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Central Electricity Authority



ताप विद्युत परियोजना नवीनीकरण एवं आधुनिकीकरण प्रभाग

Thermal Projects Renovation & Modernisation Division



R&M of Unit-7 (110 MW) of Barauni TPS

Quarterly Review Report
Renovation & Modernisation of Thermal Power Stations
Quarter: July- September, 2016

C O N T E N T S

Sl No.	Description	Page No.
	Highlights	01-02
1.0	Introduction	03
2.0	Objective of R&M programme	03
3.0	Objective of LE programme	03
4.0	R&M and LE programme from 7th Plan onwards till 11th Plan	03-04
5.0	LE/R&M Programme during 12th Plan (2012 – 17)	04
5.1	Achievement of LE/R&M Programme during the 12th Plan up to 31st March,2016	05
5.2	Details of thermal units under shut down for R&M and LE works	06
5.3	Status of R&M activities under BRGF Scheme	06
6.0	External Co-operation for R&M of TPS	07
6.1	Development of Tender Procedure and Model Contract for R&M of Fossil fuel based Power Plant	07-08
6.2	Coal Fired Generation Rehabilitation programme funded by World Bank	08-11
6.3	Indo-Japan co-operation for study on Efficiency and Environmental improvement of Coal fired stations	12-13
Annexure-1	Status of units where Life Extension/ Renovation & Modernisation works have been taken up for implementation during 12th Plan	14-25
Annexure-2	Details of Thermal Power Units where the Life Extension (LE) Works have been completed during 12th Plan	26
Annexure-3	Details of Thermal Power Units where the Renovation & Modernisation (R&M) Works have been completed during 12th Plan	27

Foreword

Renovation & Modernization (R&M) has been recognized as one of the cost effective options for obtaining the additional generation and better outputs from the existing old thermal power units. The R&M of such units is very essential for bringing in improvement in the performance of the units as well as for system upgradation to comply the stricter environmental norms to ensure improved environmental conditions. On the other hand, the Life Extension (LE) of the old thermal power units is carried out with an aim to extend their useful life 15 to 20 years beyond the original design economical life.

The Thermal Projects Renovation & Modernization (TPR&M) Division is entrusted with the responsibility of monitoring the progress of R&M/LE activities in thermal power generating units in the country under Section 73(f) of the Electricity Act, 2003. Based on the interaction and information received from various utilities, the Quarterly Review Report (QRR) is prepared highlighting the latest status of the physical progress of R&M/LE works at various thermal units.

R&M/LE works in 31 units with aggregate capacity of 4502.26 MW have been completed during 12th Plan upto 30-09-2016. At present, 5 coal based generating units with aggregate capacity of 730 MW are under shut down for carrying out the R&M/LE works.

CEA is also carrying out the technical studies related to R&M for addressing barriers to Energy Efficiency R&M in India as a part of Coal Fired Generation Rehabilitation Project funded by the World Bank. Study report on *“Reduction of Barriers to R&M Interventions in TPS in India”* and that on *“Developing Markets for Implementation of R&M Schemes in TPS in India”* submitted by Mercados EMI have been circulated to the various stakeholders for their reference and guidance during the implementation of R&M project. The reports are also available on CEA web-site. Further to facilitate the implementation of progress standard tender documents for R&M of fossil fuel based power plants in India have been prepared under Indo-German Energy Forum (IGEF). The final tender documents have been accepted by CEA.

Also, under the Indo-Japan Co-operation 3rd Phase MoU between CEA and JCOAL in the field of efficiency improvement and environmental improvement of coal fired power stations has been signed on 22nd January, 2016. Under the MoU, the CEA- JCOAL workshop and Clean Coal Technology Transfer programme have been organized. The Diagnostic activities have been carried out by JCOAL at unit-3 (210 MW) of Dadri TPS. A study on replacement of old units of Badarpur TPS by highly efficient super critical units of higher size has been carried out by JCOAL as a generic study.

In the end, I would like to express my sincere thanks and gratitude to the Utilities and other stakeholders for extending their warm co-operation for preparation of the Quarterly Review Report as well as in our endeavours for facilitation of implementation of the R&M/ LE works at old thermal power units in the country.

Dated : 21.10.2016

(Bhai Lal)
CE (TPR&M)

Highlights

1. LE/ R&M Achievements during 11th Plan (2007 – 12)

Sl. No.	Particulars	State Sctor		Central Sector		Total (State + Central)	
		No. of units	Capacity (MW)	No. of units	Capacity (MW)	No. of units	Capacity (MW)
A)	LE works						
1.	Completed during 11 th Plan	10	1024	3	267	13	1291
B)	R&M works						
2.	Completed during 11 th Plan	20	4485	39	10370	59	14855
	TOTAL	30	5509	42	10637	72	16146

2. LE / R&M Programme during 12th Plan (2012 - 17)

Category	LE/R&M works identified during 12 th Plan No. of units & capacity (MW)		Total (State Sector + Central Sector)
	State Sector	Central Sector	
LE	38 (6820)	32 (5246)	70 (12066)
R&M	20 (4150)	45 (13151)	65 (17301)
Total	58 (10970)	77 (18397)	135 (29367)

3. Achievements of R&M and LE Projects during 12th Plan (upto 30.09.2016)

Sl. No.	Particulars	LE/R&M works completed during 12 th Plan No. of units & capacity (MW)		Total (State Sector + Central Sector)
		State Sector	Central Sector	
1	LE	9(1180)	11(1261.76)	19(2441.76)
2	R&M	5(850)	6(1210.5)	11(2060.5)
	Total	14(2010)	17(2472.26)	31(4502.26)

4. External Co-operation for R&M/LE of TPS

The status of activities under external co-operation for R&M/LE of TPS is furnished below :-

(A) Phase–II Activity: Development of Tender Procedure and Model Contracts for R&M of Fossil Fuel Based Power Plants in India – funded by KfW.

Lahmeyer International (India) Ltd. was appointed as a Consultant for ‘Development of Tendering Procedures and Model Contract document for R&M of Fossil Fuel Based Power Plants in India’. The Phase-II Activity Report and final Model Documents have been submitted by Lahmeyer under the consultancy. The Documents have been accepted by CEA.

(B) ‘Technical Assistance to CEA’ funded by World Bank under the umbrella project “Coal Fired Generation Rehabilitation Project-India”

The consultants for carrying out the following studies under the above project have been appointed. The status of progress is given below :-

- a) **Study on Reduction of Barriers to R&M Interventions in TPS in India**
Mercados Energy Market India was appointed as a consultant on 02.04.2012. The Study Report submitted by Mercados EMI has been accepted by CEA in January, 2014 and sent to various stakeholders in the power sector.
- b) **Study on Developing Markets for Implementation of R&M in TPS in India**
Mercados Energy Market India was appointed as a consultant on 14.05.2012. The Study Report submitted by Mercados EMI has been accepted by CEA in January, 2014 and sent to various stakeholders in the power sector.
- c) **Review of Institutional Capacity and Capacity Strengthening Interventions in CEA**
KPMG has been appointed to carry out the study on 16-07-2012. KPMG has already submitted reports on As-Is Assessment of Institutional Capacity of CEA and Customer Expectation Survey which have been accepted by CEA. KPMG submitted the revised draft report on Capacity Strengthening plan of CEA on 6th May, 2016. Based on the comments of CEA, World Bank and other parties the revised Capacity Strengthening Plan is under preparation by KPMG.
- d) **Review of Experience from Pilot R&M Interventions in TPS in India:**
WAPCOS Ltd. has been appointed as a consultant w.e.f. 23-07-2012. WAPCOS had submitted the draft report on Procurement Experience on 03.12.2013. WAPCOS submitted draft reports on Review of Implementation Experience & Strengthening O&M Practices on 11th March 2016. The draft report on Review of Post R&M Experience in O&M from Pilot R&M intervention in TPS in India is still awaited. Based on the comments the draft final reports are under preparation by WAPCOS.

(C) Indo-Japan Co-operation for Project on Efficiency & Environment Improvement for Sustainable, Stable and Low Carbon Supply of Electricity of Coal Fired Stations.

The 3rd Memorandum of Understanding (MoU) on Indo – Japan Cooperation for Project on Efficiency & Environment Improvement for Sustainable, Stable and Low Carbon Supply of Electricity between CEA and JCOAL was signed on 22nd January, 2016. The objective of the MoU is to address issues and barriers in promoting sustainable, stable and low-carbon thermal power development in India. Under this MoU, JCOAL is carrying out feasibility study of replacement of Badarpur TPS by new units based on SC/USC technologies. RLA study at unit-3 (210 MW) of Dadari TPS has been carried out by JCOAL and report is under preparation by JCOAL. Under Clean Coal Technology (CCT) Programme two study tours to Japan were organized from 26th January, 2016 to 3rd February, 2016 and 2nd February, 2016 to 10th February, 2016 in which 10 participants from different power utilities have participated. Under CCT programme two more study tour are to be organized in the financial year 2016-17 for which nominations from concerned utilities have been received.

