

CENTRAL ELECTRICITY REGULATORY COMMISSION

EXPLANATORY MEMORANDUM TO CENTRAL ELECTRICITY REGULATORY COMMISSION (INDIAN ELECTRICITY GRID CODE) (FOURTH AMENDMENT) REGULATIONS 2015

Background

1. The Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014 has specific provisions for declaration of COD of the generating stations regulated by CERC under section 62 of the Electricity Act 2003. The Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2009 also had specific provision for declaration of COD.
2. However, there is no specific provision for declaration of COD of generating stations other than regulated by CERC under section 62 of the Electricity Act 2003 in the IEGC or any other CERC Regulations.
3. This point came to the notice of the Commission in Petition No. 85/MP/2014 filed by WRLDC with regard to declaration of COD of Unit 3 of Sasan UMPP. WRLDC has prayed for "issue of specific guidelines with respect to declaration of COD of the generators who are not governed by the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2009.
4. Commission in its order dated 8.8.2014 in Petition No 85/MP/2014 has observed as follows:

"Guidelines with regard to the commercial operation

35. WRLDC has prayed for "issue of specific guidelines with respect to declaration of COD of the generators who are not governed by the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2009 to be in line with CERC regulations so that the same can be implemented in a dispute free manner and eliminate any possibility of gaming by generator". The Commission has taken note of the prayer of WRLDC and is of the view that in case of UMPP, the PPA contains the necessary provisions with regard to the performance testing and commercial operation of the unit of the generating stations and the same should be strictly complied with. In other cases, if adequate provisions are not made in the PPA, the RLDC shall be guided by the provisions in the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014 in this regard. We direct the NLDC and RLDCs to submit report in consultation with CEA which shall include specific difficulties experienced by RLDCs in dealing with the performance testing and commercial operation of the generating stations which are not governed by the Tariff Regulations of the Commission. The report shall be submitted within two

months. We direct the staff of the Commission to study the report of the NLDC/RLDCs and place it before the Commission along with its suggestions for consideration and necessary directions."

5. POSOCO vide their letter dated 17.9.2013 submitted a white paper on the issue of COD. POSOCO subsequently vide letter dated 22.12.2014 has submitted the Minutes of Meeting dated 22.11.2014 convened by CEA on the issue of COD.

Technical Analysis

6. The issue of declaration of COD of the generating stations has been examined in the light of specific provisions relating to COD in the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014, provision relating to COD in the PPAs of UMPP projects and Case-II competitive bid projects, the guidelines issued by Central Electricity Authority/Ministry of Power, COD declaration in case of Sasan UMPP, submissions of POSOCO and Minutes of Meeting dated 22.11.2014 between POSOCO and CEA, procedure followed by NTPC etc.

7. It is seen that there is no uniform criteria and methodology for declaring COD of a unit of a generating station.

8. CERC Tariff Regulations provide for declaration of COD by the generating company after demonstrating the maximum continuous rating (MCR) or the installed capacity (IC) through a successful trial run after notice to the beneficiaries, if any, and trial run means the successful running of the generating station or unit thereof at maximum continuous rating or installed capacity for continuous period of 72 hours in case of unit of a thermal generating station or unit thereof and 12 hours in case of a unit of a hydro generating station.

9. As per PPA in respect of Sasan UMPP, COD means, in relation to a Unit, the date one day after the date when each of the procurers received a Final Test Certificate of the Independent Engineer after demonstration of unit tested capacity not less than 95% of the contracted capacity for a continuous period of 72 hours and establishing Super critical parameters of the unit.

10. As per the Model PPA for the Competitively Bid projects on DBFOT basis of September 2013, the commercial operation date of the Power Station or any Unit, as the case may be, shall be the date on, which the Power Station or such Unit is deemed fit for generating electricity and supplying it to the Grid upon issuance of such Completion Certificate or the Provisional Certificate by the Independent Engineer after demonstration of unit tested capacity not less than 95% of the contracted capacity for a continuous period of 72 hours.

11. The Ministry of Power OM of 3rd September 2009 provided following definition of commissioning of projects:

(a) Thermal Units (coal, Gas, Lignite)

A thermal unit may be considered as commissioned when the construction and commissioning of all plants and equipments required for operation of the unit at rated capacity are complete and the unit achieves full rated load on the designated fuel.

