

Chapter - II

2. Performance Audit on Power Sector PSUs

2.1 Performance Audit on 'Execution of Yeramarus Thermal Power Station of Raichur Power Corporation Limited'

Executive Summary

Introduction

To deal with the power shortage in the State, Karnataka Power Corporation Limited (KPCL), a State Public Sector Undertaking (PSU) involved in the generation of hydel/thermal power, explored the possibility of establishing one more thermal power station in the State. KPCL proposed (July 2007) to establish a 2 x 500 Mega Watt (MW) coal-based thermal power station at Yeramarus in Raichur District. Bharat Heavy Electricals Limited (BHEL), a Central Public Sector Undertaking, which was working on supercritical technology (800 MW Plants), evinced (May 2008) interest in having a Joint Venture (JV) with KPCL on mutually agreeable terms and conditions to execute the project. The Board of Directors of KPCL approved (June 2008) implementation of the Yeramarus Thermal Power Station (YTPS) at an enhanced capacity with two Units of 800 MW capacity each, *i.e.* 1,600 MW, in a Joint Venture with BHEL. It was stated that while KPCL was in a position to do the Project on its own in the XII five-year Plan (2012-17), joining with BHEL would ensure acceleration of the project and advance the project to the XI Plan/early XII Plan.

Constitution of Joint Venture Company for implementing the project

On approval (January 2009) of the Government for the Project, the KPCL entered (January 2009) into a Memorandum of Understanding with BHEL and executed (January 2009) a Joint Venture Agreement with it. Raichur Power Corporation Limited (RPCL, the Company) was incorporated on 15 April 2009. The JV envisaged bringing in Financial Institutions as a shareholder, and IFCI Limited was included as another JV partner in November 2011 for infusing ₹ 432.72 crore. The Share holding pattern as at the end of March 2018 was: KPCL-53.80 *per cent*, BHEL-27.97 *per cent* and IFCI Limited-18.23 *per cent*.

The Joint Venture Agreement envisaged that the JV Company shall formally issue a contract on BHEL for installing the Boiler, Turbine Generator (BTG) and their associated equipment on mutually agreed terms and conditions, which included Engineering, Procurement, Inspection and Construction supervision, as well as commissioning services of Boiler, Turbine Generator (BTG) and their associated equipment.

Audit Objective

The objective of the Performance Audit was to assess whether the objectives of YTPS to bridge the gap between demand and supply of power and provide electricity in a sustainable manner at a reasonable cost were achieved.

Audit Findings

- Though KPCL was facing difficulties with other Projects entrusted to BHEL, it formed a JV with BHEL without exploring the option of going in for a Public-Private Partnership for execution of the Project despite availability of various incentives under the scheme promoted by the GoK. (Paragraph 2.1.8.2)
- Failure to get the benefits (duty concessions) under Mega Power Status despite entering into a Power Purchase Agreement in December 2010 resulted in foregoing the benefit of ₹ 335.01 crore. (Paragraph 2.1.8.3)
- Due to changes in the layout and re-testing of soil by the Company, the completion of geo-technical work was delayed by 17 months from its milestone date. (Paragraph 2.1.11)
- Due to non-identification of the total land requirement in time and frequent revisions of the location, the land acquisition was delayed affecting the implementation of the Railway Siding and Marshalling Yard works, General Mechanical Works and Coal Handling Plant. (Paragraphs 2.1.13, 2.1.14, 2.1.16.4)
- Failure to finalise the type of Cooling Tower and delay in handing over the site and approval of designs resulted in delay from milestone date besides incurring additional cost (₹ 29.75 crore) towards piping work and additional annual auxiliary power consumption of ₹ 19.70 crore. (Paragraph 2.1.12.2)
- Failure to decide on the type of water treatment in the Cooling Water System resulted in delay in completion of work besides the use of untreated water affecting the health of the pipelines. (Paragraph 2.1.12.3)
- Due to non-completion of the Railway Siding and Marshalling Yard work, delay in receipt of approved DPR and bridge drawing, etc., there was no rail arrangement to bring coal to the YTPS Project, though the Project was declared ready for commercial operation (March/ April 2017) more than 18 months ago. (Paragraphs 2.1.13, 2.1.13.2)
- General Mechanical Works were delayed due to delay in finalisation of technical specifications, delay in cancellation of bids due to unresponsiveness and ambiguity in tender conditions resulting in delay of 27 months in awarding the work. The delay in completion of General Mechanical Works delayed the process of bringing raw water to the YTPS Project. (Paragraph 2.1.14)

- Due to not monitoring the work of BHEL in construction of Turbo Generator Deck with designs, the changes in the position of the columns were noticed belatedly, resulting in stoppage of work. The Company took the opinion of experts, which delayed the resumption of work by eight months. (Paragraph 2.1.16.2)
- Due to delay on the part of the Company in handing over the required land to BHEL for Coal Handling Plant and further delay by BHEL in completion of work, the YTPS plant, was unable to run optimally as the Coal Handling Plant was not ready as of September 2018. (Paragraph 2.1.16.4)
- Though the Plant was declared for commercial operation in March/April 2017, there was no regular coal linkage for operation of the Plant (as of September 2018). Against the annual requirement of 58.3 lakh tonnes for operation of the Plant, the Company tied up only 30 lakh tonnes under Bridge-linkage. Moreover, Railway Siding and Marshalling Yard and Coal Handling Plant works were pending completion (September 2018). In absence of railway siding, the coal received through bridge linkage was unloaded in a nearby Siding and transported by road to the Plant entailing an additional expenditure of ₹ 25.40 crore in 2017-18, which turned out to be 83 per cent of the cost of the railway siding itself. (Paragraph 2.1.17.2)
- BHEL proposed Ash Handling Plant with a capacity of 171 Tonnes Per Hour (TPH) as against the requirement of 179 TPH as per the norms of Central Electricity Authority. (Paragraph 2.1.18.1)
- Though generation commenced from 2017-18, YTPS was yet to comply (September 2018) with the conditions given in the Environmental Clearance for the Project. (Paragraph 2.1.19)
- The delay in completion of the project increased the project cost from the estimated cost (April 2009) of ₹ 8,806.23 crore to ₹ 12,915.90 crore provisionally as of March 2018. The cost of generation per unit also increased from ₹ 3.24 to ₹ 5.36 provisionally. (Paragraph 2.1.20)
- Failure of the Joint Committee to finalise the Report on the reasons for delay in completion of works delayed the levy of liquidated damages, which would have had an effect on the total project cost, as the capital cost would be adjusted to that extent by the Regulatory Commission while determining tariff. (Paragraph 2.1.21)
- A total of 23,188.86 Million Units of power, in the form of short and medium-term power valued at ₹ 11,079.22 crore, were purchased during 2014-15 to 2017-18. Out of this, additional cost on the purchase of 22,283.03 Million Units of power (short/medium-term) from private producers amounting to ₹ 2,517.92 crore was avoidable had the Company completed the implementation of the Project within the stipulated time. (Paragraph 2.1.20)

Introduction

2.1.1. Power is an essential requirement on which the socio-economic development of the country depends to a large extent. The availability of reliable and quality power at competitive rates is crucial to sustain the growth of all sectors of the economy.

Karnataka being a power deficit State was not able to meet the peak demand ranging from 5-15 *per cent* during the period 2005-10³⁰.

Karnataka Power Corporation Limited (KPCL), a State Public Sector Undertaking (PSU) involved in the generation of hydel/thermal power, explored the possibility of establishing one more thermal power station in the State. KPCL proposed (July 2007) to establish a 2 x 500 Mega Watt (MW) coal-based thermal power station at Yeramarus in Raichur district. Bharat Heavy Electricals Limited (BHEL), a Central Public Sector Undertaking which was working on supercritical³¹ technology (800 MW Plants), evinced (May 2008) interest in having a Joint Venture (JV) with KPCL on mutually agreeable terms and conditions to execute the project. The Board of Directors of KPCL approved (June 2008) implementation of the Yeramarus Thermal Power Station (YTPS) at an enhanced capacity with two Units of 800 MW capacity each, *i.e.* 1,600 MW, in a Joint Venture with BHEL. It was stated that while KPCL was in a position to do the Project on its own in the XII five-year Plan (2012-17), joining with BHEL would ensure acceleration of the project and advance the project to the XI Plan/early XII Plan.

KPCL prepared (April 2009) the Detailed Project Report (DPR) for 1,600 MW Project at an estimated cost of ₹ 8,806.23 crore. The levellised tariff (future tariffs discounted to present rates) was projected at ₹ 3.24 *per unit*. The justification for taking up the Project was that over 40 *per cent* of the households in the region did not have power and even those who had electricity faced frequent power failures. The challenge was therefore to provide electricity in a sustainable manner at reasonable cost. It was further mentioned that if Karnataka was to be free of power shortages, substantial amount of installed capacity was required over and above the XI Plan targets. Due to the uncertainty in implementation of the other power projects owing to location, capacity and fuel allocations, this project would help bridge the gap between demand and supply of power in Karnataka. The DPR *inter alia* also mentioned that the project could be fast-tracked, as:

- The basic requirement of land, water, availability of coal and its transport, as well as power evacuation, were well met by the site selected for the Project (YTPS). The distinct advantage of the site was the fact that the land was already allotted (June 2008) to KPCL, thereby gaining valuable savings in time and money in land acquisition proceedings; and

³⁰ The period between 2005 to 2010 was when this Project was conceived and awarded.

³¹ Supercritical technology implies use of steam pressure beyond the critical point of water/steam, which is about 225 kg./cm.², with various combinations of temperature and pressure. Further, unlike sub-critical pressures, there is no co-existence of the two phases, water and steam in the Boiler.

