



सत्यमेव जयते

भारतसरकार
Government of India
विद्युतमंत्रालय
Ministry of Power
उत्तरक्षेत्रीयविद्युतसमिति
Northern Regional Power Committee

पत्रांक: उक्षेविस/वाणिज्यिक/211/केविविआ /2019/ 8816
No.:NRPC/Comml/211/CERC/2019/

दिनांक: 16 अगस्त, 2019
Date: 16 August, 2019

सेवा में/To,

सचिव
केन्द्रीय विद्युत नियामक आयोग
3रा तल, चन्द्र लोक भवन
36, जनपथ नई दिल्ली – 110001

Secretary,
CERC, 3rdFloor,
Chanderlok Building
36, Janpath
New Delhi- 110001.


विषय: भारतीय विद्युत ग्रिड कोड की समीक्षा के संदर्भ में उ.क्षे.वि.स. सचिवालय के सुझाव |
Sub: Inputs of NRPC Secretariat with reference to review of Indian Electricity Grid Code.

महोदय /Sir,

This has reference to CERC letter dated 13.08.19 seeking views of NRPC Sectt. on above cited subject. The requisite inputs are enclosed at Annex.

सलंगनक: यथोपरी।

भवदीय /Yours faithfully,


(नरेश भंडारी) 16/8/19

(Naresh Bhandari)
सदस्य सचिव
Member Secretary

1. Section 6.3A of IEGC, inter-alia deals with Commercial Operation of CGSs and ISGs. As per clause 6.3A (iii), before declarataion of COD, the generating company shall certify that:

“The generating company meets the relevant requirements and provisions of of the technical standards of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electrical Lines) Regulations, 2010 and IEGC, as applicable.”

Clause 7(4) of the above mentioned CEA’s regulations, applicable for coal or lignite based thermal generating stations states as under:

“The design shall cover adequate provision for quick start up and loading of the unit to full load at a fast rate. The unit shall have minimum rate of loading or unloading of 3% per minute above the control load (i.e. 50% MCR).”

It has been observed that even though the CEO/MD of the generating company has been certifying that the generating station meets the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electrical Lines) Regulations, 2010 while declaring COD, during real time operation, the ramp up/down rate achieved by the plants, is in the range of 1-1.5% only.

Since ramp rate has an important role to play in stability of the grid, it is proposed that a provision of checking/verification of ramp rate, as per CEA regulations, may be added in Clause 6.3A(iii). The generating station may be issued final certificate of successful completion of trial run, only after the station has successfully demonstrated its ramp rate.

Besides above, Clause 6.5.14 of IEGC which also deals with ramp rates of ISGS, states that:

“ A ramping rate of 200MW per hour should generally be acceptable for an ISGS and for regional entity (50MW in NER), except for hydro electric generating stations which may be able to ramp up/ramp down at faster rate.”

Further, CERC Tariff Regulations, 2019 clause 30(2)(iii) states that an additional rate of return on equity of 0.25% shall be allowed for every incremental ramp rate of 1% per minute achieved over and above the ramp rate of 1% per minute, subject to ceiling of additional rate of return on equity of 1.00%.

Above clauses may also be suitably modified so that it is in coherence with the said CEA’s regulations.

2. Clause 6.4.16 deals with DC declaration by plants in case of fuel shortage. However, “fuel shortage” has not been specifically defined in the regulation. The issue has been discussed in detail in various RPC meetings. Beneficiaries have expressed concern that there have been instances where during off peak season, despite fuel shortage

generators continue declaring full DC knowing the fact that their machines would not get scheduled. Hence, a fuel stock of at least 2-3 days could be made mandatory for Generators to declare full DC.

3. In case of plants having more than one unit, during off peak period, some of the units go under RSD on the insistence of one beneficiary. There have been instances when only one beneficiary agrees to run a unit at Technical Minimum during off-peak in order to meet its requirement during peak period. The other beneficiary does not request for power initially; but later during exigency, punches requisition from the same running machine as per its entitlement, due to which requested schedule of the first beneficiary is not fulfilled. The entitlement of beneficiaries from the unit on bar in such scenario, may be addressed properly in the RSD procedure. A mutually agreed procedure in this regard has recently been finalized by NRPC for APCPL, Jhajjar. Copy of the same is enclosed at **Annex-1**.
4. Compensation for degradation of Station Heat Rate and Auxiliary Power Consumption due to part load operation of gas power plants is yet to be finalized. Comments of NRPC Sectt in this regard have already been sent to CERC vide letter dated 25.07. 2018 (a copy is included at **Annex-2**) and presented in the meeting held at CERC on 01.11.2018. The procedure for the same may be finalized and included in IEGC.
5. Generators have been allowed to declare DC after including overload capacity of 5% in case of thermal generators and 10% in case of hydro generators after IEGC 5th amendment (order in Petition No. 74/MP/2018 dated 11.07.2018) . However, schedule of the generators is restricted to its ex bus generation corresponding to 100% of its installed capacity, barring spillage scenario in case of hydro power plants. The 5% and 10% overload capacity, which does not get scheduled, is merely being used by Generators to achieve/surpass their target Plant availability factor (PAF), and earn incentive (in case of hydro plants) from beneficiaries while serving no utility to them. It is suggested that DC of a plant may be restricted to its ex bus generation that can be scheduled from the plant.
6. Proposed modification of Clause 4.6.2.: Reliable and efficient data and **voice** communication systems shall be provided to facilitate necessary communication and data exchange, and supervision/control of the grid by the RLDC, under normal and abnormal conditions. All Users, STUs and CTU shall provide **communication system** to **tele-protect** and telemeter power system parameter such as flow, voltage and status of switches/ transformer taps etc. in line with interface requirements, other guideline made available by RLDC **and the Technical Standards for Communication System in Power system Operations Regulation of CEA**. The associated communication system to facilitate data flow up to appropriate data collection point on CTU's system, shall also be established by the concerned User or STU as specified by CTU in the Connection Agreement. All Users/STUs in coordination with CTU shall provide the required facilities at their respective ends as specified in the Connection Agreement.
7. In view of the phase nomenclature mismatch between stations of some states/BBMB and POWERGRID in Northern Region, addition of clause 4.6.6. (Uniform phase nomenclature) is proposed: STU / Transmission Licensee shall be responsible for same phase sequencing nomenclature at their side with reference to grid.
8. In view of para 14.6.3 of SOR to CERC-terms & conditions of tariff regulations 2019, there is proposed amendment to para 2.4.4: Member Secretary, RPC shall, certify transmission system availability factor for regional AC and transmission systems and

outage hours of HVDC regional system separately for the purpose of payment of transmission charges.

