Comments / Suggestions from stakeholders on Draft Energy Performance Norms for Thermal Power Generating Units

1. BACKGROUND

1.1 All India Installed Capacity as on July, 2019 stood at 3,57,874 MW; of which 1,05,076 MW and 86,596 MW i.e. 29.36 per cent and 24.19 percentage is installed in the State and Central sector respectively.

1.2 Coal is the single largest source of energy for electricity production. As on July 2019, out of 2,26,324 MW of thermal capacity, 2,00,749 MW is from Coal & lignite. Further, 45,399 MW is from hydro, 6,780 MW is from nuclear and 79,371 MW is from renewable energy.

Sources	Thermal	Renewable	Hydro	Nuclear	Total
Share (MW)	226324	79371	45399	6780	357874

Table 1: Indian Power installed capacity breakup

2. INTENT OF RETIREMENT OF OLD AND INEFFICIENCT COAL BASED THERMAL POWER PLANTS

2.1 In the last 6 years, approximately 1,10,000 MW capacity has been added including 100,000 MW from coal based plants. However, the demand has not increased at the same pace. As a result, the available capacity is more than the demand and peak power shortage has reduced from 8.71 per cent in 2012-13 to 0.7 per cent in 2017-18. As a result, large capacity is lying underutilized.

2.2 At the same time, there are many old plants in operation with high heat rate which are also non-compliant with environmental norms. The specific coal consumption of such plants is also higher than the new and more efficient plants. In order to ensure efficient utilization of scarce coal resources and curb pollution, old and high heat rate plants not complying with proposed heat rate may be considered for retirement in a phased manner keeping in mind that there is no demand/supply mismatch.

State / Central Units (based on Gross Operating Heat Rate data for 2017-18)						
	Age (>25 yrs)					
	>2600 Kcal/Kwh		>2800 Kcal/Kwh		>3000 Kcal/Kwh	
	Nos.	**Capacity (MW)**	Nos.	Capacity (MW)	Nos.	Capacity (MW)
State	**63**	**9976**	37	4674	19	2305
Centre (NTPC)	**16**	**1715**	8	680	0	0
Centre (DVC)	**2**	**340**	2	340	1	130
Total	**81**	**12031.5**	**47**	**5694**	**20**	**2435**

Table 2: TPPs Units under proposed Age and Gross Operating Heat Rate (GOHR) criteria

3. NEED FOR POLICY GUIDELINES

3.1 In its report of the High Level Empowered Committee (HLEC) to Address the issues of Stressed Thermal power Projects, Ministry of Power stated that old and inefficient plants of 8470 MW of capacity have already been retired and approximately another 10,000 MW of capacity have been identified for retirement in next 2 - 3 years.

3.2 The Committee recommends that guidelines to be laid down for retirement of old and inefficient capacity.

3.3 With reference to the OFFICE MEMORANDUM (**No. L-2/2018-IPC(Part-4)**) dated 08.03.2019 regarding ACQ based on efficiency, ACQ per MW entitlement for all thermal power plants, irrespective of their age or technical parameter, shall be calculated based on Normative Station Heat Rate with upper ceiling of 2600 kcal/kwh.

3.4 The Bureau of Energy Efficiency (BEE) in association with CEA, efficiency based criteria has considered to specify the norms for generation of electricity by such plants.

DRAFT NOTIFICATION

[To be published in the Gazette of India, Extraordinary Part-II, Section-3 (ii)]

MINISTRY OF POWER

NOTIFICATION

New Delhi, the XX of August 2019

S.O.XXX(E)- In exercise of the powers conferred under sub-section (a) of Section 14, Section 18, read with Section 55 of the Energy Conservation Act, 2001 (52 of 2001), the Central Government, in consultation with Bureau of Energy Efficiency, hereby specifies the following norms for retirement or renovation and modernization of coal based thermal power generation units:

1. Thermal power generation units:
    i. which have been in commercial operation for a period of twenty five (25) years from the date of commencement of their commercial operations, by whatever name called; and
    ii. whose average gross operating heat rate is equal to or more than 2600 Kcal/kWh by reference to generation of power in the immediately preceding (02) years of commercial operation,

    shall comply with the procedure set out in Annexure-A (*Procedure for Implementation of Norms*).