Quarterly Review Report on Renovation, Modernisation and Life Extension of Thermal Power Plants

1.0 Introduction

At the time of independence, the total installed capacity in the power sector was 1362 MW of which steam power plants contributed 756 MW. The installed generation capacity has since grown manifold. The total installed capacity as on 30.09.2016 was 306358.25 MW of which thermal power plants contributed 213228.9 MW (69.6 %). The contribution of Coal, Gas and Diesel based thermal power plants of total installed capacity is 61.12 %, 8.18 % and 0.30 % respectively.

Renovation & Modernization (R&M) is seen as a cost-effective option for additional generation from the existing thermal power stations and better asset management due to its low cost and short gestation period. Besides generation improvement and improvement in availability, other benefits achieved from R&M / LE include life extension, improved safety, reliability and environmental conditions.

Many of the thermal power plants are not operating to their full potential and large numbers of thermal units including 200/210 MW units are old and outlived their normal economical design life. The 66 LMZ units of 200/210 MW Capacity are best potential candidates for Energy Efficiency R&M (EE R&M).

2.0 Objective of R&M Programme

The main objective of Renovation & Modernisation (R&M) of thermal generating units is to make the operating units well equipped with modified / augmented with latest technology equipment and systems with a view to improve their performance in terms of output, reliability, availability, reduction in maintenance requirements, ease of maintenance and minimizing inefficiencies.

3.0 Objective of Life Extension Programme

The R&M programme is primarily aimed at generation sustenance and overcoming problems. The life extension (LE) programme on the other hand focuses on plant operation beyond their original design life after carrying out specific life assessment studies of critical components with an aim to increase the life beyond the design economic life of 25 years.

4.0 Renovation and Modernisation (R&M) and Life Extension Programme (LEP) from 7th Plan onwards till 11th Plan

R&M Programme in a structured manner was initiated in 1984 as a centrally sponsored programme during 7th Plan and the programme continued during the two Annual Plans 1990-91 & 1991-92. The Plan wise details are given below:-

S. No.	Five Year Plan	Year	No. of TPS / No. of Units	Capacity (MW)	Additional Generation Achieved MU/ Annum*	Equivalent MW**
1	7 th Plan & 2 Annual Plans	85-86 to 89-90 & 90-91, 91-92	34 / 163	13570	10000	2000
2	8 th Plan (R&M) (LEP)	92-93 to 96-97	44 / 198 43/(194) 1/(4)	20869 (20569) (300)	5085	763
3	9 th Plan (R&M) (LEP)	97-98 to 2001-02	37 / 152 29/ (127) 8/ (25)	18991 (17306) (1685)	14500	2200
4	10 th Plan (R&M) (LEP)	2002-03 to 2006-07	9/25 5/(14) 4/(11)	3445 (2460) (985)	2000	300
5	11 th Plan (R&M) (LEP)	2007-08 to 2011-12	21/72 15/(59) 6/(13)	16146 (14855) (1291)	5400	820

*Tentative figure.

** Equivalent MW has been worked out assuming PLF prevailing during that period.

5.0 R&M/ LE Programme during 12th Plan (2012 - 17)

The Summary of R&M/ LE Programme to be implemented during the 12th Plan is given below. The status of implementation of the R&M/LE works at various units is furnished at Annexure-1.

S.No.	Particulars	LE/R&M works identified during 12 th Plan No. of units & capacity (MW)		Total (State Sector + Central Sector)
		State Sector	Central Sector	
1.	LE	38 (6820)	32 (5246)	70 (12066)
2.	R&M	20 (4150)	45 (13151)	65 (17301)
Total		58 (10970)	77 (18397)	135 (29367)

The Summary of achievements of R&M/ LE Projects is given below:

As on 30.09.2016

Year	LE No. of units (MW)		R & M No. of units (MW)		Total (state + central) No. of units (MW)		Total LE and R&M No. of units (MW)
	State	Central	State	Central	State	Central	
2012-2013	1(110)	1 (106)	5 (850)	1 (110)	6 (960)	2 (216)	8 (1176)
2013-2014	2(220)	3 (343)	0 (0)	3 (100.5)	2 (220)	6 (443.5)	8 (663.5)
2014-2015	2(220)	6(681.76)	0(0)	0(0)	2(220)	6(681.76)	8(901.76)
2015-2016	2 (320)	1(131)	0(0)	2(1000)	2(320)	3(1131)	5(1451)
2016-2017	2(310)	0(0)	0(0)	0(0)	2(310)	0(0)	2(310)
Total No. of units (MW)	9(1180)	11 (1261.76)	5 (850)	6 (1210.5)	14 (2030)	17 (2472.26)	31 (4502.26)
	20(2441.76)		11(2060.50)		31(4502.26)		

5.1 Details Achievements of LE and R&M Programme during 12th Plan upto 30.09.2016

	Name of the TPS	Unit No.	Capacity (MW)	Utility	Sector	Date of Achievement
1. 2012-2013						
LE	Bathinda	3	110	PSPCL	State	05.08.2012
	Kawas	GT-1A	106	NTPC	Central	21.01.2013
R&M	DPL	6	110	DPL	State	07.05.2012
	Patratu	10	110	NTPC	State	24.05.2012
	Anpara'A	1 to 3	3x210	UPRVUNL	State	21.03.2013
	Tanda	2	110	NTPC	Centre	15.09.2012
Sub Total		8 (units)	1176.00			
2. 2013-2014						
LE	Parichha	2	110		State	05.05.2013
	Muzafarpur	1	110		State	05.07.2013
	Kawas	GT-1B	106	NTPC	Central	28.08. 2013
	Gandhar	GT – 3	131	NTPC	Central	29.09.2013
	Kawas	GT-2B	106	NTPC	Central	31.03.2014
R&M	Kathalguri	GT-3	33.5	NEEPCO	Central	31.03.2014
	Kathalguri	GT-4	33.5	NEEPCO	Central	31.03.2014
	Kathalguri	GT-5	33.5	NEEPCO	Central	31.03.2014
Sub Total		8(units)	663.50			
3. 2014-2015						
LE	Bathinda	4	110	PSPCL	State	10.07.2014.
	Muzafarpur	2	110	BSPGCL	State	30.09.2014
	Auraiya	GT-1	111.19	NTPC	Central	22.06. 2014
	Gandhar	GT-1	131	NTPC	Central	06.07.2014
	Kawas	GT-2A	106	NTPC	Central	22.08.2014
	Auraiya	GT-2	111.19	NTPC	Central	28.10.2014
	Auraiya	GT-3	111.19	NTPC	Central	25.12.2014
	Auraiya	GT-4	111.19	NTPC	Central	02.03.2015
R&M	NIL	-	-	-	-	-
Sub Total		8 (units)	901.76			
4. 2015-2016						
LE	Harduaganj	7	110	UPRVUNL	State	01.05. 2015
	Bandel	5	210	WBPCL	State	21.09.2015
	Gandhar	GT-2	131	NTPC	Central	15.04.2015
R&M	Simhadri	1	500	NTPC	Central	31.03.2016
	Simhadri	2	500	NTPC	Central	31.03.2016
Sub Total		5 (units)	1451.00			
5. 2016-17						
LE	Obra	10	200	UPRVUNL	State	08.04.2016
	Barauni	7	110	BSPGCL	State	03.08.2016
R&M	NIL	-	-	-	-	-
Sub Total		2(unit)	310			
Total LE	20 (2441.76)	State	09 (units)	1180		
		Centre	11 (units)	1261.76		
Total R&M	11 (2060.50)	State	05 (units)	850		
		Centre	06 (units)	1210.5		
Grand Total		31 (units)	4502.26			

Details of thermal power units where the R&M/ LE Works have been completed during 12th Plan up to 30.06.2016 are given at **Annexure 2& 3**.

5.2 Details of thermal units under shut down for R&M and LE works

The following 6 units are under shut down for R&M and Life Extension works.

Sl.No.	Name of Project	Utility	State	Unit No.	Capacity (MW)
1.	Patratu TPS	JSEB	Jharkhand	9	110
2.	Obra TPS	UPRVUNL	U.P.	11	200
3.	Obra TPS	UPRVUNL	U.P.	7	100
4.	Barauni TPS	BSPGCL	Bihar	6	110
5.	Koradi TPS	MSPGCL	Maharashtra	6	210
Total					730

5.3 Status of R&M activities under Backward Region Grant Fund (BRGF) Scheme.

Under RSVY (now BRGF), Planning Commission in a meeting held on 10.05.2005 identified Barauni TPS, units 6&7 and Muzaffarpur TPS units 1&2 for carrying out Life Extension (LE) works. Subsequently, a five party agreement between the Government of India, Govt. of Bihar, BSEB, BHEL and NTPC was signed on 29.5.2006.

