



सत्यमेव जयते

भारत सरकार / Government of India

विद्युत मंत्रालय / Ministry of Power

केंद्रीय विद्युत प्राधिकरण / Central Electricity Authority

तापीय यांत्रिकी एवं अभियांत्रिकी विकास प्रभाग

Thermal Engineering & Technology Development Division

संख्या: CEA/TETD-TT/2018/N-15/1451

दिनांक : 10.12.2018

सेवा में

✓ सचिव,

केंद्रीय विद्युत विनियामक आयोग,

तीसरी और चौथी मंजिल,

चंद्रलोक बिल्डिंग, 36, जनपथ,

नई दिल्ली - 110 001

**विषय: CERC Terms and Conditions of Tariff for the tariff period starting from 01.04.2019
– CEA Recommendations on Operation Norms for thermal generating stations - के
बारे में.**

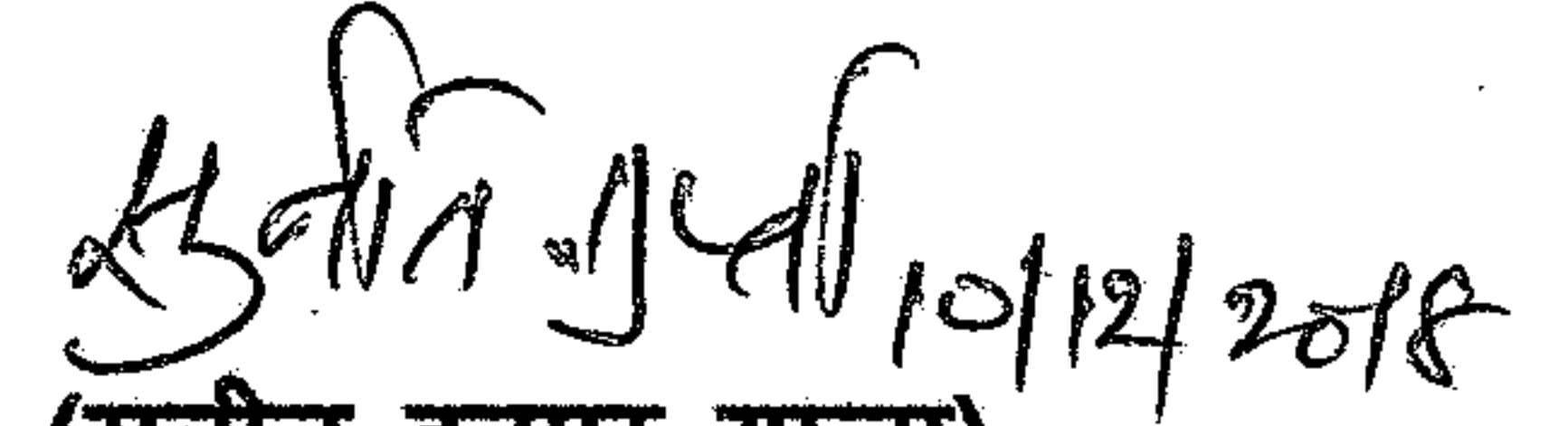
महोदय,

This is with reference to your D.O. letter No. No. 1-1/225/2017– CERC dated 26.03.2018 addressed to Chairperson, CEA requesting for CEA recommendations on the operation norms for hydro and thermal generating stations for the tariff period 2019-24 starting from 01.04.2019. The additional operational norms have also been requested for units/ stations on account of implementation of new environmental norms.

The issue of operation norm for tariff period 2019- 24 has been examined and the Recommendation on Operation Norms for Thermal Generating Stations for the Tariff Period 2019- 24 as approved by Chairperson, CEA is enclosed herewith. The additional operation norm as pertaining to implementation of new environmental norms shall be furnished later.

संलग्नक: यथोपरी.

भवदीय,


(सुनील कुमार गुप्ता)

उप - निदेशक

Copy for kind information to: i) अध्यक्ष, के.वि.प्रा.
ii) सदस्य (तापीय), के.वि.प्रा.
iii) मुख्य अभियंता (टी.ई.टी.डी.)

