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ORF SPECIAL REPORT

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Modernising India's Coal Sector

This Special Report reviews the path towards the commercialisation of coal mining in India, in the context of the auctions of blocks held in the last two years, and makes an assessment of the challenges facing the sector in view of global events. It builds on discussions raised during ORF's roundtables on the subject.

EXECUTIVE SUMMARY

- Coal India Limited (CIL) has achieved an unprecedented increase in domestic coal production in 2015-16 aided by lower regulatory and logistical barriers

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within the constraints of state ownership. However, the turnaround in CIL's production efficiency has come at a time when demand and price of globally traded commodities in general, and coal in particular, have fallen to their lowest levels in a decade, raising questions over policies that exclusively focus on the quantity of coal production.

- CIL, which accounts for more than 80 percent of the total coal production of the country, has 34 billion tonnes (BT) of reserves of coking coal, or a 90-percent share in the country's coking coal reserves. As the focus of CIL is on power grade coal, coking coal production in India has stagnated for the last several years. Policy measures need to be strengthened to develop a domestic coking coal base in the country.
- Captive coal mining by consumers is not practised anywhere else in the world and is not optimal from economic, geological and ecological perspectives as it requires coal reserves to be artificially sub-divided. A review of this policy may be considered.
- India has depended on import of coking coal since the early 1980s as domestic production was unable to meet demand in terms of quantity and quality. Coking coal imports increased from 13 million tonnes (MT) in 2003-04 to about 44 MT in 2014-15, implying a compounded annual growth rate (CAGR) of 11.7 percent, but in the same period import of non-coking coal grew three times faster from 8.7 MT in 2003-04 to over 212 MT in 2014-15 (CAGR of over 33 percent). The share of non-coking coal in total coal imports increased from 60 percent in 2003-04 to about 80 percent in 2014-15. Imports of coking coal have also increased over the years. To ensure raw material security and minimise the impact of volatility in coal prices, it is desirable to increase domestic coking and non-coking coal production by putting new mineable blocks for auctions.
- The coal sector is burdened with taxes. Apart from regular taxes, mining now involves the payment for District Mineral Foundation (DMF), payment of National Mineral Exploration Trust (NMET), both as a percentage of royalty, and clean energy cess that has been increased to INR 400 per tonne for 2016-17, in addition to auction commitments. There is a need for meticulous intervention by policymakers to sustain the competitiveness of the domestic coal mining industry.
- Reform, liberalisation and privatisation of the coal industry must take into account the fact that certain rigidities that are locked up or institutionalised in the sector cannot be undone quickly. It may not be credible to expect that CIL, a holding company with several subsidiaries each of which is a monopoly in their particular geographies, would become more efficient through closer government intervention. Goal-setting and development of policy frameworks cannot be replaced by investing all resources in micromanaging CIL. The inevitable consequence is that insufficient attention is paid to dealing with institutional and framework issues. In the absence of broad-based institutional reforms, it makes sense to de-merge CIL into several constituent companies – Bharat Coking Coal Limited (BCCL) Eastern Coalfields Limited (ECL), Central

Coalfields Limited (CCL), Western Coalfields Limited (WCL), Northern Coalfields Limited (NCL), Mahanadi Coalfields Limited (MCL), South Eastern Coalfields Limited (SECL) and North Eastern Coalfields Limited (NECL) – and leave them to thrive in an environment of friendly competition.

- While 'commercial mining' is indicated in the Coal Mines (Special Provisions) Act 2015 (CMA 2015), issues such as pricing and marketing freedom need to be elaborated for putting the coal sector on the path of complete deregulation.
- A part of coking coal produced by CIL subsidiaries and currently being diverted to power plants may be allocated as long-term linkage to washeries established by steel plants for their exclusive use. Policymakers may seek requirement from steel companies and commence allocation accordingly. Going by present capacities, 5 million tonnes per annum (MTPA) of coking coal may be allocated in the first tranche. Suitable augmentation plans may be drawn up for all the existing washeries to enable them to handle all qualities of coal at least up to their installed capacities to ensure that most of the coking coal mined does get washed instead of being diverted to power plants.

INTRODUCTION

Modernising India's coal sector is generally interpreted as an effort to increase the quantity of coal production through the participation of efficient and technology-savvy private players in an industry dominated by state-owned CIL. Policies for captive mining in the mid-1990s and the effort to auction coal blocks in 2014-15 were driven by this goal. However, they have failed to live up to expectations.

Meanwhile, CIL has managed to achieve unprecedented increase in domestic coal production in 2015-16 aided by lower regulatory and logistical barriers within the constraints of state ownership. However, the turnaround in CIL's production efficiency has coincided with a fall in demand and price of globally traded commodities in general, and coal in particular, to their lowest levels in a decade, raising questions over policies that exclusively focus on the quantity of production.

This Special Report, based partly on inputs discussed at two roundtables organised by the Observer Research Foundation, aims to: (a) review the path towards commercialisation of coal mining in the context of the auctions of blocks held in the last two years; (b) assess the challenges facing the Indian coal sector in the global context; and (c) argue that modernising the sector should go beyond increasing production and emphasise on improving the competitiveness of the industry.

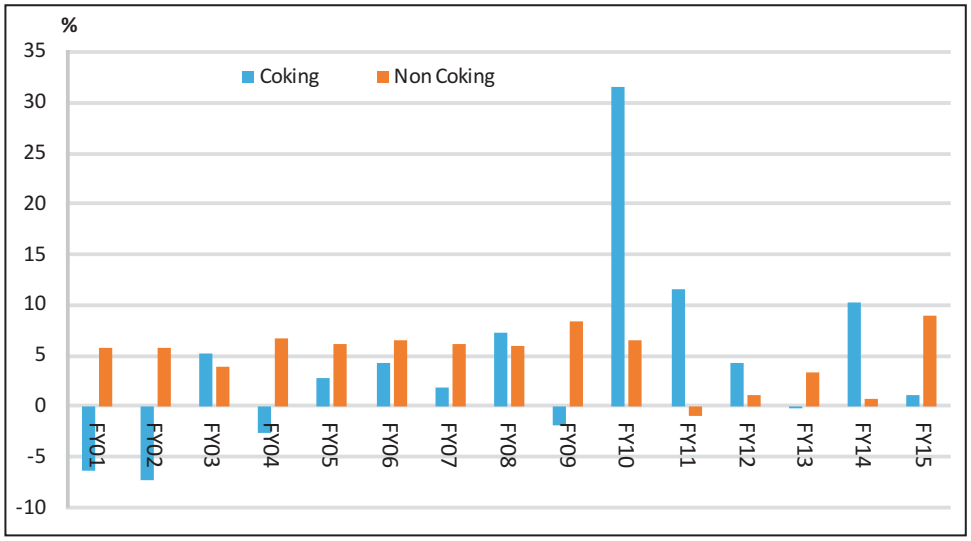
INCREASING THE QUANTITY OF COAL SUPPLY

Trends in Domestic Coal Supply

The average growth in the production of non-coking coal and lignite in the decade that followed nationalisation of the coal sector in the 1970s was 4.0 percent per year, which was lower than the average of 4.3 percent per year achieved in the decade that preceded it. Output growth picked up in the 1980s to an average of 7.8

percent, with four years posting a growth of 9.3 to 10.5 percent. This experience was not repeated in the 1990s; average growth slowed to 5.2 percent per year with only two years demonstrating a growth close to 10 percent.[1]

Chart 1: Growth Rates by Coal Type (Coking and Non-coking)



Source: Energy Statistics, MoSPI and Provisional Coal Statistics by MoC

In the 2000s, total coal production (non-coking and coking) demonstrated a slow but steady increase from about 3.2 percent per year in 2000-01 to about 7.9 percent per year in 2010-11.[2] Regulatory constraints slowed down domestic production dramatically in the four-year period from 2010 to 2014. With the change in regulatory environment in 2014, production growth caught up with past trends. In 2014-15 total coal output growth was 8.3 percent despite a strike in January 2015 and associated loss of output (See Chart 1). In 2015-16, output growth is expected to be over 9 percent. If output were to increase at a steady 7.3 percent per year from now, production would catch up with the established growth trends by 2020-21. At 9.3 percent growth, catch-up can be achieved by 2017-18. An average annual growth of over 22 percent in coal production would be required to meet the target of 1.5 BT per year by 2020.

Domestic Supply of Coking and Non-coking Coal

The working group on coal for the 12th Five Year Plan observed that even in the most optimistic scenario, domestic coal shortage (non-coking and coking) will stand at 185.5 MT by 2016-17. It noted that in the 'business as usual' scenario, the shortage was likely to increase to 265.5 MT (See Chart 2) as domestic demand was expected to grow to 980.5 MT while domestic production was expected to be limited to 715 MT.

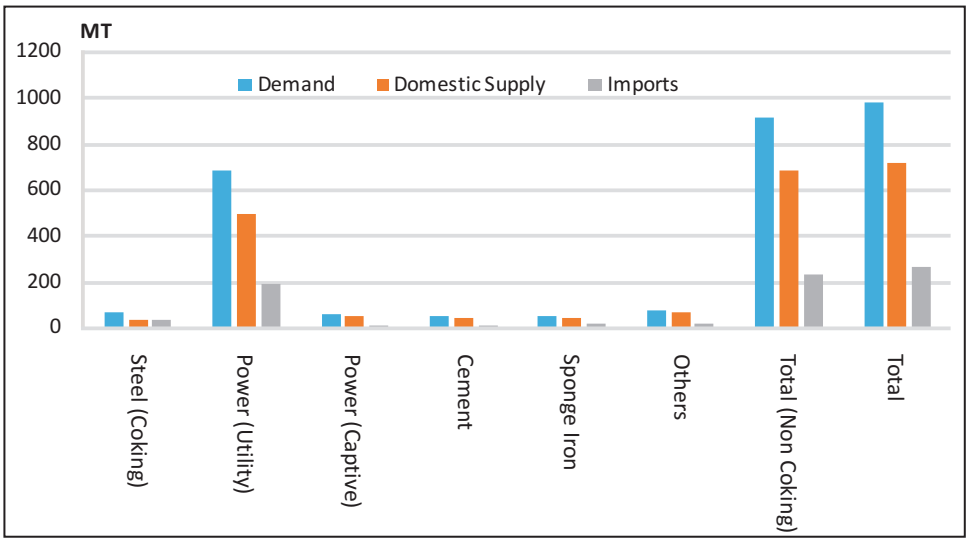
Current developments indicate that the Planning Commission may have overestimated shortages. Demand for coal (coking and non-coking) in 2015-16 was estimated to be 910 MT and the target for domestic production is set at 700 MT.[3] Domestic production by CIL is expected to touch 550 MT in 2015-16, which would require a growth rate of over 11 percent. Production by Singareni Collieries

Company Limited (SCCL) is expected to touch 56 MT by 2015-16 from 52 MT achieved in 2014-15. Together, CIL and SCCL are expected to produce 606 MT by 2015-16. The target for production from captive and other production is about 94 MT in 2015-16. Overall, the target for production in 2015-16 is set at 700 MT (See Table 1). Production targets for 2020 are more ambitious. A CAGR of about 14 percent in the next five years is required to increase production by CIL to 908 MT ('difficult but not impossible'[4]) and increase production by SCCL to 100 MT by 2020.[5]

Table 1: Coal Balance (2015-16)

Particulars	Million Tonnes
Total Demand	910
Supply (CIL+SCCL)	606
Captive Supply	94
Total Domestic Supply	700
Imports (Coking + Non Coking)	44 + 193

Chart 2: Projected Coal Demand-Supply (2016-17)



Source: Planning Commission

CIL has stated in its Roadmap for Enhancement of Coal Production that (a) large-scale contract mining and mechanisation, (b) improvement in mining infrastructure, and (c) modernisation of mines will facilitate achievement of the 1 BT target for coal production.

