, the ambition of the government is to double electricity generation to 2,000 TWh by FY2020 (1,105 TWh in FY2015) to enable economic development at a price that makes Indian manufacturing competitive and electricity affordable for Indian households.¹¹⁸ This growth represents a new paradigm. To meet this target,

¹¹² Ventura, 'Government mulls common coal trading platform for Coal India and private companies', 23 June 2015, <http://content1.acesphere.com/newscontentventura/NewsDetailsPointer.aspx?NewsId=381084&SecId=7&subsecId=15>

¹¹³ For instance, in the IEA WEO 2014 New Policy Scenario (NPS), Indian electricity demand is expected to rise at a CAGR of 4.4 per cent from 869 TWh in 2012 (the reference year in WEO 2014) to 2,915 TWh in 2040. Indian coal demand is projected to rise from 354 Mtoe in 2012 to 604 Mtoe in 2040, while coal production would increase from 260 Mtoe in 2012 to 465 Mtoe in 2040. In 2030 coal demand will reach approximately 1,342 Mt (604 Mtoe) under the NPS and 1,547 Mt (696 Mtoe) under the CPS (Current Policy Scenario), assuming calorific value of 4 500 kcal/kg for Indian coal. India's GDP growth is assumed to average 6 per cent a year in the projected period (2013–2040).

¹¹⁴ Economic growth reached 7.5 per cent in the first quarter of FY2016, but slowed down to 7 per cent in the second quarter.

¹¹⁵ World Bank, Global Economic Prospects, June 2015, <http://pubdocs.worldbank.org/pubdocs/publicdoc/2015/9/961521443473555360/Global-Economic-Prospects-June-2015-Global-economy-in-transition.pdf>

¹¹⁶ Government of India, Economic Survey 2014-15, February 2015, <http://indiabudget.nic.in/es2014-15/echapter-vol1.pdf>

¹¹⁷ NITI Aayog, India Energy Security Scenarios, 2047 Version 2.0, Call for evidence, June 2015, http://niti.gov.in/mgov_file/Call%20for%20Evidence-IESS%20V2/Call_for_evidence_15.06.pdf

¹¹⁸ Financial Express, 'India to stop imports of low grade thermal coal in two years, says Piyush Goyal', 15 May 2015, <http://www.financialexpress.com/article/economy/india-to-stop-imports-of-low-grade-thermal-coal-in-two-years-says-piyush->



while also reducing imports of fuels, the government aims at maximizing the potential of power generation through all energy sources, solar, wind, hydro, nuclear, gas, and coal. A thorough look at the development of coal power plants under construction shows that coal demand by the power sector as projected in most scenarios is likely to be exceeded, despite the massive push towards renewables. Recently, the government announced that coal demand would reach 1,200 Mt by FY2020,¹¹⁹ which represents a CAGR of 7.9 per cent over the estimated demand of 820 Mt in FY2015.

A huge investment of nearly \$250 billion in the energy sector over the next four to five years will be needed to increase energy supplies, including \$100 billion in renewables and \$50 billion in transmission and distribution.¹²⁰

Box 7: India's INDC

At the end of September 2015, India submitted its INDC (intended nationally determined contribution) setting out its approach to GHG mitigation ahead of COP21 in Paris.¹²¹ India has pledged to reduce its carbon intensity by 33 to 35 per cent by 2030 compared to 2005 levels. India has also pledged that 40 per cent of the country's electricity would come from non-fossil fuels by 2030, if the international community helps with technology transfer and low-cost finance. India intends to introduce new, more efficient, and cleaner technologies in thermal power generation, reduce emissions from the transportation sector, and promote energy efficiency, mainly in industry, transportation, buildings, and appliances.

Specifically, India has confirmed the goal to install 175 GW of solar, wind and biomass electricity by 2022, and to scale up further in following years. The country will also aggressively pursue development of hydropower and also aims to achieve the target of 63 GW of installed nuclear power capacity by 2032.

India intends to create an additional carbon sink of 2.5–3 GtCO₂eq (carbon dioxide equivalent) by 2030 through additional forest and tree cover.

3.4.2 New coal-fired power plants

3.4.2.1 Coal-based capacity additions by FY2020

While investment in renewable energy sources is undoubtedly on the rise, there is even greater investment already underway into coal-fired electricity generation which indicates that India's coal consumption is likely to rise for some time.

During the past three years, 53 GW of coal-based capacity was added to the fleet (that is, 18 GW per year). According to the CEA, at the beginning of April 2015, there was 84 GW of announced coal

[goyal/72786/](#). According to NITI Aayog, power generation from conventional sources is expected to increase from 1,048 TWh in FY2015 to 1,491 TWh by FY2020, rising at a CAGR of 7.3 per cent in the next five years. Niti Aayog, Infrastructure: Powering Growth through Connectivity, May 2015, http://niti.gov.in/mgov_file/presentations/infrastructure-slides.pdf

¹¹⁹ Financial Express, 'Coal India goes for makeover', 3 June 2015,

<http://www.financialexpress.com/article/industry/companies/coal-india-goes-for-makeover/79443/>. CILs' roadmap indicates

coal demand at 1,215 Mt by FY2020, CIL, Roadmap for enhancement of coal production, 26 May 2015,

[http://coal.nic.in/sites/upload_files/coal/files/webform/notices/RoadMap for Enhancement of Coal Production 26052015.pdf](http://coal.nic.in/sites/upload_files/coal/files/webform/notices/RoadMap%20for%20Enhancement%20of%20Coal%20Production%2026052015.pdf).

Higher figures (as high as 1.6 Gt) have also been quoted by the government. See for instance: Rediff.com, Govt to tap private sector to meet 1.6 bn tonne coal demand, 20 December 2014, <http://www.rediff.com/money/report/govt-to-tap-private-sector-to-meet-16-bn-tonne-coal-demand/20141220.htm>

¹²⁰ Reuters, 'Power minister says \$250 billion needed to tackle energy crunch', 6 November 2014,

<http://in.reuters.com/article/2014/11/06/india-energy-investment-idINKBN0IQOAK20141106>

¹²¹ UNFCCC, India's intended nationally determined contribution,

<http://www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf>



capacity under construction and likely to be commissioned during the 12th FYP and beyond.¹²² Of this, 30 GW are planned to be commissioned during the 12th FYP (so in FY2016 and FY2017), although some projects have been delayed.¹²³ In order to speed up these projects, the government has decided to fast-track 10 projects, with 15.6 GW of capacity, which have hitherto been held up by land-related issues.¹²⁴ The remaining capacity under construction (54 GW) consists of additional projects which were not originally included in the 12th FYP target. These power plants, mostly developed by the private sector, are expected to be commissioned during the 12th FYP and beyond. They include around 30 projects linked with captive blocks,¹²⁵ with almost 18 GW of capacity, which are either completed (10 GW) or close to completion but lack PPAs (see Section 3.2.4).¹²⁶

Table 8: Coal-fired power plants under construction at the end of March 2015

GW	Commissioned at end March 2015	To be commissioned	Total
Projects to be commissioned during the 12th FYP (2012-2017)			
Central government	8.5	5.5	14.1
States	9.9	2.4	12.2
Private	21.3	22.2	43.5
Total 1	39.7	30.1	69.8
Additional projects likely to be commissioned during the 12th FYP and beyond			
Central government	0.0	20.1	20.1
States	0.3	16.8	17.1
Private	13.9	17.1	31.0
Total 2	14.2	54.0	68.2
Grand total	53.9	84.0	138.0

Source: Ministry of Power, Answer to Question No. 501, Lok Sabha; Annex II: Details of thermal power projects lying incomplete (under construction) in the country, 23 July 2015.

Based on the announced commissioning dates of the projects, most of the 84 GW of capacity is to be commissioned in the next three to four years, except 11 projects with a combined capacity of 12.6 GW which are stalled due to financing and land issues. Therefore, projected capacity at the end of FY2020 could increase by around 70 GW and reach 230 GW, assuming some delays in the actual commissioning dates of the plants but no cancellations. New projects announced after FY2015 will enter into service after FY2020 as it takes around five years to complete a new power plant from its inception.

3.4.2.2 The UMMPs policy

In addition, the finance minister announced in February 2015 the setting up of five more ultra-mega power projects (UMPPs) of 4,000 MW each.¹²⁷ They entail investments of about INR 1 trillion (\$16

¹²² Lok Sabha, Ministry of Power, Answer to Question No. 501, Annex II: Details of thermal power projects lying incomplete (under construction) in the country, 23 July 2015. The list includes 82 thermal projects aggregating to 81.7 GW. For this analysis, we have removed gas-fired power plants from the list, and added coal-fired power plants commissioned during the first months of FY2016 to assess the situation from FY2016.

¹²³ For instance, according to the CEA, 17.4 GW are expected to be commissioned in FY2016, while the detailed list of identified projects under construction mentioned above includes 25 GW of capacity to be commissioned that year.

¹²⁴ Economic Times, Government decides to speed up Rs 90,000 crore power projects, 9 March 2015, http://articles.economictimes.indiatimes.com/2015-03-09/news/59931864_1_land-acquisition-law-lakh-crore-nabinagar. NTPC, which intends to double its current capacity within the next ten years, is developing eight of the 10 projects. The company has 21 projects under construction, including joint-venture projects. Of this, 16 projects are coal-based. They would add 22 GW of capacity, of which 14.4 GW from FY2016 to FY2018.

¹²⁵ As the mines recently put up for auction will not be brought into production immediately, these projects have been given assurances by the government on coal supplies from CIL, initially through tapering linkage and then through e-auctions.

¹²⁶ New Indian Express, 'Coal India Asked to Light up 30 Ongoing Power Projects', 31 March 2015, <http://www.newindianexpress.com/business/news/Coal-India-Asked-to-Light-up-30-Ongoing-Power-Projects/2015/03/31/article2738644.ece>

¹²⁷ Livemint, 'Five ultra-mega power projects feature in Union Budget 2015', 28 February 2015, <http://www.livemint.com/Politics/4PHOZ3Q2sSC1JZ3gth8mfM/Budget-2015-Finance-minister-announces-plan-for-ultra-mega.html>



billion). The projects are proposed to be executed on a 'plug-and-play' model (all regulatory clearances and coal linkage for the projects will be put in place before they are awarded to private developers through a transparent auction). As it takes around five years to complete a project after its award, the five UMMPs announced by the finance minister would add 20 GW of coal capacity towards the end of the 13th FYP.

Box 8: The UMMPs policy

In order to meet the growing gap between demand and supply of power, the government introduced the concept of UMPPs in November 1995. These large-scale projects, each with a capacity of about 4,000 MW, were aimed at building power capacities at low costs, benefitting from significant economies of scale which could consequently facilitate the sale of power at low tariffs to consumers. The projects were awarded to developers on tariff-based competitive bidding on a 'build-own-operate' basis. They use supercritical technology to achieve higher levels of efficiency, which results in coal savings and lower CO₂ emissions. They were developed as integrated power projects with dedicated captive blocks for pithead projects. Coastal projects were designed to use imported coal.

Initially, nine such projects had been identified (four at pithead and five at costal locations). Later, seven additional UMPPs were identified in various parts of the country. Of the 16 projects, only four (Sasan in Madhya Pradesh, Mundra in Gujarat, Krishnapatnam in Andhra Pradesh, and Tilaiya in Jharkhand) have been awarded to the successful bidders,¹²⁸ and only two are operating (see Table 9). UMPPs have turned out to be more expensive than expected, leading utilities to seek increased tariffs to recover their costs.¹²⁹ Private sector interest in UMPPs has waned. The latest two offered up to investors in 2013, Cheyyur (Tamil Nadu) and Bedabahal (Odisha) UMPPs, had to be withdrawn due to inadequate investor response. With the proposed plug-and-play model, the government hopes to revive private investors' interest and resolve issues of long delays due to land acquisition problems. The government expects to reopen the bids in 2015–16 for the two withdrawn UMMPs, while the auction process for the remaining three announced in the Union Budget 2015–16 may be awarded in 2016–17. The government is currently determining the locations and plants that can be taken up in UMPP mode and examining places where there is adequate land, water, clearances of environment and forest, and coal block availability.¹³⁰ The government is also looking at the option of upgrading existing power plants into larger capacity-UMPPs using clean technology, and offering them to investors in the plug-and-play mode. Sites where power plants are more than 25 years old could be considered as potential locations for UMPPs.

The exact number and implementation schedule of UMPPs therefore remain uncertain, as some initial projects have been withdrawn or face environmental or local opposition issues, while new UMPPs may be identified in the future.

¹²⁸ Ministry of Power, Status of UMPP, 9 March 2015, <http://www.pib.nic.in/newsite/erelease.aspx?relid=25644>

¹²⁹ Especially for UMPP based on imported (Indonesian) coal. See The Hindu, 'Tata Power, Adani get relief for Mundra UMPP', 23 February 2014, <http://www.thehindu.com/todays-paper/tp-business/tata-power-adani-get-relief-for-mundra-umpp/article5717910.ece>

¹³⁰ Economic Times, 'Large projects will ensure 24x7 power for all in next five years: Piyush Goyal', 18 May 2015, http://economictimes.indiatimes.com/articleshow/47321714.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

Table 9: Status of UMPP projects

State	Project name	Developer	Capacity (MW)	Coal source	Levelized tariff (INR/kWh)	Status
Awarded						
Gujarat	Mundra	Tata Power	5X 800	Imported	2.264	Operating
Madhya Pradesh	Sasan	Reliance Power	6 X 660	Domestic	1.196	Operating
Andra Pradesh	Krishnapattnam	Reliance Power	6 X 660	Imported	2.333	Tariff issue linked to new regulation of coal pricing in Indonesia. The procurers have issued termination notice. The matter is subjudice.
Jharkhand	Tilaiya	Reliance Power	6 X 660	Domestic	1.77	Reliance Power terminated the PPA contract in April 2015 over inordinate delays in land acquisition
To be awarded in 2015-16						
Odisha	Bedabahal		4000	Domestic		Fresh bid to be issued in FY2016
Tamil Nadu	Cheythur		4000	Imported according to initial intention		Fresh bid to be issued in FY2016
Identified projects						
Uttar Pradesh	Site not finalized		4000	Not finalized		Sites selection
Karnataka	Dakshina Kannada		4000	Imported		Some issues to be resolved linked to the site
Maharashtra	Not finalized		4000	Not finalized		Location not finalized
Jharkhand	Deoghar		4000	Domestic		MoC has tentatively recommended coal blocks.
Odisha	Bhadrak		4000	Imported		Site identified
Odisha	Kalahandi		4000	Domestic		Site identified
Bihar	Banka		4000	Domestic		MoC has tentatively recommended coal blocks.
Tamil Nadu	Tamil Nadu UMPP 2		4000	Not finalized		Under examination by CEA/PFC
Gujarat	Gujarat UMPP 2		4000	Not finalized		Under examination by CEA/PFC
Chhattisgarh	Surguja		4000	Domestic		Withdrawn (coal blocks falling in inviolate area). MoC has tentatively recommended new coal blocks.

Sources: Ministry of Power; IEA; DNA India, 28 April 2015.

3.4.3 Coal demand scenarios

3.4.3.1 Methodology and main assumptions

This section presents two demand scenarios developed to FY2020 which mainly focus on coal demand from power utilities. For the non-regulated sector, the assumption of future demand is based on economic activity and efficiency gains and is the same in both scenarios.

For the power utilities sector, the approach taken in this report is a bottom-up approach, based on coal-based capacity build-up over the period FY2016–FY2020, as presented in the previous section (Table 8). In both scenarios, an improvement in the average efficiency of the power fleet has been assumed due to the commissioning of supercritical plants and improvement of coal quality. The two scenarios are based on historical and recent PLFs. The scenarios do not include any assumption on coal prices, or changes in coal taxation, as the aim is just to assess the maximum possible coal demand based on installed coal-power capacity. Despite this aim, a scenario where PLF recovers to 80 per cent as observed at the end of the 2000s, has not been taken into consideration as the recovery of PLF to these high levels is likely to be gradual and will not occur in the timeframe of the scenarios.

Table 10: Main assumptions for steam coal demand by power utilities

	FY 2015 (provisional)	FY2016	FY2017	FY2018	FY2019	FY2020
Installed capacity (GW at the end of the year) (1)	159	176	196	212	222	228
SubC	134	143	153	153	153	153
SC	25	33	43	59	69	76
Specific coal consumption (kg/kWh)						
SubC	0.7	0.7	0.65	0.65	0.65	0.65
SC	0.6	0.6	0.56	0.56	0.56	0.56
Plant Load Factor						
Low PLF Scenario	0.65	0.63	0.64	0.65	0.65	0.65
Improved PLF Scenario	0.65	0.63	0.65	0.66	0.68	0.70

(1) Excludes 6 GW of lignite-based capacity.

Source: Author's calculations.

First, the capacity build-up each year has been estimated, broken down into subcritical and supercritical plants. It has been estimated that half of the plants commissioned during the 12th FYP (2012–2017), and all capacity after 2017 (13th FYP), are based on supercritical technology, as announced by the government. Only half of the additional capacity built in one year is available during the year.

Then, plant load factors (PLF) have been applied to derive electricity generation each year, taking into account auxiliary consumption of the plants. As stated, the scenarios are based on historical and recent PLFs. In the first, the 'low plant load factors' scenario, the current low utilization of coal plants (less than 65 per cent in FY2015, and even 61 per cent in the first half of FY2016¹³¹) continues over the period. The PLF is assumed to fall to 63 per cent on average in FY2016 before recovering to 64 per cent in FY2017 and remaining at 65 per cent for the rest of the period. In the second scenario (called 'Improved PLF'), plant utilization gradually improves to 70 per cent by FY2020, although a low PLF is assumed at the beginning of the period (see table 10).

The estimated coal demand is then calculated by applying specific average coal consumption per kWh, which is currently 0.7 kg/kWh for subcritical plants and of 0.6 kg/kWh for supercritical plants.¹³² Current efforts to improve coal quality by washing coal is estimated to decrease the specific coal consumption per kWh by 15 per cent from FY2017. This is applied to half of the coal power fleet.¹³³ This implies that from FY2017 the specific average consumption is 0.65 kg/kWh for subcritical plants and 0.56 kg/kWh for supercritical plants.

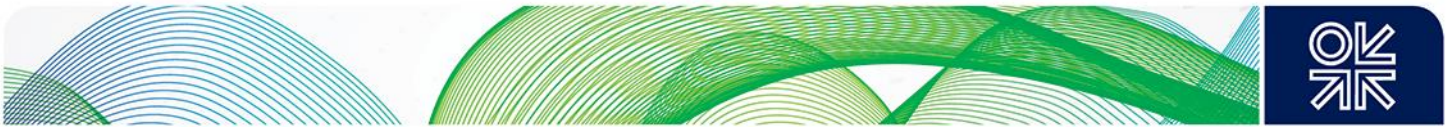
3.4.3.2 Estimation of capacity addition each year

The estimated capacity addition each year has been assessed based on the assessment of total additional capacity by FY2020 (Table 8, Section 3.4.3.1), and taking into account the announced commissioning date of each plant and some delays as observed in the past (30 per cent of the announced capacity each year is delayed by one year). While there is still a significant number of coal power plants under construction to be commissioned from FY2016 to FY2018, the number of plants to be commissioned will fall after these dates. As some delays in the actual commissioning have been

¹³¹ CEA, Executive Summary, Power Sector, September 2015. The drop in the PLF since the beginning of FY2016 is sharp for state power plants (PFL of 53.6 per cent in June 2015, compared with 61.6 per cent in June 2014) and private plants (55.4 per cent versus 61.7 per cent). This may be explained by 'lack' of demand, but also by the non-availability of coal from coal blocks as only 7 mines on the 67 auctioned/allotted at the end of March 2015 were in operation at the beginning of July 2015.

¹³² Niti Aayog, India Energy Security Scenarios, 2047 Version 2.0, Call for evidence, June 2015, http://niti.gov.in/mgov_file/Call%20for%20Evidence-IESS%20V2/Call_for_evidence_15.06.pdf

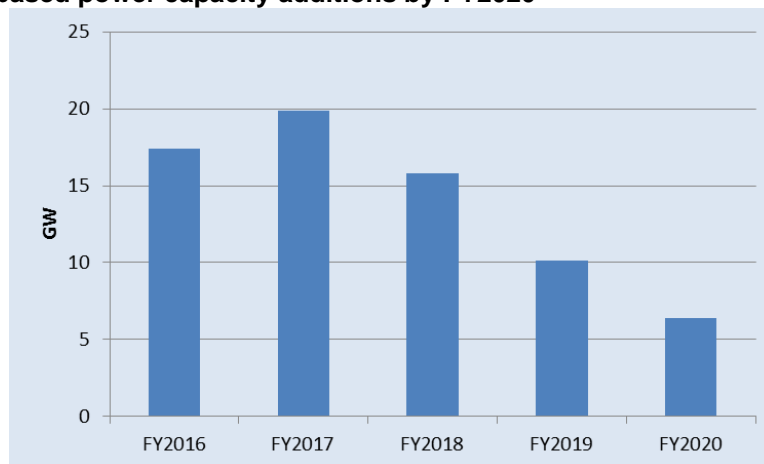
¹³³ According to a study of the National Transport Development Policy Committee, published in 2013, when the distance is reduced to 500 km, about 90 GW of capacity would require about 360 mtpa of washed coal (National Transport Development Policy Committee (NTDPC), Transportation of energy commodities, 2013, http://tripp.iitd.ernet.in/publications/NTDPC/Vol%2002-2/NTDPC%20Vol%2002_Part%202%20Ch%2008.pdf). See also Sections 3.2.1 and 5.2.2.



assumed, the capacity addition in FY2019 is still significant but falls sharply in FY2020. The result of the assessment is presented in Figure 16.

The outcome is consistent with the current strategy of major power utilities. Their strategy consists in improving utilization rates of existing thermal power plants rather than adding incremental capacity above the projects currently under construction. This will slow down the rate of capacity build-up after pending projects are completed in the next two to three years. It could even lead to cancellations of projects ‘under construction’, which are at an early stage. A more efficient utilization of existing capacity implies that less additional capacity would be required, leading to savings in capital costs.¹³⁴ In addition, investments in solar power projects will further reduce the need for additional thermal power capacity additions, as observed in Section 3.2.3. Therefore, coal-based capacity additions are expected to decrease after FY2018, as most of the power plants currently under construction will be commissioned.

Figure 16: Coal-based power capacity additions by FY2020



Source: author’s calculations based on CEA’s list of thermal power plants under construction as of 23 July 2015

3.4.3.3 Estimated demand by the power utilities sector

In the low PLF scenario (Scenario 1), power generation reaches around 1,200 TWh in FY2020 (a CAGR of 8.1 per cent over the period) and requires coal supplies of around 730 Mt in FY2020. In Scenario 2 (‘Improved PLF’), coal-based generation reaches around 1,300 TWh in FY2020 – a CAGR of 9.7 per cent over the period FY2015–FY2020. This high level of electricity generation would require coal supplies of almost 790 Mt in FY2020 – a CAGR of 8.2 per cent over the next five years.

Table 11 presents the results of our analysis, showing annual electricity generation and coal demand over the period FY2016–FY2020, compared with actual (provisional) data in FY2015. Our projected electricity generation for FY2016 is lower than the CEA estimated output, which in March 2015 estimated that coal-based power generation by utilities would rise by 11 per cent to 888.75 TWh in FY2016 compared with 800.3 TWh in FY2015.¹³⁵

¹³⁴ If the current coal-based capacity (159 GW at end of March 2015) was utilized at 80 per cent, instead of 65 per cent, electricity generation would increase to more 1,000 TWh compared with 800 TWh generated in FY2015.

¹³⁵ Revision of electricity generation target of 2015–16, 5 May 2015, http://www.cea.nic.in/reports/articles/god/generation_target_1516.pdf

Table 11: Estimated coal demand by the power utilities sector (FY2015–FY2020)

	FY 2015 (provisional)	FY2016	FY2017	FY2018	FY2019	FY2020	CAGR (FY2015- FY2020) %
Installed capacity (GW at the end of the year)	158.6	176	196	212	222	228	7.5
Scenario 1 "Low PLF"							
Plant Load Factor	0.65	0.63	0.64	0.65	0.65	0.65	
Electricity generation (TWh) (2)	800	849	959	1068	1135	1179	8.1
Coal demand (Mt) (3)	531.5	580	606	670	708	732	6.6
Scenario 2 "Improved PLF"							
Plant Load Factor	0.65	0.63	0.65	0.66	0.68	0.70	
Electricity generation (TWh) (2)	800	849	974	1084	1188	1269	9.7
Coal demand (Mt) (3)	531.5	580	615	680	740	788	8.2

Sources: 2015 CEA (provisional), 2016-2020; Author's calculations.

3.4.3.4 Estimated coal demand by the non-regulated sector

For the other sectors (non-regulated sectors: steel, captive power plants, cement, sponge iron, etc.), the scenarios assume that demand increases in line with economic growth, expected at a CAGR of 7.5 per cent during the period in both scenarios. Efficiency gains reduce this growth rate by one percentage point in both scenarios. Under these assumptions, total coal demand by non-regulated sectors increases from 288 Mt in FY2015¹³⁶ to 395 Mt in FY2020. This total coal demand includes both steam and coking coal.

3.4.3.5 Estimated steam coal demand

Total steam and coking coal demand (which is the sum of demand by power utilities and the non-regulated sector) reaches 1,127–1,183 Mt in FY2020. These potential high levels correspond to a CAGR of 6.6 and 7.6 per cent over the five-year period.

To estimate steam coal demand from total coal demand, trends in coking coal demand, used as a raw material, have been estimated based on actual level in FY2015. Coking coal demand (only metallurgical coal production and coking coal imports¹³⁷) was 67 Mt in FY2015 and could reach 92 Mt by FY2020 (under the assumptions taken for non-regulated sectors – a 6.5 per cent growth per year during the period).

Therefore, steam coal demand (which is total coal demand minus coking coal demand) may reach 1,035–1,091 Mt by FY2020 (that is, a CAGR of 6.6–7.7 per cent over the period).

¹³⁶ This is calculated consumption based on total consumption coal demand, published by the Coal Controller's Organisation, less coal demand by power utilities. This certainly includes stocks at industrial plants, but there is no data on the level of these stocks. Likewise, while coal demand for major sectors, steel, cement, CPPs, sponge iron, is detailed in the Coal Controller's Organisation data, there is a large part of demand by 'others' which is not detailed.

¹³⁷ Coking coal demand, based on provisional data published by the Coal Controller's Organisation, only includes domestic metallurgical coal demand (22.7 Mt in FY2015) and coking coal imports (43.7 Mt in FY2015). The production of coking coal totaled 57.4 Mt in FY2015. However, a large share of this is consumed as a fuel and not as a raw material in the iron and steel industry.

Table 12: Steam coal demand Scenarios

Mt	FY2015 estimated	FY2016	FY2017	FY2018	FY2019	FY2020	CAGR (FY2015- FY2020) %
Scenario 1							
Demand by power utilities	532	580	606	670	708	732	6.6
Demand by non-regulated consumers	288	307	327	348	371	395	6.5
Total Coal demand	820	887	932	1,018	1,078	1,127	6.6
of which coking coal	67	71	76	81	86	92	6.5
of which Steam coal demand	753	815	856	937	992	1,035	6.6
Scenario 2							
Demand by power utilities	532	580	615	680	740	788	8.2
Demand by non-regulated consumers	288	307	327	348	371	395	6.5
Total Coal demand	820	887	942	1,028	1,111	1,183	7.6
of which coking coal	67	71	76	81	86	92	6.5
of which Steam coal demand	753	815	866	947	1,025	1,091	7.7

Source: Author's calculations.

These high levels of coal demand – although lower than in a scenario without renewables – are based on four assumptions: that economic growth continues to improve; that all announced coal power projects likely to be built are actually built; that coal quality improves; and that PLF improves (Scenario 2). This requires that the government fast-tracks projects that are currently stalled due to land acquisitions, or other issues, and requires that reforms in the power sector enable state Discoms to sign long-term PPAs. These levels can be considered as maximum levels of future steam coal demand, except in a scenario where the utilization factor of coal power plants increases to more than 70 per cent, an assumption that does not currently appear realistic.

These high levels of coal demand require a massive increase in domestic coal production as the government has made it very clear that its priority is to lower India's dependence on fuel and steam coal imports. They also indicate that the announced target of 1.5 Gt of domestic production by FY2020 exceeds India's actual coal requirements. The next chapter analyzes how domestic production could evolve by FY2020.

4. Coal production: a paradigm shift

4.1 New ambitious production targets

Despite a significant increase in coal demand from FY2010 to FY2014, on the back of strong demand from the power sector, India's coal production over the period increased at a CAGR of only 1.6 per cent, leading to recurrent coal shortages and increasing imports. In contrast, in FY2015 production increased by a healthy 8.2 per cent but still fell short of demand.¹³⁸

Table 13: Coal and lignite production in India (FY2010–FY2015)

(Mt)	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015 (provisional)
Eastern Coalfields (ECL)	30.1	30.8	30.6	33.9	36.1	40.0
Central Coalfields (CCL)	47.1	47.5	48.0	48.1	50.0	55.6
Bharat Coking Coal (BCCL)	25.5	29.0	30.2	31.2	32.6	34.5
Western Coalfields (WCL)	45.7	43.7	43.1	42.3	39.7	41.2
Mahanadi Coalfields (MCL)	104.1	100.3	103.1	107.9	110.4	121.4
South Eastern Coalfields (SECL)	108.0	112.7	113.8	118.2	124.3	128.3
Northern Coalfields (NCL)	67.7	66.3	66.4	70.0	68.6	72.5
North Eastern Coalfields (NEC)	1.1	1.1	0.6	0.6	0.7	0.8
CIL total	431.3	431.3	435.8	452.2	462.4	494.2
Singareni Collieries Company Limited (SCCL)	49.3	51.3	52.2	53.2	50.5	52.5
Captive blocks	35.5	34.2	36.2	37.0	39.5	53.2
Others	16.1	15.8	15.7	14.0	13.4	12.5
Total hard coal production	532.0	532.7	540.0	556.4	565.8	612.4
Of which coking coal	44.4	49.6	51.7	51.6	56.8	57.4
Of which steam coal	487.6	483.1	488.3	504.8	509.0	555.0
Lignite production	34.1	37.7	42.3	46.5	44.3	48.3
Total coal and lignite production	566.1	570.4	582.3	602.9	610.0	660.7

Source: Coal Controller's Organisation.

In order to achieve its social and economic development goals, while simultaneously ensuring India's steam coal independence, the government has set an ambitious target for Indian coal production. While the 12th FYP aimed at increasing coal production to 715–795 Mt in FY2017 and targeted 950–1,100 Mt by FY2022, the new target is far more ambitious and aims at a tripling of production to 1.5 Gt by FY2020.¹³⁹ The government has set a production target of 1 Gt for CIL – up from 494 Mt in FY2015. In parallel, the government expects production from other public and private companies, including from newly re-allocated coal blocks, to reach 500 Mt by FY2020, from 118 Mt in FY2015, and has introduced major reforms in the coal mining sector.

¹³⁸ Annex 2 provides detailed information on historical coal production by mining companies.

¹³⁹ Economic Times, 'Making efforts to settle project related issues: Coal Ministry to PMO', 11 January 2015, http://articles.economictimes.indiatimes.com/2015-01-11/news/57941134_1_coal-ministry-coal-mining-projects-coal-output

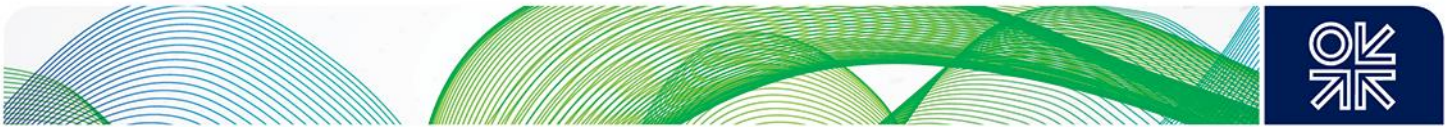
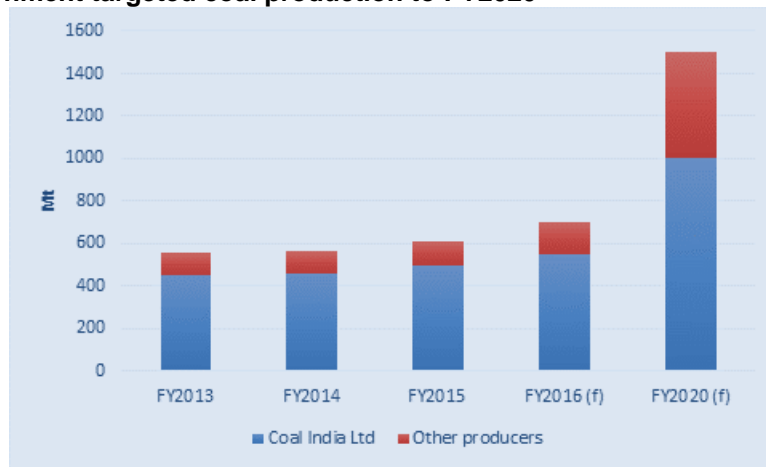


Figure 17: Government targeted coal production to FY2020



Source: Government of India.

