

Central Electricity Authority  
Thermal Power Renovation and Modernization Division

Final Draft Report of the committee

Constituted for studying various aspects of R&M  
and LE of Coal based power plants

April, 2023

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# 1 BACKGROUND

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## 1.1 RENOVATION AND MODERNIZATION (R&M)

The main objective of R&M of power generating units is to make the operating units well equipped with modified/augmented equipment/components/systems, with a view to improve their operating performance, reliability and availability to the original design values or better than original design, reduction in maintenance requirements, ease of maintenance and enhanced efficiency, meeting the latest environmental norms, achieving flexibility in generation, help in achieving the reduced technical minimum and compatibility to biomass co-firing.

## 1.2 LIFE EXTENSION (LE) WITH OR WITHOUT UPRATING (LE&U)

The LE programme is an another aspect of R&M work, which is a major event in the thermal power station's lifetime, as it envisages extension of life over a considerable period of time beyond its designed life. At this time it is a good practice to examine whether a plant requires a viable modernisation which has not been carried out earlier so that during the extended life the plant operates efficiently and delivers the rated or higher capacity with improved heat rate. Adoption of improved and proven technologies can play an important role in plant upgraded output & higher efficiency. There are cost effective options to uprate the machines for higher output and improved efficiencies thus making it economically viable to integrate life extension programme with or without uprating.

## 1.3 COMMITTEE FORMATION

A meeting was held on 25.02.2022 under the chairmanship of Secretary Power (MoP) to review a presentation on "Why LE/R&M of Coal Stations is required in India" prepared by NTPC. After deliberations in the meeting, Secretary (Power) directed CEA to constitute a committee/team comprising representatives from NTPC, CEA, GSECL and BHEL to study various aspects of Life extension and R&M of coal based thermal power stations. Thereafter, CEA issued an OM dated 16.03.2022 informing about committee formation under the chairmanship of Member (Thermal), CEA and sought nominations for members of committee from BHEL, NTPC and GSECL. The composition of committee is as under: -

1. Sh. A. Balan, Member (Thermal)	CEA	<b>Chairman of committee</b>
2. Sh. B. C. Mallick, C.E. (TPR&M)	CEA	Member & Convener
3. Sh. D. K. Srivastava, C.E. (TE&TD)	CEA	Member
4. Sh. Ajay Talgaonkar, C.E. (F&CA)	CEA	Member
5. Sh. Praveen Gupta, C.E. (IRP)	CEA	Member
6. Sh. R. Sarangapani, GM	NTPC	Member
7. Sh. D. M. Jethva, C.E.	GSECL	Member
8. Sh. Dhiman Chattopadhyay, GM	BHEL	Member
9. Sh. Pawan Meshram, Sr. DGM	BHEL	Member

Following members were invited in 7<sup>th</sup> Meeting held on 15.06.2022

1. Sh. P. K. Sinha, ED (North), PFC
2. Sh. Arvind Shankar, Manager, Siemens
3. Sh. Archan Gor, Manager, Siemens
4. Sh. Shakun Narula, Manager, NGSL

Following members were further invited in 9<sup>th</sup> Meeting held on 08.09.2022

1. Smt. Rehana Beg, Resident Engineer, MPPGCL
2. Sh. Rajendra Kumar Patel, MPPGCL
3. Sh. Vijay Nand Sharma, CE, DVC

Committee held the 1<sup>st</sup> meeting to study the various aspects of R&M and life extension on 23.03.2022. Consecutively 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> meeting were held on 01.04.2022, 13.04.2022, 22.04.2022, 09.05.2022, 26.05.2022, 15.06.2022, 22.08.2022 and 08.09.2022 respectively.

The broad objectives of the study have been categorized as below:

1. Guidelines for choosing the candidate plants for R&M/LE
2. Objective of R&M in these plants
3. Viable business model
4. Model Bidding Document for R&M and LE

## 2 GUIDELINES FOR CHOOSING THE CANDIDATE PLANTS FOR R&M/LE

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A candidate plant may be selected on the basis of Residual Life Assessment (RLA) / Condition Assessment (CA)/ Destructive test studies and Energy Audit studies and existing plant performance data. This should include Boiler, Turbine, Generator, Transformers, Motors Heaters, fans, Pumps, Critical piping and hangers, Structures including stairs and railings. There is need to check the remaining life of these components after about 1,60,000 hours of operation lest it may result into serious failures. RLA/CA studies may be carried out earlier considering flexible operation of power plants, for boiler it shall be conducted after 1,00,000 hours or approx. 12 Years of operation. Subsequently, this will be done every 5 years as per IBR provisions. Same practice shall be followed for turbine. Depending upon the review of the past performance, residual life and results of above studies, decision is required to be taken whether to perform R&M/LE with or without uprating.

Scope of R&M work should be finalized on the basis of RLA /Condition Assessment studies and cost benefit analysis, for an approx. payback period of 7 to 8 years. Further, Techno economic analysis is required to ensure merit order rating to be viable for operation.

### **Prerequisites of R&M candidates Thermal Generating Units:**

- i. Unit installed capacity equal to or more than 150 MW with reheat cycle to be considered for R&M. Further, environmental friendly technologies for smaller size capacity can also be explored.
- ii. For R&M, Units after 8-10 years of operation and with Gross Heat rate deviations more than 15-20% from design Gross heat rate, even after regular Annual Overhauling should be considered for R&M of Turbine, Boiler and all critical associated equipment.
- iii. For Life extension, the units which have completed 20 years shall be selected for assessment.
- iv. Integrity and reparability of civil structures in BTG Island and Balance of Plant (BOP) area should be assessed by R&M consultant.
- v. Ash dyke sustenance and feasibility of modification/improvement of in-plant facilities for better ash utilization to be ascertained. As a prerequisite, ash management plan should be ensured before taking up R&M/LE works.
- vi. Feasibility of compliance of prevailing environmental norms (considering space constraint) may be ascertained.
- vii. The cost of R&M/LE&U works shall not exceed 50% of the EPC cost of a new generating unit of indigenous origin (BHEL). If the R&M/LE&U works is limited to BTG, the cost ceiling shall be restricted to 50% of the new BTG unit only. However, a detailed study should be carried out to ensure its techno-economic viability. The payback period may be limited to 7 to 8 years.

## **3 OBJECTIVE OF R&M AND VIABLE BUSINESS MODEL**

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### **3.1 OBJECTIVE OF R&M**

Once the candidate plants are selected using guidelines at 2.0 above, the objectives of R&M/LE shall be as detailed below.

The main objective of R&M/uprating and Life extension of power generating units should be to make the operating units well equipped with modified/augmented equipment/components/ latest technology equipment systems, with a view to improve their operating performance, reliability and availability to the original design values or better than original design, reduction in maintenance requirements, reduction in auxiliary power consumption, safety, ease of maintenance and enhanced efficiency, meeting the latest environmental norms, improvement in capability of flexible operation of the plants and use of biomass in generation as part substitution of coal.

The R&M programme is primarily aimed at generation sustenance and the following-

#### **3.1.1 Operational Improvement:**

- i. Rectification of generic defects/ design deficiencies
- ii. Replacement of obsolete equipment/component
- iii. Increasing plant availability and operating on new technical minimum
- iv. Heat Rate / Efficiency Improvement
- v. To cater to deterioration in quality of coal as compared to design coal
- vi. Major replacements of equipment on account of unforeseen failures and/or generation sustenance not covered under regular O&M
- vii. Modernization/Up gradation of Plant Control system with state-of-the-art technology
- viii. Enhancing safety requirements and Enabling cyber security
- ix. Ability to meet peak demand and run unit on full load and improvement in cyclic operation.
- x. Application of hardware & software to limit life loss of pressure parts due to cyclic loading & metal temperature variation.
- xi. Reduction in Auxiliary Power Consumption
- xii. Reduction in water consumption

### 3.1.2 **Life Extension (LE) with or without uprating:**

- i. Extending life of plant & equipment
- ii. Capacity enhancement (uprating) subject to availability of margins in all other critical systems, an alternative to the construction of new power plants which usually have a much longer gestation period.

### 3.1.3 **Compliance of latest environment norms as notified by MOEF&CC /CPCB**

Meeting latest environmental norms for PM, SO<sub>x</sub>, NO<sub>x</sub>, water consumption

- i. ESP upgradation
- ii. FGD Retrofit
- iii. Combustion Modification
- iv. Measures for reduction of specific water consumption and ZLD implementation etc.

### 3.1.4 **Flexible Operation for RE integration and lowering the minimum load:**

Improvement in Capability of flexible operation of the units as per applicable guidelines/regulations

- i. Controls upgradation & optimization solution implementation
- ii. Ramp rate improvement
- iii. Low load operation etc.
- iv. Start-up optimization

### 3.1.5 **Biomass Co-firing capability as per prevailing policy/regulation:**

Augmentation of all associated / auxiliary equipment and systems such as handling, storage, milling and operation (Boiler modification and Ash handling) etc. to make thermal units capable of biomass co-firing as per prevailing policy/regulation.

## 3.2 GUIDING PRINCIPLES

- i. Capacity Uprating may call for major upgradation in other critical equipment of the plant. LMZ turbine sets may be prioritized for uprating due to availability of inherent margins available in these sets. This is, however, to be decided on case to case basis depending on the boiler base parameters and margins available in all associated critical / auxiliary equipment and systems. Margin available in all the important systems are to be assessed for Uprating.
- ii. Any short comings in BOP areas are to be upgraded / replaced.
- iii. To take care of the deterioration of coal compared to design coal, Boiler modification, APH and Fans modification may be required.
- iv. After RLA study, assessment study for the R&M should be carried out by utility in consultation with R&M consultant also considering views of bidders/industry players before bidding stage and made available so that the scope related to R&M is clear.
- v. Complete scope of modifications by the executing agency based on RLA/ other assessment studies should be taken up achieving minimum overall down time of the unit and partial execution should be avoided to fulfill the objectives of R&M.
- vi. Assessment of existing control system after flexible operation study/test with respect to meeting requirement of flexible operation and other objectives and detailed requirement of replacement/augmentation to be clearly mentioned in specification example Advanced process control, mill scheduler, flame scanner & dynamic classifier etc.
- vii. State of the art Industry 4.0 solutions Industrial Internet of Things (IIOT) may be implemented in the plants to modernize Operation and Maintenance through Plant Analytics & Diagnostics and Asset Management based on latest AI-ML. This may help the Utility to transform into modern Digital Enterprise.
- viii. Plants having higher emission level than the stipulated latest MOEF&CC norms are to be considered for ESP R&M, FGD Retrofit, and NOx control/Combustion modification with state of the art control technology.
- ix. All the above recommendations are not exhaustive and further suitable guiding factors/principles may be considered based on cost benefit analysis with a view towards achieving the payback period within a span of 7-8 years of operation.



### 3.3 VIABLE BUSINESS MODEL

Following alternative options appear practical and feasible for investment in R&M schemes. However, states/power utilities may have other innovative options which could also be considered.

#### 3.3.1 Conventional Competitive bidding:

The work of R&M/LE including turbine and Boiler Modification work may be done by power utility through competitive bidding for equipment supply and erection contract subject to prevailing Govt. guidelines. This is the most conventional model.