- Some common facilities like township for personnel could be shared with the Raichur Thermal Power Station (RTPS) of KPCL. Also, there was a proposal of using the ash bund of RTPS for ash disposal.

Constitution of Joint Venture Company for implementing the project

2.1.1.2. Based on the approval (January 2009) of the Government for the Project, the Company entered (January 2009) into a Memorandum of Understanding with BHEL and also executed (January 2009) the Joint Venture Agreement with BHEL. As per the terms of the MoU and JV Agreement, a Joint Venture Company, *i.e.* Raichur Power Corporation Limited (RPCL, the Company) was incorporated on 15 April 2009. The JV envisaged bringing in Financial Institutions as a shareholder³². IFCI Limited³³ was included as another JV partner in November 2011 for infusing ₹ 432.72 crore. The Share holding pattern as at the end of March 2018: KPCL-53.80 *per cent*, BHEL-27.97 *per cent* and IFCI Limited-18.23 *per cent*. KPCL and BHEL did not transfer / encumber their share in the JV for an initial period of five years from the date of incorporation of the JV Company or until the commencement of commercial operation of the Project. As per the Share Holders Agreement, KPCL had the buy-out option for the shares of IFCI for an aggregate consideration equal to Internal Rate of Return (IRR) of at least 15.5 *per cent* on the subscription amount invested by IFCI Limited.

The Joint Venture Agreement envisaged that the JV Company shall formally issue contract on BHEL for installing the Boiler, Turbine Generator (BTG) and their associated equipments on mutually agreed terms and conditions. The services to be provided by BHEL shall include Engineering, Procurement, Inspection and Construction supervision, as well as commissioning services of BTG and their associated equipments.

Organisational Structure

2.1.1.3. The affairs of the Company (RPCL) are managed by the Board of Directors (BoD) comprising a Chairman from BHEL, three Directors from KPCL, three Directors from BHEL and one Director from IFCI Limited. The management of the day-to-day affairs of the Company rests with the Managing Director (MD) nominated by KPCL. The Managing Director, KPCL is currently the Managing Director of the Company (RPCL). The MD is assisted by the Chief Engineer (Mechanical) and Chief Engineer (Electrical) on deputation from KPCL and Chief Engineer (Civil) and Chief Engineer (Technical Designs) who hold additional charge in the Company (RPCL) along with their charge at KPCL.

³² The share holding pattern as per the MoU / JV agreement was KPCL (26 *per cent*), BHEL (26 *per cent*) and Financial Institutions (48 *per cent*).

³³ Erstwhile Industrial Finance Corporation of India Limited.

Audit Objective

2.1.2. The objective of this Performance Audit was to assess whether the objectives of YTPS to bridge the gap between demand and supply of power and provide electricity in a sustainable manner at a reasonable cost were achieved.

Scope and Methodology of Audit

2.1.3. The Performance Audit covers the implementation of the Project from its date of inception (July 2007) upto the end of March 2018.

The audit involved scrutiny of records at the Corporate Office at Bengaluru and the Project Office at Yeramarus Thermal Power Station, Raichur. The Company awarded 209 Work Orders/ Letters of Award aggregating ₹ 8,479.33 crore for the implementation of YTPS. Of this, Audit reviewed 68 Work Orders³⁴/ Letters of Award on works awarded for the supply of various machinery, components and works totaling to ₹ 8,357.25 crore.

The methodology adopted for audit involved explaining the Audit Objective and Criteria to the top Management of the Government and the Company through an Entry Conference, which was held on 15 March 2018. The Methodology also involved interaction with the personnel of the audited entity and KPCL, analysis of data, collection of information through audit requisitions, issue of audit queries and issue of Draft Performance Audit Report to the Management and the Government. The Management furnished replies to the Draft Performance Audit Report in September 2018 and November 2018. The Audit Report was discussed with the Government in the Exit Conference held on 5 October 2018 and the views of the Management are included in the Report at the appropriate places.

Audit Criteria

2.1.4. The following sources of criteria were adopted for assessing the achievement of the audit objectives:

- Guidelines/Norms/Orders of Central Electricity Regulatory Commission (CERC), Central Electricity Authority (CEA), Karnataka Electricity Regulatory Commission (KERC);
- Instructions of the Ministry of Power, Government of India (GoI) and Government of Karnataka (GoK);
- The Karnataka Transparency in Public Procurements Act, 1999 and its Rules, 2000; and
- Detailed Project Report, design specifications, PERT Charts and Circulars/Manuals of the Company.

³⁴ The Work Orders excluded from the selection were other works such as construction of compound wall, roads, maintenance works, etc.

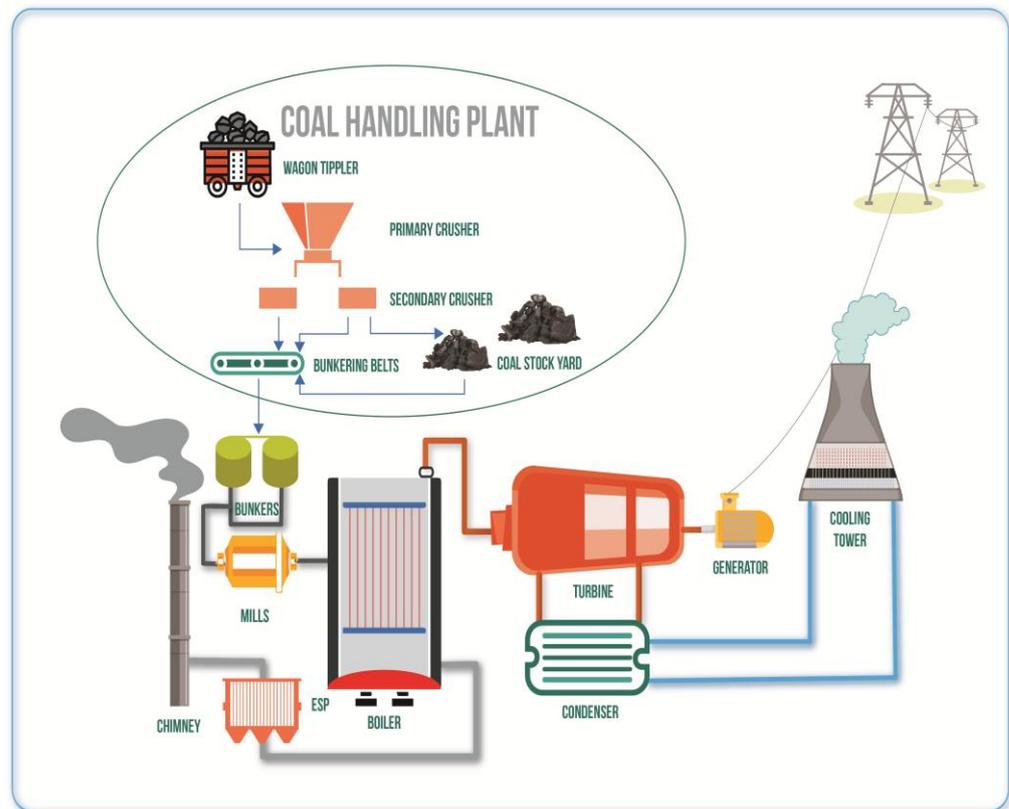
Acknowledgment

2.1.5. Audit acknowledges the co-operation extended by the Energy Department of GoK and the Management of the Company in facilitating the conduct of the Performance Audit.

Generation process of Thermal Power Stations

2.1.6. The schematic diagram of the generation process in a Thermal Power Station is given below:

Chart No. 2.1.1: Schematic diagram of the major components of a Thermal Power Station



In Thermal Power Plants, steam is produced under high pressure in the steam boiler by burning of coal in Boiler furnaces. This steam enters into the Turbine and rotates the Turbine blades mechanically, coupled with Alternator, which rotates the Rotor with the rotation of Turbine blades. After imparting energy to the turbine rotor, the steam passes on to the condenser. Cold water is circulated to condense the low-pressure wet steam. This condensed water is further supplied to the water heater where the low-pressure steam increases its temperature and it is again heated under high pressure. In the process, electricity is generated and is transmitted for further distribution.

The main components of a Thermal Power Plant are:

- Boiler and Turbine Generator (BTG), and
- Other Ancillary input or Balance of Plants (BoPs) works, which include Cooling Tower, Coal Handling Plant, Ash Handling Plant, Plant Water System, Chimney, Railway Siding and Marshalling Yard, etc.

The functions of the different components of the Thermal Power Plant are given in **Appendix-7**.