4.2 CIL’s roadmap to 1 Gt production

CIL has developed a mine-wise roadmap for the next five years to augment output to 1 Gt by FY2020 from 494 Mt in FY2015.¹⁴⁰ The company has approved a plan to raise production to 908 Mt by FY2020, which is a CAGR of 12.9 per cent from FY2015 (see Figure 18). Existing coal projects are envisaged to contribute 165 Mt and projects under implementation are likely to contribute 561 mtpa. In FY2015, CIL’s Board approved seven projects which are expected to add a total capacity of 73 mtpa.¹⁴¹

CIL is also working on a strategy to add new projects (with an estimated capacity of 182 mtpa) to reach the target of 1 Gt. As of February 2015, 35 of these new projects are under preparation and are expected to add a production capacity of around 60 mtpa by FY2020.¹⁴²

¹⁴⁰ CIL, Roadmap for enhancement of coal production, 26 May 2015, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/RoadMap_for_Enhancement_of_Coal_Production_26052015.pdf

¹⁴¹ CIL, 2014-15 Annual Report and Accounts, August 2015, [https://www.coalindia.in/DesktopModules/DocumentList/documents/Annual_Report_&_Accounts_2014-15_Shareholder_version_03082015\(1\).pdf](https://www.coalindia.in/DesktopModules/DocumentList/documents/Annual_Report_&_Accounts_2014-15_Shareholder_version_03082015(1).pdf). While the commissioning dates are not specified, it can be expected that these new mines will start production from FY2016.

¹⁴² CMPDI, Preparations for 925 Million Tonne Production from CIL in 2019-20, February 2015, http://coal.nic.in/sites/upload_files/coal/files/coalupload/cil/CMPDI%20presentation%20for%2020%20Jan%202015.pptx

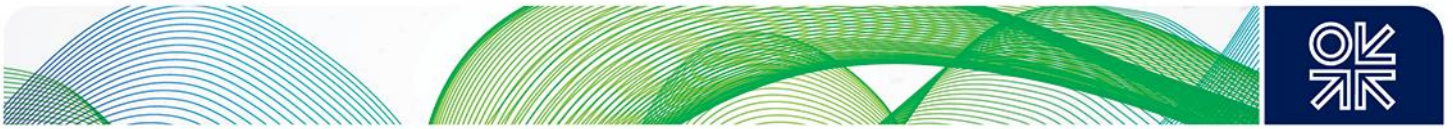


Figure 18: CIL’s projected production from ongoing projects



Source: CIL.

This mine-wise approach is not new, as CIL’s Board has always projected future coal production based on the development of detailed mine projects. The difference this time is the involvement of the central government as an active partner in the mine-wise plan. CIL has identified major issues mine by mine, and the government has committed its assistance in clearing the hurdles that have stalled mining and infrastructure projects in the past and in ensuring functioning operation of the identified projects.

The key issues for CIL are the timely completion of three critical railway lines,¹⁴³ land acquisition, and environmental clearances (see Section 4.3 for a detailed analysis). Reaching the challenging target therefore depends on a concerted effort by CIL, the states to access the reserves, and the railways to evacuate coal.

A major factor in the success of these efforts is the massive investments in mining and transportation that will be required to reach the 1 Gt target. CIL has announced investments of \$20–25 billion in better mine technology and facilities in the next five years and equity funding in infrastructure projects being developed for coal evacuation. CIL has a strong balance sheet, and the refocus of its investment strategy on domestic activity, away from international operations, is likely to help. Investment in the creation of additional opencast (OC) mining capacity of 500 mtpa, taking into account the depletion of existing capacity at 25 mtpa for five years, to meet the 1 Gt per year target, would amount to a further \$10–11 billion.¹⁴⁴ Capital expenditure of \$5–6 billion is also required to create at least 150 mtpa of mechanized underground mining capacity. Replacement capital expenditure and investment in washeries, operator-independent truck dispatch system (GPS truck dispatch system to increase productivity), land acquisition, and rail and road infrastructure would require another \$1–3 billion. The company has already significantly increased its capital expenditures from INR 50 billion in FY2015 to INR 120 billion in FY2016 (from about \$800 million to \$1.8 billion). Half of the sum will be earmarked for mining development and the other half for railway investment.

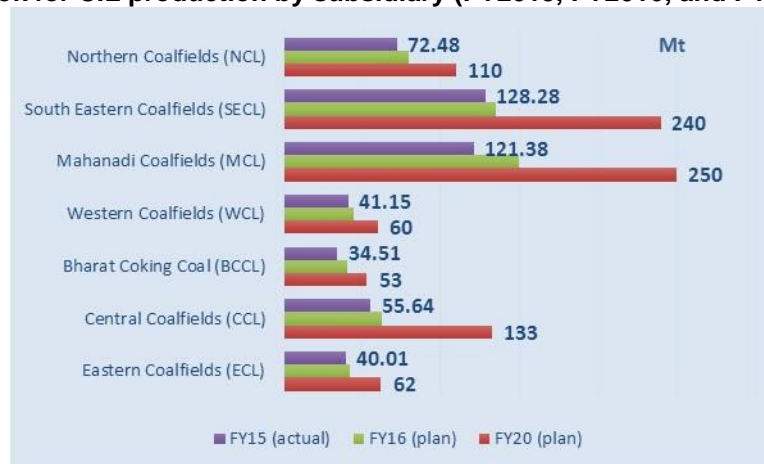
In the mine-wise plan to produce 908 Mt by FY2020, CIL has earmarked targets for all its subsidiaries. Among its seven coal-producing subsidiaries, three – SECL, MCL, and CCL – will be responsible for 77 per cent of the increase in output.

¹⁴³ The three lines include: Tori-Shivpur-Kathautia in Jharkhand, Jharsuguda-Barpalli-Sardega in Odisha, and Bhupdeopur-Korichapan-Dharamjaigarh in Mand-Raigarh and in Chhattisgarh (see Section 4.3.4).

¹⁴⁴ Mining Weekly, ‘Coal India aiming to double output to one-billion tons a year by 2020’, 17 July 2015, <http://www.miningweekly.com/article/coal-india-aiming-to-double-output-to-one-billion-tons-a-year-by-2020-2015-07-17-1>



Figure 19: Outlook for CIL production by subsidiary (FY2015, FY2016, and FY2020)



Source: CIL.

Currently, CIL produces more than 90 per cent of its coal through OC mining and has a low stripping ratio¹⁴⁵ (1.9 in FY2015), thereby ensuring that reserves are easily extractable. This has helped to position the company as among the lowest-cost coal producers in the world. The cost of production in the case of OC mines was INR 800–1,000/t (\$13–17/t) in FY2014, which is in the lowest decile of the global cost production curve and is almost one-fourth of underground mining cost of INR3,000–4,000/t (\$50–66/t). CIL’s average cost of production stood at INR 1,088.5/t (\$18/t) in FY2014. At present, salaries constitute around 53 per cent of the total cost of production, which is high by international standards of around 20–25 per cent.

Table 14: CIL’s subsidiary-wise cost of production

CIL’s subsidiaries	FY2012	FY2013	FY2014
Eastern Coalfields Limited (\$/t)	51.33	40.63	36.98
Bharat Coking Coal Limited (\$/t)	41.80	37.03	31.50
Central Coalfield Limited (\$/t)	21.68	18.76	17.84
Northern Coalfield Limited (\$/t)	14.89	14.75	16.10
Western Coalfields Limited (\$/t)	33.30	29.73	27.98
South Eastern Coalfields Limited (\$/t)	17.56	16.73	14.79
Mahanadi Coalfields Limited (\$/t)	10.59	8.89	8.76
Coal India Limited (\$/t)	21.64	19.27	17.99
Coal India Limited (INR/t)	1,037.02	1,048.45	1,088.52

Note: Original data in INR/t (exchange rates: FY2012: 47.92, FY2013: 54.41, FY2014: 60.5).

Source: CIL.

SECL, MCL, and CCL are the lowest-cost producing subsidiaries. This will ensure that future production costs are kept under control, which will be needed when CIL mines deeper or more difficult mines.

SECL, located in the state of Chhattisgarh, is currently the largest coal-producing subsidiary of CIL. In FY2015, the company produced 128 Mt and plans to raise its output to 240 Mt by FY2020 (a CAGR of 13.4 per cent). SECL plans to expand its existing Kusmunda OC coal mine in Chhattisgarh from 18.75 mtpa to 50 mtpa. SECL already has two Special Purpose Vehicles (SPVs) with state governments to develop its rail network. MCL produces coal in the eastern state of Odisha, which holds 75 Gt of geological resources in two major coal basins (the IB Valley and Talcher coalfields). MCL, which produced 121 Mt in FY2015, plans to increase its production to 250 Mt by FY2020 (a CAGR of 15.5

¹⁴⁵ The stripping ratio refers to the ratio of the volume of overburden (or waste material) required to be handled in order to extract some volume of coal (cubic meters of waste/cubic meters of ore).



per cent), almost all of which is in OC mines at current and planned projects.¹⁴⁶ Eighteen projects totalling 151 mtpa-capacity (capital investment of \$1.3 billion) are under implementation. MCL will resort to outsourcing to mine two large projects. CCL, located in Jharkhand, operates 58 mines comprising 21 UG mines and 37 OC mines. The company produced 56 Mt in FY2015 and plans to raise output to 133 Mt by FY2020 (a CAGR of 18.9 per cent). For this, CCL will rely on recently commissioned ongoing projects, which will add 35 mtpa of capacity by FY2020, and on new large projects to be commissioned from FY2017, including: Sanghamitra OC, 20 mtpa; Pachra OC, 15 mtpa; and Chatti-Baratu, Kerandari OC, 13 mtpa. The increase in production depends on the timely completion of the Tori–Shivpur–Kathutia railway line for coal evacuation.

4.3 Measures taken to attain the production goal

While the government and CIL have taken major logistical, technical, and regulatory steps to raise production rapidly, there are still further challenges to overcome to reach the ambitious production targets, in addition to the time required to build and ramp up production at new mines. Bureaucratic delays in land acquisition, ‘green’ (environmental and forest) clearances, and transportation bottlenecks have so far resulted in a time lag for the actual implementation of new mine projects and production growth. Local agitations and law and order problems have also restricted the production of CCL and MCL. At the beginning of April 2015, CIL had 49 coal mining projects facing delay due to land acquisition and associated ‘Rehabilitation & Resettlement’ (R&R) issues, as well as environmental clearance (EC) and forestry clearance (FC) issues.¹⁴⁷ In addition, 33 projects were running behind schedule due to lack of railway infrastructure for coal evacuation and other issues.

4.3.1 Government initiatives to speed up delayed projects

The government is attempting to address these challenges by changing the tone of the debate from why things have not worked in the past to what can be done to make it happen. It has taken major initiatives to speed up the implementation of coal projects and remove the hurdles that prevented CIL from raising its production. In November 2014, the government fast-tracked 90 of CIL’s ongoing projects, entailing an investment of INR 880 billion (\$14.2 billion).¹⁴⁸ The MoC sought faster clearances for these outstanding projects, some of which had been on the drawing board for decades. Hurdles, such as EC and FC, stalling 28 projects with a capacity of 95 mtpa have been lifted. The remaining 62 fast-track projects could add 400 mtpa.

With the government’s assistance, CIL opened the remote Amrapali mine in eastern India in July 2014.¹⁴⁹ This had been delayed for a decade due to poor rail links. In FY2015, CIL has opened four more big mines (Makardhokra 1, Bhanegaon, Panganga in Western Coalfields, and Jampali in South Eastern Coalfields) and expanded others. In addition, 15 new projects, with a capacity of 41 mtpa, are in the pipeline for FY2016. This includes CCL’s Magadh mine expansion (20 mtpa).

¹⁴⁶ MCL, Workshop on Technology Development for reaching 250 MT (19-20), February 2015.

¹⁴⁷ CIL, 2014-15 Annual Report and Accounts, August 2015,

[https://www.coalindia.in/DesktopModules/DocumentList/documents/Annual_Report_&_Accounts_2014-15_Shareholder_version_03082015\(1\).pdf](https://www.coalindia.in/DesktopModules/DocumentList/documents/Annual_Report_&_Accounts_2014-15_Shareholder_version_03082015(1).pdf)

¹⁴⁸ Economic Times, ‘Centre puts 90 of Coal India’s mining projects worth Rs 88k crore on fast track’, 3 November 2014, http://articles.economictimes.indiatimes.com/2014-11-03/news/55720014_1_coal-ministry-coal-india-limited-coal-block. There is no detail about the projects which have been fast-tracked, so it is not possible to reconcile the figures given by CIL in its Annual Report and the announced fast-tracked projects.

¹⁴⁹ The Amrapali coal mine in Jharkhand is CIL’s first major new project in the last five years and has a capacity of 12 mtpa. The coal produced from the mine will be transported through the Tori-Shivpur railway line, which is yet to be completed. Pending completion of the rail line, CIL has allowed power companies to pick up coal directly from the mine without signing any FSAs.



Table 15: CIL's new mining projects to be started in FY2016

Mine/Project	Subsidiary	State	Area	Annual Capacity (Mt)
Hura C OCP	ECL	Jharkhand	Rajmahal Area	3
Muraidih UGP	BCCL	Jharkhand	Barora	2
Magadh OCP	CCL	Jharkhand	Magadh	20
Saraipalli OCP	SECL	CG	Korba	1.4
Ketki UGP	SECL	CG	Bishrampur	0.42
New Majri Sector IA & II A OC	WCL	Maharashtra	Majri	1.2
Jamunia UG	WCL	Madhya Pradesh	Pench	0.84
Gokul OC	WCL	Maharashtra	Umrer	1.5
Sharda UG	WCL	Madhya Pradesh	Kanhan	0.32
Dinesh OC	WCL	Maharashtra	Umrer	4
Dhau North UG	WCL	Madhya Pradesh	Kanhan	0.36
Singhori OC	WCL	Maharashtra	Nagpur	0.8
Amalgamated Yekona-I & II OC	WCL	Maharashtra	Majri	2.5
Amalgamated Pauni-II & III OC	WCL	Maharashtra	Ballarpur	2.5
Chincholi OC	WCL	Maharashtra	Ballarpur	0.3
			TOTAL	41.14

Source: Ministry of Coal.

One major step initiated by the MoC is the creation of an electronic platform to address all regulatory hurdles related to coal mining projects and mine-by-mine progress monitoring. The Electronic Coal Projects Monitoring Portal (e-CPMP) aims at fast-tracking infrastructure investment in stalled projects, both public and private.¹⁵⁰ The portal allows the regular monitoring of project-related issues and coordination with different ministries and state authorities, therefore enhancing efficiency and transparency. At the beginning of July 2015, the portal listed 246 coal-related projects, most of which were coal mines developed by CIL, including 19 projects for which all pending issues had been resolved. The implementation of the projects is also monitored regularly through quarterly project review meetings under the chairmanship of the Secretary of Coal.

4.3.2 Land acquisition and rehabilitation and resettlement issues

Land acquisition is a major hurdle to the development of infrastructure in India, and certainly the key obstacle to reach the new coal production goals, whether it be for opening new mines, expanding existing projects, or building evacuation infrastructure.

The incremental land requirement due to projected growth in production makes land acquisition crucial for the coal-mining sector. However, while the central and state governments own much of the land where coal reserves are located, land acquisition has become difficult due to various socio-political reasons, leading to delays and cancellations in coal-mining projects. The major impediments in the land acquisition process include: delays in notification of need to acquire land; delay in the authentication of land records/determination of 'Record of Rights'; delay in handing over the land; reluctance on the part of 'land oustees' to handing over land even after receiving compensation; non-availability of R&R sites which are required to be provided by state governments; and demand of extra compensation from project-affected persons. Social resistance has made the actual possession of land extremely slow in the recent years. Though CIL acquires land through special legal provision (the 1957 Coal Bearing Areas Acquisition and Development Act), in practice the company has received it in patches and with four to eight years' delay, meaning that production could not grow as planned.

In order to expedite the process of land acquisition, the government promulgated a new ordinance¹⁵¹ on 31 December 2014 – the Right to Fair Compensation and Transparency in Land Acquisition,

¹⁵⁰ MoC, Electronic Coal Projects Monitoring Portal (e-CPMP), 2015, <https://esuvidha.gov.in/coal/index.php>

¹⁵¹ Executive orders which bypass parliament



Rehabilitation and Resettlement (Amendment) Ordinance, hereafter referred to as 'LARR' – which amended the Land Acquisition, Rehabilitation and Resettlement Act (LARR Act, 2013) adopted by the former UPA government. The LARR Bill was passed by the Lok Sabha on 10 March 2015, but it failed to be passed in the Rajya Sabha (the upper house of India's parliament) during its March/April session. The government had to re-promulgate the Land Ordinance for the third time at the beginning of June 2015. The bill was debated in the summer session of the parliament. However, due to the absence of a consensus in parliament, the government decided at the end of August 2015 to let the Land Acquisition Ordinance lapse and adopted an alternative route providing greater flexibility to the states to deal with the issue.¹⁵² One suggestion, by Niti Aayog¹⁵³ Vice-Chairman Arvind Panagariya, has been to ask states to frame land acquisition laws as per their needs as in Tamil Nadu, which has an amended Act in place since January 2015.¹⁵⁴ On the whole, although this could lead to regional imbalances, it could partially resolve the deadlock on land acquisition in coal-bearing states which have a financial interest developing coal production.

Box 9: The land acquisition debate

Some of the major changes proposed by the 2015 LARR Bill¹⁵⁵ (as passed by the Lok Sabha on 10 March 2015) related to provisions, including: obtaining the consent of land owners; conducting a Social Impact Assessment (SIA); return of unutilized land; inclusion of private entities instead of private companies in the former act.¹⁵⁶ The 2015 LARR Bill amended the previous act to include 13 laws previously exempted from payment of compensation as well as R&R, including Coal Bearing Areas Acquisition and Development Act 1957. Their exclusion could have made the bill applicable in a relatively small number of cases.

The LARR Bill exempted five categories of projects from the required consent of communities, and from requirement of an SIA: projects vital to national security; rural infrastructure including electrification; affordable housing and housing for the poor; industrial corridors set up by the government and government undertakings; and infrastructure projects, including those under public-private partnerships (PPP) where the ownership of land continues to be vested with the government.

The government stated that these exemptions were being made in order to expedite the process of land acquisition in these specific areas of public interest. However, the opponents of the LARR Bill pointed out that these five exempted categories could cover a majority of projects for which land could be acquired, and consent and SIA would not therefore apply for these projects. As the government was trying to build a consensus on the LARR Bill prior to its passage by the Lok Sabha (lower house) and the Rajya Sabha (upper house), a campaign against the legislation developed based on tribal and forest land, despite the fact that tribal and forest land did not come under the ambit of the bill. Nine amendments were introduced when the LARR Bill was adopted on 10 March 2015 by the Lok Sabha, including provisions for mandatory employment for at least one member from each family displaced by land acquisition, ensuring that the land acquired is the bare minimum required for a project, and undertaking a survey of the nation's wastelands.

While addressing the issues of land acquisition at the central level, the government has also worked at the state level on specific coal-mining projects directly with coal-bearing states. For instance, the government has negotiated with West Bengal, where the state government has responded favourably

¹⁵² Indian Express, 'Not to re-promulgate land ordinance is not a setback for government', says Arun Jaitley, 31 August 2015, <http://indianexpress.com/article/india/india-others/not-to-re-promulgate-land-ordinance-is-not-a-setback-for-government-says-arun-jaitley/>

¹⁵³ A policy making body set up by the Modi government.

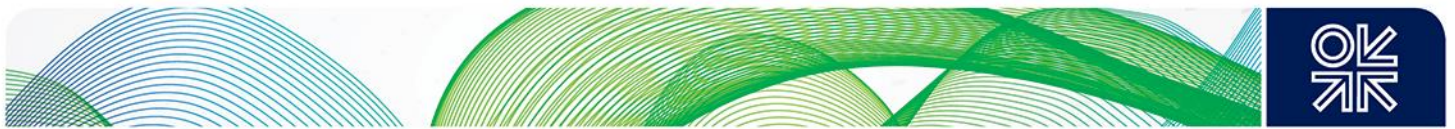
¹⁵⁴ Times of India, 'Frame own land law: Panagariya to states', 11 September 2015,

<http://timesofindia.indiatimes.com/india/Frame-own-land-law-Panagariya-to-states/articleshow/48907137.cms>

¹⁵⁵ PRS legislative, The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Amendment) Bill, 2015, March 2015,

<http://www.prsindia.org/administrator/uploads/media/Land%20and%20R%20and%20R/Bill%20Summary%2019%20LARR%20Bill%202015.pdf>

¹⁵⁶ According to the Companies Act, 2013, a 'private company' means a company with a paid-up share capital of at least INR 100,000. It excluded other entities such as proprietorships, partnerships, corporations and non-profit organizations.



to the land acquisition process for coal projects that have been stuck for several years.¹⁵⁷ The government has also attempted to ensure that compensations for land acquired are being paid as per the revised rates notified by the state governments. This approach has allowed the resumption of stalled projects despite the lack of an overarching framework at the central government level.

4.3.3 Easing of environmental and forest clearances

In addition to land acquisition issues, the growth of coal production has also been constrained by difficulties in obtaining environmental clearance (EC), restrictions arising out of imposition of Comprehensive Environmental Pollution Index (CEPI) guidelines, and non-availability of forest clearances (FC) in time. Obtaining EC and FC for coal-mining projects can be very cumbersome. It involves prescribed procedures that can take years and often get delayed due to the involvement of multiple agencies, delays in finalizing ToR (Terms of Reference), and delays in conducting public hearings (for new mines). More than 15 agencies need to be involved at various stages of the clearance process such as the MoEF, the Coal Controller's Organisation (CCO), and the MoC at central level and various state government agencies, such as the mining department, revenue department, forest department, State Pollution Control Board (SPCB), and district authorities.

In the past, the issue of FC was amplified by the policy of 'no-go' areas adopted by the environment ministry in 2009, banning mining in forest areas with canopy cover of more than 70 per cent, resulting in the banning of mining projects in major coal-bearing areas. The move blocked the development of allocated coal blocks with reserves of 660 Mt.¹⁵⁸ Apart from CIL's projects, blocks allocated to private and public companies, including NTPC, Hindalco Industries, Essar Power, and Adani Power, were also affected under the 'no-go' zones. The 'no-go' classification was scrapped in September 2011, since which time FC has been based on the Forest Conservation Act. In addition, under the Forest Rights Act, community forest rights must be recognized before consent is sought for diversion of forest land for any mining or infrastructure project. The 'no-go' policy, however, stalled almost every big coal-mining project in India for two years (2009–11) and has resulted in long delays, through a knock-on effect, for new projects located in the so-called no-go areas. Overall EC and FC approvals granted fell significantly after 2009, adversely affecting CIL's production volume growth (see Figures 20 and 21). FC has remained an issue in dense forest lands. For instance, the Mahan coal block (8.5 mtpa of capacity) in Madhya Pradesh was withdrawn from the recent auctions of coal blocks as it fell in 'involute forests'.¹⁵⁹

The new government has been driving efforts to improve the ease of doing business and ensure predictable and expeditious green clearances. This is a pre-condition for CIL to be able to reach the 1 Gt target as mines are expected to be productive about three years after being granted regulatory clearances for production. EC and FC issues have been addressed at district, state, and central level, particularly at the MoEF level.

Coal-mining projects have been the focus of the MoEF. Among 187 development projects that were granted EC between June 2014 and April 2015, some 37 projects were coal-mining projects.¹⁶⁰ Most of these were awarded to CIL's subsidiaries and SCCL, and they cumulatively represent production capacity of 96.6 mtpa.

¹⁵⁷ Economic Times, 'Making efforts to settle project related issues, Coal Ministry to PMO', 11 January 2015, http://articles.economictimes.indiatimes.com/2015-01-11/news/57941134_1_coal-ministry-coal-mining-projects-coal-output

¹⁵⁸ Business Standard, 'No-go ghost still haunts Coal India', 22 May 2012, http://www.business-standard.com/article/companies/no-go-ghost-still-haunts-coal-india-112052200055_1.html

¹⁵⁹ Responding to Climate Change (RTCC), 'Coal mining banned in India's Mahan forest', 25 March 2015, <http://www.rtcc.org/2015/03/24/coal-mining-banned-in-indias-mahan-forest>

¹⁶⁰ Centre for Science and Environment (CSE), First year of NDA rule, 2015, <http://cseindia.org/userfiles/Factsheet-One-year-review.pdf>

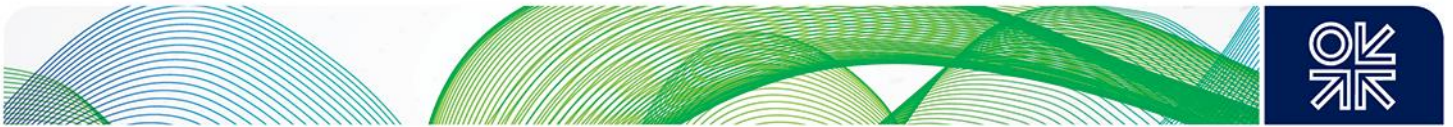
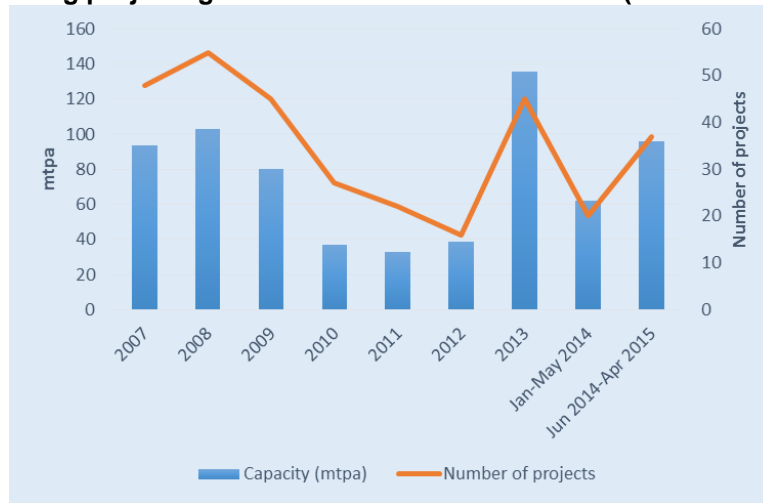


Figure 20: Coal mining projects granted environmental clearance (2007–2015)



Source: Green Clearance Watch.

The government has taken new initiatives to ease the process of granting green clearances. Similar to the coal platform created by the MoC, the MoEF has put in place an online system for submission and monitoring of EC and FC proposals, in an effort to improve efficiency, accountability, and transparency in the granting of regulatory clearances.¹⁶¹ In addition, the MoC and CIL’s subsidiaries regularly communicate with the MoEF and state agencies to review the status of clearance. Projects with pending issues are also monitored by the MoC and the Project Monitoring Group (PMG) to expedite various processes for obtaining clearances.

The government has further facilitated capacity expansion for existing coal mines by relaxing the requirements for public hearings in case of large mines.¹⁶² This policy is an acceleration of the policy initiated by the former government in December 2012 and will allow CIL to increase its production from existing mines by around 25 per cent. Although these exemptions relate to capacity expansion within the same lease area, meaning that public hearings have already been held for these mines, the exemption has been seen as a move to exclude peoples’ participation in the EC process.¹⁶³

¹⁶¹ Economic Times, ‘Environment ministry unveils online system for submission and monitoring of forest clearance proposals’, 16 July 2014, http://articles.economicstimes.indiatimes.com/2014-07-16/news/51600486_1_clearance-environment-ministry-forest-rights-act

¹⁶² Ministry of Environment, Forests and Climate Change (MoEF), Guidelines for granting Environment Clearance for expansion of Coal Mining Projects involving one time Production Capacity Expansion in the existing operation - reg., OFFICE MEMORANDUM No. J-IIO15/30/2004-IA.11 (M), 28 July 2014, <http://www.moef.nic.in/sites/default/files/OM%20dated%2028.07.2014%20one%20time%20expansion.pdf> and The New Indian Express, ‘MoEF Eases Norms for Coal Mining Projects’, 4 September 2014, <http://www.newindianexpress.com/nation/MoEF-Eases-Norms-for-Coal-Mining-Projects/2014/09/04/article2413949.ece>

¹⁶³ Centre for Science and Environment (CSE), First year of NDA rule, 2015, <http://cseindia.org/userfiles/Factsheet-One-year-review.pdf>

Table 16: Public hearing exemptions for coal mining expansion within the same lease area

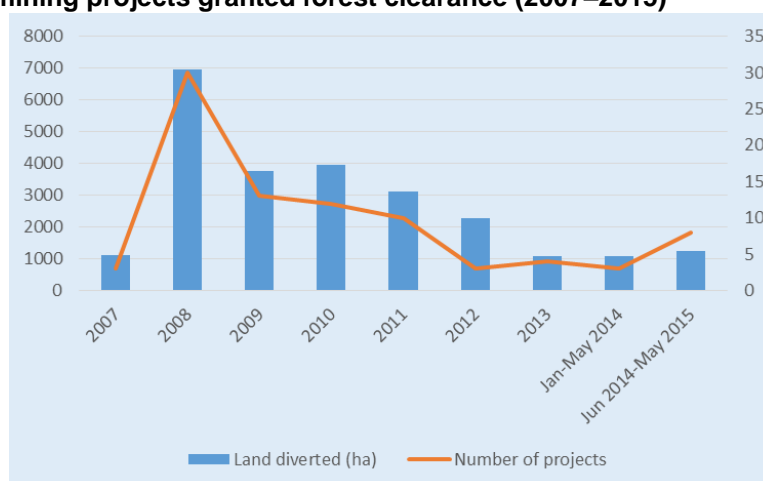
Dates	Exemption provisions
19 December 2012	Coal mines seeking one time capacity expansion of up to 25 per cent within the same lease area —with a ceiling of 2 mtpa additional production
7 January 2014	Coal mines with up to 8 mtpa production capacity, seeking one time capacity expansion up to 50 per cent within the same lease area (or incremental production of 1 mtpa, whichever is more)
30 May 2014	Coal mines with production capacity over 8 mtpa and up to 16 mtpa, seeking one time capacity expansion within the same lease area with production enhancement up to 4 mtpa
28 July 2014	Coal mines with production capacity more than 16 mtpa, seeking one time capacity expansion within the same lease area with production enhancement up to 5 mtpa
2 September 2014	Coal mines with production capacity more than 20 mtpa, seeking one time capacity expansion within the same lease area with production enhancement up to 6 mtpa

Source: MoEF.

In a more controversial move, the MoEF has allowed expansion capacity of existing mines in Chandrapur – a critically polluted area (CPA) in Maharashtra.¹⁶⁴ The action was taken following observations that ‘coal mining activities do not seem to be major contributor of pollution load in the area’, as other sources of pollution (paper and chemical industries) appeared to contribute much higher levels. This decision is temporary and subject to certain conditions¹⁶⁵.

Turning to FC, between June 2014 and May 2015, eight coal-mining projects received Stage II FC (final FC clearance). This corresponds to 1,245 hectares (ha) of forest land diverted for coal-mining projects.

Figure 21: Coal mining projects granted forest clearance (2007–2015)



Sources: MoEF; Green Clearance Watch.

Some of the notable changes made by the new government to expedite FC include making it easier to identify land for projects and compensatory afforestation and providing guidelines for the diversion of forest land. The MoEF has reduced the forest area where mineral extraction is forbidden, thus opening up larger areas of the forest for mining. Although it is a positive sign for coal mining projects, this does not mean that it is a green signal for all such enterprises, as the recommendation whether forests should be diverted for a particular coal-mining project will still be made by the Forest Advisory

¹⁶⁴ MoEF, Office Memorandum J11013/5/2010-IA II, 1 September 2014, http://www.moef.gov.in/sites/default/files/Chandrapur_OM%20dated%2001.09.2014.pdf

¹⁶⁵ Among the conditions imposed by the government, it is stated that: 1) All project proposals for expansion of existing mines will be considered at the level of MoEF; 2) There is no additional mine lease area involved; 3) There is no change in mining method; 4) Monitoring of Actions plans on pollution control and their implementation will be pursued by the MoEF (see the full list of conditions in the Office Memorandum of 1 September 2014, cited above).



Committee, which is the statutory body for forest clearances. The government has placed the Compensatory Afforestation Fund Bill (2015) in the Lok Sabha, which could potentially give states a large amount of funds for afforestation¹⁶⁶ as the bill essentially seeks to establish compensatory afforestation funds at the national and state level.

4.3.4 Removing transportation bottlenecks

4.3.4.1 Rail transportation dominates but is heavily congested

In addition to land issues, the transportation of coal is a significant barrier to increasing domestic production. While the largest coal deposits are in the east, southeast, and central parts of the country, the areas of highest demand are in the west and northwest regions. Due to this geographical mismatch, power plants in the north and west are served by long-distance rail routes from mines in the eastern and central regions. Imported coal is also carried to power producers over long distances from western ports to the north of the country.