#### 3.3.2 Joint Venture between Power utility and Private/Public Company/Manufacturer

In this option, a new company will be formed as a joint venture (JV) of the power utility/ and selected private/public company/manufacturer (including Financial Institutions). The JV Company would own, operate, maintain the power station and undertake the R&M/ LE works. The public/private collaborator could also be an equipment supplier.

#### 3.3.3 Service Model:

The fundamental core concept of this business model is that the Power utility may not have to fund any of upfront capital cost for the R&M/LE Projects and is only responsible to pay for this investment from actual savings it realizes from the implemented Projects.

In this option, the implementation of R&M/LE can be done by defining the baseline and awarding the contract generally through nomination to a Service Provider (SP) having a good standing and record or through competitive bidding for a specified duration over which phased performance improvement can be achieved and sustained with flexible payment models. Any other mode of tendering as may be found suitable by the utility with the broad principles suggested in the models may be adopted by the utility.

*\*Detailed Explanation given in Appendix II.*

### 3.4 POTENTIAL THERMAL GENERATING UNITS FOR R&M AND LE

The total capacity of thermal generating units with age older than 20 years from 2022 onwards up to 2030 and 150 MW or higher with reheat cycle for the potential candidates of R&M/LE works are 67560 MW (224 Units). There can be some units less than 20 yrs. old where heat rate deviations or other criteria of R&M are met and which can be included as potential candidates for R&M. The sector and year wise segregation is provided in **Annexure IIA** and the detailed list of above thermal units is enclosed as **Annexure IIB** for ready reference.

## 4 PREPARATION OF BIDDING DOCUMENTS FOR R&M:

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There is no “one size fits all” solution in case of R&M/LE works of Thermal Power Stations. Each unit needs a customised solution of R&M/LE with or without uprating works depending upon the condition of the unit as determined through RLA/Condition Assessment/Energy Audit, financial condition of utility and grid condition. However, directives or principles given below needs to be followed while preparing the bidding documents for R&M.

### 4.1 GUIDING PRINCIPLES FOR BIDDING DOCUMENT FOR R&M:

- i. Before deciding the scope of R&M/LE with or without uprating works, the utilities have to determine the availability of design maps/drawings and status of health of equipments of various systems as also their residual life by carrying out various Residual Life Assessment (RLA) / Condition Assessment (CA)/ Destructive test studies and Energy Audit studies after 1,60,000 hours of operation. It is also mentioned that a RLA study may be required earlier than 1,60,000 hours of operation due to participation in flexibilisation., say after 1,00,000 hours of operation. Depending upon the review of the past performance and results of above studies, decision is required to be taken whether to run, retrofit or replace each of the critical equipments.
- ii. A single R&M Consultant should be appointed for carrying out the investigative studies such as RLA, CA, Energy Audit etc., preparing feasibility report & detailed project report, facilitating approval from regulatory agency, preparing technical specification for bidding documents & Bid evaluation and detail engineering. Appointment of a single R&M Consultant will reduce the time gap between the investigative studies and the selection of R&M Contractor.
- iii. Comprehensive R&M approach has to be adopted by R&M Consultant.
- iv. After the completion of investigative studies, a matrix of possibilities and options for carrying out R&M solutions should be evaluated in order to choose the most feasible and economic option of R&M to be implemented. The matrix of such options has been enclosed herewith as **Annexure-I** for ready reference.
- v. Keeping in view the complexities involved with various contract packages and for having adequate number of eligible and willing bidders with relevant expertise and experience to carry out the R&M works under a package, it is recommended that R&M contracts should be awarded in following typical packages as mentioned below as per site requirement:
  - a) Boiler & Auxiliaries
  - b) Turbine and Generator with Auxiliaries
  - c) Coal Handling Plant
  - d) Ash Handling System
  - e) Balance of Plant (Mechanical)
  - f) Balance of Plant (Electrical)
  - g) C & I
- vi. Bidding documents may be prepared package wise for all components eg. Boiler & auxiliaries, Turbine & generator, Balance of Plant (Mechanical), Balance of Plant (Electrical), C&I, CHP and AHP etc.

- vii. It is advisable to engage the services of an Implementation Support Consultant (ISC) for supporting the utilities in implementation of the R&M works through site supervision, monitoring the progress of works, checking the quality of construction & erection, supervising the commissioning activities, witnessing and evaluation of Performance Guarantee Tests and coordinating for R&M/LE works between different agencies for better synergy.
- viii. To facilitate the engagement of Consultants and R&M Works Contractors in a planned, systematic and time bound manner, a two-step process in single stage (Single stage two envelope method) comprising Request for Qualification (RFQ) and Request for Proposal (RFP) is recommended.
- ix. Pre-qualification requirements(PQR) of Bidder:

The mentioned PQR is a sample PQR. Utility may opt for below mentioned PQR or prepare suitable PQR as per their requirement

- The Bidder shall be Steam Turbine manufacturer and successfully carried out R&M of 150 MW or higher capacity LMZ/ KWU make or impulse type Steam Turbine. The retrofitted Steam Turbine is in successful operation for at least one (1) year prior to bid submission date
  - If Bidder is Joint Venture/ Collaborator/ Partner/Holding Company/ Subsidiary Company, one partner shall be steam turbine manufacturer of 150 MW or higher capacity and other partner must have experience of R&M of LMZ/KWU make or impulse type steam turbine of 150 MW or higher capacity. The retrofitted Steam Turbine is in successful operation for at least one (1) prior to bid submission date
  - The Bidder shall be an Indian Company wherein Bidder itself or through its JV Company/Subsidiary Company who is Steam Turbine Manufacturer and should have completed Phased Manufacturing Program (PMP) for 660/800 MW Supercritical Steam Turbine set. The company who have completed Phased Manufacturing Program (PMP) shall have manufactured and supplied at least one (01) Super Critical Steam Turbine set manufactured in thermal power station from its Indian PMP facility and such Steam Turbine set shall be in commercial operation for at least one (1) year prior to bid submission date
  - Bidder shall have to meet the minimum local content criteria as per the prevailing government guidelines of total EPC package cost. For confirmation of the same, Bidder shall have to provide the unconditional duly notarized undertaking along with list of Goods, Service or Works offered from within India. If, bidder fails to submit the same, their bid shall be considered as non-responsive and liable to be rejected.
- x. Considering the complexities of R&M Projects, it is recommended to invite the bids in two parts, Part-I (Techno-commercial Bids) and Part-II (Price Bids) in single stage (Single stage two envelope method). The price-bid of techno-commercially non-responsive bid is not opened at all.
- xi. Since the scope of work of the **R&M Consultant makes him responsible for preparing the bidding documents for R&M Contractors** and also to assist the utilities in bid evaluation for the appointment of R&M Contractors, the above two

provisions will reduce the time gap between the completion of R&M studies and execution of R&M works thereby minimizing the technical surprises during execution. In case, some technical surprises are encountered during the course of execution of the R&M works, a change order should be issued by the owner after studying the need of change in scope, pursuant to the proposal received from the R&M Contractor. The unit rate of item which are prone to technical surprises is advised to be kept in contract (to be operated as per need to save time).

- xii. It has also been observed that huge delay in completion of R&M/LE works has impacted the total cost incurred on R&M/LE work and its economic viability after time overrun and consequently cost overrun. Therefore, it is advised that apart from having L1/L2 schedule, L3 network schedule may also be finalized with the suppliers considering all micro management and sequential supply of material to be tied up with contractor to avoid dumping of material and consequential delay in completion of work.
- xiii. Performance Guarantee (PG) Test should be conducted as earlier as possible after the unit gets stabilized after successful continuous running of the unit for 14 days and at least 72 hours at full rated/uprated capacity and technical minimum load as per prevailing govt. Guidelines after recommissioning of the unit. **A maximum time gap of three (3) months for the completion of Performance Guarantee test of the BTG (Boiler, Turbine, Generator) as also any of the BOPs (Balance of Plant) is recommended** since after this period some OEMs (Original Equipment Manufacturers) normally insist on the application of correction factors (due to deterioration) on the test results. Provision of Liquidated Damages (LDs) should be made in the Contracts to deal with the aspects of 'delay in completion of works' as well as 'shortfall in performance parameters' demonstrated during Performance Guarantee Test.
- xiv. In order to put a robust mechanism for sustained performance, a provision of repeat PG test after 2 years may be kept in Bidder's scope in supervisory mode (wherein Bidder shall advise modifications for arresting any performance shortfall) without any Bank Guarantee.
- xv. Another method of tendering viz., Swiss Challenge Model may be selected. Instead of conventional approach of tendering, in this proposed methodology both parts may be carried out by the agency qualified for execution of R&M works. Initially, Expression of Interest (EOI) is to be invited from qualified Bidders to carry out comprehensive R&M. Through EOI, qualified bidders are to be shortlisted. Thereafter, bidding process may be carried out in two phases. **In Phase-I**, after evaluating the quoted price of preparation of DPR & tender documents considering proposed R&M/LE works by qualified bidders, lowest quoted firm may be selected for Phase-I process i.e. Preparation of DPR (Part-A) & Preparation of Tender Documents (Part-B). After approval of CERC/SERCs on the DPR and completion of tendering documents, **in Phase-II**, the whole details is to be published for all other prospective bidders to offer their bids in Swiss Challenge Mode with competitive price/ better performance than earlier selected bidder in Phase-I. After comparison and evaluation, finally selected bidder may carry out comprehensive R&M/LE work. The detailed description is provided in **Appendix I**.
- xvi. Bid Security Amount/ EMD (Earnest Money Deposit) shall be taken by the organization to ensure that only serious bidders participate in the tender. This is a refundable deposit which is sought in the form of fixed deposit Receipt/crossed Bank Draft/Irrevocable Bank Guarantee.

- xvii. Provision of discussion of DPR/ draft technical specifications with potential bidders during pre-NIT stage may also be kept.
- xviii. Pre-Bid Queries shall be submitted by the Bidders followed by Pre-Bid Meeting. Thereafter, Bids shall be submitted online/offline. Bidder shall submit Soft copy of Bid along with physical copy of bid.

## **4.2 TIME TAKEN/SCHEDULE FOR COMPLETION OF R&M WORKS**

The following time frame may be adopted for implementing the R&M/LE with or without uprating works-

- i. Appointment of consultant by utilities & RLA/ Energy Audit – 3 to 6 months.
- ii. Assessment study after RLA study and Preparation and approval of DPR Freezing the scope of work/activities and – 2 to 3 months
- iii. Placement of order – 3 to 6 months.
- iv. Engineering, Manufacturing and Supply – 12 to 15 months
- v. Shut down of unit – 3 to 8 months depending on the scope of work.
- vi. Implementation time after Placement of order– 18 to 29 months.
- vii. PG test of unit/boiler/turbine– within 3 months after successful commissioning of Unit.

The above requirements call for a new approach towards implementation of R&M/LE works by the utilities by revisiting the existing procedures being adopted by each utility/ stake holders/ approving authority and to simplify them to meet the compressed time schedule and encouraging increased participation from various executing agencies. It should be attempted to match the shutdowns for R&M/LE with opportunity outages/shutdowns.

