



Discussion Paper

Subject: Operating parameters under UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009 for 660 MW, 300/250 MW and 45 MW coal based Thermal Power Plants generating electricity in the State of U.P.

1. UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009 apply to cases of generation and/ or supply of electricity within the State of U.P. by a generating company. The regulations have come into force with effect from 01.04.2009 and unless reviewed earlier or extended by the Commission, shall remain in force for five years, up to 31.03.2014.
2. The Energy Policy, 2009 of the Government of Uttar Pradesh has mandated that power would also be procured for the State through MoU Route. The Policy also authorizes co-gen plants to setup additional power generation capacity, not exceeding 100 MW, based on conventional fuel such as coal or gas to generate power round the year. Subsequently MoUs for procurement of power from 660 MW, 300/250 MW and 45 MW coal based thermal generating plants were signed with the GoUP.
3. At the time when exercise on UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009 was taken up by the Commission, there were no coal based thermal generating plants of these capacities in the State. Therefore, operating parameters for 660 MW and 45 MW coal based thermal generating plants had not been determined under the Regulations. With the advent of plants of these capacities, now it has become necessary to determine the operating parameters for these plants. In view of probable use of imported coal for generation, the requisite parameter for 300/250 is also to be determined.
4. In its order dated 18.11.2010 for approval of model Power Purchase Agreements (PPA) in accordance with MoU signed with GoUP under UP Government Energy Policy 2009, the Commission had decided to fix the

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norms of operation for these plants separately by an order and to make necessary amendments in the Regulations accordingly.

5. It is observed by the Commission that the norms of operation as provided under Regulation 16 of UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009 for coal based thermal generating plants commissioned on or after 01.04.2009, may also be made applicable for these plants except for certain norms which are to be decided by the Commission. The details are as given in the following table:

S. N.	Norms of Operation	Normative value
(i)	Target Availability	85%
(ii)	Target Plant Load Factor for incentive	85%
(iii)	Gross Station Heat Rate (GSHR) (a) 660 MW and 45 MW (b) 300/250 MW	To be decided To be decided (on imported coal)
(iv)	Secondary Fuel Oil Consumption	2.5 ml/kwh during stabilization 1.0 ml/kwh during subsequent period
(v)	Auxiliary Energy Consumption (a) 660 MW unit (b) 45 MW unit	6% with cooling tower and 5.5% without cooling tower as provide in the Regulations To be decided
(vi)	O & M expenditure (a) 660 MW unit (b) 45 MW unit	As provided for 600 MW & above in the Regulations To be decided

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6. In this manner, GSHR has to be determined for 660 MW and 45 MW coal based thermal generating plants whereas O&M and Auxiliary Energy Consumption only for 45 MW units. GSHR for 300/250 MW generating unit when using imported coal is also to be decided. For this purpose data has been gathered from different sources like documents of Central Electricity Authority, Central Electricity Regulatory Commission, National Thermal Power Corporation, State Agencies and Manufacturers.
7. As regarding 660 MW coal based Super Critical Thermal Power Plants,
- (i) Regulation 26 (ii) B of CERC (Terms & Conditions of Tariff) Regulations 2009 has provided as below:

	Indian Coal		Imported Coal	
P Rating (kg/cm ²)	247	247	247	247
SHT/RHT (°C)	537/565	565/593	537/565	565/593
Max. Design Heat Rate	2235	2176	2135	2079
Correction factor	1.065	1.065	1.065	1.065
Gross Station Heat Rate (GSHR)	2380	2317	2274	2214

- (ii) While conducting the Case – 2 based standard bidding process for 3x660 MW Prayagraj Thermal Power Project, Bara and 2x660 MW Sangam Thermal Power Project, Karchana in the State, the Central Electricity Authority (CEA) had advised the Net Station Heat Rate in the band of 2200 kcal/kwh to 2500 kcal/kwh for 660 MW coal based Thermal Power Plants. Accordingly as per the UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009, taking Auxiliary Energy Consumption as 6%, the Gross Station Heat Rate (GSHR) comes in the band of **2068 kcal/kwh to 2350 kcal/kwh**. Taking auxiliary consumption as 6.5 % it would be in the band of 2057 kcal/kwh to 2337 kcal/kwh.

- (iii) As per UPPCL's letter dated 6.10.10, the Net Station Heat Rate quoted by the bidders for Bara and Karchana were in the range of 2350 kcal/kwh to 2420 kcal/kwh meaning thereby that the GSHR in the range of **2209 kcal/kwh to 2275 kcal/kwh**.
- (iv) National Thermal Power Corporation is coming up with its first 660 MW coal based thermal generating unit at Sipat, Chattisgarh. NTPC has informed vide letter dated 7.2.11 that the GSHR of Sipat is **2350 kcal/kwh**.