(b) Hydro

- (i) the trial run operation has started
- (ii) the unit has achieved full rated capacity in case of purely run-of river stations and run-of-river stations with pondage.
- (iii) The unit has achieved full rated capacity or the design capacity corresponding to prevailing reservoir level in case of storage power stations.

(c) Nuclear

Nuclear units could be declared to have been commissioned after these are declared “commercially operational” by plant authority.’

12. This was mainly for the purpose of considering capacity addition at the national level and not for any commercial purpose. The above definition does not stipulate the duration for which the full rated load has to be achieved. Some of the PPAs between a generator and its customers possibly are silent on this issue and there have been instances when some generators have declared COD after just touching the Maximum Continuous Rating or MCR.

13. NTPC internal circular dated 01.12.2009 with regard to declaring commercial operation of coal based units, also provides for continuous trial run of the unit at full load for 72 hours after intimating the beneficiaries. The objective of this test is to prove the capability of the boiler-turbine-generator unit along with the auxiliaries (including common) to run at the installed capacity.

14. As per the minutes of meeting dated 12.11.2014 following methodology was agreed between CEA and POSOCO for declaration of COD of a unit of a generating station:

- 1. The generating company shall be required to demonstrate the maximum continuous rating (MCR) or the Installed Capacity (IC) of the unit through a successful Trial Run after notice to the beneficiaries, if any, as laid down in the CERC Terms and Conditions of Tariff Regulations 2014. In any case, Generators (under RLDCs jurisdiction) would give one week advance notice to RLDCs before commencement of Trial Run. Those under SLDC's jurisdiction would give similar notice to SLDC.
- 2. Trial Run would be for a 72 hour period for thermal machines wherein the Minimum Net Generation capacity corresponding to MCR or IC shall be

established for each of the 288 blocks of 15 minutes period. The Minimum Nett Generation capacity to be established shall be determined after allowing normative auxiliary power admissible as per CERC Terms and Conditions of Tariff Regulations.

3. Trial run shall be for 12 hours for hydro unit wherein the Maximum Net Generation capacity corresponding to Maximum Continuous Rating (MCR) or Installed Capacity (IC) shall be established for each of the 48 blocks of 15 minutes period. In case of water shortage in hydro stations, the generator could test at full load/ installed capacity for the period water is available and declare provisional COD However the generator would test at the earliest for 12 hours. The Minimum Nett Generation capacity to be established shall be determined after allowing normative auxiliary power admissible as per CERC Terms and Conditions of Tariff Regulations 2014.
4. Before conducting the trial operation the Generating company, shall furnish the details of installed capacity, applicable normative Auxiliary Power Consumption as per CERC Tariff Regulations and Minimum Net Generation capacity to be demonstrated; which shall be demonstrated for each of the 288 blocks of 15 minutes for successful completion of Trail Run. (48 blocks of 15 minutes for hydro units)
5. In case of plants governed by PPAs, having specific provisions in regard to the COD, the Minimum Net Generation capacity to be demonstrated during the Trial Run shall be as per the provisions of PPA subject to a minimum of 95 % Net Generation capacity corresponding to the MCR or installed capacity.
6. After the Trial Run, the generator would submit the 15 minutes time block wise energy meter data to RLDC which shall examine the same before certifying COD.
7. The procurers may separately take up with the generator for any additional tests required contractually and satisfy themselves of the same.

Capacity to be Tested

15. It may be seen from the provisions with regard to COD of a unit of a generating station in different Regulations, OMs, PPAs and procedure followed by NTPC that emphasis is on demonstration of Maximum Continuous Rating of the unit or Installed Capacity or the Nameplate Rating or the contracted capacity. But declaration of COD in case of UMPP projects and Competitive bid projects in Case II on DBFOT basis is based on demonstration of 95% of Installed capacity or more.