## **4.3 COMMERCIAL ASPECTS OF DOCUMENT FOR BIDDING**

- i. Preferably, Competitive Bidding process should be opted as per the guidelines of Govt. of India
- ii. Provision of PV clause (Price Variation) should be kept in the tender to take care of price index.
- iii. There may be provision of bonus / incentive for establishing better Performance Parameters both for contractor/consultant after execution of the project out of differential sustainable gains per annum due to R&M for a defined period.
- iv. Time schedule of R&M should be mentioned.
- v. Liquidated Damages (LD) on account of delay should be limited to 10% of contract price and should be graded. Liquidated Damages (LD) on account of shortfall of performance parameters shall be customised as decided by utilities on case to case basis. Both the LDs shall run concurrently.
- vi. Bid evaluation factor to be included in bid for rewarding parties guaranteeing better parameters/outcome/results.

## **4.4 TECHNICAL ASPECTS OF DOCUMENT FOR BIDDING**

- i. The Bidder should meet the minimum / maximum Functional Guarantees as specified in the tender, e.g. Minimum Output Power, Maximum Unit Heat Rate, Maximum Auxiliary Power Consumption, Maximum Outlet emissions, Minimum Boiler efficiency and Maximum Turbine heat rate etc.
- ii. Terminal Points and Exclusions should be clearly defined in the tender.
- iii. The tenderer shall provide General Arrangement (GA) drawings, Historical data, operating data & trends, Product Data sheets, log sheets, RLA /Energy audit reports and any other document as available for the machine. If required, measurements/scanning and reverse engineering can be taken-up by the bidder.
- iv. BOQ (Bill Of Quantities) should be clear in all respects and there should be provision for handling quantity variations in the tender during contract stage.
- v. All civil design inputs (e.g. Soil Investigation/ Geotechnical Investigation Report, Topographical survey, underground survey, ageing of foundations, NDT (Non Destructive Testing) results for adequacy checking of foundations / structures, drawings of existing foundations etc.) as available should be provided in the tender.
- vi. All C&I logics and clearly spelt out BOQ for C&I items should be made available by customer.

As per deliberation of committee members, it has been concluded that customised unit/project specific bidding documents containing commercial aspects may be prepared by R&M Consultant based on above guiding principles, selected business model, taking inputs from power utilities and assessment from RLA/Condition Assessment/Energy Audit.

Once the business model is zeroed in, Technical aspects of Bidding Document may be prepared outlining the general technical parameters including above mentioned points and conditions with boundary limits, general PQR guidelines, standard commercial terms & conditions, etc. Technical aspects will depend on size, make, residual life, design and the condition of the unit as determined through RLA/Condition Assessment/Energy Audit. Committee members suggested that customised unit/project specific bidding documents containing technical aspects may be prepared by R&M Consultant based on above mentioned parameter/data and taking inputs from power utilities.

#### **4.5 DO'S AND DON'TS IN BIDDING PROCESS**

##### **Do's-**

1. Appointment of single R&M Consultant.
2. Comprehensive R&M approach has to be adopted.
3. Bidding documents may be prepared package wise.
4. Bid Security Amount/ EMD (Earnest Money Deposit) sought by the Utility.
5. Pre-Bid Queries shall be submitted by the Bidders followed by Pre-Bid Meeting.
6. Liquidated Damages shall be customised to avoid time overrun and shortfall of performance. Both the LDs shall run concurrently.

## Don'ts

1. Choice of bidding made through nomination basis.
2. Time overrun due to delay in completion of bidding process.

## 5 CASE STUDY OF SUCCESSFUL IMPLEMENTATION OF R&M

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Two recent cases of successful R&M interventions on Turbines have been carried out in NTPC, Ramagundam Stage-I (3X200MW) and Wanakbori Unit #3 (210MW) of GSECL. Substantial improvement in the turbine heat rate (in the range of 150-300 Kcal/KW hr) with LE has been achieved in these stations only through turbine R&M.

### 5.1 NTPC RAMAGUNDAM ST-I (3x200 MW)

Date of commissioning Stage-I –1983-84

Unit # 3 TG Life Extension Work completed in Dec 2021

#### Major Scope:

- Complete HP IP Module Replacement
- LPT internals Replaced
- Upgrading From 200 MW to 210 MW.
- Guaranteed Turbine Heat Rate: 1935 Kcal/KWh

#### Achievements:

- Life extended by 15 years.
- Improved Turbine cycle heat rate by 182 Kcal/KWh
- Upgraded unit output by 10 MW
- Modernized TG control system with state of art technology.
- Guarantees met: PG Test conducted in March, 2022.
- 100% TMCR HR & Output test cleared. No shortfall Observed

Particulars	Before R&M	After R&M
Capacity (MW)	200	210
Turbine Heat Rate (Kcal/KWH)	2101	1919 as per PG test result
Awarded R&M Cost/Unit	122 ₹ Cr	
LE Cost /MW ₹ Cr	0.61	

## 5.2 GSECL WANAKBORI TPS U# 3 (1x210 MW)

Date of commissioning WTPS Unit# 3 –1983-84

Unit # 3 TG R&M and Life Extension Work completed in Dec 2017

Major Scope

- Complete HP IP Module Replacement
- LPT internals Replaced
- Guaranteed Turbine Heat Rate: 1950 Kcal/KWh

Achievements

- Life extended by 15 years.
- Improved Turbine cycle heat rate by 315.86 Kcal/KWh
- Modernized TG control system with state of art technology.
- Guarantees met: PG Test conducted in February-2018.
- 100% TMCR HR & Output test cleared. No shortfall Observed

Particulars	Before R&M	After R&M
Capacity (MW)	210	210
Turbine Heat Rate (Kcal/KWH)	2260	1944.14
Awarded R&M Cost/Unit	94.00 ₹ Cr	
Per month saving in fuel cost	Rs. 6.3 Crores.	



## **Appendix I**

### **(Swiss Challenge Model)**

#### 1. Steps of Phase –I (Through bidding among qualified bidders):-

- a) The qualified bidders have to quote for Preparation of DPR (Part-A) & Preparation of Tender Documents Part-B, separately. The same is to be evaluation and comparison of quoted rates, is to be on lump sum basis.
- b) The lowest firm will submit the Detailed Project Report (DPR), after completing RLA, CA study etc. (Part-A), in a time bound manner. The firm will also submit recommendations for various R&M activities along with their techno-commercial viability.
- c) After getting approval of Electricity Regulatory Commission on the DPR, the contractor will prepare tender documents (Part-B) for awarding contract of proposed R&M work through Swiss Challenge Mode.

#### 2. Steps of Phase –II (Execution of R&M through SCM bidding):-

- a) The whole, detail is to be then published for all other prospective bidders having minimum PQR as specified in the EOI, to offer their bids in Swiss Challenge Mode, complying all the conditions but with competitive price/ better performance. However, prior to bidding, the qualified bidders may be allowed to get convinced with the proposed R&M measures.
- b) The better offer so received shall be then counter offered to the originally successful bidder (of Phase-I). If it accepts, then it becomes the successful bidder. On exercising its right to refuse the counter offer, the other firm which has quoted the better offer will become successful bidder and shall be required to execute the work. However, the cost of preparation of DPR & tender documents shall be paid to the original firm who has prepared these, by new successful bidder.

With above approach of SCM, there is possibility that maker of DPR will also carry the responsibility of execution and shall bear the responsibility of post R&M guarantee for next requisite (3/5) years after execution. It will protect Power Utility from getting trapped in plan of executing agency who may disown post R&M Guarantee on later date, taking plea of one or other on consultant etc.

## **Appendix II**

### **Service Model**

#### **Service Provider's (SP) Role-**

Offer design, retrofitting and implementation for heat rate, spec. oil & APC improvement projects after verifying the energy saving opportunities in existing facilities. It may also include O&M, financing or assisting the power utility in arranging finances. The SP operates by providing a savings guarantee, risk management in the implementation of the R&M works and would also perform PG tests to quantify actual savings post implementation.

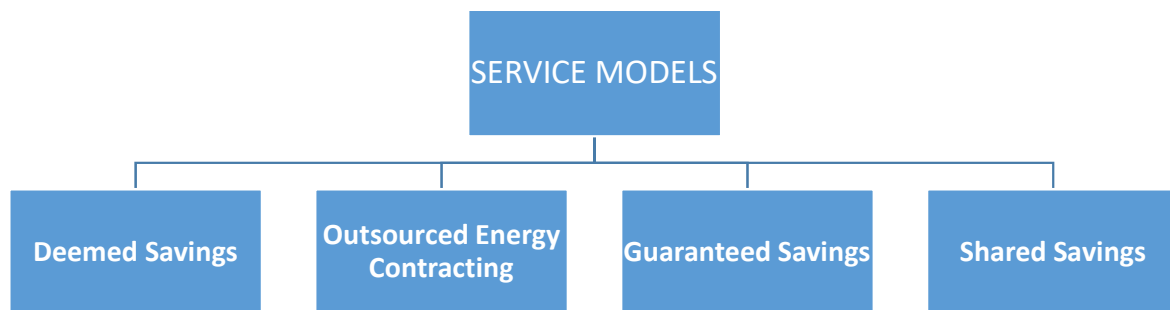
The SP shall implement R&M/LE projects and receive payment for their services on the differential savings being achieved.

The SP conducts a comprehensive RLA/CA/Energy audit for the utility and identifies avenues for improvements in operational parameters. In consultation with the utility, the SP designs and implements a project assuring guaranteed savings that meets the utility's needs and arranges the necessary financing.

The SP guarantees that the improvements will generate cost savings sufficient to pay for the project over the term of the contract. After the contract ends, all additional cost savings accrue to the Utility.

Various modalities can be derived by different combinations of features of the service models indicated in Appendix. The funding of R&M/LE costs and subsequent benefits can also be split and shared between Utility & Service Provider depending on the agreement of both the parties.

#### **Mode of Services:**

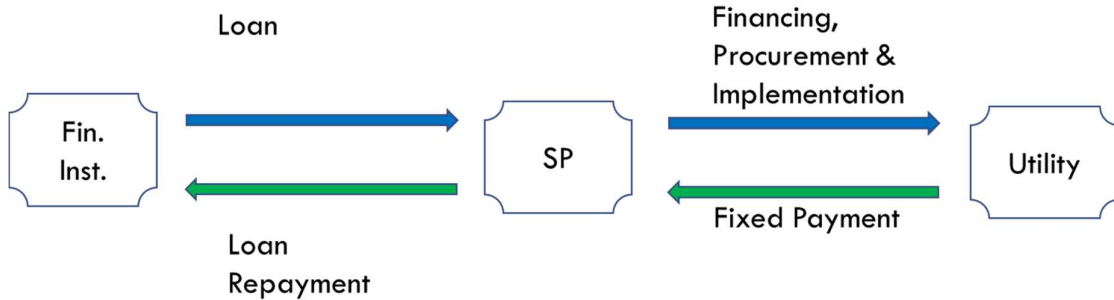


#### **1. Deemed Savings model (Payment to Service Provider on annuity basis)**

Contract will be executed between the SP and Utility with a fixed price for services provided and financial agreement will be executed between the SP and FI for debt. The SP will make loan repayments and interest from the pay outs made by the Utility based on deemed savings.

