

CHAPTER – IV
ENERGY
DEPARTMENT

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Compliance Audit on “Construction, Operation & Maintenance of Power House-II of Shree Singaji Thermal Power Station, Khandwa of Madhya Pradesh Power Generating Company Limited”

Summary

Audit covered the construction and operational performance of the PH-II of the Shree Singaji Thermal Power Station (SSTPS), Khandwa from the period of preparation of feasibility study in the year 2009-10 by the consultant upto the commissioning of plant on 28 March 2019, including operational performance till 31 March 2021.

During the audit of SSTPS, Khandwa and Corporate office of Company at Jabalpur, the following observations were noticed: -

- *Due to improper planning and delay in pre-execution activities of the project loss of ROE benefit, avoidable payment of water charges, non-availing of the benefit of Clean Development Mechanism (CDM).*
- *Foregone Interest During Construction (IDC) /Incidental Expenditure During Construction (IEDC) claims due to delay in payment of advance to Contractor, additional payment of ERV, slippage of project schedule, delay in completion of CHP, delay in commissioning of AHP, delay in commissioning of Boiler Auxiliaries, deficiencies in supplies of mandatory spares, non-conduct of performance guarantee test.*
- *Delay in execution of work and grant of undue extension of time to contractor.*
- *Non achievement of PAF and PLF against target by MPERC, higher GSHR of frequent tripping, higher auxiliary consumption, high fuel oil consumption.*
- *Reduction in GCV between loading ends at mines and unloading end at TPS, shortage of coal, excess un-burnt coal in bottom and fly ash.*
- *Failure of Turbines installed in PH-losses led to non-recovery of fixed out.*
- *Excess stack emission, non-compliance of ash utilisation norms of MOEF&CC, excess specific water consumption.*

These instances of shortcomings, in aggregate, involved an overall impact of ₹ 2,113.01 crore.

4.1 Introduction

The Madhya Pradesh Power Generating Company Limited, Jabalpur (Company) was incorporated (November 2001) as a wholly owned Company of Government of Madhya

Pradesh (GoMP). The Company was operating four Thermal Power Stations (TPSs)¹ with a total installed capacity of 5,400 Mega Watt² (MW).

In its endeavour to supply bulk power to the Malwa-Nimar region, Government of Madhya Pradesh (GoMP) approved (January 2008) the Malwa Thermal Power project of 4 X 600 MW capacity (Power House I & II). However, based on the recommendation³ of Expert Advisory Committee (EAC), the Environmental Clearance (EC) for only two units (2x600MW) was accorded (October 2008) by the Ministry of Environment and Forest (MoEF), Government of India (GoI).

The Company appointed (October 2010) M/s Ramkey Enviro Engineers Limited as a consultant (Consultant) for preparing pre-Feasibility Report (FR) of the Power House-II (PH-II) of the TPS. The FR⁴ submitted (December 2010) by the consultant justified the installation of (2x660MW), Shree Singaji Thermal Power Station (SSTPS), PH-II to bridge the widening gap between projected demand and supply.

The GoMP (January 2011) and the Board of Directors (BoD) of the Company (December 2011) accorded administrative approval for installation of SSTPS, PH-II of 2x660 MW at an estimated cost of ₹ 6,500 crore.

4.2 Organisational Structure of the Company

The Company is under the overall administrative control of the Department of Energy, GoMP, headed by the Additional Chief Secretary (ACS)/ Principal Secretary. The day-to-day management of the Company is vested with a Board of Directors (BoD). The Managing Director (MD) is the Chief Executive Officer of the Company, who is assisted by Director (Technical), Director (Commercial), Chief Financial Officer, Executive Directors (EDs), Chief Engineers (CEs) and Company Secretary. Each TPS, is headed by a CE, who is assisted by Additional CEs (ACEs) and Superintending Engineers (SEs) who looks after regular operation and maintenance at respective TPS.

4.3 Audit Objective

The Compliance Audit was conducted with a view to assess-

- Whether the construction work of the TPS was executed as per the Detailed Project Report and works were awarded and executed in a prudent manner, and
- Whether the TPS was operated and maintained as per the norms determined by Madhya Pradesh Electricity Regulatory Commission, GoMP and the Company, to obtain the envisaged output.

¹ In a thermal Power Station heat energy obtained from combustion of coal is converted into Electric Energy. In the process of electric power generation, steam-operated turbines convert heat into mechanical power and then finally to electric power.

² ATPS Chachai 210 MW, SGTPS Birsinghpur 1340 MW, STPS, Sarni 1330MW and SSTPS Khandwa 2520 MW.

³ Owing to limited availability of coal i.e. 4.62 MTPA linkage with the Company.

⁴ Envisaged the peak Demand Deficit of 14.4 *per cent* and 10.7 *per cent*, Peak Energy Deficit of 19.0 *per cent* and 10.6 *per cent* during the year 2009-10 and 2010-11 respectively.

4.4 Scope and Methodology of Audit

Audit covered the construction and operational performance of the PH-II of the SSTPS since preparation of feasibility study in the year 2009-10 by the consultant till the commissioning⁵ of plant including operational performance till 31 March 2021.

The records relating to construction of the PH-II were analysed at the corporate office of the Company at Jabalpur and the records of operational performance were analysed at SSTPS, Khandwa.

Entry conference was held in July 2021 wherein the Audit Objectives and Criteria were discussed with the Management along with explanation of the process to be followed during audit. The Audit Report was discussed with the Government/ Management of the Company in the Exit Meeting held in June 2022 and the views of Government/ Management have been incorporated suitably in the Report.

4.5 Audit Criteria

The audit findings have been derived against the following criterion:

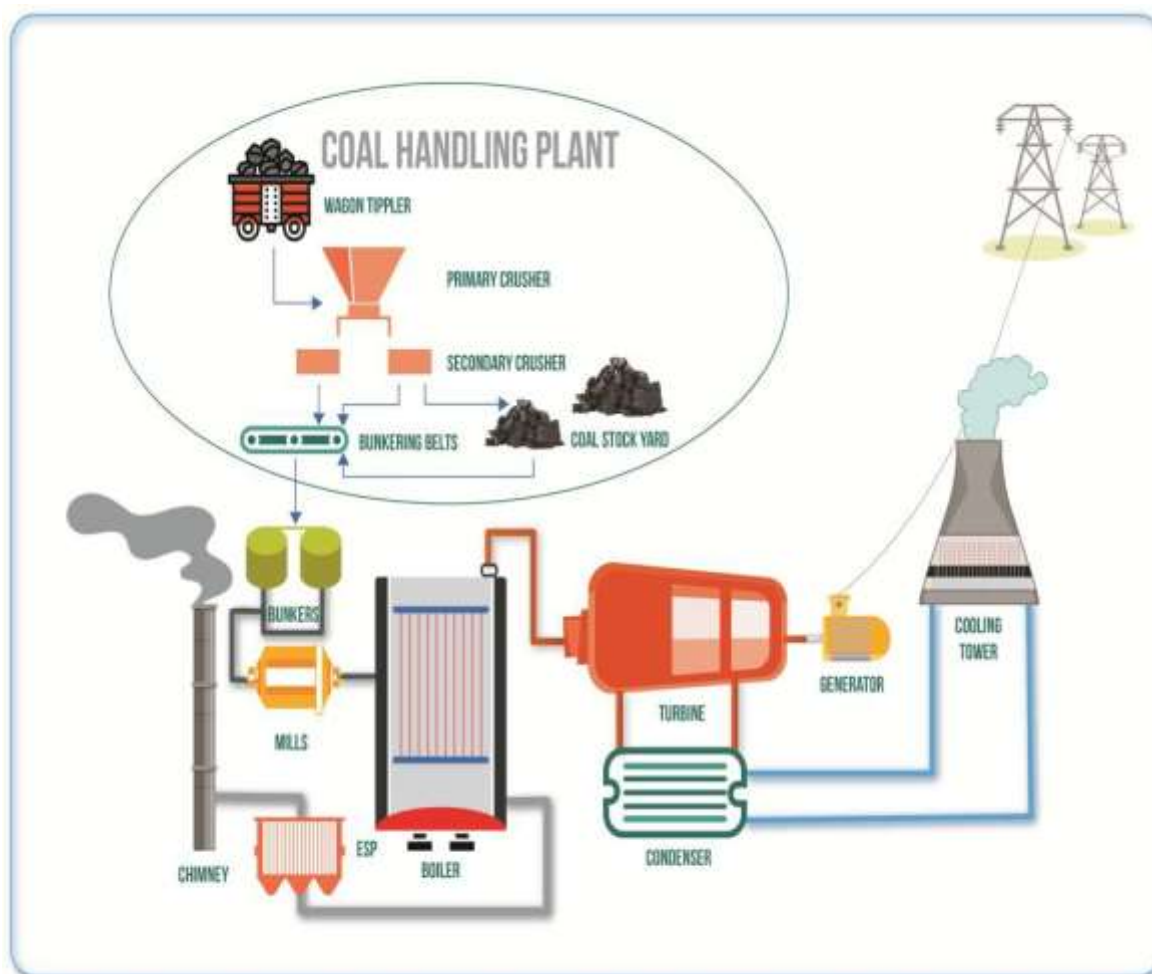
1. Policy and Guidelines issued by the Government of India (GoI), Government of Madhya Pradesh (GoMP), Central Electricity Authority (CEA)/ Central Electricity Regulatory Commission (CERC)/ Madhya Pradesh Electricity Regulatory Commission (MPERC);
2. Guidelines/ Environmental Norms issued by the Ministry of Environment and Forest (MoEF), GoI/GoMP, Central/Madhya Pradesh Pollution Control Board (CPCB/MPPCB) and other Statutory Authorities;
3. Agenda /Minutes of the meetings of Board of Directors/ Business Committee, MIS reports submitted to MPERC/ CEA/ MPPCB; and
4. Feasibility/ Detailed Project Report, terms and conditions stipulated in the Tender Documents/ Contract Agreements/ Fuel Supply Agreements/ Power Purchase Agreements, etc.