Rail transportation dominates coal transportation. Half of domestic coal production is transported through railways, 16 per cent through MGR (Merry-Go-Round systems – block trains of hopper wagons which load and unload cargoes while moving and are mainly used for power plants located close to mines), 29 per cent by roads, and the rest is moved by conveyor belts and ropeways.¹⁶⁷ In FY2015, Indian Railways, the federal government-run monopoly, transported 508 Mt of domestically produced and imported coal.¹⁶⁸ However, growing domestic production and the rapid increase in import volumes have stretched the railways' capacities.

Due to the overwhelming share of rail transportation, adequate rail capacity is critical. But although India has one of the largest railway systems in the world, it is inefficient, inadequate, and relatively expensive for coal consumers. The rail tariff for coal increased from INR 1.35/t-km in FY15 to 1.44/t-km in FY2016 (\$0.023/t-km).¹⁶⁹ Although the rate per km is low by international standards, railway transportation costs are expensive for consumers located far away from the mines: they can double or triple the pithead price when that coal is transported across the country. The average cost for transporting coal between production areas in the east and electricity demand centres in Delhi, Mumbai, or Chennai (around 1,500 km) is close to INR 2,000/t, based on the new rail tariff. Moreover, relative to imported coal, domestic coals are of poorer quality and have lower heat content. On an energy equivalent basis, the cost of transporting domestic coal is around 15 to 30 per cent higher.

The existing system is arguably insufficient to transport domestic and imported coal. A shortage of railcars limited coal offtake in FY2015 despite the growth achieved in coal production. Coal transportation is also constrained by rail congestion and the delayed implementation of three critical railway lines to evacuate coal production from existing mines. The railway system will therefore require massive capacity augmentation to handle the projected growth in coal production.

To overcome the immediate hurdle of lack of 'rakes' (a goods train consisting of 59 wagons), CIL has decided to purchase 250 additional rakes worth \$800 million to expeditiously evacuate greater quantities of coal, primarily to power plants. The company purchased 37 rakes in March 2015 and now has access to 220 rakes per day. However, it will require 450 rakes per day to move 1 Gtpa. In addition, CIL is realigning its logistics management, for instance by transporting coal to the southern states of Tamil Nadu and Karnataka through eastern ports and leveraging multi-modal transport.¹⁷⁰

¹⁶⁶ PRS Legislative Research, The Compensatory Afforestation Fund Bill, 2015, 29 May 2015, <http://www.prsindia.org/uploads/media/Compensatory%20Afforestation/Bill%20Summary-%20Compensatory%20Afforestation.pdf>

¹⁶⁷ CCO, Coal Statistics 2013-2014, April 2015, http://coal.nic.in/sites/upload_files/coal/files/coalupload/coaldir13-14.pdf

¹⁶⁸ Platts, 'India's coal industry,' 27 May 2015, http://www.platts.com/news-feature/2015/coal/india-coal-transport/index?wt.mc_id=coap201505we_indiarail&wt.tsrc=eloqua

¹⁶⁹ Coal Junction, 'Rail freight on grains, coal, cement to increase from April 1', 31 March 2015, http://www.coaljunction.in/news/n_newsdetail/Rail-freight-on-grains-coal-cement-to-increase-from-April-1_1#sthash.btJqebmj.dpuf

¹⁷⁰ Economic Times, 'Coal India draws logistics strategy to push coal evacuation', 19 April 2015, http://articles.economictimes.indiatimes.com/2015-04-19/news/61303962_1_coal-india-sutirtha-bhattacharya-eastern-coalfields



Coast-to-coast shipment by ports owned by the central government ('major ports') and private ports ('minor ports', as they are known), is limited. The share of the cargo handled through coastal movement is almost stagnant at around 15–20 per cent of total cargo traffic handled by ports over the last 10 years. Coast-to-coast shipment of steam coal can alleviate coal transportation problems, removing pressure on railway transportation, and can also mitigate environmental pollution engendered by land movement of coal. Coastal transportation of steam coal thus has tremendous scope for expansion in India.

River transportation could also become a new source of coal transportation, reducing the burden on the railways. River transportation is completely undeveloped in India, but a new scheme involving NTPC, Inland Waterways Authority of India (IWAI), and Jindal ITF Ltd has started to move imported coal unloaded from Kolkata port to NTPC's Farakka power plant in West Bengal by river.¹⁷¹ According to NTPC, the waterway would cost 15–20 per cent less than land transportation. Encouraged by this experiment, IWAI has drawn up plans to develop a longer water route between Haldia and Allahabad in Uttar Pradesh, measuring 1,620 km, which could carry imported coal to 11 existing power plants and the 10 more which are likely to be constructed in the next five to six years.

4.3.4.2 Three critical railway links

To remove evacuation bottlenecks at existing mines, the government fast-tracked construction of three critical railway lines in June 2014, and concerted efforts have been made between the ministries of coal and railways to expedite laying out of the lines and clear remaining land and environmental clearance issues. The three rail lines, Tori-Shivpur-Kathautia in Jharkhand, Jharsuguda-Barpalli-Sardega in Odisha, and Bhupdeopur-Korichapan-Dharamjaigarh – Mand-Raigarh, in Chhattisgarh, are crucial: they connect the growth areas for mining that are expected to account for about 70 per cent of CIL's incremental production, and they could provide access to 200 mtpa of coal each year (and 300 mtpa at peak capacity). The three states (Jharkhand, Odisha, and Chhattisgarh) together produce more than 50 per cent of India's steam coal and hold two-thirds of the country's proved reserves. Over the years, construction of these lines has been delayed due to challenges related to land acquisition and environment-related clearances. Consequently, the associated mines have not been able to be developed to their full potential. The lines are now expected to be completed from 2016 to 2018.

¹⁷¹ Platts, 'New schemes to transport coal in India', 27 May 2015, <http://www.platts.com/news-feature/2015/coal/india-coal-transport/transport-schemes>



Table 17: Critical railway lines

Rail link	Tori-Shivpur-Kathautia	Jharsuguda-Barpalli-Sardega	Bhupdeopur-Raigarh-Mand (east corridor)
Coal field	North Karanpura	IB Valley	Mand-Raigarh
Coal subsidiary	CCL	MCL	SECL
State	Jharkhand	Odisha	Chhattisgarh
Length of rail link (km)	93	52	180 (the full project includes 3 stretches: east corridor, 180 km, north corridor, 77 km and east-west corridor, 122 km)
Project cost (INR billion)	35.7	10	25
Mines involved (mtpa)	Magadh (20), Amrapali (12), Koed Manatu (10) and Pachra (15)	Basundhara (7), Garjanbahal (10), Siarmal (14), Kulda (10-15), Chaturdhara (4)	Mines of Gare-Pelma block
Volumes to be transported (mtpa)	80-100	50 (potential: 90 mtpa)	40 (potential: 100 mtpa for the full project)
Current status (as of June 2015)	The Tori-Shivpur section is likely to be completed by December 2016. The Shivpur to Kathautia section is waiting for stage-I clearance from MoEF. The line will be developed by an SPV (MoU signed in May 2015).	CIL has received stage-I clearance from the MoEF and survey work has begun. Stage-II clearance and land acquisition are due. The line will be developed by an SPV (MoU signed in April 2015).	CIL's Board gave its in-principle approval to the east corridor project in February 2015. The east corridor will be developed by SPV Chhattisgarh East Rail Ltd. The east-west corridor has also been planned by another SPV, Chhattisgarh East-West Rail Ltd. CIL's board is yet to clear this project.
Expected completion date	Dec-16 (Tori-Shivpur)	2016/17 (June 2016 for the 1st phase of Jharsuguda-Barpalli)	Dec-16

Source: Daiwa Capital Markets, 3 November 2014 (updated by author).

Funding for the three rail lines is vital to increasing CIL's production. To expedite the construction of the new lines, CIL is participating in their development and financing through dedicated companies (Special Purpose Vehicles, SPVs) with Indian Railways and coal-bearing states.¹⁷² CIL has 64 per cent equity in each of the SPVs, the Indian Railways Construction Company (IRCON) 26 per cent, and the coal-bearing state 10 per cent. SECL has signed two SPVs with the state of Chhattisgarh to develop the east and west corridors. In April 2015, CIL and the MoC signed a MoU with the state of Odisha to form an SPV and undertake project development, financing, and implementation of seven identified projects.¹⁷³ Among them are: the doubling of the Sambalpur-Talcher (174 km), Sambalpur-Titlagarh (182 km), and Raipur-Titlagarh (203 km) lines; and the Champa-Jharsuguda third line (165km). A similar MoU was signed at the beginning of May 2015 with the state of Jharkhand for the construction of two railway lines.¹⁷⁴ CIL will invest \$950 million in infrastructure in FY2016, and most of this funding will go into setting up the three rail networks.

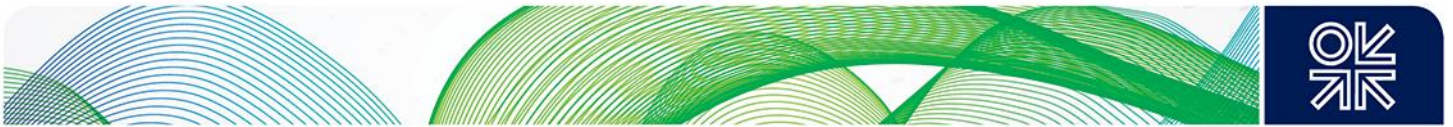
In addition, CIL is to form a major joint venture with Indian Railways to co-develop a number of railway projects to extract coal.¹⁷⁵ CIL is expected to provide the funds, while Indian Railways will provide the labour force creating the infrastructure, including the tracks, sidings, and related infrastructure. The MoC has identified 60 new railway lines to connect coal blocks.

¹⁷² Time of India, 'CIL will double capex to Rs 10,000 crore in FY16 to meet production target', 27 March 2015, <http://timesofindia.indiatimes.com/business/india-business/CIL-will-double-capex-to-Rs-10000-crore-in-FY16-to-meet-production-target/articleshow/46714064.cms>

¹⁷³ Orissa Diary, 'MoU signed between Odisha govt Coal, Railway ministries for implementation of common rail corridor projects for coal evacuation', 20 April 2015, <http://www.orissadiary.com/CurrentNews.asp?id=58783#sthash.rcKmxDSi.dpuf>

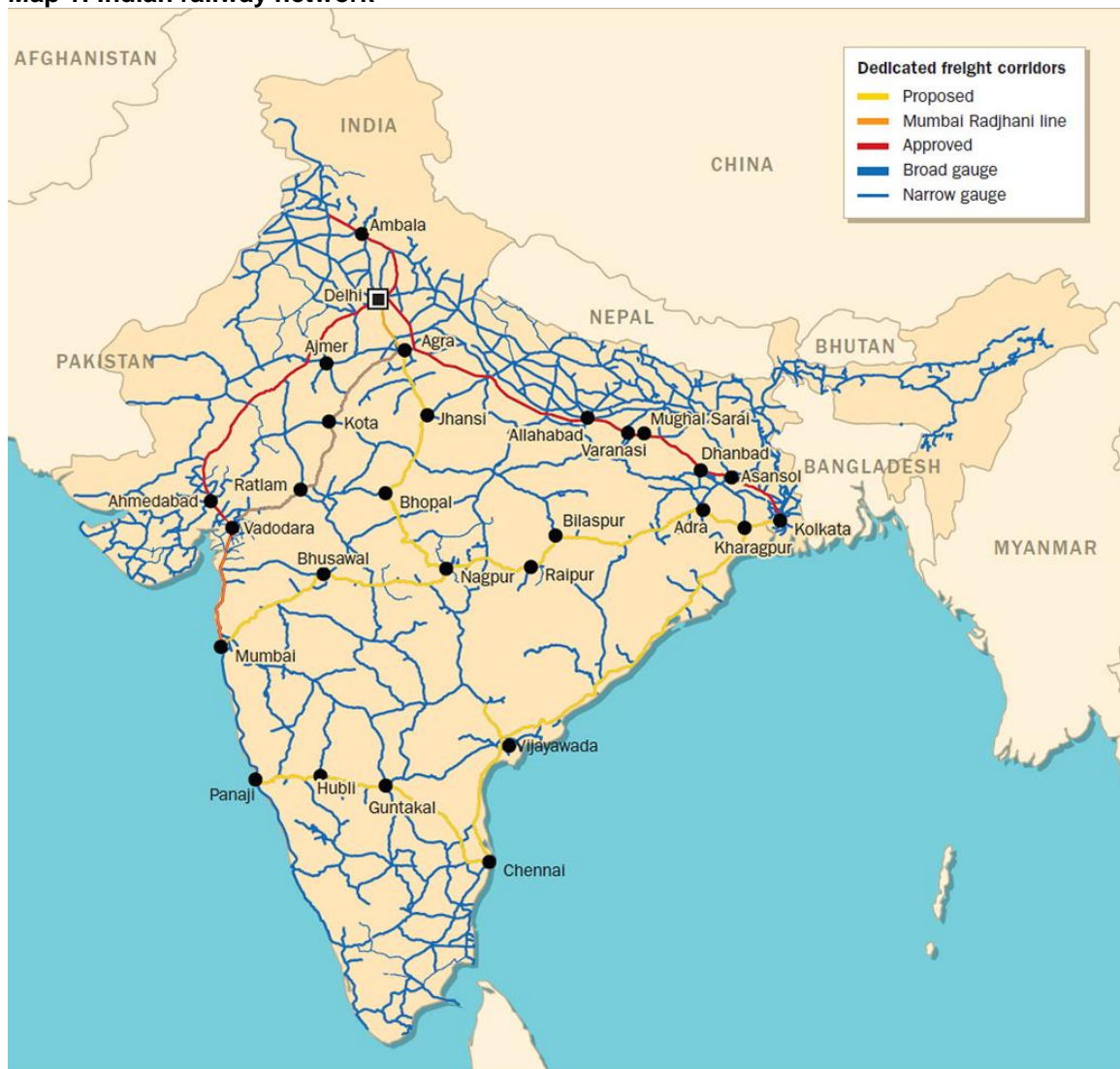
¹⁷⁴ Economic Times, 'Coal Ministry, Railways, Jharkhand government pact to build railway lines', 4 May 2015, http://articles.economicstimes.indiatimes.com/2015-05-04/news/61800422_1_railway-line-central-coalfields-ltd-tori-shivpur-kathautia

¹⁷⁵ Global CemFuels, 'Coal India to form coal joint venture with India Railways', 1 April 2015, <http://www.cemfuels.com/news/item/2856-coal-india-to-form-coal-joint-venture-with-india-railways>



At the central level, plans exist for East-West Dedicated Freight Corridors (DFCs) which would shift most of the freight traffic on these routes to new lines currently under construction.¹⁷⁶ Funding of the 1,839-km East DFC between Dankuni in West Bengal and Ludhiana in Punjab has recently been cleared by the cabinet. The line will ease the movement of coal from the eastern region mines to power stations in the north. Coal alone is expected to account for about two-thirds of the estimated 90 Mt/year annual freight traffic in this direction by 2022. The 1,483-km West DFC from Jawaharlal Nehru port in Maharashtra to Dadri in Uttar Pradesh close to New Delhi will also carry some coal. Both the dedicated routes should allow longer and heavier trains to run. The construction of the East DFC is being supported financially by the World Bank, with funding assistance from Japan for the West DFC. Engineering and traffic surveys are under way for four more DFCs as the government plans to increase revenue-earning freight traffic by 50 per cent and transport 1.5 Gt a year of freight by 2020. These are the 1,976-km East-West DFC (Howrah-Mumbai), the 2,190-km North-South DFC (Delhi-Chennai), the 1,097-km East Coast DFC (Kharagpur-Vijaywada), and the 902-km South DFC (Chennai-Goa). Coal transportation will figure prominently in this high-growth freight plan.

Map 1: Indian railway network



Sources: Platts; Indian Railways.

¹⁷⁶ Platts, 'New schemes to transport coal in India', 27 May 2015, <http://www.platts.com/news-feature/2015/coal/india-coal-transport/transport-schemes>



4.3.4.3 Rationalization of coal linkages

In a further effort to improve coal transportation, the government, through a dedicated Inter-Ministerial Task Force (IMTF), has undertaken a comprehensive review of existing coal sources and feasibility for rationalization of coal linkages with a view to optimizing transportation costs and improve availability of coal at consuming plants.¹⁷⁷ Coal blocks mostly have arrangements with power plants located at a considerable distance, with an average distance of almost 600 km, which leads to heavy carriage expenses. The rationalization of coal linkages is aimed to link power plants to the nearest mines and involves swapping of coal between power plants to optimize transportation logistics and costs.

The IMTF review, carried out by consultancy firm KPMG,¹⁷⁸ has listed several proposals for coal swapping arrangements in the power sector. These include bilateral and multilateral swaps for 114 power plants of more than 100 GW capacity.¹⁷⁹ Between \$700 and \$950 million in logistics cost could be saved annually through these proposals. It would also result in decongestion of the railway network by helping to reduce the average distance travelled by coal from 597 km/t to 416 km/t.¹⁸⁰

The rationalization of coal linkages nevertheless remains a complex exercise as it involves the agreement of all stakeholders (mines, power utilities, and railways) to implement the swaps. The IMTF has therefore recommended a step-by-step approach. In a first stage, which is under implementation, the MoC has directed bilateral swapping arrangements for 19 thermal power plants (TPPs) of public companies, like NTPC and Damodar Valley Corp (DVC) and electricity generation utilities of the states of Haryana, Rajasthan, Gujarat, Maharashtra, Telangana, and Punjab. These swapping arrangements could save \$160 million annually thanks to optimized distances and will maximize dispatches of coal. The second stage, to be implemented in the short run, consists of bilateral swaps between utilities of six states – Uttar Pradesh, Haryana, Rajasthan, Gujarat, Tamil Nadu, Maharashtra, and Punjab – and power stations of NTPC and DVC and involves swaps between imported and domestic coal. In Stage III, to be implemented in the long run, a cluster-wise approach based on multilateral arrangements has been recommended by the task force to achieve further rationalization and a net reduction of the overall costs.

4.3.5 Adequacy of coal reserves and accelerated exploration

India has huge coal resources: a total of 306.6 Gt of geological hard coal resources¹⁸¹ at a maximum depth of 1,200m are estimated by the Geological Survey of India (GSI) as of 1 April 2015, of which 131.6 Gt are proved reserves. At current production rates (612 Mt in FY2015), the ratio of reserves to production (R/P) exceeds 200 years. The major hard coal deposits of the country are located in the eastern and southeastern parts of the country. Jharkhand, Chhattisgarh, Odisha, and West Bengal account for 79 per cent of the country's coal reserves. Telangana, Madhya Pradesh, and Maharashtra are the other significant coal states in India. In addition, India has 44 Gt of lignite resources, of which 6.2 Gt are proven. The southern state of Tamil Nadu hosts most of the country's lignite deposits.

¹⁷⁷ MoC, Report of the new Inter-Ministerial Task Force (IMTF) on Rationalization of sources of Coal to Power plants, 2 February 2015, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/030215a.pdf

¹⁷⁸ MoC, 2 February 2015, *ibid*

¹⁷⁹ The linkage rationalization exercise included CIL and SCCL linked TPPs only. It assumed that 5.2 Mt (at 4,000 kcal/kg GCV) was required per 1,000 MW at 90 per cent PLF.

¹⁸⁰ MoC, Report of the new Inter-Ministerial Task Force (IMTF) on Rationalization of sources of Coal to Power plants, 2 February 2015, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/030215a.pdf

¹⁸¹ Based on the results of regional/promotional exploration, where the boreholes are normally placed 1–2km apart, geological resources are classified into 'Indicated' or 'Inferred' category. Subsequent detailed exploration in selected blocks, where boreholes are less than 400m apart, upgrades the resources into the more reliable 'Proved' category.



Table 18: Geological resources and proved reserves of hard coal in India, as of 1 April 2015

State	Proved reserves (Gt)	Indicated (Gt)	Inferred (Gt)	Total geological resources (Gt)
West Bengal	13.5	13.0	4.9	31.4
Jharkhand	41.5	33.0	6.6	81.0
Bihar	0.0	0.0	0.2	0.2
Madhya Pradesh	10.4	12.8	3.3	26.5
Chhattisgarh	18.2	34.4	2.3	54.9
Uttar Pradesh	0.9	0.2	0.0	1.1
Maharashtra	6.0	3.2	2.1	11.3
Odisha	30.7	36.5	8.5	75.8
Telangana	9.8	8.8	2.6	21.2
Assam	0.5	0.0	0.0	0.5
Others	0.1	0.1	0.8	1.1
Total India	131.6	143.2	31.7	306.6

Source: Geological Survey of India.

That most of India's coal reserves are located at depths of less than 300m is reflected by the focus of most exploration work, which has thus far been done at depths of less than 600m. Some 76 per cent of proved reserves and 58 per cent of geological resources are located at depths of less than 300m. Most proved coal reserves (107 Gt or 85 per cent) consist of steam coal (data for FY2014). As mentioned before, India lacks coking coal reserves of good quality.

Within India's endowment, CIL has a huge geological resource and extractable reserve base (64 Gt and 22 Gt respectively). Its extractable coal reserves can suffice for the current production level (494 Mt) for the next 44 years – a figure similar to international mining companies such as Peabody, which has an R/P ratio of 33 years. At 1 Gtpa the R/P ratio is reduced to 22 years, meaning that CIL will need to invest in coal exploration to transform its resource base into extractable reserves.

The Central Mine Planning & Design Institute Limited (CMPDI), which carries out exploration, invested \$50 million in exploration in FY2014 (in CIL and non-CIL blocks). Thanks to its detailed exploration, about 3 Gt of proved reserves are being added each year. In the past, the pace of exploration has been constrained due to limitation on the boreholes in areas under forest cover and also due to law and order problems prevailing in some areas. Exploration investment has also been much lower than the level in other coal-bearing countries. These issues are being addressed by the new government, which has targeted a doubling of exploration activities from 700 km in FY2014 to 1,500 km in FY2016. In FY2015, CMPDI achieved record exploration, adding 3.6 Gt to total proved reserves.¹⁸² In order to reach the target set by the MoC for FY2016, which requires the preparation of 26 new project reports assessing the economic viability of new mines, CMPDI has signed a MoU with Mineral Exploration Corporation Limited (MECL) to enhance its exploration capacity and has also outsourced exploration in some blocks. It is also strengthening its drilling capacity through mechanizing and modernizing drilling operations. CMPDI envisages an increasing usage of hydrostatic drill rigs, adoption of 3D seismic surveys with high resolution, and advanced software tools for geological modelling and mine planning. CMPDI is focusing on establishing coal reserves lying between 300–600m depths with a special focus on proving dip side extension of already established coal mines/blocks.

4.3.6 Going deeper: underground mining

Part of CIL's plan to increase production to 1 Gt is based on the development of underground (UG) mining. In India, where 93 per cent of CIL's production is from shallow-depth opencast mines, UG mining is a 'new' technology. The clear preference for OC mining is due to difficult geological conditions, lack of expertise and technology in deep mining, and costs. However, with 42 per cent of

¹⁸² Economic Times, 'Coal India arm achieves record exploration in FY15', 13 April 2015, http://articles.economictimes.indiatimes.com/2015-04-13/news/61102903_1_coal-india-arm-cmpdi-ak-debnath



Indian geological resources located at depths beyond 300m, thus accessible only by UG mechanized mining, CIL will need to exploit deeper seams in existing OC mines and significantly invest in UG mining. In addition, UG mining has lower environmental effects and requires less land than OC mining. It also allows the production of better quality coal and overcomes hurdles related to working in areas that are not suitable for OC operations for surface reasons – be it forest cover or cultivated fields and habitation.

UG coal mining is a challenging area in India.¹⁸³ The most efficient way to carry out UG mining is to extract long panels of coal with the use of massive shearers and a roof support system through long-wall mining. This mining technique has not been successful in India because there are no large areas of continuous coal deposits underground. One of the ways in which UG mining could be boosted in India is through continuous miner (CM) technology, which requires less investment than long-wall mining and can work in difficult conditions, even in the absence of a long stretch of continuous coal seams.

Currently, CIL operates 231 UG mines and 28 mixed mines, corresponding to half of its operating mines. However, production at UG mines totalled only 35 Mt in FY2015. Production per mine is very small: 0.1 to 0.2 mtpa for most of them, and only one has a production above 1 Mt (in the main coal-producing countries, UG mines have production capacity above 10 mtpa). In addition, CIL operations are highly intensive in their use of unskilled labour. The productivity for CIL's UG mines, measured through output per man-shift (OMS), was 0.78 tons in FY2015. The corresponding figure for OC mines was 13.16.

UG mining is thus more costly than OC mining. According to CIL, the cost of production from operational UG mines had gone up to about \$54 per ton in FY2014, thus making small-capacity UG mines unviable. CIL's UG production has therefore decreased from 47 Mt in FY2005 to 35 Mt in FY2015.

Despite these challenging conditions, CIL intends to arrest the drop in UG production by identifying more productive mines, introducing heavy mechanization and skilled manpower to operate the equipment, and improving efficiencies and safety standards. The company also intends to reopen mines that have been abandoned but can be made productive with mechanization. As CIL does not have the technology to mine UG efficiently, it plans to undertake a study of 90 UG mines with the help of global experts.

By FY2020, CIL is expected to achieve UG production of 52.20 Mt by using improved technology to limit upward pressure on extraction costs.¹⁸⁴ The company intends to introduce CM technology at large-scale long-wall technology at selected mines where the technology can be implemented, man-riding systems in major mines to utilize shift hours fully, and the use of tele-monitoring techniques.¹⁸⁵

¹⁸³ Coal Junction, 'Govt's underground coal mining plan hits hurdles', 3 July 2015, http://www.coaljunction.in/news/n_newsdetail/Govt-s-underground-coal-mining-plan-hits-hurdles_1#sthash.EB5heJle.dpuf

¹⁸⁴ Business Standard, CIL's underground coal output declines 3% to 35 MT in FY15, 18 May 2015, http://www.business-standard.com/article/pti-stories/cil-s-underground-coal-output-declines-3-to-35-mt-in-fy15-115051801299_1.html

¹⁸⁵ Economic Times, Coal India plans to utilize underground resources for boosting production figures, 13 October 2014, http://articles.economictimes.indiatimes.com/2014-10-13/news/54970708_1_underground-mines-new-mines-coal-india; Energysector.in, 'Steps to increase coal production from underground mines', 2 August 2014, <http://www.energysector.in/coal-news/steps-to-increase-coal-production-from-underground-mines-august-2014>



Figure 22: CIL’s underground coal production, historical and planned



Source: CIL; Business Standard, 18 May 2015.

In order to grow UG production, there is a need for huge technology absorption and competence in addition to capital investments. This is already underway at three of CIL’s subsidiaries. BCCL has taken the strategic initiative for exploitation of deeper deposits by UG methods, and in 2010/11 it invited global bids for the development and operation of six high-capacity UG mines with the latest global technology. Six tenders were finalized for a total output of 8 mtpa. In addition, another six UG mines with tenders are in the pipeline and are envisaged to add 6 mtpa of capacity. Through the operation of these high-capacity UG mines, BCCL expects to develop indigenous capability in UG mining, similar to the indigenization of OC technology which has taken place over the last two decades. SECL and ECL have identified underground mines where high-technology mining is required. They are expected to be the first to award mines under the new Mine Development & Operator (MDO) model.¹⁸⁶

Despite the potential revival in UG production, CIL’s plan does not constitute a major shift from OC to UG mining. Most of the mines planned to be developed in CIL’s roadmap are primarily OC in nature, so there will be no shift from low-cost OC to higher-cost UG production in the short term. In addition, it takes almost six years of planning to develop new UG mines, so efforts undertaken in this decade will not actually materialize until after 2020.

4.3.7 Going bigger: a huge need for modern equipment and improved efficiency

In order to rapidly ramp up its production, CIL needs to upgrade and modernize its coal mining technology. Mega OC projects have been planned with large-scale equipment for excavation, transportation, drilling, and other auxiliary operations¹⁸⁷ (such as high-capacity Heavy Earth Moving Machinery [HEMM] for coal extraction and removal of ‘overburden’,¹⁸⁸ in-pit crushing technology, deployment of surface miners,¹⁸⁹ and operator independent truck dispatch system using GPS to reduce time for loading). Adoption of different types of conveyers for transportation of coal from pit to surface and installation of more coal handling plants with large capacity silos for faster loading of coal into the wagons are also planned.

One of the basic constraints to increasing production is the availability of HEMM and spare parts for all kinds of equipment to remove the overburden and produce and evacuate coal. The massive increase in production requires a paradigm shift in HEMM procurement and maintenance, which so

¹⁸⁶ Mining Weekly, ‘Longwall mining making a comeback in India’, 9 June 2015, <http://www.miningweekly.com/article/long-wall-mining-making-a-comeback-in-india-2015-06-09>

¹⁸⁷ Business Standard, ‘Coal India designs roadmap for 1-bn-tonne coal production’, 20 February 2015, http://www.business-standard.com/article/companies/coal-india-designs-roadmap-for-1-bn-tonne-coal-production-115022000986_1.html

¹⁸⁸ The layer of the sedimentary rock material that covers coal seams

¹⁸⁹ Surface miners cut, crush, and load the material in one single machine pass – meaning that one single machine completes the job of many different pieces of equipment.



far has been inefficient. CIL plans to make extensive investments in HEMM, IT systems, and related infrastructure facilities.¹⁹⁰

In order to bring in better technology through private investment, the development of several mines is envisaged through engaging the MDO model.¹⁹¹ In accordance with the government's public-private partnership (PPP) model, CIL is preparing to float an Expression of Interest (EoI) to award long-term mining contracts to private companies.¹⁹²

The mechanization move will impact CIL's workforce and costs. By not replacing 100,000 workers who retire over the next five years, CIL plans to cut its workforce by nearly a third, to 240,000.¹⁹³ Most of the retiring workers were recruited around 1975, when CIL was formed. With this, its manpower costs will fall from 53 per cent to 35 per cent in five years, thus helping the company make its coal price more competitive vis-a-vis private-sector producers. To adapt its human resources (HR) to the new needs of the company, CIL also plans to recruit around 30,000 new employees over the next five years.

4.4 Commercial coal mining and coal block re-allocations

The government has started to auction and allot the 204 coal blocks that the Supreme Court cancelled in September 2014. These blocks have a production capacity of 800–900 mtpa and could generate revenues of about \$110 billion. The MoC expects production from non-CIL sources to reach 500 Mt by FY2020.¹⁹⁴ Most of the increase is expected to come from these coal blocks.

4.4.1 The captive mines policy and the cancellation of coal blocks

In 1993, the Coal Mines (Nationalization) Act of 1973 (the CMN Act) was amended to allow private Indian companies to mine coal only for captive use.¹⁹⁵ A screening committee was set up by the MoC to provide recommendations on allocations for captive coal mines. All allocations to private companies were made through the committee. For government companies, allocations for captive mining were made directly by the MoC. Certain coal blocks were allocated by the MoP for UMPPs through tariff-based competitive bidding. Between 1993 and 2011, 218 coal blocks were allocated to both India's public and private companies, of which 103 blocks were allocated to private companies, 80 to state PSUs, 7 to cement PSUs, 12 to UMPPs, and four to joint-ventures.

In August 2012, the Comptroller and Auditor General (CAG) of India released a report on the coal block allocations. In its findings, the CAG noted that lack of a transparent bidding process had caused a staggering loss of INR 1,860 billion (about \$30 billion) to the exchequer. This led to the 'coal mining controversy' (aka 'Coalgate scandal'), which refers to the former government allocation of 142 national coal blocks arbitrarily to state-run and private companies from 2004 to 2009. Following the CAG report, in September 2012, a Public Interest Litigation was filed in the Supreme Court against the coal block allocations.¹⁹⁶ In September 2014, the Supreme Court cancelled the allocation of 204

¹⁹⁰ See MoC, Record Note of Discussions and the Recommendations of the Workshop on 'The Technology Development & Mechanization of Mines in CIL in the context of reaching 1 Billion Tonne Coal production in 2019-20' held on 20.01.2015, 19 February 2015, <http://coal.nic.in/>

¹⁹¹ Under this concept, the MDO shall develop, operate the mine and be responsible for detailed designing, financing, procurement, construction, operations and maintenance of all infrastructures, including coal washery, loading arrangement etc. All activities within the mine premises and till the loading of coal in rail wagons, according to agreed annual targets, are the MDO's responsibility. The responsibility of acquisition of land, obtaining statutory clearances etc. remains with CIL/subsidiary companies.