Planning Commission vide their letter dated 16.11.2009 approved Rs. 1053 crores including consultancy charges under the Special Plan for Bihar for LE works of Barauni TPS (Unit 6&7) and Muzaffarpur TPS (Unit 1&2) as per details given below:

Barauni TPS Unit (6&7)	:	Rs. 554.16 crores
Muzaffarpur TPS (1&2)	:	Rs. 471.80 Crores
Consultancy charges to NTPC (for Barauni TPS only)	:	Rs. 27.04 Crores
TOTAL	:	Rs. 1053.00 Crores

Details of Funds released by Planning Commission upto 30th September, 2016 :

i)	BHEL	:	Rs. 725.07 crores
ii)	KBUNL	:	Rs. 180.00 crores
iii)	NTPC	:	Rs. 20.11 crores
	Total	:	Rs. 925.18 crores

Commencement of work and Completion Schedule :

Name of TPS	Unit No.	Zero Date	Contractual Completion Date	Anticipated Completion Date	Present physical status as on 31.12.2015
Barauni TPS	7	15.11.2009	15.11.20011	Completed	Unit synchronized on 03.08.2016.
	6	15.11. 2009	15.06.2012	28.02.2017	Erection of 1520 MT have been done out of 2900 MT. Civil works of ID, FD, PA fan is under progress.R&M works of Mills and APH Syetem have been stopped due to non-availability of spares. ESP: Erection of 660 MT have been done out of 1400 MT. Turbine: HP, IP and LP turbines have been received at site. Bearing checking works is under progress. Cooling Tower: R&M works of Cooling Tower is in stop position. Generator: One no. stator has already sent for repair work , work order has been placed on BHEL for repair. Anticipated completion of Unit- 6 is expected by

					28.02.2017 i.e. after six months from synchronization of unit-7.
Muzaffarpur TPS	1	15.04. 2010	15.04.2012	Completed	Unit synchronised on 05.07.2013.
	2	15.04. 2010	15.08.2012	Completed	Unit synchronised on 30.09.2014.

6.0 External Co-operation for R&M of TPS

To demonstrate the Energy Efficiency R&M programme in thermal power stations in India, a few pilot R&M projects have been financed by some external funding agencies such as KfW Development Bank-Germany, World Bank, European Union (EU) etc. The soft loans are provided by these external agencies for energy efficiency R&M programmes. Also, KfW & World Bank have provided some grant for technical assistance for preparation of Feasibility Reports/DPRs at selected thermal units and carrying out some R&M related studies. METI (Ministry of Economy, Trade and Industry), Japan and MOP, Govt. of India have agreed to extend their cooperation in sharing of technical expertise as well as in actual implementation of mutually agreed techno-economical R&M solutions. In addition to this, KfW has also financed the project “Development of Tender Procedure and Model Contract for the R&M of Fossil Fuel Based Thermal Power Plants in India”. The details of the above programme are as follows:-

6.1 Development of the Tender Procedures and Model Contract for the R&M of Fossil Fuel Based Power Plants in India.” Funded by KfW Development Bank– Germany.

The Sub-Group-I on “ Efficiency Enhancement in Fossil Based Power Plants” constituted under the Indo-German Energy Forum, in its first meeting held on 12.03.2008 identified the Development of Standard Documents for R&M Projects among the three other issues. The development of Standard Documents was envisaged to be done in two phases as under.

Phase-I Activity

The objective of Phase-I Activity is an assessment of tendering procedures currently being followed by public utilities in India and a review of documents used for standard R&M projects as well as the documents which have already been developed for projects financed particularly by World Bank. The Phase-I Activity was carried out by the consultant-M/s. Evonik Energy Services India appointed and funded by GIZ. M/s. Evonik Energy Services India submitted the report on Phase-I activity in September 2009.

Phase-II Activity

The main objective of Phase-II Activity is the preparation of the model documents/templates for R&M Projects in consultation with Task Force, Power Utilities & financing agencies. It is intended to apply the documents for the Energy Efficiency Programme financed by KfW.

The MoP nominated CEA as Project Implementing Agency in December 2009 to carry out the Phase-II Activity. Lahmeyer International (India) Pvt. Ltd has been appointed as consultant w.e.f 16-03-2012 for “Development of the Tender Procedures and Model Contract for the R&M of Fossil Fuel based Power Plants in India” under Phase-II Activity.

The following final R&M model documents and final Phase-II Activity Report submitted by Lahmeyer on 29.09.2014. The documents have been accepted by CEA.

Sl No.	Description of the Report
1	Model Feasibility Report
2	Model Detail Project Report (DPR)
3	Model RLA/CA Report of R&M projects Model
4	Model Energy Audit Report of R&M projects
5	Model Tender Documents for selection of R&M Contractor
6	Model Tender Documents for selection of R&M Consultant
7	Model Tender Documents for selection of ISC
8	Phase –II Activity Report

6.2 “Coal-Fired Generation Rehabilitation Project-India” funded by World Bank.

The World Bank has financed the “Coal-Fired Generation Rehabilitation Project-India” for demonstrating Energy Efficiency Rehabilitation & Modernization (EE R&M) at coal fired generating units through rehabilitation of 640 MW of capacity across three States-West Bengal, Haryana and Maharashtra. The above project has two components:-

Component-1. Energy Efficiency R&M at Pilot Projects

This component would fund implementation of Energy Efficient R&M of 640 MW capacity comprising Bandel TPS Unit-5(210 MW) of WBPDC, Koradi TPS Unit-6(210 MW) of Mahagenco and Panipat TPS Unit-3&4 (2x110 MW) of HPGCL. The World Bank has earmarked US \$ 180 million of IBRD loan and US \$ 37.9 million of GEF grants for the Component-1.

Component-2. Technical Assistance to CEA and Utilities

The Technical Assistance component of the project is aimed at providing support in implementation of EE R&M pilots, developing a pipeline of EE R&M interventions, addressing barriers to EE R&M projects and strengthening institutional capacities of implementing agencies for improved operation and maintenance practices. The World Bank has earmarked US \$ 7.5 million GEF grant for the Component-2.

6.2.1 World Bank funded Energy Efficiency Pilot R&M Projects

(A) Bandel TPS (Unit-5, 210 MW)

The total estimated cost of R&M project is around US \$ 107.38 Million comprising of loan of around US \$ 59, GEF Grant of around US \$ 12.45 million. In addition to above, Technical Assistance of US \$ 1.3 million under GEF Grant has been provided for consultancy. Further, additional US\$ 22.21 million comprising of IBRD loan of US\$ 18.01 million and GEF grant of US\$ 4.2 million due to restructuring of funds as a result of cancellation of R&M works in Panipat TPS have also been provided for Bandel TPS.

Status of Physical Progress

Detailed Project Report (DPR) for the R&M project consisting major packages, viz., Main Plant Package (BTG -Boiler, Turbine & Generator), Coal Handling System Package (CHP), Ash Handling Package & Water System Package (AHP & Water), Electrical System Package was prepared by the M/s Evonik Energy Services (Project Design Consultant). Original completion date for R&M works was May, 2014 which was then revised to Sept, 2014.

The unit- 5 was taken under S/D for R&M works in November.2013. However, the zero date for SID for the R&M works was considered as 02.12.2013.

R&M works at BTG, TG Area, Boiler Area, ESP, Coal Handling Plant, Ash Handling Plant, Electrical Packages, Civil works etc. have been completed. Unit has been synchronized on coal on 21st September, 2015. The unit attained a load of 215 MW on 24th November, 2015.

(B) Koradi TPS (Unit-6, 210 MW)

Background

The total estimated cost of the project is around US\$ 110.5 Million and the fund allocation for the Koradi TPS is loan of around US \$ 59 million (Loan)), grant of around US \$ 12.45 million. In addition to above Technical Assistance of US \$ 3.3 million under GEF Grant has been provided for 10 consultancy studies.

The Commercial Operation Date of the unit is 30.03.1982 & the unit is about 34 years old. The estimated cost of the R&M project based on award of contract is Rs. 486 Crore. The zero date for R&M project is 3rd March, 2014. The unit is under shutdown since 25th August, 2015 and targeted synchronization date is 31.03.2017.

Brief scope of R&M

Boiler to be uprated from 700 TPH to 721 TPH. Replacement of existing Bag Filters with new design retrofitted ESP for all 4 passes to achieve guaranteed SPM of 70 mg/nm³ with one field out of service. TG set to be uprated to 215 MW with new HP & IP turbines and elimination of Bauman's stage in LP turbine. New Generator & Transformer. Replacement of UAT. Unified Distributed Digital Control Monitoring & Information System, and Modifications in BoP equipment.

Status of Physical Progress

- i) **BTG Package:** Mahagenco issued that the Letter of Award to M/s BHEL Ltd. on May 31, 2013. The contract was signed on December 18, 2013 and M/s BHEL opened the site office on January 22, 2014. Approximately 75% of the material (on Amount basis) is supplied by M/s BHEL at site & further supply is in progress. Dismantling of ESP, ID Fan & PA fan has been completed. New ESP foundation work is in progress. Dismantling of existing coal mills is in progress. 30 % work of new ESP Control Room building at new location completed.

ii) **Electrical Package:** Mahagenco issued the Letter of Award to M/s ABB Ltd on March 19, 2012 and the final contract was signed on May 25, 2012. Later on the package price escalation issue was resolved & M/s ABB restarted the work at site from 07.10.2015. Material supply of M/s. ABB has commenced. Retrofitting of HT breakers 32 Nos. out of 36 are completed, remaining retrofitting work is in progress.

iii) **BOP Package:** MSPGCL floated the tender for BoP as four separate packages namely, Ash Handling Plant (AHP), Cooling Tower plant (CT), De-Mineral Plant (DMP) & Fire Detection & Protection System package. Agencies for AHP package and Fire Detection Package are finalized. Finalization of agencies for DM Plant Package and Cooling Tower Plant Package is in progress.