Status of the Project

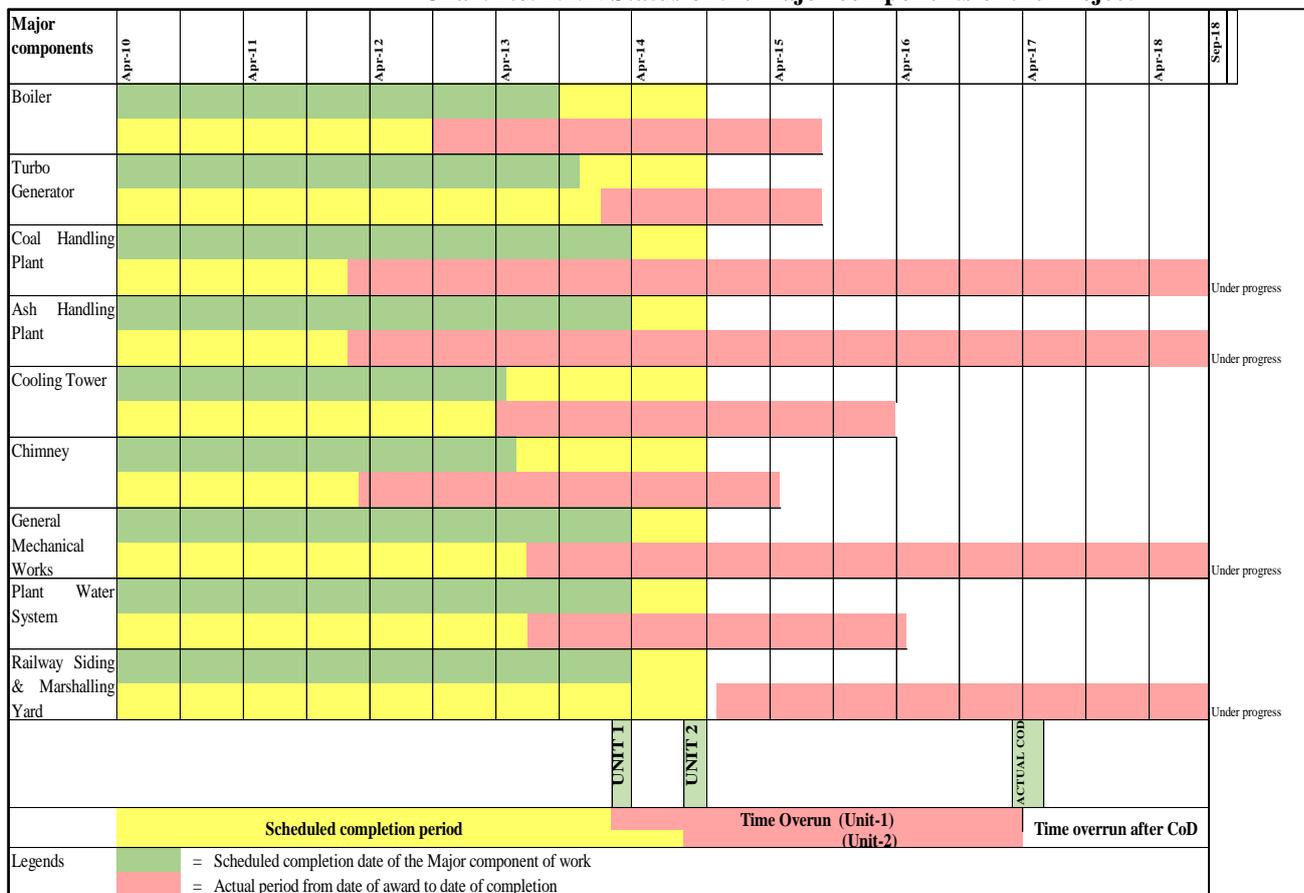
2.1.7. After the formation of the JV Company in April 2009, the Company requested (July 2009) BHEL to offer the rate for the Boiler, Turbine Generator (BTG) package for the two Units.

After negotiations, the Company issued (9 April 2010) Letters of Award (LoA) on BHEL for supply and erection services for the BTG package (including agreed Balance of Plants³⁵ and civil works) at a cost of ₹ 6,300 crore (excluding taxes and duties).

Further, orders for other works under the Balance of Plant works, such as General Mechanical Works, Railway Siding and Marshalling Yard, *etc.* were placed on various firms after inviting tenders.

2.1.7.1. The Chart below summarizes the status of different components of the Project with respect to their scheduled date of completion and the time taken to execute the work.

Chart No. 2.1.2: Status of the major components of the Project



Source: Compiled by Audit based on Contract documents and Progress Reports

³⁵ Station - Control and Instrumentation; Switchyard, including civil work; Power Transformers; Power Cycle Piping and valves; Cooling Water System, excluding Cooling Tower, *etc.*

The scheduled completion of Unit 1 and Unit 2 were April 2014 and October 2014 respectively. However, the Units were declared as ready for commercial operation only in March and April 2017 after a delay of three years from the scheduled completion date. It can also be seen from the Chart No. 2.1.2 that important ancillary works of Coal Handling Plant, Ash Handling Plant, General Mechanical Works and Railway Siding and Marshalling Yard works were not completed even as on date (September 2018), *i.e.* more than 18 months after the Plant was declared ready for commercial operation. As a result, the Plant was not operating at the envisaged capacity to bridge the gap between demand and supply (September 2018).

The Management confirmed that there were delays of 35 months and 30 months in the commissioning of the two units. The Management also replied (September 2018) that as the project was implemented with borrowings from Financial Institutions and commercial banks, the commissioning of the Plant was essential even as the balance works were in progress.

Audit Findings

2.1.8. During the course of this Performance Audit, Audit reviewed the execution of the Project and analysed the reasons for the delay in completion of the Project.

The results are summarized in the succeeding paragraphs broadly under the following heads:

- Strategic Planning for execution;
- Obligations of the JV partners in the implementation of the BTG Package; and
- Deficiencies in implementation of Ancillary works/Balance of Plants works and its non-synchronisation with the completion of BTG Package.

Strategic Planning for execution

2.1.8.1. Strategic Planning is the process of identifying the long-term goals of the entity and the broad steps necessary to achieve the goals incorporating the concerns and expectations of the stakeholders.

The Board of Directors of KPCL ³⁶ discussed (March 2008) that for establishment of the YTPS Project, (i) it would be prudent to go in for International Competitive Bidding (ICB) as it would facilitate the participation of other world-class players, and (ii) in the context of the financial crunch and need for raising equity, the possibility of having Joint Venture (JV) with NTPC to execute the YTPS Project was also to be explored.

In the BoD meeting of KPCL held in June 2008, it was apprised that KPCL addressed a letter to NTPC and BHEL to explore their interest in having a JV for execution of the Project. BHEL agreed in principle for JV, if the Project

³⁶ Karnataka Power Corporation Limited was handling the YTPS Project before the Joint Venture Company (Raichur Power Corporation Limited) was formed in April 2009.

was executed with supercritical technology, as they had the requisite corpus for equity participation for such projects. The BoD of KPCL approved (June 2008) the YTPS Project of 2 X 800 MW with supercritical technology in Joint Venture with BHEL. Later, in April 2009, the JV was formed and the JV Company awarded (April 2010) the work of BTG to BHEL.

Though the BoD were informed (June 2008) that the matter for JV was taken up with NTPC, there were no records to substantiate the fact that NTPC had either made an offer for, or declined to participate in, the JV.

In this connection, Audit observed the following:

Joint Venture arrangement

2.1.8.2. In the same BoD meeting (June 2008) where the YTPS project was decided to be executed through a Joint Venture with BHEL, the BoD discussed about two other projects. In respect of the status of implementation of Bellary Thermal Power Station – Unit 2, the BoD was apprised about the delay in starting the works due to heavy overbooked order position of BHEL while in respect of establishing Bellary Thermal Power Station – Unit 3 of 500 MW, the Principal Secretary, Energy Department, GoK suggested that KPCL go for ‘Divisible Package’ approach (where Major packages are separately tendered) to ensure fast-track completion.

Thus, as could be seen from the discussions of the BoD at that point in time (June 2008), it was evident that KPCL was facing difficulties with the other Projects entrusted to BHEL. Yet, when the BoD discussed the YTPS Project, it was decided (June 2008) to go in for the JV route with BHEL to implement the Project. Therefore, the decision to go in for the JV route with BHEL again, which was already overbooked and whose constraints with respect to timely implementation were already well known, for implementation of the project under Engineering, Procurement, Inspection and Construction supervision contract, was *ab initio* weak.

The Company also did not explore the option of going in for a Public-Private Partnership for execution of the Project despite availability of various incentives under the scheme promoted by the GoK.

The Management replied (September 2018) that it was felt that the benefit of going with a Government body would far outweigh the incentive available under a Private Public Partnership. On the other hand, GoK expected that a Maharatna Company like BHEL would rise to the occasion and justify the trust reposed on it. Moreover, the JV was required to obtain equity support for the project as KPCL/ GoK does not have infinite resources to fund all the projects. In the Exit Conference, the Energy Department informed (October 2018) that the decision to go for JV was taken considering the circumstances of the day. The reply is not to the point as the objection is not on the decision to go in for JV per se, but on the decision to select BHEL as the JV partner. Moreover, going in for a JV with BHEL was not a prudent decision as the Company was already aware that BHEL was not able to keep up its commitments, from its experience of implementing other projects.

2.1.8.3. The Government of India introduced (November 1995) the Mega Power Project (MPP) Policy wherein Power Plants having a capacity of 1,000 MW or more were eligible for exemptions from customs duty, excise and sales tax. The condition to get Mega Power Status *inter alia* included that the machinery had to be procured through International Competitive Bidding (ICB).

After the formation of the JV Company, the BoD of the JV Company while deliberating (April 2010), on the cost of the project, (with Mega Power Status), discussed that if the equipments were procured through International Competitive Bidding (ICB), the time required for the tendering process itself would be six months. In the process, the project cost would increase due to increasing prices and there would be a loss of a generation equivalent to 6,200 MUs during these six months. Moreover, the benefit of duty concessions cumulatively valued at ₹ 350 crore (estimated) under Mega Power Status (MPS) would get traded off with this six months' generation. As the State faced acute power shortage it was decided to proceed with BHEL on entrustment basis.

Audit observed that the condition that mandated the procurement of machinery through ICB to get the benefit of Mega Power Status, was removed in December 2009 by GoI, if the requisite quantum of power has been tied up. However, the Board did not deliberate on the relevant issue of tying up of power with Electricity Supply Companies to avail the MPS as contemplated in the DPR. The Power Purchase Agreement (PPA) was entered into with Electricity Supply Companies in December 2010. Even after entering into PPAs, the Company did not pursue to get the benefits (excise/sales tax concessions) under Mega Power Status. The actual benefit foregone under MPS was ₹ 335.01 crore.