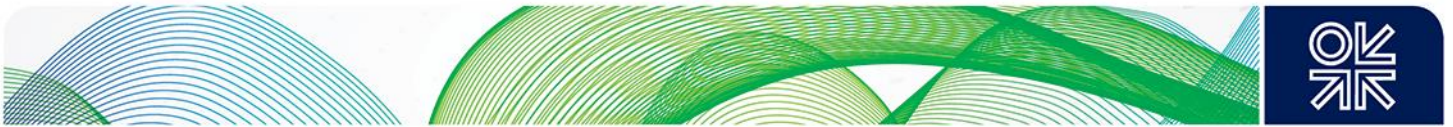
¹⁹² Energysector.in, 'Coal India To Go For PPP Model For Coal Production', 14 April 2015, <http://www.energysector.in/coal-news/coal-india-to-go-for-ppp-model-for-coal-production>

¹⁹³ Energysector.in, 'Coal India Limited Plans To Reduce Workforce', 26 May 2015, <http://www.energysector.in/coal-news/coal-india-limited-plans-to-reduce-workforce>

¹⁹⁴ Nikkei Asian Review, 'Modi looks to double coal production by 2020', 3 April 2015, http://asia.nikkei.com/Politics-Economy/Policy-Politics/Modi-looks-to-double-coal-production-by-2020?n_cid=NARAN012

¹⁹⁵ PRS Legislative, Coal Block Allocations and the 2015 Bill, 7 March 2015, <http://www.prsindia.org/theprsblog/?p=3487>

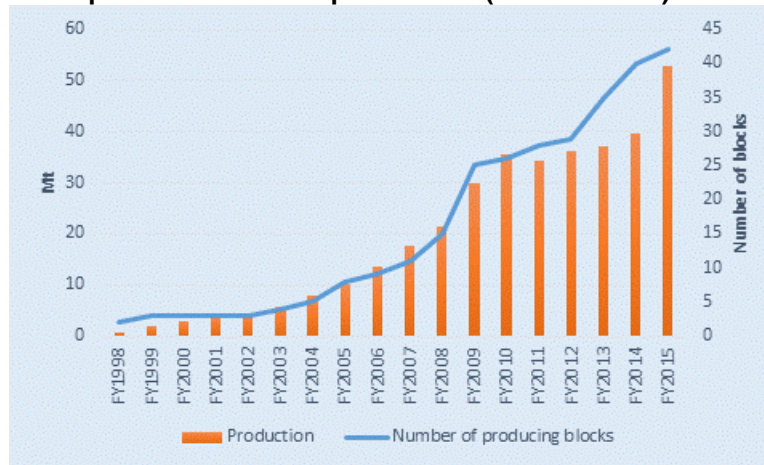
¹⁹⁶ PRS Legislative, op.cit.



coal blocks, out of a total of 218 allocated since 1993,¹⁹⁷ on the grounds that the allocation process made through the screening committee and government dispensation was arbitrary and illegal. Further, the court said that the cancellation of 42 coal blocks that were operational or near-operational at that time would be effective from 31 March 2015.¹⁹⁸ The court has also directed that an additional levy of INR 295/t be paid by these 42 coal blocks for the coal extracted since the commencement of production until 31 March 2015.

The cancellation of the 204 blocks impacts around 40–50 Mt of production, and much more on the basis of future production: the 12th FYP envisaged that captive mines would produce 100 Mt in FY2017 and 315 Mt by FY2022. Despite ambitious plans, however, coal production from the allocated captive blocks has grown at very slow pace over the past 20 years on account of constraints like delays in forest and environmental clearances, problems of land acquisition and R&R, lack of business expertise, and various other issues. Production from captive blocks was 52.8 Mt in FY2015.

Figure 23: Evolution of production from captive mines (FY1998–2015)



Source: Coal Controller’s Organisation, 2015.

4.4.2 Commercial mining: the 2015 Coal Mines Bill

Following the Supreme Court decision, the government acted swiftly to reduce coal supply uncertainty emerging from the de-allocation of the coal blocks. Soon after the Supreme Court judgment, on 21 October 2014, the government promulgated the Coal Mines (Special Provisions) Ordinance 2014, for the management and re-allocation of all cancelled blocks. The chosen route was competitive bidding, using electronic auctions to make the allocation process fully transparent. In order to implement the provisions of the ordinance, rules were issued in December 2014, namely the Coal Mines (Special Provisions) Rules. The ordinance, which was replaced by the 2014 Coal Mines (Special Provisions) Bill, could not be passed by parliament since it was not in session, and lapsed. The government then promulgated the Coal Mines (Special Provisions) Second Ordinance, 2014 on 26 December 2014, allowing the government to start the allocation process in line with the ordinance and rules. The ordinance was then introduced in the parliament in its spring session and the Coal Mines (Special Provisions) Bill, 2015 (the Coal Bill) was passed by the Lok Sabha (lower house) on 4 March 2015. It won parliamentary approval on 21 March 2015 when the Rajya Sabha (upper house), passed the legislation.¹⁹⁹

¹⁹⁷ 14 blocks were not cancelled: Tasra coal block allocated to SAIL, Pakri Barwadiah block to NTPC and 12 blocks allocated to UMPPs via competitive bidding for lowest tariffs.

¹⁹⁸ Among the 218 coal blocks, 40 were under production and six were ready to start production. Of the 40 blocks under production, 37 were cancelled and of the six ready to produce, five were cancelled.

¹⁹⁹ Although the central government National Democratic Alliance (NDA) is in a minority in the Rajya Sabha, the revenues expected from the auctions of the coal blocks, which are transferred to the state governments where the mines are located, have helped the passage of the bill.



While the primary aim of the Coal Bill is to swiftly re-allocate the cancelled operational blocks, the government took this as an opportunity to rationalize coal mining operations, consumption, and sale. The step with the most significant long-term implications is the introduction of a provision allowing commercial mining. This is a major shift from previous policies where only CIL was allowed to sell coal to other companies.

Further, the Mines and Minerals (Development and Regulation) Amendment Act 2015,²⁰⁰ hereafter 'the Mining Law', introduced a system of auction for mines, instead of government allocations, and allowed commercial mining by removing the restriction of end use from the eligibility to undertake coal mining. The Mining Law also allows the central government to increase the maximum area of one mining lease, previously limited to 10 sq km, instead of providing additional leases, a key criteria for the expansion of OC mines. The Mining Law was passed by the Rajya Sabha on 21 March 2015.

Box 10: Commercial mining in India: the Coal Mines (Special Provisions) Bill, 2015

The Coal Bill (and previous ordinances) primarily seeks to allocate the coal mines that were cancelled by the Supreme Court. It provides details for the auction process, compensation for the previous licence holders, the process for transfer of mines, and details of authorities that would conduct the auction. In addition, and in a complete shift with the practice of the past 40 years, the Coal Bill opens the sector for commercial mining.

The Coal Bill creates three categories of mines, Schedule I, II, and III. In Schedule I, all the 204 cancelled blocks are listed. Of these 204 blocks, Schedule II includes the 42 blocks currently under production or about to start production. Schedule III mines includes Schedule I mines that have been earmarked for a specified end-use (power, iron and steel, and cement). Initially, there were 32 blocks in Schedule III in the Coal Bill. The MoC added 36 blocks in Schedule III transferred from Schedule I mines. Schedule III blocks are substantially developed coal blocks and are expected to be operational within 1–2 years, reaching peak production capacity in another 2–3 years to reach peak production capacity.

Schedule I mines can be allocated by way of either public auction or government allotment. For the public auction route, any government, private, or joint-venture company can bid for the coal blocks. They can use the coal mined from these blocks for their own consumption, sale, or for any other purpose as specified in their mining lease. The government may also choose to allot Schedule I mines to any government company or any company that was awarded a power plant project (including UMPP) on the basis of competitive bidding for tariff. In such a case, a government company can use the coal mined for its own consumption or sale.

For Schedule II and III mines, only government, private, and joint-venture companies with a specified end-use are eligible to bid. The allocations can be made only through auction by competitive bidding. The Coal Bill also allows the government to allot a coal mine without bidding to a government company or to an electricity generator that has been awarded a power project on the basis of competitive bids for tariffs.

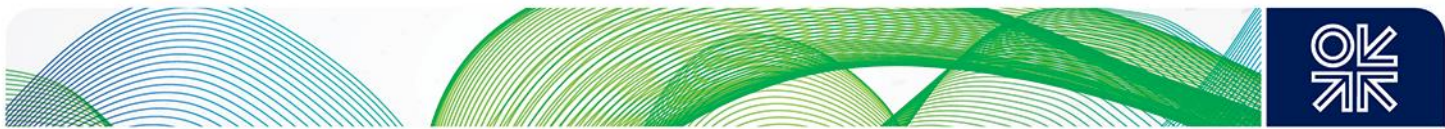
4.4.3 A two-step approach to open up the coal sector

Rather than privatizing CIL to foster competition and attract private investment in the coal sector – a political decision which was expected to trigger considerable opposition from political parties²⁰¹ and trade unions in the coal sector – the government has taken a less radical approach, but still a transformative and strategic one, to open up the sector.

In a first step, the government is allocating blocks for captive mining where PSUs and private domestic companies that run power, steel, or cement plants are allowed to mine coal specifically to

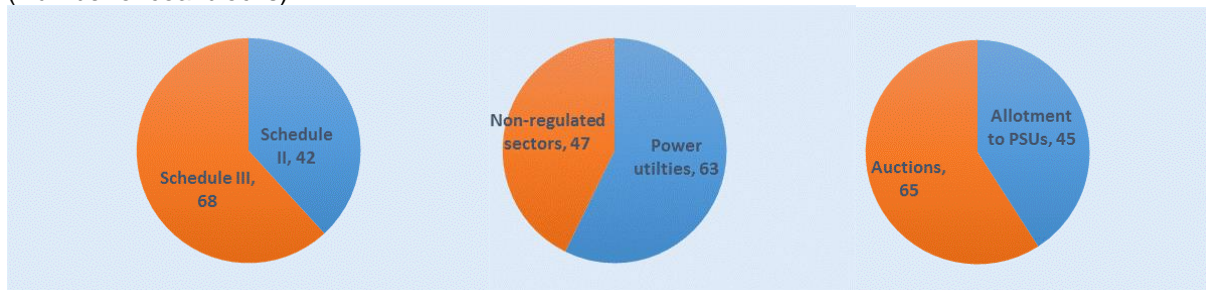
²⁰⁰ PRS Legislative, The Mines and Minerals (Development and Regulation) Amendment Ordinance, 2015
<http://www.prsindia.org/billtrack/the-mines-and-minerals-development-and-regulation-amendment-ordinance-2015-3601/>

²⁰¹ As the government lacks a majority in India's upper house of parliament, such an approach would have certainly failed.



feed those plants. The first step includes the auction or allotment of 110 blocks: the 42 operational blocks (Schedule II mines) and 68 Schedule III mines.²⁰² The power sector has been assigned 63 blocks from the 110, including blocks previously allocated to other users, as the Supreme Court order directly impacted roughly 37 GW of power capacity that was being set up on the basis of captive coal blocks (18 GW by the private sector and 19 GW by PSUs).

Figure 24: Breakdown of the initial 110 blocks to be auctioned or allotted
(Number of coal blocks)



Source: MoC; MSTC.

Altogether, these 110 mines have geological resources of 23.7 Gt and a production capacity of around 350 mtpa, of which 90 mtpa for Schedule II mines (operational).²⁰³ The allocation process started at the end of December 2014 and was expected to be completed in 2015. In the MoC's plan, setting a coal production target of 1.5 Gt by FY2020, these mines are expected to produce 300 Mt by FY2020.

However, the final number of allocated mines will differ from the 110 blocks identified for this first step: some blocks have been withdrawn from the offer as they are located in inviolate forest areas (the Mahan block for instance); some blocks have been grouped and allocated as one mine (four blocks in the first two rounds of auctions were grouped into two mines); some blocks have not been allocated as there were no sufficient applications for the blocks (for instance, 38 blocks were allocated to PSUs while initially 43 blocks were offered); and some blocks have been put on hold by the High Court of Jabalpur and the High Court of Delhi (five blocks as of June 2015).

Likewise, while the government expected to complete the allocation process by the end of March 2015, the process has been extended into FY2016 as the government added new mines to the initial list of 74 blocks. The allocation of the 42 operational mines (Schedule II), which was the first priority of the government to ensure continuous operation of the mines, was completed at the end of March 2015 (see next section).

After satisfying these captive needs, the government is further planning to open up the sector to commercial mining: state-owned and standalone companies, both private and foreign, will be allowed to mine and sell coal without any end-use restrictions. The first auctions for commercial mining are expected to start when the first round of allocations for captive mining is completed and the full process is expected to be completed sometime in 2016. In this second step, the government will allocate the remaining 94 blocks, which have geological resources of 21.2 Gt and an estimated production capacity of 450–550 mtpa. The government will first give commercial mining rights to state governments and PSUs from any sectors (iron ore miners, for instance), before giving rights to private players. Following this, standalone private firms and foreign companies will be invited to bid for commercial mining. In the case of foreign mining companies, the only restrictions would for the entity to be registered in India before the miner is considered eligible for participating in the auctions.

²⁰² These 68 Schedule III blocks include the initial 32 blocks identified in the Coal Bill, 27 blocks that have been transferred from schedule I to schedule III to ensure enough coal for power plants and that will be auctioned and 9 additional blocks to be allotted to state PSUs in view of high demand for allotment by state-owned entities.

²⁰³ Live Mint, 'Coal block auction bids cross Rs1.5 trillion', 9 March 2015, <http://www.livemint.com/Politics/xzmEfJHP67CcKdiPYsJryK/Coal-block-auction-bids-cross-Rs-15-trillion.html>



The government has recently begun to identify suitable coal blocks to be put up for auction for commercial mining.²⁰⁴ Consultations with industry stakeholders to lay out an enabling roadmap for commercial mining are also underway. The fiscal terms of contracts need to be specified, including whether commercial miners will be asked to sign a revenue sharing contract or a profit sharing contract. As part of the consultations, the Federation of Indian Chambers of Commerce and Industry (FICCI) – the related industry body – has recommended three options for commercial mining.²⁰⁵ The government is also working on including some restrictions, including a ban on exports of coal and a regulated pricing regime, to offer protection to CIL. Specifically, the MoC has ruled out any kind of free pricing regime, considering the shortage of coal in the country, and miners would not have the power to set coal sale prices to final end-users.²⁰⁶ This regulated price regime has yet to be defined. The government has also appointed a special committee to negotiate with trade unions operating in the coal industry with a view to getting around workers' opposition to opening up coal mining to private investors.²⁰⁷

In the MoC's plan setting a coal production target of 1.5 Gt by FY2020, blocks allocated for commercial mining are expected to produce 200 Mt by FY2020. It is therefore imperative for the government to lay out a roadmap to attracting private miners, foreign and domestic, especially since the current global low-price environment does not encourage international mining companies to invest in new projects. However, India is the biggest growth market for global coal demand, which should aid government efforts.

Another key issue is regulation. Currently, the coal sector is regulated by the Coal Controller's Organisation, under the MoC.²⁰⁸ The Coal Bill does not establish an independent regulator to ensure a level playing field for both private and government companies bidding for mines at auction. For the conduct of the process of auction and allotment, the central government has appointed a nominated authority.²⁰⁹ It remains that with the fundamental changes that are occurring in the coal sector, a regulatory authority will be necessary to implement and oversee coal sector reforms. As the definition of the regulatory framework and pricing policy for mines to be offered for commercial mining are ongoing at the time of writing, it is not possible to assess the attractiveness of the chosen model.

4.4.4 Allocation of coal mines to private companies and PSU with specified use

Under the auspices of the Coal Secretary, the allocations of the 110 coal blocks dedicated to private companies, state governments, and PSUs with captive use in the power, cement, and steel sectors

²⁰⁴ Mining Weekly, 'India's coal block auction to be ready by June', 27 February 2015, www.miningweekly.com/article/indias-coal-block-auction-to-be-ready-by-june-2015-02-27

²⁰⁵ The three approaches are: 1) The mining lease be auctioned against an adjustable up-front price and production-linked payments for classified and explored blocks; 2) Auction of prospecting licence-cum-mining leases for blocks having deposit identification and blocks where reserves are 'proved' but where mining has not started; 3) FICCI suggested a two-stage process commencing with an exploration contract followed by auctioning of mining leases for areas where reserves are yet to be proved and detailed exploration is pending.

Business Standard, 'FICCI designs model for commercial mining', 22 June 2015; http://www.business-standard.com/article/economy-policy/ficci-designs-model-for-commercial-coal-mining-115062200030_1.html; Business Line, 'Commercial mining: Coal Ministry seeks to finalise model for contracts', 24 June 2015, <http://www.thehindubusinessline.com/news/stakeholder-consultations-on-roadmap-for-commercial-coal-miningbegin/article7345959.ece>

²⁰⁶ Mining Weekly, 'India won't consider free pricing regime for commercial coal miners', 13 April 2015, <http://www.miningweekly.com/article/india-wont-consider-free-pricing-regime-for-commercial-coal-miners-2015-04-13>

²⁰⁷ In a major victory for the government, CIL's workers unions in January 2015 called off a five-day strike on its second day. The five powerful unions of the company opposed the government's move to sell a stake and open up the industry, but cancelled the strike after the Minister of State for Power, Coal & New and Renewable Energy assured them that a committee would be formed to address their concerns.

²⁰⁸ An independent regulator was established by the Coal Regulatory Authority Bill, 2013. However, the bill introduced in the Lok Sabha lapsed with the dissolution of the 15th Lok Sabha on 18 May 2014. The government has considered re-introducing the bill in the Lok Sabha but no concrete actions have been taken thus far.

²⁰⁹ According to the Coal Bill, functions of the nominated authority include: (i) conducting the process of auction and allotment, (ii) executing the vesting and allotment orders, (iii) collecting the auction proceeds and transferring them to the respective state governments.



started at the end of December 2014. In the first three months of 2015, the government conducted two rounds of auctions to private companies and one allotment to state governments and PSUs. A third round of auctions, including five blocks, was held in August 2015.²¹⁰ The government also intends to add eight to 10 more mines in a fourth auction.

Box 11: Rules for auctions, conditions for bidding and monitoring of coal production

The auctions are electronic and use a dedicated platform managed by state-owned MSTC Limited.²¹¹,²¹² In view of its impact on coal prices in each sector, the auction process has been designed differently for different categories of end-use consumers:

- For the regulated sector (power utilities), a reverse auction method is applicable, where the winning bidder is the one who quotes the lowest bid below a ceiling price determined by the government (the objective is to reduce electricity tariffs).
- For the non-regulated sector (iron and steel, sponge iron, cement, CPPs, etc.), forward bidding is applicable, where qualified bidders quote incremental bids above the pre-determined floor price (the objective is to maximize revenues for the states).

The auction offer is the bid price per ton of coal produced. Such bid prices shall be above the floor price (fixed at INR 150/t) in case of forward bidding or a below-the-ceiling price, which is the prevailing CIL notified price for each block, in case of reserve bidding. In that case, the lowest bidder wins the auction. This price would only be allowed as a pass through of fuel cost in the determination of the power tariff by the appropriate regulatory commission to ensure that the benefit of lower bid prices is passed on to the consumers. Additionally, for power projects having Power Purchase Agreements (PPAs), a fixed reserve payment of INR 100/t has to be made on actual production by the successful bidder. In case the reverse bidding amount reaches zero, the bidders are required to bid on an 'additional premium' over and above the fixed reserve price. This premium is payable to the state government concerned and is not allowed as a pass through of fuel cost in the power tariff.

The level of readiness of end-use plants is one of the qualifying requirements. For the auction bid, at least 80 per cent of the investment in the end-use project, and at least 40 per cent of investment in other units if it is a multiple unit project, should have been incurred for Schedule II mines, and a similar condition of 60 per cent and 30 per cent investment have been imposed for Schedule III mines.

In order to monitor the efficient development of the allocated mines, milestones for development and production of coal from the allocated mines have been prescribed under the Coal Mines Development and Production Agreement (CMPDA)²¹³ signed with the successful bidders/allotees. According to the CMPDA, the successful bidders have to report periodically to the nominated authority and state governments during the various stages of mining and shall conduct mining operations at the coal mine in accordance with the defined milestones or 'efficiency parameters'. The most important of these is to reach the rated production capacity defined in the mining plan. Failure to comply with the efficiency parameters would result in appropriation of the bank guarantee. In case of shortfall in

²¹⁰ Initially, the government intended to auction 10 mines, but four mines were withdrawn due to lack of bids and one mine, Jamkhani, due to ongoing litigation. Economic Times, 'Third tranche of coal auctions from Tuesday; 22 bids qualify', 8 August 2015, http://articles.economictimes.indiatimes.com/2015-08-08/news/65350952_1_coal-auction-coal-block-marki-mangli

²¹¹ DNA, 'Government issues draft rules for coal block auction', 19 December 2014, <http://www.dnaindia.com/money/report-government-issues-draft-rules-for-coal-block-auction-2045211>

²¹² MSTC Limited, Coal mine allocation, 2014 and 2015, <http://www.mstcecommerce.com/auctionhome/coalblock/index.jsp>

²¹³ Business Standard, 'Coal Ministry issues mine development, production agreement for upcoming e-auction', 23 January 2015, http://www.business-standard.com/article/economy-policy/coal-ministry-issues-mine-development-production-agreement-for-upcoming-e-auction-115012300710_1.html



production, the government will deduct the bank guarantee²¹⁴ in proportion to the shortfall in any year. The CMPDA also provides for conditions of withdrawal/cancellation of the mining rights. It is therefore expected that the mine operators will efficiently develop and ramp up production to the production capacity defined in the CMPDA in order not to lose their bank guarantee, or even their coal supply.

In the event that the operator mines coal in excess of its annual requirement, surplus coal has to be sold to CIL at the bid price (non-regulated sector) or at the prevailing CIL-notified price for similar grades (power utilities).

The winning bidder in the power sector is allowed to sell 15 per cent of power in the merchant market, while the remaining capacity has to be contracted through long- and medium-term PPAs.

The first two rounds of auctions to allocate mines to the private sector for captive mining were held in February and March 2015. Nineteen blocks (Schedule II mines) from the first auction were allocated in March 2015, and they are expected to produce 34 mtpa. In the second auction, 14 blocks (Schedule III mines) were allocated, and they are expected to produce 29 Mt (see Annex 5).

The government has re-examined nine bids out of the 33 coal mines allocated in these two rounds of auctions. Although the winning bids for these mines were the highest in their individual auctions, they were low by comparison with the winning bids for other similar blocks. In addition, the bidding process was quickly completed and the winning bid prices were in the vicinity of opening prices. Bids for five of those mines were finally accepted, but four bids were rejected (Jindal's bids for 2 Schedule II blocks, Gare Palma IV/ 2 and 3, and one Schedule III block, Tara; and BALCO's bid for Schedule II block, Gare Palma IV/1).²¹⁵ Despite the sensible message delivered to the market ahead of more auctions, the government took this decision to avoid any complaints regarding cartelization in bidding. The blocks will have to be re-auctioned. In the meantime, and following the judgement of the Supreme Court of September 2014,²¹⁶ CIL has interim custody of these blocks.²¹⁷ The number of allocated blocks in the first two rounds of auctions was therefore 29.²¹⁸ Out of these 29 coal mines, 16 are operational coal mines included in Schedule II and 13 are Schedule III mines.

In addition, 43 blocks (17 under the Schedule II category and 26 under the Schedule III category) were offered to central and state PSUs, such as NTPC and State Electricity Boards, for the power and steel sector. In March 2015, the government allotted 38 mines to central and state PSUs, as there were no applications for some coal blocks.²¹⁹ 37 blocks were allotted to the power sector, and one block was allotted to the Steel Authority of India (SAIL). Almost all PSUs that lost their producing coal blocks following the Supreme Court judgment have got back the same in the re-allocation undertaken by the government (see Annex 6).

²¹⁴ To calculate the bank guarantee, the intrinsic value of the blocks is calculated by computing its Net Present Value based on discounted cash flow method. The winning bidder has to pay 10 per cent of this intrinsic value upfront and the balance annuitized and paid on a per ton basis.

²¹⁵ NDTV, 'Government Rejects Low Winning Bids for 4 'Outlier' Coal Mines', 21 March 2015,

<http://profit.ndtv.com/news/industries/article-government-rejects-low-winning-bids-for-4-outlier-coal-mines-748453>

²¹⁶ According to the judgement of the Supreme Court, for the operating mines which have not been auctioned till 31 March 2015, or not successfully, the government may appoint a custodian, to operate and manage the mine, on behalf of the central government, till the completion of auction or allotment, so that the production of those mines are not disrupted. In addition to the four mines where the bids were rejected by the government, CIL has been appointed as Designated Custodian of other Schedule II mines, which could not be auctioned successfully (Marki Mangli-II, Namchik Namphuk, Gotitoria (East) and Gotitoria (West)).

²¹⁷ Energysector.in, 'CIL Gets Interim Custody of 3 Coal Blocks', 30 March 2015, <http://www.energysector.in/coal-news/cil-gets-interim-custody-of-3-coal-blocks>

²¹⁸ Or even 28, as one mine, (Ardhagram with a peak rated capacity of 0.4 mtpa), where successful bidder was declared, has been handed over to Designated Custodian, in view of a Court Case.

²¹⁹ Money Control, 'Govt allots 38 coal mines to central', state PSUs, 24 March 2015,

http://www.moneycontrol.com/news/economy/govt-allots-38-coal-mines-to-central-state-psus-1338504.html?utm_source=ref_article; Business Standard, 'Coal block re-allocation: States, PSUs get back lost mines',

25 March 2015, http://www.business-standard.com/article/economy-policy/coal-block-re-allocation-states-psus-get-back-lost-mines-115032500025_1.html



Altogether, 67 Schedule II and Schedule III mines have been allocated as of end of March 2015 – the power sector received 46 blocks, which have a respective peak rated capacity of 58 mtpa and 195 mtpa.²²⁰

Table 19: Peak rated capacity of mines auctioned and allotted as of end of March 2015

	Peak rated capacity (mtpa)		
	Schedule II	Schedule III	Total
Auctions (private companies)			
First two auctions	34	29	63
Allotments (central and state companies)	24	166	190
Total	58	195	253

Sources: Ministry of Coal; MSTC; BMI; ICRA.

Box 12: NTPC to become a large coal producer

NTPC has got five Schedule III blocks – all of which it previously owned. The company plans to become one of the largest coal producers in the country and is targeting coal production of 300 Mt.²²¹ NTPC currently meets almost 90 per cent of its coal requirement of 160 mtpa from CIL. It imported about 16 Mt in FY2015. The company's generation capacity is close to 45 GW, of which 34 GW is coal-fired. In addition, NTPC has some 23 GW of generation capacity under construction (22 GW coal-based) and another 4,540 MW under bidding. Eighty-three per cent of its coal capacity under construction is of supercritical technology, and 7 per cent is of ultra-supercritical technology. NTPC aims at a capacity of 90 GW in the next 10 years, of which 15 GW will be from renewable power. The coal-based power plants will initially be supplied by CIL and imported coal, but NTPC wants to raise its own production capability to meet almost 90 per cent of its coal requirements. With the five blocks reallocated to the company, NTPC has 10 coal blocks²²² with cumulative estimated reserves of 5 Gt and the potential to achieve an annual production of 100 mtpa. To hit the 300 mtpa target, NTPC is banking on the allocation of more coal blocks by the government and is planning to set up a separate division within the company to be exclusively responsible for mining operations.

4.4.5 Revenues from the auctions and allotment

The total value of the auction and allotment of the 67 coal blocks²²³ allocated up to the end of March 2015 amounts to nearly INR 4,000 billion (\$64 billion).²²⁴ The total revenue for the state governments is estimated at INR 3,350 billion (\$53 billion) over a mine-life of 30 years/or the lease period. In addition, the government estimates that INR 693 billion (\$11 billion) will accrue to the state distribution companies and power consumers through the reverse auctions and lower power generation tariffs.

The government has allotted 20 blocks in Jharkhand, 14 in Chhattisgarh, 11 in West Bengal, nine in Maharashtra, seven in Odisha, five in Madhya Pradesh, and one in Telangana. The revenues for the state governments from royalty and auction proceeds from the 33 mines²²⁵ auctioned to private

²²⁰ ICRA, Power Sector: Structural issues continue; Aggressive bidding in coal auction lead to increased vulnerability, though positive steps being taken to improve fuel supply, July 2015, <http://www.icra.in/Files/ticker/SH-2015-Q2-2-ICRA-Power.pdf>

²²¹ Coal Age, 'India's NTPC to Emerge as Country's Second Largest Coal Miner', 2 January 2015, <http://www.coalage.com/news/world-news/4156-india-s-ntpc-to-emerge-as-country-s-second-largest-coal-miner.html#.VebuaPntmkp>

²²² NTPC has five other blocks which were not cancelled by the Supreme Court judgement: Pakri Barwadi coal block, expected to start production at the end of FY2016 and four blocks allocated under the provisions of the Auction by competitive bidding of Coal Mine Rules, 2012, of which two are joint ventures.

²²³ This includes the 38 blocks allotted to PSUs and the 29 blocks allotted to private companies through auctions (the 4 rejected bids have been excluded from the calculation).

²²⁴ The allocation of 3 additional mines (round 3) in August 2015 brings this figure to INR 4,364 billion (\$68 billion). Money Control, 'Coal auctions: Govt raises Rs 4,364 crore in third round', 14 August 2015,

http://www.moneycontrol.com/news/economy/coal-auctions-govt-raises-rs-4364-crorethird-round_2512981.html?utm_source=ref_article

²²⁵ The calculation includes the four rejected bids.



companies in the first two rounds total an estimated to \$33 billion over the next 30 years based on estimated production of the mines, surpassing CAG's earlier estimates of losses of \$30 billion on allotment without auction.

Coal-rich eastern states such as Jharkhand, Chhattisgarh, Odisha, West Bengal, and Madhya Pradesh will benefit most from the proceeds of coal auctions, which will help them to develop their infrastructure. Higher revenue to the states may also help the central government to solve pending land acquisitions and green clearances.

Table 20: Estimated state-wise revenues from the first two rounds of auctions

	Total E-auction proceeds (estimated) \$ billion	Total Royalty (estimated) \$ billion	Upfront Payment (10% of intrinsic value) (estimated) \$ million
Odisha	4.6	0.7	43.5
Madhya Pradesh	6.0	0.7	19.4
Maharashtra	0.4	0.1	1.8
Jharkhand	6.8	0.9	47.8
Chhattisgarh	9.5	1.2	41.0
West Bengal	1.8	0.3	22.8
Total	29.1	4.0	176.2
Total (in INR billion)	1,836	250	11.10

Note: Original data in INR (exchange rate: 63).

Source: Ministry of Coal.

4.4.6 Outcome of the auctions for the private sector

The first two rounds of auctions²²⁶ have been a huge success for the government, by fetching high revenues for state governments and lowering power tariffs.²²⁷ The government has also demonstrated its willingness and capacity to conduct the process in a fully transparent way. The auction results also send a strong message that investors are willing to invest when a clear and transparent policy and regulatory framework is offered. The outcome for the industry is mixed: while successful bidders are ensured greater control over their coal supplies, the aggressive bidding of power companies in the reverse bidding auctions raises doubts about the viability of their projects.

The blocks were auctioned at much higher prices than expected. Prices paid by successful bidders are high compared to CIL's notified prices, on par or higher than CIL e-auction prices, and in some cases similar to imported coal prices (Hindalco's bid for Gare-Palma IV-5 at INR 3,500/t, or \$55/t, is the highest bid in Schedule II mines). The value of the blocks depends on individual cases of quality of coal from specific mines (coking or steam coal), the reserve left, the location of the mine relative to end-use consumers, and whether companies tried to retain, own, or acquire blocks from others. The winning bids also reflect the value of capital invested in end-use plants (especially for Schedule II mines). Unreliable coal supply has forced large investments in several power, aluminium, and steel plants to operate below capacity, besides putting their expansion plans on hold. A secure supply enables end-use plants to operate to their full potential.

Bid prices are higher in the first auction as it relates to operating mines. In the second and third auctions related to yet-to-be-developed mines, bid prices include discounting for development risks. In the auctions for commercial mining, it can be expected that bids will be higher as there will be no restriction on the final use of coal.

Bidding has been very aggressive in the power sector, with bids being negative (that is, an 'additional premium' was being offered above the INR 100/t reserve price). While companies have bid 'zero' for

²²⁶ The analysis was done before the allotment of 3 mines in September 2015 which were allocated to the non-regulated sector at prices around INR 1,200/t.

²²⁷ Economic Times, 'Coal auction lessons: Investors are willing to bet capital when transparent policy is offered', 22 February 2015, http://articles.economictimes.indiatimes.com/2015-02-22/news/59386540_1_coal-auction-schedule-ii-coal-mines-end-use



the cost of coal to determine their power tariff, they have also agreed to pay INR 302 to 1,100/t (\$4.8 to 17.5/t) to state governments. This 'additional premium' will not be allowed to be a pass-through and will have to be borne by the successful bidders.²²⁸ In the first two rounds of auctions, private power producers won nine operating coal mines. The blocks are estimated to ensure fuel supplies to an aggregate 6 GW of capacity. While winning the mines ensures companies are able to run their power plants without disruption and at higher PLF, the 'additional premiums' are estimated to lead to significant under-recovery in fuel cost for the successful bidders.²²⁹ According to rating agency ICRA, some of the bidders could face under-recovery estimated to vary between INR 0.39/kWh and 1.2/kWh on a levelized basis over 25-year period. The viability of these power plants is therefore not ensured. The same situation was already observed in the past, when UMPPs developers bid very aggressively but projects were stalled thereafter.

The real financial impact on power companies will be known only after they sign PPAs and, indeed, depends on the production costs of each mine, the quality of coal, and its distance from consumers. As such, efficient mining, cost control, and maximum recovery are key for success. However, there is a risk that the price to be paid for the blocks, with the lack of supply agreement, leads to losses and non-performing assets. Around 75 per cent of projects which won captive mines in the auction do not have PPAs. If PPAs are not eventually signed, these projects risk becoming non-performing assets for the banks involved.²³⁰

In the non-regulated sector, bid prices have been similar to, and sometimes higher than, the price of CIL's coal offered through e-auctions and in some cases close to the landed cost of imported coal. This indicates that participants have focused on the prospects of ramping up output, higher utilization of end-use plants, and lack of volatility in fuel costs rather than low prices. They have hedged themselves against the risk of future rise in international prices with a secure steady supply at a fixed price for 30 years.