The fixed price (annuity) is determined on the basis of demonstration of savings on sample basis due to R&M and calculating the savings based on demonstrated improvement in

operational parameters over the normative annual running hours. The annuity payment shall typically be in the range of 10 to 15 years. This model helps in simplifying the contracting arrangement as it would not be necessary to develop complex baseline and measurement criterias.

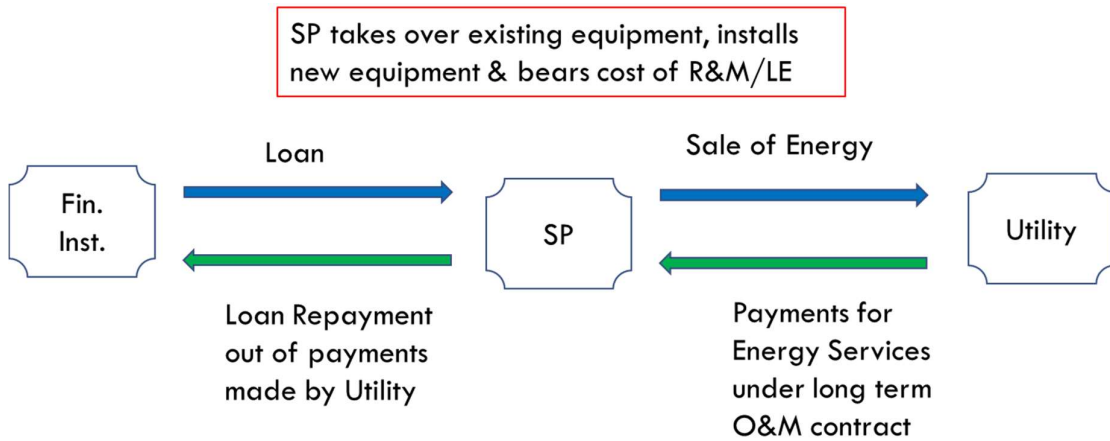


**Figure:** Deemed saving model

Project shall be awarded to a SP having a good standing and record on nomination basis or through competitive bidding to SP which shares more percentage of monetary value of savings with the Utility. However, different parameters like Project's Internal rate of return, Cumulative NPV, Net saving potential etc. shall also be considered depending upon the requirement of project before awarding the contract to the SP. It should be taken into consideration that SP should not face excessive financial risk by delay in payments or other financial constraints of utility. Also, there should be appropriate limits for contract boundary condition and pricing, keeping SP's financial interest into consideration else there may be chances of hedging coming into picture which will impact utility at the end. To counter the possibility of hedging, securitisation of SP's investments shall be provided for in the contract by suitable means.

## 2. Outsourced Energy Contracting model

This model can also be called energy supply contracting. An agreement will be executed between the SP and Utility under which the SP takes over operation and maintenance of the plant. The SP pays for R&M expenses and sells the energy output to the Utility under a long-term contract at an agreed price. The ownership of plant can be on build-own-operate model or build-own-operate-transfer model.

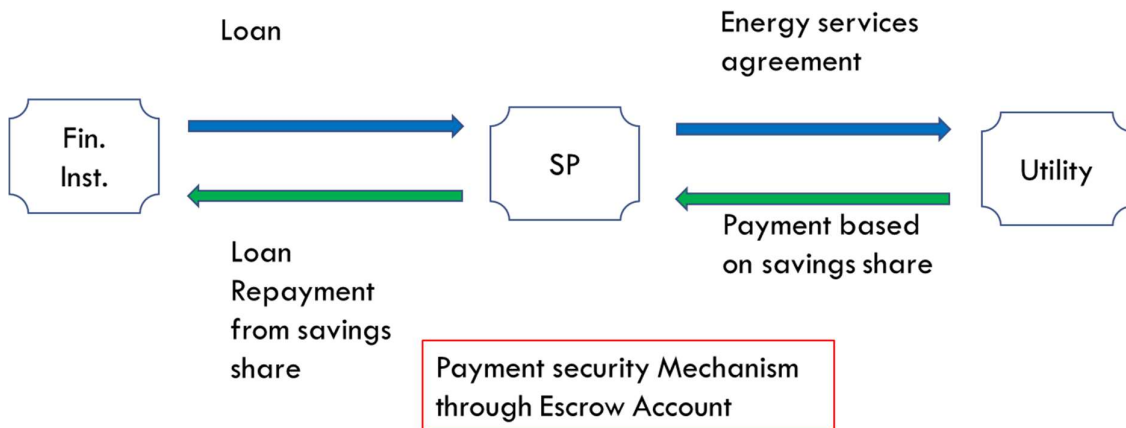


**Figure:** Outsourcing Model

Project shall be awarded to that SP which claims to supply required energy at lowest price maintaining the power quality and safety as defined by the Utility.

### 3. Shared saving model

Implemented on turnkey basis by SP. SP's role includes RLA/CA/Energy Audit and determination of baseline following which the works are identified for execution as per mutual agreement between the SP and the Utility. SP thereafter undertakes design, engineering, installation/construction, commissioning, and measurement & verification of savings post commissioning. SP can also undertake operations and maintenance, providing/arranging financing and training of O&M staff of utility for sustaining the savings post completion of the contract period. The key criteria here is to share the value of the savings, which constitutes the revenue stream for the SP. The Utility gets to retain all the savings beyond the contract period. However, the Utility would be required to provide some security of cash flow to the SP.

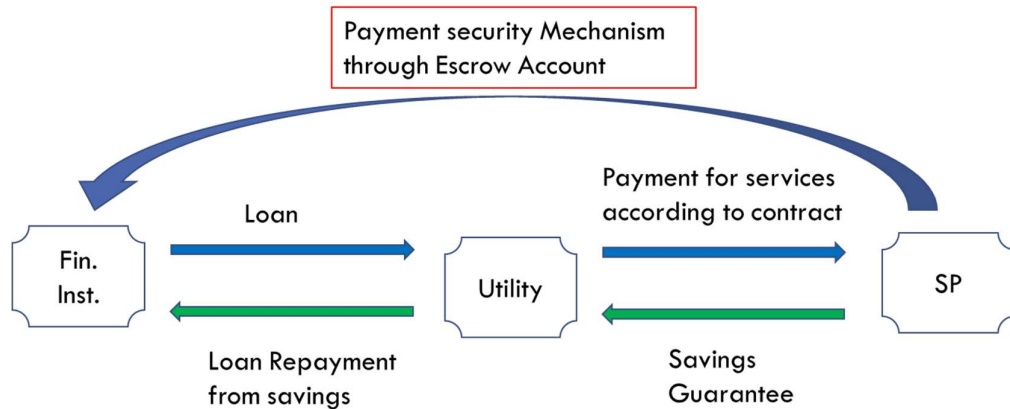


**Figure:** Shared saving model

Project would be awarded to that SP which shares more percentage of monetary value of actual savings with the utility. However, different parameters like Project's Internal rate of return, NPV, Net saving potential etc. shall also be considered depending upon the requirement of project before awarding the contract to the SP.

**4. Guaranteed saving model**

The basic model would be the same as in case of shared savings model except that the financing of the project is provided by the Utility. SP implementing the project offers a guarantee in savings. The Utility would pay SP a sum agreed upon, based on the service being provided, linked to the guaranteed savings from the R&M work. If savings are lower than the guarantee, the SP pays the difference. If the savings are higher, the SP may get a bonus payment. In this model, utility may mobilize margin money for the debt and the FI will lend debt to the SP. The Utility then provides for loan repayments and interest to the FI from its savings.



**Figure:** Guaranteed saving model

Project shall be awarded to that SP which guarantees more savings and asks less service charge keeping in mind the quality of manpower, work and other relevant factors suitable to the project.

**Award of Work**

The contract can be awarded to the bidder considering mode of the Services business discussed above or to the lowest (L1) bidder after technical and financial evaluation or through a combination of technical and financial scores as deemed fit by the Utility

**Formulation of Project document**

The documents that would need to be prepared would include the various agreements to be entered into with the SP and Utility detailing the terms of the reference for the project and the

rights and obligations of both parties. These project documents would vary depending on the R&M works, type of contracting model, type of financing mechanisms etc.

The bid document would clearly indicate the objectives, scope of work, activities, tasks to be performed, respective responsibilities of the Utility and the SP, expected outcomes and deliverables of the R&M/LE work. Contract provisions shall have time schedule & Liquidation Damages (LD) for delay and shortfall in guaranteed performance parameter. The contract shall also include various timeframes of the project cycle, penalties provision in case of violation of the contract etc. Due consideration shall be given to Force Majeure conditions.

SP should be provided opportunity to familiarize themselves with site conditions and take them into account in preparing their Proposal.

## 6 ANNEXURES

### Annexure-I (Options for carrying out R&M)

Option	Objectives to be achieved by carrying out R&M/LE
I	<ul style="list-style-type: none"> <li>i. Designing Boiler, Turbine &amp; Auxiliaries to suit average coal quality likely to be available for the next 15 Years.</li> <li>ii. Increasing the output of the unit by retrofitting the LP turbine without retrofitting Generator (Restoring to rated capacity or uprating the capacity if margins are available in Generator &amp; transformer). Improving heat rate and also the Auxiliary Power Consumption to the original design values.</li> <li>iii. Replacing the existing obsolete technology.</li> <li>iv. Meeting the revised statutory emission standards.</li> <li>v. Extending the life of the unit by a minimum of 15 years.</li> </ul>
II	<ul style="list-style-type: none"> <li>i. Designing Boiler, Turbine &amp; Auxiliaries to suit average coal quality likely to be available for the next 15 Years.</li> <li>ii. Increasing the output of the unit by retrofitting the LP and HP turbine without retrofitting Generator (Restoring to rated capacity or uprating the capacity if margins are available in Generator &amp; transformer). Improving heat rate and also the Auxiliary Power Consumption to the original design values.</li> <li>iii. Replacing the existing obsolete technology.</li> <li>iv. Meeting the revised statutory emission standards.</li> <li>v. Extending the life of the unit by a minimum of 15 years.</li> </ul>
III	<ul style="list-style-type: none"> <li>i. Designing Boiler, Turbine &amp; Auxiliaries to suit average coal quality likely to be available for the next 15 Years.</li> <li>ii. Increasing the output of the unit by retrofitting complete new energy efficient turbine without retrofitting Generator. (Restoring to rated capacity or uprating the capacity if margins are available in Generator &amp; transformer). Improving heat rate and also the Auxiliary Power Consumption to the original design values.</li> <li>iii. Replacing the existing obsolete technology.</li> <li>iv. Meeting the revised statutory emission standards.</li> <li>v. Extending the life of the unit by a minimum of 15 years.</li> </ul>
IV	<ul style="list-style-type: none"> <li>i. Designing Boiler, Turbine &amp; Auxiliaries to suit average coal quality likely to be available for the next 15 Years.</li> <li>ii. Increasing the output of the unit by retrofitting complete new energy efficient turbine with minor modification of Generator. (Restoring to rated</li> </ul>