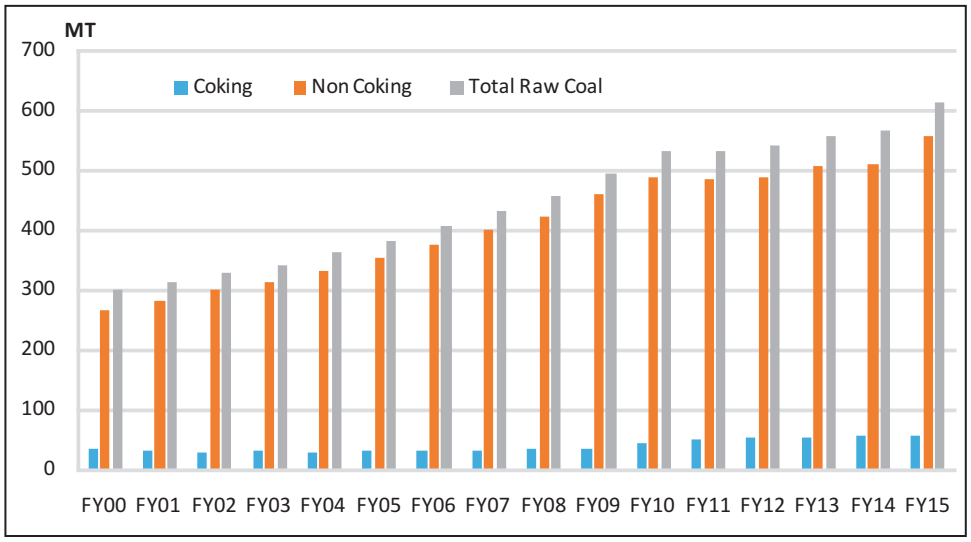
Table 2: Coal Production by CIL: Projections 2020

Source of Production	Quantity
Existing Mines	164.96 MT
Mines under Implementation	561.48 MT
Future Projects	181.66 MT
Total	908.1 MT

Source: Roadmap for Enhancement of Coal Production, CIL

To increase production from mines allocated or auctioned for captive consumption to yield another 400 MT adding up to a total of over 1.4 BT production by 2020 would require a CAGR of 46 percent. The total peak production capacities of mines auctioned and allocated so far add up to less than a fourth of the target production of 400 MT. Overall, the industry is optimistic enough to declare that barring coastal power plants (which require about 40-50 MT of imported coal), India will not be importing non-coking coal by 2017. Reality may turn out to be different, and it will be wise not to limit strategy only to questions of how production can be increased.

Chart 3: Trends in Domestic Production by Coal Type



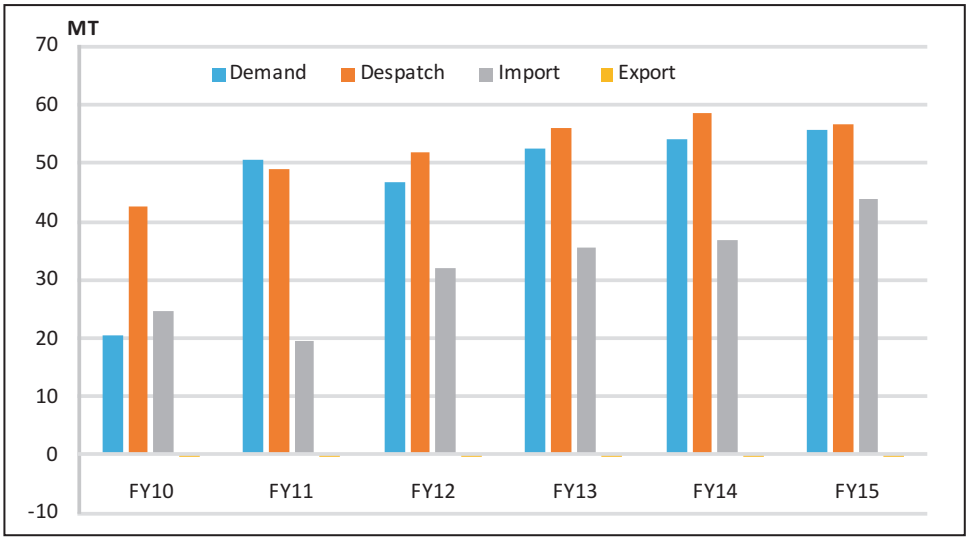
Source: Energy Statistics, MoSPI and Provisional Coal Statistics by MoC

The optimism over an increase of production to 1.5 BT by 2020 is partly driven by the idea that constraints that held up production in the recent past – land acquisition problems, rehabilitation & resettlement (R&R) issues, difficulties in obtaining environmental and forest clearances, restrictions arising out of the imposition of Central Environmental Pollution Index guidelines and problems in long-distance transportation of coal – can be corrected swiftly through interventions by the central government. It is also driven by the increase in production of 32 MT achieved in 2014-15 which was more than the cumulative increase in production of 31 MT during the previous four years.[6] While these achievements are commendable, it may be prudent to acknowledge that they may not be replicated every year.

Coking Coal Requirement and its Distribution

To comprehend the requirement of coking coal in real terms, the Planning Commission had been estimating demand for each year in advance. However, the actual supply (despatch + import – export) has been showing variance from these estimates (See Chart 4). The assessment of demand needs to be done meticulously. Chart 4 shows how the imports of coking coal have increased over the years despite demand matching despatch. Hence, there is a need to increase domestic production of coking coal.

Chart 4: Demand-Supply of Coking Coal



Source: Provisional Coal Statistics 2014-15, MoC

Table 3: Production of Raw Coal (in MT, 2014-15)

Sector	Coking	Non-coking	Total coal
Public	51.010	516.023	567.033
Private	6.441	38.961	45.402
All India	57.451	554.984	612.435

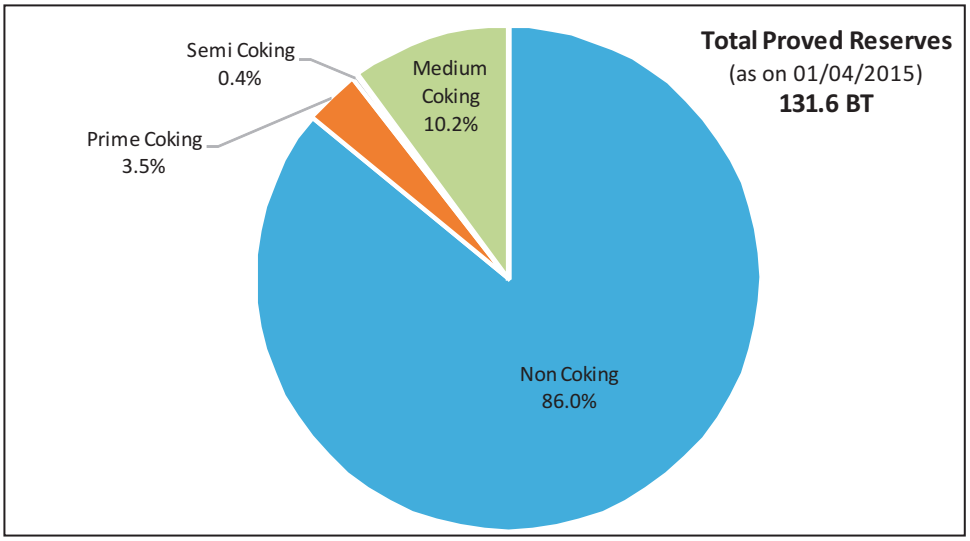
- Import of coking coal was 43.715 MT in 2014-15 against 36.872 MT in 2013-14, i.e. an increase of 18.56 percent over 2013-14.
- The geological resources of coking coal (prime, medium and semi-coking) as of 1 April 2015 was 34.404 BT and 272.192 BT for non-coking coal.
- In 2014-15, almost total coking coal of the country was produced in the state of Jharkhand, which accounted for 98.23 percent of the total coking coal production.
- In case of coking coal, metallurgical coal with the production of 13.789 MT in 2014-15 registered a decrease of 8.8 percent and non-metallurgical coal with the production of 43.662 MT registered an increase of 4.69 percent.

The estimated annual raw material requirement by 2025-26 to cater to the steel industry for production of 300 MT steel in the country is shown in Table 4. The present coking coal production of 57.45 MTPA needs to be increased threefold in the next decade to meet this target.

Table 4: Annual Raw Materials Requirement for Steel Industry (in MT, 2025-26)

Iron Ore	Limestone & Dolomite	Coking Coal	Non-coking Coal CPP	Non-coking Coal PCI/DRI	Ferro alloy
490	95	150	80	168	19

Chart 5: Distribution of Proved Coal Reserves



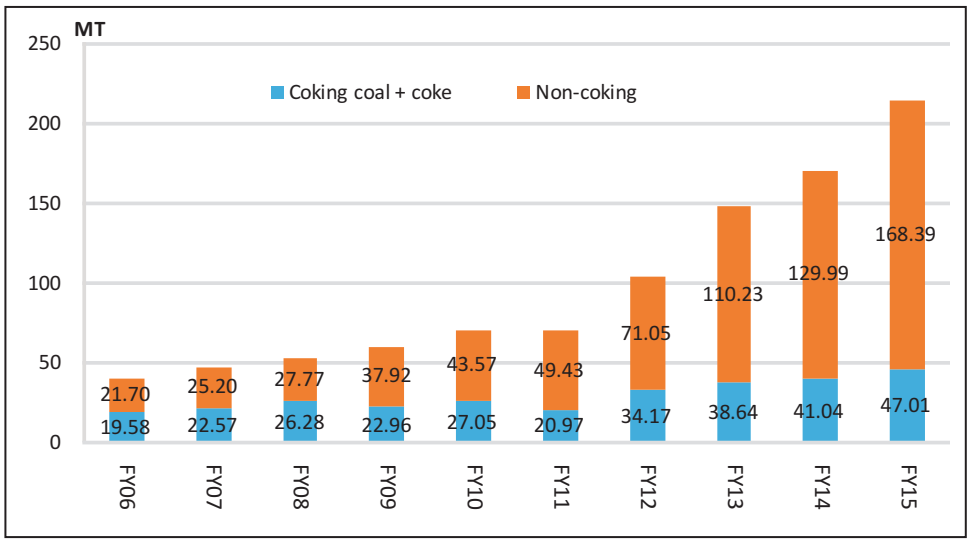
Source: Provisional Coal Statistics 2014-15, MoC

As shown in Chart 5, prime and semi-coking coal reserves are far less than the medium coking coal. It needs to be ensured that medium grade coking coal (Washery Grade III/IV) is used exclusively for metallurgical purposes after washing and beneficiation rather than be diverted to the power industry. This will reduce the import of coking coal that will produce economic and strategic benefits to the country.

The Role of Imports in Coal Supply

India has depended on import of coking coal since the early 1980s as domestic coal was unable to meet demand in terms of quantity and quality. Coking coal imports increased from 13 MT in 2003-04 to about 44 MT in 2014-15, implying a CAGR of 11.7 percent but in the same period, import of non-coking coal grew three times faster from 8.7 MT in 2003-04 to over 212 MT in 2014-15 (CAGR of over 33 percent).[7] The share of non-coking coal in total coal imports increased from 60 percent in 2003-04 to about 80 percent in 2014-15.[8] Import of coal fell to 193 MT in 2015-16 compared to 212 MT in 2014-15 largely on account of lower demand for non-coking coal but imported coal still accounted for about a quarter of India's coal consumption.[9] Coal import costs increased from about $9 billion in 2011 to $16.5 billion in 2012 because of not only the increase in quantity of imports but also the depreciation of the rupee in the period. The value of Indian coal imports was around INR 955 billion (roughly $14 billion) in 2014-15 which came down to INR 721 billion ($10 billion) in 2015-16 due to the lower quantity of imports and stabilisation of the rupee. Overall coal imports (coking and non-coking) showed a tenfold increase since 2004 and a threefold from 2010.[10]

Chart 6: Imports of Coking and Non-coking Coal

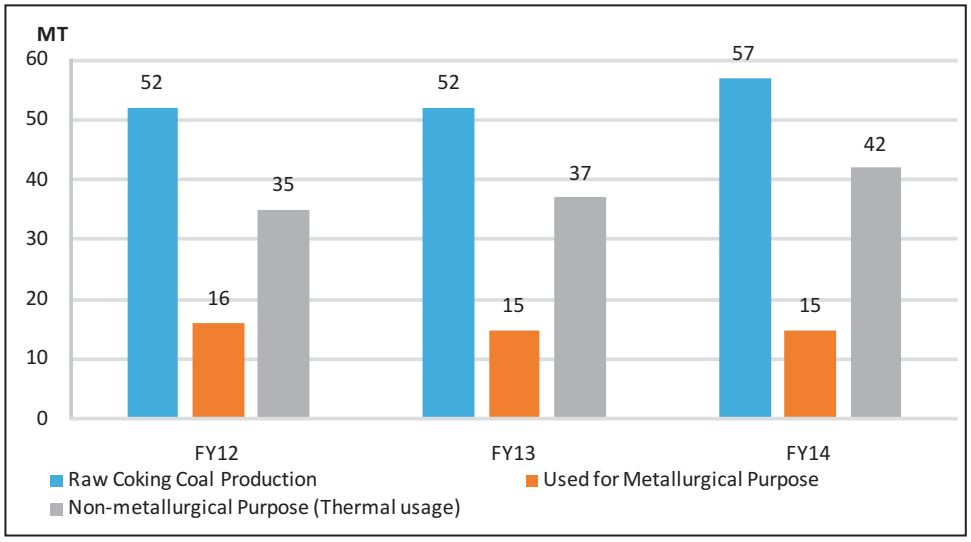


Source: Provisional Coal Statistics 2014-15, MoC

Coking Coal

Half of the total coking coal reserves is of the high ash variety (35-50 percent ash content) and possesses difficult to very difficult washability characteristics due to typical geological formation and origin. Presently around 95 percent of coking coal produced in India is of this grade and most of this is sold to power plants after de-shaling due to the non-availability of adequate and appropriate washing capacities. This results in import of coking coal that could be potentially avoided.