4.5 Assessments of coal production to FY2020

4.5.1 Main assumptions

Major policy reforms, such as commercial mining and transparency in auctions of coal blocks, regulatory changes, such as easing of capacity expansions of existing mines, as well as efforts to remove environmental clearances and logistical issues, have the potential to transform the coal mining sector and allow a new phase of growth of Indian production. However, reaching 1.5 Gt by FY2020 seems quite challenging when taking into account the time required to develop and ramp-up new mines even with the most optimistic assumptions on land acquisitions, upgrade of transportation capacity, and rapid re-allocation of coal blocks.

This section presents two assessments of domestic production by FY2020 (the 'new business-as-usual' assessment and the 'roadmap') which factor the recent development in production for CIL, SCCL, and coal blocks (see sections 4.2. to 4.4 for the full set of changes taken into account in these assessments). These are assessments, rather than scenarios, as they include a large part of personal judgement on what is achievable in a five-year period. We now sum up our main assumptions from each source of production.

²²⁸ The government has amended guidelines for long-term procurement of Discoms to make sure that power tariffs are reduced in already concluded PPAs when coal is being procured from coal mines auctioned or allocated under Coal Mines (Special Provision) Ordinance, 2014. For PPAs to be signed, a resolution of 16 April 2015 requires the stipulation of an upper ceiling for the first year fixed/capacity charges. Lok Sabha, Ministry of Power, Answer to Question No 2908, Procurement cost of power, 6 August 2015.

²²⁹ Coaljunction, 'Aggressive bidding for coal mines detrimental to returns: ICRA', 31 Mar 2015 http://www.coaljunction.in/news/n_newsdetail/Aggressive-bidding-for-coal-mines-detrimental-to-returns-ICRA_1#sthash.ixjrQDHR.dpuf

²³⁰ India Energy Forum, 'Post Coal Auction Worries for Power Sector', Total Energy, Vol 9, Issue II, March–April 2015



4.5.2 CIL

The 1 Gt target set for CIL's production requires a CAGR of 15.1 per cent in the next five years (even 15.4 per cent if calculated on despatches and not production), which seems unrealistic in view of CIL's performance in the past five years. However, the government and CIL have taken major steps to make it achievable. Specifically, due to government intervention, the procedures for land acquisition and grant of various clearances required for development and operation of coal mines have been streamlined and expedited. CIL received 37 ECs and eight FCs from June 2014 to the beginning of July 2015. It started five mines in FY2015 and plans to work on 15 new projects in FY2016, while the CIL board has approved seven projects with a total capacity of 73 mtpa in FY2015. The government's commitment to ensure that both ongoing and new projects get requisite land and green clearance in time is crucial since it takes about three years to ramp up production after the possession of land. Work has begun on three critical railway lines, which were stalled for years, and the first line is expected to be in service by June 2016. CIL has also started to rationalize its coal linkages to optimize transportation and manages its transportation logistics to increase despatches. Last but not least, CIL plans to invest \$25 billion in the next five years to meet the output target. The company has a strong balance sheet, and the decision to redirect funds earmarked for international operations to domestic operations will help.

The first encouraging results have already emerged. CIL increased its production by almost 7 per cent in FY2015, or 32 Mt, the biggest incremental rise in four decades. During the first half of FY2016, its production increased by 8.9 per cent to 230 Mt. Despatches increased by 9.3 per cent to 251 Mt thanks to increasing railcar availability and better management of logistics.

CIL's roadmap to 1 Gt is a clear and comprehensive plan, analyzing output performance at mine level and areas of improvement. The exercise involves the development of large OC mines with modern mechanized equipment. This is a major shift from the past when the average size of new mines was very small and development lacked modern mechanized equipment. To develop new large mines, the company will partly resort to outsourcing and external expertise. Enhancing coal exploration and improving efficiency and productivity also figure high in the company's agenda. CIL has also developed an HR plan to recruit the needed workforce.

It remains the case that matters related to land acquisition, R&R, green clearances, and rail links need substantial and coordinated efforts by central/state authorities, and the risk of delays cannot be underestimated. While a CAGR of 15.1 per cent over the next five years is required to reach 1 Gt by FY2020, most experts estimate that 10 per cent would be the maximum achievable. This is the assumption of the first assessment (new business-as-usual). In such a case, CIL's production would reach 788 Mt in FY2020. Although less than the 1 Gt target, this already constitutes a paradigm-shifting increase of 300 Mt over the five years. In the second assessment, the roadmap, CIL's production increases as planned in its mine-wise plan to produce 908 Mt by FY2020 (this does not include new projects that CIL intends to develop to reach the goal of 1 Gt).

4.5.3 SCCL

While the company produced only 9 per cent of domestic hard coal production (52.5 Mt) in FY2015, it expects to enhance its production capacity to 80 mtpa by FY2020 and was recently asked to set higher production targets by the Coal Secretary.²³¹ Its production target for FY2016 has already been raised to 56 Mt, a growth of 7 per cent compared with FY2015. In the first half of FY2016, SCCL increased its despatches by 14 per cent. In both production assessments, it is assumed that SCCL is able to achieve an annual 7 per cent growth rate until FY2020, when its production reaches 74 Mt.

²³¹Business Line, 'Singareni Collieries set to set higher production target', 16 July 2015, <http://www.thehindubusinessline.com/companies/centre-assures-support-to-singareni-projects-expansion/article7429962.ece>



4.5.4 Coal blocks

In assessing future coal production, the main difficulty arises from the estimation of production from coal blocks, the allocation process for which is ongoing. The estimates therefore include some personal judgements/estimates by the author on how fast the government will allocate the remaining blocks, how many will be successfully allocated, and how fast Schedule III mines will start and ramp up production.

Overall, the 204 coal blocks have a potential capacity of 800–900 mtpa. When the re-allocation process started, the government expected that blocks allocated for captive mining would produce around 300 Mt by FY2020 and those allocated for commercial mining would add a further 200 Mt. The timing of this projection now seems to be unachievable as auctions for commercial mining has not started yet. However, the legislative framework is in place and the government has started consultations with stakeholders to formulate a realistic commercial coal mining policy and give a secure environment to the private sector.

As allocation of coal blocks for commercial mining has not started yet, their contribution to future production has not been taken into account in our assessments as it is not possible to assess the interest of domestic and foreign private companies to develop these mines, nor the expected production. Obviously, they can only raise future production, but this will only take place two to three years after their allocation as these mines are not developed, and some are only partly explored.

Production from captive blocks and other mines²³² reached 65.7 Mt in FY2015 and is expected to reach 94 Mt in FY2016, but obstacles continue to plague production from captive blocks. Only seven of the 67 coal mines successfully auctioned/allotted by the end of March 2015 were in operation at the beginning of July 2015.²³³ In FY2015, production from operating blocks (Schedule II) was not impacted by the Supreme Court judgement, as mining from these blocks was permitted until end of March 2015. However, while the central government has urged states to re-allocate the cancelled mines, the effective transfer of operatorship rights to the winning bidders has been delayed by administrative procedures at state level.

This report's assessments have factored in a decrease (new business as usual) or only a slight increase (roadmap) in coal block production in FY2016, due to delayed transfer of operatorship rights to allottees and the cancellation of the allocation of three large producing blocks (Gare Palma IV/ 1, 2, and 3, with an estimated production of 12–13 Mt). The slowdown is followed by a 'catch-up' effect in FY2017/FY2018. The expected lower performance of coal blocks will partly be compensated by CIL, which benefits from its role of designated custodian of the operating mines (Schedule II) that have not been allocated so far or whose bids were rejected by the government. But the impact of the possible non-performance of captive blocks in FY2016 may be high, particularly for the non-regulated sector.

The actual production from coal blocks by FY2020 will mainly depend on how quickly the remaining blocks are allocated, how many blocks (Schedule III) will solve land and green clearance issues quickly enough to be able to ramp up production by FY2020, and how efficient the new operators of the mines will be.

As of June 2015, 67 blocks have been allocated from the 110 blocks earmarked for captive mining. A third round of auctions took place in August 2015 (three mines allocated) and a fourth one (eight to 10 mines) has been announced. But as mentioned previously, not all the 110 blocks will be allocated: some blocks fall in inviolate forest areas and some mines have been withdrawn from auctions due to ongoing litigation. While the peak rated capacity of the 110 blocks earmarked for captive mining is

²³² 'Other mines' corresponds to production by other state companies, such as PANEM in Jharkhand. In FY2015, this production totalled 12.5 Mt and has declined (16 Mt in FY2010).

²³³ Lok Sabha, Ministry of Coal, Answer to Question No. 584, 23 July 2015. At the beginning of August 2015, 12 out of the 28 (29 mines were allocated but one is subject to Court decision) auctioned blocks were awaiting green clearances and state-level approvals to begin mining (Business Line, Coal mine auctions: 12 out of 28 winners wait for clearances to start mining, 14 July 2015, <http://www.thehindubusinessline.com/economy/coal-mine-auctions-12-out-of-28-winners-wait-for-clearances-to-start-mining/coal-mine-auctions-12-out-of-28-winners-wait-for-clearances-to-start-mining/article7422041.ece>).



estimated at 350 mtpa, the assessments in this report have assumed that blocks with a peak rated capacity of 300 mtpa will be allocated, of which 90 mtpa for Schedule II mines²³⁴ (operational or ready to commence production) and 210 mtpa for Schedule III mines.²³⁵ Schedule III mines are expected to be operational within one or two years and would take another two to three years to reach their peak rated capacity.

Schedule II mines produce 60 Mt by FY2020 in the new business-as-usual assessment and 80 Mt in the roadmap. The assumption is that Schedule III mines start production from FY2018 only and reach 40 per cent of their peak rated capacity in FY2020 in new business-as-usual. In the roadmap assessment, they start production from FY2017 and reach 60 per cent of their peak rated capacity in FY2020. With these assumptions, production from coal blocks allocated or not yet allocated for captive mining reach 157 Mt in FY2020 in new business-as-usual and 219 Mt in roadmap.²³⁶ As mentioned above, production from the mines to be allocated for commercial mining has not been taken into account.

4.5.5 Coal production scenarios to FY2020

The main assumptions for the two assessments are summarized below:

- The **new business-as-usual** assessment factors the higher growth rate of CIL's production as registered recently. It is based on the following assumptions: a) CAGR of 10 per cent in CIL's output (despatches) over the period; b) some delay in the start-up and ramping-up of coal blocks mines – production from Schedule II mines reach 60 Mt in FY2020, while Schedule III mines start production from FY2018 and reach 40 per cent of their peak rated capacity in FY2020; c) in SCCL's production reaches 74 Mt in FY2020.
- The **roadmap** assessment presents an optimistic view of future production, based on the assumption of: a) CIL's mine-wise plan to 908 Mt by FY2020 being achieved; b) fast development of coal blocks, with production from Schedule II mines reaching 80 Mt in FY2020, while production of Schedule III mines starts from FY2017 and reaches 60 per cent of peak rated capacity in FY2020; and c) SCCL's production reaches 74 Mt in FY2020 – same as in the first assessment.

With these assumptions, total steam and coking coal production reaches 1,018 Mt in FY2020 in new business as usual and 1,201 Mt in roadmap – implying CAGRs of 10.9 per cent and 14.6 per cent respectively from FY2015 to FY2020. These growth rates are impressive, but they are dependent on a larger number of new blocks being put into production.

To estimate steam coal production from total coal production, metallurgical coal production (22.65 Mt in FY2015) has been subtracted from total coal production. Steam coal production reaches 996 Mt in FY2020 in new business-as-usual projections and 1,178 Mt in the roadmap – respective CAGRs of 11.2 per cent and 15 per cent. The annual data is detailed in Table 21.

²³⁴ 36 Schedule II blocks have been auctioned/allotted in the first two rounds of auctions/allotment and two mines are auctioned in the third round. One block was withdrawn from the auctions due to technical reasons (Namchik Namphuk, with peak rated capacity of 0.1 mtpa) and one block (Ardhagram, with peak rated capacity of 0.4 mtpa), where a successful bidder was declared, has been handed over to the Designated Custodian, in view of a court case.

²³⁵ 30 Schedule III blocks were auctioned/allotted in the first two rounds of auctions/allotment (195 mtpa of rated capacity) and 3 blocks are auctioned in August 2015. 8 to 10 more blocks should be auctioned soon.

²³⁶ Including 13 Mt of production from other mines (flat level until FY2020).



Table 21: Coal production assessments by FY2020

Mt	FY2015 (provisional)	FY2016	FY2017	FY2018	FY2019	FY2020	CAGR (FY2015- FY2020) %
"New Business as Usual"							
CIL (despatch)	488.9	538	592	651	716	787	10.0
SCCL (despatch)	52.7	56	60	65	69	74	7.0
Coal blocks (captive mining) and other mines	66.0	53	58	93	118	157	18.9
Total coal production	607.6	647	710	808	903	1,018	10.9
Of which steam coal production	585.0	625	687	786	880	996	11.2
"Roadmap"							
CIL (despatch)	488.9	550	598	661	774	908	13.2
SCCL (despatch)	52.7	56	60	65	69	74	7.0
Coal blocks (captive mining) and other mines	66.0	73	108	133	168	219	27.1
Total coal production	607.6	679	766	859	1,011	1,201	14.6
Of which steam coal production	585.0	657	744	836	988	1,178	15.0

Source: Author's estimates.

The expected production by FY2020 is less than the 1.5 Gt target. The next chapter looks at the supply-demand balance.

5. Towards steam coal self-sufficiency

Over the past few months, the government has emphasized its intention to cease steam coal imports in order to increase security of supply of the strategically important power sector and reduce the burden on India's trade deficit. Considering the low quality of coal in India and the level of steam coal imports in FY2015 (168 Mt – a 30 per cent jump over FY2014), this requires an increase in indigenous production of about 220–250 Mt,²³⁷ *ceteris paribus*. However, steam coal demand is likely to increase significantly, making the objective even more demanding. Moreover, in addition to the supply challenge to ramp up production and increase transportation capacity, there are some technical, environmental, and economic barriers that may thwart the government's plan to completely end steam coal imports in the short term.

5.1 A slowdown in steam coal imports and self-sufficiency on the horizon

Table 22 shows the steam coal supply-demand balance by FY2020 based on the assessments of domestic production and demand provided in Chapters 3 and 4.

Table 22: Scenarios for steam coal supply/demand balance by FY2020

Mt	FY2015 (provisional)	FY2016	FY2017	FY2018	FY2019	FY2020	CAGR (FY2015- FY2020) %
Scenario 1							
Steam coal demand (a)	753	816	857	938	993	1,036	6.6
Steam coal production	585	625	687	786	880	996	11.2
Supply/demand gap or excess (b)	168	192	170	152	113	41	-24.7
Steam coal import dependence (%) (b/a)	22%	23%	20%	16%	11%	4%	-
Scenario 2							
Steam coal demand (a)	753	816	867	948	1,026	1,093	7.7
Steam coal production	585	657	744	836	988	1,178	15.0
Supply/demand gap or excess (b)	168	160	123	112	38	-86	-
Steam coal import dependence (%) (b/a)	22%	20%	14%	12%	4%	-	-

Source: Author's calculations.

In Scenario 1,²³⁸ steam coal imports are expected to continue increasing in FY2016 by 14 per cent to 192 Mt – a much lower growth than in previous years – before gradually declining to 41 Mt at the end of the decade. The overall dependence on steam coal imports would fall to only 4 per cent in FY2020.

In Scenario 2,²³⁹ steam coal imports decline slightly in FY2016 (minus 5 per cent to 160 Mt) and sharply from FY2017 to only 38 Mt in FY2019. Projected steam coal production exceeds demand in FY2020, which means that India would be fully self-sufficient for steam coal and would only need to import coking coal.

Both scenarios indicate that the government is likely to achieve its self-sufficiency goal, but they show this is likely to be towards the end of the decade rather than in the announced time-frame.

Easing of the transportation constraints with the commissioning of new railways, including to supply coal to coastal power plants, is a prerequisite to achieving these reduced levels of imports. Recently, CIL has been able to increase its dispatches significantly (see Box 13), thanks to optimized management of railcar availability and rationalization of coal linkages.

²³⁷ When imported coal of high calorific value is replaced by domestic coal with less calorific value.

²³⁸ In Scenario 1, CIL's dispatches rise at a CAGR of 10 per cent from FY2016 to FY2020, SCCL production rises at a CAGR of 7 per cent, and coal blocks auctioned/allotted for captive mining are delayed and reach 40 per cent of their peak rated capacity by FY2020.

²³⁹ In Scenario 2, CIL's mine-wise plan to produce 908 Mt by FY2020 is attained, SCCL production rises at a CAGR of 7 per cent, and output from coal blocks auctioned/allotted for captive mining reaches 60 per cent of their peak rated capacity by FY2020.



The import projections, however, need to be strongly qualified by a set of constraints which need to be specifically addressed in order for India to cease steam coal imports. They are discussed in the next section.

Over the period, the impact on the CAD of steam coal imports will be limited by the decline in international coal prices. India's steam coal import bill was \$9.5 billion in FY2014 and jumped to \$11.6 billion in FY2015.²⁴⁰ If India is able to keep its steam coal imports at 160–190 Mt this year and next, the import bill in dollars may be reduced despite the current rupee depreciation²⁴¹ as international steam coal prices are expected to remain subdued due to the sharp decline in Chinese coal imports. Global steam coal prices have continued to decline since the beginning of 2015. The price of high-grade South African coal was \$57/t in July 2015, a 17 per cent drop compared with its average price in FY2015. The price of Indonesian coal (4,900 kcal/kg) was \$43/t in July 2015, an 18 per cent drop compared with its average price in FY2015. Despite these already weak levels, some analysts forecast even lower prices in the near term: Credit Suisse Commodities forecasts that global FOB coal prices will not recover before 2018, and even then at a much lower level than in the past (\$60–65/t for high-grade coal).²⁴²

Box 13: FY2016 – a turning point for Indian steam coal imports

FY2016 may be a turning point for the coal sector in India, marked by a slowdown in the pace of growth or even a slight decline of steam coal imports. The MoC projects coal demand will reach 910 Mt in 2016, a 10 per cent increase over FY2015.²⁴³ Despite the planned 15 per cent growth in domestic production to 700 Mt (of which 550 Mt produced by CIL, 56 Mt by SCCL, and 94 Mt by the coal blocks' operators), the supply/demand gap covered by imports is expected to amount 210 Mt. This level, which includes coking and steam coal imports, represents a slight decrease (-1 per cent) compared with FY2015 (212.1 Mt).

Coal imports in the first quarter of FY2016 (April 2015 to June 2015) already gives an indication of the capacity of CIL's production to better keep pace with growing steam coal demand. During the quarter, total coal imports (coking and steam coal) totalled 56.3 Mt, an increase of 2.5 per cent compared with the same period in FY2015.²⁴⁴ However, all the increase was due to increasing coking coal imports; steam coal imports stagnated at 45 Mt. Imports by power utilities even decreased by 4 per cent to 21.5 Mt,²⁴⁵ which is a very encouraging outcome for the government but also means that steam coal imports by the non-regulated sector increased during the quarter.

In March 2015, the CEA estimated steam coal imports by power utilities at 115 Mt in FY2016, a 26 per cent jump over FY2015.²⁴⁶ The import level included 73 Mt imported for blending purposes at 37 power plants (a 35 per cent increase from FY2015)²⁴⁷ and 42 Mt for power plants designed on imported coal.

²⁴⁰ This does not include coking coal imports, which added \$5.8 billion in FY2014 and \$5.5 billion in FY2015.

²⁴¹ Money Control, 'Rupee may weaken more on China currency depreciation: Citi', 13 August 2015

http://www.moneycontrol.com/news/rupee/rupee-may-weaken-morechina-currency-depreciation-citi_2504561.html?utm_source=ref_article

²⁴² Credit Suisse, India Utilities Sector, 14 May 2015, Credit Suisse Equity Research, https://doc.research-and-analytics.csfb.com/doc/view?language=ENG&source=ulg&format=PDF&document_id=1048655381&serialid=iiSMLBOeIBNI6aB3r5Kd4X3PYZnVWI6pkOLi%2BW7%2BFM%3D

²⁴³ Lok Sabha, Ministry of Coal, Answer to Question No. 514, 'Shortage of Coal', 23 July 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=19240>

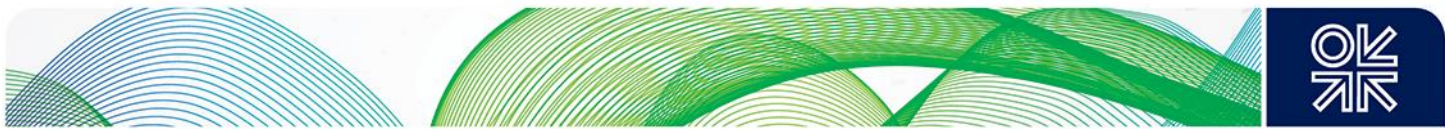
²⁴⁴ Reuters, 'India coal imports flat in June as local supply jumps –trade', 2 July 2015, <http://af.reuters.com/article/energyOilNews/idAFL3N0Z140M2015072>

²⁴⁵ Platts, 'Indian utilities' Apr-Jun coal imports down 4% on year to 21.5 mil mt', 17 July 2015, <http://www.platts.com/latest-news/coal/newdelhi/indian-utilities-apr-jun-coal-imports-down-4-26151475>

²⁴⁶ Times of India, 'India raises coal import by 35% to aid power plants', 5 April 2015

<http://timesofindia.indiatimes.com/city/chennai/India-raises-coal-import-by-35-to-aid-power-plants/articleshow/46809633.cms>

²⁴⁷ MoP, 'Import of coal target for the year 2015-16 –reg', Office Memorandum, 30 March 2015, http://www.cea.nic.in/reports/planning/coal_import_1516.pdf



However, imports by power utilities may be much lower. Already, during the period April-September 2015, they have declined by 6 per cent to 41.5 Mt compared with the same period in 2014.²⁴⁸ On the demand side, the growth in electricity generation by coal power plants slowed down in the first half of FY2016, with a rise of only 5 per cent over the same period of FY2015.²⁴⁹ This led to a very low PLF (61 per cent on average in first half of FY2016 against 64 per cent in the same period last year), which again shows that state Discoms are unable to increase their purchase despite the increased power capacity. On the supply side, there are clear indications that Indian production is entering a new phase of growth. CIL has raised its production by 8.9 per cent in the first half of FY2016 and its despatches even grew by 9.3 per cent to 251.4 Mt. SCCL despatches during the same period grew by 14.4 per cent to 28.3 Mt. Coal stocks at power plants have also impacted the trend in coal imports. For instance, NTPC, which has been allocated a quota of 22 Mt of imported coal for FY2016, reduced its imports in the first quarter of FY2016 and indicated that it would not book any imported coal in the second quarter in view of adequate supplies from CIL and full coal stockyards.²⁵⁰ At the end of September 2015, coal stocks at power stations reached 26 Mt.²⁵¹

The recommendation by the environment ministry's expert appraisal committee (EAC) in October 2015 to ease the restriction on maximum ash content of imported coal (see Box 3) will further facilitate the government policy to reduce steam coal imports for blending purposes of power utilities, as less imported coal will be needed to produce the same amount of electricity.

On the contrary, imports by the non-regulated sector could still increase from the 77 Mt imported in FY2015. The sector relies on FSAs, e-auctions sales from CIL, coal blocks output, and imports. Its imports surged last year due to lower e-auction sales. The reduced volumes of e-auctions raised their price by 12 per cent to an average of around \$40/t in FY2015. Faced with uncertain availability of domestic supplies, non-regulated consumers have booked more supplies from foreign suppliers. Now that CIL's production is growing fast, it has earmarked a higher volume of sales to the non-regulated sector, estimated at 21–22 per cent of its planned production. A large part may be sold through e-auctions as the cap on such sales has been removed by the government. However, these volumes become available at a time when consumers have already booked imported cargoes. So despite available domestic supplies, imports by the non-regulated sector may still increase. The significant decline in international coal prices since the beginning of 2015 has also made imported coal cheaper than CIL's e-auction sales for some grades of coal, to which royalties and other taxes, and high transportation costs, must be added. Low-rank Indonesian coal delivered at Indian ports was available at \$38/t at the beginning of July 2015. The price of CIL's e-auction sales has started to drop to reflect this tough competition: it declined to INR 2,184/t (around \$35/t) in the first quarter of FY2016.²⁵²

Overall, the level of steam coal imports in FY2016 will depend on the ability of the new operators of captive blocks to re-commission the mines and ramp up production quickly, but above all it will depend on the price spread between imported coal and CIL's e-auction sales. Under the best assumptions, steam coal imports may be reduced only marginally in FY2016.

²⁴⁸ Platts, 'India utilities' thermal coal imports fall 6% on year in Apr-Sep', 13 October 2015, <http://www.platts.com/latest-news/coal/newdelhi/indian-utilities-thermal-coal-imports-fall-6-27877928>

²⁴⁹ CEA, Executive Summary Power Sector September-15, http://www.cea.nic.in/reports/monthly/executivesummary/2015/exe_summary-09.pdf

²⁵⁰ Economic Times, 'NTPC not to import coal in Q1, cites sufficient CIL supply', 27 April 2015, http://articles.economictimes.indiatimes.com/2015-04-27/news/61578134_1_coal-india-coal-stock-coal-supply

²⁵¹ CEA, <http://www.cea.nic.in/reports/daily/coal/2015/September/30.pdf>

²⁵² Economic Times, 'Coal India to tweak e-auctions to check falling prices', 18 August 2015, http://articles.economictimes.indiatimes.com/2015-08-18/news/65530391_1_coal-production-state-run-coal-india-e-auctions



5.2 Main constraints to India's independence from steam coal imports

While the key driver of rising steam coal imports can be attributed to the increasing gap between demand and indigenous availability of steam coal, other factors are also at play:

- Power plants designed to be operated on imported coal only – that is, on high-quality coal, especially low-ash coal.
- Environmental considerations requiring blending imported coal of low ash content with indigenous coal of high ash content to comply with the amendments to the Environment Protection Rules 20/4 (Environment (Protection) Amendment Rules, 2014) and inadequate availability of such coal from indigenous sources.
- Commercial optimization of fuel supply at power plants in coastal locations in view of constraints on transport logistics and declining import prices.

These factors need to be addressed specifically to cease steam coal imports.

5.2.1 Power plants designed on imported coal

Due to coal shortages in the past, a number of power plants were designed and built to operate on imported coal only, which has a higher calorific value and lower ash content than domestic coals. Major public and private companies (NTPC, Adani Power, Essar Power, and Tata Power) have built, or are building, power plants at coastal locations with boilers designed for imported coal and have either signed long-term contracts with overseas suppliers or acquired foreign assets (mainly in Indonesia, South Africa, and Australia) to feed these plants. Most of these plants are supercritical power plants located in the western states of Maharashtra and Gujarat, which are far away from the northeastern mines.

As the boilers of these plants were designed for low-ash coal, burning high-ash domestic coal would require the facilities to be revamped, which does not make economic or environmental sense. These plants, which import around 40 Mt/year, are therefore expected to continue importing coal. This is reinforced by the existence of long-term contracts/foreign assets and the lack of railway capacity/congestion of railway lines from mines to ports.

In addition, plant expansions or new plants designed on imported coal may increase import demand. In January 2015, despite its plans to rely on its own production and CIL's increased output, NTPC issued a tender for the long-term (15 years plus options) procurement of imported coal for its proposed 4-GW Pudimadaka project.²⁵³ NTPC was seeking the supply of coal of 5,000 kcal GAR minimum with maximum ash content of 12 per cent, a quality that is not easily found on the domestic market. The Pudimadaka project is a proposed UMPP project located in Nakapalli, Andhra Pradesh, near the Bay of Bengal and, as currently designed, may import 14 Mt/year. The project received clearance from the MoEF to start environmental studies in March 2015 and is expected to be completed during the 13th FYP.^{254, 255}

²⁵³ McCloskey Coal Report (MCR), 'India's NTPC issues long-term tender', 9 January 2015, MCR Issue N° 351

²⁵⁴ The Hindu, 'NTPC Pudimadaka project cleared by MoEF', 25 March 2015,

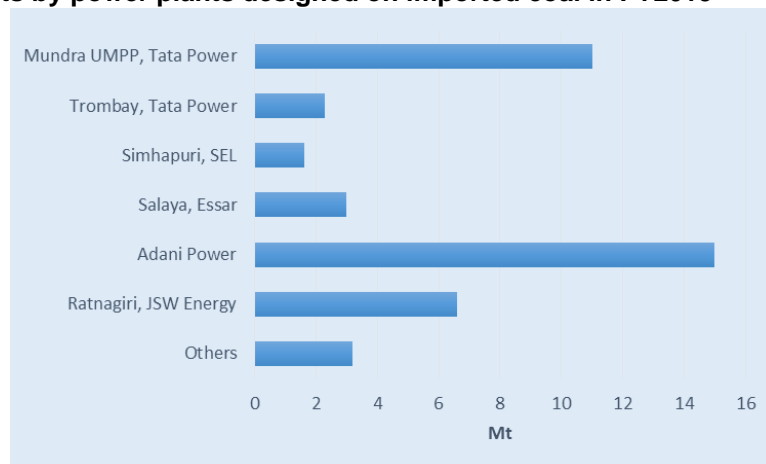
<http://www.thehindu.com/news/cities/Hyderabad/tor-for-ntpc-pudimadaka-project-cleared-by-moef/article7032086.ece>

²⁵⁵ The Hindu, 'NTPC to finalise bids for Pudimadaka plant', 8 July 2015,

<http://www.thehindu.com/news/cities/Visakhapatnam/ntpc-to-finalise-price-bids-for-pudimadaka-plant/article7397023.ece>



Figure 25: Imports by power plants designed on imported coal in FY2015



Source: CEA.

Adani, the biggest coal importer and trader in India, does not expect a reduction in Indian coal imports during this decade.²⁵⁶ In a financial presentation in June 2015,²⁵⁷ the company estimated that Indian steam coal imports could in fact double by FY2020 with an additional need of 200 Mt compared with current imports. Adani projects that demand from the power sector will increase faster than domestic supplies, and the profile of that demand is going to be changed by the coming generation of power plants. It should be noted, however, that while supercritical power plants have a higher efficiency and a better environmental performance when burning high-quality coal, as Adani rightly argues, supercritical power plants can also burn low-quality coal, provided their boilers have been designed for such coal and several supercritical plants, now under construction in India, are based on domestic coal.

Adani has built its strategy on coal imports and trading. The company has invested in overseas mines and built receiving coal terminals in India. It is the owner of the two largest 'non-major' (private) ports: Mundra, the largest port in India, handles over 100 Mt of cargo per year and hosts one of the world's biggest coal import terminals, boasting a 60 mtpa capacity. On the east coast, Adani bought the newly built Dhamra port in Odisha in May 2014 and announced a second phase of development to take cargo handling capacity to 100 mtpa by 2020. The group is also the largest private power producer in India, operating over 11 GW of capacity, including 4.6 GW near Mundra port. It has a target of 20 GW by 2020. The company is involved in the development of one of the largest mines in the world, the Carmichael mine in Central Queensland to export the coal to India (see Box 3), and believes that the quality of Australian coal better fits the new needs of supercritical plants that will become the norm in India from FY2017.

While plants designed and built on imported coal are likely to continue importing coal in the short term, these plants may turn to domestic coal in the medium/long term if washed coal or higher-quality coal (higher calorific value and low ash content) is produced in sufficient quantities in India and transportation bottlenecks from mines to coastal areas are removed. Blending domestic coal at plants designed to use imported coal is a possibility, though it depends on the design of the boilers. Since Indonesia increased its prices in 2011, Tata Power has been blending low-grade domestic coal with imported coal to bring down the fuel cost at Mundra UMPP, where the boilers have been designed to

²⁵⁶ ABC, 'Adani CEO says India will remain an importer of coal', 25 May 2015, <http://www.abc.net.au/news/2015-05-25/adani-ceo-speaks-to-faithful-in-mackay/6494536>; AFR, 'India to fuel Adani's coal expansion', 16 June 2015, <http://www.afr.com/business/mining/coal/india-to-fuel-adanis-coal-expansion-20150616-ghpg3x#ixzz3jupRRhxV> (subscription only)

²⁵⁷ Adani, 'Adani group: new form and new substance', 20 June 2015, http://www.adani.com/Common/Uploads/InvestorRelationTemplate/19_InvBotDL_Adani%20Group%20Presentation%20Jun%2015.pdf



burn sub-bituminous coal from MCL and imported coal from Indonesia. Moreover, in the 1970s, when Indian production mostly came from UG mines, the quality of coal was much better than it is today, with an average GCV of 5,900 kcal/kg. Increasing UG production may allow India to mine better quality coal. The transportation bottleneck from mines to coastal areas may be dealt with by using coast-to-coast shipment. In a scenario with less coal imports, coal terminals could be used to move coal across the country and thus reduce the pressure on the railway system.