**Recommendations on Operation Norms for Thermal Generating Stations
for the Tariff Period 2019- 24**

*Reference: Regulation 36 under Chapter 8 in CERC (Terms and Conditions of Tariff)
Regulations, 2014:*

The recommendations of Central Electricity Authority on plant operation norms in respect of thermal generating stations for the tariff period 2019- 2024 are as below:

A. Normative Annual Plant Availability Factor (PAF)

- i) a) All coal/ lignite based thermal generating stations, except those covered under clause ii), iii) & iv) below:

Pithead stations	:	83%
Non-pithead stations:		75% (to be reviewed after 2 years)
First FY after COD	:	68.5%

- i) b) All gas/ liquid fuel based thermal generating stations, except those covered under clause v) below : 85%

- ii) M/s NLCIL's following pulverised lignite fired thermal generating stations:

a) TPS- I	:	72%
b) TPS- II Stage- I & Stage- II	:	80%

- iii) M/s DVC's following coal fired thermal generating stations:

a) Bokaro TPS (210 MW Unit- 3)	:	75%
b) Chandrapura TPS (630 MW)	:	75%
c) Durgapur TPS (210 MW)	:	75%

- iv) Lignite fired generating stations using circulatory fluidized bed combustion (CFBC) technology and generating stations based on coal rejects:

a) First Three years from COD	:	68.5%
b) For next year after completion of three years of COD	:	75%

- v) M/s NEEPCO's gas fired thermal generating stations:

a) Assam GBP	:	72%
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B. Normative secondary fuel oil consumption

- i) Coal-based generating stations other than Farakka, Stage- II TPS and those at (ii) & (iii) below: 0.50 ml/kWh

Farakka, Stage- II TPS : 1.0 ml/kWh

In Farakka, Stage- II TPS there is front fired boiler which requires oil support during every mill changeover. The actual oil consumption is more than around 1.07 ml/kWh during last 5 years.

Further, considering fast pace of renewable energy based capacity addition in the country, it is suggested that norm of specific oil consumption may be suitably reviewed in near future as for its adequacy based on actual consumption under increased flexible operation of the coal and lignite based thermal generating stations.

- ii) Coal-based generating stations of DVC:

- a) Bokaro TPS 210 MW Unit- 3 : 1.5 ml/kWh
- b) Chandrapura TPS (630 MW) : 0.7 ml/kWh
- b) Durgapur TPS (210 MW) : 2.4 ml/kWh
- c) Mejia TPS 210 MW Unit- 1 to 4 : 1.0 ml/kWh

- iii) Lignite-fired generating stations:

- a) Pulverised lignite-fired generating stations except TPS- I : 1.0 ml/kWh
- b) TPS-I : 1.5 ml/kWh
- c) Lignite-fired generating stations based on CFBC technology : 1.0 ml/kWh

- iv) Generating stations based on coal rejects : 2.0 ml/kWh

C. Gross station heat rate

1. Existing Thermal Generating Stations (COD achieved before 1.4.2009):

- i) The normative gross station heat rate for coal based thermal generating units/ stations other than those relaxed norms covered under clause (ii) and (iii) below shall be as under:

200/210/250 MW sets	500 MW sets (sub-critical)
2450 kcal/kWh(no change)	2400 kcal/kWh (increased by 25 kcal/kWh)

*Recommendations to CERC on Operation Norms for Thermal Power Stations for
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Note:

In respect of 500 MW and above units where the boiler feed pumps are electrically operated, the gross station heat rate shall be 40 kcal/kWh lower than the gross station heat rate specified above.

ii) NTPC's coal based thermal generating stations:

Talcher TPS (4x60MW+ 2x110MW)	2830 kcal/kWh
Tanda TPS (4x110MW)	2775 kcal/kWh

ii) DVC's coal based thermal generating stations:

Bokaro TPS 210 MW Unit- 3	2700 kcal/kWh
Chandrapura TPS 130 MW Unit 3	3000 kcal/kWh
Durgapur TPS (210 MW Unit- 4)	2750 kcal/kWh

iii) Lignite fired thermal generating stations:

The relaxed heat rate norms in respect of NLCIL's TPS- I, TPS- I Expansion, TPS- II Stage- I & Stage- II lignite based thermal generating stations shall be as below:

TPS-I (6x50MW+ 3x100MW)	4000 kcal/kWh
TPS-I (Expansion) (2x210MW)	2720 kcal/kWh
TPS-II Stage I (3x210MW) and TPS-II Stage I (4x210MW)	2890 kcal/kWh

v) Open cycle gas turbine/ combine cycle thermal generating stations:

The operation norm for existing open cycle gas turbine/ combine cycle thermal generating stations of NTPC and NEEPCO is proposed to be retained.