2. The renovation, modernization and life extension activities, if any opted by the power generation unit, must be completed within the timeframe mentioned in the CEA's guidelines on 'Renovation and Modernization/ Life Extension of Coal/ Lignite based Thermal Power Stations', as the same may be amended from time to time by the Central Electricity Authority.

3. The gross operating heat rate of the power generation unit shall be calculated based on Gross Calorific Value of the coal measured on 'as receipt basis' at the power generation unit.

4. The above norms for retirement or renovation and modernization of the power generation unit shall not be applicable to captive power plants.

The norms notified by way of this Notification shall be deemed to have come into force from the date of its publication in the Official Gazette.

[F. No. XXXXXXX- EC]

EA / Joint Secretary

ANNEXURE-A

METHODOLOGY OF IMPLEMENTATION OF NORMS FOR RETIREMENT OF OLD AND INEFFICIENT THERMAL POWER UNITS

1. Thermal power generation units operating on coal as a fuel:
    a. which have been in commercial operation for a period of twenty five (25) years from the date of commencement of their commercial operations, by whatever name called; and
    b. the average gross operating heat rate of which are equal to or more than 2600 Kcal/kWh by reference to generation of power in the immediately preceding (02) years of commercial operation such units,

    shall submit a report to the Ministry of Power, Government of India; Bureau of Energy Efficiency and Central Electricity Authority, giving out the necessary details in the format set out in **Annexure B (*Format for Intimation*)**, within a time period of three (03) months from the date of this Notification.

2. The Bureau of Energy Efficiency, upon receipt of such report from such thermal power units, may by notice require the relevant power generation units which satisfy the conditions set forth in para 1 above to take a decision on : (i) retirement of relevant power generation unit; or (ii) undertaking renovation and modernization/ life extension activities to reduce their heat rate below 2600 kcal/kWh.

3. The relevant power generation units which have received notices from the Bureau of Energy Efficiency in accordance with para 2 shall, within a time period of five (05) months from the receipt of such notice, intimate their decision on (i) retirement of power generation unit; or (ii) undertaking renovation and modernization/ life extension activities, to the Bureau of Energy Efficiency, in writing.

4. The power generation units which opt to retire their units shall achieve the closure/ retirement of their power generation unit within a time period of three (3) months from the date of intimation of their final decision in terms of clause (3) above to the Bureau of Energy Efficiency.

5. The power generation units which opt to undertake renovation and modernization/ life extension activities so as to reduce their heat rate below 2600 kcal/kWh, shall undertake such activities only in accordance with the methodology and timeframe set out in ‘Guidelines on Renovation and Modernization/ Life Extension of Coal/ Lignite based Thermal Power Stations’,

a copy of which is also set out in **Annexure C (*Guidelines on Renovation and Modernization/ Life Extension*)** of this Notification.

6. Bureau of Energy Efficiency may, in its sole discretion, consult/ hire partner agencies, which have relevant experience and expertise, to assess the feasibility of renovation and modernization/ life extension activities and to monitor the renovation and modernization/ life extension activities of the relevant power generating units.

7. The relevant power generating unit shall at all times allow the employees, officers and agents of Bureau of Energy Efficiency and agencies appointed by Bureau of Energy Efficiency access to the power generating units to carry out their functions, including renovation and modernization/ life extension activities of the relevant power generating units.

ANNEXURE-B

FORMAT FOR INTIMATION

Name of Thermal Power Plant	
Year of Establishment	
Plant Head Detail	
Total Capacity	
Unit configuration	
Unit Proposed for retirement or shut down	
Details of under construction units and probable date of COD	

