

Summary of the comments and suggestions received on Approach Paper on Terms and Conditions of Tariff Regulations for the tariff period 1.4.2014 to 31.3.2019

(Ref No. 20/2013/Fin(Vol-I)/Tariff Reg/CERC Date: 25th June'2013)

5.2.1 Station Heat Rate

Whether the existing norms of station heat rate are required to be strengthened? Alternative methodology for arriving at revised norms, if any, and present level of station heat rate based on the technological improvement that may also be specified. What are the important criteria to be considered while specifying norms for station heat rate? The need for continuation of relaxed norms for specific stations? Changes required in the existing norms given in Tariff Regulation 2009-14 may be commented duly supported with authentic data, if any.

Comments/Suggestions

Sr. No.	Name of organization/ stakeholder	Comments/ Suggestions
A) Autonomous Bodies (JERCs/SERCs/Other Commissions)		
A.1	Uttar Pradesh Electricity Regulatory Commission	The existing norms of station heat rate should be strengthened. The normative station heat rate should specifically be provided for all categories of thermal generating stations including the small capacities upto 50/100 MW. The normative station heat rate should have specific mention for indigenous/imported coal use, based on percentage (%) of use, in view of higher cost of imported coal and higher calorific value. However, the technical constraints of blending should also be considered.
A.2	Chhattisgarh State Electricity Regulatory Commission (CSERC)	While PLF, Sp Oil and transit loss may remain constant for the life of the plant, the two major operational parameters SHR and Auxiliary Consumption should be linked to the age of the power plant. Further, with fixed SHR, currently a near linear relation is considered between the GCV and the specific coal consumption. However, the design SHR itself depends on coal quality. The compensation curve has to be accounted for, to arrive at a more scientific and prudent SHR target. With blending of coal, this has become more relevant, otherwise plants running on high quality high cost imported coal will gain unfair advantage over the plants running on low cost low quality domestic plants.
B) Government Departments		
B.1	Govt. of Odisha	(A) The SHR should be fixed as per the average of actual figures achieved during the first four years

		<p>of the last Control Period or the design value whichever is lower.</p> <p>(B) In case of TTPS no relaxation should be allowed, instead it should be treated at par with other thermal stations as massive R & M activity has been carried out.</p> <p>(C) It should also be viewed in light of the PAT scheme implement by the generating stations.</p>
B.2	Govt. of Tripura, Dept. of Power	A strict audit in respect of gas consumption should vis-à-vis energy generated should be undertaken for earlier control period and the norms may be accordingly strengthened. Therefore, in this regard there is no need to provide any relaxation because Central Generating Stations (CGS) take periodical maintenance including replacement of damage spares.
C) Central Sector (Generators/Transmission Cos./NLDCs/RLDCs)		
C.1	IL & FS Energy	The Station Heat Rate should consider the degradation of heat rate as having a constant heat rate for 25 years is very difficult scenario to keep up with. In addition, norms may be introduced for projects using imported coal with lower calorific value and higher moisture content.
C.2	North Eastern Electric Power Corporation Ltd. (NEEPCO)	<p>The following important criteria may be considered while specifying norms for station heat rate:</p> <ol style="list-style-type: none"> 1. Quality of Fuel 2. Operating pattern of machines (part load/full load etc) 3. Ageing of machines 4. Unit size 5. Climatic condition. <p>In the existing regulation, additional margin of 5% over the gross station heat rate guaranteed by the OEM is allowed in case of new gas/liquid fuel base CCGT stations. The allowable percentage of margin needs to be increased with the ageing of the machines. This principle needs to be continued and extended to old and OCGT stations also, as the heat rate is a crucial parameter which has substantial impact on tariff. While agreeing the allowable margin over the gross station heat rate guaranteed by the OEM, it is required to examine that whether the guaranteed figure was based on NCV or GCV. If it was based on NCV, it needs to be suitably converted. Further, the normative gross station heat rate may be considered, with allowable margin over the gross station heat rate guaranteed by the OEM and the average actual heat rate over the last five years, whichever is lower.</p>
C.3	National Thermal Power Corporation (NTPC)	Operating norms should be based on the average performance of units in the country and not confined to NTPC stations alone. Further, operating norms should be based on past performance of units in the country including State Utilities / IPPs of relevant vintage and