2. Existing Thermal Generating Stations (coal & lignite) having COD achieved on or after 1.4.2009 till 31.03.2014:

The normative gross station heat rate of coal-based and lignite-fired thermal generating stations

= 1.05 X Design Heat Rate (kcal/kWh)

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Where the Design Heat Rate of a generating unit means the unit heat rate guaranteed by the supplier at conditions of 100% MCR, zero percent make up, design coal and design cooling water temperature/back pressure.

The design heat rate to be considered for coal based stations shall not exceed the following maximum design unit heat rates depending upon the pressure and temperature ratings of the units:

Pressure Rating (kg/cm ²)	150	170	170	247	247
SHT / RHT (° C)	535/ 535	537/ 537	537/ 565	537/ 565	565/ 593
Type of BFP	Electrical Driven	Turbine Driven	Turbine Driven	Turbine Driven	Turbine Driven
Maximum Design Unit Heat Rate (kcal/ kWh)					
Sub-Bituminous Indian Coal	2300	2294	2276	2235	2176
Bituminous Imported Coal	2197	2191	2174	2135	2097

Further, the applicability of the condition, "Provided that the heat rate norms computed as per above shall be limited to the heat rate norms approved during FY 2009-10 to FY 2013-14." mentioned at end of the regulation may be deleted.

- Existing thermal generating stations (coal & lignite) having COD achieved on or after 1.4.2014 till 31.3.2019 and new thermal generating stations (coal & lignite) achieving COD on or after 1.4.2019

The normative gross station heat rate of coal-based and lignite-fired thermal generating stations

$$= 1.05 \times \text{Design Heat Rate (kcal/kWh)}$$

Where the Design Heat Rate of a generating unit means the unit heat rate guaranteed by the supplier at conditions of 100% MCR, zero percent make up, design coal and design cooling water temperature/back pressure.

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The design heat rate to be considered for coal based stations shall not exceed the following maximum design unit heat rates depending upon the pressure and temperature ratings of the units:

Pressure Rating (kg/cm ²)	170	247	247	270	270
SHT / RHT (° C)	537/ 565	537/ 565	565/ 593	593/ 593	600/ 600
Type of BFP	Turbine Driven	Turbine Driven	Turbine Driven	Turbine Driven	Turbine Driven
Maximum Design Unit Heat Rate (kcal/kWh)					
Sub-Bituminous Indian Coal	2250	2235	2176	2093	2081
Bituminous Imported Coal	2174	2135	2078	2022	2011

i) Further, the applicability of the condition that the heat rate norms computed as per above shall be limited to the heat rate norms approved during last tariff period mentioned at end of the regulation may be deleted.

ii) The impact of dry cooling system on design heat rate shall be mentioned as below:

“Provided also that maximum turbine cycle heat rate and maximum design unit heat rate shall be increased by 6% each for units based on dry cooling system.”

iii) The impact of change of BFP drive from steam turbine driven to electric motor driven on unit heat rate shall be mentioned as below:

“In respect of generating units where the boiler feed pumps are electrically operated, the maximum design unit heat rate shall be 40 kcal/kWh (60 kcal/kWh for supercritical units) lower than the maximum design unit heat rate specified above with turbine driven BFP.”

4. Gas-based/ Liquid-based thermal generating unit(s)/ block(s) having COD on or after 01.04.2009:

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The existing operation norms as at CERC Regulation 36(C)(d) are proposed to be retained.

Further, the applicability of the condition, "Provided that the heat rate norms computed as per above shall be limited to the heat rate norms approved during FY 2009-10 to FY 2013-14." mentioned at end of the regulation may be deleted.