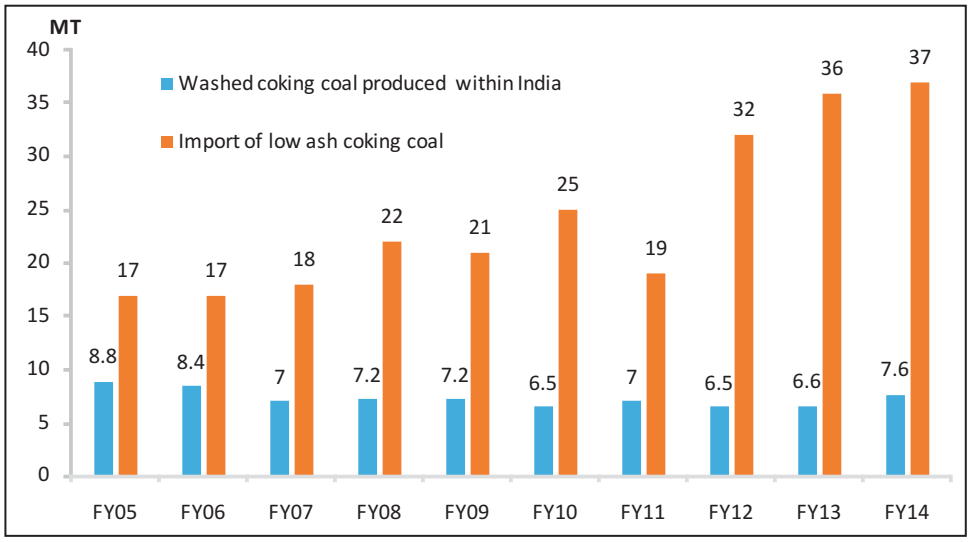
Chart 7: Coking Coal: Production and Usage



Source: Compiled form Coal Directory of India FY14, MoC

As seen from Chart 7 and 8, India has registered a CAGR of 11.1 percent from 2005-06 to 2014-15 in the net import of low ash coking coal. Over $6 billion was spent on import of low ash coking coal (8-12 percent ash) in 2013-14. But unfortunately, only around 27 percent of the domestically mined coking coal was used for metallurgical purpose in 2013-14, which has incidentally come down to 23 percent in 2014-15. The balance was used for non-metallurgical purpose.

Chart 8: Imports of Coking Coal



Source: Compiled form Coal Directory of India FY14, MoC

Non-coking Coal

The import of coal was placed under open general licence (OGL) as early as 1993-94[11] but the spurt in the growth of import of non-coking coal began with the growth of the private sector in power generation following the implementation of the Electricity Act 2003. Certain government policies favour the import of non-coking coal. During the 10th and 11th Five Year Plans (2003-12), setting up of ultra-mega power projects (UMPPs) based on imported coal in coastal regions was encouraged. In 2011, the Central Electricity Authority (CEA) recommended that all new power projects are designed for a blend of domestic and imported coal up to a blending ratio of 30 percent. The New Coal Distribution Policy of 2007 introduced a system of coal allocation based on fuel supply agreements (FSAs). Power generators (including Independent Power Producers [IPPs] and captive generators) as well as steel, sponge iron and cement producers were allocated coal with issuance of letter of assurance (LOA) from CIL and its subsidiaries through the inter-ministerial forum of Standing Linkage Committee (Long-Term).[12] For power projects commissioned before March 2009, FSAs provided assurance of supply of 90 percent contracted quantity of coal with domestic coal. However, for power plants expected to be commissioned between September 2009 and March 2015, 80 percent of contracted quantity of coal was assured with 65 percent domestic and 15 percent imported coal.

Low import duty on coking and non-coking coal (reduced to 2.5 percent in the Budget for 2014-15) along with the directive by the Ministry of Environment, Forests and Climate Change (MoEF&CC) that the ash content in coal transported over 750 km should be less than 34 percent from the beginning of January 2015 facilitated growth in the import of low ash non-coking coal from Indonesia. The blending of imported low ash coal with domestic coal for power generation not

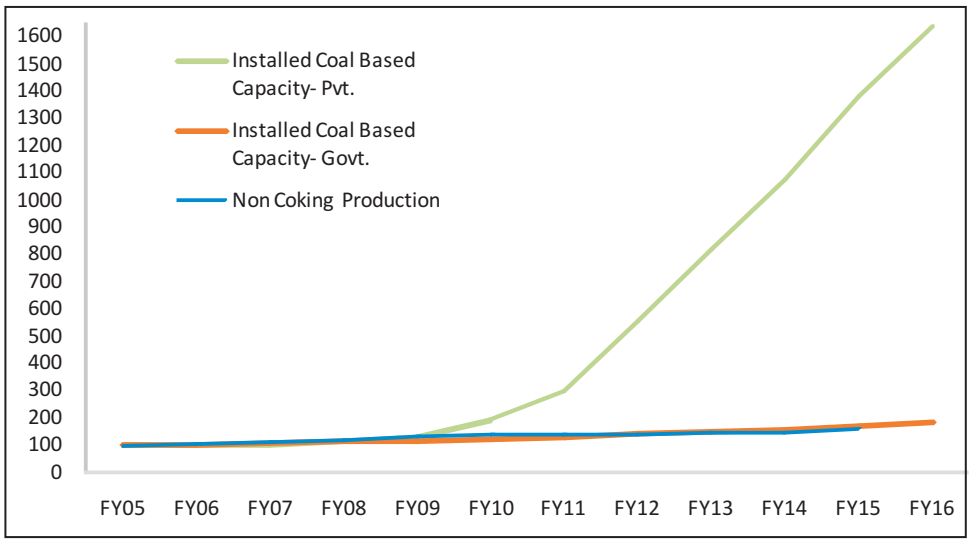
only allowed generators to meet shortfalls in availability of domestic coal but also bypass restrictions in the transport of high ash coal. More importantly, blending of imported coal eased the pass through of the increase in cost of low ash imported coal to power consumers.[13] The recommendation by the MoEF&CC's Expert Appraisal Committee (EAC) in October 2015 to ease the restriction on maximum permissible ash content for imported coal to 25 percent from the earlier 12 percent facilitated the import of higher grade (higher calorific value) coal but with higher ash content from Australia and South Africa by coastal power generators. This shifted emphasis of coal imports from quantity to quality facilitated by the fall in the price of high-grade non-coking coal available in the international market and the stabilisation of the rupee. Though Indonesia continues to remain the largest exporter to India with 36.72 MT exports in the first five months of 2016, this was 20 percent lower than the 46.9 MT supplied in the same period last year. South Africa, on the other hand, exported 16.58 MT higher quality coal to India, an increase of 26 percent over exports last year. Even Russia and Columbia have increased their export of coal to India. Import of bituminous coal (above 5800 kcal/kg) increased from 5 MT in 2013-14 to 18.7 MT in 2014-15.

DRIVERS OF COAL DEMAND

Non-coking Coal: Power

In the 12th Plan period, the total new capacity creation was estimated at 88.5 GW (Gigawatt), of which 72.3 GW was thermal power plants. Of this, 49.2 GW or 68 percent was completed by the end of January 2015. In total 22,566 MW (Megawatt) of capacity was added between April 2014 and March 2015, exceeding the target of 17,830 MW. The 12th Plan period is likely to show an average capacity addition of 20 GW per year which is above the historic average of about 5 GW per year. The key factor behind the improvement in capacity creation is the participation of the private sector. In 1991, installed power generation capacity by the private sector was 2.5 GW or 3 percent of the total. It increased to over 78 GW or 33 percent of total installed capacity in 2014, representing a CAGR of about 16 percent. In the same period, CAGR of domestic coal production was about 3.4 percent. In the short span of five years from 2010 to 2015, coal-based power generation capacity nearly doubled from 84 GW to about 165 GW, an unprecedented development in the history of the Indian power sector. In this period, non-coking coal production merely increased by 15 percent. The mismatch in the growth rates of the two sectors resulted in coal supply shortages and fuelled expectations of dramatic growth in imported coal. The 2012 government directive that CIL should prioritise coal supply to power companies that had long-term power purchase agreements (PPAs) with distribution companies aggravated the situation as private generators were yet to firm up long-term PPAs.

Chart 9: Trends in Coal-Based Power Capacity & Non-coking Coal Production



Source: Compiled from the statistics from CEA & Ministry of Coal
Note: For Indexing 2004-05 is taken as base year, i.e. (values for 2004-05 = 100)

BOX 1: CHINA'S COAL IMPORT BEHAVIOUR: FOCUS ON COST MINIMISATION[14]

In 2009, China, a traditional net exporter of coal, suddenly imported a record-breaking 126 MT of coal which accounted for 15 percent of globally traded coal. As per a study, China's sudden coal import behaviour did not represent a structural shift in the global market but rather a cost-minimisation strategy that would involve both buying and selling coal in the international market to take advantage of the arbitrage opportunities in the price of domestic and globally traded coal.

Coking Coal

Historically, production capacity is taken to represent the demand for steel and cement in India. The optimistic projection for steel production in 2016-17 is 105 MT. Based on the recommendation of the National Steel Policy that 0.64 tonnes of coking coal is used to produce 1 tonne of steel, coking coal requirement was estimated at 67.2 MT for 2016-17. Between 2006 and 2015 consumption of coal by the steel sector increased threefold to 66 MT, out of which over two-thirds was imported coal. If India's steel production is to increase to 173 MT by 2020 and eventually 300 MT by 2025-26, coking coal requirement from the steel sector is projected to be about 96 MT by 2020.[15]

The cement sector has undergone substantial technological changes. With more emphasis now on dry process by cement plants, the specific coal consumption in cement plants has shown immense improvement over the years. Apart from the technological development in cement production, improvement in blending-mix with imported coal and pet-coke has also contributed to lowering specific coal consumption. The cement sector, which has a capacity of 360 MT in 2014-15, accounts for 5 percent of India's total coal consumption. Coal

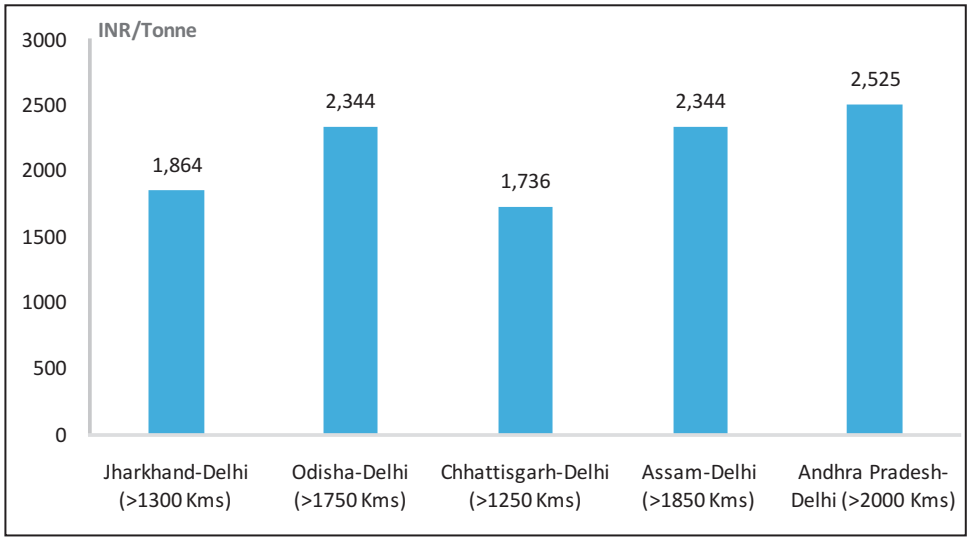
consumption by the sector has more than doubled in the last 10 years and about two-thirds of coal consumption by the sector was met through imports. Based on growth rates of about over 7 percent for cement consumption, coal demand from the sector is expected to touch 70-80 MT by 2020.[16]

The import of non-coking coal by sponge iron, cement and captive power plants increased by 54 percent to 77 MT in 2014-15 as coal available on CIL's e-auctions reduced by about 13 MT. In addition, high-grade coal available in international markets was less expensive than CIL's coal of comparable grade, especially when transport costs were taken into account.