		<p>should factor in operating constraints, like, partial loading due to erratic load pattern of the beneficiaries and lower operating load factor due to shortfall of quantity and quality of fuel which is expected to continue in future.</p> <p>Further, norms should be capable of achievement on a consistent basis. actual operating conditions in future is expected to deteriorate further as compared to the existing situation, particularly with respect to availability/quality of coal, addition of substantial capacity from renewable sources, grid parameters, higher availability of power from multiple generators, sellers, etc, which is likely to reduce the PLF of thermal power stations. Besides, unit gross heat rate also depends up on the following factors:</p> <ul style="list-style-type: none">a. Ageing of Machine: The turbine performance deteriorates with ageing during the operating cycle of the plant, which in turn adversely affects the cycle operating heat rate. The average heat rate deviation factor for aging, accordingly, is of the order of 1.74% (39 kCal/kWh) for the 500 MW units commissioned before 2009 and 2.7% (62 kCal/kWh) for the 200 MW units. As per NTPC experience, it is possible to recover only 70% of heat rate deviation after capital overhaul. The loss shall be as per the average life of the unit.b. Operating Margin: In real time operation of power plants, it is not possible to achieve the design heat rate as deviations occur due to number of parameters which are uncontrollable, viz., Boiler Efficiency, Super Heater/ Re-heater Spray, Condenser Back Pressure, Main Steam / Reheat Steam Temperature, Make-up water and miscellaneous losses (all losses which are unaccountable, radiation losses, heat loss due to leakages, passing, etc and piping losses).c. Coal Quality: There is an increasing trend in moisture, ash and decreasing trend in GCV of coal in most of the stations of NTPC. This deterioration has been observed to be in the range of up to 389kCal/kg. Boiler efficiency deterioration on account of the deterioration in GCV is around 0.3 to 0.4%.d. Partial Loading Loss: Unit partial loading occur due to various reasons like grid constraints (high frequency regime), fuel constraints (fuel shortage, wet coal and coal quality), equipment problem and other problems such as water shortage & heavy rains, etc. <p>NTPC further submitted that the performance of the unit (Gross HR & APC) in future will depend upon following factors:</p>
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		<p>a. Expected Coal Quality for 2014-19: If we go by the trend of deterioration in quality of domestic coal since 2010-13 and the projection for the next five years, the total deterioration is expected to be in the range of around 10% which means additional decrease in the operating boiler efficiency by around 0.7% from the existing levels. Reduction in the boiler efficiency by around 0.7% will lead to additional unit heat rate loss of 20 kCal/kWh for the next 5 years period over and above the operating levels of base period (2009-14).</p> <p>b. Loss from Ageing of Machine: The average heat rate deviation factor on account of ageing is of the order of 0.2% per annum which is equivalent to 12.5 kCal/kWh on average basis for the next 5 year period.</p> <p>c. Partial Loading Loss: 10% partial loading at the base of 85% would increase the heat rate of the unit 34.5/44.5 kCal/kWh respectively for 500 & 200 MW units.</p> <p>Considering the actual heat rate achieved and at the base of 85% DC during the present tariff period and the predicted deviations due to all the above three factors like reduction in boiler efficiency (20 kCal/kWh) due to coal quality degradation, average annual ageing loss (12.5 kCal/kWh) and partial loading (10%) of the units (34.5 kCal/kWh) the anticipated heat rate of 500 MW units during the start of coming tariff period would be of the order of:</p> <ul style="list-style-type: none">➤ 500 MW units: $2386 + 20 + 12.5 + 34.5 = 2453$ kCal/kWh (8.0% of Design)➤ 200 MW units: $2425 + 20 + 12.5 + 34.5 = 2492$ kCal/kWh (8.5% of Design)➤ 660 MW units: $2325 + 20 + 12.5 + 22.0 = 2379.5$ kCal/kWh (7.8% of Design) <p>Therefore, existing norms of station heat rate should be continued in case of 200 MW. In case of 500MW the norms needs to be set at 2450 kCal/KWh. And in case of 660 MW units, margin above design should be 8.0% in view of future scenario as elaborated above.</p> <p>With regard to the gas based stations, in view of deterioration in Gas Turbine, WHRB performance deterioration, performance data of last 5 yrs and projected partial loading in the coming years, the existing norms of station heat rate of Anta, Faridabad, Kawas, Gandhar & Kayamkulam Station should be increased by 25 kCal/kWh whereas Auraiya station tariff Heat rate should be</p>
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		increased by 50 kCal/kWh for Tariff period 2014-19.												
C.4	Neyveli Lignite Corporation	<ul style="list-style-type: none"> • The generators should continue to be permitted to avail the gain resulting from efficient O&M of the plant and hence no truing up with respect to any savings in normative values of operational norms should be imposed on the generator. • The CERC has fixed relaxed norms for Station Heat Rate for the old plants after examination in detail of the various factors affecting the performance of the Units in these Plants. There is no change from these conditions even today and hence such relaxed norms should continue to be considered for the new tariff period also, though not relaxed further. • Justifications in respect of each power station are furnished below for continuing with the existing norms for NLC-TPSI, TPSI Expn. & TPSII and relaxed norms in respect of BTPP. <p>TPSI:</p> <ul style="list-style-type: none"> ➤ Many of the units have served for more than 50 years and other units also nearing 50 years of service. During the service the unit efficiency reduced and hence the fuel consumption is high. ➤ Partial load operation due to the following reasons leads to higher heat rate <ul style="list-style-type: none"> ▪ Bunker choke because of variation in moisture content of Lignite. ▪ Low OPLF due to variation in quality of lignite. OPLF values for the past 5 years are given below. <table border="1" data-bbox="760 1262 1419 1367"> <thead> <tr> <th>Year</th> <th>2008-09</th> <th>2009-10</th> <th>2010-11</th> <th>2011-12</th> <th>2012-13</th> </tr> </thead> <tbody> <tr> <td>OPLF</td> <td>84.83</td> <td>88.72</td> <td>85.89</td> <td>87.98</td> <td>88.22</td> </tr> </tbody> </table> <ul