For previous 2 financial years	**Station gross operating heat rate (Kcal/KWh)**	**Station APC (%)**	**Station PLF**
20__ - 20__			
20__ - 20__			

if inclusion in PAT scheme of BEE	DC Registration No.	PAT Cycle

	Unit Capacity (MW)	**Date of Commissioning**	**For previous 2 financial years**				**Whether plant has undergone for any R&M in past or presently in process of any R&M activity!**	
			20__ - 20__		**20__ - 20__**			
			Unit Gross Operating Heat Rate (Kcal/KWh)	**Unit PLF**	**Unit Gross Operating Heat Rate (Kcal/KWh)**	**Unit PLF**	**R&M Start Date**	**R&M completion date**
Unit -1								
Unit -2								
Unit -3								
Unit -4								
Unit -5								
Unit -6								
Unit -7								
Unit -8								
Unit -9								
Unit -10								

ANNEXURE C

GUIDELINES ON RENOVATION AND MODERNIZATION/ LIFE EXTENSION

Government of India

Ministry of Power

Central Electricity Authority

GUIDELINES FOR RENOVATION AND MODERNISATION / LIFE EXTENTION WORKS

OF

COAL/LIGNITE BASED THERMAL POWER STATIONS

October 2009

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1.0 BACKGROUND

1.1 Coal based thermal power generation provides a major share of power availability in the country. More than 69 % of total generation comes from coal/ lignite based power plants. At present, the maximum thermal generation (73 % of thermal generation) comes from coal / lignite units of 200/210MW and above capacity. The first 200 MW unit was installed at Obra in 1977. Prior to that, the units were of smaller size and many of these were of non-reheat type with lower efficiency. Over a period of past few decades there has been growth in the size of thermal units and in steam parameters resulting in plant's better efficiency.

1.2 Renovation and Modernisation (R&M) and Life Extension (LE) have been recognized as cost effective options to achieve additional generation from existing units at low cost and in shorter period.

1.3 A centrally sponsored R&M Programme was launched in 1984 as Phase-I programme for which financial assistance for implementing R&M works was provided by Govt. of India. The R&M programme continued albeit in a different form subsequently during 9^{th} & 10^{th} plan periods with resultant improved performance from thermal generating units.

1.4 Presently, a large existing capacity i.e. 129 units of total capacity 26283 MW and 95 units of total capacity 21212 MW has been identified for R&M/LE works during 11^{th} plan and 12^{th} plan period. The old and small size units of early post- independence period were based on technology as available at that time having a very low efficiency. These units are therefore near obsolescence. The LMZ Russian design larger size units (200/210MW) and initial KWU design machines are now in fag end of their economic life span. Further, though there has been gradual improvement in plant load factor over the years, there exists a lot of scope for further improvement. These groups of 200/210 MW machines (LMZ design and early KWU design machines) constitute a major chunk of R&M/LE programme in the 11^{th} plan and beyond.

2.0 INTENT OF RENOVATION & MODERNISATION (R&M)/LIFE EXTENSION (LE) PROGRAMME

2.1 There has been substantial increase in capacity addition in the successive five year plans of the country, yet there still exists a gap between demand and availability of power. The new installation being capital intensive, it is considered prudent to maximise the generation from the existing power stations to ensure optimal utilisation of resources. This would involve replacement of the existing obsolete items of equipment in operation with those with more efficient and of latest designs incorporating the state-of-the-art technologies and improved metallurgy.

2.2 Many thermal power stations in the country were designed for a given quality of coal, which has deteriorated over a period of time. The design PLF was also based on the norms prevailing at that time which is below rated value. The

capacity of the raw coal feeding system, pulverizers, primary air fan system, ash handling system etc., for these power stations may have to be augmented to maintain the rated capacity of the boiler, provided the furnace size is adequate to burn the coal of deteriorated quality.

2.3 The environmental regulations are becoming more and more stringent day by day. The plants which were designed earlier were provided with less effective environmental systems which do not meet the present day standards, requiring either refurbishing the systems or complete replacement.

2.4 The R&M/LE programme may be designed in such a way so as to improve the plant performance and efficiency enhancement.

3.0 NEED FOR REVISED POLICY GUIDELINES

3.1 The Government of India have accorded a high priority to the R&M and Life Extension of thermal power stations to maximise generation and improve their overall performance.

With a view to expediting the R&M/LE works during the 10th Plan period, Govt of India, Ministry of Power issued guidelines vide letter No. 12/6/99-Th-3 Dated 12.1.2004 and subsequent clarification dated 3.2.2004.