4.6 Power generation process of Thermal Power Station

The schematic diagram of the generation process in a TPS is given in **Chart 4.1** below:

⁵ Unit-3 of the plant was commissioned 18th November 2018 and Unit-4 of the plant was commissioned on 28th March 2019.

Chart 4.1: Generation process in TPS



In TPSs, high pressure steam produced in the boiler rotates the Turbine connected to the Generator, where the electricity is generated.

4.7 Construction of the Project

The DPR of the Project, finalised in March 2012, envisaged the cost of the Project at ₹ 6,499.93 crore, which was revised (September 2017) to ₹ 7,738.00 crore⁶. The GoMP accorded its approval (March 2019) for the revised cost and the MPERC too, through the final generation tariff order dated 18 May 2021, approved the revised Project cost.

The total expenditure incurred on the Project till 30 September 2021, as against the total approved Project cost, and its source of funding is given in **Table 4.1** below:

Table 4.1: Details of Project Expenditure

Particular	Total	₹ in crore)	
		Equity from GoMP	Loan from Power Finance Corporation
Approved project cost	7,738.00	1,547.60	6,190.40
Expenditure up to 30 September 2021	6,757.01	1,300.20	5,456.81
Percentage of Expenditure with total cost	87.32	84.01	88.15

⁶ Due to installation of Flue Gas Desulfurization (FGD) equipment (required as per the new environmental norms 2015), applicability of water charges and Goods and Service Tax (GST), increase in Price Variation (PV) and Exchange Rate Variation (ERV).

Audit findings

The Audit findings on the construction of the Project broadly cover the issues on Draft Project Report, obtaining of required clearances, arranging of fuel, and tendering and execution of the Project, including the performance guarantee test of the plant.

The Audit findings on operation and maintenance of the Project broadly cover the operational performance of the plant against various operational parameters, analysis of major forced outages and compliances with various environmental and safety norms.

4.8 Planning of the Project

The Audit findings relating to planning and pre-execution activities are discussed in the succeeding paragraphs.

4.8.1 Delay in various stages of Project led to foregoing of Return on Equity benefit

The MPERC Generation Tariff Regulation⁷ allows the power generating companies to recover Return on Equity (RoE) at the rate of 15.5 *per cent* per annum for Thermal Generating Stations. It further allows an additional return of 0.5 *per cent* for those extension projects of 660 MW and above, which complete their first unit within 50 months and the second unit within 56 months from the date of investment approval by the Board of the generating company.

The GoMP accorded its administrative approval for installation of Project in January 2011 and the BoD of the Company, despite unavailability of confirmed coal linkage⁸, accorded approval for the Project on 14 December 2011.

The GoI granted Environmental Clearance (EC)⁹ for the Project in August 2014 and the Company placed the work orders¹⁰ for the Project in September 2014 i.e. 32 months after the approval of Project by BoD. The Units 3 and 4 were completed on 18 November 2018 and 28 March 2019 respectively. MPERC allows a period of 50 months and 56 months respectively for completion of two Units from the date of investment approval by BoD i.e. 14 December 2011. As such there was a delay in completion of the two units by 33 months 4 days and 31 months 14 days respectively from the date of investment approval by the BoD.

The Company claimed (February 2020) the RoE at the rate of 16 *per cent* in its Tariff Petition (No.-25 of 2020). The MPERC, however, disallowed additional (0.5 *per cent*) RoE on the grounds that both the units (Unit-3 and 4) of the Project could not be completed within the stipulated time period.

Thus, the Company failed to schedule the Project approval strategically, and monitor the Project execution schedule to ensure timely completion of work, so as to gain additional RoE. The time lapsed in the process of obtaining firm coal linkage, EC, delays in project execution together led to delay in achieving Commercial Operation Date (CoD) from the stipulated time

⁷ Madhya Pradesh Electricity Regulatory Commission (Terms and Conditions for Determination of Generation Tariff) Regulations, 2015.

⁸ As per MoEFCC, GoI, circular (November 2010) a thermal power project would be considered for Environmental Clearance (EC) only if it had a firm coal linkage.

⁹ On the assurance given (July 2014) by the Company to divert the 6.6 MTPA coal allocated for units of Satpura TPS, Sarni, which were soon to be phased out.

¹⁰ Wherein, the time limit for COD of unit 3 and 4 was 43 and 47 months respectively.

period and deprived the Company of the benefit of additional RoE to the extent of ₹ 120.75 crore¹¹ during the life (25 years) of the power plant.

The Government stated (May 2022) that the Ministry of Power (MoP), GoI intimated (September 2010) that it had forwarded its recommendations to Ministry of Coal (MoC), GoI for allocation of coal linkage for SSTPs, PH-II. Accordingly, the GoMP had accorded its approval for the Project. It was further stated that date of “Investment Approval” was not clearly defined in the MPERC’s Regulation 2009 (for control period 2010-12) and Regulation 2012 (for control period 2014-16) for completion of project within the timeline specified, hence Effective Date of the contract was considered as ‘Investment Approval Date’.

The reply confirms that the approval was accorded in anticipation of the coal linkage and no firm linkage was obtained till the time of approval. Further, Government’s claim that the date of Investment Approval was not clearly defined in the MPERC Regulation 2009 and 2012 is factually incorrect as these Regulations clearly stated that, “*The completion time schedule shall be reckoned from the date of investment approval by Board (of the Generating Company), up to the Date of CoD of the Units.*”

4.8.2 Avoidable payment of water charges ₹ 67.80 crore

To cater to the need of water for operation and maintenance of both PH I and II, the Company obtained (August 2013) the allocation of water from Water Resource Department (WRD) for supply of 75.60 million cubic meter (MCM)¹² per year and executed Water Supply Agreement (WSA) (February 2015) with WRD, GoMP for supply of water to both PH I and II. As per the terms of the WSA, the Company was liable to pay for 90 *per cent* of the total quantity of annual allocated water or actual quantity of water drawn, whichever is higher at the rate of ₹ 5.50 per Cu. m. Further, as per the provisions of MP Irrigation Rule, 1974¹³, the water charges for Unit 3 and 4 became payable from August 2015 i.e. after six months from the date of entering in to WSA.

The WRD, considering the far-off schedule completion¹⁴ of PH-II, suggested (May 2016) the Company to enter into a separate WSA for PH-II and avoid the payment of water charges.

However, the Company did not enter into a separate WSA for PH-II and it had to pay ₹ 67.80 crore towards water charges during the period from August 2015 to November 2018 for Unit-3 and till March 2019 for Unit-4 without consuming any water.

Government stated (May 2022) that water allocation was mandatory requirement for obtaining EC as well as Coal Linkage for the Project and if the water allocation for stage –II had been surrendered, it might have posed a threat to the project due to unavailability of water when needed.