style="list-style-type: none"> ▪ Outages of Mills (Reserve Mill not available) and Slag Conveyors ▪ Increase in marcasite content in lignite is also very much likely. This will cause severe damage to the mills of the boilers and increased slagging inside the furnace causing increased loss of generation due to frequent maintenance of mills and failures of Slag conveyors. ➤ Damaged Fills in the cooling towers and choking of mud in the fills result in reduction in the performance of cooling towers. This causes increase in the Circulating water inlet temperature to 410 C as against the design value of 290 C resulting in reduction of Condenser vacuum to 650 mm of Hg against the design value of 700 mm of Hg thus leading to reduction in load for the same quantity of steam input and requiring additional lignite consumption. In spite 	Year	2008-09	2009-10	2010-11	2011-12	2012-13	OPLF	84.83	88.72	85.89	87.98	88.22
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		<p>of the cost incurred towards renovation of cooling towers is not being allowed to be capitalized as per the regulations, TPS-I has carrying out the renovation under Revenue head to contain Heat Rate.</p> <p>In spite of the difficulties narrated above, TPS-I is taking all possible steps to monitor and to contain the Heat Rate. Hence, continuation of relaxed norms is needed for plants like TPS-I and it is requested that the Heat Rate norm is not to be reduced and shall be retained at the present value of 4000 kCal / kWhr.</p> <p>TPSI Expn.:</p> <p>The Commission has fixed 2750 kCal / kWhr as norm for the Station Heat Rate (SHR) for TPS-I Expansion. Already our annual weighted average Station heat rate is very close to the norm (barring the years 2008-'09 / 2012-'13) as can be seen from the Station Heat Rates of the previous year's tabulated below:-</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Year</th> <th>Gross Station Heat Rate (kCal./kWhr.)</th> </tr> </thead> <tbody> <tr> <td>2008-09</td> <td>2730</td> </tr> <tr> <td>2009-10</td> <td>2742</td> </tr> <tr> <td>2010-11</td> <td>2750</td> </tr> <tr> <td>2011-12</td> <td>2745</td> </tr> <tr> <td>2012-13</td> <td>2737</td> </tr> </tbody> </table> <p>It is stated that when OPLF of the station is less, the station heat rate will be higher than the norm. Maintaining the heat rate below the norms will be difficult in the coming years because of the following reasons.</p> <ul style="list-style-type: none"> ➤ The heat rate is hovering around the norms because of the high OPLF achieved so far. This may not be the case in the coming years due to aging of units. Also increases in moisture content during monsoon seasons do have impact on heat rate. ➤ The presence of marcasite in lignite is a point of concern. This will cause severe damage to the beater wheel mills of the boilers and increased slagging inside the furnace causing increased loss of generation due to frequent maintenance of mills and failures of ABGs & Slag conveyors. <p>So the heat rate norms fixed for TPS-I Expansion may be maintained as 2750 kCal/kWhr. for the tariff period 2014-2019.</p> <p>TPSII:</p> <p>Ageing of the machines is a contributing factor in</p>	Year	Gross Station Heat Rate (kCal./kWhr.)	2008-09	2730	2009-10	2742	2010-11	2750	2011-12	2745	2012-13	2737
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2008-09	2730													
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		<p>increasing the heat rate. All the Units in TPS-II have served for more than one lakh hours. Life Extension Programme by Phased replacement / rectification of Critical components in Stage-1Units has been planned from 2012-'13. RLA studies are being taken up in the units of Stage-2 also to monitor the healthiness of the units and initiate corrective action, if any.</p> <p>The heat rate is bound to increase due to part load operation of the units on account of the following.</p> <ul style="list-style-type: none">➤ During rainy seasons, it is almost impossible to keep the units in service as slushy lignite is to be handled and fed to the boilers. The generation on the units consequently goes down even below 50% and it is very difficult to maintain the generation level closer to the schedule. Also even after the rains recede, due to high moisture content the performance of the pulverizing milling system get severely affected, resulting in operation of the units below the rated capacity.➤ During the year 2012-13, the monsoon failed and rainfall in the region was at a historically lowest level. Problem of slushy lignite was not encountered. However, high sand contamination in the lignite posed a problem in the quantity of lignite that can be handled by the lignite conveyor thus lowering the load on the units.➤ As the boilers are prone to slagging, water lancing operation is being carried out periodically which is unique to lignite fired Boilers. During such time, load on the machine has necessarily to be reduced if on full load, to facilitate lancing operation. Running of the units at partial load will contribute for increased heat rate.➤ The capability of the station is declared after considering the power consumption of the linked mine to a predictable extent. As the mining load varies unprecedentedly, in order to maintain the load as per schedule it becomes unavoidable to operate the units below their rated capacity. With the draft Regulation for Deviation Settlement Mechanism to replace the existing UI regulations, the problem of low load operation of the units merely to adhere to the contracted schedule is bound to increase manifold.➤ The quality of Lignite from the pithead mines varies from time to time. In order to avoid slagging in the furnace and boiler furnace instability the generation of the Unit has to be brought down resulting in operating the Unit at part load which again has an adverse effect on the heat rate.➤ Due to the capricious nature of the consistency in
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quantity and quality of the cut face of lignite, problem of paucity of lignite due to constraints in mining front may be encountered at any point of time and the power station may have to operate the units on low load. Therefore, when lignite mined at MINE-II the linked Mine is insufficient, TPS-II will have to resort to transfer from other Mines of NLC. Hence, while fixing the heat rate norm, considering the capacity of Mine alone may not be sufficient.