9. Taking into consideration para 7(4) of CEA Technical Standards for construction of Electrical plants and electric lines regulations 2010 – the thermal unit shall have minimum rate of loading / unloading of 3% per minute above the **control load (i.e. 50% MCR)**, amendment to para 6.3.B is proposed: The technical minimum for operation in respect of a unit or units of a Central Generating Station of inter-State Generating Station shall be **50%** of MCR loading or installed capacity of the unit of generating station.
10. In para 5.2, new sub-para is proposed in view of CEA Regulation impacting RE generators: The licensee of solar/wind generator shall comply with the stipulations of CEA ((Technical Standards for Connectivity to the Grid) Regulations).
11. In para 6.5.11, following addition is proposed: All instances of backing down of MUST RUN plants shall be reported by concerned SLDC to respective RPC on monthly basis.
12. Concept of REMC (Renewable Energy Management Centres) is proposed:

2. Definition

REMC

Establishment of Renewable Energy Management Centres (**REMC**) in RLDC and SLDC level for better forecasting of RE generation on very short term, real time tracking of RE generation & its geo-spatial visualization, control for smooth grid operation and single source information repository & coordination point for RE penetration.

5.3 (g) The SLDC **in coordination with concerned REMC** shall take into account the **RE** forecasting to meet the active and reactive power requirement.

6.5 23(ii) The schedule of solar generation shall be given by the generator based on availability of the generator, weather forecasting, solar insolation, season and normal solar generation curve and shall be vetted by the **REMC** in which the generator is located and incorporated in the inter-state schedule. If **REMC** is of the opinion that the schedule is not realistic, it may ask the solar generator to modify the schedule.

6.5 23(iii) Concerned **REMC** shall maintain the record of schedule from renewable power generating stations based on type of renewable energy sources i.e wind or solar from the point of view of grid security. While scheduling generating stations in a region, system operator shall aim at utilizing available wind and solar energy fully.

13. Proposed clause 5.2(n): All SEBS, distribution licensees / STUs shall provide automatic under-frequency and df/dt relays for load shedding in their respective systems, to arrest frequency decline that could result in a collapse/disintegration of the grid, as per the plan separately finalized by the concerned RPC and shall ensure its effective application to prevent cascade tripping of generating units in case of any contingency. **For effective planning of load shedding by automatic under frequency and df/dt relays, requisite data shall be provided by SEBs, distribution licensees / STUs to respective SLDC in a time bound manner....**

14. Proposed clause 4.6.1(c): SLDCs shall maintain updated network data at distribution level (11kV, 33kV, 66kV). Distribution licensees shall submit the updated network data of preceding FY to concerned SLDC in the first fortnight of current FY and also as and when required for updating the distribution level network data.
15. New clause – Each SLDC shall maintain its SCADA information in such a manner so that the visibility remains to 100%.



सत्यमेव जयते

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
उत्तर क्षेत्रीय विद्युत समिति
Northern Regional Power Committee

संख्या: NRPC/OPR/106/02/5178-81

दिनांक: 21.05.2019

To,

- 1) GM, NRLDC, New Delhi
- 2) DGM (SO), Delhi SLDC, New Delhi
- 3) SE (SLDC), Haryana SLDC, Panipat
- 4) AGM, APCPL, Jhajjar

विषय: Minutes of meeting held on 14.05.2019 to discuss modalities regarding procedure when only one beneficiary is requesting for Unit to be on BAR.

उपरोक्त विषय पर दिनांक 14.05.2019 को उ.क्षे.वि.स. सचिवालय में आयोजित बैठक का कार्यवृत्त संलग्न है।

संलग्नक: यथोपरि

-sd-

(सौमित्र मजूमदार)
अधीक्षण अभियंता (प्रचालन)

Minutes of the meeting held on 14.05.2019 at NRPC Sectt. to discuss modalities regarding procedure when only one beneficiary is requesting for Unit to be on BAR

In pursuance of the decision taken in the 158th OCC meeting dated 23.04.2019, a meeting was held on 14.05.2019 at NRPC Sect., New Delhi to discuss modalities when only one beneficiary agrees to keep the machine on bar during off peak hours and subsequently its requested share of power during peak hours gets reduced when the second state punches requisition from the same machine on bar as per its entitlement. The list of participants for the meeting is enclosed as **Annexure-I**.

2. Member Secretary, NRPC welcomed all participants and mentioned that both Delhi and Haryana raised concern in the past when their requested schedule was not fulfilled from APCPL Jhajjar. MS, NRPC requested the representatives of NRLDC, Delhi, Haryana and APCPL Jhajjar to explain the matter.

3. GM, NRLDC explained that issue arises when only one beneficiary agrees to run the machine at Technical Minimum during off-peak in order to meet its requirement during peak period. The other beneficiary does not request for power initially; but later during exigency, punches requisition from the same running machine as per its entitlement, due to which requested schedule of the first beneficiary is not fulfilled. It was mentioned that such problems have been faced by both Delhi and Haryana at different points of time. Further, it was stated that beneficiaries are entitled to get proportional schedule on running units as per IEGC. However, it would be ethical that the entity agreeing to run the unit by ensuring technical minimum during low demand hours should get requested power during high demand period.

4. Representative of APCPL explained that there are 3 machines in APCL Jhajjar each having 500MW installed capacity and ex-bar capacity of 471.25 MW. Haryana and Delhi both have share of 46.2% in Jhajjar (i.e., 217.7 MW in each machine). Technical Minimum of each machine is 259.18 MW.

5. Representative from TPDDL suggested to establish documented procedure that can be followed by both beneficiaries so that scheduling can be done transparently.