	<p>capacity or uprating the capacity if margins are available in Generator &amp; transformer). Improving heat rate and also the Auxiliary Power Consumption to the original design values.</p> <p>iii. Replacing the existing obsolete technology.</p> <p>iv. Meeting the revised statutory emission standards.</p> <p>v. Extending the life of the unit by a minimum of 15 years.</p>
V	<p>i. Designing Boiler, Turbine &amp; Auxiliaries to suit average coal quality likely to be available for the next 15 Years.</p> <p>ii. Increasing the Output of the unit from by retrofitting complete new energy efficient turbine along with new Generator, Generator Transformer and new Excitation System. (Restoring to rated capacity or uprating the capacity if feasible). Improving heat rate and also the Auxiliary Power Consumption to the original design values.</p> <p>iii. Replacing the existing obsolete technology.</p> <p>iv. Meeting the revised statutory emission standards.</p> <p>v. Extending the life of the unit by a minimum of 20 years.</p>
VI	<p>i. In situ major replacement of Boiler on the existing foundations, retrofitting complete new energy efficient turbine along with new Generator, Generator Transformer and new Excitation System. Designing the boiler to suit the average coal quality likely to be available for the next 20 years.</p> <p>ii. Increasing the Output by installing new Boiler / Turbine of higher Capacity after replacing the old one (Restoring to rated capacity or uprating the capacity if feasible). Achieving Heat Rate and Auxiliary Power Consumption better than Options 'III' &amp; 'IV'.</p> <p>iii. Replacing the existing obsolete technology.</p> <p>iv. Meeting the revised statutory emission standards.</p> <p>v. Extending the life of the unit by a minimum of 20 years. {This option is advised only when the unit to be renovated is either the first or last unit of the power plant, since the intermediate units are likely to have space constraint.}</p>

While considering various options, the following minimum objectives are considered by the committee:

- i) Redesigning the boiler to suit the average coal quality likely to be available for the next 15-20 years.
- ii) Retrofitting of majority 150 MW units and above provided with LMZ design having LP Turbines with inherent deficiency in efficiency and output due to Baumann type exhaust.



- iii) Improving the performance parameters at least to the original design values.
- iv) Extending the life of the unit by a minimum of 15 years.
- v) Replacing the existing obsolete technology, most particularly the control instrumentation.
- vi) Meeting the revised prevailing statutory emission standards.
- vii) Meeting the Prevailing guidelines/regulations regarding Flexible operation for RE integration and help attaining new technical minimum.
- viii) Meeting the Prevailing guidelines/regulations regarding Biomass Co-firing.
- ix) Increasing Boiler Efficiency.
- x) Reducing Turbine Heat Rate.
- xi) Reducing Auxiliary Power Consumption
- xii) Reducing specific oil consumption
- xiii) Improving the specific water consumption and implementation of ZLD

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## Annexure-IIA (Sector and Year wise Seggregation)

20 years+ in 31.12.2022

Sector	Capacity	Count of Unit No	Sum of Capacity
Central Sector	200.00	14	2800
	210.00	21	4410
	500.00	18	9000
<b>Central Sector Total</b>		<b>53</b>	<b>16210</b>
Private Sector	250.00	4	1000
	500.00	1	500
<b>Private Sector Total</b>		<b>5</b>	<b>1500</b>
State Sector	200.00	3	600
	210.00	72	15120
	250.00	2	500
	500.00	5	2500
<b>State Sector Total</b>		<b>82</b>	<b>18720</b>
<b>Grand Total</b>		<b>140</b>	<b>36430</b>

20 years+ in 31.12.2023  
(Excluding units with 20+ yrs in 2022)

Sector	Capacity	Count of Unit No	Sum of Capacity
Central Sector	500.00	2	1000
<b>Central Sector Total</b>		<b>2</b>	<b>1000</b>
State Sector	195.00	1	195
	250.00	1	250
<b>State Sector Total</b>		<b>2</b>	<b>445</b>
<b>Grand Total</b>		<b>4</b>	<b>1445</b>

20 years+ in 31.12.2024  
(Excluding units with 20+ yrs from 2022 to 2023)

Sector	Capacity	Count of Unit No	Sum of Capacity
Central Sector	210.00	1	210
	500.00	2	1000
<b>Central Sector Total</b>		<b>3</b>	<b>1210</b>
State Sector	250.00	1	250
<b>State Sector Total</b>		<b>1</b>	<b>250</b>
<b>Grand Total</b>		<b>4</b>	<b>1460</b>

**20 years+ in 31.12.2025**  
**(Excluding units with 20+ yrs from 2022 to 2024)**

Sector	Capacity	Count of Unit No	Sum of Capacity
Central Sector	500.00	3	1500
<b>Central Sector Total</b>		<b>3</b>	<b>1500</b>
State Sector	250.00	1	250
<b>State Sector Total</b>		<b>1</b>	<b>250</b>
<b>Grand Total</b>		<b>4</b>	<b>1750</b>

**20 years+ in 31.12.2026**  
**(Excluding units with 20+ yrs from 2022 to 2025)**

Sector	Capacity	Count of Unit No	Sum of Capacity
Central Sector	210.00	1	210
	500.00	1	500
<b>Central Sector Total</b>		<b>2</b>	<b>710</b>
State Sector	210.00	2	420
<b>State Sector Total</b>		<b>2</b>	<b>420</b>
<b>Grand Total</b>		<b>4</b>	<b>1130</b>

**20 years+ in 31.12.2027**  
**(Excluding units with 20+ yrs from 2022 to 2026)**

Sector	Capacity	Count of Unit No	Sum of Capacity
Central Sector	250.00	1	250
	500.00	3	1500
<b>Central Sector Total</b>		<b>4</b>	<b>1750</b>
Private Sector	250.00	1	250
<b>Private Sector Total</b>		<b>1</b>	<b>250</b>
State Sector	210.00	3	630
	250.00	5	1250
	300.00	3	900
	500.00	2	1000
<b>State Sector Total</b>		<b>13</b>	<b>3780</b>
<b>Grand Total</b>		<b>18</b>	<b>5780</b>

**20 years+ in 31.12.2028**  
**(Excluding units with 20+ yrs from 2022 to 2027)**

Sector	Capacity	Count of Unit No	Sum of Capacity
Central Sector	250.00	1	250
	500.00	2	1000
<b>Central Sector Total</b>		<b>3</b>	<b>1250</b>
Private Sector	250.00	3	750
<b>Private Sector Total</b>		<b>3</b>	<b>750</b>
State Sector	210.00	1	210
	250.00	2	500
	300.00	2	600
<b>State Sector Total</b>		<b>5</b>	<b>1310</b>
<b>Grand Total</b>		<b>11</b>	<b>3310</b>

20 years+ in 31.12.2029  
(Excluding units with 20+ yrs from 2022 to 2028)

Sector	Capacity	Count of Unit No	Sum of Capacity
Central Sector	250.00	2	500
	500.00	1	500
<b>Central Sector Total</b>		<b>3</b>	<b>1000</b>
Private Sector	250.00	2	500
	300.00	3	900
	330.00	1	330
<b>Private Sector Total</b>		<b>6</b>	<b>1730</b>
State Sector	195.00	1	195
	210.00	1	210
	250.00	2	500
	500.00	1	500
<b>State Sector Total</b>		<b>5</b>	<b>1405</b>
<b>Grand Total</b>		<b>14</b>	<b>4135</b>

20 years+ in 31.12.2030  
(Excluding units with 20+ yrs from 2022 to 2029)

Sector	Capacity	Count of Unit No	Sum of Capacity
Central Sector	250.00	1	250
	490.00	2	980
	500.00	4	2000
<b>Central Sector Total</b>		<b>7</b>	<b>3230</b>
Private Sector	300.00	4	1200
	330.00	3	990
	600.00	2	1200
	660.00	1	660
<b>Private Sector Total</b>		<b>10</b>	<b>4050</b>

<b>State Sector</b>	210.00	1	210
	250.00	4	1000
	500.00	1	500
	600.00	2	1200
<b>State Sector Total</b>		<b>8</b>	<b>2910</b>
<b>Grand Total</b>		<b>25</b>	<b>10190</b>

## Annexure-IIB

Potential Thermal Units for R&M with age older than 20 years as on 31.12.2022

Sr. No.	State	Sector	Developer	Organisation	Name of Project	Unit No	Capacity	Date of Commissioning
1	Haryana	State Sector	HARYANA POWER GENERATION CORPORATION LIMITED	HPGCL	PANIPAT TPS	6	210.00	31-03-2001
2	Punjab	State Sector	PUNJAB STATE POWER CORP. LTD.	PSPCL	GH TPS (LEH.MOH.)	1	210.00	29-12-1997
3	Punjab	State Sector	PUNJAB STATE POWER CORP. LTD.	PSPCL	GH TPS (LEH.MOH.)	2	210.00	16-10-1998
4	Punjab	State Sector	PUNJAB STATE POWER CORP. LTD.	PSPCL	ROPAR TPS	3	210.00	31-03-1988
5	Punjab	State Sector	PUNJAB STATE POWER CORP. LTD.	PSPCL	ROPAR TPS	4	210.00	29-01-1989
6	Punjab	State Sector	PUNJAB STATE POWER CORP. LTD.	PSPCL	ROPAR TPS	5	210.00	29-03-1992
7	Punjab	State Sector	PUNJAB STATE POWER CORP. LTD.	PSPCL	ROPAR TPS	6	210.00	30-03-1993
8	Uttar Pradesh	State Sector	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED	UPRVUNL	ANPARA TPS	1	210.00	24-03-1986
9	Uttar Pradesh	State Sector	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED	UPRVUNL	ANPARA TPS	2	210.00	28-02-1987
10	Uttar Pradesh	State Sector	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED	UPRVUNL	ANPARA TPS	3	210.00	12-03-1988
11	Uttar Pradesh	State Sector	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED	UPRVUNL	ANPARA TPS	4	500.00	19-07-1993
12	Uttar Pradesh	State Sector	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED	UPRVUNL	ANPARA TPS	5	500.00	04-07-1994
13	Uttar Pradesh	State Sector	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED	UPRVUNL	OBRA TPS	13	200.00	21-07-1982
14	Chhattisgarh	State Sector	CHHATTISGARH STATE POWER GENERATION CO. LTD.	CSPGCL	KORBA-WEST TPS	1	210.00	30-03-1984
15	Chhattisgarh	State Sector	CHHATTISGARH STATE POWER GENERATION CO. LTD.	CSPGCL	KORBA-WEST TPS	2	210.00	21-06-1983
16	Chhattisgarh	State Sector	CHHATTISGARH STATE POWER GENERATION CO. LTD.	CSPGCL	KORBA-WEST TPS	3	210.00	26-03-1985
17	Chhattisgarh	State Sector	CHHATTISGARH STATE POWER GENERATION CO. LTD.	CSPGCL	KORBA-WEST TPS	4	210.00	13-03-1986
18	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	GANDHI NAGAR TPS	3	210.00	20-03-1990