Deficiencies in implementation

2.1.9. Proper planning for implementation of the Project was important for timely completion of the Project and achievement of the milestones. Any deficiency thereon would have consequential effect on the completion of the Project.

The zero date of the YTPS Project was April 2010. A kick-off meeting was held between the Company and BHEL in September 2010, wherein the milestones for the Project were agreed to by both the parties.

As per the scope of Letter of Award to BHEL and agreed milestones, the Company and BHEL (Contractor) were to adhere to their obligations, so as to complete the project as envisaged. It was, however, observed that the parties did not adhere to their commitments, which was the main cause for delay in completion of the Project by three years.

The details are discussed in the succeeding paragraphs:

Providing land for the Project

2.1.10. As per the DPR, the total land required for the project was roughly 1,000 acres. The project was proposed to be set up on the Karnataka Industrial Area Development Board (KIADB) land. KIADB handed over (June 2008) 826 acres

of land (after survey), to KPCL and negotiations were on for additional allotment of about 245 acres' land. The GoK approved transfer of land in favour of the JV Company in December 2011. In July 2012, the JV Company entered into a lease-cum-sale agreement with KIADB towards this 826 acres of land (termed Part-I of acquisition).

Audit observed that the acquisition of the remaining land required for the Project was mired in difficulties owing to periodic revisions of the location and extent of land required.

- KPCL identified (November 2008) additional land of 234 acres (Part-II) adjacent to the land already acquired, which was later pursued for acquisition by the JV Company. It was seen that out of 234 acres, land of 58 acres, 34 guntas, which was on the other side of the road was deleted from the proposal and additional land of 19 acres 12 guntas for the raw water line and ash slurry line pipeline was included. In January 2010, the Company proposed deletion of 30 acres of land from the above after finalisation of layout. In February 2010, the Company proposed deletion of 25 acres 20 guntas citing site condition³⁷ and alignment of Marshaling Yard but withdrew this in October 2010. Similarly, 68 acres proposed for acquisition in February 2010 was deleted subsequently in March 2012. Finally, the KIADB (Government agency for acquiring land) handed over possession of 166 acres 18 guntas³⁸ of the land in July/September 2014 under Part-II of acquisition;
- In December 2011, the Company proposed additional acquisition (Part-III) of land of 152 acres 21 guntas³⁹ for providing Railway Siding and Marshalling Yard and laying raw water/ash slurry pipeline (General Mechanical Works). Of this, KIADB handed over (June/October 2015) possession of 134 acres and 39 guntas; and
- In November 2015, the Company again sent request for acquisition of another 8 acres, 4 guntas⁴⁰ of land for Railway Siding and Marshaling Yard, which is yet to be acquired (November 2018).

As of September 2018, possession was obtained for 301 acres 17 guntas of land.

Thus, frequent revisions of the desired location of the land coupled with failure in assessing the correct requirement of land delayed the land acquisition. This affected the implementation of the Railway Siding and Marshalling Yard (RSMY) works (Paragraph 2.1.13) as well as the General Mechanical Works (Paragraph 2.1.14).

The Management replied (September 2018) that since the Project was in a Planning stage and there were many impediments in acquisition of land, it could not freeze the plot plan/layout plan of the Project in time. It was stated that

³⁷ No specific mention is made on what constituted site conditions.

³⁸ Includes 1 acre 22 guntas (34 guntas *plus* 28 guntas) acquired along with the proposal.

³⁹ In Devasugur, Heggasanhalli, Chicksugur, Kuknoor and Yegnur villages.

⁴⁰ In Kuknoor village.

though Part-II was planned to accommodate components such as CHP, Plant Water System, Railway tract, *etc.* based on the technical feasibility and land availability, the above components were relocated by revising the plot plan of the Project. The Management further stated (November 2018) if the entire land acquisition was initiated in one stage, the whole process would have delayed the execution of different project components.

The reply does not address the fundamental observation on why the requirement of land could not be assessed realistically/correctly and why there were multiple occasions of deletions and additions of the same stretch of lands by the Company.

2.1.10.1. Further, it was observed that for the additional land requirement of 134 acres 39 guntas and 8 acres 4 guntas, the compensation had to be paid at higher rates as against the rates paid for earlier proposals for acquisition of 166 acres and 18 guntas (Part-II). The increase in cost of land for these 143 acres 3 guntas as compared to earlier acquisition rates was ₹ 13.28 crore⁴¹. The Management replied (September 2018) that due to delay in processing of the land acquisition coupled with increased demand for land by the private parties, the cost of land got raised automatically. Therefore, the land owners demanded for increased cost.

Soil investigation for starting civil works

2.1.11. One of the first works to be started for the Project was to conduct the geo-technical investigations. Geo-technical investigations are evidence of proof of site realities, confirmation that foundation strata would bear the structural loads, *etc.* Conducting geo-technical investigation was in the scope of BHEL. As per the project milestone, the completion period of topography and soil investigation was six months (*i.e.* by October 2010) from zero date of the Project (April 2010).

After a joint meeting (September 2010) held by the Company with BHEL to discuss the Plant layout, the Company shifted (October 2010) the site location by 500 metres due to proximity to the State Highway. In the joint meeting held in June 2011, the geo-technical Investigation Report (GTR), which reported the completion of the soil investigation work, was discussed. The Company, considering the properties of soil⁴² at the site location, insisted (June 2011) on conducting the soil test again before filling/backfilling the excavated locations. The soil tests were redone and the final GTR was approved in March 2012.

Thus, despite availability of land, due to changes in the layout and re-testing of soil by the Company, the completion of geo-technical work was delayed by 17 months from its milestone date. As such, the civil work for Unit-1 and Unit-2 started in March 2012 and April 2012, respectively as against its scheduled date of January 2011, *i.e.* 14 months and 15 months from its scheduled commencement date.

⁴¹ Being the rate difference of land (₹ 16 lakh per acre in the Part-II acquisition) and ₹ 24 lakh per acre in the Part-III acquisition and ₹ 40 lakh per acre after Part-III acquisition.

⁴² Top soil being highly compressible and expansive silty clay/sandy clay.

The Management replied (September 2018) that the change in location was due to changes made by Railways owing to meeting the requirement of both the Company and a nearby Thermal Station belonging to M/s. Surana Industries. After the Exit Conference, the Management replied (November 2018) that as per Environment Clearance, the Plant Layout was to be at a distance of 500 metres from the State Highway.

Ancillary works/Balance of Plants (BoP) works

2.1.12. In addition to keeping its commitments to enable BHEL to execute its portion of BTG work, the Company was to simultaneously take action to execute the ancillary works/ Balance of Plants (BoP) works, viz. Chimney, Cooling Tower, Ozonisation System, Railway Siding and Marshalling Yard, Plant Water System, etc. so that when BHEL completed the BTG package, the YTPS Plant could be operated without any further delay.

Audit observed the following delays and deficiencies in designs attributable to the Company:

Chimney

2.1.12.1. The construction of the Chimney (catering to both Units) was to be completed by June 2013.

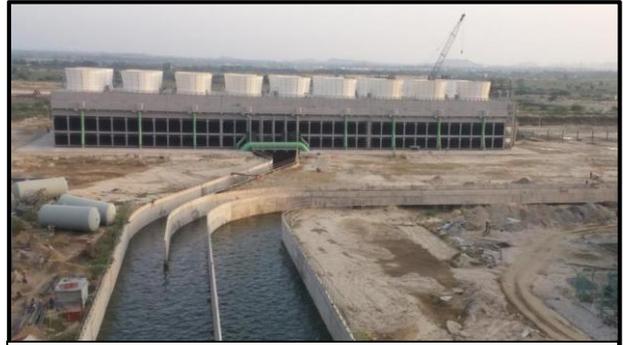
There were delays in submission of design drawings by the contractor (Gannon Dunkerley & Co. Ltd., Hyderabad) and approval due to revisions by the Company. The Work Order was finally issued in April 2012 with a scheduled completion period of 28 months, i.e. by August 2014. The scheduled completion date for the Chimney was, thus, beyond the scheduled completion date for Unit-1 (April 2014). The Company suggested other changes in design including change in the thickness of the Flue-can of the Chimney (from 10mm to 12mm), and as a result, the work was further delayed. It was finally completed by the contractor in May 2015.

The Management attributed (September 2018) the delay in award of the Chimney work to the delay in commencement of Civil works. The Management, however, informed that the Chimney was ready (May 2015) well before the Boiler light-up activity (August 2015/February 2016) for the two units. In a further reply (November 2018), the Management replied that there were no delays in finalisation of design drawings.

The reply is not acceptable as the Company while considering the time extension to be given to the contractor had stated (December 2013) that there was considerable delay in submission of design drawings and the fact remains that there was delay in providing this input (Chimney) by 23 months from its milestone date.

Cooling Tower

2.1.12.2. As per the DPR, the Cooling Tower was of Natural Draft Cooling Tower (NDCT)⁴³ type. NDCT uses natural air, which is drawn into the tower naturally for cooling the hot water. NDCT does not consume electricity for its operations. As per the milestone, the Cooling Tower was to be ready by May 2013. The technical specifications for NDCT were submitted by the



Picture No. 2.1.1: IDCT of the Plant (April 2018)

Source: Monthly Meeting Reports of the Management.

Consultant (M/s. Evnoik Energy Services India Private Ltd.) in June 2010 and specifications were finalized in July 2011. There had been no time limit fixed for the approval process for the drawings.