Various Revised Milestones for R&M work at unit-6, Koradi TPS are as under:

S.No.	Milestone	Revised Target Date
1.	Date of Shut Down for R&M	25.08.2016
2.	Synchronization	31.03.2017
3.	Trial Run or Reliability Run	30.04.2017
4.	P.G. Test	31.05.2017

C) Panipat TPS (Unit-3&4, 2x110 MW)

The unit 3 &4 of Panipat TPS was initially identified for R&M under World Bank Programme. A loan of 448.36 Crores was assigned under R&M of Unit 3&4, PTPS, Panipat. As per the final TAR of consultant R&M cost was 561.27 Crores which was not found financial viable due to high sensitivity of returns to Station Heat Rate and exceeding of estimated cost against available funds. Therefore, HPGCL requested World Bank for foreclosure of the Loan Agreement.

6.2.2 Technical Assistance to CEA

World Bank has financed the project “India: Coal Fired Generation Rehabilitation Project.” aimed at demonstrating Energy Efficiency Rehabilitation & Modernization (EE R&M) of coal fired generation units through rehabilitation of 640 MW of capacity across three states- West Bengal, Haryana and Maharashtra. The project is funded through IBRD loan of USD 180 million and GEF grants of USD 45.4 million out of which USD 7.5 million have been earmarked for Technical Assistance/Studies.

CEA is implementing the project on “Technical Assistance to CEA for Addressing the Barriers to Energy Efficient R&M of Coal Fired Generating Units in India”. The consultants appointed for the above project are namely, ABPS Infrastructure, M/s KPMG, M/s Mercados Energy Market India and M/s WAPCOS Ltd. Brief Status of various consultancies under Technical Assistance.

Sl No	Name of Study	Current Status
1.	Implementation Support Consultancy (ISC)	CEA has appointed ABPS Infrastructure Advisory Private Limited as Implementation Support Consultant (ISC) on October 28, 2010. ABPS assisted CEA in appointment of consultants and signing of contracts. ABPS has also assisted in conducting the in-house technical & management training organised by KPMG during Oct 2014 to Feb 2015. The consultant is assisting in analysing & providing comments on the outputs of other consultants under the project. The contract period of the contract signed with ABPS has been extended up to 30th October, 2016 vide letter dated 20th May, 2016.
2.	Review of Institutional Capacity and Implementation of Capacity Strengthening Interventions at CEA	KPMG has been appointed to carry out the study on 16-07-2012. KPMG has already submitted reports on As-Is Assessment of Institutional Capacity of CEA and Customer Expectation Survey which have been accepted by CEA. The Technical and Management Training Programme for CEA officers was conducted by KPMG from 13.10.2014 to 17.11.2014 and 19.01.2015 to 06.02.2015 respectively. KPMG submitted the revised draft report on Capacity Strengthening plan of CEA on 6 th May, 2016. The comments of Wind Nodal Officers of CEA and the World Bank on the Plan have been communicated to KPMG on 30 th May, 2016. Based on the comments the revised Capacity Strengthening Plan is under preparation by KPMG.
3.	Reduction of barriers to R&M interventions in thermal power plants in India	The Study Report has been accepted by CEA in January, 2014 and sent to various stake holders in the power sector. The consultancy has been completed.
4.	Developing Markets for Implementation of R&M scheme in thermal power stations in India	The Study Report has been accepted by CEA in January, 2014 and sent to various stake holders in the power sector. The consultancy has been completed.
5.	Review of experience from Pilot R&M interventions in thermal power stations in India	WAPCOS Ltd. has been appointed as a consultant w.e.f. 23-07-2012. WAPCOS had submitted the draft report on Procurement Experience on 03.12.2013. WAPCOS submitted draft reports on Review of Implementation Experience & Strengthening O&M Practices on 11 th March 2016. The draft report on Review of Post R&M Experience in O&M from Pilot R&M intervention in TPS in India is still awaited. The 4 th meeting of the Task Force for “Promotion of Energy Efficiency R&M in TPS in India” was held in CEA on 19th April, 2016 to discuss the three draft reports prepared by WAPCOS. The comments of CEA, World Bank, Task Force Members and other parties on the three draft reports have been communicated to WAPCOS during May, 2016. Based on the comments the draft final reports are under preparation by WAPCOS.

Brief Financial Status: The total original estimated cost for the Project is USD 1.1 million (Rs. 484 Lac, using conversion rate 1USD = Rs. 44). The cumulative expenditure incurred till date is ` 232.75 Lac (including taxes).

6.3 Japan-India co-operation for Study on Efficiency and Environmental Improvement of Coal Fired Stations

A MOU between Central Electricity Authority and Japan Coal Energy Centre (JCOAL) for preliminary study of Efficiency and Environment improvement study in coal fired power plants was signed on 30.4.2010 to carryout necessary diagnostic activities in few candidate coal-fired power plants pertaining to Energy Efficient Renovation & Modernisation works and finding out measures to overcome barriers for promoting R&M, towards carrying out efficiency and environmental improvement of coal-fired power plants in India. Accordingly studies were taken up in Ukai and Wanakbori TPS (GSECL), Ramagundem STPS (NTPC) and Vijaywada TPS (APGENCO) for pre – primary studies. After Pre-Primary Studies, JCOAL finalized 3 units viz., Vijaywada TPS Unit-1 (210MW) of APGENCO, Wanakbori TPS Unit-1 (200 MW) of GSECL and Kahelgaon STPS Unit-2 (210 MW) of NTPC for full-fledged diagnosis. The final report had been submitted in December 2012.

The 2nd Phase MOU between CEA and JCOAL was signed on 11.06.2012 for carrying out detail diagnostic study for energy efficiency oriented R&M activities in three nos. of units. Durgapur TPS unit no.4 (210 MW LMZ Unit) of DVC and one unit each from Badarpur TPS and Unchahar TPS of NTPC were selected for studies during the 2nd phase. JCOAL team visited these stations during December, 2012. The final report for carrying out study for energy efficiency oriented R&M activities was submitted on 15th April, 2013.

The 3rd Memorandum of Understanding (MoU) on India – Japan Cooperation for Project on Efficiency & Environment Improvement for Sustainable, Stable and Low Carbon Supply of Electricity was signed on 22nd January, 2016.

A workshop on “Project on Efficiency and Environmental Improvement of Coal Fired Power Stations – Towards sustainable, stable and low carbon supply of electricity was held on 20.11.2015.

Under Clean Coal Technology (CCT) Programme two study tours to Japan have been organized from 26th January, 2016 to 3rd February, 2016 and 2nd February, 2016 to 10th February, 2016 in which 10 participants from different power utilities have participated during this quarter which leads to a total participation of 62 officers from MoP, CEA and different power utilities under CEA-JCOAL cooperation. The participants visited the latest USC power stations and updated about various applicable technologies and equipment as well as O&M technique. During the current year 2016-17 also, CCT training programme is underway in which the officers/ engineers from MoP, CEA, NTPC and other utilities would participate for exposure to the Japanese technologies for power generation.

Under CEA- JCOAL Co-operation a study on replacement of old units of Badarpur TPS by highly efficient super critical units of higher size has been carried out. JCOAL team has carried out three site surveys and investigations in the month of Nov, 2015, Jan, 2016 and in March, 2016. A presentation on Joint Feasibility Study for replacement of Badarpur TPS to the latest Ultra Supercritical TPS with comprehensive Environmental measures held on 14th June 2016 at Scope Complex NTPC Ltd. The report on the study has been submitted in June, 2016 by JCOAL.

JCOAL team has also conducted RLA/Diagnostic Study at Dadri TPS of NTPC from 30th November, 2015 to 10th of December, 2015. A meeting was held between CEA & JCOAL on 18.02.2016 to discuss the draft report prepared by JCOAL on RLA/CA study of Unit-3 of Dadri TPS.

Mini-workshops under the CEA-JCOAL Cooperation for the project on Efficiency and Environment improvement of Coal Fired Power Stations in India were organized on 01.03.2016 at MAHAGENCO and on 03.03.2016 at TANGEDCO.

Under CEA- JCOAL Co-operation a study is being carried out by JCOAL on adoption of available technologies to meet new environment standards and the economic viability of using such technologies in existing power plants.