19	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	GANDHI NAGAR TPS	4	210.00	20-07-1991
20	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	GANDHI NAGAR TPS	5	210.00	17-03-1998
21	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	UKAI TPS	3	200.00	21-01-1979
22	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	UKAI TPS	5	210.00	30-01-1985
23	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	WANAKBORI TPS	1	210.00	23-03-1982
24	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	WANAKBORI TPS	2	210.00	15-01-1983
25	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	WANAKBORI TPS	4	210.00	09-03-1986
26	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	WANAKBORI TPS	5	210.00	23-09-1986
27	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	WANAKBORI TPS	6	210.00	18-11-1987
28	Gujarat	State Sector	GUJARAT STATE ELECTRICITY CORPORATION LIMITED	GSECL	WANAKBORI TPS	7	210.00	31-12-1998
29	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	SANJAY GANDHI TPS	1	210.00	26-03-1993
30	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	SANJAY GANDHI TPS	2	210.00	27-03-1994
31	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	SANJAY GANDHI TPS	3	210.00	28-02-1999
32	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	SANJAY GANDHI TPS	4	210.00	23-11-1999

33	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	SATPURA TPS	6	200.00	27-06-1979
34	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	SATPURA TPS	7	210.00	20-09-1980
35	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	SATPURA TPS	8	210.00	25-01-1983
36	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	SATPURA TPS	9	210.00	27-02-1984
37	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	CHANDRAPUR(MA HARASHTRA) STPS	3	210.00	03-05-1985
38	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	CHANDRAPUR(MA HARASHTRA) STPS	4	210.00	08-03-1986
39	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	CHANDRAPUR(MA HARASHTRA) STPS	5	500.00	22-03-1991
40	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	CHANDRAPUR(MA HARASHTRA) STPS	6	500.00	11-03-1992
41	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	CHANDRAPUR(MA HARASHTRA) STPS	7	500.00	01-10-1997
42	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	NASIK TPS	3	210.00	26-04-1979
43	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	NASIK TPS	4	210.00	10-07-1980
44	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	KHAPARKHEDA TPS	1	210.00	26-03-1989
45	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	KHAPARKHEDA TPS	2	210.00	08-01-1990
46	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	KHAPARKHEDA TPS	3	210.00	31-05-2000
47	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	KHAPARKHEDA TPS	4	210.00	07-01-2001
48	Andhra Pradesh	State Sector	ANDHRA PRADESH POWER GENERATION CORP. LIMITED	APGENCO	RAYALASEEMA TPS	1	210.00	31-03-1994
49	Andhra Pradesh	State Sector	ANDHRA PRADESH POWER GENERATION CORP. LIMITED	APGENCO	RAYALASEEMA TPS	2	210.00	25-02-1995



50	Telangana	State Sector	TELANGANA STATE GENCO	TSGENCO	KOTHAGUDEM TPS (NEW)	9	250.00	27-03-1997
51	Telangana	State Sector	TELANGANA STATE GENCO	TSGENCO	KOTHAGUDEM TPS (NEW)	10	250.00	28-02-1998
52	Karnataka	State Sector	KARNATAKA POWER CORPORATION LIMITED	KPCL	RAICHUR TPS	1	210.00	29-03-1985
53	Karnataka	State Sector	KARNATAKA POWER CORPORATION LIMITED	KPCL	RAICHUR TPS	2	210.00	02-03-1986
54	Karnataka	State Sector	KARNATAKA POWER CORPORATION LIMITED	KPCL	RAICHUR TPS	3	210.00	30-03-1991
55	Karnataka	State Sector	KARNATAKA POWER CORPORATION LIMITED	KPCL	RAICHUR TPS	4	210.00	29-09-1994
56	Karnataka	State Sector	KARNATAKA POWER CORPORATION LIMITED	KPCL	RAICHUR TPS	5	210.00	31-01-1999
57	Karnataka	State Sector	KARNATAKA POWER CORPORATION LIMITED	KPCL	RAICHUR TPS	6	210.00	22-07-1999
58	Karnataka	State Sector	KARNATAKA POWER CORPORATION LIMITED	KPCL	RAICHUR TPS	7	210.00	11-12-2002
59	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	METTUR TPS	1	210.00	04-01-1987
60	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	METTUR TPS	2	210.00	01-12-1987
61	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	METTUR TPS	3	210.00	22-03-1989
62	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	METTUR TPS	4	210.00	27-03-1990
63	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	NORTH CHENNAI TPS	1	210.00	25-10-1994
64	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	NORTH CHENNAI TPS	2	210.00	27-03-1995
65	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	NORTH CHENNAI TPS	3	210.00	24-02-1996

66	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	TUTICORIN TPS	1	210.00	09-07-1979
67	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	TUTICORIN TPS	2	210.00	17-12-1980
68	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	TUTICORIN TPS	3	210.00	16-04-1982
69	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	TUTICORIN TPS	4	210.00	11-02-1992
70	Tamil Nadu	State Sector	TAMIL NADU GENERATION & DISTRIBUTION CORP. LTD.	TANGEDCO	TUTICORIN TPS	5	210.00	31-03-1991
71	Jharkhand	State Sector	TENUGHAT VIDYUT NIGAM LIMITED	TVNL	TENUGHAT TPS	1	210.00	14-04-1994
72	Jharkhand	State Sector	TENUGHAT VIDYUT NIGAM LIMITED	TVNL	TENUGHAT TPS	2	210.00	10-10-1996
73	Odisha	State Sector	ORISSA POWER GENERATION CORPORATION LIMITED	OPGC	IB VALLEY TPS	1	210.00	02-06-1994
74	Odisha	State Sector	ORISSA POWER GENERATION CORPORATION LIMITED	OPGC	IB VALLEY TPS	2	210.00	22-10-1995
75	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	BAKRESWAR TPS	2	210.00	17-07-1999
76	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	BAKRESWAR TPS	3	210.00	20-05-2000
77	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	BAKRESWAR TPS	4	210.00	21-03-2001
78	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	BANDEL TPS	5	210.00	08-10-1982
79	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	KOLAGHAT TPS	3	210.00	16-12-1985
80	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	KOLAGHAT TPS	4	210.00	24-01-1984
81	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	KOLAGHAT TPS	5	210.00	28-12-1993
82	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	KOLAGHAT TPS	6	210.00	17-03-1991

83	Maharashtra	Private Sector	ADANI ELECTRICITY MUMBAI LIMITED	AEML	DAHANU TPS	1	250.00	06-01-1995
84	Maharashtra	Private Sector	ADANI ELECTRICITY MUMBAI LIMITED	AEML	DAHANU TPS	2	250.00	29-03-1995
85	Maharashtra West	Private Sector	TATA POWER COMPANY LTD.	TATA PCL	TROMBAY TPS	5	500.00	25-01-1984
86	Bengal West	Private Sector	CALCUTTA ELECTRIC SUPPLY CO. LTD.	CESC	BUDGE BUDGE TPS	1	250.00	16-09-1997
87	Bengal West	Private Sector	CALCUTTA ELECTRIC SUPPLY CO. LTD.	CESC	BUDGE BUDGE TPS	2	250.00	06-03-1999
88	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	DADRI (NCTPP)	1	210.00	21-12-1991
89	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	DADRI (NCTPP)	2	210.00	18-12-1992
90	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	DADRI (NCTPP)	3	210.00	23-03-1993
91	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	DADRI (NCTPP)	4	210.00	24-03-1994
92	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	RIHAND STPS	1	500.00	31-03-1988
93	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	RIHAND STPS	2	500.00	05-07-1989
94	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	SINGRAULI STPS	1	200.00	14-02-1982
95	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	SINGRAULI STPS	2	200.00	25-11-1982
96	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	SINGRAULI STPS	3	200.00	28-03-1983
97	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	SINGRAULI STPS	4	200.00	02-11-1983
98	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	SINGRAULI STPS	5	200.00	26-02-1984
99	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	SINGRAULI STPS	6	500.00	23-12-1986
100	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	SINGRAULI STPS	7	500.00	24-11-1987
101	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	UNCHAHAH TPS	1	210.00	21-11-1988
102	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	UNCHAHAH TPS	2	210.00	22-03-1989
103	Pradesh Uttar	Central Sector	NTPC LIMITED	NTPC	UNCHAHAH TPS	3	210.00	27-01-1999
104	Pradesh Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	UNCHAHAH TPS	4	210.00	22-10-1999
105	Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	KORBA STPS	1	200.00	28-02-1983
106	Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	KORBA STPS	2	200.00	31-10-1983
107	Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	KORBA STPS	3	200.00	17-03-1984
108	Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	KORBA STPS	4	500.00	31-05-1987
109	Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	KORBA STPS	5	500.00	25-03-1988
110	Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	KORBA STPS	6	500.00	26-02-1989

111	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	1	210.00	10-10-1987
112	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	2	210.00	23-07-1988
113	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	3	210.00	03-02-1989
114	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	4	210.00	26-12-1989
115	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	5	210.00	31-03-1990
116	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	6	210.00	01-02-1991
117	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	7	500.00	03-03-1999
118	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	8	500.00	26-02-2000
119	Telangana	Central Sector	NTPC LIMITED	NTPC	RAMAGUNDEM STPS	1	200.00	27-10-1983
120	Telangana	Central Sector	NTPC LIMITED	NTPC	RAMAGUNDEM STPS	2	200.00	29-05-1984
121	Telangana	Central Sector	NTPC LIMITED	NTPC	RAMAGUNDEM STPS	3	200.00	13-12-1984
122	Telangana	Central Sector	NTPC LIMITED	NTPC	RAMAGUNDEM STPS	4	500.00	26-06-1988
123	Telangana	Central Sector	NTPC LIMITED	NTPC	RAMAGUNDEM STPS	5	500.00	26-03-1989
124	Telangana	Central Sector	NTPC LIMITED	NTPC	RAMAGUNDEM STPS	6	500.00	16-10-1989
125	Andhra Pradesh	Central Sector	NTPC LIMITED	NTPC	SIMHADRI	1	500.00	22-02-2002
126	Andhra Pradesh	Central Sector	NTPC LIMITED	NTPC	SIMHADRI	2	500.00	24-08-2002
127	West Bengal	Central Sector	DAMODAR VALLEY CORPORATION	DVC	MEJIA TPS	1	210.00	01-03-1996
128	West Bengal	Central Sector	DAMODAR VALLEY CORPORATION	DVC	MEJIA TPS	2	210.00	24-03-1997
129	West Bengal	Central Sector	DAMODAR VALLEY CORPORATION	DVC	MEJIA TPS	3	210.00	25-03-1998
130	West Bengal	Central Sector	NTPC LIMITED	NTPC	FARAKKA STPS	1	200.00	01-01-1986
131	West Bengal	Central Sector	NTPC LIMITED	NTPC	FARAKKA STPS	2	200.00	24-12-1986
132	West Bengal	Central Sector	NTPC LIMITED	NTPC	FARAKKA STPS	3	200.00	06-08-1987
133	West Bengal	Central Sector	NTPC LIMITED	NTPC	FARAKKA STPS	4	500.00	25-09-1992
134	Bengal	Central Sector	NTPC LIMITED	NTPC	FARAKKA STPS	5	500.00	16-02-1994
135	Bihar	Central Sector	NTPC LIMITED	NTPC	KAHALGAON TPS	1	210.00	31-03-1992
136	Bihar	Central Sector	NTPC LIMITED	NTPC	KAHALGAON TPS	2	210.00	17-03-1994
137	Bihar	Central Sector	NTPC LIMITED	NTPC	KAHALGAON TPS	3	210.00	24-03-1995
138	Bihar	Central Sector	NTPC LIMITED	NTPC	KAHALGAON TPS	4	210.00	18-03-1996