5.2.2 Environmental and quality constraints

For plants built with blending possibilities, imports of higher-quality coal (low ash content and high calorific value) allow more efficient operation of the plants, leading to lower coal consumption and lower emissions of local pollutants and CO₂. From June 2016, power plants located at more than 500 km from mines will have to use coal containing not more than 34 per cent of ash, compared with a current distance of 750 km. To implement the directive, CIL is raising its washing capacity for steam coal to 88 Mt and will use capacities at private washeries (see Section 3.2.1). According to a 2013 study of the National Transport Development Policy Committee,²⁵⁸ published in 2013, when the distance is reduced to 500 km, about 90 GW of capacity would require about 360 mtpa of washed coal. New washeries (CIL and private) may be sufficient, but they are unlikely to be completed by June 2016. The time required to establish the new washeries may lead to a temporary increase in coal blending and imports to comply with the regulation after June 2016.

Rationalization of coal linkages could help in resolving the issue by decreasing the distance travelled by coal. As stated earlier, a study carried out by consultancy firm KPMG for the Inter-Ministerial Task Force on rationalization of coal linkages concluded that rationalization of coal linkages would reduce the average distance travelled by coal to 416 km/t from 597 km/t.²⁵⁹ It also showed that import needs for the TPPs considered in the study were lower post-rationalization than pre-rationalization (79.8 Mt compared with 103.5 Mt²⁶⁰). However, as mentioned previously, the rationalization of coal linkages is a complex exercise that involves the agreement of all stakeholders (mines, power utilities, railways) to implement the swaps. Therefore, there is a risk that the limit imposed on the transportation of coal with ash above 34 per cent could lead to a temporary increase in steam coal imports. The strategy of coal producers may reinforce this trend. For instance, in March 2015, SCCL announced its intention to import coal of high calorific value to blend it with its own coal production in order to provide its customers better quality products.²⁶¹

5.2.3 Competition between imported and domestic coal

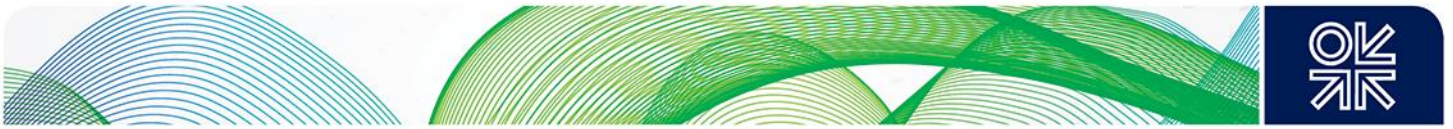
Thus far, import needs are calculated as a residual: that is, projected demand minus the projected supply of a given year. This calculation assumes that domestic prices are lower than international ones and that consumers do not arbitrage between domestic production and imports, as is common in large producing and consuming countries, like China and the USA, which are both producers and importers of coal based on commercial and transportation considerations. Up to now, domestic coal prices at the pithead have been much cheaper than imported coal of a corresponding variety for most coals, favouring domestic coal against imports, except for high grades. But the evolution of domestic and international prices over the past few months makes a huge difference. In some circumstances, domestic prices for power utilities, including inland transportation costs, are higher than current import prices of coal delivered at coastal ports. With the decline in Indonesian prices from \$61/t in January 2014 to \$43/t in July 2015, the competitiveness of domestic washed coal transported to western coast

²⁵⁸ National Transport Development Policy Committee (NTDPC), Transportation of energy commodities, 2013, http://tripp.iitd.ernet.in/publications/NTDPC/Vol%2002-2/NTDPC%20Vol%2002_Part%202%20Ch%2008.pdf

²⁵⁹ MoC, Report of the new Inter-Ministerial Task Force (IMTF) on Rationalization of sources of Coal to Power plants, 2 February 2015, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/030215a.pdf

²⁶⁰ Import needs for 114 TTPs were calculated based on a targeted PLF of 83 per cent on average.

²⁶¹ Express News Service, 'Singareni to Blend Its Coal with Exotic Coal', 13 March 2015, http://www.newindianexpress.com/states/andhra_pradesh/Singareni-to-Blend-Its-Coal-with-Exotic-Coal/2015/03/13/article2711155.ece



ports is no longer ensured. This makes the import of better quality coal more viable for those western power plants, such as those in Gujarat and Maharashtra, located at considerable distances from the main northeastern mines. For non-regulated users, imported coal can be much cheaper than domestic supplies from e-auctions, which sell at a premium of 40–60 per cent to CIL's average price (see Table 6).

The notified prices of CIL's sales have been kept low to enable low power tariffs. However, Indian coal prices are expected to increase to reflect higher production costs (UG mines, deeper and wider seams requiring to remove more overburden, salaries increase, and rising costs related to land acquisition and R&R). Besides the cost of mining, higher taxes can also be expected. There are ongoing studies to review the royalty rate, currently at 14 per cent *ad valorem*. Furthermore, the cess on coal is expected to increase in the future to better reflect the environmental cost of coal production. However, because it is applied to both coal production and imports, any future rise will be neutral in the competitiveness between indigenous and imported coal.

Simultaneously, international coal prices are not expected to fully recover from their low levels due to the current global oversupply, the shift away from coal in a number of importing countries, and the slowdown in China. The assumption that Indian coal prices will remain much lower than international prices cannot be taken for granted, especially when coal is transported from far away mines and sold to the non-regulated sector through e-auctions that include premium of 40 to 60 per cent above regulated prices. In such a situation, arbitrage between CIL's e-auction sales and imported coal may favour coal imports.



6. Conclusion

India's steam coal imports have more than doubled over the past four years, reaching 168 Mt in FY2015 and making India the world's second-largest steam coal importer after China. With Chinese demand for seaborne coal falling,²⁶² India has become the great hope of the seaborne coal market. However, in November 2014, the government announced its intention to cease steam coal imports in the next two to three years. This report has tried to assess whether India could become the next engine of growth in world steam coal trade or, on the contrary, cease its steam coal imports by the end of FY2017 in line with its government's policy ambitions. The report analyzed the main drivers of steam coal imports: increasing demand by power utilities and non-regulated sectors and the new trend in domestic coal production in the light of the reform of the coal mining sector.

Following a review of the challenges encountered on both sides of the supply-demand equation in India, it is difficult to arrive at a firm number for the future level of Indian steam coal imports, but the general direction is clear. Steam coal imports are likely to level off in FY2016 or FY2017 before declining sharply as CIL's production ramps up, more mines are opened up, and production from auctioned/allocated coal blocks takes off. Indeed, FY2016 could be the turning point for Indian steam coal imports, which this report shows are likely to increase at a much lower rate than in previous years, or even decrease slightly.

These results are based on an analysis of coal demand and production in India in the context of the new coal policy and coal sector reforms initiated in early 2015 and the government's strong emphasis on, and pragmatic approach towards, making the country self-sufficient in coal. Reforms in the coal mining sector, adopted in March 2015, constitute a major policy breakthrough and, as shown in this report, will allow India to raise its coal production to record high levels. Even in the event that the 1.5 Gt target for FY2020 is not met, this paper has shown that strong growth in coal production will be adequate to make India almost self-sufficient in steam coal production, albeit by the end of the decade rather than in the time-frame announced by the government.

The scenarios used to consider future steam coal demand to FY2020 show that demand will remain robust, with power and industrial demand expected to grow significantly, in line with economic growth, urbanization and demographic trends, and the government's commitment to provide energy access to all citizens by 2019. Specifically, growth in coal demand from the power sector is assured by a massive increase in coal installed capacity as seen during the last five years, when coal capacity increased from 84 GW to 165 GW, as well as additional capacity currently under construction and expected to be commissioned in two or three years.

However, the rate of increase in coal demand will be offset to an extent by several factors. First, it will slow down due to energy efficiency measures in the power and industrial sectors, and also in the coal sector itself, where clean coal technologies offer huge opportunities for efficiency improvements and reduction of coal demand per unit of electricity generated. Additionally, the growth of renewable power will slow down the reliance of the power sector on coal. The financial weaknesses of state Discoms will also limit the growth of coal demand and can only be addressed gradually with tariff increases and the full cooperation of state governments, which oversee electricity policy at the state level. This key constraint was clearly visible in FY2015, when PLFs declined to 65 per cent, and even more in recent months (PLFs of 61 per cent in the first half of FY2016) despite recurrent blackouts and load-shedding in the country. The steam coal demand scenarios used are based on an analysis of coal-based capacity build-up, as announced by power producers, and assumptions on plant utilization. They take into account an improvement in the average efficiency of the coal power fleet due to the commissioning of supercritical plants and improvements in coal quality. Steam coal demand by power utilities and the non-regulated sector amounts to 1,035 Mt by FY2020 in the 'low plant load factors'

²⁶² China's coal imports have collapsed – Over January-August 2015, the country imported a total 138.59 Mt of coal, down 31.3 per cent year on year. Reuters, 'China August coal imports drop nearly 18 pct on month', 8 September 2015, <http://www.reuters.com/article/2015/09/08/china-economy-trade-coal-idUSL4N11E1P920150908>



(around 65 per cent, but dropping marginally in FY2016 and FY2017) scenario, while it reaches 1,090 Mt by FY2020 in the 'improved plant load factors' scenario (PLF gradually recovering to 70 per cent) compared with 754 Mt in FY2015. This corresponds to respective CAGRs of 6.6–7.7 per cent over the period.

On the supply side of the equation, a paradigm shift is currently under way. It cannot be better illustrated than by the reforms of the coal mining sector that took place in the first quarter of 2015. The Coal Bill adopted by the parliament in March 2015, with the parallel adoption of the Mining Law, has opened the sector up to domestic and foreign companies for commercial mining, ending 40 years of state monopoly on coal sales. It has also introduced the possibility of allocating coal blocks for captive mining in a transparent and effective manner, with the use of auctions to allocate mines to the private sector. The government's swift re-allocation of coal blocks is likely to ensure further growth in production. While barriers still exist to increasing coal production as planned – for instance, the lack of a consensus on land acquisition, implying further hurdles for the development of new mines – the pragmatic approach adopted by the government, such as direct negotiations with coal-bearing states, relaxation of environmental norms for expansion of existing mines which have already passed environmental assessment, fast-tracking, and real-time monitoring of mine and transportation projects, has already begun to yield some positive results. CIL's dispatches increased by a healthy 9.3 per cent in the first half of FY2016, a record incremental increase in the last 40 years, and SCCL's dispatches increased by 14 per cent during the same period. However, there are still barriers to be overcome – especially at the state level, where administrative procedures have delayed the re-commissioning of newly allocated coal blocks.

In the assessments of future coal production used in this paper, the most difficult aspect has been to assess future production from coal blocks, as their allocation for captive mining is ongoing at the time of writing and the economic framework for commercial mining is as yet unannounced. The assessments therefore included some personal judgment and did not take into account potential production from coal blocks to be auctioned for commercial mining. Overall, in the new business-as-usual assessment, which assumes that the renewal with growth of CIL's production will continue and takes into account delays in the ramp-up of newly allocated coal blocks for captive mining, steam coal production reaches 996 Mt by FY2020. In the more optimistic roadmap assessment, which considers that CIL will achieve its mine-wise plan to reach 908 Mt by FY2020, and also assumes a more rapid ramp-up of coal blocks production, steam coal production reaches 1,178 Mt by FY2020.

The supply-demand balance is therefore clear: under these assumptions, Indian coal imports would plateau in the short term before falling sharply by the end of the decade. While Indian steam coal imports have increased at a steep rate over the past three years, FY2016 could be a turning point for the coal sector in India, marked by a slowdown in the pace of growth, or even a slight decline, of steam coal imports. The recent recommendation by the environment ministry's Expert Appraisal Committee (EAC) in October 2015 to ease the restriction on maximum ash content of imported coal will further facilitate the government's attempts to reduce steam coal imports. It will allow the import of higher (calorific) grades of coal, implying that less imported coal will be needed in power plants blending imported coal with domestic supplies in order to produce the same amount of electricity.

The report presented two broad scenarios for steam coal imports to 2020. In our first scenario, steam coal imports are expected to continue increasing in FY2016 by 14 per cent to 192 Mt before gradually declining to 41 Mt at the end of the decade. The overall dependence on steam coal imports would fall to only 4 per cent in FY2020. In our second scenario, steam coal imports decline slightly in FY2016 (minus 5 per cent to 160 Mt) and sharply from FY2017 to only 38 Mt in FY2019. Projected steam coal production exceeds demand in FY2020, which means that India would be fully self-sufficient in steam coal supply and would only need to import coking coal.

Both scenarios indicate that the government is likely to achieve its self-sufficiency goal, although this is likely to be towards the end of the decade rather than within the announced time-frame.



One prerequisite to these outcomes is the simultaneous development of transportation infrastructure, in particular three key rail lines from major mines to customers, but also rail lines from the mines to the ports, as a large number of coal-fired power plants are located in coastal areas.

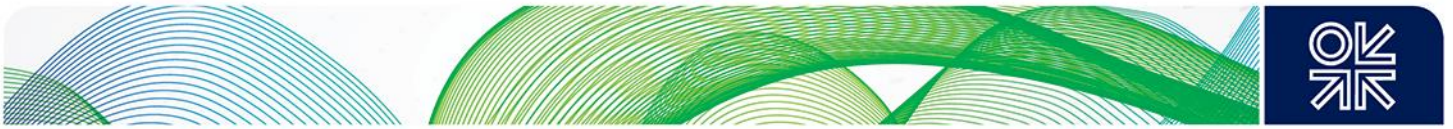
The import projections, however, need to be strongly qualified by a set of constraints:

- Some power plants were designed and built to be operated on imported coal only – high-quality coal, especially low-ash coal. In the short term, in the absence of the required quality in India, these plants will continue burning imported coal. This is reinforced by the existence of long-term contracts with foreign suppliers or participation of Indian companies in mining activities overseas. This means that a certain level of steam coal imports (40 Mt in FY2015) will still be needed in the short/medium term. In the longer term, it could be eliminated with the procurement of better quality domestic coal, either washed coal, or coal produced in underground mines, which in the past was of better quality than the current coal production, which comes mainly coming from opencast mines.
- New environmental regulations, limiting the use and transportation of coal with high ash content, adopted in 2012 and reinforced in 2014, and the inadequate availability of such coal from indigenous sources requires blending of imported coal of low ash content. This issue can be overcome with the washing of coal. Coal miners have responded to the new regulation by building new washeries. However, in the short term, the capacity of existing washeries is limited and coal with low ash content will continue to be imported to comply with environmental regulations.
- The commercial optimization of fuel supply at power and industrial plants in coastal locations favours imported coal, in view of the constraints on transport logistics and declining import prices. This commercial strategy may limit the fall in coal imports as historically low coal import prices mean that Indian steam coal buyers (mainly from the non-regulated sector) arbitrage between domestic coal and coal imports. The global steam coal market remains oversupplied. Despite cuts in production, the rebalancing of the market does not appear likely in the short term as import demand in major countries, in China especially, is falling in line with lower economic growth and stringent environmental measures. The competition between domestic coal and imported coal (for certain grades of coal and some customers) is a new phenomenon, as so far Indian coal prices have been much lower than imported prices.

These constraints will need to be considered and addressed by the government in the implementation of policies targeted at ending steam coal imports.

India is also reforming its domestic coal market to introduce more competition and transparency. Under the proposed reforms (which are still under review), Fuel Supply Agreements for the non-regulated sector will be auctioned, instead of being allocated upon the recommendation of the Inter-Ministerial Standing Linkage Committee. Prior to finalizing this policy, the government will need to carefully assess the evolution of the global steam coal market. The proposed auctioning of FSAs in the non-regulated sector will allow Indian coal prices to be set by the market. They should, therefore, align with international coal prices, a move facilitated by the envisaged creation of a common platform for domestic and imported supplies. This move may allow higher prices and margins for Indian producers, as international prices have so far been higher than domestic prices for most grades of coal, except high grades. However, in the oversupplied global market, imported coal is less expensive than domestic coal in some cases. In addition, the reform may lead to aggressive bidding from distressed foreign suppliers seeking outlets for their coal cargoes. This situation was observed in China in 2014 and led to a price war between domestic and foreign suppliers (falling prices and margins) before the Chinese government intervened to try to stabilize its market.

In the regulated sector, the reform is aimed at eventually replacing all existing and new coal supply contracts through a power tariff-based e-auction model under which the lowest-cost power producer would obtain coal supplies from CIL and SCCL. Auctions of FSAs by states/Discoms through tariff-based bidding and more competition at the distribution level would allow the government to keep power tariffs as low as possible and in turn provide coal supplies to the sector as cheaply as possible. Coal prices will nevertheless need to ensure the financial health of coal producers. Although this can



be most easily done through reductions in the cost of production, this strategy is unlikely to yield results, as CIL has one of the lowest costs of production in the world. Therefore, CIL will need to increase its revenues from the non-regulated sector, which will require additional sales to the sector at attractive prices compared with foreign supplies. In the oversupplied global market, this narrows the room for manoeuvre.

Finally, although there is likely to be greater interaction between the Indian and global steam coal market, international coal exporters have to factor in a major setback going forward: India will not be the promised growth market for steam coal that it was expected to be at the beginning of this decade, when Indian steam coal imports were forecasted to jump to 400 Mt by 2030.²⁶³ Additional output cuts in coal-exporting countries can be expected, as can a persistent low level of international prices which will be increasingly dependent on India's coal (and energy) policy and CIL's monthly coal production.²⁶⁴

²⁶³ See for instance Wood Mackenzie, 'Wood Mackenzie Says Global Thermal Trade Flow Changes Will Ensure Security of Thermal Coal Supply, Albeit At a High Price', 14 March 2012, <http://www.woodmacresearch.com/cgi-bin/wmprod/portal/corp/corpPressDetail.jsp?oid=10441615>

²⁶⁴ CIL's monthly coal production is available at <https://www.coalindia.in/en-us/performance/physical.aspx>



Annex 1: Coal in the energy and electricity mix in india

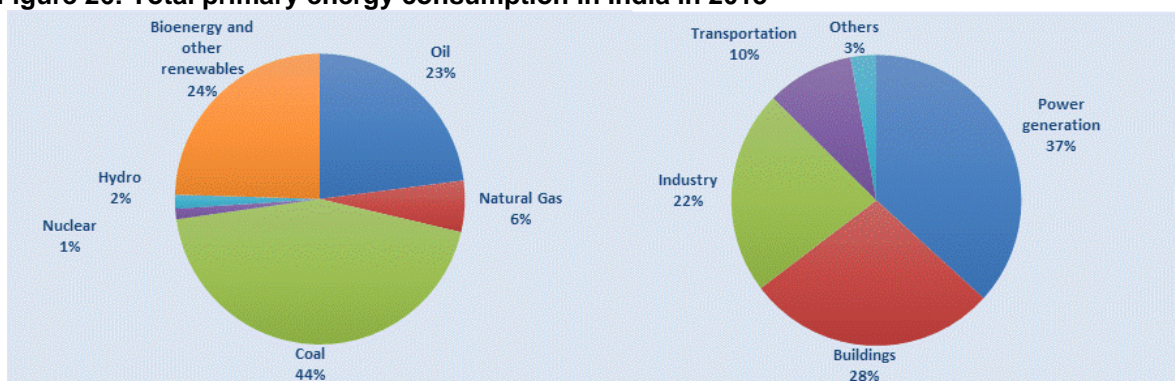
1. Primary energy sources

According to the IEA, India is the third-largest energy consumer in the world after China and the United States (and just ahead of Russia).²⁶⁵ India's energy consumption more than doubled from 316 Mtoe in 1990 to 770 Mtoe in 2013. This includes non-commercial energy such as traditional biomass. However, India's per capita energy consumption is still at a much lower level than that of developed countries – and even of some developing countries. Its per capita energy consumption is 0.64 toe/capita, compared to the world average of 1.9, 4.19 in the OECD, and 2.14 in China.²⁶⁶ This low level indicates that India's energy demand will continue to grow substantially, a trend accelerated by growing economic activity, urbanization and demography, and the needs of a 1.27 billion population aspiring to a better quality of life and full access to electricity. Currently 280 million people, or about a fourth of India's population, still lack access to electricity, while electrified areas suffer from chronic power shortages, which is a significant impediment to economic growth and development. The large-scale blackouts in northern and eastern India in July 2012, when up to 600 million people in 20 states lost electricity access, illustrate the weaknesses of the power system and the need to reform the energy market.

Coal dominates India's energy mix: in 2013, its share in primary energy supply was 44 per cent (56 per cent if only commercial energy sources are taken into account).²⁶⁷ The second-largest source was traditional biomass, such as fuel wood, which is still widely used for cooking and heating purposes by low-income households, primarily in rural areas. India's economic development and growing urbanization over the past two decades has seen its share decrease, however, from 42 per cent in 1990 to 24 per cent in 2013. In that year, oil represented 23 per cent and natural gas 6 per cent. Other fuels, such as nuclear, hydro, and other renewables, have a relatively small share in the current energy mix.

The power sector, primarily fuelled by coal, is the largest and fastest-growing area of energy demand, having risen from 22 per cent to 37 per cent of total energy consumption between 1990 and 2013. This was attributable to soaring demand for electricity for industrial, residential, and commercial activities.

Figure 26: Total primary energy consumption in India in 2013



Source: IEA, 2014.

²⁶⁵ IEA data include non-commercial energy (such as bioenergy), while BP and some Indian official data refer to commercial energy. The energy balances are therefore not directly comparable. If only commercial energy is taken into account, energy demand totalled 638 Mtoe in 2014 (BP, 2015) and India is the world's fourth-largest energy consumer, after China, the USA and Russia.

²⁶⁶ IEA, Key world energy statistics 2014, 2015, <http://www.iea.org/publications/freepublications/publication/keyworld2014.pdf>

²⁶⁷ All data from IEA, World Energy Outlook 2014.



2. CO₂ emissions

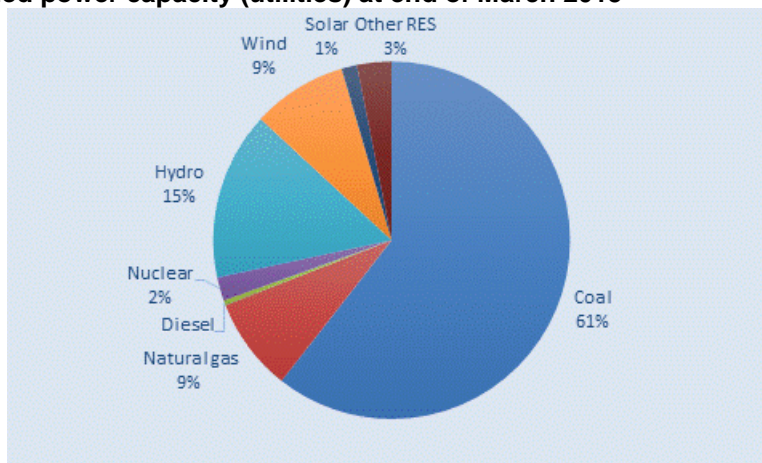
As fossil fuels dominate the energy mix, India is a large CO₂ emitter. In 2013, its energy-related CO₂ emissions reached 1.95 Gt, making India the world's third-largest emitter, although the country ranks low in per capita emissions – 1.6 tons compared with the world average level of 4.51 tons. The power sector emitted 727 Mt of CO₂ emissions in FY2014.

One of India's current key challenges is balancing its growing energy needs with the global move to reduce carbon emissions. As a non-Annex I country,²⁶⁸ India does not have binding emissions reduction targets, but it has voluntarily pledged in the Copenhagen Accord to reduce its carbon intensity by 20–25 per cent in 2020 compared to 2005 levels.²⁶⁹ In its INDC, submitted in September 2015, India has pledged to reduce its carbon intensity by 33 per cent to 35 per cent by 2030 compared to 2005 levels (see Box 6). The government holds to the principle of 'common but differentiated responsibilities' and has made it clear that India's enormous needs preclude any option to move away from coal. The government does not intend to compromise its economic development with stringent targets to reduce CO₂ emissions, but it is aiming at providing energy to all in a sustainable way. It has therefore set an ambitious target to raise renewable energy generation and aims at using energy sustainably with significant improvements in energy efficiency.

3. Installed power capacity

At the end of March 2015, total installed capacity from the utilities segment reached 272 GW. Thermal installed capacity totalled 189 GW, of which 165 GW (61 per cent) was coal-based and 23 GW was fuelled by natural gas; hydro and renewable energy installed capacity totalled 41 GW and 36 GW respectively; and nuclear energy capacity increased to 6 GW (up by 1 GW) due to the commissioning of the Kudankulam Unit-1 nuclear power plant in Tamil Nadu in December 2014.

Figure 27: Installed power capacity (utilities) at end of March 2015



Source: CEA, 2015.

In addition, captive power plants (CPPs) had an installed capacity of 47 GW.²⁷⁰ The total installed capacity was therefore 319 GW, and CPPs accounted for 15 per cent of India's total installed capacity. Total installed capacity has surged in the past five years, going from 175 GW at the end of FY2009 to 319 GW at the end of FY2015.

²⁶⁸ The UN Framework Convention for Climate Change (UNFCCC) divides countries into three main groups according to differing commitments. Non-Annex I Parties are mostly developing countries.

²⁶⁹ This target does not cover emissions from the agricultural sector.

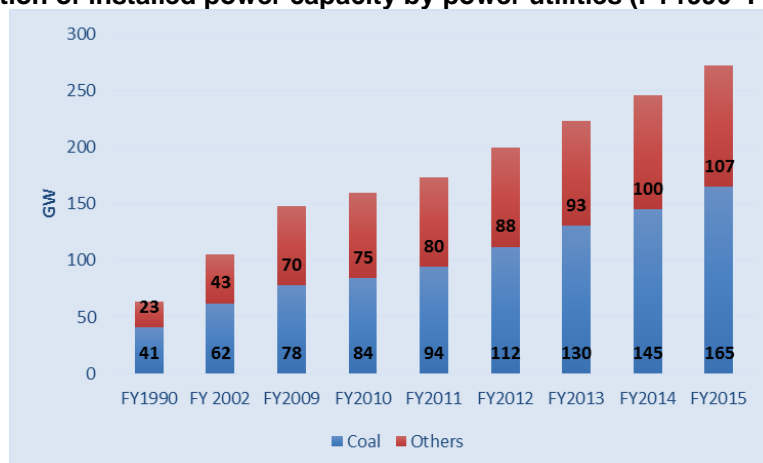
²⁷⁰ CEA, Growth of Electricity Sector in India from 1947-2015, April 2015, http://www.cea.nic.in/reports/planning/dmlf/growth_2015.pdf

Box 14: Captive power plants

In India, CPPs are prevalent in energy-intensive process industries such as sugar, cement, chemicals, steel and iron, fertilizers, and textiles, where such plants provide power, heat, and steam (co-and tri-generation plants). Captive power (power generated from a CPP) is used to meet electricity demand without resorting to access to the transmission networks. CPPs are scattered across the country with around 2,500 CPPs and an average capacity of 20 MW.²⁷¹ The 47 GW of installed capacity in March 2015 is mostly fired by coal (28 GW) and diesel (14 GW). In FY2014 the sector consumed 64 Mt of coal (52.6 Mt of steam coal and 11.6 Mt of lignite). The CPP sector, and thereby the industry, is therefore highly dependent on availability of coal. However, due to coal shortage and a lack of coal linkages (agreements for assured supply of coal), CPPs only receive 50 per cent of their requirements through coal linkages.²⁷² They have to buy their remaining needs through CIL's e-auctions or rely on imported coal, which many CPPs are not able to afford. In addition, the coal price – either through coal linkages, e-auctions or imports – is higher than the regulated price for public and private power plants (utilities sector). In the case of domestic coal, the revision of coal prices introduced by CIL in 2011 means that CPPs pay 20 per cent more for their coal input than power utilities. Since 2009, the MoC has stopped issuing fresh coal linkages for CPPs. As a result, 382 CPP applications for 34 GW are pending; a large number of these CPPs have been commissioned or are at an advanced stage.²⁷³ In the absence of coal linkages, many CPPs have been shut down or are operating at partial load – hence coal-based CPPs operated at a PFL of only 53 per cent in FY2015. The sector has started investing in non-conventional and renewable energy sources to diversify fuel shortage risks.

A total capacity of 118 GW is forecasted to be added during the 12th FYP (FY2012–FY2017). This includes 88 GW from conventional sources, of which 72 GW will be from thermal capacities and 30 GW from renewable sources. In the first three years of the 12th FYP (FY2012–FY2015), a record total thermal power capacity addition of around 58 GW was added – 63 per cent of which was added by the private sector.

Figure 28: Evolution of installed power capacity by power utilities (FY1990–FY2015)

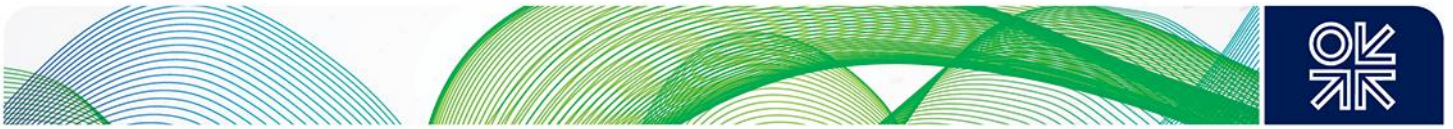


Source: CEA, 2015.

²⁷¹ EPR, 'Coal-linkage to captive power plants: the inside story', 16 June 2015, <http://www.eprmagazine.com/article.php?ItemId=1183%20%20CategoryId=5> and EPR, Time to rise to the occasion and support CPP, 13 May 2014, <http://www.eprmagazine.com/article.php?ItemId=751%20%20CategoryId=4>

²⁷² EPR, *ibid*

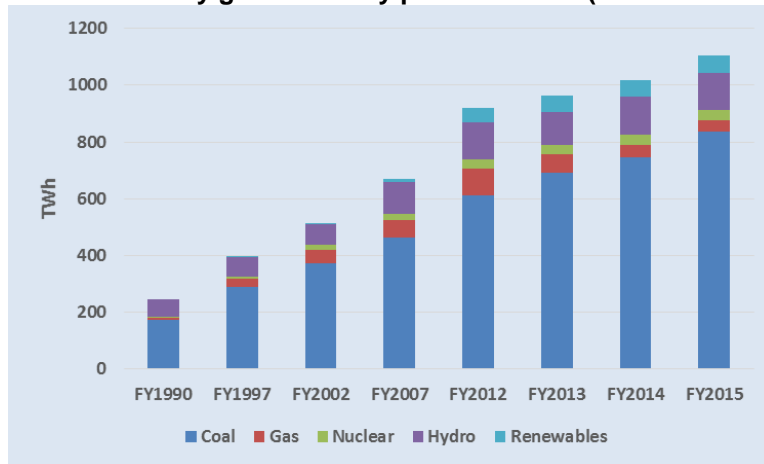
²⁷³ EPR, *ibid*



4. Electricity generation

Electricity generation from power utilities totalled 1,105 TWh in FY2015 (gross generation), a healthy growth of 8.4 per cent compared with FY2014, 76 per cent of which was generated by coal and 12 per cent by hydro. Other renewables generated 6 per cent, nuclear 3 per cent, and natural gas only 4 per cent. The contribution of gas has decreased over the past two years due to fuel shortages linked to the decline in domestic gas output and the high cost of LNG imports. In addition to gross generation from utilities, CPPs generated 166 TWh, adding up to a total gross electricity generation of 1,272 TWh in FY2015.²⁷⁴

Figure 29: Evolution of electricity generation by power utilities (FY1990–FY2015)



Source: CEA, 2015.

As reported by the CEA, during FY2015, as against a target of 784.2 TWh, power utilities achieved coal-based generation of 800.3 TWh (not including lignite) – 102 per cent of the target, recording a growth of 12 per cent over FY2014. The CEA expects coal-based generation to increase by 11.1 per cent to 889 TWh in FY2016.

5. Electricity consumption

Electricity consumption more than doubled, at a CAGR of 8.2 per cent, in the past 10 years and reached 939 TWh in FY2015, driven by the growing needs of the industrial sector, which accounts for 42 per cent of total consumption.

²⁷⁴ CEA, Growth of Electricity Sector in India from 1947-2015, April 2015, http://www.cea.nic.in/reports/planning/dmlf/growth_2015.pdf

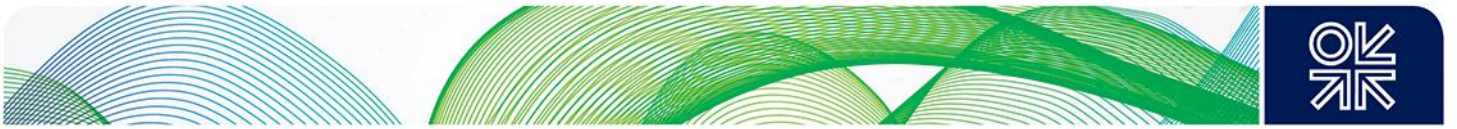
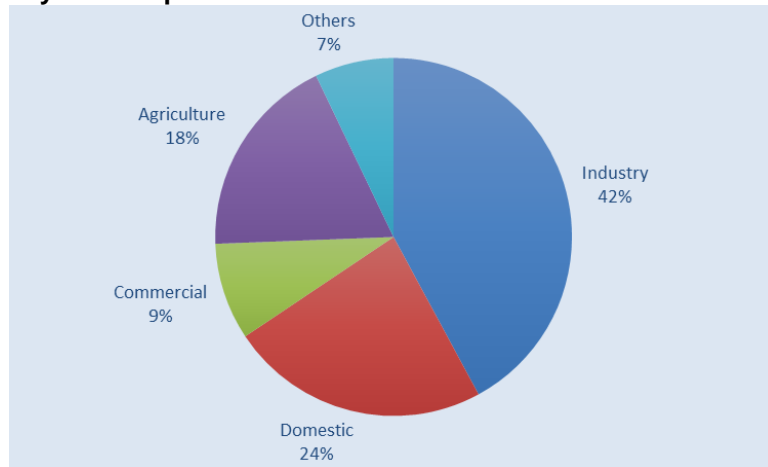


Figure 30: Electricity consumption in India in FY2015



Source: CEA, 2015.