16. However, it is felt that from the point of view of the beneficiaries / procurers and the grid operation point of view, the capacity demonstrated should be MCR capacity or the Installed Capacity or the name plate rating and not less than this. In such a situation it may not be desirable to provide for declaration of COD for the demonstration of capacity less than the installed capacity or the contracted capacity. However, it is up to the generating company to derate the unit which should not be less than 95% of the name plate rating or the contracted capacity and with corresponding derating of unit considering grid response to 105% of the capacity so derated in terms of IEGC. In such case of derating RLDC should accept COD after demonstration of capacity to such derated capacity. The UMPP PPAs will have to be aligned to this particular provision.

Duration of Test and treatment of Interruptions during the trial operation

17. The other issue is the duration of capacity test before declaring COD. All Regulations and PPA provisions etc provide for trial run of 72 hour continuous operation except the MoP OM dated 9.9.2009 which provide for achieving full load of unit or name plate rating without specifying the period of sustaining load continuously. However aforementioned MoP OM is for the purpose of commissioning of a unit/ station and not for its commercial operation. No specific genesis for 72 hour continuous trial run has been found but perhaps this is from the point of view of establishing sustained operation of the unit. However, it is found that industry is not following the practice of 72 hour trial operation continuously at rated capacity or name plate rating or 95% of the capacity and the name plate rating in letter and spirit.

18. As per procedure followed by NTPC, during trial run, minor interruptions (less than 4 hours at a time) do not affect the duration of trial run. If the interruption-outage is long (more than 4 hours), the trial run is prolonged for the period of interruption. Minor partial loading is allowed, but the average load during the running hours has to be equal to the Installed Capacity.

19. From the practical point of view as well, sustaining unit load at the rated capacity or the name plate rating may always not be possible throughout 72 hour due to various reasons such as low system demand during off peak hours, system constraints, unit partial loading due to operational reasons, etc. From the commercial point of view, retesting would involve extra cost. It may therefore, be desirable that short interruptions may be allowed with a cumulative of 4 hours during 72 hour testing with corresponding increase in total duration of test. Cumulative interruptions of more than 4 hours would call for retesting. Further partial loading may be allowed with the condition that average load (based on 15 minute SEM readings) during the duration of the trial run shall not be less than Maximum Continuous Rating, or the Installed Capacity or the name plate rating.

Who should Declare COD

20. The generating company should be allowed to declare the COD only after clearance from the respective RLDC on providing of generation data to the concerned RLDC through SCADA or through e-mail. The respective RLDC should notify the clearance within 7 days of receiving the generation data or else inform the generating company of any deficiency in the trial run operation.

Compliance with various provisions of CEA Regulations and Grid Code

21. During the meeting of CEA and POSOCO, it was also decided that the following technical requirements need to be fulfilled by the generators from the power system security view points and as per the CEA Standards/Regulation:-

1. Primary response through governor action.
2. Availability of Automatic Voltage Regulator (AVR) and ability of the generator to operate over the entire range of its capability curve from 0.85 power factor lag to 0.95 power factor lead.
3. Power System Stabilizer (PSS) being in service and tuned.
4. Protective systems on generators and transmission lines provided as per the Standards and tested.
5. Synchronous condenser capability of hydro units.
6. Black Start capability of gas turbines and hydro power stations.
7. Availability of real time data and communication facilities with RLDCs/ SLDCs/ NLDC through main and alternate paths.
8. Provision of Disturbance Recorder, Event Logger and other Data Acquisition equipment which are time synchronized through Global Positioning System (GPS) signal.
9. Completion of all the switchyard bays and equipment ensuring that the switching scheme has at least two complete diameter in the breaker and half switching scheme so that reliability is maintained.
10. Submission of model data for generator, exciter, PSS governor and other equipment, if any to RLDCs for the purpose of simulation.
11. Any other statutory requirement.

22. In the meeting held in CEA, it was agreed that the above tests are necessary for establishing the capability of the units for safe and reliable operation in the grid. CEA has suggested that the above technical requirements could be tested by the generator within the six month period from the date of synchronization and the COD and certificate given to RLDCs.

23. In the meeting held in CEA, it was also agreed that CERC shall be requested for provision to be made in the Indian Electricity Grid Code (IEGC) for completion of these tests in a specified time frame after grant of connectivity along with suitable

penal provisions including disconnection of the generator by the SLDC or RLDC as the case may be so that it is applicable for all generating units, be it in the State sector, Central Sector or Private Sector. If required, suitable provisions could be made by CEA in connectivity standards.