Reply confirms that mere allocation of water was sufficient for obtaining the EC which the Company had already obtained in August 2013 and was valid till August 2019¹⁵, i.e. beyond

¹¹ ₹ 149.85 crore (RoE per year allowed by MPERC at 15.5 *per cent*) * 0.5 *per cent*/ 15.5 *per cent* = ₹ 4.83 crore per year * 25 years = ₹120.75 crore.

¹² Unit-1 & 2: 18 MCM each and Unit-3 & 4: 19.80 MCM each.

¹³ Company may fix different dates for start of production for different Units but the difference could not be more than six months.

¹⁴ July 2018 for Unit-3 and November 2018 for Unit-4.

¹⁵ As per clause (d) of the Gazette Notification, dated 22.06.2013, water allocation order would be deemed as cancelled in cases where the industrial units had not started industrial production up to 72 months (August 2019) from the date of issuance of water allocation order (August 2013).

the schedule completion of PH-II. Thus, had the Company entered into a separate WSA for PH-II it could avoid the infructuous payment of ₹ 67.80 crore towards water charges.

4.8.3 Non-availing of the benefit of Clean Development Mechanism (CDM)

The Feasibility Report as well as Detailed Project Report envisaged the CDM¹⁶ benefits on adoption of Supercritical technology as it would result in enhanced plant efficiency and reduce the coal consumption. Projected revenue from sale of carbon credits in 10 years was ₹ 2,289.07 crore.

The Company did not approach the Designated National Authority (DNA)¹⁷ to register the Project as CDM project with United Nations Framework Convention of Climate Change (UNFCCC). The issue of non-registration of the then projects of the Company for CDM benefits was included in CAG's Audit Report (Commercial) for the year 2009-10. In response, the Company had stated (October 2010) that their ongoing projects including SSTPS PH-I were based on sub-critical technology which did not qualify for the CDM benefits.

Government stated (May 2022) that none of the Super Critical Thermal Power Plants in India, received the CDM benefits possibly because of emission reductions due to efficient technologies *vis-a-vis* the baseline emission, hence registering the project with DNA of UNFCCC for sale of carbon credits would have been a futile exercise. Further, the Company would have been benefitted with the notional revenue of ₹ 36.30 crore only because of reduction in the prices of CER during the year 2013 to 2020. It further informed (June 2022) that the registration of the Project could be done only up to the date of its COD.

The reply indicates that the Company would have realised the revenue of ₹ 36.30 crore if it had registered the project with DNA before COD of the project. Further, the reply that registering the project with DNA would have been a futile exercise, is an afterthought only as no considered decision of Management in this regard was available on the records.

4.9 Tendering and execution of Contracts for Plant

The Company initiated (July 2012) tendering process for installation of Project on complete Engineering, Procurement and Construction (EPC) basis and finalised the same in August 2013, wherein, M/s L&T EPC Power Vadodara (EPC Contractor) emerged as the L1 bidder with a total cost of ₹ 5,134.75 crore. Company intimated the same to EPC Contractor (October 2013) stating that the Letter of Award (LoA) would be issued only after receipt of Environment Clearance (EC) from the Ministry of Environment & Forest (MoEF), Government of India (GoI).

4.9.1 Foregone Interest During Construction (IDC)/ Incidental Expenditure During Construction (IEDC) claims due to delay in payment of advance to Contractor

The Generation Tariff Regulations of MPERC allows Generator to recover, through tariff, the cost of Interest During Construction (IDC) and Incidental Expenditure During Construction (IEDC) respectively, incurred during the construction of a power project.

¹⁶ The CDM, defined in Article 12 of the Kyoto Protocol under the UNFCCC, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO₂, which can be counted towards meeting Kyoto targets.

¹⁷ In India the Ministry of Environment, Forest and Climate changes, Government of India was nominated as DNA.

The Company decided¹⁸ (31 August 2013) that the Effective Date (Zero Date) of contract would be the date of issue of LoA and the payment of advances was to be made within 60 days from the issue of LoA. In case the payment was delayed due to Owner's fault beyond 60 days, the Effective Date (Zero Date) was to be extended accordingly.

The Company issued LOA on 04 September 2014 and paid the initial advance of ₹ 375.07 crore to the Contractor during December 2014 to June 2015. As the delay in payment of advance was for more than 60 days, the date of payment of first advance i.e. 31 December 2014, was treated as effective date and scheduled COD¹⁹ of both the units were accordingly shifted to 31 July 2018 and 30 November 2018 from 03 April 2018 and 03 August 2018 for Unit 3 and Unit 4 respectively.

As the delay in payment of initial advances was attributable to the petitioner (Company), the MPERC, while fixing (May 2021) the first Generation Tariff for Unit 3 and 4, disallowed the IDC of ₹ 185.47 crore and IEDC of ₹ 29.56 crore for the delayed period of 118 days.

Audit observed that:

- Despite having the budget (2014-15) provision of ₹ 360 crore, the Company approached the GoMP belatedly (01 October 2014) for disbursement of funds, which were received on 25 November 2014, leading to delay in the payment of advance to the Contractor, consequently delaying the Project by deferring the scheduled COD, and
- The Company had not drawn the funds from loan of ₹ 4,862.17 crore sanctioned (September 2011) by Power Finance Corporation to pay the initial advance amount despite having the power to draw the funds for the similar purpose.

Thus, the Company, despite having the availability of funds, delayed payment of advances to the Contractor and lost the opportunity to recover IDC and IEDC through tariff.

Government stated (May 2022) that restructuring of JV partner companies of EPC contractor was carried out in June 2014 and the EPC contractor intimated the same to the Company after issue of LOA on 08 September 2014. Thereafter the Company sought legal opinion from Advocate General GoMP who concurred to the restructuring on 15 November 2014. After approval of BoD of the Company on 25 November 2014, EPC contractor was asked to submit further documents, which it did on 26 December 2014. Thereafter the advance was released.

The reply is not acceptable as the EPC Contractor (i.e. M/s L&T Power) was selected as L-I bidder in August 2013 and this too was intimated to the Contractor in October 2013, the EPC contractor should have intimated to the Company about restructuring (June 2014) of its partner companies at the time of its restructuring itself. Further, the Company took no action on EPC contractor for delayed intimation and instead the Company itself took entire responsibility for delay in making advance while presenting the case before MPERC thereby losing the opportunity of availing the benefits of IDC and IEDC.

¹⁸ It was as per the terms of LOA issued on 04 September 2014.

¹⁹ Scheduled COD was 43 months and 47 months from the effective date in respect of Unit 3 and 4 respectively.

4.9.2 *Payment of additional Exchange Rate Variation (ERV)*

The Company issued (04 September 2014) five LoAs to EPC Contractor for setting up of the Project. Two contracts included payment in foreign currencies²⁰. As per the contracts, the materials were to be supplied before scheduled COD of the projects and the prices of the material quoted in foreign currencies were to be paid in the respective foreign currencies against supply of material.

Audit observed that there was an upward trend in the foreign currency exchange rates and the Company had not included any clause in the agreements to restrict the additional payment on account of upward revision in foreign currency exchange rates for delayed supplies, beyond scheduled COD.

The Company had to incur an additional expenditure of ₹ 3.38 crore²¹ due to increase in exchange rates after the scheduled COD of Unit-4 (November 2018) against supply of material worth ₹ 57.28 crore, quoted in foreign currencies which was supplied during November 2018 to June 2021.

Government stated (May 2022) that if ceiling had been kept on payment of ERVs, there is a possibility that the contractors would have quoted higher prices to cover the unforeseen loss on account of adverse forex rates, which would have resulted in higher price bids.

The reply is not cogent as the price variations are allowed till scheduled COD as a general prudence and the contractors are to be penalised for delays thereafter. Not restricting the payment of ERV up to scheduled COD resulted in avoidable payment of ERV of ₹ 3.38 crore up to June 2021 and the burden of ERV would further increase when the supplies of remaining material would be received on later dates.

4.9.3 *Slippage of Project schedule*

As per the agreement with the EPC Contractor, Liquidated Damages (LD) at the rate of 0.5 *per cent* of the contract price for a delay of one week or a part thereof beyond the date of scheduled completion²², subjected to a maximum of 10 *per cent* of the contract price²³ was to be levied on the contractor.

The Company achieved the Commercial Operation Date (COD) of Unit-3 on 18th November 2018 with a delay of 110 days and of Unit-4 on 28th March 2019 with a delay of 118 days.

The delay in commissioning of both the units had resulted in generation losses of 3069.79 MU²⁴ (at 85 *per cent* PLF) energy. This forced the GoMP to procure costlier energy from other sources and imposed an additional burden of ₹ 102.32 crore on GoMP.