Annex 2: Coal industry structure in India

India is the third-largest coal producer in the world and produced 660 Mt in FY2015, 612 Mt of which was hard coal (steam and coking coal) and 48 Mt was lignite. For four decades, mining in India has been dominated by state-owned CIL, which is the world's largest coal miner and boasts annual production of about 500 Mt. CIL produces 80 per cent of India's hard coal and fuels more than 70 per cent of India's power generation.

In 1973 the coal industry was nationalized, and since then CIL has enjoyed a quasi-monopoly on the production of coal and until recently was the only entity in India allowed to sell coal commercially to other companies. A first amendment to the Coal Mines Nationalization Act in 1976 permitted companies in the iron, steel, or power industries to produce coal from designated mines for their end-use, or so-called 'captive' consumption. In 1993, the government adopted the National Mineral Policy aimed at encouraging foreign and private investment in India's mineral sector. Eligibility for captive production was expanded to cement producers and coal washing, and then to coal gasification and liquefaction in a 2007 amendment. Until March 2015, when the Coal Bill was adopted by the parliament, the produced coal was only for self-consumption and was not commercially tradable or exportable.

1. CIL

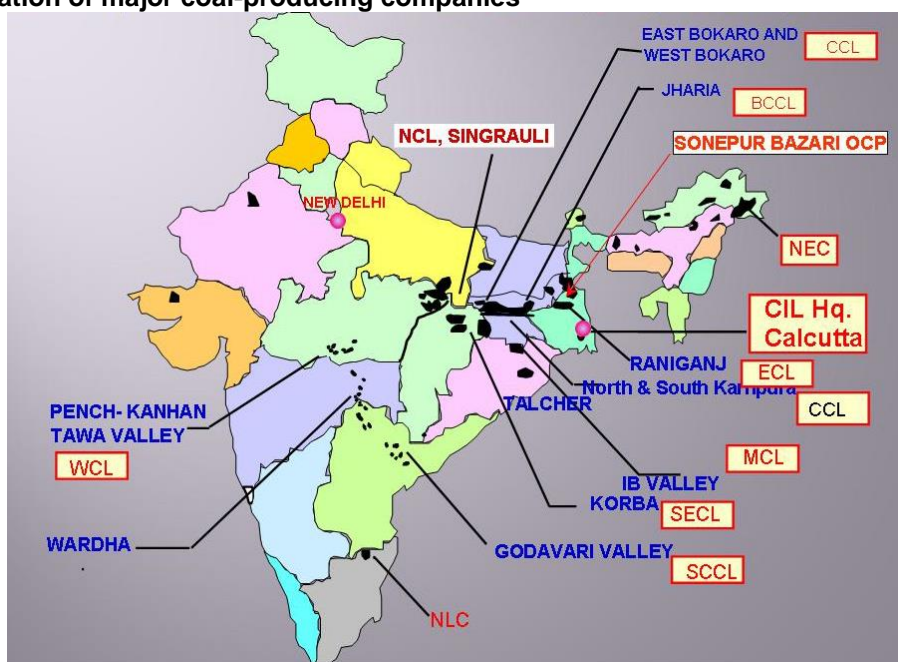
CIL, which is 79.65 per cent state-owned,²⁷⁵ operates 431 mines across eight states, with marketable coal reserves of 22 Gt and geological resources of 64 Gt.²⁷⁶ Its mandate is to mine and sell coal on the basis of FSAs/MoUs to consumers having valid linkages/LoAs. CIL, which employs about 35,000 people, has eight subsidiaries: Bharat Coking Coal Limited (BCCL), Central Coalfields Limited (CCL), Eastern Coalfields Limited (ECL), Western Coalfields Limited (WCL), South Eastern Coalfields Limited (SECL), Northern Coalfields Limited (NCL), Mahanadi Coalfields Limited (MCL), and the Central Mine Planning & Design Institute Limited (CMPDI). After four years of weak production growth, CIL's production rose 32 Mt to 494 Mt in FY2015 (a 6.9 per cent rise from FY2014). Though this was the biggest incremental increase in four decades, output was 13 Mt below the target set by the government (507 Mt). Around 90 per cent of coal produced by CIL is steam coal.²⁷⁷

²⁷⁵ In January 2015, the government sold a 10 per cent stake in Coal India for about \$3.6 billion. The government intends to sell another 10 per cent share in FY2016.

²⁷⁶ Motilal Oswal, 'Coal India: Share of higher margin volumes to rise sharply', 20 August 2015, <http://www.motilaloswal.com/Financial-Services/Research/Detailed-Report/Company-Updates/13832>

²⁷⁷ The figure is even higher if international classification of coal is used. Under international classification, coking coal has coking properties and is mainly used in steel making and metallurgical industries as raw material. In FY2014, CIL produced 50 Mt of coking coal, of which 38 Mt was sold to the power utilities sector (COO, 2015). As coking coal is a scarce resource in India, this 'coking coal' has no coking coal properties.

Map 2: Location of major coal-producing companies



Source: Central Statistics Office (from ECL).

2. SCCL

The Singareni Collieries Company Limited (SCCL), India's oldest mining company, is the only other state-owned hard-coal mining company in the country. The company produced 52.5 Mt of steam coal in FY2015, representing approximately 9 per cent of India's coal production. The output rose 2.5 Mt thanks to the opening, in October 2014, of the country's biggest underground mine, boasting a capacity of 2.8 mtpa. SCCL mainly supplies steam coal to southern India (Telangana,²⁷⁸ Maharashtra, Andhra Pradesh, and Karnataka). It is jointly managed by the central government and the Telangana state. SCCL operates 16 opencast (OC) and 32 underground (UG) mines in four districts of Telangana in the Godavari Valley, which has proved reserves of 9.6 Gt of coal.

3. Coal blocks

Coal production from public and private power, steel, and cement companies at captive blocks totalled 53 Mt in FY2015, of which more than half was produced by private companies. Almost all of it was steam coal. In addition, some 13 Mt is produced by other state companies, such as PANEM in Jharkhand.

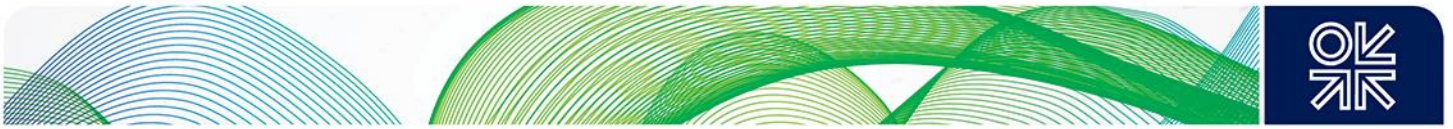
4. NLC

India also produced some 48 Mt of lignite in FY2015, 26.5 Mt of which was produced by Neyveli Lignite Corporation Limited (NLC), which is based in Tamil Nadu and owned by the central government.

5. Breakdown of Indian coal production

Steam coal makes up the bulk of Indian hard coal production. Despite significant resources of coking coal, and its growing domestic production (57 Mt in FY2014, 16 Mt of which was metallurgical coal), the quality of most Indian coking coal is insufficient for metallurgical use. Therefore India is expected to continue importing large quantities of prime coking coal.

²⁷⁸ On 2 June 2014, Telangana was separated from Andhra Pradesh as a new 29th state of India, with the city of Hyderabad as its capital.



As mining in India is mostly limited to a depth of less than 300m, the majority of Indian production comes from opencast (OC) mining. OC mining typically has lower production costs and is less dangerous for workers, but it causes environmental damage and requires large surface areas of land.

Despite the fact that most mines are OC, productivity in India is very poor. CIL produces 1,100 tons of coal per employee a year, compared with 36,700 tons for Peabody Energy and 12,700 tons for China's Shenhua Energy. This is mainly due to the lack of mechanization of coal mines, but it is also due to frequent strikes and a strong unionized workforce that is resisting mechanization for fear of job losses. The resulting inefficiencies have been partly responsible for years of missed output targets.

India's coal mines are mainly located in seven states: Jharkhand and West Bengal in the east, Odisha to the south, Madhya Pradesh and Chhattisgarh in the central region, Maharashtra in the west, and the newly created state of Telangana in the south. During FY2014, Chhattisgarh accounted for 22.4 per cent of steam coal production in the country, followed by Odisha (20 per cent), Madhya Pradesh (13.3 per cent), Jharkhand (10 per cent), Telangana (9 per cent), and Maharashtra (6.6 per cent).²⁷⁹

²⁷⁹ More information: Coal Controller's Organisation, Provisional Coal Statistics 2014-2015, Ministry of Coal, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/Provisional_Coal_Statistics_2014-15.pdf



Annex 3: Classification of Coal in India

In India, coal is classified into two types – coking and non-coking coal (referred as steam coal in this report). The former constitutes only a small part of the total coal resources of the country. These two are further subdivided as follows – on the basis of physical and chemical parameters as per the requirement of the industry.

- Coking coal is broken down into ‘coking coal’ and ‘semi-coking coal’, but only the former has coking properties. Washed coking coal is used in manufacturing of hard coke for steel making.
- Non-coking coal is subdivided into ‘non-coking coal’, ‘washed coal’ and ‘middlings and rejects’. Non-coking coal does not have coking properties and is mainly used for power generation. It is also used for cement, fertilizer, glass, ceramic, paper, chemical and brick manufacturing, and for other heating purposes.
- Washed coal: processing of coal through water separation mechanisms to improve the quality of coal by removing denser material (rocks) and high ash produces washed coal which has less ash, higher moisture, better sizing, better consistency, and is less abrasive.
 - Washed non-coking coal is used mainly for power generation but is also used by cement, sponge iron, and other industrial plants.
 - Middlings and rejects: are the by-products of washed coal.
 - Washed coal, also referred to as clean coal in India, has low density, whereas rejects have high density. Middlings have intermediate density.

Categorization of coal in India

Coking coal is categorized or graded on the basis of ash content, while Indian steam coal has, since 2012, been reported under 17 grades based on its gross calorific value (GCV). It was previously graded according to its Useful Heat Value. Production of G10 to G13 grades (GCV from 3,400 to 4,600 kcal/kg) dominates.

Table 23: Steam coal grades and production by grade in FY2014

Grades	GCV range (kcal/kg)	CIL production (Mt)	Indian production (Mt)
G1	GCV exceeding 7000	0.33	6.13
G2	GCV between 6701 and 7000	0.42	0.42
G3	GCV between 6401 and 6700	5.37	5.37
G4	GCV between 6101 and 6400	18.59	21.53
G5	GCV between 5801 and 6100	12.29	13.24
G6	GCV between 5501 and 5800	14.08	17.71
G7	GCV between 5201 and 5500	28.33	35.84
G8	GCV between 4901 and 5200	20.99	28.27
G9	GCV between 4601 and 4900	45.73	57
G10	GCV between 4301 and 4600	51.72	55.41
G11	GCV between 4001 and 4300	107.69	126.33
G12	GCV between 3701 and 4000	52.02	56.37
G13	GCV between 3401 and 3700	55.23	68.98
G14	GCV between 3101 and 3400	0.66	4.56
G15	GCV between 2801 and 3100	0	3.86
G16	GCV between 2501 and 2800	0	3.09
G17	GCV between 2201 and 2500	0	4.79
TOTAL		413.45	508.9

Source : Coal Controller's Organisation.

Annex 4: Norms for coal consumption of power plants

Table 24: Annual coal consumption of power plants: norms issued on 15 January 2015

Grade	GCV considered (Kcal/kg)	Subcritical Technology				Supercritical units
		Less than 100 MW	100 MW to less than 200 MW	200 MW to less than 250 MW	250 MW and above	
		Unit Heat Rate (kcal/kWh)				
		2770	2615	2500	2375	
Annual coal consumption at 85% PLF (tons per MW per annum)						
G4	6,100	3,381	3,192	3,052	2,899	2,746
G5	5,800	3,556	3,357	3,209	3,049	2,889
G6	5,500	3,750	3,540	3,385	3,215	3,046
G7	5,200	3,966	3,744	3,580	3,401	3,222
G8	4,900	4,209	3,974	3,799	3,609	3,419
G9	4,600	4,484	4,233	4,047	3,844	3,642
G10	4,300	4,797	4,528	4,329	4,113	3,896
G11	4,000	5,156	4,868	4,654	4,421	4,188
G12	3,700	5,574	5,263	5,031	4,780	4,528
G13	3,400	6,066	5,727	5,475	5,201	4,928
G14	3,100	6,653	6,281	6,005	5,705	5,404
G15	2,800	7,366	6,954	6,648	6,316	5,983

Note: The table shows the coal savings that can be achieved from moving from subcritical to supercritical plants, and also from moving from low-grade coal to high-grade coal.

Source: CEA.²⁸⁰

²⁸⁰ CEA, January 2015, http://www.cea.nic.in/reports/articles/thermal/coal_cons_norms.pdf



Annex 5: Results of e-auctions

First two rounds of auctions held in February and March 2015

Coal Block	Reserves (Mt)	Expected output in FY2015 (Mt)	Expected output as per mining plan (Mt)	Name of successful bidder	Bid price (INR/ton)	End-use	Prior Allottee
Results of e-auction for Schedule II mines							
Amelia (North)	70.3	1.5	2.8	Jaiprakash Power Ventures Limited	712	Power	Madhya Pradesh State Mining Corporation
Ardhagram (a)	19.3	0.3	0.4	OCS Iron & Steel Limited	2,302	Non-regulated sector	Sova Ispat Limited, JaiBalaj Sponge Limited
Belgaon	8	0.24	0.27	Sunflag Iron & Steel Company Limited	1,785	Non-regulated sector	Sunflag Iron & Steel Ltd
Bicharpur	29.1	0.03	0.75	Ultratech	3,003	Non-regulated sector	Madhya Pradesh State Mining Corporation Limited (MPSMC)
Chotia	25.9	1	1	Bharat Aluminium Company Limited	3,025	Non-regulated sector	Prakash Industries Limited
Gare-Palma IV/1 (b)	114.2	6	6	Bharat Aluminium Company Limited	1,585	Non-regulated sector	Jindal Steel & Power Limited
Gare-Palma-IV/2 & IV/3 (2 blocks) (b)	187.2	6.25	6.9	Jindal Steel & Power Limited	108	Power	Jindal Steel & Power Limited
Gare-Palma-IV/4	15.4	1	1	Hindalco Industries Ltd	3,001	Non-regulated sector	Jayaswal Neco Limited
Gare-Palma-IV/5	50	1	1	Hindalco Industries Ltd	3,502	Non-regulated sector	Monet Ispat Limited
Gare-Palma-IV/7	57	1.2	1.2	Monnet Ispat & Energy Limited	2,616	Non-regulated sector	Sarda Energy & Minerals Limited
Kathautia	26	0.8	0.8	Hindalco Industries Ltd	2,860	Non-regulated sector	Usha Martin Ltd
Mandla North	84	0.01	1.5	Jaiprakash Associates Limited	2,505	Non-regulated sector	Jaiprakash Associates Ltd
Marki Mangli-III	4.2	0.36	0.21	BS ISPAT	918	Non-regulated sector	Shree Veerangana Steels Limited
Sarisatolli	83	2.8	3.5	CESC Limited	470	Power	CESC Ltd
Sial Ghoghri	5.7	0.13	0.3	Reliance Cement Company Private Limited	1,402	Non-regulated sector	Prism Cement Ltd
Talabira-I	28.8	2.5	3	GMR Chattisgarh Energy Limited	478	Power	Hindalco Industries Ltd
Tokisud North	52	na	2.32	Essar Power M. P. Limited	1,110	Power	GVK Power (Govindwal Sahib) Ltd
Trans Damodar	48.4	1	1	The Durgapur Projects Limited	940	Power	West Bengal Mineral Dev. & Trading Corp. Ltd
TOTAL	908.5	26.12	33.95				
Results of e-auction for Schedule III mines							
Brinda and Sasai (2 blocks)	25.4		0.68	Usha Martin Limited	1,804	Non-regulated sector	Abhijeet Infrastructure Pvt. Ltd.
Dumri	46.1		1	Hindalco Industries Ltd	2,127	Non-regulated sector	Nilachal Iron & Power Ltd., Bajrang Ispat Pvt. Ltd.
Ganeshpur	91.8		4	GMR Chattisgarh Energy Limited	704	Power	Tata Steel Ltd, Adhunik Thermal Energy
Gare Palma IV/8	11.8		1.2	Ambuja Cements Limited	2,291	Non-regulated sector	Jayaswal Neco Ltd
Jitpur	65.5		2.5	Adani Power Limited	302	Power	Jindal Steel & Power Ltd
Lohari	9		0.2	Araanya Mines Private Limited	2,438	Non-regulated sector	Usha Martin Ltd.
Mandakini	287.9		7.5	Mandakini Exploration and Mining Limited	650	Power	Monet Ispat Energy Ltd, Jindal Photo Ltd, Tata Power Company Ltd
Mandla South	13.4		0.3	Jaypee Cement Corporation Limited	1,852	Non-regulated sector	Madhya Pradesh State Mining Corporation Ltd
Meral	12.7		0.44	Trimula Industries Limited	727	Non-regulated sector	Abhijeet Infrastructure Pvt. Ltd.
Moitra	29.9		1	JSW Steel Limited	1,512	Non-regulated sector	Jayaswal Neco Ltd
Nerald Malegaon	10.3		0.36	Indrajit Power Private Limited	660	Non-regulated sector	Gupta Metallics & Power Ltd., Gupta Coalfields & Washeries Ltd.
Tara (b)	166.9		6	Jindal Power Ltd	126	Power	Chhattisgarh Mineral Development Corporation Limited
Utkal-C	123.9		3.37	Monnet Ispat & Energy Limited	770	Power	Uktal Coal Ltd
TOTAL	894.6		28.55				

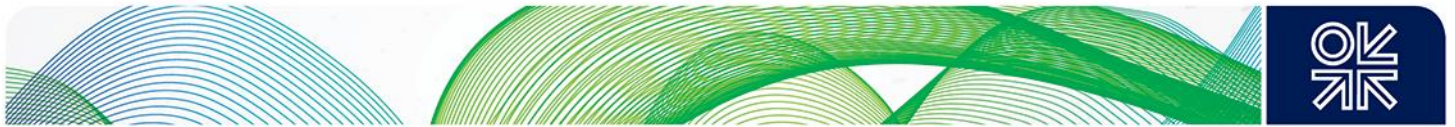
Note: a) Although successful bidder was declared, the mine has been handed over to Designated Custodian, in view of a Court Case; b) Not allocated (rejected by the government).

Sources: MoC; MSTC; BMI.

Annex 6: Coal blocks allotted to PSUs

Name of new allottee	Coal Block	Geological Reserves (Mt)	Expected output in FY2015 (Mt)	Prior allottee
Schedule II mines				
Damodar Valley Corporation	Kagra Joydev	196	na	Damodar Valley Corporation
Karnataka Power Corporation Ltd.	Baranj-I	10.9	0.18	Karnataka Power Corporation Ltd.
Karnataka Power Corporation Ltd.	Baranj-II	14.2	0.23	Karnataka Power Corporation Ltd.
Karnataka Power Corporation Ltd.	Baranj-III	28	0.46	Karnataka Power Corporation Ltd.
Karnataka Power Corporation Ltd.	Baranj-IV	15.3	0.25	Karnataka Power Corporation Ltd.
Karnataka Power Corporation Ltd.	Kiloni	39.5	0.65	Karnataka Power Corporation Ltd.
Karnataka Power Corporation Ltd.	Manora Deep	44.7	0.73	Karnataka Power Corporation Ltd.
Punjab State Electricity Board	Pachwara Central	562	7	Punjab State Electricity Board
Rajasthan Rajya Vidyut Utpadan Nigam	Parsa East	180	2.75	Rajasthan Rajya Vidyut Utpadan Nigam
Rajasthan Rajya Vidyut Utpadan Nigam	Kanta Basan	180	2.75	Rajasthan Rajya Vidyut Utpadan Nigam
West Bengal Power Development	Barjora (North)	85.5	2.2	Damodar Valley Corporation
West Bengal Power Development	Barjora	8	0.5	West Bengal Power Development
West Bengal Power Development	Gangaramchak	10	0.01	West Bengal Power Development
West Bengal Power Development	Gangaramchak-Bhadulia	4	0.01	West Bengal Power Development
West Bengal Power Development	Pachwara North	126	4	West Bengal Power Development
West Bengal Power Development	Tara (East)	84.5	0.8	West Bengal State Electricity Board
West Bengal Power Development	Tara (West)	126	1.2	West Bengal Power Development
TOTAL		1714.6	23.72	
Schedule III mines				
Bihar State Power Generation Company Limited	Badam			Tenughat Vidyut Nigam Limited
Chhattisgarh State Power Generation Company Limited	Gare Palma Sector III			Goa Industrial Development Corporation
Chhattisgarh State Power Generation Company Limited	Gidhmuri			Chhattisgarh State Electricity Board
Chhattisgarh State Power Generation Company Limited	Paturia			Chhattisgarh State Electricity Board
Gujarat State Electricity Corporation Limited	Gare Palma Sector I			Chhattisgarh Mineral Development Corporation Limited
Jharkhand Urja Utpadan Nigam Limited	Banhardih			Jharkhand State Electricity Board
Maharashtra State Power Generation Company Limited	Gare Palma Sector II			Maharashtra State Mining Corporation Limited/Tamil Nadu State Electricity Board
NTPC Limited	Kerandari			NTPC Limited
NTPC Limited	Talaipali			NTPC Limited
NTPC Limited	Chatti Bariatu			NTPC Limited
NTPC Limited	Chatti Bariatu (South)			NTPC Limited
NTPC Limited	Dulanga			NTPC Limited
Odisha Coal and Power Limited	Manoharpur			Odisha Power Generation Corporation
Odisha Coal and Power Limited	Dipside Manoharpur			Odisha Power Generation Corporation
Rajasthan Rajya Vidyut Utpadan Nigam Limited	Parsa			Chhattisgarh State Electricity Board
Tenughat Vidyut Nigam Limited	Rajbar E & D			Tenughat Vidyut Nigam Limited
Telangana State Power Generation Company Limited	Tadicherla - I			Andhra Pradesh Power Generation Corporation Limited
The Singareni Collieries Company Limited	Naini			Gujarat Mineral Development Corporation, Pondichery Industrial Promotion Development and Investment Corporation Limited
SAIL	Sitanala			SAIL
UP Rajya Vidyut Utpadan Nigam Limited	Saharpur Jamarpani			Damodar Valley Corporation
West Bengal Power Development	Kasta (East)			Damodar Valley Corporation

Sources: Ministry of Coal; MSTC; BMI.



Annex 7: Exchange rates

India reports financial data in lakh and crore.

1 Lakh = INR 100,000

1 crore = 100 Lakh = INR 10,000,000

Data in lakh and crore have been converted in US\$, with the following exchange rates:

FY2010: 47.4

FY2011: 45.6

FY2012: 47.9

FY2013: 54.4

FY2014: 60.5

(Economic Survey 2014–2015)

FY2015: 61.1 (x-rates)

Beginning of FY2016: 63



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References

- ABC, Adani CEO says India will remain an importer of coal, 25 May 2015, <http://www.abc.net.au/news/2015-05-25/adani-ceo-speaks-to-faithful-in-mackay/6494536>
- Adani, Adani group: new form and new substance, 20 June 2015, http://www.adani.com/Common/Uploads/InvestorRelationTemplate/19_InvBotDL_Adani%20Group%20Presentation%20Jun%2015.pdf
- Australian Financial Review (AFR), Adani granted approval for Carmichael mine, 15 October 2015, <http://www.afr.com/business/mining/adani-granted-approval-for-carmichael-mine-20151015-gk9wz5>
- AFR, India to fuel Adani's coal expansion, 16 June 2015, <http://www.afr.com/business/mining/coal/india-to-fuel-adanis-coal-expansion-20150616-ghpg3x#ixzz3jupRRhxV>
- Anand M.R., Prasad D.N, Recent trends in production and import of coal in India, Ministry of Coal Occasional Working paper Series No. 1, 13 October 2013 http://www.coal.nic.in/sites/upload_files/coal/files/coalupload/wp101014.pdf
- Australian Government, Office of the Chief Economist, Coal in India, 2015, Department of Industry and Science, <http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Pages/Coal-in-India.aspx>
- Australian Government, Office of the Chief Economist, Resources and Energy Quarterly, September Quarter 2015, September 2015 Department of Industry and Science, <http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Pages/Resources-and-energy-quarterly.aspx>
- Barnes Ian, Upgrading the efficiency, IEA Clean Coal Centre 2014, Cornerstonemag.com, Volume 3, Issue 1, Spring 2015, <http://cornerstonemag.net/upgrading-the-efficiency-of-the-worlds-coal-fleet-to-reduce-co2-emissions/>
- BBC news, Adani's Australian coal prospects in doubt, 9 August 2015, <http://www.bbc.com/news/world-australia-33815059>
- Bloomberg, World's Worst Air Spurs Modi's \$25 Billion Utility Clean-Up Push, 4 May 2015, <http://www.bloomberg.com/news/articles/2015-05-04/world-s-worst-air-spurs-modi-s-25-billion-utility-clean-up-push>
- BMI, Industry Trend Analysis - India Coal Crackdown: Sector Implications, November 2014, BMI Research, <http://www.mining-insight.com/industry-trend-analysis-india-coal-crackdown-sector-implications-nov-2014>
- BP, Statistical Review of World Energy 2015, June 2015, <http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy.html>
- Business Line, Singareni Collieries set to set higher production target, 16 July 2015, <http://www.thehindubusinessline.com/companies/centre-assures-support-to-singareni-projects-expansion/article7429962.ece>
- Business Line, Coal mine auctions: 12 out of 28 winners wait for clearances to start mining, 14 July 2015, <http://www.thehindubusinessline.com/economy/coal-mine-auctions-12-out-of-28-winners-wait-for-clearances-to-start-miningcoal-mine-auctions-12-out-of-28-winners-wait-for-clearances-to-start-mining/article7422041.ece>



Business Line, Commercial mining: Coal Ministry seeks to finalise model for contracts, 24 June 2015, <http://www.thehindubusinessline.com/news/stakeholder-consultations-on-roadmap-for-commercial-coal-miningbegin/article7345959.ece>

Business Line, Will coal linkage auctions really help the deregulated sector? 10 June 2015, <http://www.thehindubusinessline.com/economy/will-coal-linkage-auction-really-help-the-deregulated-sector/article7306238.ece>

Business Line, Thermal coal imports will stop by 2017: Goyal, 15 May 2015, <http://www.thehindubusinessline.com/economy/thermal-coal-imports-must-be-stopped-goyal/article7209584.ece?ref=relatedNews>

Business Line, Delay in price hike hits Coal India profits, 4 March 2015, <http://www.thehindubusinessline.com/companies/delay-in-price-hike-hits-coal-india-profits/article6959717.ece>

Business Standard, New power plants face strain on insufficient off-take agreements: India Ratings, 4 August 2015, http://www.business-standard.com/article/companies/new-power-plants-face-strain-on-insufficient-off-take-agreements-india-ratings-115080300281_1.html

Business Standard, FICCI designs model for commercial mining, 22 June 2015; http://www.business-standard.com/article/economy-policy/ficci-designs-model-for-commercial-coal-mining-115062200030_1.html

Business Standard, CIL's underground coal output declines 3% to 35 MT in FY15, 18 May 2015, http://www.business-standard.com/article/pti-stories/cil-s-underground-coal-output-declines-3-to-35-mt-in-fy15-115051801299_1.html

Business Standard, Power purchase rules changed, 7 May 2015, http://www.business-standard.com/article/economy-policy/centre-amends-rules-for-power-procurement-by-distribution-licensees-from-coal-based-projects-115050600662_1.html

Business Standard, Power charges: Leeway to be tightened, 17 April 2015, http://www.business-standard.com/article/economy-policy/power-charges-leeway-to-be-tightened-115041400889_1.html

Business Standard, Coal block re-allocation: States, PSUs get back lost mines, 25 March 2015, http://www.business-standard.com/article/economy-policy/coal-block-re-allocation-states-psus-get-back-lost-mines-115032500025_1.html

Business Standard, Efficiency of India's coal based power plants way below global, 21 February 2015, http://www.business-standard.com/article/pti-stories/efficiency-of-india-s-coal-based-power-plants-way-below-global-115022100510_1.html

Business Standard, Coal India designs roadmap for 1-bn-tonne coal production, 20 February 2015, http://www.business-standard.com/article/companies/coal-india-designs-roadmap-for-1-bn-tonne-coal-production-115022000986_1.html

Business Standard, 'Coal Ministry issues mine development, production agreement for upcoming e-auction', 23 January 2015, http://www.business-standard.com/article/economy-policy/coal-ministry-issues-mine-development-production-agreement-for-upcoming-e-auction-115012300710_1.html Business Standard, No-go ghost still haunts Coal India, 22 May 2012, http://www.business-standard.com/article/companies/no-go-ghost-still-haunts-coal-india-112052200055_1.html

Central Electricity Authority (CEA), http://www.cea.nic.in/new_website/

CEA, Monthly generation reports, June 2015, http://www.cea.nic.in/reports/monthly/generation_rep/actual/jun15/opm_11.pdf and http://www.cea.nic.in/reports/monthly/generation_rep/actual/jun15/opm_01.pdf



CEA, Revision of electricity generation target of 2015-16, 5 May 2015, http://www.cea.nic.in/reports/articles/god/generation_target_1516.pdf

CEA, Load generation balance report 2015-16, May 2015, http://www.cea.nic.in/reports/yearly/lgbr_report.pdf

CEA, Growth of Electricity Sector in India from 1947-2015, April 2015, http://www.cea.nic.in/reports/planning/dmlf/growth_2015.pdf

CEA, Monthly Report on broad status of thermal power projects in the country, April 2015, http://www.cea.nic.in/reports/proj_mon/broad_status.pdf

CEA, Executive Summary, Power Sector, various issues, monthly, http://www.cea.nic.in/exesum_cood.html

Central Statistics Office, Energy Statistics 2015, March 2015, http://mospi.nic.in/mospi_new/upload/energy_stats_2015_26mar15.pdf

Centre for Science and Environment (CSE), First year of NDA rule, 2015, <http://cseindia.org/userfiles/Factsheet-One-year-review.pdf>

Climate Action Tracker, countries: India, 2015, <http://climateactiontracker.org/countries/india.html>

Climate policy initiative, Three ways to attract domestic institutional investment for renewable energy projects in India, September 2015, <http://climatepolicyinitiative.org/2015/09/10/three-ways-to-attract-domestic-institutional-investment-for-renewable-energy-projects-in-india/>

Coal Age, CIL Withdraws from ICVL, 26 March 2015, <http://www.coalage.com/news/world-news/4309-cil-withdraws-from-icvl.html#.VRyl4PmsXul>

Coal Age, India's NTPC to Emerge as Country's Second Largest Coal Miner, 2 January 2015, <http://www.coalage.com/news/world-news/4156-india-s-ntpc-to-emerge-as-country-s-second-largest-coal-miner.html#.VebuaPntmkp>

Coal Controller's Organisation (CCO), Provisional Coal Statistics 2014-2015, Ministry of Coal, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/Provisional_Coal_Statistics_2014-15.pdf

CCO, Coal Statistics 2013-2014, April 2015, (and previous issues) Ministry of Coal, http://coal.nic.in/sites/upload_files/coal/files/coalupload/coaldir13-14.pdf

Coal India Limited (CIL), 2014-15 Annual Report and Accounts, August 2015, [https://www.coalindia.in/DesktopModules/DocumentList/documents/Annual_Report_&_Accounts_2014-15_Shareholder_version_03082015\(1\).pdf](https://www.coalindia.in/DesktopModules/DocumentList/documents/Annual_Report_&_Accounts_2014-15_Shareholder_version_03082015(1).pdf)

CIL, Roadmap for enhancement of coal production, 26 May 2015, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/RoadMap_for_Enhancement_of_Coal_Production_26052015.pdf

CIL, Monthly production: <https://www.coalindia.in/en-us/performance/physical.aspx>

Coal Junction, Govt's underground coal mining plan hits hurdles, 3 July 2015, http://www.coaljunction.in/news/n_newsdetail/Govt-s-underground-coal-mining-plan-hits-hurdles_1#sthash.EB5heJle.dpuf