The Station Heat Rate of the previous years are tabulated below

Year	Gross Heat Rate kCal/kWhr.	
	Stage-1	Stage-2
2008-09	2939	2945
2009-10	2916	2893
2010-11	2894	2877
2011-12	2883	2880
2012-13	2875	2871

The performance of the unit at its best may not be a true indicator of all the parameters at all times. Hence a heat rate of at least 2930 kCal/kWhr may be considered keeping in view the ageing factor of the units and the fact that 4 years have elapsed since fixing the norm of 2900 Kcal/KWhr.

Further, in the current Tariff period, there is no provision to transfer the heat saved out of lower level of oil consumption compared to norms to the heat of lignite. It is requested that heat rate norm be considered as a composite figure of the heat of the primary fuel and the secondary fuel oil and the Regulations framed accordingly

Barsingsar Thermal Power Plant:

- o For BTTP, with CFBC Technology, many teething problems are still experienced and are being sorted out after much trials and experiments. Any forced outage leads a minimum of 5 to 6 days of idle period for attending works inside the boiler. This impacts SHR seriously. Hence, Relaxed Norms on Station Heat Rate may be extended with due considerations for CFBC Boiler Units.

PAT HEAT RATE NORM NOT TO BE LINKED:

- ❖ BEE fixed the PAT target arbitrarily and there is no

		<p>scientific approach or study. The PAT targets are fixed based on the extent of deviation of actual Station Heat Rate from the design Station Heat Rate. NLC furnished all the reasons and data for large deviation of operating heat rate from design heat rate. The operating norms for the Tariff periods 2004-2009 & 2009-14 have been fixed by the Commission after thoroughly analyzing all the data and performance of the NLC owned old power Stations viz. TPS-I & TPS-II (Stage-1 & Stage-2).</p> <ul style="list-style-type: none">❖ In TPSI Expn., to achieve the target of 2948 kCal/kWhr Net Heat Rate under the PAT scheme for TPS I Expansion, the plant will have to bring down the Gross Station Heat Rate to 2696 kCal/kWhr. The Gross Station Heat Rate of the Station in the best performance year of 2012-'13 when all the contributing factors were most favourable for maximizing the output of the units was 2737 kCal/kWhr.❖ Despite the fact that the plant had achieved 90.23 % PLF during the year 2012-13 the heat rate was only 2737 kCal/kWhr And even if such a level of generation is achieved, GSHR reduction by 42 kCal/kWhr is not possible.❖ In TPSII, to achieve the target of 3148 kCal/kWhr Net Heat Rate under the PAT scheme, TPS II will have to bring down the Gross Station Heat Rate to 2841 kCal/kWhr. The Gross Station Heat Rate of the Station in the best performance year of 2012-'13 when all the contributing factors were most favourable for maximizing the output of the units was 2873 kCal/kWhr. With anticipated huge capacity addition in the region in the next Tariff Period and the uncertainty in the influencing factors like monsoon, repetition of the same performance as in 2012-13 may be next to impossible. And even if such a level of generation is achieved, GSHR reduction by 32 kCal/kWhr is not possible. Also the stringent volume control measures introduced by the Commission in the proposed Deviation Settlement Mechanism, there may be huge quantum of surrender by beneficiaries which may lead to part load operation resulting in increase in Auxiliary Consumption and consequent increase in Net Station Heat Rate. Hence, the PAT target shall not be considered for Tariff purposes.
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D) State Sector (Generators /Transmission Cos./Distribution Cos./SEBs/SLDCs)		
D.1	Pragati Power Corporation Ltd	For gas based station, due to fuel issue and scheduling issue, station heat rate suffers. Changes should be allowed for heat rate correction on part load due to non scheduling & fuel shortage.
D.2	Madhya Pradesh Power Generation Co Ltd	As per the prevailing norms SHR for existing stations are determined based on the past performance data. There is a need to specify to interpret the past performance data so as to arrive at achievable SHR. Any additional capital allowed on account of efficiency improvement should also be accounted for while deciding the SHR. The procedure for determination of SHR based on the past performance data needs to be specified for the reasons that various State Commissions are fixing the Station Heat Rate by interpreting past performance data in their own way and fixing SHR norms which are not achievable.