139	Odisha	Central Sector	NTPC LIMITED	NTPC	TALCHER STPS	1	500.00	19-02-1995
140	Odisha	Central Sector	NTPC LIMITED	NTPC	TALCHER STPS	2	500.00	27-03-1996
141	Tamil Nadu	Central	NEYVELI LIGNITE	NEYVELI LIGNITE	NEYVELI ( EXT) TPS	1	210.00	21-10-2002
142	Tamil Nadu	Central	NEYVELI LIGNITE	NEYVELI LIGNITE	NEYVELI TPS-II	1	210.00	17-01-1988
143	Tamil Nadu	Central	NEYVELI LIGNITE	NEYVELI LIGNITE	NEYVELI TPS-II	2	210.00	06-02-1987
144	Tamil Nadu	Central	NEYVELI LIGNITE	NEYVELI LIGNITE	NEYVELI TPS-II	3	210.00	29-03-1987
145	Tamil Nadu	Central	NEYVELI LIGNITE	NEYVELI LIGNITE	NEYVELI TPS-II	4	210.00	30-03-1991
146	Tamil Nadu	Central	NEYVELI LIGNITE	NEYVELI LIGNITE	NEYVELI TPS-II	5	210.00	31-12-1991
147	Tamil Nadu	Central	NEYVELI LIGNITE	NEYVELI LIGNITE	NEYVELI TPS-II	6	210.00	30-10-1992
148	Tamil Nadu	Central	NEYVELI LIGNITE	NEYVELI LIGNITE	NEYVELI TPS-II	7	210.00	19-06-1993
149	Tamil Nadu	Private	TAQA	TAQA	NEYVELI TPS(Z)	1	250.00	21-10-2002
<b>Sub Total</b>						<b>149</b>	<b>38360.00</b>	

Potential Thermal Units for R&M with age older than 20years as on 31.12.2023

Sr. No.	State	Sector	Developer	Organisation	Name of Project	Unit No	Capacity	Date of Commissioning
1	Rajasthan	State Sector	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED	RRVUNL	KOTA TPS	6	195.00	30-07-2003
2	Rajasthan	State Sector	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED	RRVUNL	SURATGARH TPS	5	250.00	30-06-2003
3	Odisha	Central Sector	NTPC LIMITED	NTPC	TALCHER STPS	3	500.00	21-02-2003
4	Odisha	Central Sector	NTPC LIMITED	NTPC	TALCHER STPS	4	500.00	25-10-2003
<b>Sub Total</b>						<b>4</b>	<b>1445.00</b>	

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Sr. No.	State	Sector	Developer	Organisation	Name of Project	Unit No	Capacity	Date of Commissioning
1	Haryana	State Sector	HARYANA POWER GENERATION CORPORATION LIMITED	HPGCL	PANIPAT TPS	7	250.00	28-09-2004
2	Telangana West	Central Sector	NTPC LIMITED DAMODAR VALLEY CORPORATION	NTPC	RAMAGUNDEM STPS	7	500.00	26-09-2004
3	Bengal	Central Sector	DVC CORPORATION	DVC	MEJIA TPS	4	210.00	12-10-2004
4	Odisha	Central Sector	NTPC LIMITED	NTPC	TALCHER STPS	5	500.00	13-05-2004
<b>Sub Total</b>						<b>4</b>	<b>1460.00</b>	

Potential Thermal Units for R&M with age older than 20years as on 31.12.2025

Sr. No.	State	Sector	Developer	Organisation	Name of Project	Unit No	Capacity	Date of Commissioning
1	Haryana	State Sector	HARYANA POWER GENERATION CORPORATION LIMITED	HPGCL	PANIPAT TPS	8	250.00	28-01-2005
2	Uttar Pradesh	Central Sector	NTPC LIMITED	NTPC	RIHAND STPS	3	500.00	31-01-2005
3	Uttar Pradesh	Central Sector	NTPC LIMITED	NTPC	RIHAND STPS	4	500.00	24-09-2005
4	Odisha	Central Sector	NTPC LIMITED	NTPC	TALCHER STPS	6	500.00	06-02-2005
<b>Sub Total</b>						<b>4</b>	<b>1750.00</b>	

Potential Thermal Units for R&M with age older than 20years as on 31.12.2026

Sr. No.	State	Sector	Developer	Organisation	Name of Project	Unit No	Capacity	Date of Commissioning
1	Uttar Pradesh	State Sector	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED	UPRVUNL	PARICHHA TPS	3	210.00	29-03-2006
2	Uttar Pradesh	State Sector	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LIMITED	UPRVUNL	PARICHHA TPS	4	210.00	28-12-2006
3	Uttar Pradesh	Central Sector	NTPC LIMITED	NTPC	UNCHA HAR TPS	5	210.00	28-09-2006
4	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	9	500.00	27-07-2006
<b>Sub Total</b>						<b>4</b>	<b>1130.00</b>	

Potential Thermal Units for R&M with age older than 20years as on 31.12.2027

Sr. No.	State	Sector	Developer	Organisation	Name of Project	Unit No	Capacity	Date of Commissioning
1	Haryana	State Sector	HARYANA POWER GENERATION CORPORATION LIMITED	HPGCL	YAMUNA NAGAR TPS	1	300.00	01-11-2007
2	Chhattisgarh	State Sector	CHHATTISGARH STATE POWER GENERATION CO. LTD.	CSPGCL	DSPM TPS	1	250.00	30-03-2007
3	Chhattisgarh	State Sector	CHHATTISGARH STATE POWER GENERATION CO. LTD.	CSPGCL	DSPM TPS	2	250.00	11-12-2007
4	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	SANJAY GANDHI TPS	5	500.00	18-06-2007
5	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	PARAS TPS	1	250.00	31-05-2007

6	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	PARLI TPS	6	250.00	16-02-2007
7	Andhra Pradesh	State Sector	ANDHRA PRADESH POWER GENERATION CORP. LIMITED	APGENCO	RAYALASEEMA TPS	3	210.00	25-01-2007
8	Andhra Pradesh	State Sector	ANDHRA PRADESH POWER GENERATION CORP. LIMITED	APGENCO	RAYALASEEMA TPS	4	210.00	20-11-2007
9	Karnataka	State Sector	KARNATAKA POWER CORPORATION LIMITED	KPCL	BELLARY TPS	1	500.00	03-12-2007
10	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDCL	BAKRESWAR TPS	5	210.00	24-12-2007
11	West Bengal	State Sector	DURGAPUR PROJECTS LIMITED	DPL	D.P.L. TPS	7	300.00	24-11-2007
12	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDCL	SAGARDIGHI TPS	2	300.00	21-12-2007
13	West Bengal	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDCL	SANTALDIH TPS	5	250.00	07-11-2007
14	Chhattisgarh	Private Sector	JINDAL POWER LTD.	JPL	OP JINDAL TPS	1	250.00	02-09-2007
15	Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	SIPAT STPS	4	500.00	27-05-2007
16	Madhya Pradesh	Central Sector	NTPC LIMITED	NTPC	VINDHYACHAL STPS	10	500.00	08-03-2007
17	West Bengal	Central Sector	DAMODAR VALLEY CORPORATION	DVC	MEJIA TPS	5	250.00	01-10-2007
18	Bihar	Central Sector	NTPC LIMITED	NTPC	KAHALGAON TPS	5	500.00	31-03-2007
<b>Sub Total</b>						<b>18</b>	<b>5780.00</b>	

Potential Thermal Units for R&M with age older than 20years as on 31.12.2028

Sr. No.	State	Sector	Developer	Organisation	Name of Project	Unit No	Capacity	Date of Commissioning
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1	Haryana	State Sector	HARYANA POWER GENERATION CORPORATION LIMITED	HPGCL	YAMUNA NAGAR TPS	2	300.00	29-03-2008
2	Punjab	State Sector	PUNJAB STATE POWER CORP. LTD.	PSPCL	GH TPS (LEH.MOH.)	3	250.00	03-01-2008
3	Punjab	State Sector	PUNJAB STATE POWER CORP. LTD.	PSPCL	GH TPS (LEH.MOH.)	4	250.00	31-07-2008
4	Madhya Pradesh	State Sector	M. P. POWER GENERATING CORPORATION LIMITED	MPPGCL	AMARKANTAK EXT TPS	3	210.00	15-06-2008

5	West Bengal Chhattisgarh	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	SAGARDIGHI TPS	1	300.00	20-07-2008
6	h Chhattisgarh	Private Sector	JINDAL POWER LTD.	JPL	OP JINDAL TPS	2	250.00	10-02-2008
7	h Chhattisgarh	Private Sector	JINDAL POWER LTD.	JPL	OP JINDAL TPS	3	250.00	06-03-2008
8	h Chhattisgarh	Private Sector	JINDAL POWER LTD.	JPL	OP JINDAL TPS	4	250.00	17-06-2008
9	h Chhattisgarh	Central Sector	NTPC-SAIL POWER COMPANY LIMITED	NSPCL	BHILAI TPS	1	250.00	20-04-2008
10	h Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	SIPAT STPS	5	500.00	13-08-2008
11	Bihar	Central Sector	NTPC LIMITED	NTPC	KAHALGAON TPS	6	500.00	16-03-2008
<b>Sub Total</b>						<b>11</b>	<b>3310.00</b>	

Potential Thermal Units for R&M with age older than 20years as on 31.12.2029

Sr. No.	State	Sector	Developer	Organisation	Name of Project	Unit No	Capacity	Date of Commissioning
1	Rajasthan	State Sector	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED	RRVUNL	CHHABRA-I PH-1 TPP	1	250.00	30-10-2009
2	Rajasthan	State Sector	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED	RRVUNL	KOTA TPS	7	195.00	31-08-2009
3	Rajasthan	State Sector	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED	RRVUNL	SURATGARH TPS	6	250.00	29-08-2009
4	Andhra Pradesh	State Sector	ANDHRA PRADESH POWER GENERATION CORP. LIMITED	APGENCO	Dr. N.TATA RAO TPS	7	500.00	08-10-2009
5	West Bengal Chhattisgarh	State Sector	WEST BENGAL POWER DEVELOPMENT CORP. LIMITED	WBPDC	BAKRESWAR TPS	1	210.00	07-06-2009
6	h Chhattisgarh	Private Sector	LANCO AMARKANTAK POWER PVT. LTD.	LANCO	PATHADI TPP	1	300.00	04-06-2009
7	Gujarat Maharashtra	Private Sector	ADANI POWER LTD.	APL	MUNDRA TPS-I & II	1	330.00	04-08-2009
8	ra	Private Sector	TATA POWER COMPANY LTD.	TATA PCL	TROMBAY TPS	8	250.00	26-03-2009
9	Karnataka	Private Sector	JSW ENERGY LTD.	JSWEL	TORANGALLU TPS(SBU-II)	1	300.00	23-04-2009
10	Karnataka	Private Sector	JSW ENERGY LTD.	JSWEL	TORANGALLU TPS(SBU-II)	2	300.00	24-08-2009
11	West Bengal	Private Sector	CALCUTTA ELECTRIC SUPPLY CO. LTD.	CESC	BUDGE BUDGE TPS	3	250.00	29-09-2009
12	h Chhattisgarh	Central Sector	NTPC-SAIL POWER COMPANY LIMITED	NSPCL	BHILAI TPS	2	250.00	12-07-2009