LOGISTICAL LINKAGES

Most of India's coal reserves are concentrated in the eastern states of Odhisa, West Bengal, Chhattisgarh and Jharkhand while demand, especially for bulk non-coking coal, is from power generators based in western, southern and northern states. Most of the increase in non-coking coal production in the next five years is expected from the eastern states with coal reserves. Rail linkages are, therefore, expected to play a critical role in connecting demand centres with supply. In 2014-15, CIL's coal output grew at 7 percent but its despatches grew only at 3.5 percent and power generators were reporting shortages of coal. CIL's coal stocks at pithead increased by 5 MT in 2014-15 and stocks of imported coal increased by 12 MT (end of March 2015) due to inadequate rail capacity to move stocks to consuming centres.

Chart 10: Approximate Freight Rates for Coal



Source: Compiled from Ministry of Railways

The railway budget for 2014-15 articulated plans to speed up construction of three critical rail links: (i) Tori-Shivpur-Kathautia Area (in North Karanpura, Jharkhand), (ii) Jharsuguda-Barpalli-Sardega (in IB Valley, Odisha) and (iii) Bhupdeopur-Korichapan-Dharmjaigarth-Raigarh-Mand (in Chhattisgarh). These railway lines are seen as critical links that will carry incremental coal production in Jharkhand, Odisha and Chhattisgarh to demand centres. These three states

currently produce more than 50 percent of India's non-coking coal and have 75 percent of India's coal reserves. Initially these lines are expected to add 100 MT of incremental coal traffic and reach a peak capacity of 300 MT eventually. CCL in Jharkhand, MCL in Odisha and SECL in Chhattisgarh together account for 70 percent of the target 908 MT of coal production by 2020. In addition, eight critical feeder rail routes are expected to be completed by the end of the 12th Plan.

Non-coking coal is imported through ports in the eastern and western coasts. On the other hand, about 80 percent of coking coal is imported through Paradip, Kolkata, Vishakhapatnam and Krishnapatnam, ports on the east coast which are close to the iron and steel industry.[17] An increase in short distance rail routes, merry-go-round systems and conveyer belt systems are expected to play a major role in linking non-coking coal consumers that are within the coal-rich states and those located in coastal regions which use imported coal.

QUALITY OF COAL SUPPLY: COAL BENEFICIATION

Non-coking Coal

The intrinsic quality of Indian coal along with the dominant practice of opencast mining has meant that run of the mine (ROM) Indian coal contains a high share of ash and other minerals. ROM coal typically has high ash content from 30-50 percent and low calorific value (2500-5000 kcal/kg). In general, high ash content is seen to create problems for power plants including erosion, difficulty in pulverisation, poor emissivity and flame temperature, low radiative transfer and generation of excessive amounts of fly-ash containing large amounts of unburnt carbon. In addition, the transport of ROM coal across long distances is wasteful as it carries large quantities of ash-forming minerals that result in shortages of rail and port capacity.[18] In 2011-12, the freight composition of Indian Railways was 47 percent coal by tonnage and 44 percent by net tonne kilometres. Of this, 40–45 percent may be considered mineral content in terms of tonnage (non-coal). If washed coal is transported, it can provide an additional 20 percent rail capacity at no extra cost.[19]

The use of beneficiated coal is also said to: (a) facilitate use of higher quality fuel with consistent heat value, (b) reduce fuel quantity requirements (handled and transported) for the same heating value, (c) enhance utilisation of installed capacity, (d) reduce capital funding requirements, (e) reduce fuel transportation capacity and reduce cost of transportation, and (f) decrease fly ash volume in both pre and post-combustion stages.[20] Even fluidised bed combustors (FBC) that are designed to burn low-grade high ash coal are said to operate more efficiently with higher grade low ash coal.[21]

Government policies overwhelmingly favour beneficiation of coal. As per the Environment Protection Amendment Rules 2014, power plants located more than 750 km from the source of coal must use coal that has ash content below 34 percent from January 2015. The same norms are applicable for all power plants above 100 MW capacity located more than 500 km from 5 June 2016. In addition,

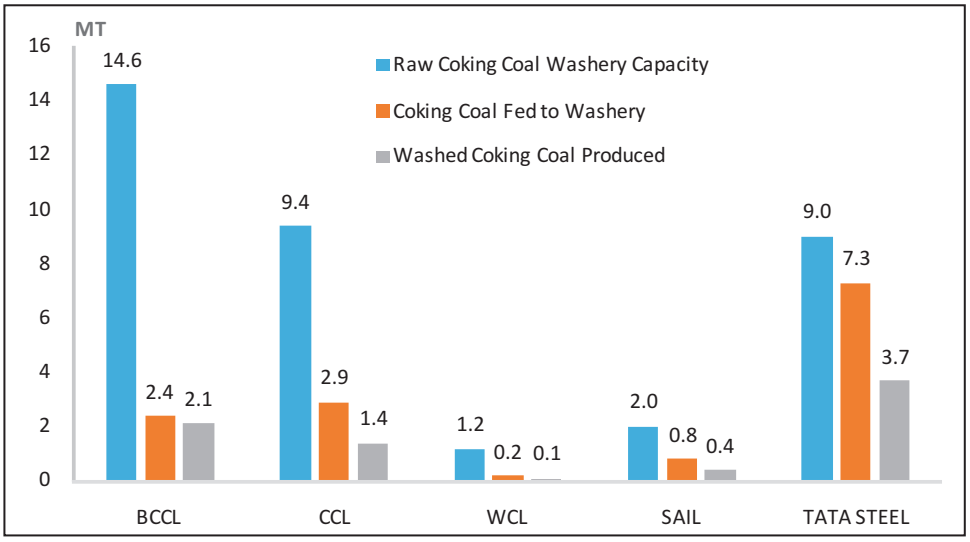
all new coal plants have been mandated to use supercritical technology and 144 existing plants have been assigned mandatory efficiency targets that should promote the use of low ash coal. What also needs to be factored into this progressive policy is the mandate for sustainable use of the coal byproducts generated out of coal washing, especially for the coking coal where the quantity of byproducts is reasonably large and the quality is good enough for use in power generation. To facilitate coking coal production and its washing, the byproducts should be exempted from the 34 percent stipulation to promote sustainable use of coal byproducts.

Despite economic benefits (that have been documented) and the positive policy environment, Indian coal producers and users have not embraced coal beneficiation. The country's coal washing capacity in 2015 was 131 MTPA, out of which about 100 MTPA was for non-coking coal. For 2013-14, India produced 565.5 MT of coal of which only 22.3 MT (3.9 percent) was washed, indicating low capacity utilisation.[22] Among many reasons for under-utilisation of the coal washing capacity is the fact that Indian coals wash poorly. The result is a substantial loss in coal quantity as well as energy content in the process of beneficiation. In certain types of coal, if ash content is to be reduced to 20 percent, it would remove 30-40 percent of the ROM coal as 'rejects' that would still contain 20-35 percent combustible coal. In the absence of incentives for using them either to generate power in pit head plants or for filling mines, rejects that have economic value are treated as waste and lie as burning heaps in the open.

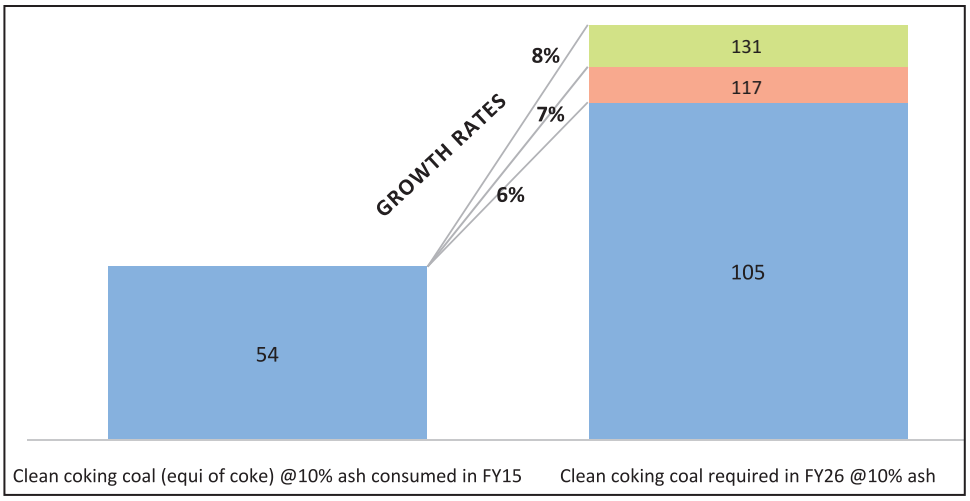
Coking Coal

Production of washed coking coal has shown declining trend in the last 10 years despite rising demand from the steel sector. The production of clean coking coal in the washeries of the respective companies handling this is also depicted in Charts 11 and 12 for 2013-14. It can be seen that the capacities of CIL subsidiaries (BCCL and CCL) are grossly under-utilised because they were designed to primarily

Chart 11 & 12: Washery Performance in Fy14



Source: Compiled form Coal Directory of India FY14, MoC



Source: Graph based on the Calculations by Tata Steel Limited

handle coal with ash up to 20 percent and therefore became obsolete as most of the current produce from their mines contains ash well in excess of 20 percent. This leads to non-segregation of a lot of coal that has the potential to be washed and beneficiated, which is thereafter diverted for suboptimal utilisation in power plants in lieu of thermal coal even though it is a well-known fact that technology exists for washing this fraction through augmentation and modernisation of the washing facilities.

With an ambitious steel production target of 300 MTPA by 2025, India urgently needs to correct the above-mentioned imbalance and ensure utilisation of the scarce commodity of coking coal in the most efficient manner which is restricted to metallurgical purposes. At present, if coking coal being sold to a power plant is washed, there is potential to cut approximately 40 percent of import at current level of production, thereby saving the country close to $3 billion annually. It may well be estimated that a policy and practice correction on Indian coking coal produced by CIL would be worth billions of dollars in the future steel scenario depicted in the graph above.

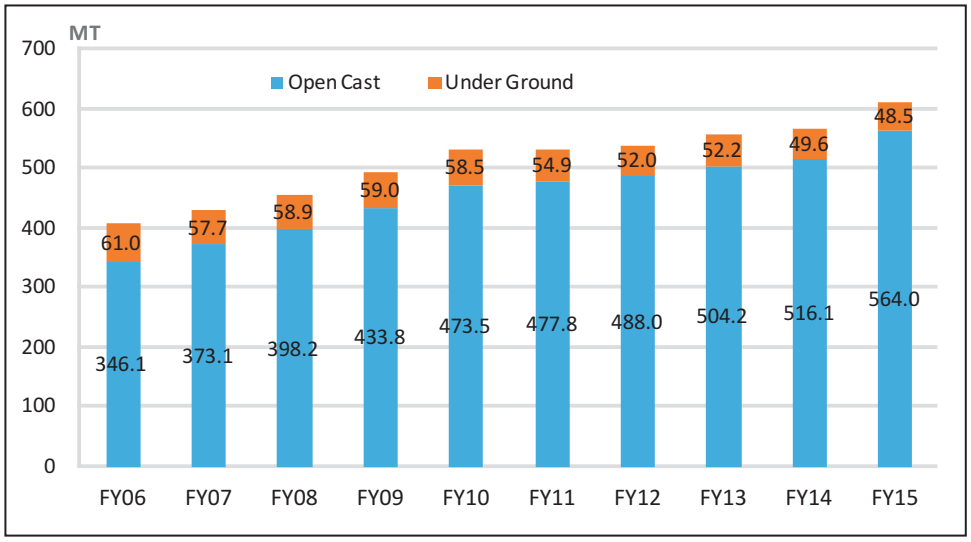
Underground Mining

The clear preference for opencast or strip mining has limited extraction of coal at greater depths through underground mechanised mines. But this is the obvious solution for working coal at greater depths, for producing better coal and for working in areas that are not suitable for opencast operations for surface reasons be it forest cover or cultivated fields and habitation. Underground (UG) coal production has been declining steadily since nationalisation. The target for coal production from UG mines in 2016-17 is 55.89 MT. Production in 2013-14 was about 49 MT.[23] The share of UG coal declined from about 16.3 percent in 2004-05 to about 8.7 percent in 2013-14. According to government sources, out of 249 underground mines operated by CIL, all make losses and are cross-subsidised by production from opencast mines. The case for zero import duty on UG mining equipment, cost plus approach for development to yield 12 percent internal rate of return (IRR), higher allowances for technical manpower and special skill development programmes are among the recommendations made by the Ministry

of Coal (MoC). These incentives may not be mere cost savings in the long run, they will also facilitate social and environmental benefits in terms of lower demand and impact on scarce land resources, and lower local pollution levels. However, miners would require tangible economic incentives to increase the share of UG mining in the short term.