**Status of units where Life Extension/ Renovation & Modernisation works have been taken up
for implementation during 12th Plan**

STATE SECTOR (LE Works)

S.N.	State	Name of Station	Unit No.	Year of Comm.	Cap. (MW)	Present status
1	U.P.	Obra	10	1977	200	Unit was under shut down on 23.12.2012. Unit has been oil synchronized on oil 31.03.2016 & synchronized on coal on 08.04.2016. The unit is under stabilization.
2	U.P.	Obra	11	1977	200	Date of commissioning given by M/s. BHEL is December, 2016. U#11: unit under s/d since 13.07.2011. Boiler: 95% work completed. Turbine: 92% work completed. Generator: 98% work completed. ESP : Pass A-75% Pass B-98% Compressor 06 nos.: E&M Works 75% AHP : 95% work completed. Switchyard: 95% work completed. WTP : 99% work completed. CHP : 55% work completed. Synchronisation of the unit is expected by Dec., 2016.
3	U.P.	Obra	12	1981	200	Date of commissioning given by M/s. BHEL is 31.03.2017. LE Works started on 01.10.2016.
4	U.P.	Obra	13	1982	200	Date of commissioning given by M/s. BHEL is September, 2017 Approval from Head Quarter to get s/d for unit-13 is under consideration.
5	U.P.	Harduaganj	7	1978	110	Unit was under shut down on 05-03-201. Unit has been synchronized on 03.04.2015 on coal.
6	U.P.	Parichha	1	1984	110	LE work in unit-1 dropped. Utility decided to do some R&M activities in BTG area at an estimated cost of Rs. 93.89 crores. Total expenditure upto Nov., 2015 is 27.86 crores. After completion of the scheme average PLF of the unit to sustain near about 75%. To achieve the environmental norms the old ESP is being replaced by new one. Completion of R&M works expected by March, 2017.
7	U.P.	Parichha	2	1985	110	Unit was synchronised on 5.5.2013.
8	Punjab	Bathinda	3	1978	110	The unit was taken under s/d on 14.01.2010, and synchronised on 05.8.2012.
9	Punjab	Bathinda	4	1979	110	Unit was taken under s/d on 05.11.2012. The unit synchronised on coal on 10.07.2014.
10	Haryana	Panipat	3	1985	110	The unit 3&4 were identified for World Bank funded project.

11	Haryana	Panipat	4	1985	110	The R&M of these units were found financially unviable Therefore the scheme of R&M was dropped with the approval of State Govt. and Department of Economic Affairs (DEA), Govt. of India was informed on 30.08.2012 to foreclose Loan agreement with World Bank for R&M of unit 3&4. Units 1- 4 of PTPS, Panipat have been retired / decommissioned w.e.f. December, 2015.
12	Maharashtra	Nashik	3	1979	210	The unit-3 was to be taken up under KfW funded project. All studies completed, and DPR has been prepared. Also Tender documents have been prepared. But Nasik Unit-3 R&M project withheld and Nasik Unit -4 R&M shall be taken up on priority. Further, MSPGCL Board directed that no other R&M work shall be taken up without monitoring results of Koradi U-6.
13	Maharashtra	Nashik	4	1980	210	All studies Completed, Draft Feasibility Study Report received & forwarded to KfW in order to get the approval for the funds earmarked for Unit 3 now for Unit 4. Nasik Unit -4 R&M shall be taken up on priority. Further, MSPGCL Board directed that no other R&M work shall be taken up without monitoring results of Koradi U-6.
14	Maharashtra	Koradi	5	1978	200	The LE works at unit-5 would be started after completion of LE works at unit-6 of Koradi TPS.
15	Maharashtra	Koradi	6	1982	210	The unit is being taken up by WB funded project. The total cost of the project including IDC is 636.93 crores. The unit is under shutdown since 25th August, 2015. The project is now in the implementation stage. Zero date of R&M Project : 03.03.2014 Revised date of s/d : 25.08.2016 Expected synchronization : 31.03.2017 Trial Run Reliability Test: 30.04.2017 PG Test : 31.05.2017 BTG: Approximately 75 % of the material supplied by M/s BHEL at site & further supply is in progress. Electrical: Material supply of M/s. ABB has commenced. BOP: Agencies for AHP & Fire Fighting System Packages have been finalized. Bid evaluation of Cooling Tower and DM Plant Packages is in progress. The coal synchronization of the unit is expected by 31.03.2017.
16	Maharashtra	Bhusawal	2	1979	210	All studies Completed, Draft DPR received from M/s Energo Engg Ltd, New Delhi & is put up for MSPGCL Board approval. Further, MSPGCL Board directed that no other R&M work shall be taken up without monitoring results of Koradi U-6.
17	Maharashtra	Bhusawal	3	1982	210	RLA/ Feasibility study for EER&M is not carried out.
18	Maharashtra	Chandrapur	1	1983	210	All studies Completed, DPR received from M/s Energo Engg Ltd, New Delhi & MSPGCL Board accorded approval for DPR. Further, the Board directed that no other R&M work shall be taken up without
19	Maharashtra	Chandrapur	2	1984	210	

						monitoring results of Koradi U-6.
20	Maharashtra	Parli	3	1980	210	All studies Completed, DPR received from M/s Energo Engg Ltd, New Delhi & MSPGCL Board accorded approval for DPR. Further, the Board directed that no other R&M work shall be taken up without monitoring results of Koradi U-6.
21	Chhattisgarh	Korba (West)	1	1983	210	RLA studies done by M/s Evonik. Scope of work of Boiler, Turbine, Electrical Instrumentation, Civil and BOP is being finalised. After that DPR will be updated and submitted to Board of Directors of CSPGCL and State Regulatory Commission of approval.
22	Chhattisgarh	Korba (West)	2	1984	210	
23	M.P.	Satpura	6	1979	200	These units may be considered to be retired in the span of 3 to 4 years accordingly a proposal for the same has been submitted to BoD of MPPGCL for retirement of unit nos. 6 to 9 of Satpura TPS Sarni. The BoD of MPPGCL has decided that the proposal for comprehensive R&M through PPP mode be dropped and special allowance in tariff as per provision 18.5 of MPERC's Regulation may be availed for the control period from FY 2008-09 to FY 2015-16 and onwards as per applicable regulations. No comprehensive R&M will be carried out, utility decided to do only need based R&M.
24	M.P.	Satpura	7	1979	210	
25	Tamilnadu	Tuticorin	1	1979	210	Unit: 1 Need based R&M works have been carried out at the unit is TG, ESP, C&I and BoP. Scope for Boiler R&M works under identification. Tender has been lodged for installation of Ammonia Injection System on 01.08.2016. Preparation of Tender specification is under process for DDCMIS. Unit:2 Need based R&M works have been carried out in Boiler TG, C&I and BoP. Tender for Second RLA Study lodged on 18.06.2016. Re- tender called for with due date on 24.08.2016.
26	Tamilnadu	Tuticorin	2	1980	210	
27	A.P.	Dr. N.T. TPS (Vijaywada)	1	1979	210	APGENCO have taken up 78 activities under RLA/LE programme for Dr NTTPS units-1&2. Most of the activities have been completed except few items for unit-2, which will be taken up during the Capital Overhaul of unit-2 in 2017-18.
28	A.P.	Dr. N.T. TPS (Vijaywada)	2	1980	210	
29	Karnataka	Raichur	1	1985	210	KPCL informed that they are taking up need based R&M/LE works for Raichur TPS Units-1&2. As such for Unit-1 BTG RLA study and for Unit-2 comprehensive BTG RLA study have been completed by BHEL. Most of the R&M/LE works have been taken up KPCL: Expected date of start of Phase-I (BTG, Retrofitting of ESP, & Electrical works and Phase-II (BOP, Non BHEL) Package is in 2017-18. Order already placed for replacement of APH module for both the units- 1&2, PLSH, FSH, RH coils, BFP
30	Karnataka	Raichur	2	1986	210	

						recirculation valves, LPH-3 of unit -1 and C&I of TG & Station. These R&M works is planned to be carried out during MOH scheduled on 20.09.2016.to 29.12.2016. Other) works: Boiler C&I works completed. DPR is being revised, duly incorporating additional works in the R&M/LE scope of work. Once the DPR is finalized, same will be submitted to KERC for approval.
31	Bihar	Barauni	6	1983	110	Boiler: Erection of 1520 MT have been done out of 2900 MT. Civil works of ID, FD, PA fan is under progress.R&M works of Mills and APH Syetem have been stopped due to non-availability of spares. ESP : Erection of 660 MT have been done out of 1400 MT. Turbine: HP, IP and LP turbines have been received at site. Bearing checking works is under progress. Cooling Tower: R&M works of Cooling Tower is in stop position. Generator: One no. stator has already sent for repair work , work order has been placed on BHEL for repair.
32	Bihar	Barauni	7	1985	110	Unit synchronized on oil firing on 28.02.2016 and synchronized on coal on 03.08.2016.
33	Bihar	Muzaffarpur	1	1985	110	Unit was under s/d since 6.10.2003. Unit was Synchronised on 5th July, 2013.
34	Bihar	Muzaffarpur	2	1986	110	S/d taken on 29.03.2012. Unit was Synchronised on 30th September, 2014.
35	W.Bengal	Kolaghat	1	1990	210	DPR has been prepared and accepted. After successful completion of the unit-3 work the R&M works of the Unit -1&2 will be taken up.
36	W.Bengal	Kolaghat	2	1985	210	DPR has been prepared and accepted. After successful completion of the unit No. 3 work the R&M works of the Unit No 1&2 will be taken up.
37	W.Bengal	Kolaghat	3	1984	210	DPR has been prepared and accepted. The R&M works are planned to be carried out mainly in Combustion System in Coal Mills, APH, ESP and ID Fans to address the coal quality and environmental issues. Tendering is under progress for unit -3. Schedule time of the project : 9 months Starting of the project : January, 2017 Total cost of project : Rs. 289.30 Crs
38	W.Bengal	Bandel	5	1982	210	World Bank funded project. Contract for BTG pkg. awarded to M/s DHIC and signed on 29.2.2012. Unit was taken under shut down for LE works in November,2013. However, the Zero Date for S/D for R&M works was considered as 02.12.2013. Unit synchronized on 21.09.2015 on Coal. The unit attained a load of 215 MW on 24.11.2015.
Sub Total State Sector (LE)			38		6820	