The Company, on the request (January/June 2018) of Contractor, granted provisional extension of time for completion of Unit-3 up to 30 November 2018 and Unit-4 up to 31 March 2019 keeping in reserve, the right of the Company to recover LD. However, the time extension has not been finalised so far (October 2021). Considering the delay in

²⁰ USD 25.504 million, EURO 8.706 million & JPY 2339.046 million in first contract and USD 58.453 million, EURO 7.541 million, JPY 2761.184 million & local (Indian) supplies/services of ₹ 29,703.602 million in the second contract.

²¹ Calculated as difference in cost due to currency rate variation as on SCOD and actual supply date.

²² Unit- 3 and 4 were scheduled to be completed by July 2018 and November 2018 respectively.

²³ The Contract price of the first unit (Unit-3) for the purpose of LD was to be taken as 60 *per cent* of the total contract price and that of second unit (Unit-4) as 40 *per cent* of contract price.

²⁴ (1481.04 MU = 15.84 MU x 85 *per cent* x 110 days of Unit 3 and 1588.75 MU = 15.84 MU x 85 *per cent* x 118 days of Unit 4).

achieving the COD, the LD of ₹ 413.25 crore (₹ 240.31 crore²⁵ for Unit 3 and ₹ 172.94 crore²⁶ for Unit 4) was to be levied and recovered from the Contractor. However, the Company did not recover the same even after elapse of 31 months from the commissioning (March 2019) of PH-II. The final recovery of LD needs to be watched.

Government accepted (May 2022) that it could not generate 3069.79 MUs of energy. Further, it stated that as per the terms of contracts, LD for delay was to be levied for the reasons solely attributable to the Contractor. A high level committee, constituted by the Company for analysing the reasons for delay, had submitted its recommendations (3 July 2021) to grant extension with levy of LD and the same was under consideration for final decision of the competent authority.

The fact remains that the Company could not finalise the decision for granting time extension to the contractor and penalise the contractor till date (October 2021) for the reasons attributable to the contractor.

The delay in completion of following facilities mainly attributed to delay on commissioning of Project-

4.9.3.1 Delay in completion of Coal Handling Plant

The EPC contract included the work of construction of Coal Handling Plant (CHP) which further included the work of construction of railway siding which were to be completed by 15 December 2017 (Unit 3) and 15 April 2018 (Unit 4) respectively.

However, the work of laying of rail line for Unit 3 could be completed on 23 June 2018 with a delay of 190 days and Unit-4 could be completed on 25 January 2019 with a delay of 285 days.

Government stated (May 2022) that delay in completion of CHP was not the only reason for delay in CoDs of Unit-3 and Unit-4 as major part of CHP, i.e., Wagon Tippler (WT) No 4, WT-3 and Track Hopper No. 2 were completed in June 2018, September 2018 and January 2019 respectively before the actual CoD of both the respective Units.

Reply confirms that the major part of CHP, i.e., Wagon Tippler (WT) No 4, WT-3 were commissioned in June/September 2018 as against their schedule completion date of March 2018 and Track Hopper No. 2 was completed in January 2019 against schedule completion date of July 2018. This had impacted the actual CoD of both the units.

4.9.3.2 Delay in commissioning of Ash Handling Plant (AHP)

The EPC contract included the work of construction of Ash Handling Plant (AHP)²⁷. As per the schedule for completion of work, the work of commissioning of AHP was to be completed within the period of 36 months (i.e. up to 31 December 2017) from the Effective Date (31 December 2014) of contract.

However, there was inordinate delay in supply of material required for Fly Ash Handling System and the Company decided to evacuate the 100 *per cent* ash through Bottom/ Wet Ash Disposal System till the final commissioning of Fly Ash Handling System.

²⁵ ₹ 3080.85 crore (60 *per cent* of Contract Price ₹ 5134.75 crore) X 7.8 *per cent* (delay no. of week = 110 days/ 7 = 15.71*0.5 penalty per week).

²⁶ ₹ 2053.90 crore (40 *per cent* of Contract Price ₹ 5134.75 crore) X 8.42 *per cent* (delay no. of week = 118 days/ 7 = 16.86*0.5 penalty per week).

²⁷ AHP is established for evacuation of ash from the TPS. There are two types of ash generated from the TPS i.e. Bottom Ash and Fly Ash. The AHP is generally divided in to three types- Fly Ash Handling System, Bottom Ash Handling System and Ash Slurry Disposal System.

The Bottom/ Wet Ash Slurry Disposal System were also completed in July 2018 (Unit 3) and January 2019 (Unit 4) with a delay of seven and nine months respectively.

Government stated (May 2022) that the commissioning of Dry Fly Ash System was delayed due to delay in supply of material by the contractor. However, the Bottom/ Wet Ash Slurry Disposal System was available in July 2018 (for Unit-3) and in January 2019 (for Unit-4) well in advance before achieving actual CoDs.

Reply is not acceptable as to achieve the schedule CoD for Unit-3 (31 July 2018) and Unit-4 (30 November 2018), the process of coal firing/ full load operation was to be started from March 2018 and July 2018, respectively, for which the commissioning of Bottom/ Wet Ash Slurry Disposal System was a prerequisite. However, these facilities were commissioned in July 2018 and January 2019, which resulted in delayed CoDs of both the units.

4.9.3.3 Failure of Electrostatic Precipitator due to operation of plant without complete erection of Ash Handling Plant

During the review of records, it was noticed that due to evacuation of 100 *per cent* ash through Bottom Ash Disposal System/ Ash Slurry Disposal System till December 2019 and partial completion of Bottom Ash Disposal System/ Ash Slurry Disposal System, the Electrostatic Precipitator (ESP)²⁸ of Unit-3 and 4 stopped working on 10 June 2019 and 14 June 2019 respectively due to choking issues and problem in de-ashing and resultant deposition of ash in the hoppers of ESP. As a result, both the units went under forced shutdown for 335.17 hours and 160.57 hours respectively causing generation loss of 327.52 MUs and consequent loss of ₹ 47.56 crore²⁹ due to non-recovery of fixed cost during shutdown period. The Company, however, did not initiate any action against the contractor for the substandard work and delayed completion of work.

Government, while accepting the audit observation, stated (May 2022) that the contractor delayed the commissioning of Dry Fly Ash System and entire ash generated was evacuated from Bottom/ Wet Ash Slurry Disposal System, causing choking. Further, the Company had proposed to penalise the contractor for delay in commissioning of Dry Fly Ash System. However, the fact remains that the Company had suffered the generation loss of 327.52 MUs and consequent loss of ₹ 47.56 crore due to delayed commissioning of AHP and proposal to penalise the contractor is still in process.

4.9.3.4 Delay in commissioning of Boiler Auxiliaries

Boiler³⁰ forms an imperative part of the EPC contract. The Contractor delayed the supply of material and the commissioning of boiler auxiliaries of Unit-4 and these boiler auxiliaries could be commissioned only in November 2018 with a delay of four months. This resulted in

²⁸ Electrostatic Precipitator (ESP) is an electro-mechanical equipment installed for cleaning the flue gases emitted from the TPSs. The substances i.e. fumes, fly ash and suspended dirt from the gas stream collected from the flue gases, goes to the hoppers fitted with the ESP from where it is either transported to fly ash silos or sent to ash pond in the form of ash slurry.

²⁹ Annual Generation on 100 per cent NAPAF-11,563.20 MUs, Annual Generation on 85 *per cent* NAPAF-9828.72 MUs, Annual Capacity (fixed) charges- ₹ 1,427.20 crore, total generation loss due to ESP problem-327.52 MUs. Thus loss of capacity (fixed) charges due to ESP problem is –₹ 1,427.20 crore * 327.52 MUs / 9828.72 MUs = ₹ 47.56 crore.

³⁰ Boiler is an enclosed pressure vessel in which water is converted into steam by gaining heat from any source (coal, oil, gas etc.). It accumulates the steam and build up a pressure to expend it in turbine and convert thermal energy to mechanical energy. The Boiler contains many auxiliaries such as Air-Pre Heater (APH), Induced Draft Fan (ID Fan), Forced Draft Fan (FD Fan), Pulveriser Mills etc. Commissioning of these auxiliaries are required before start of trial run to achieve the final commissioning of any of the unit of a TPS.

deferment of various stages of trial run to be conducted before the final commissioning/COD of the Unit.