The 'fire zone' at Jharia has remained unresolved even 50 years after its identification and the first plans to deal with the problem. Bringing appropriate technologies to bear – be it in mechanised UG mining where conventional long-wall equipment has reportedly found to be not suitable to Indian coal seams or in containing underground fires that consume millions of tonnes of good quality coal each year – calls for institutional change.

Chart 13: Production by Type of Mines



Source: Provisional Coal Statistics 2014-15 by MoC

REGULATORY COSTS IN COAL MINING

Mine owners have to pay a mix of other direct and indirect taxes (Table 5).

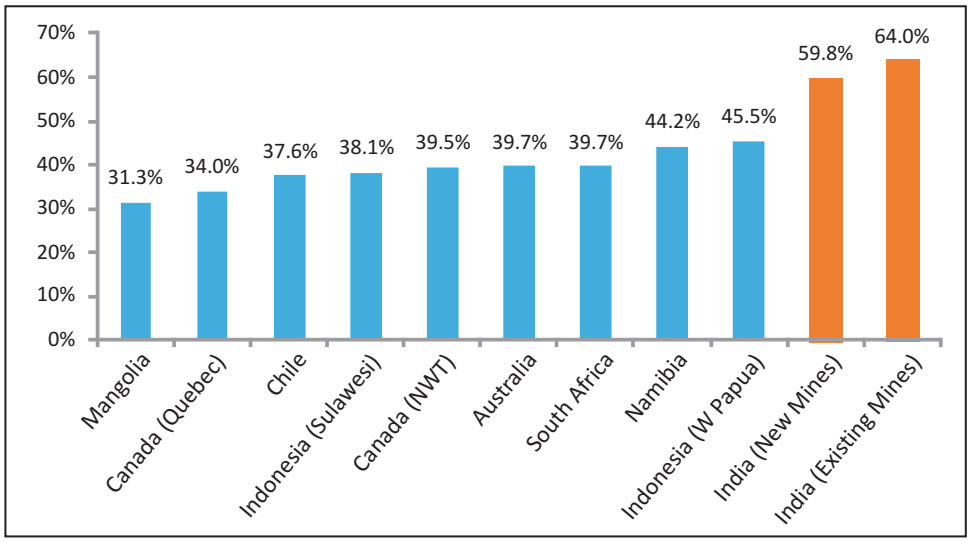
Table 5: Direct and Indirect Taxes Paid by Mine Operators

Nomenclature	Central Levy	State/Local Levy
Direct taxes		
Income Tax	☑	
Withholding Taxes	☑	
Royalty, DMF & NMET		☑
State Charges		
Prospecting Licence Fee and Security Deposit		☑
Prospecting Fee		☑
Mining Lease Fee and Security Deposit		☑
State Water Pollution Consent Fee		☑
State Air Pollution Consent Fee		☑
Dead Rent		☑
Indirect taxes		
Excise duty	☑	
Sales tax	☑	☑
Capital goods import duty	☑	
State Indirect Taxes		
Surface Rate & Water Rate		☑
Welfare Development Funds / Local Area Development Charges		☑
Stamp Duty on Transfer of Assets		☑
Road Tax		☑

Effective Tax Rate (ETR)

ETR can be defined as the division of value of all amounts paid to the government and the value of profits before taxes are paid. The graph below depicts the same.

Chart 14: Country-wise combined effect of all taxes

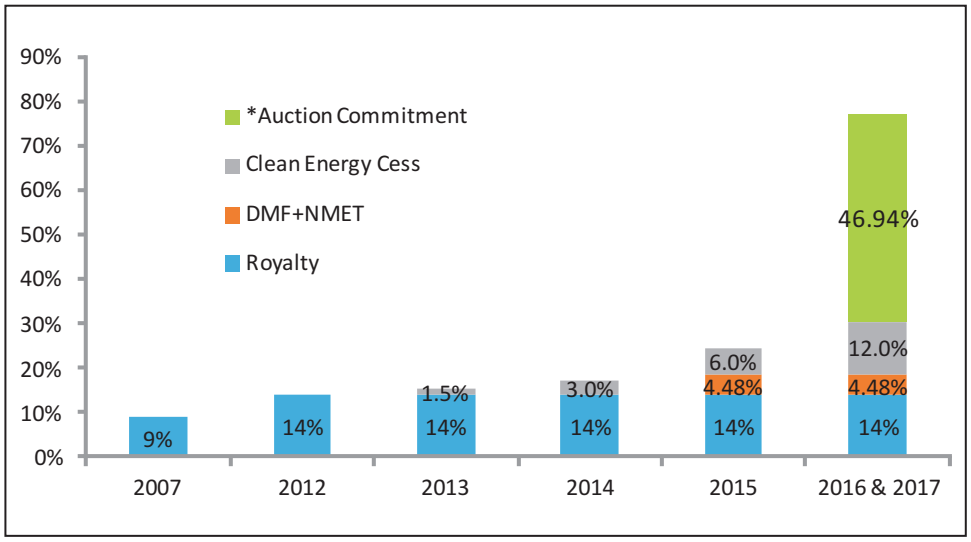


Source: PwC's Report on Mining Taxation (2014)

Royalty and Taxation Scenario in Coal

Apart from the regular taxes mentioned above, coal mining now involves the payment of DMF (@ 30 percent of royalty), NMET (@ 2 percent royalty), clean energy cess (@ INR 50, 100 & 200 for FY-13, 14 & 15-16, now @ INR 400 for FY-17). Auction Commitment has also been introduced. It is very clear from Charts 14 and 15 that the tax burden on the mining sector is disproportionally high.

Chart 15: Tax on Mineral Concessions Obtained Through Auctions



Source: Graph based on the Calculations by Tata Steel Limited

**Auction Commitment as % of Royalty based on W-III Coal Royalty of approx. INR 451/ T and Auction Commitment of Moitra Block @ INR 1512/T.*

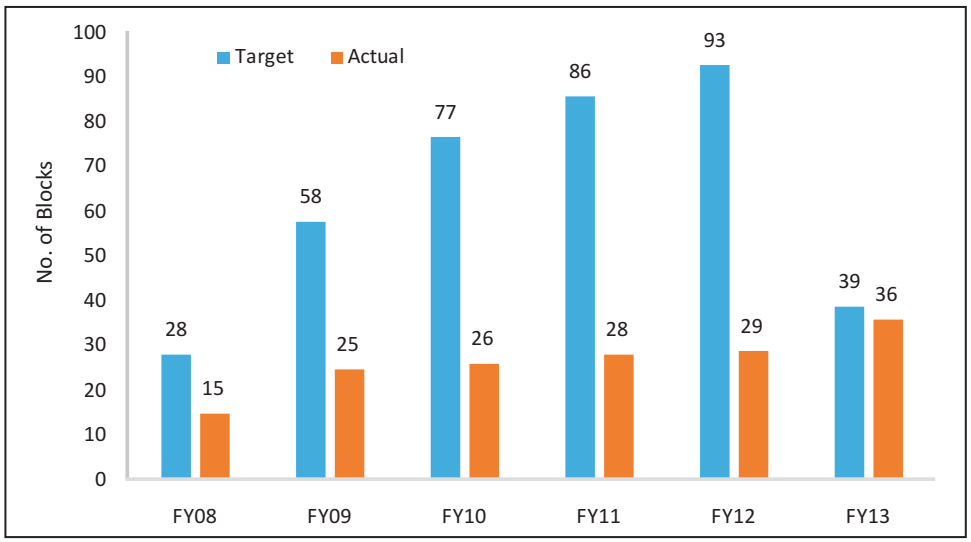
INCREASING PRIVATE SECTOR PARTICIPATION IN COAL PRODUCTION

Captive Coal Mining

Until 1970, most coal mines were exploited by private parties. In 1970, the government nationalised the mines as not enough capital investments were coming from private miners. The condition of mine workers was also a cause for concern. The government first nationalised all coking coal mines through the Coking Coal Mines (Emergency Provision) Act, 1971, and subsequently all mines in 1973 through the Coal Mines Nationalisation Act. After liberalisation in the 1990s, the hunger for power increased significantly but the public sector was not able to keep up the pace with the supply of coal. The Coal Nationalisation Act was amended in 1993 for allowing private sector participation in captive coal mining for power generation, washing of coal and other end-uses as notified by the government. By 31 March 2011, 194 coal blocks, with aggregates geological reserves of 44.44 BT, stood allocated. The Supreme Court of India, through its judgment dated 25 August, 2014 read with its order dated 24 September, 2014 (collectively, "Supreme Court judgment") cancelled allotment of 204 coal blocks. Subsequent to the Supreme Court judgment, an ordinance was promulgated and rules were framed for auction and allotment of all blocks the Supreme Court cancelled.

Captive coal mining aimed to create space for private sector units not only to meet their own requirements but also to initiate greenfield projects that would otherwise not be developed by CIL. The blocks selected by CIL for allocation were mines it would not need in the next 50 years, given relatively more difficult conditions for mining and poorer infrastructure.[24] A steering committee comprising of representatives from state and central ministries and CIL was set up for the allocation oversight. No clear criteria was set for selection of applicants and so in the early years, blocks were allotted to those associated with IPPs.[25] IPPs preferred coal supplied by CIL rather than divert their attention to an extraneous activity like mining and so 'blocks were said to be chasing projects rather than projects chasing blocks'.[26] State companies were also allocated blocks directly by the MoC through 'government dispensation' and some blocks were allocated by the Ministry of Power (MoP) for UMPPs through competitive bidding.[27] Between 1993 and 2011, 218 coal blocks were allocated. Of these, 132 blocks were allocated by the screening committee (out of which 103 were allocated to private companies), 72 were allocated under government dispensation, 12 were allotted to UMPPs and two were allotted for coal to liquid projects.[28] The provision for competitive bidding was introduced through an amendment to the Mines and Minerals (Development & Regulation) Act 1957 (MMDR Act 1957) in 2010 and the rules for competitive bidding were introduced in 2012. Public sector undertakings were awarded 14 coal blocks in 2012-13 on the basis of these provisions.

Chart 16: Captive Block Status: No. of Blocks Targeted for Production, 2007 to 2013



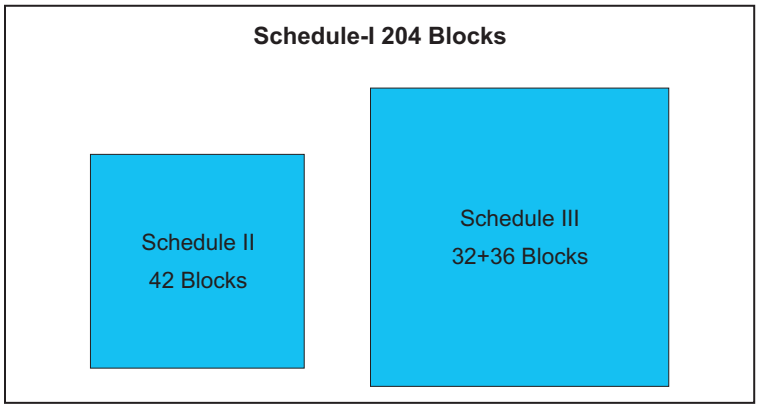
Source: Provisional Coal Statistics 2013-14, Ministry of Coal

If the performance of captive blocks is evaluated on the basis of targets set for production, the results may be satisfactory until 2009-10 but production fell short of targets thereafter (see Chart 16). The 12th Five Year Plan envisaged production of 100 MT from captive blocks by 2016-17 and 315 MT by 2022. Production from captive blocks was 52.8 MT in 2014-15.[29]

Coal Block Auctions

The 204 coal block allocations cancelled by the Supreme Court judgment (barring four that were excluded from the judgment) are in the process of being auctioned under the provisions of the CMA 2015. Out of the cancelled mines, 204 with a cumulative production of 800-900 MT were listed for auctions. The mines were categorised as Schedule I (consisting of all 204 blocks cancelled), Schedule II (42 blocks which were either producing or about to produce at the time of cancellation) and Schedule III (initially 32 mines that were earmarked for specific end-uses from the power, steel and cement industries which were expected to be operational in one to two years). A further 36 blocks from Schedule I were added to Schedule III by the MoC.