The CEA has suggested the GSHR in the range of 2068 to 2350 kcal/kwh. The CERC Regulations have provided GSHR in the range of 2317 to 2380 kcal/kwh with Indian coal and 2214 to 2274 kcal/kwh with Imported coal for two categories of super critical plants i.e. SHT/RHT 565/593 °C and 537/565 °C.. The bidders in U.P. have quoted in the range of 2209 kcal/kwh to 2275 kcal/kwh for Bara and Karchana. NTPC has informed 2350 kcal/kwh for Sipat 660 MW.

The GSHR quoted by the bidders in the bidding process of Bara and Karchana show the competitive picture of the technical parameters for the coal based power plants in the prevailing market. The range provided by the CEA has determined the limits on technical basis. The values as per CERC are deciding the higher limit on the basis of design value whereas the NTPC data shows the practically achievable value. Therefore, in view of above, the Commission opines that the maximum Gross Station Heat Rate for 660 MW coal based Thermal Power Plants in the State may be considered 2350 kcal/kwh with Indian Coal and 2250 kcal/kwh with Imported Coal for a 660 MW 537/565 °C SHT/RHT unit. For a unit of 660 MW 565/593 °C SHT/RHT unit the values would be 2290 kcal/kwh with Indian coal and 2190 kcal/kwh with Imported coal. The corresponding values of GSHR would be as given under:



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	Indian Coal		Imported Coal	
P Rating (kg/cm ²)	247	247	247	247
SHT/RHT (°C)	537/565	565/593	537/565	565/593
Gross Station Heat Rate (GSHR)	2350	2290	2250	2190

8. The Commission finds that **GSHR for 250 MW and 300 MW** coal based thermal generating plants are also to be considered when Imported Coal is being used. In consonance with the GSHR of 660 MW as above, the GSHR for 250 MW and 300 MW coal based thermal generating plants would be **2500 kcal/kwh during stabilization period and 2400 kcal/kwh for subsequent period**. Other norms of operations shall remain as provided in the UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009.
9. As regarding 45 MW coal based Thermal Power Plants,
- (i) Normative Auxiliary Consumption:
- UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009 provides normative auxiliary consumption of **9.0 % with cooling tower and 8.5 % without cooling tower** for coal based thermal Power Plants of 200/300 MW capacity. The same shall be applicable for the units of 45 MW.
- (ii) Gross Station Heat Rate:
- The GSHR of 2800 kcal/kwh for Thermal Power Plants of 0-100 MW capacity has been provided by the Commission vide order dated 9.9.09. Design GSHR for 50 MW units of Obra 'A' thermal power station has been provided as 2824 kcal/kwh under the UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009. As per submission made by the Generating Company M/S Bajaj Energy Pvt Limited on affidavit, the manufacturer of the plant Siemens and

Thyssen Krupp have provided a design turbine heat rate of 2281 kcal /kwh and guaranteed boiler thermal efficiency of 83.6 % for 45 MW coal based Thermal Power Plant. Based on these the Gross Station Heat Rate is calculated as $2281/0.836 = 2728$ kcal/kwh. Multiplying this value with the correction factor of 1.065 as provided by the CERC in the Tariff Regulations, 2009, the value of Gross Station Heat Rate comes about 2900 kcal/kwh. The Commission considers that for the plants having capacity of upto 50 MW, GSHR of **2900 kcal/kwh with Indian Coal and 2800 kcal/kwh with Imported Coal** and would be sufficient and justified.

(iii) O&M Expenditure:

UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009 does not categorically provide for normative O&M Expenditure for a 45 MW capacity Thermal generating plant. CERC Regulations also do not have any such category. As the GoUP has promoted these plants to be developed on own land using the ground water under the GoUP Energy Policy, 2009, it is considered that it would have less O&M expenditure in comparison to independent plant as there would be common administration and common expenditure on auxiliary etc. Therefore, the Commission considers that the O&M @ **2.5 %** of the Capital Cost per MW as provided in the order dated 9.9.09 for the coal based thermal power plants would be appropriate, which would be escalated by 5.72 % in succeeding years.

10. The necessary amendments in the UPERC (Terms and Conditions of Generation Tariff) Regulations, 2009 shall be made accordingly.

11. The comments, suggestions and objections are invited in writing so as to reach to the Commission's office at Kisan Mandi Bhawan, 2nd Floor, Gomti Nagar, Lucknow, personally or by post, so as to reach within 15 days from the date of publication of discussion paper.