Government accepted the audit observation and stated (May 2022) that the Contractor delayed the supply of requisite material, hence there were delays in erection/ commissioning of Boiler Auxiliaries, and consequently the CoD of Unit-4 was delayed. The decision of grant of time extension is under consideration of competent authority and the amount of LD would be decided and levied accordingly.

The fact remains that despite acknowledging the fault of the contractor, Company had not levied any penalty on the contractor so far.

4.9.4 Deficiencies in supplies of mandatory spares

Of the five LOAs issued to the EPC contractor, the two LOAs were issued for off shore supply and on shore supply of materials of ₹ 3,937.35 crore (including mandatory spares of ₹ 226.99 crore). The Contractor was required to supply all the materials and equipment including the mandatory³¹ spares within the period of 39 months (i.e. up to March 2018) and 43 months (i.e. up to July 2018) for Unit-3 and 4 respectively from the effective date of contract (December 2014).

Audit observed that the Contractor did not supply the mandatory spares worth ₹ 4.40 crore under various packages under Onshore Supplies and Offshore Supplies till March 2022. Further, the Company had to procure mandatory spares valuing ₹ 2.83 crore, at the risk and cost of the Contractor. The risk and cost amount, worked out to ₹ 2.24 crore, had not been recovered from the Contractor.

Government while accepting (May 2022) the audit observation stated the Company would recover the risk and cost amount, incurred in procurement of spares in case the contractor would not supply the same in future.

The reply confirms the pendency of mandatory spares even up to March 2022 and that the Company had not yet (June 2022) recovered the 'risk and cost' amount from the contractor.

4.9.5 Non-conduct of Performance Guarantee Test

As per the contract agreement, the Performance Guarantee (PG) Test³² was to be conducted within three months after achieving the COD. Further, as per the Appendix12 of contract agreement "*if the contractor fails to meet the specified Performance Guarantees within 90 days from Commissioning or within reasonable period as agreed, the Owner may at its discretion reject the equipment/system and recover the payment already made or accept the equipment / system only after levying liquidated damages*".

Unit-3 was stopped twice during the period from May 2019 to July 2020 for total 149.22 hours for PG Test, however it could not be conducted for no reasons on record, and the Company suffered the generation loss of 98.58 MUs (valuing ₹ 41.12 crore) and Fixed cost of ₹ 14.06 crore. Similarly, Unit-4 was stopped from 12 May 2021 to 13 May 2021 for 23 hours for preparatory works and the PG test was conducted in July- August 2021. The results of the PG test are still awaited (November 2021).

³¹ Additional spares kept for emergency use.

³² Performance Guarantee (PG) Test is the test conducted to check the plant performance and efficiency after some time (i.e. time prescribed in the contract agreement with the Original Equipment Manufacturer (OEM) for conducting PG Test) of its Commercial Operation Date (COD). Under the Test, all the major and critical parameters disclosed in the contract agreement with the OEM, are observed and plant is taken to its full rated capacity. In the event the OEM fails to demonstrate/ achieve the guaranteed parameters, they are liable for the penalty.

In the absence of the results of PG test of unit-4 and non-conduct of PG test for unit-3, the Company could not verify the guaranteed parameters mentioned in the contract agreement.

Government stated (May 2022) that both the units were kept under shut down of attending problems therein and for arranging preparatory works required for conducting PG test. Further, the PG test report of Unit-4 as submitted by the contractor was under review and the PG test for Unit 3 would be conducted as and when the system would be offered by the contractor.

The fact remains that despite several shutdowns for attending major/ minor defects and preparatory works for conducting the PG test of Unit-3, the same could not be performed so far (May 2022) and report of PG test of Unit-4 could not be finalised.

4.10 Execution of Civil Works

In addition to the five contracts awarded to EPC contractor on 04 September 2014, 13 allied civil works (including 2 deposit works executed by Indian Railways) were awarded by the Company. Audit scrutinized 11 works (excluding works executed by Indian Railways) of which four works were awarded on EPC basis and remaining works were awarded on percentage Rate Contract³³ basis.

4.10.1 Delay in execution of work and grant of undue extension of time to contractor

According to terms/ clauses EPC Contract and Percentage rate contracts, awarded for execution of various civil works, the Contractor was liable to pay Liquidated Damages (LD) for non-completion of work within the time specified in the contract. The Company in the following two cases granted time extension to the contractors on unjustified grounds, without levy of penalties:

- The Company awarded (February 2016) the General civil work package of 2X660 MW of SSTPS on EPC³⁴ basis with a cost of ₹ 104.40 crore. The scope of work mainly included the work of construction of 599 residential quarters and other allied civil works. As per the terms (Clause 5.19 of General Conditions of EPC Contract) of the contract, the Contractor was liable to pay Liquidated Damages (LD) at the rate 0.5 per cent of the contract price per week or part thereof for the delay in completion of work subject to maximum 10 per cent of the contract price.

The work was completed (July 2019) with delay of 16 months from the schedule completion date (February 2018). The Company granted final time extension (May 2019) for 18 months for different reasons³⁵ without the levy of LD.

Audit observed that out of above extension period, the time extension of four months was on the grounds³⁶ which were not justified. Thus, by grant of time extension on the above reasons, the Company extended the undue financial benefits of ₹ 4.65 crore to contractor by not levying LD.

³³ In Percentage Rate Contract, contractors are required to quote rate as overall percentage above or below the total estimated cost.

³⁴ Includes carrying out site related investigations including topographical survey, geotechnical investigation before start of work.

³⁵ Due to the reason of demonetization, ban on extraction of sand, implementation of GST, engineering related issues, non-availability of Ring Main Unit (RMU) for providing power supply at site and shifting of location of sewage treatment plant due to green belt area.

³⁶ Ban on extraction of sand (two months), engineering related issues (two months).

- The Company awarded (August 2018) the work of constructing 240 Nos. residential quarters (on Percentage rate) with a cost of ₹ 22.42 crore. As per the terms (Clause 2 (a) (i) of the Percentage rate contracts) of the contract, the Contractor was liable to pay Liquidated Damages (LD) at the rate 0.5 *per cent* of the contract price per week or part thereof for the delay in completion of work subject to maximum 10 *per cent* of the contract price.

The work was completed (December 2020) with the delay of about nine months from the stipulated date (31 March 2020). The Company granted (February 2021) the total time extension of eight months and 25 days on various grounds without levy of LD.

Audit observed that some grounds³⁷ for which the extension of time was granted, were not justified and the contractor was liable for levy of LD of 10 *per cent* of contract amount. However, Company extended undue advantage to the contractor to the tune of ₹ 2.24 crore by not levying LD.

Government stated (May 2022) that the extension of time granted to the contractor for the contract of construction of 599 residential quarter was justified as there was complete ban on extraction of sand from Narmada river in May 2017. Hence, the supply of river sand was instantly stopped which was to be used in flooring, plastering, masonry, water proofing, etc. Further, there were also certain issues in the initial stages regarding design methodology, finish ground level of quarter and road etc. so the work was held up for some period.

Regarding time extension for construction of 240 quarter, it was further stated that due to the imposed ban on sand mining in August 2019 and June 2020 which resulted in scarcity of sand. Further, the work was also held up on account of excessive rain during monsoon in 2019 and by-election of the constituency of Mandhata. Hence, the extension of time given was justified.

Reply is not acceptable as these reasons do not come under the category of *force majeure* as the completion period given in the contract was inclusive of monsoon season and ban on sand mining is common occurrence during monsoons etc.

4.11 Operational Performance

The Unit 3 and Unit 4 achieved COD on 18 November 2018 and 28 March 2019 respectively. The MPERC, in response to the Tariff Petition filed (February 2020) by the Company, issued (May 2021) Tariff order³⁸ for the year 2018-19. The MPERC, further issued (19 May 2021) the Multi Year Tariff (MYT) for Company's thermal and hydel power stations and determined various operation norms for control period of Financial Year 2019-20 to 2023-24. The operational performance of the PH-II has been measured with the various operational norms determined by the MPERC.

The operational performance of the PH, *vis-a-vis* parameters is discussed below-

³⁷ Scarcity of sand (4 month and 10 days), excessive rains (1 month) and by-election (15 days).

³⁸ Which contained various operational norms for GCV of coal, plant load factor, station heat rate, fuel oil (HFO and LDO) consumption and auxiliary consumption.