Figure 1: Number of mines assigned for auctions

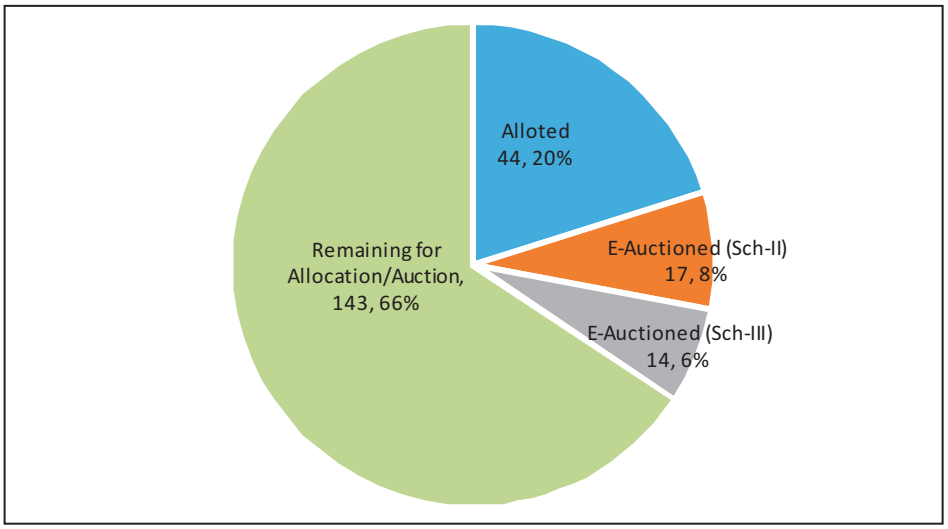


For Schedule II and III mines, bidders from the public, private or joint sector were required to have a specified end-use. Schedule I mines that were not in Schedule II & III could be allocated or auctioned to end-users without the restriction on end-use which is interpreted as a provision for commercial mining of coal. The interpretation of 'commercial mining' appears to be limited to non-captive coal mining while issues such as pricing and marketing freedom are not elaborated.

In Schedule II, mines with extractable reserves estimated at about 380 MT with a peak capacity of about 19 MT per year were offered to the power sector and mines with extractable reserves of 600 MT with a peak capacity of about 10 MT per year were offered to the non-power sector. In schedule III, extractable reserves of 1 BT and peak capacity of 34 MT per year were offered to the power sector and extractable reserves of about 500 MT with a peak capacity of about 19 MT per year of high-quality coal were offered to the non-power sector.

The auction process was carried out separately for the power and non-power sector end-use in a two-stage tender process. The first stage consisted of technical and eligibility qualification (based on requirements for power and non-power segments) that required bidders to quote an initial offer price. This was followed by a second stage with a final price offer made through the electronic process. Bidders were not allowed to bid for coal mines capable of producing in excess of 150 percent of bidder's annual requirement for 30 years. Only 50 percent of the total technically qualified bidders were allowed to participate in the e-auction (subject to a minimum of five) and any block with only three or less bids was not taken up for e-auction.

Chart 17: Distribution of 204 De-allocated Mines

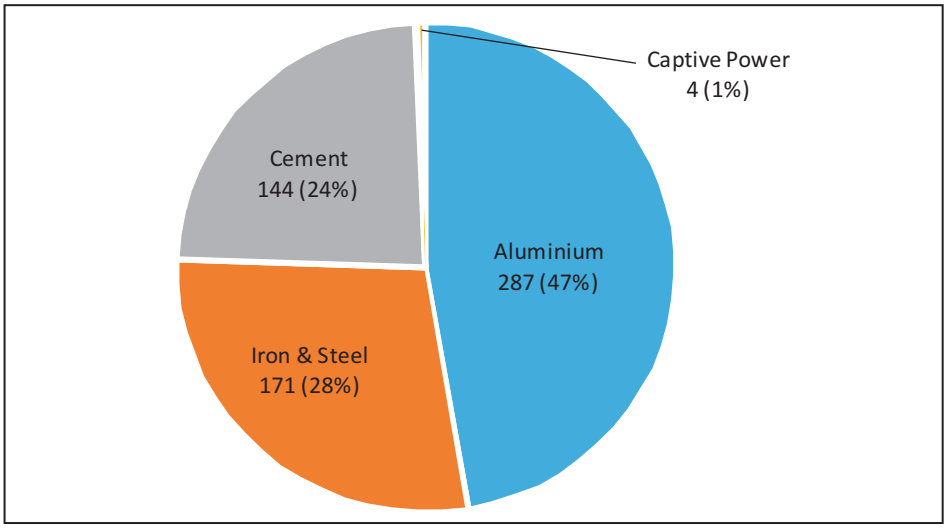


Source: Compiled from PIB (Aug 1 &4) and Rajya Sabha (Unstarred Q. No. 708)

Unregulated Sector

A total of 20 mines with extractable reserves of 600 MT were offered to the unregulated sector (iron & steel, cement, and captive power for aluminium and other industries).

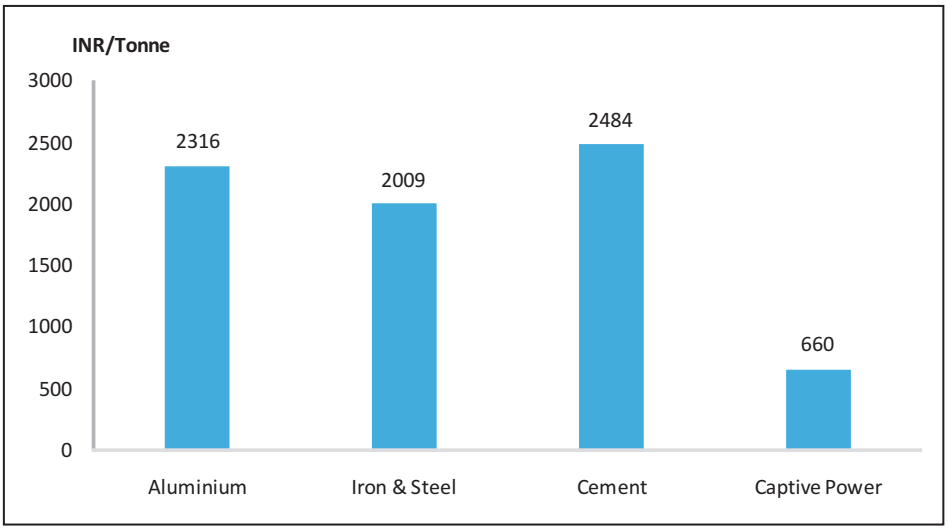
Chart 18: Distribution of 600 MT of Reserves for Unregulated Sector



Source: Presentation by Mr. Nitin Zamre at the Rountable on Coal Auctions

The bidders were expected to consider that the delivered cost to their expected end-use plants would include cost of mining, sizing, washing (if required), transportation, royalty, taxes and the premium. A floor price was set by the government for each mine based on its intrinsic value and the entity which offered the highest premium price over and above the floor price and royalty won the bid. The bids received were described as 'aggressive' in the sense that the price quoted by the winning bids ranged from INR 900 to INR 3000 per tonne that were close to CIL e-auction coal prices or imported coal prices. The aluminium sector (for captive power generation) won 47 percent of reserves and the cement sector made the highest average bid.

Chart 19: Average Winning Bids by Sectors



Source: Presentation by Mr. Nitin Zamre at the Rountable on Coal Auctions

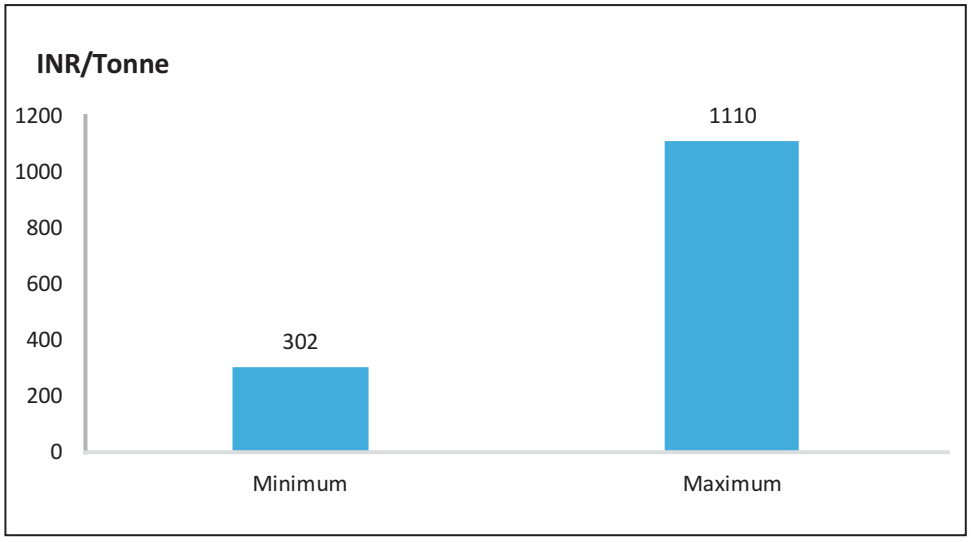
Regulated Sector

For the power sector (regulated), the entity which provided the lowest ROM cost and in some cases the bid that offered a 'negative premium' well below the ceiling price was the preferred bidder. Case 2 power projects, where land and fuel were

expected to be provided by the government (power procurer), were not allowed to bid. An additional condition was that energy charges of the winning bid would have to be lower than or equal to the energy charge as per its existing PPA. Successful bidders were allowed to use 15 percent of coal production for merchant power. The MoC set the ceiling price for each mine based on CIL prices for coal of similar quality (not the actual cost of mining). The bidders were required to bid an initial price that was lower than the ceiling price followed by a final price on e-auction. During the online auction, the bidders were allowed to continue bidding an additional premium even after the bids reached zero ('negative premium'). The negative premium quoted for the power sector ranged from INR 302 per tonne to INR 1,110 per tonne. These negative premiums appeared to signal willingness of the bidders to bear the cost of the negative premium over and above foregoing recovery of the mining costs just to secure fuel supply. Mining cost, sizing cost, handling and washing costs, transportation costs, royalty, taxes and duties weighed in the computation of energy charges. As energy charges were already fixed by the bidders' PPAs, the presumption was that mining and other costs would be recovered from fixed charges and the sale of merchant power. But this option was closed when the government directed the Central Electricity Regulatory Commission to advise power distribution companies to cap payment of fixed charges from producers in their PPAs after the auctions. This led to some controversy, as it appeared that the government was compromising on its own auction design by 'changing goalposts after the race'.[30]

For its part, the government seemed to expect negative bids to reduce power subsidies and also provide an advantage to the states that owned coal reserves. In addition, the government also expected the auctions to minimise disruption from the Supreme Court ruling to cancel allocated mines.

Chart 20: Negative Premium Quoted by Bidders



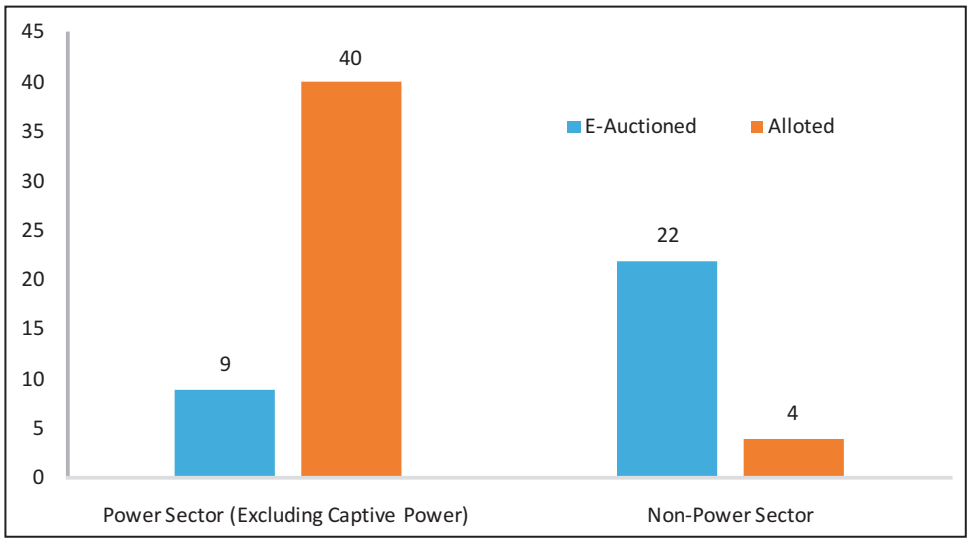
Source: Presentation by Mr. Nitin Zamre at the Rountable on Coal Auctions

Current Status

So far the government has auctioned or allocated 75 (one on hold) coal blocks under the provisions of the CMA 2015. In addition, 10 blocks have been allocated

under Rule 4 of the Auction by Competitive Bidding Rules 2012.[31] Vesting orders have been transferred in favour of 45 successful bidders. Out of these, environmental clearances have been given for 37 coal blocks and forest clearances have been transferred in favour of 25 blocks. In some blocks, forest clearances were not required as the successful bidders were prior allottees. The remaining blocks are at various stages of development. Some blocks which are in operational stage are given below:

Chart 21: Distribution of Allotted Mines by Sector



Source: Rajya Sabha, Unstarred Q.No. 708

The 35 mines allocated or auctioned under Schedule II mines are expected to produce their peak capacity of 73 MT by 2020 as these were already in production or close to production. Those mines allocated or auctioned under schedule III are expected to contribute 208 MT when they start production.

