
Executive Summary

INTRODUCTION

The installed electricity generation capacity in the country as on 31 October 2016 was 307278 MW out of which coal based capacity was 186493 MW (60.69 percent). NTPC Limited is the largest power utility in the country, its coal based capacity being 40084 MW (October 2016).

Coal cost constitutes 60 to 70 percent of the total generation tariff of a coal based power station and has a major impact on cost of supply of power to consumers. Inefficiencies in fuel management would increase the energy charges for the stations and cost of power to the ultimate consumer. Keeping in view the significance of fuel management to affordable power, the performance audit on fuel management of coal based power stations of NTPC Limited was carried out. The performance audit covers fuel management of 13 out of 26 coal based power stations of NTPC Limited and its Joint Ventures during the period from April 2010 to March 2016.

MAJOR AUDIT FINDINGS

Procurement of Domestic Coal

Coal is primarily procured domestically through long term coal linkages from subsidiary companies of Coal India Limited (CIL) and Singareni Collieries Company Limited (SCCL) at notified rates. For all other procurements, such as procurement through MOU, e-auction and import, the rates are higher.

Stations having inadequate fuel linkage

Examination of fuel linkages revealed that two power stations, viz., Barh-II and Kahalgaon-II, were operating without long term fuel linkage while Ramagundam-III was operating with reduced linkage. The three stations incurred an extra expenditure of ₹2483.39 crore due to procurement of coal through costly sources during the period from 2010-11 to 2015-16. Fuel Supply Agreement (FSA) on cost-plus basis was agreed to for Mouda station though New Coal Distribution Policy did not mandate it. Coal supplied under cost-plus agreement was costlier than notified rates and resulted in extra fuel cost for Mouda station to the extent of ₹31.11 crore from February 2015 to March 2016.

(Para 3.1.1 and 3.1.2)

Delay in signing FSA

There were significant time gaps between Commercial Operation Date and signing of FSA in five stations, viz., Sipat-I, Rihand-III, Farakka-III, Vindhyachal-IV and Korba-III, which forced these stations to procure coal under 'Performance Incentive' provision of the FSA of older units, incurring additional fuel cost of ₹323.37 crore.

(Para 3.1.3)

Performance Incentive paid under FSA

As per New Coal Distribution Policy, 100 *percent* of the Annual Contracted Quantity (ACQ) as per the normative requirement of the consumers would be supplied through FSA at notified prices. However, NTPC agreed to pay performance incentive for supplies above 90 *percent* of ACQ. This increased fuel cost of 10 stations by ₹558 crore.

(Para 3.1.4.1)

FSA for stations commissioned after 31 March 2009 provided for payment of performance incentive on Deemed Delivered Quantity, which included imported coal not actually delivered to the station. The payment of performance incentive for such notional deliveries increased the outgo of two power stations (Vindhyachal and Rihand) by ₹18.43 crore for the year 2013-14 without any commensurate benefit.

(Para 3.1.4.2)

As per the FSA (both old and new), the trigger level for performance incentive was 90 *percent* of ACQ. The new FSA (applicable for units commissioned after 31 March 2009) introduced compensation payable by coal companies in case supply falls below 80 *percent* of ACQ. In six stations, both the old and new FSAs with the same coal companies were in operation. NTPC and CIL arrived at an understanding regarding apportionment of supply against old and new FSAs; - CIL would consider supply of coal up to 90 *percent* of the ACQ in respect of old FSA and after fulfilling minimum commitments (80 *percent* of ACQ) under new FSA, the balance supply, if any, would be considered for incentive against old FSAs. This meant that NTPC paid additional performance incentives for supplies beyond 80 *percent* of ACQ in new FSAs. Audit noticed that the extra incentive payment by the stations on this account was ₹32.65 crore for the period 2013-14 and 2014-15.

(Para 3.1.4.3)

Deviation in supplies vis-a-vis scheduled quantity

The Annual Contracted Quantity was divided into quarterly scheduled quantities and further sub-divided into monthly scheduled quantities. FSAs provided that a deviation in monthly scheduled quantity up to 5 *percent* can be made with the written consent of both parties, but total variation in any month shall in no case exceed 10 *percent* of the scheduled quantity. For quarterly scheduled quantities, old FSA did not permit any excess supplies, while new FSA permitted deviation with the written consent of both parties. Examination of data regarding actual supplies vis-à-vis scheduled supplies revealed that deliveries to stations were rarely as per schedule. Since FSA provided for calculation of performance incentive/disincentive on annual basis, intra-year short supplies did not impact the earning of incentive by coal companies so long as there was no annual shortfall. This led to a paradoxical situation where the stations suffered generation loss due to coal shortage, while they paid incentives for additional supplies made over the year.