D.3	Rajasthan Discom Power Procurement.	These norms need to be revised on actual basis. Our proposal is to be specify these norms based on actual data with certain operating margins with the condition that saving in cost due to better performance then norms should be equally shared with the beneficiaries. In a way moving towards performance based regulation. This has been adopted by the Commission in respect of secondary oil consumption in Tariff Regulation 2009.
D.4	Uttar Pradesh Power Corporation Ltd. (UPPCL)	It has been observed that the CERC (Terms and Conditions of Tariff) Regulations 2009 does not mention any thing about the SHR of TPS where super critical operation (i.e. operation above 221bar initial steam pressure) is adopted in case of 660MW units at initial pressure of steam of 270bar. In the case of super critical operation of TPS of 660MW the efficiency of TPS increases from 44% to 46% at super critical State of initial pressure of steam. Therefore the maximum turbine cycle heat rate will be lower and the "Minimum Boiler Efficiency" will be higher. Therefore the maximum design heat rate (kCal/kWh) for sub-bituminous coal and bituminous imported coal will be lower for new power station in comparison to what is provided in Regulation 26(ii) of CERC (Terms and Conditions of Tariff) Regulations, 2009.
D.5	GRIDCO	The SHR should be fixed as per the average of actual figures achieved during the first four years of the last Control Period or the design value whichever is lower. In case of TTPS no relaxation should be allowed, instead it

		<p>should be treated at par with other thermal stations as massive R & M activity has been carried out. It should also be viewed in light of the PAT scheme implemented by the generating stations.</p>
D.6	Government of Punjab, Dept. of Power	<p>These norms need to be revisited based on actual data with certain operating margin with the condition that saving in cost due to better performance than norms should be shared with the beneficiaries. This has been adopted by the Commission in respect of secondary oil consumption in Tariff Regulations 2009. This will give way to the Performance Based Regulations (PBR).</p>
D.7	Tripura State Electricity Corporation Ltd.	<p>A strict audit in respect of gas consumption vis-à-vis energy generated should be undertaken for earlier control period and the norms strengthened accordingly. Therefore, there is no need to provide any relaxation on this account as because CGS is taking periodical maintenance including replacement of damage spare through infusion of huge expenditure.</p>
D.8	Power Company of Karnataka Ltd.	<p>For every one percent improvement in the Station Heat Rate, certain percentage increase in ROE may be allowed, subject to the revision of normative Station Heat Rate to Weightage Average Station Heat Rate i.e., $\text{Weightage Average Station Heat Rate} = (\text{normative Station Heat Rate} + \text{Actual Station Heat Rate}) / 2$ will be considered as normative gross station heat rate for tariff computation for that year.</p>
D.9	Power Trading Corporation	<p>The present CERC operation norms do not address varying quantum of energy generation for coal based TPS since the operation norms such as Station Heat Rate is fixed. In the present scenario, Thermal Generating Stations would need to operate in varying load (Availability Based Tariff) to harness renewable energy and hydro potential to the maximum extent and also due to shortage of domestic coal and high cost of imported coal, which discoms are not able to bear.</p> <p>1. Specific issues for introduction of operation norms for varying load (Availability Based Tariff)</p> <p>a. Gross Specific Heat Rate (GSHR) GSHR is the production Turbine Generation (TG) heat rate and inverse of boiler efficiency. The TG heat rate increase with decrease in load while the boiler efficiency is not adversely affected by decrease in load. Hence, a formula needs to be evolved for varying GSHR. This has already been done both in CEA operation norms for varying load (way back in 2000) and by Black & Veatch for 6x660 MW Hirma TPS.</p> <p>b. Boiler Efficiency Boiler Efficiency needs to be adjusted for moisture</p>