Audit observed that:

- The Cooling Tower was to be available by May 2013 (37th month from Project start date of April 2010) as per milestone date. As the work of NDCT takes 36 months for completion, it was imperative that the drawings were approved and tenders awarded within the first two months from the Project start date (April 2010). However, the drawings were submitted in June 2010 and approved only in July 2011, after a delay of one year;
- Tenders for NDCT type cooling towers invited in July 2011 were cancelled (September 2011) due to receipt of only a single bid. Tenders were invited a second time in October 2011. As the time required for construction of NDCT was 36 months, which went beyond the scheduled completion date of the Project (April/October 2014), it was then decided (March 2012) to cancel the tender and go in for Induced Draft Cooling Tower (IDCT)⁴⁴, which takes only 24 months for completion. Tenders were again invited in July 2012 for IDCT type cooling tower and work was awarded in May 2013 to L&T Limited for ₹ 148.45 crore, with the scheduled completion date as May 2015; and
- The other reason for cancellation of NDCT tender of March 2012 was (i) cost reduction of 20-30 *per cent*, and (ii) allowance of additional 0.50 *per cent* auxiliary consumption in tariff computation for IDCT. The offer received for NDCT in March 2012 was ₹ 194 crore, whereas the offer received for IDCT was ₹ 148.45 crore, indicating a benefit of ₹ 45.55 crore. Audit, however, observed that the contention of the Company

⁴³ NDCT is used in other thermal power stations of KPCL.

⁴⁴ Uses fans for drawing air into the tower for cooling the hot water. Electricity is used to operate the fans.

was not correct as the benefit of ₹ 45.55 crore was off-set by additional piping work (₹ 29.75 crore) and additional annual power consumption of 59.57 Million Units valued at ₹ 19.70 crore, being 0.5 per cent auxiliary consumption, which will remain a recurring expenditure.

Thus, had the Company placed the order for NDCT in March 2012, the scheduled completion period would have been March 2015, that is much ahead of the IDCT's deadline for completion. The work of IDCT was finally completed only in March 2016 as there were delays in handing over the site and approval for drawings. It therefore took almost three years for its completion from the date of Award, instead of the stipulated 24 months. Thus, from financial as well as from project completion perspective, the decision to go for IDCT was not prudent.

The Management replied (September 2018) that there were problems in PVC Fills in the NDCT in the existing units of RTPS and BTPS (other Thermal stations) and in order to avoid such problems, other options were explored. It underwent a lot of discussion before the specifications were finalised. It was also stated that the additional cost towards piping work was in the context of change in layout to facilitate partial generation, if required. In a further reply (November 2018) the Management replied that in an Energy Audit Report (August 2014) by Central Power Research Institute of another thermal station (BTPS Unit-1) the performance of cooling towers was considered poor and it had a cascading effect on the performance of condenser and turbine. Hence, the choice of IDCT was required to align with the changed operating conditions.

The above replies are not convincing as (a) problems in PVC Fills were not a point of discussion when the BoD approved the change from NDCT to IDCT in March 2012. Moreover, the fact that additional piping work would facilitate partial generation of the Plant was also not a point of consideration during discussions while approving the additional piping work in June 2012, and (b) the Energy Audit Report came much after the award for IDCT was placed in May 2013.

Ozonisation system

2.1.12.3. As per the DPR (April 2009), it was envisaged to use gas chlorination to treat Cooling Water in YTPS. It was also specified in the DPR to explore the possibility of using Ozonisation⁴⁵ in place of Chlorination to make the system eco-friendly. BHEL specified chlorination and biocides for Cooling Water (CW) Treatment in their offer for YTPS Project, which was part of the LoA (April 2010 for BTG package). In the joint meeting held in May 2010, the Company requested BHEL to avoid chlorination treatment due to environmental reasons and BHEL agreed to consider this.

BHEL did not revert and the Company again requested (April 2011) it to provide environment friendly ozone treatment (Ozonisation system) in lieu of

⁴⁵ Ozonisation is a water treatment process that destroys microorganisms and degrades organic pollutants through the infusion of ozone, a gas produced by subjecting oxygen molecules to high electrical voltage.

Gas Chlorination. In response, BHEL provided (January 2012) its Technical Offer for the Ozonisation system. The Company, however, asked (February 2012) BHEL to go ahead with the Chlorine treatment system as envisaged in the LoA without citing any reasons.

The Company again suggested (September 2012) that BHEL may go in for a less hazardous mechanism for cooling water treatment as the statutory bodies, like Department of Factory and Boilers and Karnataka State Pollution Control Board, were insisting on phasing out the use of Chlorine Gas on environmental considerations. The advantages of using Ozonisation were discussed by the Company in January 2013, and it was decided to go for Ozonisation system. BHEL submitted their second Technical Offer (March/October 2013) and after negotiations (November 2013) for rates, a Work Order was issued in January 2014 for ₹ 22.50 crore⁴⁶. The stipulated time for completion was 20 months (September 2015) with a condition that BHEL should endeavor to commission the Ozonisation system to match with the commissioning of the BTG package.

The work, however is yet to be completed (September 2018) even after 36 months from its scheduled completion date (September 2015) and 18 months of declaration of the commercial operation of the Plant (March/April 2017). The Company did not ascertain the reasons for not completing the work.

Audit observed that in spite of being aware in May 2010 itself that Ozonisation method was environmentally better as compared to Chlorination method for treating water, the Company failed to decide on the method until January 2013.

As a result of the delay, untreated water is being provided till now (September 2018) through the pipelines in the Cooling Water System, thereby affecting the health of the pipelines.

The Management attributed (September 2018) the delay to BHEL, stating that the proposed alternative system was in the scope of BHEL and they took time to formalize their offer and come for execution. The Management in another reply (November 2018) informed that because of prolonged correspondence and time lag by BHEL, they intimated BHEL to carry out the work as per LoA.

Railway Siding and Marshalling Yard

2.1.13. The DPR envisaged coal transportation through rail. The coal was to be transported from mines in wagons and would be unloaded through the Wagon Tippler system. This system was to be ready by April 2014, the envisaged completion date of the Project.

M/s. Unirail, the Railway Siding and Marshalling Yard (RSMY) Consultant, submitted (June 2010) the Pre-Feasibility Report for the alignment of RSMY with take-off point from Yeramarus Railway Station, with entry through the Company's land. As the proposed layout of RSMY involved major embankment works involving huge costs, it was decided (September 2010) to

⁴⁶ After offsetting the cost of ₹ 3.50 crore for gas chlorination included in the cost of the BTG package awarded to BHEL.

explore an alternative layout by shifting the entry point towards the northern end of the Project site.

The Company requested (September 2010) the Consultant to submit revised proposals for the alternative alignment. The Consultant informed (February 2011) that the proposed revision of plan would not fit within the land boundaries of the Company, as it would go through the land of Surana Industries, who had a Thermal Station in the vicinity.

However, the Consultant provided the revised DPR for the RSMY in July/August 2011 with alignment for the railway line passing through private lands (including 24 acres belonging to Surana Industries), which was required to be acquired through KIADB. The Company approached (February - April 2012) Karnataka Industrial Area Development Board (KIADB) for acquiring the land. KIADB informed (September 2013) that the requested land could not be made available in favour of the Company as it was already allotted to Surana Power Limited, Raichur in March 2010 for establishing a Power Plant.

The Company's efforts to get the land through intervention of the Deputy Commissioner, Raichur also did not yield any result.

Audit observed that though the Company was aware of the involvement of Surana Industries' land in February 2011, it did not go in for an alternative alignment/plot immediately. It was only in June 2014 that the Company took up the issue with Railways for an alternative alignment. Thus, the Company lost a precious 40 months (January 2011 to June 2014) to go for another alternative.

2.1.13.1. As efforts to procure land from Surana Industries failed, the Company approached (June 2014) Railways for a stretch of land belonging to Railways for railway linkage to its YTPS Project. The Railways approved the proposal for Railway Siding in September 2015. Finally, in March 2016, the Railways agreed to lease the land at a cost for ₹ 4.72 lakh per annum (excluding service tax) and a licensing agreement was entered into in April 2016. Thus, it took another 20 months (June 2014 to April 2016) for the Company to obtain lease of the Railways land.

The Management in its reply (September 2018) blamed the Consultant for failing to resolve the issue of finalisation of new alignment. The Management also replied (November 2018) that it made best efforts but Surana Industries did not agree to spare the land.

The reply is not acceptable as it was the responsibility of the Company, and not the Consultant's to acquire the land. Besides, the consultant had already brought this issue to the notice of the Company way back in February 2011, but no timely remedial actions were taken.

2.1.13.2. Meanwhile, the Company had invited tenders (June 2014) for works of Railway Siding and Marshalling Yard⁴⁷. Part-A consisted of works outside the compound wall of YTPS Project upto Yeramarus Railway Station and was awarded (November 2014) to M/s. PJB Engineers at a cost of ₹ 30.55 crore to be completed in 10 months (September 2015). Part-B - consisting of similar works inside the Plant boundary including road-under-bridge was awarded to M/s. Gannon Dunkerley & Company Ltd (GDCL) at a cost of ₹ 102.97 crore, to be completed in 12 months (November 2015).

Though Railways granted permission to work in April 2016, both PJB Engineers and GDCL did not complete the work (September 2018). For Part-A work, on the request of the agency, extensions (upto July 2016, May 2017 and March 2018) were allowed without levy of penalty. The delay was due to delay in transferring of land for execution, delay in receipt of approved DPR for RSMY and bridge drawing *etc.* In case of Part-B work, even after extensions (upto September 2016 and later, September 2017), the embankment work was not completed (September 2018) due to delay by the contractor.

Thus, with the non-completion of the RSMY work, there was no rail arrangement to bring coal to the YTPS Project, though the Project was declared as ready for commercial operation (March/April 2017) more than 18 months ago. The

Company was unable to ensure continuous supply of coal for the continuous operation of the Plant for generation of power. The Company brought coal through road transport from nearby RTPS Plant for operating the Plant by incurring extra expenditure (Refer Paragraph 2.1.17.2).