3.2 However, necessity has been felt to revise the above guidelines due to the following:

i) There have been delays in achieving the desired completion targets.
ii) Constraints are being experienced in supply of materials resulting in time/cost overruns.
iii) A large number of units of 200MW capacity and above are becoming due for R&M/LE works necessitating need for more agencies to carryout R&M/LE works.
iv) The objective is shifting from 'generation maximization' to 'performance optimization and generation maximisation' with efficiency enhancement and plant uprating becoming an integral part of the life extension programme.

3.3 The above requirements call for new approach towards implementation of R&M/LE works by the utilities through identification of optimized R&M options, compressed and definite time schedule and encouraging increased participation from various executing agencies including private sector. Accordingly, the earlier guidelines have been revised to account for the above.

4.0 CONCEPT OF R&M AND LIFE EXTENSION PROGRAMME OF THERMAL (COAL/LIGNITE BASED) POWER STATIONS

4.1 RENOVATION AND MODERNISATION (R&M) PROGRAMME

4.1.1 The main objective of R&M of power generating units is to make the operating units well equipped with modified / augmented latest technology equipment /components/ systems with a view to improving their performance in terms of output, reliability and availability to the original design values, reduction in maintenance requirements, ease of maintenance and enhanced efficiency.

4.1.2 However, R&M is not a substitute for regular annual or capital maintenance/overhaul which forms a part of operation and maintenance (O&M) activity. Middle life R&M come up preferably after 100000 hrs. of operation.

4.1.3 The R&M programme is primarily aimed at generation sustenance and overcoming problems due to:

- Generic defects.
- Design deficiencies /modifications.
- Avoidance of inefficient operation
- Non-availability of spares because of obsolescence of equipment / components.
- Poor quality of coal.
- Major replacements of equipment arising due to unforeseen failures and /or generation sustenance not covered under regular O&M.
- Stringent environmental regulation.
- Safety requirements etc.

4.2 R&M PROGRAMME WITH LIFE EXTENSION (LE) & UPRATING (LE&U)

4.2.1 The equipment subjected to fatigue stresses and creep due to high temperatures such as turbine rotor and casings, HP piping, boiler headers, Boiler drum, main steam piping and valves, feed discharge lines etc. are designed for a given fatigue life of about 25-30 years of operation. However, many equipment/ components might become prematurely weak metallographically due to various operational stresses like frequent temperature and pressure excursions, full load trippings, frequent start and stops etc. and accordingly there is need to check the remaining life of these components after about 20 years of life or ***1,60,000*** hours of operation lest it may result into serious failures. A systematic study called the Residual Life Assessment (RLA) study involving non-destructive and destructive tests would reveal the remaining life of various critical components of plants and equipment so as to take steps to extend the life of the plant by a further period of about 15-20 years by appropriate repairs/replacements. A RLA study may be carried out earlier, say after 15 years or 1,00,000 hrs. of operation if the plant condition so necessitates and as stipulated in IBR 391 A.

4.2.2 The LE programme is a major event in the thermal power station's history, 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 technology 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 uprating.

4.3 WORKS NOT RELATING TO R & M / LIFE EXTENSION:

4.3.1 In general, works usually done under routine maintenance and annual or capital maintenance do not fall under the purview of R&M Programme. The repetitive nature of activities having the frequency once in five year or less is covered under O&M.

4.3.2 The following works should not be included as a part of R&M / LE programme:

i) Infrastructural development work such as town ship, welfare measures etc., general civil works within the plant such as boundary wall, roads, drainages etc. However, technological structure works required for equipments / structure based on RLA done as per design criteria (such as turbine deck, foundation etc.) shall be part of LE.

ii) Procurement of spare equipments.

iii) Routine repairs/replacements during annual/capital overhauls.

The expenditure on such works which are of O&M in nature is to be met from O&M charges recovered through tariff for sale of electricity as notified by regulatory commission. O&M ought to be attended on a regular basis lest the condition of the unit should deteriorate to such an extent resulting in major breakdowns requiring huge expenditure.