STATE SECTOR (R&M Programme)

S.N.	State	Name of Station	Unit No.	Year of Comm.	Cap. (MW)	Present status
1	U.P.	Obra	7	1974	100	- Work is being executed by M/S BHEL. - Zero date of the scheme is 04.12.2009. Unit was scheduled on 23 months from zero date i.e Nov 2011. The revised cost of R&M scheme for unit 7 is 144.11 crores. - The coal mill issue has been sorted out. - MAX DNA system installed by IL Kota. ESP: ESP work expected to be completed by Nov, 2016. Unit 7 is expected to be synchronized on 21.08.2016.
2	U.P.	Anpara	1	1986	210	Estimated cost of R&M is Rs. 68.96 Cr. Financed by PFC and UPRVUNL. The scheme completed in March 2013.
3	U.P.	Anpara	2	1986	210	
4	U.P.	Anpara	3	1988	210	
5	U.P.	Anpara'B	4	1993	500	R&M works is being executed by M/s BHEL & M/s MITSUI & Toshiba/OEM, Japan. — Total cost of scheme is Rs. 691.97 cr. Total expenditure upto 30.06.2016 is 387.16 crs Boiler: Nearly 65% work completed. TG: Nearly 70% work completed. Electrical & Instrumentation: Nearly 58% work completed. BOP: Nearly 65% work completed. - Work is scheduled to be completed by March., 2017.
6	U.P.	Anpara'B	5	1994	500	
7	Punjab	Ropar	1	1984	210	Utility decided to do need based R&M at estimated expenditure of Rs. 55 Cr. NTPC prepared the DPR based on the previously conducted RLA/CA Study. Retrofitting of 125 Nos. and 34 nos. ACB's has been completed. Replacement of six Nos. Boiler Feed Booster Pump with more efficient. Replacement of old & obsolete HP Heaters & APH. Replacement of existing APH with modified design 24 Sector APH in unit -2 replacement of complete Reheater assemblies of unit 1&2.
8	Punjab	Ropar	2	1985	210	
9	Punjab	Ropar	5	1992	210	Utility decided to do need based R&M at estimated expenditure of Rs. 65 Cr. RLA of Unit 5 & 6 has not been carried out till date. Following R&M Works have already been executed. Phase-II Migration of WDPF System to Ovation System on Unit-5. Replacement of steam & water analysis system of Stage-III and Replacement of minimum oil circuit breakers(MOCBs) with vacuum circuit breakers.
10	Punjab	Ropar	6	2001	210	
11	Haryana	Panipat	5	1989	210	RLA of Boiler pressure parts to be done and then need based R&M will be carried out. SWAS system in units 1-6 will be completed by Dec., 2016.

12	Gujarat	Wanakbori	1	1982	210	Utility decided to do need based R&M. ESP R&M: The order for retrofitting is issued to BHEL on 18.03.2016. 90% detailed engineering works completed. 88% material supplied. S/D is planned from 01.12.2016. C&I system: Works for upgrading of C&I system has already been awarded. Most of the materials are received except cable, field instruments and turbovisory. S/D is planned from 01.12.2016. Likely to be completed by March, 2017. ESP: Retrofitting of ESP is started from 13.01.2016. Turbine and Boiler R&M Works: Order for consultancy work considering heat rate (efficiency) improvement with ramping up/down of the load and PG test of ESP is placed on STEAG, Noida on 30.03.2016. GSECL proposed to issue final order for turbine in March/ April, 2017 after observing first unit of Ukai TPS.
13	Gujarat	Wanakbori	2	1983	210	Utility decided to do need based R&M. Turbine and Boiler R&M Works: Order for consultancy work considering heat rate (efficiency) improvement with ramping up/down of the load and PG test of ESP is placed on STEAG, Noida on 30.03.2016. After observing the satisfactory performance of Phase-I(Ukai-4) retrofitted unit, the R&M of Phase-II R&M of LMZ turbine will be implemented. Tender preparation for turbine Retrofitting & Boiler R&M is under process. C&I system: Works for upgrading of C&I system has already been completed from 16.06.2012 to 17.07.2012. GSECL proposed to issue final order for turbine in March/ April, 2017 after observing first unit of Ukai TPS. ESP: : The order for retrofitting is issued to BHEL on 18.03.2016. 90% detailed engineering works completed. 82% material supplied.
14	Gujarat	Ukai	3	1979	200	Utility decided to do need based R&M. ESP R&M Phase-I: Order for Rehabilitation/ Retrofitting of ESP placed on NASL on 28.07.2014. Retrofitting of ESP started on 28.07.2016 and completed on 25.04. 2016. Foundation strengthening of existing foundation is under progress. Turbine and Boiler R&M Works: Order for consultancy work considering heat rate (efficiency) improvement with ramping up/down of the load and PG test of ESP is placed on STEAG, Noida on 30.03.2016. After observing the satisfactory performance of Phase-I(Ukai-4) retrofitted unit, the R&M of Phase-II R&M of LMZ turbine will be implemented. Tender preparation for turbine Retrofitting & Boiler R&M is under process. GSECL proposed to issue final order for turbine in March/ April, 2017 after observing first unit.

						Boiler Back Pass Modification: Work at unit-3 started after observing performance of unit-4. C&I Up gradation: Order placed to BHEL on 18.06.2015. The available existing material of Unit 1&2 of Gandhinagar TPS would be used. Erection and commissioning work is completed and machine taken on bar on 26.04.2016. 95% material for C&I up- gradation work is received at site. Actual expenditure incurred till date is 8.00 out of 9.80 crs. Schedule date of completion is July,2017 Ash Slurry Pump House: DPR submitted by consultant. The scope of include the work of Ash Slurry pump house.
15	Gujarat	Ukai	4	1979	200	GSECL is preparing for R&M implementation of LMZ design turbine by high energy efficient turbines. ESP R&M Phase-I: Order for Rehabilitation/ Retrofitting of ESP placed on NASL on 28.07.2014 and contract signed on 25.08.2014. Zero date started for the from the placement of order i.e. 28.07.2014. 99% material is recieved. Under pre- shutdown activities. Pre- S/d fabrication work started in 17.10.2016. S/d is planned from 01.12.2016 along with Turbine Retrofitting Works.The order value of supply Rs. 37.75 crs and works portion is Rs. 9.0092 crs (Inclusive taxes & duties for both U-3 & U-4). Actual expenditure incurred till date is 20.00 out of 23.38 crs. Turbine Works: Order awarded to M/s. NASL, Noida on 29.04.2015 and zero date started from 10.03.2015. Engineering work is completed and 60% material supplied. Schedule date of completion: 18 months for supply and 21 months for completion of 1 st unit i.e. 09.12.2016. Actual expenditure incurred till date is 19 out of 113 crs. Boiler Back Pass Modification: Actual expenditure incurred till date is 38.93 out of 54 crs. M/s. BHEL submitte the offer and has proposed 1% efficiency improvement on existing parameters through modification in boiler back pass and replacement of APH. Detailed Engineering work is completed and BHEL has supplied 96% material. E&C Agency finalised by BHEL. C&I Up gradation: Order placed to BHEL on 18.06.2015. The available existing material of Unit 1&2 of Gandhinagar TPS would be used. The existing DCS panels shifted to BHEL EDN, Bangalore for modification work and received back at UTPS. Actual expenditure incurred till date is 4.42 out of 9.8 crs. Schedule date of completion is July,2017 Ash Slurry Pump House: DPR submitted by consultant. Draft Tender is prepared by the consultant and the same is under review. Schedule date of completion is July,2017.
16	Rajasthan	Kota	1	1983	110	RRVUNL has identified 17 nos. schemes at an