4.11.1 Plant Availability Factor (PAF)

The MPERC has fixed PAF³⁹ target of 85 *per cent* for PH-II during the years 2018-19 to 2021-22. The details of target/actual PAF and fixed cost allowed/earned during the period from 2018-19 to 2021-22 are given in **Table 4.2** below:

Table 4.2: The details of PAF and fixed cost during 2018-19 to 2021-22

Year	PAF (<i>per cent</i>)		Fixed charges (₹ in crore)		
	MPERC Norms	Actual	Fixed cost allowed by MPERC	Earned by company	Shortfall
2018-19	85	85.29	274.08	274.08	Nil
2019-20	85	71.64	1,427.20	1,202.89	224.31
2020-21	85	38.78	1,392.44	632.30	760.14
2021-22 (up to August 2021)	85	46.59	569.25	312.07	257.18
			3,662.97	2,421.33	1,241.63

It can be seen from the table that the overall PAF achieved by PH-II (Unit-3 and 4) ranged between 38.78 *per cent* and 85.29 *per cent* during the period from 2018-19 to 2021-22. The Plant could achieve PAF as per MPERC norms only during 2018-19. Non-achievement of PAF as per MPERC norms during 2019-20 to 2021-22 resulted in under recovery of the fixed cost to the extent of ₹ 1,241.63 crore⁴⁰. The main reason for not achieving the targeted PAF by PH-II was excessive forced and planned outages during above period.

The Government agreed (May 2022) with the audit observation and stated that low PAF is attributable to shortage of coal and shutdowns/ trippings due to various reasons.

Reply is not convincing as the plant is not running with the expected efficiency as committed by the EPC contractor due to frequent shutdowns/ trippings, yet the Government is indifferent towards the PG test (as discussed in para 10.5) which would make the EPC contractor accountable and thereafter the damages/penalty, if any, for the sub-standard performance of the plant could be levied and recovered.

4.11.2 Plant Load Factor (PLF)

The PLF⁴¹ of Unit-3 (ranged between 13.39 and 84.87 *per cent*⁴²) and Unit-4 (ranged between 19.78 and 83.78 *per cent*⁴³) remained lower than the norms fixed by MPERC (85 *per cent*) leading to generation loss of 15614.89 MUs.

The major reasons for low PLF were low plant availability due to excessive forced outages; backing down of plant under reserve shutdowns, poor quality of coal and shortage of coal.

The Government agreed (May 2022) with the audit observation and stated that in the initial few years teething issues were observed. The fact, however, remains that the Company failed to comply with the norms of MPERC resulting in lower power generation.

³⁹ Represents the availability of a generating unit to produce electricity in a given period. If the actual PAF achieved by a PH-II was lesser than targeted PAF then the actual recovery of fixed cost would be reduced proportionately for that year.

⁴⁰ This includes the amounts mentioned in the paragraph numbers 10.3.3, 10.5, 13.1 and 14 and other minor outages which were not quantified in this report.

⁴¹ PLF means the total sent out energy corresponding to scheduled generation during the period, expressed as a percentage of sent out energy corresponding to installed capacity.

⁴² Except in the months of February 2019, March 2019 and January 2020.

⁴³ Except in the months of January 2020 and July 2021.

4.11.3 Gross Station Heat Rate (GSHR)

Gross Station Heat Rate refers to heat energy, measured in Kilocalorie (kCal), used to generate one unit of electrical energy.

The average GSHR attained by the PH-II since inception was always higher than the MPERC norms. The average GSHR in 2018-19, 2019-20 and 2020-21 was 2441, 2404 and 2339 kCal/kWh respectively as against the prescribed norms of 2175.28 kCal/kWh for the year 2018-19 and 2185.69 kCal/kWh for the Multi-Year (2019-20 to 2023-24).

The reasons as noticed by the audit for higher GSHR were frequent tripping; operation on reduced load due to shortage of coal and backing down of the units as per instruction of SLDC. Thus, the inefficient operation of the units, resulted in consumption of excess 458187.69 MT coal valuing ₹ 189.98 crore.

The Government agreed (May 2022) with the audit observation and stated that GSHR remained higher due to poor performance of HP Heater-6, non-achievement of Auxiliary Pressure Reducing and De-superheating System (APRDS) desired temperature for soot blowing and non-insulation at various locations etc. Actions have been taken to reduce GSHR through insulation on the locations of heat loss, monitoring of steam leakage, tripping analysis and by ensuring supply of good quality coal. The fact, however, remains that the company failed to restrict the station heat rate within prescribed norms of MPERC.

4.11.4 Auxiliary Consumption

The actual auxiliary consumption⁴⁴ by PH, always remained higher (6.71 to 12.54 per cent) than the norms prescribed by MPERC (5.25 to 5.75 per cent).

Audit noticed that operation of Units at partial load due to shortage of coal, tripping and thermal backing were the main reasons which could not be controlled by the Company. Thus, the consumption of auxiliary power in excess of norms, resulted in loss of 168.234 MUs valuing ₹ 46.79 crore as shown in **Appendix 4.1**.

The Government agreed (May 2022) with the audit observation and stated that frequent tripping occurred till stabilization period of 1-2 years. Now both the units have been stabilized by resolving the issues involved in frequent tripping. Moreover various steps⁴⁵ have been taken for reduction of auxiliary power consumption. The fact, however, remains that the Company failed to restrict the auxiliary consumption within limit/norms prescribed by MPERC.

4.11.5 Fuel oil consumption

The MPERC prescribed the norms for consumption of Secondary Fuel Oil⁴⁶ at 0.50 ml/kWh for the period from 2018-19 to 2021-22. Actual consumption of Fuel oil in both the units remained high (between 0.59 ml/kWh and 27.01 ml/kWh) except in two months (January and March 2020) wherein it was 0.36 and 0.02 ml/kWh respectively.

Audit noticed that operation of units at partial load, tripping due to various reasons and thermal backing, were the main reasons for higher consumption of fuel oil.

Thus, inefficient operations of the units led to excess consumption of 15522.41 kilolitre fuel oil valuing ₹ 66.07 crore during the period from 2018-19 to 2021-22 (up to August 2021).

⁴⁴ The quantum of energy consumed by auxiliary equipment of the generating station.

⁴⁵ By keeping transport air compressor as stand by during idle hours in ash plant, by running only two no. cooling pumps in place of 3 no's, reduction in air washer loading and by adoption of best O&M practices.

⁴⁶ Comprises of Furnace Oil (FO) and Light Diesel Oil (LDO).

The Government agreed (May 2022) with the audit observation and stated that the units were under initial synchronization and commissioning and thereafter stabilization period wherein number of shut-downs occurred which is normal practice. Further, the units have now been stabilized and various actions have been taken to avoid excess oil consumption. The fact, however, remains that the Company failed to restrict the fuel oil consumption within limit/norms prescribed by MPERC and excess oil consumption worth ₹ 66.07 crore.

4.12 Fuel Management for operation of PH

The deficiencies in management of fuel during the operation of plant are discussed in the succeeding paragraphs.

4.12.1 Reduction in GCV between Loading ends at mines and Unloading end at TPS

The most important quality parameter for coal is its heat value referred to as 'Gross Calorific Value' (GCV). The GCV in relation to thermal generation has been defined in the generation tariff regulations⁴⁷ issued by MPERC (December 2015 and February 2020), as "the heat produced in kcal by complete combustion of one kilogram of solid fuel".

The Company entered into the Fuel Supply Agreements (FSA) for SSTPS, Khandwa PH-II (Unit-3 and 4) with Northern Coalfields Limited (NCL) in October 2018 for the Annual Contracted Quantity (ACQ) of 1.79 Million ton per annum (MTPA)⁴⁸ and with South Eastern Coalfields Limited (SECL) in May 2019 for the ACQ of 2.083 MTPA⁴⁹. Each year the coal companies declare mine-wise grade of coal, keeping in view the GCV of the respective coal-mine. The bills for supply of coal are raised by the coal companies as per the GCV of coal at loading point and Company claims the Energy Charge Rate (ECR)/Variable Cost as per the GCV received at the unloading end. The Company had engaged CIMFR⁵⁰ for sampling and analysis of coal at loading ends at mines as well as at unloading end at TPS.

Since GCV is one of the key factors used for energy billing, Audit compared the GCV 'as billed' by coal companies for coal loaded on to wagons at mines end and GCV of coal 'as received' at the unloading point of the TPS. Audit observed that GCV of coal decreased from the 'as billed' stage to the 'as received' stage, though as per CEA, the GCV values, i.e., GCV 'as billed', 'as received' should be approximately same. During 2018-19 to 2021-22 (August 2021), there was drop in GCV up to 2913 kcal/kg valuing ₹ 71.54 crore⁵¹.