The Management replied (November 2018) that there were delays by Railways to give approval for the drawings and hence the works were delayed. The reply is not acceptable as the Company had not finalised the alignment for the RSMY and hence the question of delay by Railways does not arise.

General Mechanical Works (GMW)

2.1.14. The General Mechanical Works (GMW) were needed for pumping of raw water from Krishna River to the YTPS through pipe-lines of 14 km (approximate). It included construction of jack-well pump house, supply and



Picture No. 2.1.2: Track laying in RSMY works
Source: Monthly Meeting Reports of the Management of April 2018

⁴⁷ Consisting of (a) earthwork, (b) construction of bridges, and (c) construction of permanent way-works for the RSMY.

erection of pumps and laying of pipelines for Raw Water (RW) System, as well as for Ash Water Recovery (AWR) System along with Ash slurry pipe lines and Bottom ash overflow discharge pipe lines from YTPS terminal point up to Ash Pond. The package also included supply & installation of workshop equipment, supply of fire tenders, water tankers with integral high-pressure pumps, etc.

Audit observed the following:

- The Company prepared (June 2011) an estimate of ₹ 288 crore for GMW. The BoD of the Company was apprised (June 2011) of the need for tendering the Balance of Plants works, including GMW, and review of their technical specifications. The technical specifications of GMW were, however, finalised by the Company only in August 2011, *i.e.* after a lapse of 16 months from the date of issue of LoA (April 2010) for BTG package to BHEL;
- The Company floated (September 2011) a tender for the GMW. After opening the price bids (April 2012), the tender was cancelled (June 2012) by stating that it was a single responsive bid. This resulted in a delay of three months (April 2012 to June 2012) needlessly as the tender could have been cancelled in April 2012 itself and re-tendered;
- Tenders invited for the second time in September 2012 were again cancelled in February 2013 as there was ambiguity in the tender conditions and evaluation of efficiency parameters of Raw and Ash Water Pumps. Thus, the Company lost another eight months on account of not framing the tender conditions properly; and
- In order to complete the work in line with BTG, the Operations Committee of the Company decided (February 2013) to split the work into three different packages, viz. *Package-I*: Raw and Ash Recovery Water System, *Package-II*: Pumps, and *Package-III*: Workshop and miscellaneous equipments. The Workshop and miscellaneous equipments package was further split into *Packages (III a)*-Workshop equipment (*III b*)-Fire tender and water tankers, and (*III c*)-Miscellaneous equipments.
 - The scope of Package-I, which was tendered in February 2013 and awarded in August 2013 *inter alia* involved a work of providing 11 kV electrical lines for a distance of 14 kms. from the YTPS project area to the pump house. From the design studies submitted (July 2014) by Megha Engineering & Infrastructure Ltd (contractor), the Company observed a drop in voltage at the tail end (14th km). At the request (August 2014) of the Company, the contractor agreed (December 2014) to install a transformer and other accessories for a 33 kV line, which was approved by the Company in February 2015. Audit observed that the change in voltage class from 11 kV to 33 kV was due to drop in voltage due to distance factor, and this should have been known to the Executives of the Company who were executing various power projects of KPCL. Thus, due to initial lapses, the various components now had to be modified, which resulted in a delay of seven months (July 2014 to February 2015) in

approving the work. The work of electrical line was completed in November 2015.

- Further, apart from the above change, there were also delays due to non-availability of land, obtaining of clearance from Forest Department, increase in height of bund in river side and consequent changes of design of ash water recovery pump house, *etc.* in completing other works of Package-I. Though time extensions (February 2016, December 2016 and October 2017) were given to the contractor, Package-I was not completed (September 2018).
- Package-II for Supply of Pumps was tendered in May 2013 and awarded in February 2014. Similarly, the other packages (Package-III a, b, c) were tendered (March/May 2014) and awarded in October 2014/January 2015. All these works were not completed till date (September 2018) due to delays by the contractor.

Thus, the General Mechanical Works are yet to be completed. The delay in completion of these General Mechanical Works, delayed the process of bringing raw water⁴⁸ to the YTPS plant. As a result, when the Hydro Test of the main BTG package had to be done (scheduled date of January 2013/July 2013 and actual ready date of September 2014), the Company supplied de-mineralized⁴⁹ water by bringing it from RTPS and conducted the Hydro Test in August 2015/February 2016.

The Management attributed (September 2018) the delay of electrical work to time required for system study, detailed engineering and also the fact that the work was interlinked to many other works. The Management also stated that Package-I of the work was delayed as the workshop area could be handed over to the contractor only after 20 months, due to change in location to accommodate Chemical Laboratory and clearing the materials stored by another agency.

Plant Water System (PWS)

2.1.15. The Plant Water System consists of (a) Raw Water Treatment/Filtration System (Micro-filtration), (b) Service Water System, (c) Effluent Treatment Plant, (d) Waste Water Treatment Plant, (e) Sewage Treatment Plant, (f) Potable Water System, (g) Recovered Ash Water Treatment System, and (h) Sludge Handling and Disposal System.

The main input for the PWS was the Raw Water and Ash Water System, awarded under the General Mechanical Works (Paragraph 2.1.14).

The work of PWS was awarded (August 2013) to M/s. L&T Limited at a lump sum price of ₹ 123.48 crore. The work was to be completed by December 2014. The different components of work were actually completed between January 2015 and June 2016. This was due to delay in approval of drawings, delay in handing over of land, delay in clearing materials stored by other agency in

⁴⁸ The Plant required 7,210 cum. of water per hour.

⁴⁹ Raw water is drawn from the Krishna river and treated to get de-mineralised water.

M/s. L&T area, labourer's strike, non-availability of work-front (area for working) for Chemical Laboratory and Effluent Collection Pit, etc.

The Management did not give specific reply for the delays but stated (September 2018) that performance tests of the different components of Plant Water System were conducted by feeding prepared quantity and quality of inputs.

Management of work by BHEL

2.1.16. Audit also examined whether BHEL had shouldered its responsibilities as a Contractor for the main BTG Package and also as a partner on the Board of the JV Company. The findings on these aspects are given in paragraphs below.

2.1.16.1 As per the scope of work awarded (April 2010) to BHEL and milestones agreed (September 2010), the main responsibilities of the BHEL are as under:

- Complete manufacture and supply of Steam Generator, Steam Turbine Generator and Auxiliaries, including agreed Balance of Plants works along with services for providing detailed engineering, erection, testing and commissioning of the Plant; and
- Providing detailed design of the equipment and associated civil works.

Construction of Turbo Generator Deck

2.1.16.2. During execution of civil work in Turbo Generator (TG) area, as against the design, the columns (16 numbers) of the TG Deck (building) were shifted from their designed position by distances ranging from 50 mm to 80 mm. The Company noticed this deviation in January 2013. The Company requested BHEL to examine the repercussions of the constructional deviation on the dynamic behavior of the structure by re-modelling and assess the safety of the Turbo Generator foundation before proceeding with further construction. The Engineers of BHEL and the Company, after re-examination (February 2013), confirmed that there was a shift in the TG deck. Though BHEL furnished analysis to confirm that the shift will not be a problem for the structural integrity and other erection work, the Company, being the owner, preferred to ascertain the status independently. After a study by an Internal Committee of the Company and based on the opinion of the Indian Institute of Science (IISc), Bengaluru in May/July 2013 that there was no significant impact on the TG foundation, the Company directed (September 2013) BHEL to proceed with the stalled work.

Audit observed that the Company did not properly monitor the work of construction of the TG Deck with the designs and as such, the changes of the position of the columns of the TG Deck were noticed belatedly. Due to this, the Company had to stop the work and take opinions of experts thereafter, which delayed the work by eight months.

The Management attributed (September 2018) the shifting of TG columns to BHEL for not adhering to standard construction practice, resulting in reworking, retrofitting and consequent delays.

Delay in the submission of drawings

2.1.16.3. BHEL was to submit the drawings to the Company for approval before taking up the work. On receipt of drawings, the Company, in consultation with the consultant, *i.e.* M/s. Evnoik Energy Services (India) Private Ltd. (later M/s. Steag), would approve the same and communicate it to BHEL. It was observed that as on the scheduled date of completion (April 2014), out of the 2,863 drawings, BHEL had delayed submission of 507 drawings, which were pending approval by the Company/Consultant. Another 724 drawings were pending with BHEL for resubmission due to non-provision of supporting documents/ clarifications/datasheets. These drawings were for erection of the different components of the Boiler and Turbine Generator, which formed the fulcrum of the Project.

Audit also noticed from correspondence (September 2011) with BHEL, that even at that early stage, BHEL was taking additional time beyond scheduled time of about 20 days, for furnishing the required documents for approval. The delays ranged from 0-30 days for 30 drawings, 31-60 days for 24 drawings, 60-180 days for 90 drawings and more than 181 days for 21 drawings.

Thus, BHEL had failed to adhere to its responsibility of providing designs in time, so as to complete the project within the scheduled date.

In the Exit Conference (October 2018) the Management stated that there were delays by BHEL in submission of drawings and giving supporting documents, and this was being examined by a Joint Committee formed to review the reasons for delay in completion of work (refer to Paragraph 2.1.21 *infra*).

Coal Handling Plant on entrustment basis

2.1.16.4. The functions of Coal Handling Plant (CHP) in a thermal power station include unloading of coal, its crushing, storage and filling of boiler bunkers. BHEL intimated (January 2011) the Company that in order to overcome the delay of work by other agencies, its Industrial Systems Group (ISG) Division at Bangalore had been made a Nodal Agency for execution of Coal and Ash Handling Plants and requested the Company to place orders on them.