24. The para 5.2 (f) of IEGC deals with provisions relating to compliance of generating stations of RGMO/FGMO. As such, no separate provision is required to be made in respect of sub item 1 in para 21 above.

25. Central Electricity Authority (Technical Standards for Construction of Electrical plants and electric lines) Regulations, 2010 provide for complying with sub items no 2 to 6 and 9 in para 21 herein.

26. CERC Tariff Regulations, 2014 provide that the generating company shall certify to the effect that the generating station meets the key provisions of the technical standards of Central Electricity Authority (Technical Standards for Construction of Electrical plants and electric lines) Regulations, 2010 and Grid Code and this certificate is required to be signed by CMD/CEO/MD of the company subsequent to its approval by the Board of Directors in the specified format and to be submitted to the Member Secretary of the concerned Regional Power Committee and concerned RLDC before declaration of COD.

27. In order to see that all the requirement as specified from Item 2 to 6 and 9 are complied by the generating company before declaration of the COD of the unit or the station, it may be desirable that generating company may be asked to give Certificate to the effect that generating station meets all relevant requirements and provisions of the technical standards of Central Electricity Authority (Technical Standards for Construction of Electrical plants and electric lines) Regulations, 2010 and Grid Code. The certificate should also contain that all main plant-equipments and auxiliary systems including balance of plant such as fuel handling system, DM plants, ash disposal systems and other site specific systems have been commissioned and are capable for full load operation in sustained basis. It should also certify that all electric supply system, instrumentation and control, auto-locks etc. are in service for full load operation of unit(s). The certificate may be signed by CMD/CEO/MD of the company. The approval of Board of Directors may be submitted subsequently within 3 months period so as not to delay the declaration of COD.

28. Item no 7, 8 and 10 mentioned in para 21 are already provided in the IEGC.

29. The RLDCs already has power in the IEGC not to schedule the unit station in the event of non compliance of any of the provisions of Central Electricity Authority (Technical Standards for Construction of Electrical plants and electric lines) Regulations, 2010 and Grid Code.

30. Accordingly, it is proposed to insert provisions in regard to COD of a unit/block or a generating station in the IEGC which would be applicable to all the generating stations including generating stations regulated by CERC and certain other provisions as discussed above.

Issue of Technical Minimum for the thermal generating stations

31. The issue of technical minimum has been under discussion for quite some time.

32. The State utilities/Discoms have raised the issue of technical minimum during the hearing before the Commission on Draft Deviation Settlement Mechanism (DSM) Regulations and in the hearing of Petition No 6/RP/2014. MPPMCL in Petition no 6/RP/2014 has submitted that in order to control drawal, SLDC submits request for zero/less quantum of Central Sector generation well in advance. However, RLDC allots quantity required for technical minimum capacity of Central Sector machines. The same applies with intra-state scheduling. Thus, intra-state entities have to accept this even though it is not required. MPPMCL has further submitted that there are international allocation from the ISGS of NTPC situated in Western Region, like allocation to Bangladesh and in order to ensure uninterrupted power supply to international allottees, the particular generating stations has to be remain operative even in extremely low demand situation. This results in to obligation of technical minimum on other beneficiaries of that particular station and may result in under drawal because of low system demand. Tripura State Electricity Co Ltd has made submissions in Petition No 6/RP/2014, that in case of sudden reduction in demand, the Utility immediately calls for revision of drawal schedule from various generating stations but such requests for revision of drawal schedule are not accepted by the RLDC/ISGS in totality on the plea of technical constraints (technical minimum). The Restoration of system normalcy by the distribution utilities take 5 to 12 hours depending upon severity of contingency and till such time continuous under drawal takes place and Regulation forces the utility without any compensation though the utility has no control over the above circumstances. Similar pleas have been made by the State utilities during the hearings of Draft DSM Regulations.