(Para 3.1.5.1)

Non recovery of compensation for short supplies under FSAs

The FSAs provided monetary compensation for short delivery by coal companies as well as short lifting by power stations. Performance incentive was also payable by power stations for annual supplies above 90 percent of ACQ. In the case of three stations, viz., Badarpur, Jhajjar and Ramagundum, though these stations paid incentive of ₹128.08 crore, compensation amounting to ₹114.68 crore could not be recovered from coal companies. In the case of Vallur station, though there was significant short supply, compensation was not even claimed.

(Para 3.1.5.2)

Rationalisation of quantities under FSAs

Badarpur station had two FSAs, one with Eastern Coalfield Limited for an Annual Contracted Quantity (ACQ) of 2 lakh tonne and another with CCL for ACQ of 40 lakh tonne. CCL had consistently short supplied coal over 2011-2015 (except in 2012-13) which had attracted compensation of ₹21.23 crore. This was claimed, but not received. On the other hand, ECL had been supplying more than the ACQ in all the five years and the station paid performance incentive of ₹47.06 crore. NTPC did not address this situation by re-appropriation of the quantity among ECL and CCL.

(Para 3.1.5.3)

Procurement of coal through MOUs

In addition to FSAs, power stations entered into Memoranda of Understanding (MOUs) with coal companies to supplement coal supplies. Procurement of coal through MOUs was not mandated under New Coal Distribution Policy. High premium was being paid for MOU procurements, even compared to maximum incentive of 40 percent over notified rates under FSA. Premium agreed to by NTPC under MOU with Singareni Collieries Company Limited was higher than FSA rates by ₹1600.64 crore while the premium agreed to under the MOU with ECL was higher by ₹1433.19 crore.

(Para 3.2)

Procurement of coal through e-auction

NTPC procured coal through e-auction to supplement FSA supplies using the price of imported coal (GCV 5700 kCal/kg) as benchmark for bidding. Since there were significant differences between the bid price and the actual import price for the grade of coal on offer in e-auction, two scenarios could occur: (i) where the import price for the grade of offered coal is lower than the derived price, the bid amount would be on the higher side and the Company would win the bid by quoting a higher amount for an inferior quality of coal and (ii) where the import price is higher than the derived price, the Company may be losing the bid.

(Para 3.3)

Import of coal

Policy framework for import of coal

NTPC did not lay down a specific policy for importing coal. In the absence of a comprehensive policy, different approaches to key decisions such as splitting of quantity

among bidders, qualification requirements, type/GCV of coal to be procured, retendering/annulment, negotiation with bidders *etc.* were noticed. During the period from April 2011 to March 2016, 36 of the 40 packages, worth ₹ 22796.91 crore (approx.), for 36.79 million tonnes of coal accounting for over 75 percent of the procurement by value, were awarded to a single entity, Adani Enterprises Limited. In order to enhance participation level, though splitting was introduced, the splitting ratio was modified subsequently, which had the effect of awarding more quantity to L1 bidder.

(Para 4.1)

Source verification of quantity and quality of coal

To ensure quality of supply, the Qualification Requirement for bidders provided for tying up with mine owner(s) through a 'Letter of Authority' from them. Since the bid prices obtained with this condition were higher than cost estimates, the requirement regarding 'Letter of Authority' was relaxed and the bidders were asked to furnish list of mines from which supply would take place. Since the bidders submitted a large list of mines (from 33 to 740 mines), the source and quality of coal being imported was not assured.

(Para 4.2)

Incorrect adoption of index of coal for import

NTPC imported coal from Indonesia under 15 packages involving 14.6 MMT during February 2012 to February 2013. NTPC indicated in the contract documents that the requirement was for GCV of 6300 kCal/kg (on Air Dried Basis-ADB) while the payment would be based on the index for GCV of 6500 kCal/kg on Gross As Received-GAR basis instead of 5800 kCal/kg, which was the appropriate index. GCVs worked out on ADB and GAR basis are considerably different; the GCV being higher on ADB basis compared to GAR. Difference in price per tonne of Indonesian coal, as per 6500 GAR and 5800 GAR ranged from 11.97 USD to 18.75 USD

(Para 4.3)

Assessment of Quality and Quantity of coal

Pricing of coal by coal companies and pricing of energy by generating companies depends significantly on its heat value referred to as 'Gross Calorific Value (GCV)'.