5.0 RETIREMENT OF VERY OLD UNITS:

A very large number of small size units of 100 MW or less capacity are in operation. The average Plant Load Factor of most of these units is very low, even less than 50%. These units are of non-reheat type having very low design efficiencies. Further, because of their ageing & technological obsolescence, these units are performing at further lower efficiency than their design value. Such units need to be retired in a phased manner. The following approach for non-reheat units and other higher size reheating units may be followed for the purpose :

- Consider for retirement of all non-reheat units of 100 MW or less rating. However, those units on which major R&M/LE activities have been undertaken and are performing well, such units may continue to operate for another 10 years from the date of post R&M/LE to enable them to recover the expenditures incurred.
- Larger size units can also be considered for retirement on economically non-viability on case to case basis.
- The retirement may be prioritized according to their level of performance, say unit heat rate deviating more than 20% to be retired first and subsequently those units with deviation of 15% & 10% from their design heat rate.
- The SEBs/ GENCOs may identify new generating capacity to be added as substitute for older units so that overall installed capacity is not affected.

6.0 METHODOLOGY OF IMPLEMENTATION OF R&M AND LE&U SCHEMES

6.1 R&M Works

It has been observed that the power utilities are adopting following two main variants in implementation of R&M programme.

i) As a rolling plan in which the whole scope of work is conceptualized based on conditions assessment, plant operation data & feed back from O&M engineers / OEM / Consultant recommendations or compliance to statutory norms. Thereafter, the various activities/schemes, so identified are implemented in phases depending on the availability of particular system/unit shutdown. Such approach results in minimizing unit shut down requirement and thereby loss in generation. However, it results in extended execution over a long period of time and benefits accrued can not be co-related with the activities carried out and investment made.

ii) A comprehensive scheme is implemented in a single stretch and taking unit's planned shutdown after ensuring all inputs and supply of materials.

The methodology for implementation is to be decided by the utility. However, the option of comprehensive scheme is preferable due to well definable & quantifiable benefits.

6.2 LE&U Works

In order to implement LE&U works following methodology may be adopted.

i) In order to facilitate the implementation of LE&U works, utilities may appoint reputed consultant for rapid life assessment study, condition assessment, energy auditing, thermal performance test, environmental study, preparation of DPR etc. RLA studies to be conducted on the major plant and equipment through agencies of repute.

ii) Based on DPR a detail technical specification & contract document may be prepared. The contract document, inter-alia shall include provisions of changed scope of work which may come up when the machine / equipment is opened or are identified during detailed RLA studies (as a part of scope of work) to meet the stipulated performance guarantees.

iii) The responsibilities with regard to implementation of LE & U works may be shared as under:

- MOP : Govt. inputs, policy decisions.
- CEA : To follow up/ monitor with Utilities.
- Consultant(s) : To assist the utilities, if required, to carry out RLA, energy audit, preparation of DPR, bid specifications, selection of executing agency, implementation & performance evaluation. One or more consultants may be engaged by the utilities depending on the

scope of work.

- Financial Institutions : To provide funds as loans.

- Executing Agency : Project authorities to carryout the field work.

iv) The following time frame may be adopted for implementing the LE&U schemes:

a) Appointment of consultant by utilities	-	3 months
b) RLA / Energy Audit	-	6 months
c) Freezing the scope of work /activities for LE&U	-	3 to 4 month
d) Preparation of DPR	-	6 to 8 months
e) Placement of order of LE&U	-	6 to 8 months
f) Supply of critical spares	-	16 to 20 months from placement of order.
f) Shut down of unit	-	6 - 8 months.

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.

v) The utility shall appoint a Nodal Officer of the rank of Chief Engineer who will be responsible for monitoring & coordination with all concerned relating to LE&U scheme.

vi) The selection of the executing agency/bidder may be carried through the process of competitive bidding.

vii) The Life Extension & Uprating work will be declared complete on successful continuous running of the unit for 14 days and at least 72 hours at full rated / uprated capacity after recommissioning of the unit.

viii) Life Extension work without the element of uprating (rated capacityand / or efficiency improvement beyond original design values) may be undertaken only in specific cases where uprating is not found techno-economically viable.

ix) The utilities may approach the Government for additional allocation of power to the extent possible from unallocated quota of central sector power stations during the period of shut down of units for comprehensive life extension works.