D. Auxiliary energy consumption

1. Coal Based Thermal Generating Stations:

i) Coal-based thermal generating stations except at (ii) & (iii) below:

	(auxiliary energy consumption as % of gross generation)	
	Without IDCT	With IDCT
200 to 270 MW unit generating stations	8.5%	9.0%
300 to 800 MW unit generating stations (With steam turbine driven boiler feed pumps)	5.75%	6.25%
300 to 800 MW Sub- critical units (With electric motor driven boiler feed pumps)	8.0%	8.5%
300 to 800 MW Super-critical units (With electric motor driven boiler feed pumps)	9.0%	9.5%

In case of thermal generating stations provided with tube and ball mills, the additional auxiliary energy consumption allowed shall be 0.7%.

In case of thermal generating stations provided with Dry Cooling Systems, the additional auxiliary energy consumption allowed shall be as below:

Type of dry cooling system	(% of gross generation)
Direct cooling air cooled condensers with mechanical draft fans	1.0%
Indirect cooling system employing jet condensers with pressure recovery turbine and natural draft tower	0.5%

ii) NTPC's coal based thermal generating stations:

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Talcher Thermal Power Station (460 MW)	10.50%
Tanda Thermal Power Station (440 MW)	11.70%

iii) DVC's coal based thermal generating stations:

Bokaro Thermal Power Station 210 MW Unit- 3	10.25%
Chandrapur Thermal Power Station (630 MW)	9.50%
Durgapur Thermal Power Station (210 MW Unit- 4)	10.50%

2. Lignite Based Thermal Generating Stations:

- i) For all pulverised lignite fired thermal generating stations with 200 MW sets and above, the auxiliary energy consumption norms shall be 0.5 percentage point more than the auxiliary energy consumption norms of coal-based generating stations except at (ii) below.
- ii) M/s NLCIL's pulverised lignite fired generating stations:

TPS-I (600 MW)	12.0 %
TPS-II stage- I (630 MW)	9.85 %
TPS- II stage- II (840 MW)	9.85%

- iii) For lignite fired thermal generating stations using CFBC technology, the auxiliary energy consumption norms shall be 1.5 percentage point more than the auxiliary energy consumption norms of coal-based generating stations except at (iv) below.
- iv) M/s NLCIL's CFBC technology based lignite fired generating stations:

Barsingsar TPS (250 MW)	12.5 %
TPS-II Expansion (500 MW)	12.5 %

3. Gas Turbine/ Combined Cycle Generating Stations:

- i) Gas turbine/ combined cycle generating stations, except those at (ii) below:
- a) Combined cycle generating stations : 2.5%
- b) Open cycle generating stations : 1.0%
- ii) a) NEEPCO's Tripura CCPP (101 MW) : 4.2%
- b) NTPC's Kayamkulam CCPP (359.58 MW) : 2.7%

c) ONGC- TPCL's Palatana CCPP (726.6 MW) : 3.5%

E. Annual Plant Load Factor (PLF) for Incentive

The level of Annual Plant Load Factor (PLF) for Incentive is recommended at the same level of Normative Annual Plant Availability Factor (NAPAF) for the station for the year.

F. Impact of Part Load Operation on Performance of Thermal Generating Stations:

1. Coal/ lignite based thermal generating stations:

i) Impact on station heat rate:

The currently applicable factors for unit heat rate degradation at part loading for sub- critical and super- critical units as notified by CERC vide its notification dated 6.4.2016 are proposed to be modified as below:

Sl. No.	Unit loading (%)	Unit HR degradation (%)	
		Sub- critical units	Super- critical units
1.	90 – 100	0	0
2.	80 - 89.99	1.3	0.9
3.	70 - 79.99	2.8	2.1
4.	60 - 69.99	4.8	3.7
5.	50 - 59.99	7.2	5.7
6.	40 - 49.99	10.0	8.0

ii) Impact on auxiliary energy consumption:

The currently admissible additional auxiliary energy consumption values at part loading of coal/ lignite based thermal generating station as notified by CERC vide notification dated 6.4.2016 are proposed to be appropriately modified as below:

Sl. No.	Module/ plant loading as % of installed capacity	Admissible % degradation in auxiliary energy consumption (% point)
1.	90 to 100	Nil