As a particular grade of coal (having bandwidth of 300 Kcal/Kg) cannot change or convert into different grade during its transportation, the above position required in-depth analysis of the reasons for vast drop in GCV. Audit found that though this issue persisted in the Company since long despite engaging the same firm, CIMFR at loading end as well as unloading end, the Company did not make any effort to arrest this reduction. Consequently, the issue persisted during the entire period of November 2018 to August 2021⁵².

The Government/ Management informed (June 2022) that variation in coal grade were both ways and sometimes in favour of the Company.

The reply indicates the lackadaisical approach of Management to the problem though the drop in GCV was upto 2913 kCal/kg valuing ₹ 71.54 crore (during 2018-19 to August 2021).

⁴⁷ MPERC (Terms and conditions for Determination of Generation tariff), Regulations.

⁴⁸ Revised from 1.54 MTPA to 1.79 MTPA

⁴⁹ Revised from 1.79 MTPA to 2.083 MTPA

⁵⁰ Central Institute of Mining and Fuel Research (CIMFR) is a constituent laboratory of Council of Scientific and Industrial Research (CSIR) and autonomous body under GOI

⁵¹ Calculated after excluding the cases having difference in GCV upto 300 Kcal/Kg

⁵² Except four months viz December 2018 and April 2019 to June 2019

4.12.2 **Shortage of coal resulting into loss of Generation and reduction in claim of fixed cost**

As per the regulation of MPERC and the DPR of the Project, the plant was required to keep the coal stock for 30 days corresponding to normative plant availability (i.e. 85 per cent as per the norms of CEA) factor of the plant. Further, as the mines⁵³ of South Eastern Coalfields Limited (SECL), Western Coalfields Limited (WCL) and Northern Coalfields Limited (NCL) were located at distance of around 500 km to 900 km, away from the SSTPS, the Company was required to maintain the stock of coal for at least 25 days as per the methodology⁵⁴ framed by CEA.

Audit noticed that the Company failed to arrange continuous and sufficient supply of coal leading to shortage of coal and operation of plant at partial load causing loss of generation during December 2018, April 2019 to June 2019 and again in April and May 2021.

Audit further analysed the reasons of coal shortage and found that:

- The Company failed to appoint Liaisoning contractor timely for coordination among Company, Railways and Coal companies. The Liaisoning Contractor was appointed in August 2019 for supplies of coal from NCL and in October 2019 for supplies of coal from WCL and SECL. Therefore, coal supplies during the period of pre-appointment of liaisoner i.e. December 2018 to June 2019 were affected, although, there was no problem on the part of Company regarding payment of coal during aforesaid period.
- The main reason for coal shortage during April 2021 and June 2021 was lesser/regulated coal supply due to high outstanding/pending⁵⁵ bills of coal companies due to paucity of fund created by huge unrecovered dues⁵⁶ from MP Power Management Company (MPPMCL) towards sale of power. The Company, however, did not explore any alternate sources of funds for payment of outstanding dues of Coal companies to ensure the uninterrupted supply of coal.

As a result, the company suffered not only generation loss to the extent of 724.59 MUs during above mentioned months, but also failed to claim the fixed cost to the extent of ₹ 90.92 crore.

The Government agreed (May 2022) to the generation loss and stated that shortage of coal restricts declaration of 'Declared Capacity'⁵⁷ which ultimately resulted in under recovery of fixed cost due to low PAF.

The reply is not convincing as the Company did not appoint liaisoning contractors timely to ensure the uninterrupted supply of coal and also failed in arranging alternate sources of funds to clear the dues of coal companies.

⁵³ As per allocation of coal to the PH-II of SSTPS.

⁵⁴ Stipulates that the pit head TPSs situated up to 1000 KM away from the mines were required to keep the coal stock for minimum 25 days and for the power plants located up to 1500 KMs away from the coal mines, the availability of coal stock for less than seven days was treated as "Critical Stock Position" and for less than four days is treated as "Super Critical Stock position".

⁵⁵ ₹ 180.45 crore at the end of June 2019, increased to ₹ 817.93 crore by June 2021 and further up to ₹ 957.65 crore at the end of July 2021.

⁵⁶ ₹ 1,192 crore in November 2018, increased to ₹ 7,708 crore in June 2021.

⁵⁷ Declared Capacity (DC) shall mean the capacity of the generating station to deliver ex-bus electricity in MW declared by such generating station in relation to any period of the day or whole of the day, duly taking into account the availability of the fuel.

4.12.3 Excess un-burnt coal in bottom and fly ash

In TPS, the required coal fineness is to be maintained for achieving the optimum efficiency of boiler, otherwise it would result in improper combustion which causes excess release of un-burnt coal particles in the bottom and fly ash, ultimately resulting in excess coal consumption. Audit noticed that there was presence of un-burnt coal more⁵⁸ than the prescribed limit⁵⁹ in ash, resulting in avoidable loss of 6728.15 MT coal worth ₹ 2.79 crore during the period from November 2018 to March 2021. Mainly, inappropriate coal fineness was responsible for improper combustion resulting in higher amount of unburnt coal.

Government, while accepting audit observation, stated (May 2022) that earlier the sampling method of coal mill fineness was carried-out by traditional method; therefore, measurement was not appropriate. The Company has installed Iso-kinematic Sampler in November 2021 to carry out coal fineness test and now the unburnt coal in bottom and fly ash is below two per cent.

The reply is not convincing as unburnt coal in bottom ash was still ranging between 1.47 per cent and 1.52 per cent in the month of November and December 2021 respectively against the prescribed norm of 0.95 per cent.

4.13 Major Outages of PH

4.13.1 Failure of Turbines installed in PH- Losses led to non-recovery of fixed cost

The Unit-3 and Unit-4 were synchronised with the Grid on 07 July 2020 and 11 July 2020 respectively. On 05 August 2020, the unit was hand tripped and on inspection, heavy corrosive deposits and damages in the turbine blades were observed. Similarly, Unit-4 was stopped on 22 September 2020 and heavy scale deposits with small damages in the turbine were observed. The Contractor repaired the damaged turbines of both the Units, free of cost to the Company and the Unit-3 was started on 31 July 2021 after 8627.72 hours of shutdown and Unit-4 was started on 31 March 2021 after the shutdown of 4567.78 hours.

The three⁶⁰ agencies engaged for the analysis of causes of failure of turbine in their reports, commonly observed the following reasons:

- The “Poor Steam and Water Chemistry” was the primary cause of corrosive deposition (deposition of Sodium, phosphate, Silica contents and Chloride) in the turbine due to partial commissioning of SWAS⁶¹ without Chloride Analyser;
- Testing of water and steam through an out sourced agency due to delayed installation of laboratory facility;
- Non-availability of Sodium and Chloride monitoring (online as well as offline) instruments in CPU⁶² system; and
- Non- commissioning of De-humidifier System required for preservation of Turbines.

⁵⁸ 0.95 per cent to 3.90 per cent in bottom ash and 0.68 per cent to 1.90 per cent in fly ash.

⁵⁹ O&M Manual which *inter alia* indicates various parameters of boiler efficiency, prescribed the limit of 0.95 per cent un-burnt coal particles in bottom and 0.68 per cent in fly ash.

⁶⁰ National Thermal Power Corporation (NTPC) and M/s TRACTEBEL as an independent agency and also constituted (30 September 2020) a high-level committee, comprising of its high-level officers.

⁶¹ Steam and Water Analysis system (SWAS) is a system that helps in monitoring the critical parameters in the steam. These parameters include pH, conductivity, silica, sodium, dissolved oxygen, phosphate and chlorides. A well-designed SWAS must ensure that the sample is representative till the point of analysis.

⁶² Condensate Polishing Unit (CPU) typically involves Ion Exchange technology for the removal of trace dissolved minerals and suspended matter. During the process of steam generation in power plants, the steam cools and condensate forms. The condensate is collected and then used as boiler feed water.

Thus, the start of the operation of units without the adequate facilities required for monitoring of water and steam chemistry led to failure of turbine and outages of units for a long period leading to loss of ₹ 1044.38 crore in the form of non-recovery of fixed cost during the period of shut down.

Government, while accepting the audit observation, stated (May 2022) that the actual financial loss in the form of non-recovery of fixed cost, would be ₹ 1,007.98 crore for the entire period of shutdown of both the units. It was further stated that, the Company, after achieving the CoD of both units, regularly persuaded the Contractor for completing the balance facilities including the deficiencies in SWAS and CPU system, commissioning of sodium and chloride analyser etc. to monitor the critical steam purity parameters and also to supply the preservation system and Operation and maintenance manual to operate this super critical unit. The Contractor, however, had failed in completing these works timely resulting in failure of both the turbines. It was further stated that the Contractor had repaired both the turbines free of cost and the units are running smoothly.