Sample collection and methods of measurement for coal quality

Measurement of GCV depends on the location from which samples are collected and the method used to measure GCV. Different methods of measuring GCV were used for different purposes, *viz.*, GCV was reported on 'Air Dried basis' (ADB) for payment of imported coal, GCV on 'Equilibrated basis' (EB) for payment to domestic coal companies and GCV on 'Total Moisture basis' (TMB) for energy billing.

GCV on ADB basis gave undue advantage to the supplier since moisture present in the sample was dried in order to ascertain the GCV for payment. TMB method gives the lowest GCV and the same is used by stations for billing. As energy tariff is inversely proportional to GCV, this would lead to higher burden on consumers. Similarly, the method of estimation of quantity of coal did not provide adequate assurance regarding its accuracy.

(Para 5.1)

Reduction in heat value (Gross Calorific Value) of coal

Audit compared the GCV 'as billed' at mine end, GCV 'as received' at the unloading point of the power station and GCV 'as fired' in the boilers for a year (from October/November 2012 to September 2013). It was observed that GCV of coal progressively decreased from 'as billed' stage to 'as fired' stage, though as per Central Electricity Authority, the three GCV values should be approximately same, barring minor losses due to storage. More particularly, the difference in GCV between 'as received' and 'as fired' values was attributable entirely to the power stations. Audit ascertained the impact of GCV difference on efficiency and energy charges. The Station Heat Rate (SHR) ascertained using GCV 'as received' indicated that the power stations were inefficient though SHR as per GCV 'as fired' was within the norm fixed by Central Electricity Regulatory Commission (CERC). The difference in energy charges considering the 'as received' and 'as fired' stage for the one year period was ₹0.03 to ₹0.96 per unit of electricity for the different stations.

(Para 5.2.1)

Weighment of domestic coal

As per Fuel Supply Agreements (FSA), payment for the coal supplies was made as per weighment carried out at the delivery/loading point at mine end. The FSAs also provided for weighment at unloading point (power station) in order to ensure recalibration of weigh bridges at loading point. However, stations did not regularly weigh domestic coal, though in-motion weigh bridges were installed in the stations. Due to this, stations lost an opportunity to cross verify the quantity of coal received and ascertain the resultant transit loss.

(Para 5.3)

Assessment of transit loss through indirect method

CERC Tariff Regulations provided normative transit and handling loss of 0.8 and 0.2 percent for non-pit head stations and pit head stations respectively. Assessment of actual transit loss was carried out by way of physical verification of closing stock of coal stored in the yard and bunker at the end of every quarter using an indirect method called 'volumetric method'. Inaccuracy of the transit loss ascertained using this method was evidenced by the fact that quantity of coal as per the physical verification reports was one to 114 percent more than the storage capacity of the yards in eight power stations.

(Para 5.5)

Coal Supply Management

One of the important functions in operating a power station is to ensure uninterrupted supply of coal so that generation loss due to coal shortage does not arise.

Generation Loss due to coal shortage

During 2012-13, the stock level was at super critical position in seven stations for more than six months and similar situation prevailed in four stations during 2013-14. There was some improvement in 2014-15, but three stations reported super critical stock levels. Further, domestic coal stock dropped to *zero level* at stations during 2012-13 to 2014-15. There were instances of units being taken out of operation or being operated at partial load in view of

coal shortage. During 2010-11 to 2015-16, 11 out of 13 stations covered in audit reported a generation loss of 19546.26 million units of electricity with potential revenue loss of ₹4299.80 crore. Further, Due to unduly positive presumption regarding coal receipt, four power stations incurred generation fault penalty in the form of Unscheduled Interchange charges amounting to ₹101.41 crore during the period from 2010-11 to 2015-16.

(Para 6.1, 6.2 and 6.3)

Storage capacity of coal yards at power stations

Storage capacity of six stations was less than the space required to store the normative quantity for 15/30 days' requirement prescribed under CERC Tariff Regulations. Shortage in capacity as a percentage of requirement ranged from 2.60 percent (Rihand) to 53.62 percent (Farakka). Further, imported coal warranted earmarking specific area for its storage limiting the space for domestic coal.