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2.	80 to 89.99	0.25
3.	70 to 79.99	0.50
4.	60 to 69.99	0.80
5.	50 to 59.99	1.20
6.	40 to 49.99	1.80

2. Gas/ liquid fuel based thermal generating stations:

i) Impact on station heat rate:

The degradation of module/ plant heat rate for gas/ liquid fuel based thermal generating stations in CCGT mode of operation are proposed to be considered as below:

Sl. No.	Module/ plant loading as % of installed capacity	Increase in module/ plant heat rate (%)
1.	90 to 100	Nil
2.	80 to 89.99	2.5
3.	70 to 79.99	5
4.	60 to 69.99	8
5.	50 to 59.99	12

ii) Impact on auxiliary energy consumption:

The additional auxiliary energy consumption admissible at part loading of gas/ liquid fuel based thermal generating station is proposed to be considered as below:

Sl. No.	Plant/ module loading as % of installed capacity	Admissible % additional auxiliary energy consumption (% point)
1.	90 to 100	Nil
2.	80 to 89.99	0.25
3.	70 to 79.99	0.50
4.	60 to 69.99	0.80
5.	50 to 59.99	1.20

G. Transit losses and GCV loss of coal on storage and handling etc.:

The recommendations of the committee constituted by MoP on 26.2.2018 on the issue of ACQ of thermal power stations including for transit loss and GCV loss of coal on storage & handling etc. is given below:

a. Losses in Washing of Coal

For all power plants using washed coal with 34% ash content, additional RoM coal requirement of 7% for ash content up to 40% $\pm 0.5\%$ and additional RoM coal requirement of 10% for ash content beyond 40% may be considered. Further, additional RoM coal of 1% should also be given as a compensation of 1% loss of washed coal on account of addition of 1% TM (ARB) in washed coal during wet washing process.

b. Transit Loss

CERC Tariff Regulation for FY 14-19 allows transit loss of 0.8% for non-pit head plants and 0.2% for pit head plants. However, as per inputs provided by NTPC & RRVUNL, they have experienced an average transit loss of $\sim 1.2\%$ and $\sim 1.5\%$ respectively.

For the time being, the Committee feels that Transit Loss as specified by CERC in its present Tariff Regulations should be included in the consumption norms so that power plants can get compensated in terms of quantity that is lost in transit. In case above norms get modified by CERC in future tariff regulations, the prevailing norms in that regulation will be considered.

c. Loss of Energy in Storage

CEA has already recommended following recommendations to MoP and CERC related to the issue of loss of energy in storage:

- i. CEA is of the view that while taking coal sample from wagon top, GCV measurement will not be representative for the whole lot due to impact of moisture change. GCV measurement of wagon top coal will give comparatively higher GCV value due to settling of moisture at the bottom of the wagon and loss of moisture from wagon top during transportation of coal. On this account, for calculating energy charge, a GCV compensation of around 70-80 kcal/kg may be allowed to the generator.
- ii. CEA is of the view that there is a loss of GCV in the coal stock where coal is stored inside the power plant. On this account, for calculating energy charge, a GCV compensation of around 35 kcal/kg (on an average 1% loss for a coal of 3500 kcal/kg GCV) may be allowed to the generator for a storage of 30 days in a non-pit head station and 15 kcal/kg for pit head station.
- iii. CEA is of the view that there is minor unavoidable loss of GCV in the coal during handling inside the power plant and for that purpose, a GCV compensation of around 2-3 kcal/kg may be allowed to the generator.

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Further, in its inputs to MoP & CERC, CEA has suggested that above mentioned margins would vary from plant to plant, season to season and to varying coal characteristics and accordingly a margin of 85-100 kCal/kg for pit head stations and a margin of 105-120 kCal/kg for non-pit head stations may be allowed to the generators as a loss of GCV measured at Wagon top at unloading point till the point of firing in the boiler.

The committee feels that the above recommended losses in coal storage along with loss due to GCV measurement error because of wagon top sampling at plant receiving end are part of energy that needs to be supplied to the generating stations to meet the target generation and hence a quantity compensation for these losses should be provided to the stations. This quantity may be revised further as appropriate post release of revised norms by CERC.