6.3 Monitoring the progress of implementation of R&M/LE schemes.

(i) R&M / LE&U schemes of Rs.100 Crore and above shall be monitored by MOP/CEA.

(ii) The utility shall also have a system of close monitoring of the physical and financial progress of various activities to ensure timely implementation of R&M/ LE&U programme.

(iii) Physical and financial progress report in prescribed format shall be submitted to CEA regularly on quarterly basis.

7.0 COST ESTIMATES

7.1 The estimated cost of the R&M/LE&U scheme has to be worked out based on the estimated cost of the identified individual works. The estimated cost should be, as far as possible, realistic and should be based on current market rates/budgetary offers from the supplying agencies including all taxes and duties. The import content along with the country from where the equipment etc. imported, should be identified. The source of funding is also to be mentioned. The yearly phasing of funds required for implementation of the scheme will have to be given which would help in monitoring the physical and financial progress of the scheme.

7.2 The cost of LE &U works shall not exceed 50% of the EPC cost of a new generating unit of indigenous origin (BHEL). If the 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 pay back period may be limited to 5-7 years.

7.3 In cases, where the cost is estimated to exceed the above limits, a detailed cost comparison & cost benefit analysis shall be carried out between the R&M/LE work and that of setting up a new green field plant.

8.0 COST BENEFIT ANALYSIS

8.1 The investment decision on R&M/LE&U scheme should be driven by economic sensitivity analysis on cost of generation. The benefits in term of increase in PLF (including additional generation and availability, reduction in forced outages), increase in efficiency, reduction in auxiliary power consumption and fuel consumption, improvement in plant safety and environmental up-gradation expected to be achieved after implementation of R&M/LE&U scheme should be clearly brought out. The techno-economic viability will be established in terms of internal rate of return, net present value, pay back period etc. The pay back period for R&M / LE&U should be about 5-7 years.

8.2 The Empowered sub-Committee of the Committee on Infrastructure in its meetings held on 11th January, 2008 and 2nd April 2008 under the chairmanship of Deputy Chairman, Planning Commission has included R&M of power stations under the

definition of infrastructure. All kind of financial concessions / relaxation towards infrastructure projects as notified by Ministry of Finance from time to time shall also be applicable for R&M / LE&U works.

9.0 PARTICIPATION OF PRIVATE SECTOR IN LE&U PROGRAMME

9.1 In view of the liberalized economic policy of Government of India, private investment including foreign investment, are now allowed in all areas of the power sector. Following alternative options appear practical and feasible for private investment in R&M schemes. However, states/ power utilities may have other innovative options which could also be considered.

(i) Option 1:- Lease, rehabilitate, operate and transfer (LROT)

Under this option, the private promoter (PP) would take over the power station on a long -term lease, say 10 years or more. PP would invest and carry out the R&M of the power station and would takeover its operation and maintenance. Normally, the station would revert to the power utility after completion of the contracted period of lease or may be renewed on terms to be specified. However, legal title and ownership of the plant will remain with the utility throughout. This option would require a detailed lease agreement covering all aspects of financing, performance parameters, use of existing resources, sale of generated power etc.

(ii) Option 2:- Sale of Plant

Power utilities could offer power stations for outright sale to private parties. The present worth of the plant would have to be assessed which could be the reserve price for the sale.

(iii) Option 3:- Joint Venture between Power utility and public or private company.

In this option, a new company will be formed as a joint venture (JV) of the state power utility/ State Government and selected private/public collaborator. The JV company would undertake the R&M/ LE works and own, operate and maintain the power station. The private collaborator could also be an equipment supplier. Each partner shall hold minimum 26% equity in the JV company.

9.2 As a general rule, choice of private promoter should be made through competitive bidding. The above modes are illustrative. Any other mode as may be found suitable by the utility with in the above broad principles may be adopted by the utility.

9.3 Depending on the options preferred by the power utility, the detailed procedure and bid documents may be prepared by the utility/consultant in line with their procurement policies.

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