		<p>and ash content for which the formula has been devised in CEA operation norms for varying load (way back in 2000), which has been incorporated in REA guidelines for operations of TPSs. Imported coal from Indonesia has very high moisture content to bring down boiler efficiency.</p> <p>c. Heat Rate Degradation CERC has specified 1.065 Degradation Factor to arrive at the GSHR based on design heat rate guaranteed by the TG supplier. The actual heat rate during operation differs from the guaranteed heat rate due to following two factors:</p> <ul style="list-style-type: none"> • Variation in steam parameters and grid frequency. • Variation in operation period (TG heat rate deteriorates as the operation period increases) <p>There is a need to allow a fixed small margin for the first factor and a greater margin for the second factor, the average of which is 2% as per Black & Veatch recommendation for Hirma Project, as against 1.065 as per present Regulations. Accordingly, the Degradation Factor needs to be reviewed so that Discoms are not burdened. The Degradation Factor will be higher for combined cycle gas turbine stations.</p> <p>d. GCV of coal GCV is expressed on air dried basis (ADB) or as received basis (ARB). Present CERC norms specify as fired basis (AFB), which is different from ADB or ARB. Indonesian coal is on ARB as GCV for ARB is low in comparison to that for ADB. Also, CIL may not agree to price the coal on ARB unless it is made mandatory. Therefore, since boiler efficiency is related to fired basis, adjustment needs to be made for ARB or ADB to arrive at GCV on a fired basis.</p>
D.10	Bajaj Energy Pvt. Ltd.	The operating norms of CFBC plants based on coal should also be kept at par with CFBC plants based on lignite fuel in respect of Station Heat Rate.
D.11	Chhattisgarh State Power Distribution Co. Ltd.	In the CERC (Terms and Conditions of Tariff) Regulation 2009, Station Heat Rate has not been specified for plants using Super Critical Technology. Hence norms should be specified for plants on technology basis. The norms for other plants should further be tightened to increase the level of efficiency in overall performance of the plant.
D.12	MP Power Management Company Ltd.	It has been observed that the CERC (Terms and Conditions of Tariff) Regulation 2009 does not mention any thing about the SHR of TPS where super critical operation is adopted in case of 660MW units and above. In the case of super critical operation the efficiency will be