6. Decisions taken in the meeting are as under:

- i. In case only one beneficiary wants to keep the machine(s) on bar and agrees to provide technical minimum schedule for the same during off peak hours, he would have the first right to schedule power up to the DC on bar of the machine or Entitlement of the beneficiary from that machine, whichever is lower.
- ii. In case the other beneficiary wishes to schedule power from the machine in which it had surrendered power, consent of the beneficiary on whose request the machine has been kept on bar would be required. For this purpose, SLDCs shall adopt a uniform SOP. The SLDC (A) which wishes to schedule power shall send the mail, stating the quantum and duration of power required, to the SLDC (B) which was providing technical minimum schedule. After obtaining consent from its DISCOMs, SLDC (B) shall give its consent to SLDC (A) to punch the agreed schedule in WBES of NRLDC. SLDC (A) shall punch the schedule in

WBES only after obtaining this consent through mail and forwarding it to NRLDC. Consent of SLDC (B) would also be required in case URS is available in the machine on bar.

- iii. In case SLDC (B) does not give consent, SLDC (A) may request NRLDC to bring the other unit(s) of APCPL Jhajjar on bar. In this scenario, SLDC (A) shall wait till the start-up time of other unit before it can punch its requisition in WBES.
- iv. No changes would be made in the WBES software of NRLDC to prevent SLDC (A) from punching requisition up to its entitlement from the machine on bar.
- v. All stakeholders are expected to behave ethically and follow this mutually agreed procedure to avoid scheduling related issues.

List of participants for the meeting to discuss regarding procedure when only one beneficiary is requesting for Unit to be on BAR.

Date: 14.05.2019

Sl No	Name	Designation	Organization	Tel. No. / Mobile No.	E-mail
1	Rajesh Kumar	Manager	NRUDC	9560032972	r.kumar@posoco.in
2	Ashutosh Kumar Pandey	Asst. Manager	NR LDC	9599112720	ashutosh.pandey@posoco.in
3	ABHISHEK JAIN	DGM	APCPL JHAJJAR	9729042596	abhishekjain@ntpc.co.in
4	P. MEDIRATTA	AGM	APCPL JHAJJAR	9416212411	pmediratta@ntpc.co.in
5	SHREYANS NAVAL	Sr. Manager	BRPL	9312518646	shreyansnaval@relianceada.com
6	ARVIND CHAUDHRY	Xm/so	HPPE, Hamirgama	9357189063	UCR PANCHKULA18@gmail.com
7	Mukesh Dadhich	As VP	BYPL	9350261451.	mukesh.dadhich@relianceada.com.
8	NAVEEN GOEL	Manager	Delhi SDC	9999533950	naveengoel06@gmail.com
9	SANDEEP KUMAR	Sr. Manager	TPDDL	9971174097	Sandeep.K@TataPower-DDL.com
10	SUJATA GURUJI	Sr. Manager	TP-DDL	9971395315	sujata.guruji@tatapower-ddl.com
11.	N.K. MAJICAR	PC(SDC)	HVPM SDC	9966219042	sldehayana co@gmail.com

Sl No	Name	Designation	Organization	Tel. No. / Mobile No.	E-mail
11	P. Devanand	Add. GM	TPDDL	9871800506	p.devanand@ tatapower-ddl.com
12	राजीव पौरवाल	महाप्रबंधक	NRDC,	9871581133	sk.porwal@posoco.in
13	M. M. Hassan	GM	NRDC	9810952965	m.hassan@posoco.in
14	A. K. Chawla	Sr GM	NRDC	965008671	A.K.Chawla@posoco.in
15					
16					
17					
18					
19					
20					
21					
22					



सत्यमेव जयते

भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

पत्रांक: उक्षेविस/ वाणिज्यिक /201 /क्षे.ऊ.ले./2018/ 8535

दिनांक: 25 जुलाई, 2018

No.: NRPC/Comml /201/REA/2018/

Date: 25th July, 2018

सेवा में/ To,

सचिव
केन्द्रीय विद्युत नियामक आयोग
तीसरा तल, चन्द्र लोक भवन
36, जनपथ नई दिल्ली - 110001

Secretary,
CERC, 3rd Floor,
Chanderlok Building
36, Janpath
New Delhi- 110001.

विषय: गैस आधारित बिजली संयंत्रों में पार्ट लोड ऑपरेशन के कारण हीट रेट और औक्मिलिअरी उपभोग में बदलाव के कारण मुआवजे के संदर्भ में।

Sub: Compensation for Degradation of Station Heat Rate and Auxiliary Power Consumption due to Part Load Operation of Gas based power plants- regd.

महोदय / Sir,

NRPC had been assigned the responsibility for working out the degraded SHR and APC values for gas based stations operating under part load in the Northern region in accordance with CERC's Detailed Operating Procedure on Reserve Shutdown and Compensation Mechanism issued on 05.05.2017.

As intimated in letter No. NRPC/Comml./201/REA/2018/4154 dated 11.04.2018 (copy enclosed); a sub group was constituted for finalizing the degraded SHR and APC values. In the meeting of the sub group held on 22.06.2018 experts from BHEL were also invited. Representative of BHEL stated that it would not be possible to ascertain the quantum of degradation in SHR and APC in case of non availability of any operating characteristic curves of the machine as it depends on various factors. After deliberations, the subgroup recommended that to ascertain the degraded SHR and APC values, a PG test may be carried out by the respective generating company, through any third party like BHEL, EIL, etc.; under the supervision of the sub group. It was also recommended that as an interim measure, provisional billing on the basis of values derived from HBD diagrams may be started. This billing would be subject to adjustment based on the results of PG test.

The findings of sub group were discussed in the 39th TCC/ 42nd NRPC meeting held on 27.06.2018 and 28.06.2018. In the meeting, constituents expressed apprehension about provisional billing. It was stated by some constituents that their regulators may not permit them to pass on the costs which they would incur due to such provisional billing. They were of the opinion that the matter should be referred to CERC in line with the decision taken in WRPC. Constituents agreed that financial obligations, including interest if any, based on the decision of CERC will be borne by the states.

Hence, as per the recommendations of TCC and NRPC, issue of compensation for degradation of Station Heat Rate and Auxiliary Power Consumption due to Part Load Operation of Gas based power plant of Northern Region may be decided by the Honourable Commission.