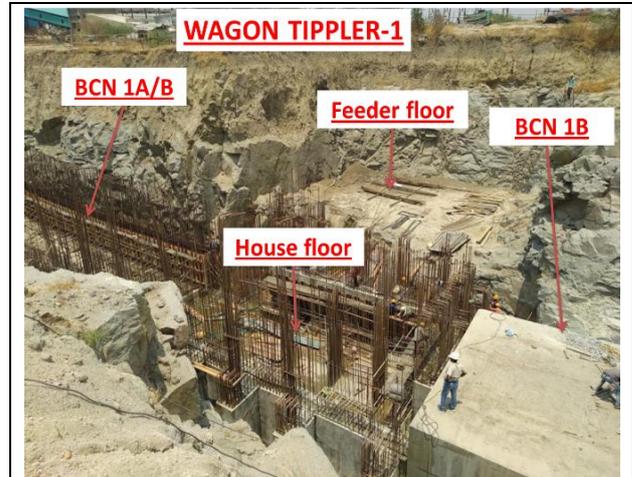
The BoD of the Company recommended (March 2011) for obtaining an offer from BHEL for the work of CHP with Mill Reject Handling System (MRHS) and Ash Handling System (AHS). After negotiations/ modifications (September 2011/January 2012), the Company placed an order (March 2012) for ₹ 966 crore, excluding mandatory spares, taxes and duties. The entrustment of the work was to synchronize with the completion of the BTG package (April/October 2014). The work is yet to be completed (September 2018).

Audit observed that there was delay on the part of the Company in handing over (February 2014) the required land to BHEL for the CHP work, *i.e.* two years after the entrustment of work. Considering the delay in handing over of the land, BHEL should have completed the work in the next two years' time (by February 2016). Yet, BHEL, who took up the work on the premise of synchronizing the work of CHP with that of the BTG package did not complete the work (September 2018).

Thus, the YTPS plant, even after being declared as ready for commercial operation (March/April 2017) cannot run optimally as the Coal Handling Plant is not ready (September 2018).

The Management replied (September 2018) that BHEL had a strong vendor list and had executed many similar projects earlier. The Company relied on BHELs assurance to mitigate the risk

of delay in execution of such works by being a single point responsibility center. Management further informed that it was pursuing with BHEL for completion of balance works early.



Picture No. 2.1.3: Status of Wagon Tippler in CHP
Source: Monthly Meeting Reports of the Management of April 2018

Supply of Coal

Allocation of coal block

2.1.17.1. Coal is the primary fuel for running the Plant. As per DPR, a total of 58.3 lakh tonnes⁵⁰ of coal per annum was proposed from Western Coalfields, Talcher Coalfields and South Eastern Coalfields for operation of the Plant.

Under a new Scheme of the GoI in 2012 for allotment of coal blocks, the Company had applied for, and was allotted⁵¹ (September 2013) coal mine at Deocha Pachami, West Bengal. The Company, however, requested (June 2014/July 2016/October 2016) the Ministry of Coal to reallocate a coal block nearer to Karnataka to reduce the burden on transportation. The Company also made an application (October 2016) for allocation for a new coal block at Ghogarpalli Mine Block in Odisha. Following this, the Ministry of Coal, GoI cancelled (December 2017) the joint allotment of the coal mine at Deocha Pachami. The new coal block has not yet been allotted (September 2018).

Due to above developments, the Company, in the meanwhile, proposed to obtain coal through Bridge-linkage.

⁵⁰ Considering Gross Calorific Value (GCV) of coal at 4,699 Kcal./kg⁵⁰, Station Heat Rate of 2,300 Kcal/kWh and Plant Load Factor (PLF) of 85 per cent,

⁵¹ Joint allotment to Karnataka and five other States.

Bridge-linkage agreement for coal

2.1.17.2. The Ministry of Coal, GoI introduced (February 2016) policy guidelines of Bridge-linkage, which acts as short-term linkage to bridge the gap in the requirement of coal. The Singareni Collieries Company Limited (SCCL) agreed for the supply of 30 lakh tonnes per annum to the Company and signed a Memorandum of Understanding to that effect in June 2016. This bridge-linkage allotted to YTPS Project was extended upto March 2019.

Audit observed that against the annual requirement of 58.3 lakh tonnes, only 30 lakh tonnes were tied up under Bridge-linkage. Even out of this the Company received only 3.73 lakh tonnes (12.43 *per cent*) of coal during 2016-17 and 7.51 lakh tonnes (25.03 *per cent*) during 2017-18 against linkage of 30 lakh tonnes each per annum. Besides, the supplies under bridge-linkage were costlier by 20 *per cent* as compared to the notified price and the Company incurred an additional expenditure of ₹ 15.43 crore due to the enhanced price.

Audit further observed that the coal required for YTPS (received through bridge-linkage) was unloaded at the nearby RTPS Siding of Karnataka Power Corporation Limited and was then being transported by road to YTPS Yard (about 14 kms) incurring an additional expenditure of ₹ 25.40 crore during 2017-18 as the work of Railway Siding and Marshalling Yard was not completed. Further, the coal was fed manually through Emergency Reclaim Hoppers directly to boilers, as Coal Handling Plant was not ready (September 2018) (Paragraph 2.1.13.2 and 2.1.16.4). With these constraints, the Company generated only 8.43 *per cent* of the capacity during 2017-18.

Thus, it can be seen that though the Plant was declared ready for commercial operation in March/April 2017 (Paragraph 2.1.7.1), the Company could not tie-up the adequate quantity of coal required to operate the Plant. Moreover, Railway Siding and Marshalling Yard and Coal Handling Plant works were pending completion (September 2018) and in the event of linkage being made available, YTPS would still be unable to operate the Plant to its full capacity.

The Management replied (September 2018) that the railway transportation system (RSMY) faced many challenges from design to execution stages. But in the light of changed ground conditions (due to non-completion of RSMY and CHP works), alternative contingency arrangements were made to transport/feed the coal to commence generation.

The fact remained that until September 2018, despite the persistent efforts of the State/Company, regular and requisite supply of coal was not available and the Plant was unable to function to its full capacity.

Challenges of having a Joint Venture in the execution of work

2.1.18. The Company was a Joint Venture between KPCL and BHEL. BHEL was a partner in the Joint Venture Company and also the contractor for the main BTG Package and agreed works of Balance of Plants⁵². Audit observed that this dual role of BHEL, being both in the decision-making body of the Management,

⁵² Station Control, Switchyard, Cooling Water System, Coal Handling Plant, Ash Handling Plant *etc.*

as well as being the contractor for the main BTG package, had certain limitations, the most important of which was noticed in designing the Plant. The details are given below:

Design limitations

2.1.18.1. The procedure for approval of designs for BTG, CHP and AHP packages was that BHEL would forward the drawings to the Company for approval. The Company, would then forward the same to the Consultant and the remarks of the Company, along with that of the Consultant, would then be passed on to BHEL for implementation.

Audit observed that the design specifications, given by BHEL were compromised in many cases as below:

- As per the Central Electricity Authority (CEA) guidelines (September 2010), for plants of 500 MW or above, the Ash Handling Plant was to be designed considering the worst coal that could be made available for use. BHEL proposed Ash Handling Plant with a capacity of 171 Tonnes Per Hour (TPH) considering 38 *per cent* ash for the coal, which was furnished by the Company. This was against the requirement of 179 TPH as per norms. The CEA guidelines further specified capacities of individual components within the Ash Handling System. Audit observed that the specifications of individual components (considering 179 TPH) also changed accordingly when compared to the norms of CEA, as given below:
 - The bottom ash evacuation was designed for 43 TPH against requirement of 45 TPH;
 - The fly ash evacuation was designed at 154 TPH against requirement of 161 TPH. This reduction was because the capacity of Hoppers was compromised (as given below); and
 - The economizer ash was designed for 8.6 TPH against requirement of 9 TPH.

This restriction would restrict the coal flow to the boiler and restrict the generation of power.

The Management replied (September 2018) that with the worst coal, the required coal flow would be 448 TPH and total ash generation would be 171 TPH. However, the fact remained that the Company had not designed the Ash Handling System as per CEA norms.

- Further, the coal stock yard was designed to hold 26 days' requirement (5 lakh tonnes) against 30 days' requirement (6 lakh tonnes) as per the norm.
- The Company initially proposed to have a tippler (travelling type) to have a provision for dropping coal into the bunker, from both sides of the conveyor which had a width of 15,400 mm. BHEL, however, designed the tippler (regular type) with provision for dropping coal, from only one side of the conveyor which had a width of 12,500 mm.

This reduced the coal filled in the bunker. The Management replied (November 2018) that as per design, the bunker height and width were fixed and hence dropping of coal from both sides was not possible, because BHEL had already finalised the drawings and was not prepared to revise them at a later stage. The reply is not acceptable as the Company and BHEL being partners in JV should have crystallised the drawings of the tippler (travelling type) and bunker jointly to avoid such a situation.

- Electrostatic Precipitator (ESP) is used to remove fly ash dust from gas streams. The fly ash is collected in Dust Hoppers. These Dust Hoppers should have a storage capacity of a minimum of eight (8) hours corresponding to the maximum ash collection rate. BHEL submitted (February 2011) a detailed drawing with a height of the Hopper at 7,000 mm and after the Company/ consultant's comments (September 2011) a revised drawing was submitted by increasing the height to 7,300 mm. This was approved by the Company in September 2011.