According to the timelines provided by the MoC, coal block allottees must secure all statutory clearances within three months of the signing of the vesting orders. The state and central governments are expected to facilitate securing these approvals. The government expects that when the 74 blocks auctioned so far come on-stream in four-five years, coal inventory will be increased by 105 MT. CIL is also planning to add 300 MT existing mines in five years. These developments are expected to bring the target of 1.5 BT by 2020 much closer to reality than it appeared in 2014 when it was announced.

Issues in Auction Design and Implementation

- The auction was carried out under tight deadlines. The time available to bidders to do a proper due-diligence on the blocks was limited.
- The bidders had already set up their end-use plants and their prime consideration at the time of auction was the proximity to the block. If the bidder was unable to win the block, the entire end-use plant would become unviable. Moreover, it could result in suboptimal transportation of coal. Coal may have to be transported to an end-use project thousands of kilometres away rather than one next to the mine.

- Some of the coal blocks that had been earlier allotted to the steel, power and sponge iron sectors were merged for unknown reasons. The merged blocks may not necessarily meet the requirements of a particular industry.
- The data and information provided by the government prior to the auctions were subject to change. The frequent changes in the data meant that the bidder could not assess the economic, geological and technical parameters of the bid accurately.
- Claims over some of the auctioned blocks were being contested in the court. According to recent reports, 31 of 40 cases were either dismissed by courts or petitioners decided against those pursuing them. Nine cases related to e-auction provisions were decided in favour of the government.
- In the regulated segment, the bidder had to match the power plant with coal mine capacities. The extractable reserves of the mine had to be less than 150 percent of the requirements of the power plant but there was inadequate information to ascertain the extractable resource accurately.
- PPAs are generally for 25 years but the useful life of a plant is 40 years. It was not clear who would be responsible for production, transport, etc. after the expiry of PPAs.
- Artificial segmentation of coal into blocks just for auctions is not necessarily congruent with the natural geological boundaries. This can lead to unnecessary wastage between the blocks.
- Captive coal mining by consumers is not practised anywhere else in the world and is not optimal from economic, geological and ecological perspectives as it requires coal reserves to be artificially sub-divided.

OPTION FOR COMMERCIAL COAL MINING

The CMA 2015 opens up commercial coal mining to private and public entities without the constraint of captive use. If implemented this would effectively end the monopoly of CIL in commercial mining and allow private companies registered in India to mine and sell coal unencumbered by end-use. The government has earmarked large partially-explored coal blocks with much larger reserves than those allocated or auctioned for captive use, such as Chendipada I & II and Mahanadi and Machhakataare, for commercial mining.[32]

The government has, however, postponed private commercial mining originally scheduled for March 2016, citing the global economic slump.[33] It is said to be uncertain as to whether auction of coal blocks for commercial mining will generate adequate interest among mining firms, given the negative response for the latest round of auctions. The government was forced to annul the fourth round of captive coal auctions due to poor response from steel and cement firms. Of the nine mines offered in the fourth round, seven received less than the required three bids, while two received just three bids. In total, the nine mines received just 15 bids. The poor response was attributed to increased domestic coal

production, slump in international coal prices and financial stress in the steel and aluminium sectors. The MoC plans to resume the fourth round of bidding when prices improve.

STRUCTURE, CONDUCT AND PERFORMANCE OF THE COAL INDUSTRY

The nationalisation of the coal industry in early 1970s has influenced the current structure, conduct and performance of the sector. First it has allowed CIL to monopolise coal production in India with 81 percent share despite two decades of efforts to involve the private sector in coal production. While monopolies are by definition inefficient, the dependence on CIL for fuel that generates roughly 70 percent of power consumed in India has meant that the country is susceptible to the performance of a single company.

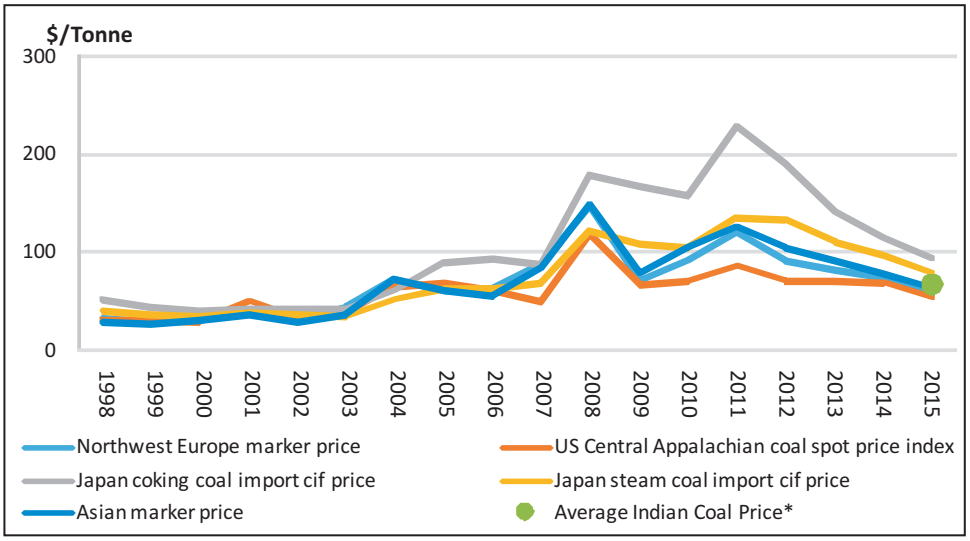
Second, it facilitated the technological shift towards opencast mining. Increased emphasis on coal as fuel for power generation began in the 1970s as part of India's response to the spurt in crude oil prices. During the Fifth Plan period (1974-79), the outlay for the coal sector saw a tenfold increase over the outlay over the Fourth Plan period following the recommendations of the Fuel Policy Committee. The Sixth Plan document (1979-84) recommended self-reliance based on coal, hydropower and nuclear energy to reduce the economy's exposure to crude oil.[34] This accelerated coal production from opencast mining and reduced the share of UG mining from 74 percent in 1975 to about 10 percent now.[35] The departure of well-managed western and Indian coal companies with advanced UG mining technologies and years of expertise affected sustainable mining practices as well as the extent of accessible coal reserves available for the future.

Third, greater coal production through opencast mining increased low-cost labour in coal production. Though this underwrote availability of low-cost coal for electrification, it came at a cost.[36] Reliance on low-cost labour has to an extent become a barrier to investment in new technologies and scientific management practices. The industry has resorted to outsourcing of mining operations to address the inflexibility in labour markets. Currently over 60 percent of coal production is from such outsourcing that use simple hand shovels as well as 4.5-cubic meter shovels. The recommendation is to opt for larger capacity shovels for greater efficiency. However, shovels last for over nine years and a dumpers for about five years, but outsourcing contracts are for much shorter periods. Longer contracts of 10 years or more with strict responsibility to meet production and efficiency targets could address this issue.

Fourth, the control on pricing of coal. Since the 1960s, a form of cost plus method has been applied to pricing coal and it continues in slightly modified form even today. The controlled pricing regime has not only artificially insulated the sector from domestic and international markets for power generation fuels but also limited its ability to adapt to shifts in prices and policy preferences towards

lower carbon fuels. However, coal pricing conundrum cannot be resolved without taking into account the coal-rail-power conflict (See Box 2).

Chart 22: International & Indian Coal Prices



Source: Compiled from BP Statistics 2016 & FAQ's of NDPL

**Avg Coal Price of 2200-2500 kcal for 2015 transported through a distance of >1200 km (from Piparwar Mine in Jharkhand to Dadri Power Plant in UP); Exchange Rate: $1= INR 65*

BOX 2: CHINA'S APPROACH TO COAL-RAIL-POWER CONFLICT

China's coal reserves are in the northern and western parts of the country while demand is concentrated in the eastern coastal provinces. Two provinces —Shanxi and Shaanxi — and the autonomous region of Inner Mongolia have 69 percent of China's coal reserves and 70 percent of their production are exported to consuming centres through first overland by truck, rail and then by sea. In 2008, the average distance from production to consumption centres was 625 km. Though the rail-to-sea route was cheaper than moving coal overland, it still accounted for 30-60 percent cost for power generating firms. Large power generating companies were owned by the central government while mining companies were owned and operated by provincial ones. Power prices were capped to sustain manufacturing competitiveness and so, power companies suffered huge losses when coal prices rose between 2008 and 2010. To resolve this coal-power conflict, China formulated the coal-power base policy that sought to integrate coal and power in 13 large coal-power bases. Each of these bases would produce 100 MT of coal annually to generate substantial quantities of power.

RECOMMENDATIONS: Increasing Competitiveness of Coal Sector

Coking Coal

Following steps may be considered to ensure maximum utilisation of coking coal produced in India exclusively for metallurgical purposes.

- A part of coking coal produced by CIL subsidiaries and currently being diverted to power plants may be allocated as long-term linkage to washeries established

by steel plants for exclusive use. For this, the MoC may seek requirement from steel companies and commence allocation accordingly. Going by present capacities, 5 MTPA of coking coal may be allocated in the first tranche.

- A suitable augmentation plan may be drawn up for all existing washeries to enable them handle all qualities of coal at least up to their installed capacities and ensure that most of the coking variety of coal mined does get washed instead of being diverted to power plants.
- Allotment of coking coal blocks for iron and steel end-use needs to be aligned with the 300 MT steel-making requirement by 2025-26 (Refer Table 4).

Right Steps towards Sustainability of Domestic Steel Industry

Domestic availability of coking coal, a critical raw material required by steel industry, is limited. The Indian steel industry has to depend heavily on imported coking coal to meet its needs. Currently, domestic steelmakers meet 70 percent of their coking coal requirement through imports. Imports may go up significantly in the 12th Plan as steel production in a large number of new projects is likely to be through the blast furnace-basic oxygen furnace route. In view of the limited availability of coking coal in the global market and the fact that its supply is controlled by a few large companies, it is very important to increase the domestic production of coking coal and upgrade its quality. Technologies that favour less coking coal and its lower grades will have to be encouraged.

Use of mine wastes such as in the case of Jhama coal in iron and steel production will be helpful to increase the mine life. Coal gasification of non-coking coals and recovery and utilisation of coal bed methane are some of the steps that could be considered to address issues such as coal/coke shortage and the growing need to minimise CO_2 emissions.

Emphasis on Unlocking Underexploited Coking Coal Reserves through Calibrated Deregulation

The Indian coal mining industry is dominated by CIL which produces more than 80 percent of the total coal production of the country. India has 34 BT reserves of coking coal of which CIL has 90 percent share. As the focus of CIL is on power grade coal, coking coal production has stagnated for last several years. The following policy measures are recommended to develop a domestic coking coal base.

- Existing coking coal mines could be de-merged from CIL and a separate company may be formed. This new entity, which can continue to be a public sector unit, should be fully responsible for coking coal mining development. Any non-coking coal that is mined in the process can be offered to CIL at a price fixed by the regulator.
- The government may consider, additionally or in substitute of the above, offering coking coal assets to steel producers for development through tender basis. Steel companies getting such mines should be allowed to sell the surplus coal mines in the open market.