भवदीय / Yours faithfully,

सलंगकः यथोपरि

आतिल ३३६
२५/७/१८

(एम. ए. के. पी. सिंह)
(M. A. K. P. Singh)
सदस्य सचिव
Member Secretary



सत्यमेव जयते

भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

पत्रांक: उक्षेविस/ वाणिज्यिक /201 /क्षे.ऊ.ले./2018/4154

दिनांक: 11 अप्रैल, 2018

No.: NRPC/Comml /201/REA/2018/

Date: 11 April, 2018

सेवा में/ To,

सचिव
केन्द्रीय विद्युत नियामक आयोग
3 रा तल, चन्द्र लोक भवन
36, जनपथ नई दिल्ली - 110001

Secretary,
CERC, 3rd Floor,
Chanderlok Building
36, Janpath
New Delhi- 110001.

विषय: पार्ट लोड ऑपरेशन और एकाधिक स्टार्ट / स्टॉप के कारण हीट रेट, आग्जिलीएरी उपभोग और सेकण्डरी ईंधन की बड़ी खपत की क्षतिपूर्ति एवं रिजर्व शट डाउन लेने के विस्तृत प्रक्रिया पर प्रतिक्रिया।

Sub: Feedback on detailed procedure for taking unit(s) under Reserve Shut Down and Mechanism for Compensation for Degradation of Heat Rate, Aux Consumption and Secondary Fuel Consumption due to Part Load Operation and Multiple Start/Stop of Units.

महोदय / Sir,

दिनांक 26.03.2018 के आपके पत्र संदर्भ में, तापीय उत्पादन केंद्रों के पार्ट लोड ऑपरेशन के लिए मुआवजे की व्यवस्था पर एन.आर.पी.सी. सचिवालय की प्रतिक्रिया संलग्न है।

With reference to your letter dated 26.03.2018, the feedback of NRPC Secretariat on the mechanism of compensation for part load operation of thermal generating stations is enclosed herewith.

संलग्नक: यथोपरी

भवदीय / Yours faithfully,

(एम. ए. के. पी. सिंह)
(M. A. K. P. Singh)
सदस्य सचिव
Member Secretary

Feedback on Mechanism for Compensation for Degradation of Heat Rate, Aux Consumption and Secondary Fuel Oil Consumption, due to Part Load Operation and Multiple Start/Stop of Units.

Proposed Changed in methodology

1. Compensation for less DC declaration

The DOP issued by CERC vide letter dated 05.05.2017 states that the effect of less declaration of DC should be to the account of the CGS/ISGS. In order to achieve that, ECR corresponding to average Declared Capacity (DC) is being calculated. Relevant clause 4.1 (v) is reproduced below.

“ECR (DC) for the calculation period shall also be calculated using the formula specified in Tariff Regulations of the Commission and used as reference for calculating compensation. This is because, the effect of less declaration (with respect to normative ex-bus Installed capacity), if any, on the SHR and AEC should be to the account of CGS/ISGS.”

However, this clause takes care of less declaration of DC by the generator only when DC declared is less than 85%. In case DC declared is in the range 85-100%, ECR (DC) remains equal to ECR (N). This may result in a situation where the CGS/ISGS becomes eligible for compensation but no compensation is payable by the beneficiaries.

For example:

Let us consider a plant having an installed capacity of 110 MW and Auxiliary Power consumption be 10 MW.

DC declared by the plant= 90 MW

Considering only one beneficiary, its entitlement=DC declared by the plant= 90 MW

Let energy scheduled by the beneficiary= 81 MW

In this scenario, the AUL of the plant becomes= $\frac{81}{(110-10)} = 81\%$

Since AUL < 85%, ECR (SE) > ECR (N)..... (1)

DC based loading of the plant= $\frac{90}{(110-10)} = 90\%$

Since DC based loading > 85%, ECR (DC) = ECR (N)..... (2)

From (1) and (2), ECR (SE) > ECR (DC), therefore plant is eligible for compensation {assuming ECR (A) is greater than ECR (N)}

However, clause 4.1 (xiv-a) of the DOP states that

“No compensation shall be payable by a beneficiaries if it has requisitioned at least 85% of its entitlement during the calculation period.”

Since the lone beneficiary has requisitioned 81/90= 90% of his entitlement, he is not liable to pay any compensation.

This anomaly can be rectified if the current method of calculating ECR (DC) is discarded. Instead, the effect of less declaration can be taken care of directly while calculating ECR (SE). This can be achieved by changing the definition of "effective capacity" used in the calculation of Average Unit Loading (AUL) of the station.

$$\text{Average Unit Loading (AUL) in \%} = \frac{\text{Effective Generation of Station (in MWh)}}{\text{Effective Capacity (in MWh)} \times (1 - \text{Normative AEC})} \times 100$$

Presently, Clause 3.1(vii) defines Effective capacity as:

"Effective Capacity in MWhr means maximum possible generation from a station during calculation period and shall be calculated as:

Total Installed Capacity of the designated generating station (in MWhr) minus Installed Capacity (MW) of the Unit(s) of the said station under outage (planned or forced outage) and under reserve shut down during the calculation period X outage time"

If this definition of Effective Capacity is changed to "On bar DC of the Station (in MWhr)", it would take into account both: less declaration of DC as well as outage/shut down of the unit(s) of the station. The calculation process would also become less tedious as tracking of outages of individual units would not be needed. The compensation payable in this case would be

$$\text{ECR (Comp)} = \{\text{ECR (SE) or ECR (A), whichever is lower}\} - \text{ECR (N)}$$

Clarifications regarding existing methodology

2. Regarding DC based loading

DC based loading is being used for calculation of ECR (DC). The formula for the calculation of DC based loading is not explicitly defined in the DOP. However presently it is calculated as below:

$$\text{DC Based Loading\%} = \frac{\text{On Bar DC of the Station (in MWhr)}}{[\text{Effective Capacity (in MWhr)} \times (1 - \text{Normative Auxaliary Consumption})]} \times 100$$

This formula may be included in the DOP.