The Company noticed (November 2013) that the Hoppers were being manufactured with 7,000 mm height only. BHEL demonstrated that the Hoppers met the desired requirement of collection by providing calculations in which the density of fly ash was considered at 750 kg./cum. Considering BHEL's workings and the fact that the Hoppers were already manufactured, the Company accepted the same. Audit observed that as per CEA norms, the density of fly ash was to be reckoned at 650 kg./cum. and considering this norm the height of the Hoppers was to be 7,300 mm. Deviation from this norm limited the capacity of the Hoppers to maximise the ash collection.

The Management replied (November 2018) that storage requirement meets the requirement as per the contract. However, the fact remains that the hopper height is not as per the design approved by the Company.

BHEL being the contractor as well as the JV partner, should have taken the lead in ensuring that the design of various components of the YTPS Project complied with the CEA norms. But, there were compromises by BHEL in designing the various components of the YTPS Project which, thereafter, were belatedly approved by the JV Company, which was anyway headed by a BHEL functionary/ nominee/representative. Even in cases where BHEL went back on accepted specification or designs and worked as per their own convenience, they were never penalized for their actions, though the Company hereafter would have to bear the consequences of those actions throughout the life of the Project.

Environmental Management Plan

2.1.19. As per the DPR, an Environmental Management Plan (EMP) was to be established for the YTPS Plant detailing the environmental quality measures to be undertaken during the construction and operational phases. The EMP was also to discuss the post-project monitoring measures to be adopted by the Plant authorities in order to maintain the effluent qualities within the acceptable limits specified by the State Pollution Control Board and the Ministry of Environmental & Forests and Climate Change (MoEF&CC).

Also, as per the DPR, an Environmental Monitoring Programme was to be provided with trained and qualified staff who would monitor the ambient air as well as stack flue gas quality to ensure that the quality of effluents was maintained within the permissible limits of the Pollution Control Board Regulations.

Further, the Environmental Clearance given by the MoEF&CC in November 2009 and January 2015 had prescribed compliance to certain conditions.

Audit observed that though the Compliance Report for the conditions stipulated was submitted to MoEF&CC in July 2014 some of the conditions were not fulfilled/met till date (September 2018). The conditions not met included failure to formulate Corporate Environment Policy, create Environmental Cell, develop Environmental Monitoring Programme, allocate separate funds, harness solar power within the premises of the plant, and obtain approval for transportation of coal by road.

Thus, though generation commenced from the YTPS Plant during 2017-18, the YTPS is yet to comply (September 2018) with the conditions given in the Environmental Clearance for the Project.

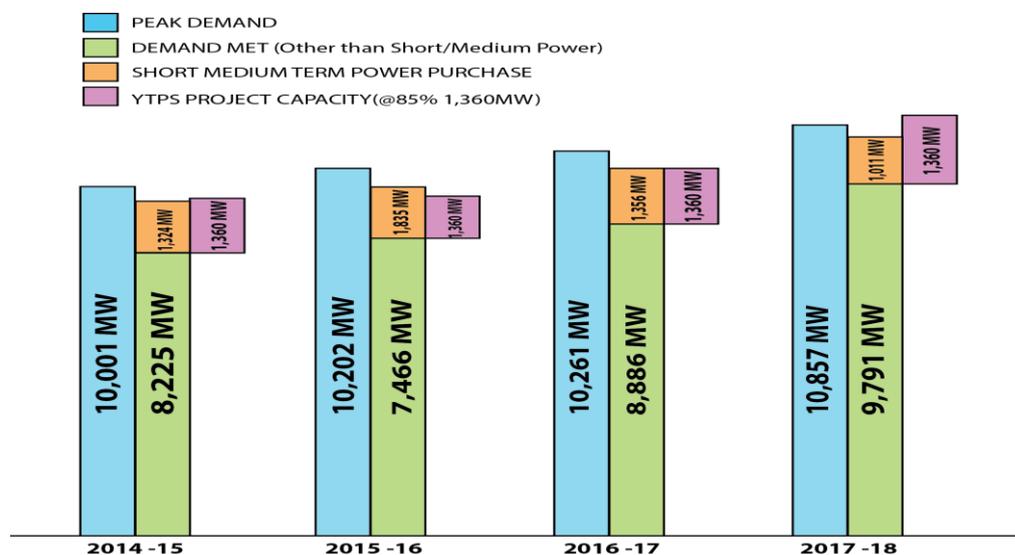
The Management replied (September 2018) that compliance to formation of Environment Cell and Corporate Environment Policy is under progress, while the proposal for harnessing solar power is under examination.

Impact due to delay in completion of the Project

2.1.20. One of the justifications for taking up the Project was to bridge the gap between demand and supply of power in Karnataka. The Project, which was to be completed by April /October 2014, was declared for commercial operation in March/April 2017 after a delay of three years. Even as on date the Plant is unable to run at its full capacity due to non-completion of ancillary works.

The situation of power (demand-supply gap) in the State during the interim period (2014-18) is given in the following Chart:

Chart No.2.1.3: Demand-Supply Gap for the four years 2014-18



Source: Based on Southern Regional Power Committee Reports, CEA’s Load Generation Balance Reports and Power Purchase information.

It can be seen from the Chart above that the Electricity Supply Companies had resorted to medium and short-term purchases during the last four years (2014 to 2018) to meet the demand of the consumers. Even after declaration of the commercial operation (April 2017), the Company generated only 996.316 MUs of Power during 2017-18, generating a revenue of ₹ 719.97 crore (provisional⁵³), whereas the interest expenses on loans alone for the Company during 2017-18 were ₹ 1,167.50 crore.

A total of 23,188.86 Million Units of power, in the form of short and medium-term power valued ₹ 11,079.22 crore, was purchased during this period. Out of this, additional cost on the purchase of 22,283.03 Million Units of power (short/medium-term) from private producers amounting to ₹ 2,517.92 crore could have been avoided during the last four years (excluding part demand in 2015-16), had the Company completed the implementation of the Project within the stipulated time.

Further, the delay in completion of the project increased the project cost from the estimated cost (April 2009) of ₹ 8,806.23 crore to ₹ 12,915.90 crore (provisional) as of March 2018. The provisional tariff also increased from ₹ 3.24 to ₹ 5.36 (provisional). There would have been surplus power for sale in the Southern Region after the State's demand had been fully met (during 2017-18), in line with such sale envisaged in the DPR. The Company lost out on this revenue too. The State/Company, did not evolve any action plan to sell surplus power in the future.

The Management accepted (September 2018) that due to delay in completion, there had been an increase in the project cost. The Management replied (September 2018) that the scope for sale of power may arise if the demand for power in the State does not grow as anticipated or if the renewables power capacity sees a further increase. The issue of sale of surplus power can then be taken up.

Levy of penalty

2.1.21. BHEL requested (April 2014) the Company for extension of time up to July 2015 and January 2016 in respect of Unit -1 and 2 respectively, without levy of penalty (Liquidated Damages). The Company approved (October 2014) the extension of time up to December 2014 for Unit-1 and March 2015 for Unit-2. This was further extended later up to June 2017. It was stated in the extension orders that recovery of liquidated damages would be deferred during the extended period.

The Company (RPCL) constituted (June 2015) a Joint Committee to review the reasons for the delay in completion of works and the levy of liquidated damages on BHEL. The Joint Committee is yet to submit its Final Report (September 2018).

⁵³ Pending approval of tariff by Karnataka Electricity Regulatory Commission.

The levy of liquidated damages for delay in completion was 10 *per cent* of the contract value given to BHEL, working out to about ₹ 811.59 crore⁵⁴. Failure of the Joint Committee to finalise the Report delayed the levy of liquidated damages, which would have an effect on total project cost and determination of tariff, as the capital cost would have been adjusted to that extent by the Regulatory Commission while determining tariff.

The Management replied (September 2018) that after the Joint Committee Report is available, further steps would be taken.

Conclusion

The Yeramarus Thermal Power Station Project was taken up for bridging the gap between demand and supply in the State and was to be fast-tracked considering the ready availability of land, water, coal transport and power evacuation, thereby gaining invaluable savings in time and money.

The units of the Project, which were scheduled to be completed by April 2014 and October 2014, were declared ready for commercial operation only in March and April 2017 respectively, after a delay of three years.

The main reasons for the delay were changes in designs and delay in finalisation of designs of the major items of work⁵⁵, apart from deficiencies in tendering and award of these works. There were also deficiencies in adhering to the design norms for the Plant. There were further challenges in the execution as Bharat Heavy Electricals Limited was on the Board as a Joint Venture partner even while it was also the primary contractor for the Project.

Further, though the Project had been declared as ready for commercial operation in March / April 2017, it did not run continuously at full load as other ancillary inputs, such as Coal Handling Plant, General Mechanical Works, and Railway Siding and Marshalling Yard Works, were yet to be completed (September 2018). This major failure was due to non-synchronisation of Boiler and Turbine Generator package with other ancillary inputs.

Despite investment of ₹ 12,915.90 crore into the Project, due to cost and time overruns in the YTPS project, the Electricity Companies of Karnataka had to procure 22,283.03 MUs of short/medium-term power to meet the deficit during 2014-15 to 2017-18, which otherwise would have been met by the YTPS project. The additional cost incurred on the purchase of 22,283.03 MUs of power as compared to the cost per unit of the tariff as per DPR of the YTPS project was ₹ 2,517.92 crore.

⁵⁴ 10 *per cent* of actual payment made for BTG package and for other BoP works (March 2018-provisional).

⁵⁵ Cooling Tower, Chimney, Ozonisation, Railway Siding and Marshalling Yard, *etc.*

Recommendations

The Company needs to:

- 1. Take immediate, time-bound action to complete the Balance of Plants works (such as General Mechanical Works, Coal and Ash Handling Plants, and Railway Siding and Marshalling Yard) at the earliest; and**
- 2. Take action to implement the Environment Management Plan.**