Coal Junction, Aggressive bidding for coal mines detrimental to returns: ICRA, 31 Mar 2015, http://www.coaljunction.in/news/n_newsdetail/Aggressive-bidding-for-coal-mines-detrimental-to-returns-ICRA_1#sthash.ixjrQDHR.dpuf

Coal Junction, Rail freight on grains, coal, cement to increase from April 1, 31 Mar 2015, http://www.coaljunction.in/news/n_newsdetail/Rail-freight-on-grains-coal-cement-to-increase-from-April-1_1#sthash.btJqebmj.dpuf



CMPDI, Preparations for 925 Million Tonne Production from CIL in 2019-20, February 2015, http://coal.nic.in/sites/upload_files/coal/files/coalupload/cil/CMPDI%20presentation%20for%2020%20Jan%202015.pptx

Credit Suisse, India Utilities Sector, 14 May 2015, Credit Suisse Equity Research, https://doc.research-and-analytics.csfb.com/docView?language=ENG&source=ulg&format=PDF&document_id=1048655381&serialid=iiSMLBOelBNI6aB3r5Kd4X3PYZnVWI6pkOLi%2BWR7%2BFM%3D

Daiwa Capital Market, Coal India, New volume target: 1 bn tonnes by 2019, 3 November 2014, http://asiaresearch.daiwacm.com/eg/cgi-bin/files/Coal_India_141103.pdf

Deutsche Bank, Make way for the sun, 19 July 2015, <https://www.db.com/cr/en/docs/Deutsche-Bank-report-Make-way-for-the-Sun.pdf>

DNA India, Centre relaxes norms after coal e-auction flops, 19 October 2015, <http://www.dnaindia.com/money/report-centre-relaxes-norms-after-coal-e-auction-flops-2136266>

DNA India, Land Acquisition Delays: Reliance Power terminates 3,960 MW Talaiya power plant, 28 April 2015, <http://www.dnaindia.com/money/report-land-acquisition-delays-reliance-power-terminates-3960-mw-talaiya-power-plant-2081351>

DNA, Government issues draft rules for coal block auction, 19 December 2014, <http://www.dnaindia.com/money/report-government-issues-draft-rules-for-coal-block-auction-2045211>

Economic Times, Coal India to tweak e-auctions to check falling prices, 18 August 2015, http://articles.economictimes.indiatimes.com/2015-08-18/news/65530391_1_coal-production-state-run-coal-india-e-auctions

Economic Times, 'Third tranche of coal auctions from Tuesday; 22 bids qualify', 8 August 2015, http://articles.economictimes.indiatimes.com/2015-08-08/news/65350952_1_coal-auction-coal-block-marki-mangli

Economic Times, Imported coal stocks pile up at a record high of 16 Mt as power firms stop spot buy, 15 June 2015, <http://economictimes.indiatimes.com/industry/indl-goods/svs/metals-mining/imported-coal-stocks-pile-up-at-a-record-high-of-16-mt-as-power-firms-stop-spot-buy/articleshow/47670179.cms>

Economic Times, Auctioning linkages to bring in transparency, not necessarily to benefit Coal India: Anil Swarup, Coal Secretary, 5 June 2015, http://economictimes.indiatimes.com/articleshow/47551545.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

Economic Times, India sees lowest plant load factor in 15 years; power capacities operating at 65%, 29 May 2015, http://economictimes.indiatimes.com/industry/energy/power/india-sees-lowest-plant-load-factor-in-15-years-power-capacities-operating-at-65/articleshow/47463610.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

Economic Times, Large projects will ensure 24x7 power for all in next five years: Piyush Goyal, 18 May 2015, http://economictimes.indiatimes.com/articleshow/47321714.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

Economic Times, NTPC not to import coal in Q1, cites sufficient CIL supply, 27 April 2015, http://articles.economictimes.indiatimes.com/2015-04-27/news/61578134_1_coal-india-coal-stock-coal-supply



Economic Times, Coal India draws logistics strategy to push coal evacuation, 19 April 2015, http://articles.economictimes.indiatimes.com/2015-04-19/news/61303962_1_coal-india-sutirtha-bhattacharya-eastern-coalfields

Economic Times, Coal India arm achieves record exploration in FY15, 13 April 2015, http://articles.economictimes.indiatimes.com/2015-04-13/news/61102903_1_coal-india-arm-cmpdi-ak-debnath

Economic Times, Government decides to speed up Rs 90,000 crore power projects, 9 March 2015, http://articles.economictimes.indiatimes.com/2015-03-09/news/59931864_1_land-acquisition-law-lakh-crore-nabinagar

Economic Times, India to add 1,00,000 MW clean coal tech-based power capacity, 3 March 2015, http://articles.economictimes.indiatimes.com/2015-03-03/news/59725414_1_power-generation-coal-market-total-installed-capacity

Economic Times, Coal auction lessons: Investors are willing to bet capital when transparent policy is offered, 22 February 2015, http://articles.economictimes.indiatimes.com/2015-02-22/news/59386540_1_coal-auction-schedule-ii-coal-mines-end-use

Economic Times, Scheme to swap coal supplies with nearest fuel source gets government nod, 4 February 2015, http://articles.economictimes.indiatimes.com/2015-02-04/news/58795878_1_coal-india-ltd-coal-supplies-damodar-valley-corp

Economic Times, Making efforts to settle project related issues: Coal Ministry to PMO, 11 January 2015, http://articles.economictimes.indiatimes.com/2015-01-11/news/57941134_1_coal-ministry-coal-mining-projects-coal-output

Economic Times, IPCC for phasing out coal, but India plans to make coal washing mandatory, 8 November 2014, http://articles.economictimes.indiatimes.com/2014-11-08/news/55836080_1_coal-washeries-coal-mining-projects-unwashed-coal

Economic Times, Centre puts 90 of Coal India's mining projects worth Rs 88k crore on fast track, 3 November 2014, http://articles.economictimes.indiatimes.com/2014-11-03/news/55720014_1_coal-ministry-coal-india-limited-coal-block

Economic Times, Coal India plans to utilise underground resources for boosting production figures, 13 October 2014, http://articles.economictimes.indiatimes.com/2014-10-13/news/54970708_1_underground-mines-new-mines-coal-india

Economic Times, Environment ministry unveils online system for submission and monitoring of forest clearance proposals, 16 July 2014, http://articles.economictimes.indiatimes.com/2014-07-16/news/51600486_1_clearance-environment-ministry-forest-rights-act

Energy Global, Power tariff regulations and thermal coal demand, 29 July 2013, http://www.energyglobal.com/upstream/special-reports/29072013/Salva_Report_India_power_tariff_regulations_and_thermal_coal_demand_285/

Energysector.in, Coal India Limited Plans To Reduce Workforce, 26 May 2015, <http://www.energysector.in/coal-news/coal-india-limited-plans-to-reduce-workforce>

Energysector.in, Coal India To Go For PPP Model For Coal Production, 14 April 2015, <http://www.energysector.in/coal-news/coal-india-to-go-for-ppp-model-for-coal-production>

Energysector.in, CIL Gets Interim Custody of 3 Coal Blocks, 30 March 2015, <http://www.energysector.in/coal-news/cil-gets-interim-custody-of-3-coal-blocks>

Energy sector.in, Steps to increase coal production from underground mines, 2 August 2014, <http://www.energysector.in/coal-news/steps-to-increase-coal-production-from-underground-mines-august-2014>



EPR, How to reduce emissions in coal-based power plants, 15 July 2015, <http://www.eprmagazine.com/article.php?ItemId=1209%20%20CategoryId=5>

EPR, Coal-linkage to captive power plants: the inside story, 16 June 2015, <http://www.eprmagazine.com/article.php?ItemId=1183%20%20CategoryId=5>

EPR, Time to rise to the occasion and support CPP, 13 May 2014, <http://www.eprmagazine.com/article.php?ItemId=751%20%20CategoryId=4>

Express News Service, Singareni to Blend Its Coal with Exotic Coal, 13 March 2015, http://www.newindianexpress.com/states/andhra_pradesh/Singareni-to-Blend-Its-Coal-with-Exotic-Coal/2015/03/13/article2711155.ece

Financial Express, Coal India goes for makeover, 3 June 2015, <http://www.financialexpress.com/article/industry/companies/coal-india-goes-for-makeover/79443/>

Financial Express, India to stop imports of low grade thermal coal in two years, says Piyush Goyal, 15 May 2015, <http://www.financialexpress.com/article/economy/india-to-stop-imports-of-low-grade-thermal-coal-in-two-years-says-piyush-goyal/72786/>

Financial Express, Coal India mines SPVs for 1-bn-tonne mark, 21 February 2015, <http://www.financialexpress.com/article/economy/coal-india-mines-spvs-for-1-bn-tonne-mark/45499/>

Geological Survey of India, Coal resources in India, 2015, http://www.portal.gsi.gov.in/portal/page?_pageid=127,721708&_dad=portal&_schema=PORTAL

Geonosis, FIS lenders helping developers in coal auctions to avoid bad assets, Volume 2, Issue 4, March 2015

Global CemFuels, Coal India to form coal joint venture with India Railways, 1 April 2015, <http://www.cemfuels.com/news/item/2856-coal-india-to-form-coal-joint-venture-with-india-railways>

Government of India (GOI), Cabinet Committee on Economic Affairs (CCEA), Approval to innovative mechanism for utilization of stranded gas based generation capacity, 25 March 2015, <http://pib.nic.in/newsite/PrintRelease.aspx?relid=117698>

GOI, Economic Survey 2014-15, February 2015, <http://indiabudget.nic.in/es2014-15/echapter-vol1.pdf>

GOI, Budget 2015-2016, Speech of Arun Jaitley, Minister of Finance, February 28, 2015, <http://indiabudget.nic.in/bspeecha.asp>

GOI, Press Information Bureau (PIB), <http://pib.nic.in/newsite/mainpage.aspx>

Green Clearance Watch, <http://www.greenclearancewatch.org/>

Hindustan Times, Modi govt's energy policy to now focus on renewable supply, 3 May 2015, <http://www.hindustantimes.com/india-news/modi-govt-s-energy-policy-to-now-focus-on-renewable-supply/article1-1343629.aspx>

ICRA, Power Sector: Structural issues continue; Aggressive bidding in coal auction lead to increased vulnerability, though positive steps being taken to improve fuel supply, Executive Summary, July 2015, ICRA Research Services, <http://www.icra.in/Files/ticker/SH-2015-Q2-2-ICRA-Power.pdf>

India Energy Forum, Post Coal Auction Worries for Power Sector, Total Energy, Vol-9, Issue II, March-April 2015,

Indian Express, Coal with increased ash content, panel gives go ahead for imports, 8 October 2015, <http://indianexpress.com/article/business/business-others/coal-with-increased-ash-content-panel-gives-go-ahead-for-imports/#sthash.dTshpfp.dpuf>



Indian Express, Not to re-promulgate land ordinance is not a setback for government, says Arun Jaitley, 31 August 2015, <http://indianexpress.com/article/india/india-others/not-to-re-promulgate-land-ordinance-is-not-a-setback-for-government-says-arun-jaitley/>

Indian Express, Coal Ministry may ask Discoms to get clearances before bidding, 28 June 2015, <http://indianexpress.com/article/business/companies/coal-ministry-may-ask-discoms-to-get-clearances-before-bidding/>

Indian Express, Small bidders wary of methodology for CIL output auction, 15 June 2015, <http://indianexpress.com/article/business/business-others/small-bidders-wary-of-methodology-for-cil-output-auction/#sthash.gG6QrNd9.dpuf>

Indian Express, Integrated energy policy soon to meet growing demand: NITI, 14 April 2015, <http://indianexpress.com/article/business/business-others/integrated-energy-policy-soon-to-meet-growing-demand-niti/#sthash.dFXgAg4Y.dpuf>

Institute for Energy Economics and Financial Analysis (IEEFA), India's electricity-sector transformation, August 2015, <http://ieefa.org/wp-content/uploads/2015/08/IEEFA-Indian-Electricity-Sector-Transformation-11-August-2015.pdf> International Coal Ventures Private Limited (ICVL), <http://icvl.in/aboutus.php?tag=company-aboutus>

International Energy Agency (IEA), Key world energy statistics 2014, 2015, <http://www.iea.org/publications/freepublications/publication/keyworld2014.pdf>

IEA, Medium-Term Coal Market Report, IEA/OCDE, December 2014, https://www.iea.org/bookshop/495-Medium-Term_Coal_Market_Report_2014

IEA, World Energy Outlook 2014, IEA/OCDE, November 2014, <http://www.worldenergyoutlook.org/publications/weo-2014/>

IEA, Energy Technology Perspectives, IEA/OCDE, 2014, <http://www.iea.org/etp/etp2014/>

IEA, Why most coal avoids a bath, 15 July 2014, <http://www.iea.org/ieaenergy/issue6/why-most-coal-avoids-a-bath.html>

IEA, Understanding energy challenges in India, IEA/OCDE, 2012, https://www.iea.org/publications/freepublications/publication/India_study_FINAL_WEB.pdf

Livemint, Lack of power demand hits NTPC in Q4, 1 June 2015, <http://www.livemint.com/Money/Da7HXF37MWKMOX3FVRPWRM/Lack-of-power-demand-hits-NTPC-in-Q4.html>

Livemint, Coal block auction bids cross Rs1.5 trillion, 9 March 2015, <http://www.livemint.com/Politics/xzmEfJHP67CcKdiPYsJryK/Coal-block-auction-bids-cross-Rs-15-trillion.html>

Livemint, Five ultra-mega power projects feature in Union Budget 2015, 28 February 2015, <http://www.livemint.com/Politics/4PHOZ3Q2sSC1JZ3gth8mfM/Budget-2015-Finance-minister-announces-plan-for-ultra-mega.html>

Lok Sabha, Question search, <http://164.100.47.132/LssNew/psearch/Qtextsearch.aspx>

Lok Sabha, Ministry of Coal, Answer to Question No. 4042, Production of coal, 8 August 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=23216>

Lok Sabha, Ministry of Power, Answer to Question No 2835 on power generation, 6 August 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=22128>

Lok Sabha, Ministry of Power, Answer to Question No 2908, Procurement cost of power, 6 August 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=22143>



Lok Sabha, Ministry of Coal, Answer to Question No. 1712, Supply of coal, 30 July 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=20616>

Lok Sabha, Ministry of Coal, Answer to Question No. 514, Shortage of Coal, 23 July 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=19240>

Lok Sabha, Ministry of Coal, Answer to Question No. 584, Auction of coal blocks, 23 July 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=19268>

Lok Sabha, Ministry of Power, Answer to Question No. 501, Setting up of UMPP, Annex II: Details of thermal power projects lying incomplete (under construction) in the country, 23 July 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=19432>

Lok Sabha, Ministry of Power, Answer to Question No 59, Power tariff, 23 July 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=19191>

Lok Sabha, Ministry of Power, Answer to Question No 601, Pollution from thermal power plants, 23 July 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=19438>

Lok Sabha, Ministry of Power, Answer to question N° 5004, Fuel supply, 23 April 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=16840>

Mahanadi Coalfields Limited (MCL), Workshop on Technology Development for reaching 250 MT (19-20), February 2015, http://www.coal.nic.in/sites/upload_files/coal/files/coalupload/cil/Mahanadi%20Coalfields%20Ltd.ppt

McCloskey Coal Report (MCR), India's NTPC issues long-term tender, 9 January 2015, MCR Issue N° 351, and various issues

Mining Weekly, CIL shifts overseas funding to domestic markets, 28 July 2015, <http://www.miningweekly.com/article/cil-shifts-overseas-funding-to-domestic-markets-2015-07-28>

Mining Weekly, Coal India aiming to double output to one-billion tons a year by 2020, 17 July 2015, <http://www.miningweekly.com/article/coal-india-aiming-to-double-output-to-one-billion-tons-a-year-by-2020>

Mining Weekly, Longwall mining making a comeback in India, 9 June 2015, <http://www.miningweekly.com/article/long-wall-mining-making-a-comeback-in-india-2015-06-09>

Mining Weekly, CIL incremental production to be offered under auctioned supply linkages, 29 May 2015,

<http://www.miningweekly.com/article/cil-incremental-production-to-be-offered-under-auctioned-supply-linkages>

Mining Weekly, India won't consider free pricing regime for commercial coal miners, 13 April 2015, <http://www.miningweekly.com/article/india-wont-consider-free-pricing-regime-for-commercial-coal-miners-2015-04-13>

Mining Weekly, India's coal block auction to be ready by June, 27 February 2015, www.miningweekly.com/article/indias-coal-block-auction-to-be-ready-by-june-2015-02-27

Ministry of Coal (MoC), <http://www.coal.nic.in/coal/index.html>

MoC, Annual Report 2014-15, 2015, <http://coal.nic.in/content/annual-report-2014-15>

MoC, Coal supplies for power projects beyond 30.6.2015, Office Memorandum, 30 June 2015, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/300615.pdf



MoC, Minutes of the fifth meeting of the Inter-Ministerial Committee for proposed auction of coal linkages/LoAs through competitive bidding held on 04.06.2015, Office Memorandum, 24 June 2015, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/250615.pdf

MoC, Report of the new Inter-Ministerial Task Force (IMTF) on Rationalization of sources of Coal to Power plants, 2 February 2015, [http://www.indiaenvironmentportal.org.in/files/file/Report%20of%20the%20new%20Inter-Ministerial%20Task%20Force%20\(IMTF\)%20on%20Rationalization%20of%20sources%20of%20Coal%20to%20Power%20Sector.pdf](http://www.indiaenvironmentportal.org.in/files/file/Report%20of%20the%20new%20Inter-Ministerial%20Task%20Force%20(IMTF)%20on%20Rationalization%20of%20sources%20of%20Coal%20to%20Power%20Sector.pdf)

MoC, Record Note of Discussions and the Recommendations of the Workshop on "The Technology Development & Mechanization of Mines in CIL in the context of reaching 1 Billion Tonne Coal production in 2019-20" held on 20.01.2015. 19 February 2015

MoC, Electronic Coal Projects Monitoring Portal (e-CPMP), 2015, <https://esuvidha.gov.in/coal/index.php>

MoC, Government Opens A New Chapter in Coal Sector; Process of e-Auction gets Underway, 31 December 2014, <http://pib.nic.in/newsite/mbErel.aspx?relid=114221>

MoC, Meeting of the IMC to formulate a policy on coal rejects allocation for washery reject based power plants – reg, Office memorandum, 7 November 2014, http://coal.nic.in/sites/upload_files/coal/files/webform/notices/101114.pdf

MoC, Report of the Working Group on coal and lignite for formulation of the twelfth five year plan (2012-2017), 2011, http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_Coal1406.pdf

Ministry of Commerce & Industry, Import Export Data Bank, <http://commerce.nic.in/eidb/icomq.asp>

Ministry of Environment, Forests and Climate Change (MoEF), Office Memorandum J11013/5/2010-IA II, 1 September 2014, http://www.moef.gov.in/sites/default/files/Chandrapur_OM%20dated%2001.09.2014.pdf

MoEF, Guidelines for granting Environment Clearance for expansion of Coal Mining Projects involving one time Production Capacity Expansion in the existing operation - reg., OFFICE MEMORANDUM No. J-IIO15/30/2004-IA.II (M), 28 July 2014, <http://www.moef.nic.in/sites/default/files/OM%20dated%2028.07.2014%20one%20time%20expansion.pdf>

MoEF, Office Memorandum, F.No. J-11013/41/2006-IA-II (I), 5 February 2013

Ministry of Power (MoP), <http://powermin.nic.in/>

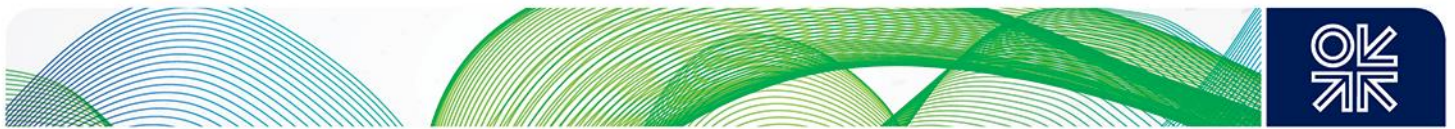
MoP, CO₂ emissions from thermal power plants, Statement at Rajya Sabha, 27 April 2015, http://powermin.nic.in/upload/pdf/RS_27072015_Eng.pdf

MoP, Import of coal target for the year 2015-16 –reg, Office Memorandum, 30 March 2015, http://www.cea.nic.in/reports/planning/coal_import_1516.pdf

MoP, 'Initiatives to Improve the Efficiency of Coal Based Power Plants', 12 March 2015, <http://pib.nic.in/newsite/PrintRelease.aspx?relid=116893>

MoP, Status of UMPP, 9 March 2015, <http://www.pib.nic.in/newsite/erelease.aspx?relid=25644>

Money Control, Reliance Power to sell off three Indonesian coal mines, 1 October 2015, www.moneycontrol.com/news/business/reliance-power-to-sell-off-three-indonesian-coal-mines_3354861.html?utm_source=ref_article



Money Control, Rupee may weaken more on China currency depreciation: Citi, 13 August 2015, http://www.moneycontrol.com/news/rupee/rupee-may-weaken-morechina-currency-depreciation-citi_2504561.html?utm_source=ref_article

Money Control, Coal auctions: Govt raises Rs 4,364 crore in third round, 14 August 2015, http://www.moneycontrol.com/news/economy/coal-auctions-govt-raises-rs-4364-crorethird-round_2512981.html?utm_source=ref_article

Money Control, Govt allots 38 coal mines to central, state PSUs, 24 March 2015, http://www.moneycontrol.com/news/economy/govt-allots-38-coal-mines-to-central-state-psus_1338504.html?utm_source=ref_article

Motilal Oswal, Coal India: Share of higher margin volumes to rise sharply, 20 August 2015, <http://www.motilaloswal.com/Financial-Services/Research/Detailed-Report/Company-Updates/13832>

MSTC Limited, Coal mine allocation, 2014 and 2015, <http://www.mstcecommerce.com/auctionhome/coalblock/index.jsp>

National Transport Development Policy Committee (NTDPC), Transportation of energy commodities, 2013, http://tripp.iitd.ernet.in/publications/NTDPC/Vol%2002-2/NTDPC%20Vol%2002_Part%202%20Ch%2008.pdf

NDTV, Government Rejects Low Winning Bids for 4 'Outlier' Coal Mines, 21 March 2015, <http://profit.ndtv.com/news/industries/article-government-rejects-low-winning-bids-for-4-outlier-coal-mines-748453>

New Indian Express, Coal India Asked to Light up 30 Ongoing Power Projects, 31 March 2015, <http://www.newindianexpress.com/business/news/Coal-India-Asked-to-Light-up-30-Ongoing-Power-Projects/2015/03/31/article2738644.ece>

New Indian Express, MoEF Eases Norms for Coal Mining Projects, 4 September 2014, <http://www.newindianexpress.com/nation/MoEF-Eases-Norms-for-Coal-Mining-Projects/2014/09/04/article2413949.ece>

Nikkei Asian Review, Modi looks to double coal production by 2020, 3 April 2015, http://asia.nikkei.com/Politics-Economy/Policy-Politics/Modi-looks-to-double-coal-production-by-2020?n_cid=NARAN012

Niti Aayog, India Energy Security Scenarios, 2047 Version 2.0, Call for evidence, June 2015, http://niti.gov.in/mgov_file/Call%20for%20Evidence-IESS%20V2/Call_for_evidence_15.06.pdf

Niti Aayog, Infrastructure: Powering Growth through Connectivity, May 2015, http://niti.gov.in/mgov_file/presentations/infrastructure-slides.pdf

NTPC Limited, <http://www.ntpc.co.in/>

NTPC Limited, Presentation at the 11th Analysts & Investors Meet held at Mumbai on 03/08/2015, 3 August 2015, <http://www.ntpc.co.in/presentations/4215/ntpcinvestorpresentation-03-08-2015>

NTPC Limited, Blending of imported/high grade coal with domestic coal, http://www.eecpowerindia.com/codelibrary/ckeditor/ckfinder/userfiles/files/Blending%20of%20Imprted%20%26%20Domestic%20Coals%20-%20Mr_%20I_K%20Rajdeva.pdf

Orissa Diary, MoU signed between Odisha govt Coal, Railway ministries for implementation of common rail corridor projects for coal evacuation, 20 April 2015, <http://www.orissadiary.com/CurrentNews.asp?id=58783#sthash.rcKmxDSi.dpuf>

Oxford Institute for Energy Studies (OIES), Gas Pricing Reform in India – Implications for the Indian gas landscape, April 2015, <http://www.oxfordenergy.org/2015/04/gas-pricing-reform-in-india-implications-for-the-indian-gas-landscape-2/>



- OIES, Energy in India, 9 March 2015, Oxford Energy Forum, Issue 99, <http://www.oxfordenergy.org/wpcms/wp-content/uploads/2015/03/OEF-99.pdf>
- OIES, China's coal market: Can Beijing tame "King coal"?, CL1, December 2014, <http://www.oxfordenergy.org/2014/12/chinas-coal-market-can-beijing-tame-king-coal-2/>
- Planning Commission, Twelfth five year plan (2012-2017), Economic sectors, Volume II, http://planningcommission.gov.in/plans/planrel/12thplan/pdf/12fyp_vol2.pdf
- Platts, Indian utilities' Apr-Jun coal imports down 4% on year to 21.5 mil mt, 17 July 2015, <http://www.platts.com/latest-news/coal/newdelhi/indian-utilities-apr-jun-coal-imports-down-4-26151475>
- Platts, India's coal industry, 27 May 2015, http://www.platts.com/news-feature/2015/coal/india-coal-transport/index?wt.mc_id=coap201505we_indiarail&wt.tsrc=eloqua
- Platts, New schemes to transport coal in India, 27 May 2015, <http://www.platts.com/news-feature/2015/coal/india-coal-transport/transport-schemes>
- Prayas (Energy Group), Largesse that wasn't: the story of coal shortages in India, March 2014, http://www.indiaenvironmentportal.org.in/files/file/Coal_Shortages_Report.pdf
- PRS Legislative Research, The Compensatory Afforestation Fund Bill, 2015, 29 May 2015, <http://www.prsindia.org/uploads/media/Compensatory%20Afforestation/Bill%20Summary-%20Compensatory%20Afforestation.pdf>
- PRS Legislative, Coal Block Allocations and the 2015 Bill, 7 March 2015, <http://www.prsindia.org/theprsblog/?p=3487>
- PRS legislative, The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Amendment) Bill, 2015, March 2015, <http://www.prsindia.org/administrator/uploads/media/Land%20and%20R%20and%20R/Bill%20Summary%2019%20LARR%20Bill%202015.pdf>
- PRS Legislative, The Mines and Minerals (Development and Regulation) Amendment Ordinance, 2015 <http://www.prsindia.org/billtrack/the-mines-and-minerals-development-and-regulation-amendment-ordinance-2015-3601/>
- PVTech, India to build green energy corridors, 8 June 2015, http://www.pv-tech.org/news/india_to_build_green_energy_corridors
- PwC for the Indian Chamber of Commerce, The Indian coal sector: Challenges and future outlook, November 2012, <https://www.pwc.in/assets/pdfs/industries/power-mining/icc-coal-report.pdf>
- Rediff.com, Govt to tap private sector to meet 1.6 bn tonne coal demand, 20 December 2014, <http://www.rediff.com/money/report/govt-to-tap-private-sector-to-meet-16-bn-tonne-coal-demand/20141220.htm>
- Responding to Climate Change (RTCC), Coal mining banned in India's Mahan forest, 25 March 2015, <http://www.rtcc.org/2015/03/24/coal-mining-banned-in-indias-mahan-forest>
- Reuters, China August coal imports drop nearly 18 pct on month, 8 September 2015, <http://www.reuters.com/article/2015/09/08/china-economy-trade-coal-idUSL4N11E1P920150908>
- Reuters, India coal imports flat in June as local supply jumps –trade, 2 July 2015, <http://af.reuters.com/article/energyOilNews/idAFL3N0Z140M20150702>
- Reuters, India to eclipse China as top coal importer in 2015, 20 May 2015, <http://in.reuters.com/article/2015/05/20/india-china-coal-idINKBN0051CD20150520>



Reuters, Coal imports jump 34 percent in 2014/15, 14 April 2015,
<http://in.reuters.com/article/2015/04/14/india-coal-imports-idINKBN0N50ZM20150414>

Reuters, Piyush Goyal Says Possible to Stop Imports of Thermal Coal in 2-3 Years, 12 November 2014, <http://profit.ndtv.com/news/industry-papers/article-piyush-goyal-says-possible-to-stop-imports-of-thermal-coal-in-2-3-years-692265>

Reuters, Power minister says \$250 billion needed to tackle energy crunch, 6 November 2014,
<http://in.reuters.com/article/2014/11/06/india-energy-investment-idINKBN0IQ0AK20141106>

Source Watch, Indian company investments in overseas coal mines,
http://www.sourcewatch.org/index.php/Indian_company_investments_in_overseas_coal_mines

The Hindu, NTPC to finalise bids for Pudimadaka plant, 8 July 2015,
<http://www.thehindu.com/news/cities/Visakhapatnam/ntpc-to-finalise-price-bids-for-pudimadaka-plant/article7397023.ece>

The Hindu, NTPC Pudimadaka project cleared by MoEF, 25 March 2015,
<http://www.thehindu.com/news/cities/Hyderabad/tor-for-ntpc-pudimadaka-project-cleared-by-moef/article7032086.ece>

Times of India, Frame own land law: Panagariya to states, 11 September 2015,
<http://timesofindia.indiatimes.com/india/Frame-own-land-law-Panagariya-to-states/articleshow/48907137.cms>

Times of India, India plans to have more clean coal technologies- Minister, 29 April 2015,
<http://timesofindia.indiatimes.com/home/environment/developmental-issues/India-plans-to-have-more-clean-coal-technology-Minister/articleshow/47099312.cms>

Times of India, NTPC to bring down coal import bill to nil in 5 years, 6 April 2015,
<http://timesofindia.indiatimes.com/business/india-business/NTPC-to-bring-down-coal-import-bill-to-nil-in-5-years/articleshow/46824586.cms>

Times of India, India raises coal import by 35% to aid power plants, 5 April 2015
<http://timesofindia.indiatimes.com/city/chennai/India-raises-coal-import-by-35-to-aid-power-plants/articleshow/46809633.cms>

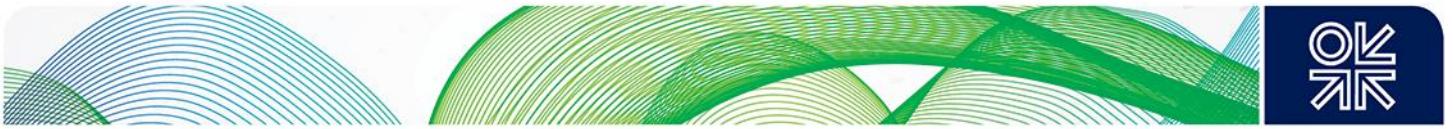
Times of India, CIL will double capex to Rs 10,000 crore in FY16 to meet production target, 27 March 2015, <http://timesofindia.indiatimes.com/business/india-business/CIL-will-double-capex-to-Rs-10000-crore-in-FY16-to-meet-production-target/articleshow/46714064.cms>

Times of India, India to invest \$4 billion to tackle power theft, 21 November 2014,
<http://timesofindia.indiatimes.com/business/india-business/India-to-invest-4-billion-to-tackle-power-theft/articleshow/45227741.cms>

Urbanemissions, Thermal Power Plants - Emissions and Health Impacts of India's Coal Expansion, April 2015,
<http://www.urbanemissions.info/images/UEI/publications/draft%20Notification%20for%20public%20comments%20for%20the%20Coal%20TPP.pdf>

UNFCCC, India's intended nationally determined contribution,
<http://www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf>

Ventura, Government mulls common coal trading platform for Coal India and private companies, 23 June 2015,
<http://content1.acesphere.com/newscontentventura/NewsDetailsPointer.aspx?NewsId=381084&SecId=7&subsecl=15>



World Bank, Global Economic Prospects, June 2015, <http://pubdocs.worldbank.org/pubdocs/publicdoc/2015/9/961521443473555360/Global-Economic-Prospects-June-2015-Global-economy-in-transition.pdf>

World Bank, India development update: towards a higher growth path, April 2015, <http://www.worldbank.org/en/news/press-release/2015/04/28/economy-upturn-india-unlock-investments-accelerate-growth>

World Bank, Beyond Crisis, The financial performance of India's power sector, November 2014, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/11/10/000333037_20141110051145/Rendered/PDF/924900PUB0978100Box385375B00PUBLIC0.pdf

X-rates, <http://x-rates.com>

4-traders.com, Mozambique mine eating into assets of ICVL, Tata's, 13 April 2015, <http://www.4-traders.com/TATA-STEEL-LIMITED-9058836/news/MOZAMBIQUE-MINE-EATING-INTO-ASSETS-OF-ICVL-TATAS-20193549/>

4-traders.com, Singareni eyes coal mines abroad, 11 April 2015, <http://www.4-traders.com/COAL-INDIA-LTD-9060008/news/Coal-India--Singareni-eyes-coal-mines-abroad-20181100/>