3. Regarding compensation for secondary oil consumption

As per clause 4.2(ii) of DOP "Compensation (in terms of kL of Secondary Oil) shall be payable to CGS/ISGS for the year due to degradation of Secondary Fuel Oil Consumption shall be calculated by multiplying no. of start-ups exceeding 7 per unit and solely attributable to reserve shut-downs with the appropriate value of additional secondary oil consumption specified in Regulation."

- In view of above, it is noted that since only shutdowns attributable to RSD after the 7th shutdown would be counted for compensation due to additional secondary oil consumption, it would adversely affect units which have planned their outages at the end of the year in comparison to those where planned outages are in the beginning as those planned outages would be included in the initial 7 shutdowns.

To remove this anomaly, only shutdowns attributable to RSD may be considered for compensation for secondary oil consumption. The number of start ups attributable to RSD after which compensation is payable may be reduced from 7 (say 3).

- If any shut down occurs in kth financial year and start-up occurs in (k+1)th financial year, it is not clear whether it should be counted in kth year or in (k+1)th year. This issue may be clarified.

4. Comparison between actual and degraded SHR

As per IEGC amendment-IV regulation 6.3B(3)(i) *"In case of coal / lignite based generating stations, following station heat rate degradation or actual heat rate, whichever is lower, shall be considered for the purpose of compensation."*

S. No.	Unit loading as a % of Installed Capacity of the Unit	Increase in SHR (for supercritical units) (%)	Increase in SHR (for sub-critical units) (%)
1.	85-100	Nil	Nil
2.	75-84.99	1.25	2.25
3.	65-74.99	2	4
4.	55-64.99	3	6

However, comparison between actual SHR and degraded SHR for calculating ECR (SE) is not mentioned in the DOP.

This issue may be clarified.

5. Verification of outage and other details

Unit wise outage details are being furnished by Generating Company directly to RPC secretariat as per Annexure-I of DOP. These outage details may be sent to RPC after verification from RLDC.

For generating stations whose tariff has been adopted by Commission (Eg. IPGCL-PPCL Bawana in NR) AUL and DC based loading may be verified by controlling load despatch centre.

A provision may be included for verification of outages by RLDC/SLDC.

6. Regarding degradation based on running hours for Gas based power plants

CERC had given the task of tabulating degraded SHR and APC for gas based generating station to the respective RPCs. The DOP issued by CERC on 05.05.2017 in its clause 4.1 (v) states:

"For Gas based generating stations, degraded SHR and AEC shall be decided based on the characteristic curve provided by manufacturer. If the characteristic curve is not provided for the entire range of the operating range i.e. up to 55% of module rating, then the extrapolation of the curve provided by the manufacturer shall be done to extend the curve up to 55% of module loading. "

In view of above, a sub group was constituted under the chairmanship of Member Secretary, NRPC with representatives from NRLDC, TE&TD Division-CEA, TPDDL and NRPC Sectt to finalize the degraded SHR and APC values.

PPCL obtained CCGP Load vs Net CCGP Heat Rate and CCGP Load vs Auxiliary Power curves for Pragati-III from its OEM, BHEL. However, BHEL has guaranteed Heat Rate values at only 100% and 80% load for the curve. The degraded SHR and APC values have been tabulated using the above curve.

With regards to NTPC stations, no detailed Load vs Heat Rate and Load vs APC curves were available. Heat Rate and APC values were available for 3 load points 100%, 80% and 60% for Anta, Auraiya and Faridabad GPS. For Dadri GPS, only Heat Rate at 100% and 80% loading was available. Heat rate value for Dadri at 60% loading was considered based on historical data provided by NTPC and APC figures taken from a test carried out by the sub group on 07.11.17. Curves were plotted using the available values and extrapolated upto 55% as per CERC order.

NTPC has claimed additional degradation based on running hours of the gas units in addition to the degraded SHR and APC values arrived at from the extrapolated curve. Some members of the sub group were of the view that as components of CCGP are to be replaced after certain firing hour as per OEM recommendation, the new components that are installed may enhance the efficiency of CCGP instead of degrading it.

Another meeting of the sub group has been proposed to look into the matter again. A member from BHEL has also been co-opted in the committee. Final outcome of the meeting would be apprised shortly.

7. Regarding conversion factor from NCV to GCV

The values of Heat rate obtained from the HBD diagrams of gas based stations of NTPC and PPCL were in NCV terms. To convert Heat Rate at NCV to Heat Rate at GCV, PPCL has used a factor of 1.12 while NTPC has used a factor of 1.103. The standard conversion factor that is to be used for conversion of GCV to NCV may be specified in the DoP.

8. Regarding part module operation of Gas stations

NTPC has provided separate values of degraded SHR and AEC for full module and half module operation. However, CERC has not specified separate heat rate values for half module operations in any of its tariff orders. On the contrary, CERC in its order on "Approval of Tariff of Pragati-III Power Plant (1371 MW)" dated 26.05.2017 (Petition no. 257/2010) has taken the Gross Station Heat Rate to be the same on COD of only GT-1 and ST-1 (half module operation) and COD of Module-1 as a whole .

Also, for gas stations metered data for the station as a whole is available with RPCs. It would not be possible to calculate the Actual generation for each module separately when a combination of full and half modules are running simultaneously. Thus, determination of average unit loading of separate modules is not possible.

It may be clarified whether separate table for degraded SHR and APC values for part load operation of CCGT have to be provided; and modalities of calculating the compensation for the same may be given in the DoP.

9. Regarding issues with multiple fuels being used in CCGT stations

For Gas based stations, DC is declared on multiple fuels like Gas, Liquid and RF. The entitlement of the beneficiaries is also prepared fuel wise and the plants get scheduled accordingly. Energy charge rate of each fuel is calculated separately and multiplied by its scheduled generation and billed to the beneficiaries. However, since fuel wise actual generation is not available, it is not possible to calculate fuel wise AUL and compensation.

The procedure for compensation for the same may be given in the DoP. If AUL of the entire station is to be calculated, entitlement and requisition by beneficiaries would also have to aggregate station wise for calculating compensation.