13	Jharkhand	Central Sector	DAMODAR VALLEY CORPORATION	DVC	CHANDRAPURA(DVC) TPS	7	250.00	04-11-2009
14	Bihar	Central Sector	NTPC LIMITED	NTPC	KAHALGAON TPS	7	500.00	31-07-2009
<b>Sub Total</b>						14	4135.00	

Potential Thermal Units for R&M with age older than 20years as on 31.12.2030

Sr. No.	State	Sector	Developer	Organisation	Name of Project	Unit No	Capacity	Date of Commissioning
1	Haryana	State Sector	HARYANA POWER GENERATION CORPORATION LIMITED	HPGCL	RAJIV GANDHI TPS	1	600.00	31-03-2010
2	Haryana	State Sector	HARYANA POWER GENERATION CORPORATION LIMITED	HPGCL	RAJIV GANDHI TPS	2	600.00	01-10-2010
3	Rajasthan	State Sector	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED	RRVUNL	CHHABRA-I PH-1 TPP	2	250.00	04-05-2010
4	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	PARAS TPS	2	250.00	27-03-2010
5	Maharashtra	State Sector	MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED	MAHAGENCO	PARLI TPS	7	250.00	10-02-2010
6	Andhra Pradesh	State Sector	ANDHRA PRADESH POWER GENERATION CORP. LIMITED	APGENCO	RAYALASEEMA TPS	5	210.00	31-12-2010
7	Telangana	State Sector	TELANGANA STATE GENCO	TSGENCO	KAKATIYA TPS	1	500.00	27-05-2010
8	Karnataka	State Sector	KARNATAKA POWER CORPORATION LIMITED	KPCL	RAICHUR TPS	8	250.00	26-06-2010
9	Uttar Pradesh	Private Sector	ROSA POWER SUPPLY CO. LTD.	RPSCL	ROSA TPP Ph-I	1	300.00	10-02-2010
10	Uttar Pradesh	Private Sector	ROSA POWER SUPPLY CO. LTD.	RPSCL	ROSA TPP Ph-I	2	300.00	26-06-2010
11	Chhattisgarh	Private Sector	LANCO AMARKANTAK POWER PVT. LTD.	LANCO	PATHADI TPP	2	300.00	25-03-2010
12	Gujarat	Private Sector	ADANI POWER LTD.	APL	MUNDRA TPS-I & II	2	330.00	17-03-2010
13	Gujarat	Private Sector	ADANI POWER LTD.	APL	MUNDRA TPS-I & II	3	330.00	02-08-2010
14	Gujarat	Private Sector	ADANI POWER LTD.	APL	MUNDRA TPS-I & II	4	330.00	20-12-2010
15	Gujarat	Private Sector	ADANI POWER LTD.	APL	MUNDRA TPS-I & II	5	660.00	26-12-2010
16	Maharashtra	Private Sector	JSW ENERGY LTD.	JSWEL	JSW RATNAGIRI TPP	1	300.00	24-08-2010
17	Karnataka	Private Sector	UDUPI POWER CORP. LTD.	UPCL	UDUPI TPP	1	600.00	23-07-2010

18	Odisha	Private Sector	VEDANTA LIMITED ARAVALI POWER COMPANY PRIVATE LIMITED	VEDANTA	VEDANTA TPP	2	600.00	29-12-2010
19	Haryana	Central Sector		APCPL	INDIRA GANDHI STPP	1	500.00	31-10-2010
20	Uttar Pradesh	Central Sector	NTPC LIMITED	NTPC	DADRI (NCTPP)	5	490.00	25-01-2010
21	Uttar Pradesh	Central Sector	NTPC LIMITED	NTPC	DADRI (NCTPP)	6	490.00	16-07-2010
22	Chhattisgarh	Central Sector	NTPC LIMITED	NTPC	KORBA STPS	7	500.00	25-11-2010
23	Jharkhand	Central Sector	DAMODAR VALLEY CORPORATION	DVC	CHANDRAPURA(D VC) TPS	8	250.00	31-03-2010
24	West Bengal	Central Sector	DAMODAR VALLEY CORPORATION	DVC	MEJIA TPS	7	500.00	30-09-2010
25	West Bengal	Central Sector	DAMODAR VALLEY CORPORATION	DVC	MEJIA TPS	8	500.00	30-09-2010
					<b>Sub Total</b>	25	10190.00	

**Annexure-III (OMs and Minutes of Meetings)**



No. 11/3/2022-Th.I  
Government of India  
Ministry of Power  
\*\*\*

Shram Shakti Bhawan, Rafi Marg,  
New Delhi, 14<sup>th</sup> March, 2022

**OFFICE MEMORANDUM**

**Sub.: Minutes of the meeting held on 25.02.2022 under the chairmanship of Secretary (Power) on Standard Bidding Documents (SBDs) for Renovation and Modernisation (R&M) of Coal based thermal power stations in India.**

The undersigned is directed to forward herewith Minutes of the Meeting held on 25.02.2022 under the chairmanship of Secretary (Power) on Standard Bidding Documents (SBDs) for Renovation and Modernisation (R&M) of Coal based thermal power stations in India.

**Encl:** As above

(Anoop Singh Bisht)

Under Secretary to the Government of India  
Tele: 23719710

To:

1. Sh. B.K. Arya, Chairperson, CEA, Sewa Bhawan, R.K. Puram, New Delhi
2. Sh. Gurdeep Singh, CMD, NTPC

Copy for information to:

Sr.PPS to Secretary(P)/PPS to AS(VKD)/PS to CE(Th), Ministry of Power

(Anoop Singh Bisht)

Under Secretary to the Government of India  
Tele: 23719710

**Record Notes of Discussion meeting held on 25.02.2022 under the Chairmanship of Secretary (Power) on Standard Bidding Documents (SBDs) for Renovation and Modernisation (R&M) of Coal based thermal power stations in India.**

List of participants is attached at Annexure-I.

1. NTPC made a presentation (enclosed) stating that the presentation was based on data provided by CEA.
2. CMD, NTPC stated that the list of potential thermal units as per CEA for life extension (5.38 GW) and R&M (~ 5GW) seems to be on lower side. It was stated that the potential for R&M was huge especially for non-pit head State Genco utilities which are not being maintained very well.
3. It was proposed that Comprehensive Life Extension (LE)/R&M on "as-is-where-is-basis" based on Residual Life Assessment (RLA)/ Energy Audit Studies is the right approach for reaping full benefits.
4. Secretary (Power) stated that the comprehensive LE/R&M should be defined very clearly in the Standard bidding documents (SBD). The objectives of LE/R&M should also include meeting peak generation targets, lowering of heat rate and ability to run unit on full load and also flexible generation.
5. Apart from the delayed LE/R&M projects, successful examples were also discussed like that of Ukai Unit# 4 where R&M work of Turbine was planned and strategically completed in very short duration (169 days) with substantial improvement in Turbine heat rate.
6. CEA suggested that the plants identified for retirement (approx. capacity of 5 GW) on account of non-compliance to FGD norms may also be considered for running in two-shift operation for meeting the intermittency of RE generation. Director (Projects), NTPC informed that the old thermal plants are not designed for two-shift operation.
7. CEA suggested that measures such as demand driven tariff can be useful to manage peak demand situations.
8. CMD, NTPC informed that Dry Sorbent Injection System (DSI) for meeting environmental norms for SO<sub>x</sub> reduction has been commissioned successfully in Dadri Unit #1 to 4 (210 MW). It was discussed that smaller units with space constraint and lower remaining useful life may adopt DSI technology for SO<sub>x</sub> reduction.
9. Secretary (Power) in his concluding remarks mentioned that a team comprising of representatives from NTPC, CEA, GSECL and BHEL be constituted for studying the various aspects of Life extension and R&M of Coal based thermal power stations in India covering the following:
  - a. Guidelines for choosing the candidate plants for R&M.
  - b. Objectives of R&M in these plants and viable business model.
  - c. Model document for bidding for R&M
- 9.1 It was advised that the study be completed within one month.

The meeting ended with a vote of thanks to all the participants.

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Annexure

List of Participants in meeting under chairmanship of Secretary(Power) on SBDs on R&M of Coal based Thermal Power Stations in India, held on 25.02.2022

Sl No.	Name	Organization
1.	Sh. Alok Kumar	Secretary (Power)
2.	Sh. V.K. Dewangan	Additional Secretary, Ministry of Power
3.	Sh. Sanjeev Kumar Kassi	Chief Engineer (Thermal), Ministry of Power
4.	Sh. Anoop Singh Bisht	Under Secretary (Thermal), Ministry of Power
5.	Sh. B.K. Arya	Chairperson, CEA
6.	Sh. Gurdeep Singh	CMD, NTPC



भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

केन्द्रीय विद्युत प्राधिकरण

Central Electricity Authority

तापीय परियोजना नवीनीकरण एवं आधुनिकीकरण प्रभाग

Thermal Project Renovation &amp; Modernization Division

No.: CEA-TH-14-23-/2/2022/-TRM division/ 72-84

Dated 16.03.2022

## OFFICE MEMORANDUM

**विषय:** Committee formation on the direction of Secretary (Power) in meeting held on 25.02.2022 to study various aspects of Life extension and R&M of coal based thermal power stations - reg.

Reference is invited to MoP OM no. 11/3/2022-Th.I dated 14.03.2022 forwarding minutes of meeting held under chairmanship of Secretary (Power) on standard bidding documents for R&M of coal based thermal power stations. Under para-9 of minutes of meeting, Secretary (Power) directed to constitute a team/committee comprising of representatives from NTPC, CEA, GSECL and BHEL to study various aspects of Life extension and R&M coal based thermal power stations.

In this regard, a high level committee has been decided to constitute under chairmanship of Member (Thermal), CEA comprising following members:

Representative (Sr. level) from NTPC	Member
Representative (Sr. level) from GSECL	Member
Representative (Sr. level) from BHEL	Member
Representative from TE&TD division, CEA	Member
Representative from IRP division, CEA	Member
Representative from F&CA division, CEA	Member
Chief Engineer, TPR&M division, CEA	Member & Convener

The following subjects shall be covered by the high level committee:

- Guidelines for choosing the candidate plants for R&M.
- Objective of R&M in these plants and viable business model
- Model document for bidding for R&M

The high level committee may submit it's report within one month. The committee may co-opt other members, if required.

  
(V. K. Mishra)  
Secretary, CEA

To:

- Member (Thermal), CEA