17	Rajasthan	Kota	2	1983	110	estimated cost of Rs. 356.13 Cr. The R&M works will be carried out during Annual Shut Down of 2016-17. Actual expenditure till 30.06.2015 is Rs. 158.53 Crores. The present status of these R&M works is as below- - 08 nos. of works fully Completed - 06 nos. of works order placed to the execution agency and work under progress - 01 nos. works of Vacuum Pump- LOI placed on 03.10.2015 - 01 no. of work of compressor replacement- Technical Bid opened on 05.08.2015 and work awarded to M/s. Millenium Impex Pvt. Ltd. on 09.11.2015 - 01 no. E- tender for VFD cancelled and fresh tendering in progress. - CHP work under progress
18	Jharkhand	Patratu	9	1984	110	Unit was under s/d from 5.8.2006 due to fire incident. – HP , IP boxed –up and LP ready for box-up for generator rotor and bearings of exciter and generator are awaited.. - 1 not nos BFP & 2 nos CEP is ready. - Boller is ready for hydro test waiting clearance for power supply & TG on Barring gear. - Mechanical & Electrical erection work of ESP is completed, comg U/P. - Panels are erected and ready for charging. - HT & LT panel- Erection completed, commissioning is pending due to unavailability of power supply. - HT mills & CEP & Balance LT motor- Overhauling completed, erection pending due to erection clearance by JSEB. - GT,UAT,ST overhauling- Overhauling and testing completed. Station TRX charging U/P. - HT cable laying- Completed. - LT/ Control cable laying-85% completed. - GRP & UCP Erection and testing completed. - Ash Handling System Supply 99% completed . Civil and E&C is U/P. - Patratu TPS has been taken over PVUNL (Patratu Vidyut Utpadan Nigam Ltd.), a joint venture of NTPC and JSEB.
19	Jharkhand	Patratu	10	1986	110	Unit was under s/d from 5.8.2006 due to fire incident. Synchronised on 24.05.2012.
20	W. Bengal	DPL	6	1985	110	Synchronised on 07. 05. 2012 after R&M.
Sub Total State Sector (R&M)			20		4150	
Total State sector (LE+R&M)			58		10970	

CENTRAL SECTOR (LE Programme) Coal Based

Sl. No.	Utility	Name of Station	Unit No.	Year of Comm.	Cap. (MW)	Present Status
1	DVC	Bokaro 'B'	1	1986	210	Considered under KfW funded project. DPRs were prepared by M/s Evonik. DPRs have been accepted by DVC. It has been decided in the Board Meeting that in view of DVC's financial condition & high investment requirement, instead of a comprehensive R&M as proposed, some R&M activities of 'Must do' nature may be taken.
2	DVC	Bokaro 'B'	2	1990	210	
3	DVC	Bokaro 'B'	3	1993	210	
4	DVC	Durgapur	4	1982	210	Study completed and Reports submitted by JCOAL to DVC in 2014. DVC is planning to address the various technical shortcomings through comprehensive overhauling of the unit. DVC has taken up the job of installing the ducting along with controls for the provision of Tertiary Air to the boiler to reduce the unburnt carbon in bottom ash & fly ash , leading to efficiency enhancement. Also one number coal mill modification for achieving desired coal fineness, along with restoring original design specification, to accommodate present poor coal quality is under consideration. Techno commercial scrutiny of three nos .of bids received for installation of Tertiary Air provision is under process.
5	NTPC	Badarpur	4	1978	210	Major R&M works put under hold. ESP: ESP work is awarded to M/s. KC Cottrell. R&M work of ESP in unit-4 & 5 have been completed. PG Test of unit-5 is completed in Feb.,2016.
6	NTPC	Badarpur	5	1981	210	
7	NTPC	Singrauli STPS	1	1986	200	a) CW Duct system scheme - under execution. b) Main Plant: PO placed for six packages. In view of CERC's reg2014-19 new R&M policy guidelines approved by NTPC Board. Balance schemes are under review/ approval.
8	NTPC	Singrauli STPS	2	1987	200	
9	NTPC	Singrauli STPS	3	1983	200	
10	NTPC	Singrauli STPS	4	1983	200	
11	NTPC	Singrauli STPS	5	1984	200	
12	NTPC	Korba STPS	1	1983	200	a) Total PO's placed till date are 41 Nos. b) In view of CERC's reg2014-19 new R&M policy guidelines approved by NTPC Board. Balance schemes are under review/ approval.
13	NTPC	Korba STPS	2	1983	200	
14	NTPC	Korba STPS	3		200	
15	NTPC	Ramagundam STPS	1	1984	200	a) Total PO's placed till date are 41 Nos. b) In view of CERC's reg2014-19 new R&M policy guidelines approved by NTPC Board. Balance schemes are under review/ approval.
16	NTPC	Ramagundam STPS	2	1984	200	
17	NTPC	Ramagundam STPS	3	1984	200	
Subtotal C. S (LE Coal based)			17		3460	

Central Sector LE (Gas based)

S.N.	State	Name of Station	Unit No	Year of Comm.	Cap. (MW)	Present status
1		Dadri GT	GT-1	1991	131	Tender annulled for main plant Package. R&M of C&I System has been awarded to Siemens on 30.09.2015. The works proposed to be executed is in 2016-17.
2		Dadri GT	GT-2	1991	131	
3		Dadri GT	GT-3	1991	131	
4		Dadri GT	GT-4	1991	131	
5		Auraiya GT	GT-1	1989	111.19	LE works of GT 1& ST 1 (Only C&I in ST) completed on 22.06.2014.
6		Auraiya GT	GT-2	1989	111.19	LE works of GT 2 completed on 28.10.2014.
7		Auraiya GT	GT-3	1989	111.19	LE works of GT3 & ST2 (Only C&I in ST) completed on 10.11.2014.
8		Auraiya GT	GT-4	1989	111.19	LE work of GT4 completed on 02.03.2015,
9		Kawas GT	GT-1A	1992	106	LE works of GT # 1A completed on 21.01.2013
10		Kawas GT	GT-1B	1992	106	LE works of GT# 1B completed on 28.08.2013. R&M of of ST-1C(only C&I in ST) complete on 12/08/13.
11		Kawas GT	GT-2A	1992	106	LE works of GT # 2 A & ST # 2C (only C&I in ST) completed on 22.08.2014.
12		Kawas GT	GT-2B	1992	106	LE works of GT # 2B completed on 05.03.2014.
13		Gandhar GT	GT-1	1994	131	LE works of GT# 1 completed on 06.07.2014
14		Gandhar GT	GT-2	1994	131	LE works of GT # 2 completed on 15.04.2015
15		Gandhar GT	GT-3	1994	131	LE work of GT # 3 completed on 29.09.2013.
Sub Total (LE Gas based)			15		1785.8	

R&M Programme Central Sector

Sl. No.	Utility	Name of Station	Unit No.	Year of Comm.	Cap. (MW)	Present status
1	NTPC	Singrauli STPS	6	1986	500	13 out 23 Schemes have been awarded. 06 schemes merged with DDCMIS packages which has been awarded on 25.06.2012. 10 Scheme have been completed. Balance Schemes under tendering process. DDCMIS of both units completed. ESP: ESP work awarded to BHEL on 14.11.2013.
2	NTPC	Singrauli STPS	7	1987	500	
3	NTPC	Korba STPS	4	1987	500	Against the 9 schemes approved, Purchase Order have been placed for 8 schemes. Work completed in 06 schemes. Balance one Scheme is under review. DDCMIS: DDCMIS work of Unit-4, unit-6 and unit-5 have been completed on 24.08.2014, 20.04.2015 and 28.11.2015 respectively. ESP: Work under progress.
4	NTPC	Korba STPS	5	1988	500	
5	NTPC	Korba STPS	6	1988	500	
6	NTPC	Ramagundam STPS	4	1988	500	All schemes awarded. Work completed in 09 schemes. DDCMIS job of unit-5,6,& 4 completed on 17.06.2014, 21.10.2014 & 19.10.2015 respectively.
7	NTPC	Ramagundam STPS	5	1989	500	
8	NTPC	Ramagundam STPS	6	1989	500	
9	NTPC	Farakka Stage-I	4	1992	500	10 Purchase Order have been placed covering all the schemes.. Work completed in 06 schemes. DDCMIS job completed in unit-4 on 03.11.2015. DDCMIS for unit -5 is planned in 2016-17.
10	NTPC	Farakka Stage-II	5	1994	500	