SUMMARY

In view of above, the following issues need to be decided:

1. Changing the definition of "Effective Capacity" to "On-Bar DC of the station" which would account for less declaration of DC without the need to calculate ECR (DC) and also rectify the anomaly where the CGS/ISGS becomes eligible for compensation but no compensation is payable by the beneficiaries.
2. Including the formula used to calculate DC based loading in the DOP.
3. Issues regarding attribution of shut downs for compensation due to secondary oil consumption
4. Comparison between actual and degraded SHR as mentioned in the IEGC 4th amendment.
5. Verification of outages by RLDCs /SLDCs
6. Degradation based on running hours while extrapolating curves to tabulate degraded SHR and APC values for Gas based generating stations.

7. Conversion factor from NCV to GCV
8. Whether separate table for degraded SHR and APC values for part load operation of CCGT have to be provided and modalities of calculating the compensation for the same.
9. Procedure for calculating compensation in gas stations where multiple fuels are used simultaneously.

Compensation due to Part Load Operation of Gas Power Plants

CERC- DOP on Reserve Shutdown and Compensation Mechanism (15-05-2017)

- The **RPCs shall work out a mechanism for compensation** for station heat rate and auxiliary energy consumption for low unit loading on monthly basis in consultation with generators and beneficiaries at RPC forum and its sharing by the beneficiaries.
- NTPC and PPCL had submitted values for degraded SHR and APC values in their stations at the 33rd CSC meeting held on 28.07.2017
- A **sub group** was constituted under the chairmanship of **Member Secretary, NRPC** with representatives from **NRLDC, TE&TD Division-CEA, TPDDL and NRPC Sectt.**
- The sub group visited Gas Stations in **Dadri** (28.09.2017 & 07.11.2017), **Bawana** (11.10.2017) and **Faridabad** (17.01.2017) and carried out run tests at different loading conditions.
- In addition to that, some historical data regarding GHR and APC values for Anta, Auraiya and Faridabad GPPs at different loading conditions were also received from NTPC.

CERC- DOP on Reserve Shutdown and Compensation Mechanism (15-05-2017)

- For Gas based generating stations, **degraded SHR and AEC shall be decided based on the characteristic curve provided by manufacturer.**
- If the characteristic curve is not provided for the entire range of the operating range i.e. up to 55% of module rating, then the **extrapolation of the curve provided by the manufacturer shall be done to extend the curve up to 55%** of module loading.
- **No compensation** for SHR degradation or increase in AEC shall be payable if the **Average unit loading** for the generating station for the computation period works out **more than or equal to 85%**.

Methodology

- NTPC and PPCL were asked to submit **Load vs GHR** and **Load vs APC** curves for their respective machine.
- **PPCL provided both the curves** through its OEM BHEL. The degraded SHR and APC values have been tabulated using curve submitted.
- **NTPC submitted that no detailed Load vs GHR and Load vs APC curves were available. Only HBD diagrams** at certain discreet loading values were available.

Loading	Anta	Auraiya	Dadri	Faridabad
100%	Module output (Gross & Net), module fuel input and NCV of fuel	Module output (Gross & Net). Net Heat Rate at NCV	Gross Heat Rate at GCV only	Module output (Gross & Net), Gross Module efficiency and NCV
80%	-do-	-do-	-do-	-do-
60%	-do-	-do-	-	-do-

Methodology

- For Dadri GPP, heat rate value at 65% loading was considered based on the data provided by NTPC.
- APC figures for Dadri GPP were taken from the test carried out 07.11.2017.
- A **quadratic curve** was plotted for all stations (except Anta) considering the Heat rate and APC values at the known points
- The **curves were extrapolated** to arrive at GHR and APC figures at different loading conditions.
- For calculation of compensation, a common value at intervals of 5% (like 84.99% to 80%) was taken by taking the average of the values at the extremes of the interval.
- The recommendations given by the sub group were shared in the 34th CSC meeting.

Deliberations in 34th CSC meeting

- In the meeting, **NTPC claimed additional degradation based on running hours** of the gas units in addition to the degraded SHR and APC values arrived at from the extrapolated curve.
- However, **some members of the sub group** were of the view that as components of CCPP are to be replaced after certain firing hour as per OEM recommendation, the **new components** that installed **may enhance the efficiency** of CCPP instead of degrading it.
- Issue of enhanced APC of Anta & Auraiya GPP and conversion factor from NCV to GCV were also discussed
- Another meeting of the sub group was proposed to further deliberate upon the issues raised
- The sub group decided to **co opt members** from the OEM, **BHEL**.

Discussions in 2nd sub group meeting

Issue-I : Additional Compensation for degradation due to ageing

- Representative of BHEL stated that it would **not be possible to ascertain** the amount of **degradation** due to ageing as it **depends on** how well the **maintenance** of the machine has been carried out.
- Also, since the **characteristic curves** as required under the CERC regulations are **not available**, **PG test may be carried out** by the respective generating company through any third party like BHEL under the supervision of the sub group.
- As an **interim measure**, the **values derived** from extrapolating HBD diagram of NTPC generating station and the curve provided by PPCL Bawana **without considering any degradation** due to ageing may be used for **provisional billing till PG test results are available**.

Discussions in 2nd sub group meeting

Issue-II : Higher APC for Anta and Auraiya GPP

- NTPC claimed **higher APC** values for Anta GPP **than** that **calculated from HBD**.
- The reason stated was that plant was **designed** to operate in **open cooling water cycle** mode whereas now it was **running closed cooling water cycle** mode due to **limited water availability**
- The sub group **accepted the claim** made by NTPC
- Additional auxiliary consumption of **2.83 MW** was considered for calculation of APC of **Anta GPP**.
- Similarly for **Auraiya** inclusion of auxiliaries of **2.132 MW** not included by OEM in the HBD was considered.

Discussions in 2nd sub group meeting

Issue-III : NCV to GCV conversion

- PPCL had submitted a conversion factor of 1.12 whereas NTPC had used a factor of 1.103 for converting NCV to GCV.
- Energy conversion matrix available on GAIL India website states NCV is 90% of GCV
- Hence, conversion factor of 1.11 (1/0.9) was considered for calculations

Discussions in 2nd sub group meeting

Issue-IV : Part module Operation

- The sub group reiterated its recommendations no separate values for part module operations would be provided.
- It was stated that even CERC has not issued any separate heat rates for part module operation for either Bawana or NTPC stations.
- Even if separate values were to be provided, it would not be possible to calculate the AUL for each module separately when a combination of full and half modules are running simultaneously.
- The sub group observed that running a GPP on half module with part loading is a wastage of precious natural gas and advices constituents against it.