Reply confirms that though the Company has suffered loss on account of non-recovery of fixed cost due to prolonged shutdowns of both the units and importantly the Company had not penalised/ held the EPC contractor responsible for the loss attributable to incomplete/ inefficient facilities.

4.14 Environmental Compliance

The Ministry of Environment, Forest and Climate Change (MOEF&CC) and Central Pollution Control Board (CPCB)/M.P. Pollution Control Boards have issued various environmental norms to be complied by the TPP. The PH, even being a newly constructed TPP, failed to meet the environmental norms as discussed below-

4.14.1 Excess Stack Emission

The MoEF&CC, GoI, has prescribed (7 December 2015) stack emission standards for the units of TPS to be installed from 1 January 2017. Emission standards have been prescribed for Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x) and Particulate Matter (PM). Actual emission as against the MoEF&CC norms has been detailed in the **Table 4.3** below:

Table 4.3: Showing Position of Stack emission in SSTPS Power House-II since COD to July 2021

Sl. No.	Parameter	Norms inmg/ Nm ³	Unit no.	Actual emission in mg/Nm ³	Remarks
1	Sulphur Dioxide (SO ₂)	100	3	417.83 - 1577.90	Always remained more than norms
			4	428 -1540.18	-do-
2	Oxides of Nitrogen (NO _x)	100	3	178.83-552.10	-do-
			4	228.72-617.06	-do-
3	Particulate Matter (PM)	30	3	42.01-559.50	Except in January 2019, when it was 18.48 mg/Nm ³
			4	33.43-739.25	Except in March 2019 and September 2020 when it remained 26.65 and 28.59 mg/Nm ³

As evident from the table, the Company failed in complying with the environmental norms regarding all the parameters shown above and continues to pose a threat to the environment by emitting huge quantities of harmful oxides into the atmosphere.

Government stated (May 2022) that the Company is in process of installing wet Flue-gas desulfurization (FGD) technology-based system to control SO₂ within statutory norms i.e.<100 mg/Nm³. Action for installation of Selective Non-Catalytic Reduction (SNCR) /Selective Catalytic Reduction (SCR) for control or reduction of NO_x; shall be taken only after feedback of installation of SCR/ SNCR from NTPC's pilot projects.

Reply confirms that despite the plant being Super Critical with latest technology, it did not comply with the emission norms and the necessary steps were not taken for controlling the stack emission levels.

4.14.2 Non-compliance of ash utilisation norms of MoEF&CC

MoEF&CC, GoI notified (25 January 2016) that the coal or lignite based TPSs shall comply with the provision of 100 *per cent* utilisation of fly ash generated by them before 31 December 2017. Therefore, SSTPS Ph-II was required to utilize 100 *per cent* ash since its CODs. Year-wise ash utilization in SSTPS Ph-II has been given in the **Table 4.4** below:

Table 4.4: Year wise ash generation and its utilization

Year	Period	Total Ash generated (in MT)	Ash utilized (in MT)	Utilization in <i>per cent</i>
2018-19	November 2018 to 31 March 2019	555313.59	0	0
2019-20	April 2019 to March 2020	1163835.55	204479.172	17.57
2020-21	April 2020 to March 2021	188327.218	100005.69	53.10
2021-22	April 2021 to August 2021	447854.434	189478.63	42.31

Low ash utilisation clearly shows Company's inability to comply with the MoEF&CC, GoI's directions. Audit further noticed that NGT, CPCB also imposed fine (July 2020) termed as 'Environmental Compensation' on SSTPS of ₹ 15.83 crore⁶³ (₹ 7.00 crore for 2018-19 and ₹ 8.83 crore for 2019-20) for non-utilization of 100 *per cent* fly ash by the Company.

The Government stated (May 2022) that recession in real estate & infrastructure sector and impact of Covid-19 pandemic were the reasons for lesser demand/utilization of fly ash.

The fact remains that the Company had not initiated requisite action to promote the ash utilization from the plant. Further, other plants of the Company *viz.* SGTPS Birsinghpur (2019-20: 99.59 *per cent*, 2020-21: 100.10 *per cent* and 2021-22: 71.50 *per cent*) and STPS Sarni (2019-20: 63.72 *per cent*, 2020-21: 94.20 *per cent* and 2021-22: 99.82 *per cent*) performed much better than SSTPS PH-II during similar period. However, the fact remains that the Company failed to comply with the MoEF&CC norms of ash utilization.

4.14.3 Excess Specific water consumption

MoEF&CC, GoI had fixed (28 June 2018) water consumption limit⁶⁴ for TPSs. installed after 01 January 2017 and these plants shall also achieve zero waste water discharge.

Audit noticed that the monthly average of water consumption (on actual MWh generation) remained high⁶⁵ to the extent of 8696175 Cu. M. valuing ₹ 4.78 crore at the rate of ₹ 5.50 per Cu. m., for the units of PH-II during the period since COD's to August 2021.

The reasons for excess consumption of water were delay in commissioning of Ash water Recovery System, conversion of dry ash into wet ash for pumping into ash pond⁶⁶, seepage in

⁶³ Including for non-utilization of fly ash of phase I of the project of the Company.

⁶⁴ As per notification dated 7 December 2015 (amended on 28 June 2018), Specific water consumption shall not exceed maximum of 3.0 Cu. M./MWh for new plants.

⁶⁵ 31906425 Cu. m. of specific water against the required quantity of 23210250 Cu. m. as per norm.

Ash dyke due to poor workmanship, shut downs/ trippings and lit up of units after reserve shut downs (which require huge water for system cleaning), running of units at partial loads and use of water for getting desired temperature of soot blower header

The Government agreed (May 2022) with the reasons of excess water consumption analysed by audit and communicated other reasons, viz. non-commissioning of Ash Water Recovery System, non-availability of sufficient quantities of wastewater for its re-utilization were also responsible. It further stated that construction/erection of Ash Water Recovery System is expected to commission soon; which shall result in reduction of water consumption. The fact, however, remains that the water consumption remained higher than the norms.

4.15 Conclusion

Based on the observations in the previous paragraphs, the following can be concluded:

- The Company did not take action for timely completion of the Project. It did not obtain requisite fuel linkage and clearances in time and had to forgo the benefit of additional RoE amounting to ₹ 120.75 crore. It delayed the payment of advances to the contractor resulting in shifting of Scheduled COD and disallowances of IDC and IEDC by MPERC amounting to ₹ 215.03 crore;
- The Company entered into WSA much before the scheduled COD of the Units resulting in avoidable payment of ₹ 67.80 crore;
- The Company could not complete the Project on the scheduled dates and had to procure power at costlier rates to mitigate the shortfall during the period of delay causing an additional burden of ₹102.32 crore;
- The Company did not ensure completion of various facilities required for running of Plant which resulted in major outages leading to generation loss of 9036.55 MUs and non-recovery of fixed cost of ₹ 1,055.54 crore;
- The Plant failed to meet the operational parameters determined by MPERC which resulted into loss of generation, excess consumption of fuel and non/under recovery of fixed cost; and
- The Company could not adhere to various environmental norms of MoEF&CC regarding stack emission, disposal of ash and water consumption, having adverse impact on the environment.

4.16 Recommendations

We recommend that:

- The Company should plan and arrange all the inputs and obtain necessary clearances for the projects to be taken up in future, so that the same may be completed in time and all the available concessions/ benefits for the project may be availed and power may be made available at the cheaper rates, as envisaged;
- The Company should ensure completion of all facilities required for running of Plant before COD of the Units to avoid outages during operations;

⁶⁶

Dry fly ash system was not completed with delay in December 2019; therefore the wet ash was being flushed to ash pond which requires higher water consumption. Further, after completion of dry ash system, whenever ash silo of unit no.3 and 4 were filled due to insufficient bulkers for transportation of ash, wet ash was transferred to pond which resulted in higher water consumption.

- The Company should expedite the PG Test of Unit 3 and finalisation of report of PG Test of Unit 4 and ensure that the EPC contractor adheres to its contractual liabilities for deficiencies, if any, in execution of the project;
- The Company should make efforts to operate the Power House within the parameters prescribed by the regulatory authority to keep the cost of generation at desired level; and
- The Company should ensure strict adherence to the environmental norms and regulations.