(Para 6.4)

Storage of domestic coal along with imported coal

As per Local Management Instructions issued by stations, imported coal was to be stacked separately in earmarked area in the yard. Physical verification reports (April 2010 to March 2016) of coal stock were reviewed in audit and it was observed that domestic and imported coal were stored in the same yard. Availability of imported coal in excess of earmarked capacity for it ranged between 6 and 158 per cent indicating that domestic and imported coal were being mixed at the yard itself before they were actually blended.

(Para 6.5)

Railway logistics

The coal supplied through railway rakes was required to be unloaded within a stipulated period known as 'free time', beyond which demurrage was levied by Railways. Stations covered in audit had to incur demurrage of ₹129.67 crore on account of inefficiencies in unloading coal within stipulated time during the period from 2010-11 to 2015-16.

Railways routinely divert rakes of coal consigned for one consumer to another, due to congestion on a particular line or route. Audit noticed that the diversion was not always between power stations of NTPC. In cases where rakes were 'diverted in' or 'diverted out' between stations of NTPC and other companies, there would be an adverse impact on NTPC when high GCV coal of NTPC stations were being 'diverted out' and low GCV coal of other companies were 'diverted in'.

(Para 6.6.1 and 6.6.2)

Consumption of coal

Although yearly average Specific Coal Consumption of stations remained below 1 kg per unit of power, Audit noticed significant monthly variations. Notably, the maximum SCC in some cases was very high, at 3.21 kg in Mouda and 1.02 kg in Badarpur.

(Para 7.1)

Blending of imported coal with domestic coal

Imported coal was blended with domestic coal and fired in the boilers. GCV of imported coal ranged from 5700 to 6300 kCal/kg while that of domestic coal ranged from 2900 to 4200 kCal/kg. Given the very high difference of GCV between domestic and imported coal, it is expected that blending of imported coal would result in lower consumption of the blended coal. Audit, however, noticed that the coal used to produce one unit of energy remained the same, irrespective of whether imported coal was blended to a lesser or greater extent. This raises doubts whether imported coal was indeed superior to domestic coal even though NTPC incurred higher cost for procuring it.

(Para 7.2)

Use of washed coal to reduce environmental pollution

Ministry of Environment and Forests stipulated that raw coal has to be cleaned to reduce ash content to less than 34 *percent*, if coal is transported beyond 1000 kms or if burnt in environmentally sensitive areas. As per this, the entire coal to be used should be washed coal. However, at Dadri station, percentage of washed coal showed a declining trend during the period from 2010-11 to 2014-15, though the situation was slightly improved in 2015-16. In the case of Badarpur station, procurement of washed coal, on an average, during 2010-11 to 2015-16 was over 16 *percent* only.

(Para 7.3)

RECOMMENDATIONS

Based on the audit findings discussed in the report, the following recommendations are made for efficient fuel management practices in NTPC coal based power stations.

For NTPC

1. The Company may review the procedures for procurement of coal above notified rates such as incentive procurement, MOU, e-auction and imports.
2. The Company may invoke, wherever feasible, provisions in the existing Fuel Supply Agreements for inter-station transfer of coal to tide over temporary coal shortages.
3. The Company may formulate a policy for import of coal. Action may also be taken to ensure source and quality of imported coal.
4. Methods for measurement of GCV for procurement of coal and billing of energy may be standardized in coordination with competent authorities.
5. Weighment of coal may be carried out at the time of receipt of coal at unloading point to ascertain the actual transit loss and take remedial measures.

For Ministry of Power

6. Pricing of energy is based on Station Heat Rate, which, in turn, is based on quantity and quality of coal (GCV) consumed by the stations. While quantity of coal received is not weighed by the stations, quality assessment of coal has inherent as well as manmade infirmities due to heterogeneous nature of coal and sampling errors. There

is a need to appropriately review the method for energy pricing. Ministry may coordinate with Central Electricity Regulatory Commission to examine this aspect in the light of the audit findings.

7. The commercial terms in FSAs were not in accordance with New Coal Distribution Policy and FSAs did not have safeguards for intra-year shortfall in deliveries. Ministry may, therefore, review the terms of FSAs in consultation with Ministry of Coal/ Coal India Limited to rectify these inadequacies.

The above recommendations were discussed in the Exit Conference held in October 2016 and the Ministry/NTPC Limited were generally in agreement with the recommendations.