Compensation Table-GHR

Loading (%)	Bawana		Anta		Auraiya		Faridabad		Dadri	
	Normative= 2.5%		Normative= 2.5%		Normative= 2.5%		Normative= 2.5%		Normative= 2.5%	
100-85	1845		2075		2100		1975		2000	
84.99-80	1845		2075		2100		1975		2000	
79.99-75	1845		2075		2100		1975		2000	
74.99-70	1845		2075		2100		1975		2032	1.60%
69.99-65	1860	0.8%	2075		2118	0.9%	1982	0.4%	2076	3.80%
64.99-60	1904	3.2%	2079	0.2%	2175	3.6%	2013	1.9%	2128	6.40%
59.99-55	1954	5.9%	2150	3.6%	2242	6.8%	2046	3.6%	2187	9.40%

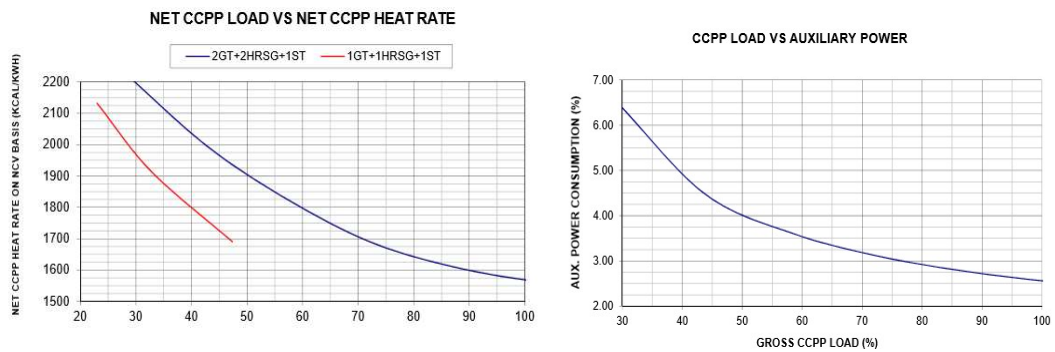
Compensation Table-APC

Loading (%)	Bawana		Anta		Auraiya		Faridabad		Dadri	
	Normative= 2.5%		Normative= 2.5%		Normative= 2.5%		Normative= 2.5%		Normative= 2.5%	
100-85	2.5		2.5		2.5		2.5		2.5	2.5
84.99-80	2.84	0.34	2.5		2.51	0.01	2.5		2.5	2.5
79.99-75	2.97	0.47	2.5		2.61	0.11	2.5		2.5	2.5
74.99-70	3.1	0.6	2.57	0.07	2.73	0.23	2.55	0.05	2.64	0.14
69.99-65	3.25	0.75	2.71	0.21	2.88	0.38	2.6	0.1	2.82	0.32
64.99-60	3.42	0.92	2.86	0.36	3.04	0.54	2.64	0.14	2.99	0.49
59.99-55	3.59	1.09	3.04	0.54	3.21	0.71	2.67	0.17	3.17	0.67

ANNEXURES

PRAGATI POWER CORPORATION LIMITED 1500 MW PRAGATI-III CCPP

DESIGN GROSS CCPP OUTPUT - 685.6 MW
DESIGN NET CCPP OUTPUT - 668.1 MW



NET CCPP LOAD (%)

NOTES:

1. 100% and 80% load points are guaranteed points on this curve. All other points on the curve are for information only.

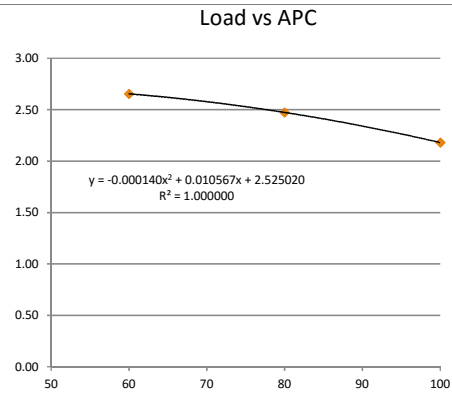
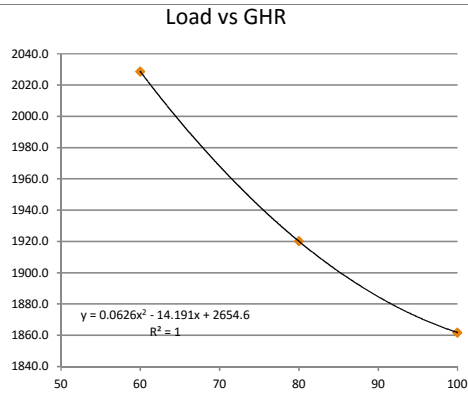
PPCL-Bawana

Loading	Net Heat Rate at NCV (kcal/kWh)	Net Heat Rate at GCV (kcal/kWh)	APC (%) Normative= 2.5%	Gross Heat Rate at GCV (kcal/kWh) Normative= 1845 kcal/kWh
100%	1569	1742	2.5	1698
95%	1580	1753	2.58	1708
90%	1596	1771	2.67	1724
85%	1617	1795	2.78	1745
80%	1643	1824	2.9	1771
75%	1674	1859	3.03	1802
70%	1711	1899	3.17	1839
65%	1753	1946	3.33	1881
60%	1800	1998	3.5	1928
55%	1852	2056	3.68	1981

NTPC-Faridabad

Loading (%)	Efficiency (%)	Heat Rate at NCV (kcal/kWh)	Heat Rate at GCV (kcal/kWh)	Gross Output (MW)	Net Output (MW)	APC (%)
100	51.3	1677.2	1861.7	442.29	432.65	2.18
80	49.74	1729.8	1920.1	355.276	346.49	2.47
60	47.08	1827.6	2028.6	268.096	260.98	2.65