		expected to increase at super critical State of initial pressure of steam. Therefore the maximum turbine cycle heat rate will be lower and the "Minimum Boiler Efficiency" will be higher. Therefore the maximum design heat rate (kCal/kWh) for sub-bituminous coal and bituminous imported coal will be lower for new power station in comparison to what is provided in Regulation 26(ii). The norms should further be tightened to increase the level of efficiency in overall performance of the plant.
D.13	Maharashtra State Power Generation Co. Ltd.	The existing norms of SHR are required to be improved besides sharing the gain/savings on account of heat rate with the beneficiaries.
D.14	Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL)	It is submitted that so far none of the CGS have declared/provided actual SHR of any of the stations in any of the filings/reports. There is need for strengthening the norms for SHR including transparency in demonstrating actual SHR. CGS make huge profits in normative SHR and hence there is no need of any relaxation of norms for any specific stations unless agreed upon by all beneficiaries/approved by Commission in extra circumstances. Based on the actual past trend and balance useful life of assets after considering Renovation & Modernisation, if any, the Commission may decide strengthened SHR norms.
D.15	Kerala State Electricity Board (KSEB)	The heat rate norms may be specified based on the performance data collected during the past. However, the heat rate of the new plant may be fixed considering the advancement in technology and manufacturers' specifications.
D.16	Tamil Nadu Generation and Distribution corporation limited (TANGEDCO)	The relaxed norms allowed for specific stations also need to be tightened from CERC Regulations, 2009 based on actual of the past five years with an upper limit as per 2009-14 Regulation.
E) Private Sector (Generators/Transcos./Distribution Cos)		
E.1	Calcutta Electric Supply Corporation Limited (CESC Ltd.)	Significant part load operation is expected in the upcoming years on account of restrictive despatch instructions because of inadequate evacuation capacity / lower demand or poor financial conditions of distribution licensees or beneficiaries, fuel scarcity and fuel quality related issues. Such part load operation will have negative impact on station efficiency, particularly heat rate, secondary fuel oil consumption and auxiliary energy consumption. Therefore, Station Heat Rate norm may kindly be fixed considering at least 8% margin over the gross station heat rate guaranteed by OEM. Station Heat Rate would also get deteriorated on account of installation of equipment, like air cooled compressor etc. which has become essential for plant operation. Additional allowance in station heat rate may be given for

		<p>such equipments.</p> <p>Also appropriate consideration may be given to vintage of the station while fixing the station heat rate norm. This is to be done to encourage economic generation from older power stations, avoiding significant capital investment, which would have otherwise been required to replace such generation assets.</p>
E.2	BSES Rajdhani Power Ltd.	SHR being used for billing purpose in MYT 2009-14 is normative and there is already a provision of passing 50% savings of secondary fuel to the beneficiaries. However, there is a scope for passing on the benefit for savings of coal to the beneficiaries. Further, each plant should be benchmarked on the basis of actual performance in past three years and, accordingly, the performance level on year to year basis should be escalated.
E.3	Jaiprakash Power Ventures Ltd.	The variable cost should be passed through in tariff on the basis of actual SHR during the initial phase until the plant stabilizes and thereafter on the basis of normative SHR. In the initial phase of stabilizing of Plant (TPS), separate norms (ideally actuals) should be provided for secondary fuel consumption and the same should be passed through in tariff on the same basis as primary fuel.
E.4	BSES Yamuna Power Limited	Comments shall be offered once actual data on SHR is available.
E.5	Association of Power Producers (APP)	<ul style="list-style-type: none"> • The approach of the Commission for computation of normative heat rate should be continued. However, it should be based on the performance guarantee tests results and not on the design heat rate as provided in the OEM contract in view of the fact that the PG Test heat rate is achieved by actual operations of the Units with the actual coal received at site. The design heat rate is estimated at ideal operating conditions and therefore the difference with actual heat rate obtained through PG test cannot be accommodated within the 6.5% margin. • Operational margin over the design heat rate may be reviewed and increased from 6.5% to 8%. • Further, Commission should allow a sliding scale of SHR to accommodate operation at below 80% PLF. Commission should also fix a ceiling limit for SHR and should facilitate planned closure of units having SHR above that limit. • Commission may consider introducing Annual Heat Rate Degradation Factor (AHRDF) to address the issue of degradation in heat rate over the plant life. The Commission on advice of CEA could develop a model for giving correction factor to the design heat rate based on life expended already.

		<ul style="list-style-type: none"> • Further, the Commission may suitably define the stabilization period and the corresponding relaxed normative heat rate in the forthcoming Tariff Regulations 2014-19. • Heat Rate & Aux Power Consumption Norms based on Unit capacity should be specified for the supercritical Units. • It is necessary to continue the relaxed heat rate norms for specific stations as these capacities are still operation worthy & may be operating on fuel outside the designed band. Mechanism needs to be determined for Heat Rate Compensation due to reasons beyond the control of Generator, such as non-approval of alternate coal procurement, non-availability of schedule from procurers, etc. There should be suitable correction in Heat rate in case of plants operating on blended coal. • Coal GCV Degradation Allowance may be provided. It is an established fact that there is a considerable GCV difference between received coal and fired coal. Imported coals exhibit predominant GCV loss during stocking due to high Volatile Matter content. • Additional SHR may be allowed if required for installation of new technologies like Air cooled condensers etc. • Based on the current scenario of the operation of the gas based plants the current norms for relaxation of 5% over guaranteed heat rate is not adequate and should be revised to 10% at least.
E.6	Bhavnagar Energy Company Ltd.	<p>Station Heat rate also has an impact on computation of energy charges. It is observed that actual Station Heat Rate is at variance with the guaranteed heat rate provided by OEM on account of different operating conditions and variation in quality of fuel.</p> <p>Computation of Station Heat Rate shall be computed based on calorific value of fuel "as fired" with specific tolerance from calorific value of fuel, "as received".</p>
E.7	Torrent Power	<p>1. Operating margin over the design heat rate for Gas-based power plants needs to be reviewed and the same be increased from current rate of 5% to 8% due to the following:</p> <ol style="list-style-type: none"> a. Unit/Station Load Factor b. Capacity degradation of machine c. Fuel Consumption by Gas heating Facility. d. Evaporative Cooling. e. Inlet air cooling f. Ambient temperature and pressure