- There are several virgin coking coal assets with CIL, which CIL does not target for development in the 12th Plan. These assets may be put on auction and the highest bidder may be allocated these blocks.
- Intensive exploration on prime coking coal beyond 300 m depth may be prioritised.
- Speedy implementation of the Jharia Action Plan for prime coking coal exploitation (in coordination with concerned ministries/ departments) will address the challenge of coking coal shortages.
- Strategic overseas acquisitions may be considered as global commodity prices are attractive.
- Long-term FSAs between coal companies and steel plants and integrated steel plants are options worth considering.
- Indigenous metallurgical coal reserves should be reserved exclusively for the steel sector to optimise on quality of available coal reserves.

In coke-making, though several plants have adopted modern technological innovations viz. pre and post-carbonisation techniques, more emphasis is needed on adoption of these technologies by all plants. This would ensure economic production of coke using inferior coal in an environment friendly manner. Stamp charging as well as partial briquetting offers significant improvement in the productivity and quality of coke, even with relatively inferior coal. These need to be promoted given scarcity of prime coking coal. Most integrated steel plants have set up top charge, byproduct coke oven batteries. Private sector steel majors have installed stamp charge batteries to ensure higher utilisation of medium coking coal and semi soft coals. Due to environmental concerns, steel units such as JSW, JSPL, and Tata Steel have established non-recovery ovens. Some of these ovens are also equipped with modern technological innovations like vibro-stamp charging and co-generation of power. The new technology has helped tackle pollution due to leakage of gases from ovens, as typically found in the conventional byproduct coke ovens. The integrated steel units need coke oven gas as the fuel for various heating purposes. If non-recovery ovens are put up, coke oven gas will not be available to meet the energy needs of steel plants. Besides, the area requirement for non-recovery oven is much higher than that required for conventional ovens of similar capacity. Therefore, the choice of either of the technologies will need to be scrutinised for environmental benefits and energy efficiency. In its quest to meet environmental norms, the Industry has started adopting coke dry quenching technology. But there is a problem of discharging treated waste water from coke oven (which presently finds application in wet quenching of coke) which may contradict objectives of zero discharge. This is an issue to be resolved by the industry and the pollution control bodies.

Non-coking Coal

The biggest opportunity for the coal sector lies in the fact that demand for the commodity in India is likely to grow as the emphasis on economic growth,

investment in infrastructure and industrialisation (through enhancement of the manufacturing sector) are unlikely to change in the foreseeable future. Like most of the developing world, especially Asia, coal is likely to remain the most competitive fuel per calorific value for power generation in India, too, as gas prices are likely to remain relatively high. Use of domestic coal is a strategic matter for the country because it minimises capital outflow.

But to capitalise on this opportunity, the Indian coal sector cannot rely simply on its traditional strength of cost-competitiveness. Being cost-competitive is a double-edged sword: it not only means the cheapest energy option but also means technical inefficiency and environmental irresponsibility. This is not a sustainable combination. While cost will remain a vital factor, environmental factors are also likely to grow in importance, making parameters such as the quality of coal and the efficiency with which it is mined and moved crucial. Energy markets are in a flux globally and domestic ones, particularly the coal market, cannot remain insulated from the rest of the world as it has been in the past.

Increasing Flexibility to Accommodate Shifts in Energy Market

The speeding up of regulatory approvals by the government and the introduction of modern technology to increase productivity in mining are welcome measures as they have addressed some of the essential weaknesses of the coal industry that have been ignored for over three decades. The concern, however, is that production goals set by the state may not automatically correspond to the demand for coal, particularly non-coking coal. Production targets, an inheritance from the Planning era, are of little relevance for a competitive industry that should respond to even the smallest shifts in energy markets. Issues in the off-take of non-coking coal have already been reported, indicating that supply is not necessarily equal to demand. While this may be a short-term concern, flexibility and resilience are what the coal industry needs to confront the multiple challenges faced by the energy industry. CIL's 'ready for mining on the shelf' strategy that focuses on removal of overburden to expose coal seams, so as to be prepared to ramp up production when demand picks up, is a step in the right direction as it will synchronise supply with demand.

Optimising Coal Transport and Power Transmission Options

The idea that underpins investment in long-distance coal transport linkages is that coal production and consumption will be geographically separated. While this may be a rational assumption in the case of coking coal, it may be less so for non-coking coal. With the evolution of a nationwide interconnected grid, the option of transmitting electricity from pit head plants in coal-rich states to the rest of the country rather than transporting coal across the country appears more realistic today than it did a decade ago. The only constraints may be issues arising out of: (a) the fact that authority over the electricity sector in India is shared by central and state governments with the latter having an overwhelming say over

market design, structure and pricing of power and (b) disproportionate environmental burden on coal mining and coal burning states of the country and how they can be offset it through policy interventions.

Furthermore, a number of uncertainties, including but not limited to economic growth of the country and consequently the growth in demand for electricity; the role of alternatives such as natural gas and renewables in power generation; and the rate of technological change that would contribute to efficiency gains in power generation may substantially change the significance of coal transport linkages in the future.

The move towards coal block auctions for specific end-use was driven largely by concerns over lack of transparency, misallocation and loss of state revenue from the administrative process of block allocations. Auctions have increased the level of transparency in allocating rights to mine coal and raised the potential for revenue for states with coal resources. However, the fundamental crisis in the sector is not just the lack of transparency and loss of revenue but rather the need for efficient fuel markets that can keep up with the growth (or change) in the markets for electricity, steel, cement and other coal-using segments.

While auctions have succeeded in correcting past mistakes, it has not exactly set a clear course for the future. The design of auctions is hinged in the past and oriented towards the present rather than being hinged in the present and oriented towards the future of the coal sector. In a well-designed and open resource auctions market, the social value of the coal would be approximately equal to the efficient firm's valuation of it. But this is the ideal case. The price quoted in the auctions appears to reflect externalities (the cost) of past mistakes, which means that it reflects private value (such as a firm having no other option but to get the block as it has invested heavily in end-use) rather than social or national value. There is a significant probability of firms walking away from their blocks in favour of imports. Aggressive bidding is not necessarily a good sign in the Indian context; Nor is it a sign of markets coming of age. The history of auctions such as in the case of UMPPs shows that self-destructive bidding is common, given that the cost of exiting or renegotiating a bid (or contract) is relatively low.

The restriction on end-use and the absence of a secondary market for the right to exploit coal limit opportunities of efficiency. If a perfect secondary market exists, a block would eventually find its way into the hands of a firm best able to use it. This means that an efficient outcome will emerge irrespective of initial results. The hope is that a liquid market for coal will eventually emerge either when the constraint on end-use is lifted or when a secondary market comes up.

Captive mining by definition is devoted to specific end-use objectives that compromise mining practices. It reduces mining to an intermediate step in the production of power, steel or cement. In the short term, this only leads to poor exploitation techniques because easier and more accessible reserves are developed quickly and the more difficult core reserves ignored. The long-term health and geological integrity of the mines, so important for the optimal use of precious

natural resources, tend to get compromised. As long as coal mining remain a subsidiary activity to what is considered the main business, be it power generation or steel, cement and aluminium production, the imperfections of the end-use industry (striking in the case of power) are likely to have a negative impact on the coal sector.

Facilitating Induction of World-class Technologies

The manner of auctions and size of blocks so far have been such that it would only attract companies whose priorities lie elsewhere in their main business activity rather than the optimal development of the mines themselves. This is not a policy designed to bring in world-class practices to the coal industry.

Large coal mining companies – companies which regard the business as a frontier technology industry requiring both investments and risk management skills – are absent in the field. The model offered currently does not fit in with their normal business models, for which long-term lease rights over the mine are essential to plan investments and manage mining operations for the long haul. A long-term lease provides certainty which, in turn, encourages full-fledged technical and managerial freedom and instils the confidence to commit large financial resources to extract maximum value from the asset.

It is not merely the lease and auction process that has to be overhauled; more effort needs to go into the proper demarcation of coal blocks so that surface boundaries, rather than following geometric straight lines, conform as far as possible to subsurface geology or at the very least to surface topography, obstacles and boundaries.

Enabling a Climate for Wealth Creation

Many opportunities missed this time around could perhaps be realised in the future by introducing auctions for genuine commercial mining. It is commercial mining that would bring to the Indian coal sector the much-needed benefits of competition and efficiency. However, for commercial mining to be a success, mine operators will demand free-market pricing, something the government of India has been hesitant to take up. Freedom of market pricing is a vital step. With global commodity prices at a trough right now, this may be the moment to integrate India's coal markets with the world's and create a competitive domestic coal industry. However, the impact of this redistribution of coal properties on production is uncertain. Therefore, it is prudent to discuss auction process in length to assess whether it can really help in the government's broad vision of building a competitive coal industry. The purpose of policy should be to open up energy markets. Private participation and foreign investment are central for the efficient development of the industry, creating a climate of wealth creation for the nation.ORF

PARTICIPANTS AT ORF'S ROUNDTABLES

Dr Saumitra Chaudhuri, Former Member, Planning Commission
Mr C Balakrishnan, Former Secretary, Ministry of Coal
Mr Alok Perti, Former Secretary, Ministry of Coal
Mr Anil Razdan, Former Secretary, Ministry of Power
Mr Vivek Bharadwaj, Jt. Secretary, Ministry of Coal
Dr S K Chowdhary, Former CMD, Coal India Limited
Dr S K Aggarwal, Former Advisor, Ministry of Environment, Forests and Climate Change
Mr R K Sachdeva, President, Coal Preparation Society of India
Mr U Kumar, Advisor, Aditya Birla Group
Mr Daljit Singh, Consultant
Mr N N Gautam, Former Advisor, Ministry of Coal
Mr Nitin Zamre, MD, ICF International
Mr Rajeev Singhal, TATA Steel
Mr S K Grover, Advisor, TATA Group
Mr V. K. Sehgal, MD, Global Coal & Mining Pvt. Ltd.
Mr B. Parathasarathy, CEO (India Operations), Anglo American Plc
Mr Chanakya Chaudhary, Group Director (Corp. Comm. & Regulatory Affairs), TATA Steel
Mr S K Agrawal, Head (Central Coal Procurement Group), Vedanta
Mr Susmit Pushkar, Khaitan & Co.
Mr D. L. R Prasad, President (Mining), Adani Group
Mr Kapil Dhagat, EVP, JSPL
Mr Ankan Mitra, Head of Regulatory Affairs (Mining & Steel), Tata Steel
Mr Sunjoy Joshi, Director, ORF
Mr Swagat Bam, ORF

ANNEXURES

Annexure 1: Coal Production by CIL in Recent Years

	2012		2013		2014		2015		2016 (APR-MAR)	
Grades	Raw coal production MT	% of Raw coal production	Raw coal production MT	% of Raw coal production	Raw coal production MT	% of Raw coal production	Raw coal production MT	% of Raw coal production	Raw coal production MT	% of Raw coal production
Non-Coking Coal	392.48	90.1	408.56	90.3	413.50	89.4	443.67	89.8	485.05	90.0
Coking Coal	43.36	9.9	43.66	9.7	48.92	10.6	50.57	10.2	53.70	10.0
Total	435.84	100.0	452.21	100.0	462.422	100.0	494.238	100.0	538.75	100.0

Annexure 2: Coal Block Allotments

Year of Allotment	Power		Iron & Steel	
	Coal Blocks (No.)	*Geological Reserves*	*Coal Blocks (No.)*	*Geological Reserves*
1993	1	171.800		
1994	1	022.550		
1995	1	100.000		
1996	1	100.000	3	484.215
1997				
1998	2	178.860		
1999	1	038.847		
2000	1	67.170		
2001	1	562.000	1	24.260
2002	1	092.920		
2003	9	173.590	2	68.289
2004	1	1436.000		
2005	3	890.840	4	269.680
2006				
2007	2	536.860	1	109.600
2008				
2009				
2010				
2011				
2012				
2013				
2014				
Total	**23**	**4261.420**	**13**	**1062.061**

Year-wise Allotment of Captive Coal Blocks for Power and Iron & Steel Sectors (status till 31 March 2015): Geological Reserves in Million Tonnes

The highlights summarised in this report draw on a selection of ideas from the discussions & presentations of the distinguished speakers at the two Roundtables organised by ORF on December 2014 and November 2015. Care has been taken not to distort the views of the speakers. The views expressed in this report may not be attributed to any individual contributor unless explicitly cited. Lydia Powell and Akhilesh Sati of the ORF's Energy Initiative compiled and arranged the contents of this report. Questions & comments may be sent to akhileshs@orfonline.org.

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20, Rouse Avenue Institutional Area, New Delhi - 110 002, INDIA
Ph. : +91-11-43520020, 30220020. Fax : +91-11-43520003, 23210773
E-mail: contactus@orfonline.org
Website: www.orfonline.org