NTPC-Faridabad

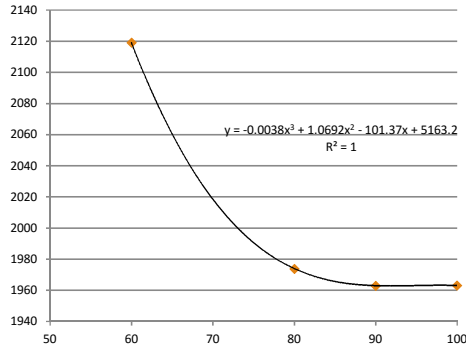


NTPC-Anta

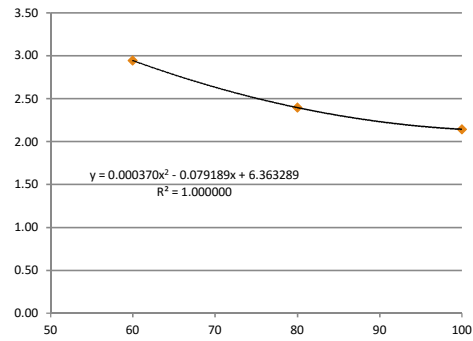
Loading (%)	Fuel Flow / GT (T/Hr)	Total Module Fuel Input (T/Hr)	NCV (kcal/kg)	GCV (kcal/kg)	Gross Output (MW)	Net Output (MW)	Gross Heat Rate (kcal/kWh)	APC (%)
100	24.444	73.332	10115	11228	419.41	413	1963	2.14
80	19.642	58.926	10116	11229	335.2	330	1974	2.40
60	15.941	47.823	10117	11230	253.43	249	2119	2.94

NTPC-Anta

Load vs GHR



Load vs APC

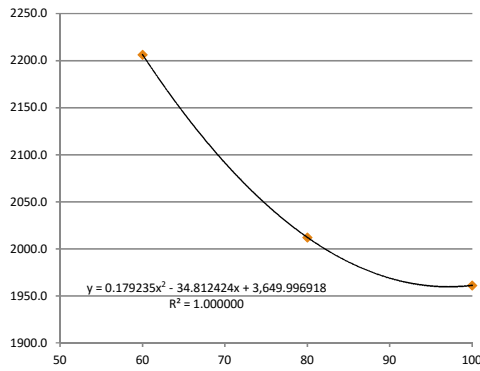


NTPC-Auraiya

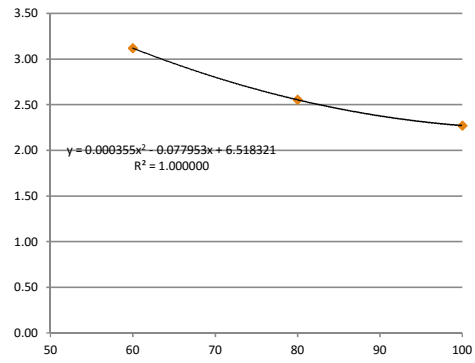
Loading (%)	Net Heat Rate at NCV (kcal/kWh)	Net Heat Rate at GCV (kcal/kWh)	Gross Heat Rate at GCV (kcal/kWh)	Gross Output module (MW)	Net Output module (MW)	APC (%)
100	1796	1993.6	1961.1	331.68	326.28	2.27
80	1845	2048.0	2012.1	265.68	261.03	2.55
60	2029	2252.2	2206.5	195.68	191.71	3.12

NTPC-Auraiya

Load vs GHR



Load vs APC

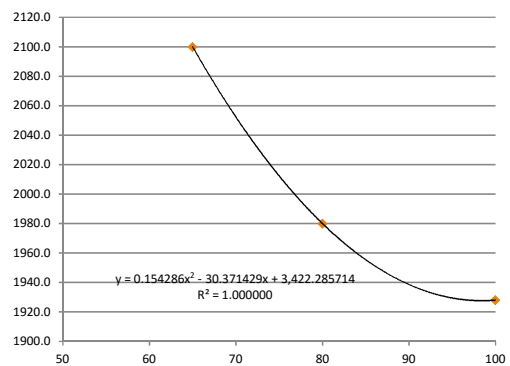


NTPC-Dadri

Loading (%)	Heat Rate at GCV (kcal/kWh)
100	1928
80	1980
65	2100

Value at 65% from data submitted by NTPC

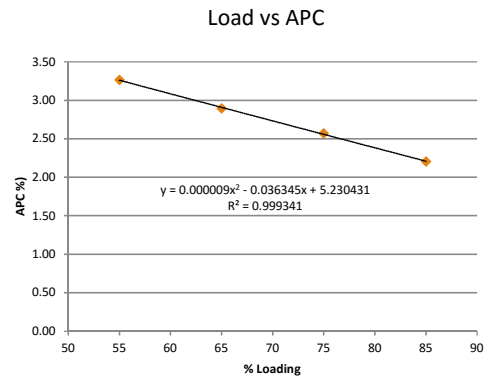
Load vs GHR



NTPC-Dadri

Loading (%)	APC (%)
55%	3.26
65%	2.89
75%	2.57
85%	2.20

Values from test carried out on 07.11.2017



NTPC-HBD GHR values

Loading (%)	Anta Normative= 2075 kcal/kWh	Auraiya Normative= 2100 kcal/kWh	Faridabad Normative= 1975 kcal/kWh	Dadri Normative= 2000 kcal/kWh
85%	1938	1986	1901	1955
80%	1951	2012	1920	1980
75%	1972	2047	1942	2012
70%	2003	2091	1968	2052
65%	2048	2144	1997	2100
60%	2109	2206	2029	2155
55%	2190	2277	2063	2219

NTPC-HBD APC values

Loading (%)	Anta Normative= 2.5%	Auraiya Normative= 2.5%	Faridabad Normative= 2.5%	Dadri Normative= 2.5%
85%	2.31	2.46	2.41	2.21
80%	2.40	2.55	2.47	2.38
75%	2.51	2.67	2.53	2.56
70%	2.63	2.80	2.58	2.73
65%	2.78	2.95	2.62	2.91
60%	2.94	3.12	2.66	3.08
55%	3.13	3.30	2.68	3.26

THANK YOU..!!