		2. Further, the design heat rate criteria may be changed from 100% MCR to 70% MCR which is based on likely domestic gas allocation for gas based plants.
E.8	Lanco	CERC should consider the deterioration in performance of the Boiler due to aging and allow higher SHR for old machines than the present one. Further, special consideration should be given to the areas of heavy rainfall and accordingly allowances should be made either at handling loss level or the Station Heat Rate.
E.9	Alstom India Ltd.	<p>There is a need to shift the approach from Plant Heat Rate to Unit Heat Rate for achieving the overall improvement goals/performance of individual units. Tariff Regulation should specify normative unit heat rate in the calculation of variable cost of generation instead of station heat rate. Further, Utilities should be mandated for efficiency improvement. There is a need to review the normative Station Heat Rate target from 2500 kCal/kWh to 2350 kCal/kWh or better.</p> <p>Further, Utilities should be incentivized for committing/achieving efficiencies better than normative operational Unit Heat Rate. This incentive should be in the form of an additional fixed cost indexed with the efficiency improvement. Part of this incentive (50%) should also be passed on the Utility to its employees as guaranteed benefit which will encourage better O&M practices.</p> <p>Further, Plant operating away from the proposed normative parameters should be provided timeframe (typically 2 to 3 years) to modernize and enhance efficiency. Inability to do so may result in inefficient capacity being penalized in the fixed cost of generation suitably.</p>
F) Other Organizations/Institutions/Banks/Investors		
F.1	Federation of Indian Chambers of Commerce and Industry (FICCI)	<p>The existing norm of 1.065 % of Designed Station Heat Rate (SHR) is subject to interpretation because many times the boiler, turbine and other major equipment are supplied by different OEMs and hence their guaranteed efficiency parameters also vary. Further plants with same size, configuration and technology are having different normative SHR because equipment supplied come from different manufacturers. In view of above, it is suggested to notify only the max. Normative SHR for each size of unit (operating in India) with different technology.</p> <p>It is also suggested to derive methodology to compensate the Developers on account of higher Heat rate due to part load operations. In case of Part load operations, mechanism needs to be determined for Heat Rate Compensation due to reasons beyond the control of generator, such as non-approval of alternate coal procurement, non-availability of schedule from procurers,</p>

z		<p>etc.,</p> <p>There should be suitable correction in Heat rate in case of plants operating on blended coal also In current regulations, date of commissioning of the units was considered for the purpose of arriving at normative operating parameters. In case, Machine was ordered by the generator based on norms prevailing on that date and the unit was commissioned in next tariff period, generator shall be constrained with operating the unit with revised norms.</p> <p>Hence the date of placing order on BTG manufacturer may be considered for the purpose of arriving normative operating parameters.</p> <p>Coal GCV Degradation Allowance: It is an established fact that there is a considerable GCV difference between received coal and fired coal. Imported coals exhibit predominant GCV loss during stocking due to high Volatile Matter content.</p>
G)Individual /Public Group/Any others		
G.1	Shri R.B.Sharma	<p>The provision of an additional margin of 6.5% over the gross station heat rate guaranteed by OEM in case of new coal/lignite based stations is a luxury in the system. Similarly, an additional margin of 5% over the gross station heat rate guaranteed by OEM in case of new gas/liquid fuel base CCGT Stations is also a luxury. This is enough proof of inbuilt inefficiency in the system. Excuses are given to perpetuate the inefficient operation and these excuses are accepted also. It is high time that we should do away with the practices of these margins for determination of norms which inculcate the habit for inefficient operation.</p>
G.2	Shri Arun Kumar Dutta	<p>No data is available, however, the working of last 5 years of station compared with other stations can help in arriving at the reasonable Station Heat Rate. The fuel being the most important factor, OEM must specify the optimum Heat Rate for the station. This may be compared with the actual SHR achieved to arrive at the truly reasonable SHR.</p>