11	NTPC	Tanda	2	1989	110	Synchronised on 15.09 2012
12	NTPC	Unchahar	1	1988	210	13 out of 14 Schemes have been awarded. Balance 01 Scheme is under tendering process. Work completed in 12 schemes. DDCMIS R&M works of unit-2 is completed on 02.10.2014 and unit-1 completed on 26.10.2015. ESP: During s/d of unit-1 from 18.09.2015 to 27.10.2015, Duct modification and other works done.
13	NTPC	Unchahar	2	1989	210	
14	NTPC	Unchahar	3	1999	210	
15	NTPC	Unchahar	4	1999	210	
16	NTPC	Vindhyachal	1	1987	210	17 out of 18 Schemes have been awarded. Balance 01 Scheme is under tendering process. Work completed in 13 schemes. One Scheme is under re-tendering process.
17	NTPC	Vindhyachal	2	1988	210	
18	NTPC	Vindhyachal	3	1989	210	
19	NTPC	Vindhyachal	4	1989	210	
20	NTPC	Vindhyachal	5	1990	210	
21	NTPC	Vindhyachal	6	1991	210	
22	NTPC	Vindhyachal	7	1999	500	
23	NTPC	Vindhyachal	8	2000	500	
24	NTPC	Simhadri	1	2002	500	All schemes awarded & work completed. R&M works completed on 31.03.2016.
25	NTPC	Simhadri	2	2002	500	
26	NTPC	Talchar STPS	1	1995	500	All the 19 schemes have been awarded. Out of 19 schemes 14 schemes have been completed. DDCMIS: DDCMIS job completed in unit-2 and unit-1 on 24.09.2014. and 08.10.2015 respectively. ESP: ESP work is awarded to Hitachi. ESP R&M in both units completed.
27	NTPC	Talchar STPS	2	1996	500	
28	NTPC	Dadri	1	1991	210	One Scheme executed with SWYD (Stage-II). Balance one Scheme is dropped. Work completed in 15 schemes incl. C&I of all 4x 210 MW units by BHEL.
29	NTPC	Dadri	2	1992	210	
30	NTPC	Dadri	3	1993	210	
31	NTPC	Dadri	4	1994	210	
32	NTPC	Rihand STPS Ph III	1	1988	500	All schemes awarded. Against 12 approved schemes, 10 have been completed and balance schemes are under execution. To be completed in 216-17. ESP:R&M of all passes (total 8 for 2x500 MW units) completed.
33	NTPC	Rihand STPS Ph III	2	1989	500	
34	NTPC	Kahalgaon	1	1992	210	Balance one Scheme is under review. Work completed in 06 schemes. DDCMIS: DDCMIS job completed in unit-2 and Unit-4 on 24.02.2016 & 11.04.2016 respectively. DDCMIS for unit -1 is planned in 2016-17.
35	NTPC	Kahalgaon	2	1994	210	
36	NTPC	Kahalgaon	3	1995	210	
37	NTPC	Kahalgaon	4	1996	210	
Sub total C.S. (R&M)			37		12890	
Sub total C.S. Coal Based (LE + R&M)			54		16350	

In addition, ESP R&M by BHEL completed in Unit 5 of Stg II (2x210 MW) of Talcher TPS. ESP R&M by Hitachi completed in both 500 MW units of Stg I (2x500MW) of Talcher TPS.

CENTRAL SECTOR R&M (Gas Based)

1	NEEPCO	Kathalguri CCGT	GT-1	1995	33.50	Gt#1 : (a) Order for supply of M/s MHI make MEGAC V, Diasys Netmation System for Up gradation and replacement of old controller MACTUS 620 sequencer and MEGAC III analog Governer already placed with the OEM, M/s MHI, Japan on 26.03.2015. The materials already received and expected to be commissioned in Jan., 2017 programmed along with major overhauling of Gas Turbine. (b) The order for procurement of new vibration monitoring system already placed and expected to be completed on or before 31.03.2017. (c) Order for Compressor Rotor Refurbishment (CRR) and Comprehensive Rotor Inspection (CRI) for unit#1 to unit #4 have already been placed with the OEM, M/s MHI, Japan on 28.05.2013 and unit is planned in 2017-18.
2		Kathalguri CCGT	GT-2	1995	33.50	GT#2 : (a) Order for supply of M/s MHI make MEGAC V, Diasys Netmation System for Up gradation and replacement of old controller MACTUS 620 sequencer and MEGAC III analog Governer already placed with the OEM, M/s MHI, Japan on 26.03.2015. The materials already received and expected to be commissioned on or before 31.07.2017. (b) The process of tender procurement of new vibration monitoring system is under process and expected to be completed on or before 31.03.2016 (c) Order for Compressor Rotor Refurbishment (CRR) and Comprehensive Rotor Inspection (CRI) for unit#1 to unit #4 have already been placed with the OEM, M/s MHI, Japan on 28.05.2013 and unit is planned in 2018-19.
3		Kathalguri CCGT	GT-3	1995	33.50	GTG -3 completed on 31.03.2014 as per schedule. Order for Compressor Rotor Refurbishment (CRR) and Comprehensive Rotor Inspection (CRI) for unit#1 to unit #4 have already been placed with the OEM, M/s MHI, Japan 28.05.2013 and unit is planned in 2016-17.
4		Kathalguri CCGT	GT-4	1995	33.50	GTG -4 completed on 31.03.2014 as per schedule. Order for Compressor Rotor Refurbishment (CRR) and Comprehensive Rotor Inspection (CRI) for unit#1 to unit #4 have already been placed with the OEM, M/s MHI, Japan 28.05.2013 and work in this unit started from 22.06.2015 and completed on 25.07.2015. New rotor utilized in this unit.
5		Kathalguri CCGT	GT-5	1996	33.50	GTG- 5 completed on 31.03.2014 as per schedule.
6		Kathalguri CCGT	GT-6	1996	33.50	GT#6 : Planned for the FY 2017-18. (Offer from the OEM, M/s BHEL yet to be received)
7		Kathalguri CCGT	ST-1	1998	30.00	Upgradation of Progrmmer/ EPROM writer has already completed and offer for upgradation of AVR already obtained from OEM and it is under process. For others, offers are yet to be obtain from the OEM.
8		Kathalguri CCGT	ST-2	1998	30.00	Offer to be obtained from OEM in due course of time.
Sub Total Gas (R&M)			8		261	
	Sub total Gas in C.S. (LE + R& M)		23		2046.8	
	Total R&M + LE		135		29367	

Details of Thermal Power Units where the Life Extension (LE)Works have been Completed During 12th Plan

Sl. No.	Name of the TPS	Unit No.	Capacity MW	Utility	State/Central Sector	Date of Synchronisation after LE Works
1.	Bathinda	3	110	PSPCL	State Sector	05.08.2012
2.	Kawas	GT-1A	106	NTPC	Central Sector	21.01.2013
3.	Parichha	2	110	UPRVUNL	State Sector	05.05.2013
4.	Muzafarpur	1	110	KBUNL	Joint venture of BSPGCL & NTPC	05.07.2013
5.	Kawas	GT-1B	106	NTPC	Central Sector	28.08. 2013
6.	Gandhar	GT – 3	131	NTPC	Central Sector	29.09. 2013
7.	Kawas	GT-2B	106	NTPC	Central Sector	05.03.2014
8.	Bathinda	4	110	PSPCL	State Sector	10.07. 2014
9.	Muzafarpur	2	110	KBUNL	Joint venture of BSPGCL & NTPC	30.09.2014
10.	Auraiya	GT-1	111.19	NTPC	Central Sector	22.06. 2014
11.	Gandhar	GT-1	131	NTPC	Central Sector	06.07.2014
12.	Kawas	GT-2A	106	NTPC	Central Sector	22.08.2014
13.	Auraiya	GT-2	111.19	NTPC	Central Sector	28.10.2014
14.	Auraiya	GT-3	111.19	NTPC	Central Sector	25.12.2014
15.	Auraiya	GT-4	111.19	NTPC	Central Sector	02.03.2014
16.	Harduaganj	7	110	UPRVUNL	State Sector	01.05. 2015
17.	Bandel	5	210	WBPDCCL	State Sector	21.09.2015
18.	Gandhar	GT-2	131	NTPC	Central Sector	15.04.2015
19.	Obra	10	200	UPRVUNL	State Sector	08.04.2016
20.	Barauni	7	110	BSPGCL	State Sector	

Sub -total (State) - 09 Units 1180 MW
Sub-total (Central) - 11 Units 1261.76 MW
Total (LE) - 20 Units 2441.76 MW

Details of Thermal Power Units where the R&M Works have been Completed During 12th Plan

Sl. No.	Name of the TPS	Unit No.	Capacity MW	Utility	State/Central Sector	Date of completion of R&M works
1.	DPL	6	110	WBPDC	State Sector	07.05.2012
2.	Patratu	10	110	JSEB	State Sector	24.05.2012
3.	Anpara 'A	1	210	UPRVUNL	State Sector	21.03.2013
4.	Anpara 'A	2	210	UPRVUNL	State Sector	21.03.2013
5.	Anpara 'A	3	210	UPRVUNL	State Sector	21.03.2013
6.	Tanda	2	110	NTPC	Central Sector	15.09.2012
7.	Kathalguri	GT-3	33.5	NTPC	Central Sector	31.03.2014
8.	Kathalguri	GT-4	33.5	NTPC	Central Sector	31.03.2014
9.	Kathalguri	GT-5	33.5	NTPC	Central Sector	31.03.2014
10.	Simhadri	1	500	NTPC	Central	31.03.2016
11.	Simhadri	2	500	NTPC	Central	31.03.2016

Sub -total (State) - 5 Units 850 MW
Sub-total (Central) - 6 Units 1210.5 MW
Total (R&M) - 11 Units 2060.50 MW