33. NTPC in Petition No 142/MP/ 2012 with regard to regulation of power by Power supply Grid has stressed the need of ensuring technical minimum schedule to NTPC power stations. NTPC has requested POWERGRID and RLDCs to ensure technical minimum for its stations & that merit order of all inter-state generating stations may be considered while implementing Regulation drawing attention to clause 6.5.14 of CERC IEGC Regulations, 2010. NTPC in Petition No 142/MP/2012 has also submitted that scheduling at less than 70% load levels would affect the reliability of operation as well as the efficiency and economy of operation. In the long run, due to cyclic load fluctuation which in turn would also cause the operational parameters to vary, and would have an adverse impact on the machine health and life. Almost 30 years old stations like Singrauli and Korba are still running at high

efficiency levels with minimum expenses and R&M mainly because of high loading factors of the units over the years. Although in the technical specification for the BTG supplier normally the power generators including NTPC put 30% of BMCR as the limit for stable operations, this limit is generally used for a performance guarantee test in a new boiler under controlled/ideal conditions with designed fuel and cannot be ensured over the life of the plant as normal operating conditions will vary from ideal/controlled operating environment.

34. To take a holistic view of the issue, the Commission in hearing dated 28.5.2013 in Petition No 142/MP/2012 directed CEA to submit their views on technical minimum for thermal generating station. CEA in a communication dated 12.9.2013 to CERC in Petition No. 142/MP/2012 has given following views on the issue of technical minimum:

"The control range for coal fired units is generally taken as 50% to 100% MCR and the rated steam temperature can be maintained in this range. However, the units can operate at any lower load without any limits; and minimum load without oil support is taken as about 30% MCR and operation below this limit needs oil support. The CEA Technical Standards for Construction of Electric Plants and Electric Lines Regulations – 2010 prescribe a control load of 50% MCR. The operating capability generally specified in the technical specifications also stipulate continuous operation without oil support above 30% MCR load and control load range of 50% to 100% TMCR

Thus unit operation may be envisaged as indicated above, barring any specific operating constraints brought out or recommended by OEMs with proper technical justification."

35. In the above back drop, the concern of generating companies such as NTPC has merit but it needs to be appreciated that with the substantial capacity addition during the 11th Plan and capacity addition of around 88,537 MW planned during 12th Plan as well as optimistic projection of incidence of renewable power capacity in the country in the near future, it is likely that there may be surplus situation during certain periods requiring generating units to shed load even below 65% to 70 % of Installed Capacity/ MCR. Therefore, the technical minimum generation to be scheduled by a generating station needs to be reviewed.

36. It is proposed that the technical minimum may initially be kept as 55% of Installed Capacity/ MCR of unit/units for old as well as new plants in due consideration of CEA's recommendations and giving some margin over the recommended technical minimum of 50% by CEA. However, the operation at 55% loading has commercial implication for the generator in terms of increase in heat rate, secondary fuel oil consumption and auxiliary energy consumption, thereby increasing the actual energy charges. The generator will have to be compensated for this increase in energy charges.

37. It is felt that any reduction in loading of units below 85% on account of low despatch schedule given by beneficiaries/RLDCs may have to be compensated by the beneficiaries. The Standard Bidding Documents (SBD) for case-II/UMPP projects brought out by Ministry of Power provide for heat rate degradation for part load operation corresponding to different unit loadings. In accordance with the same, following heat rate degradation for part load operation corresponding to different unit loadings may be provided:

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

Below 55%, the station may go for reserve shut down.

38. The generating company may be allowed to seek relief at the end of the year based on average unit loading due to low despatch schedule given by beneficiaries/RLDC but not because of any other reason including short supply of fuel/shortage of fuel; Commission may allow compensation for increase in station heat rate, secondary fuel oil consumption and auxiliary energy consumption after prudence check on a petition to be filed by the generating company giving requisite details of unit loadings, forced outages, planned outages, PLF , generation at generator terminal, energy sent out ex-bus, actual heat rate, number of start ups, actual secondary fuel oil consumption, actual auxiliary energy consumption etc. In case of gas based stations, compensation shall be decided based on the characteristic curve provided by the manufacturer and after prudence check of the actual operating parameters of station heat rate, auxiliary energy consumption. The compensation worked out by the Commission shall be borne by the entity was caused the plant to be operated at technical minimum. In case of generating stations not regulated by the Commission, the generating company shall have to factor these provisions in the PPA for sale of power in order to claim compensation for operating at the technical minimum schedule.

39. This also requires all concerned including NLDC/RLDCs, RPCs generators, beneficiaries and buyers of all regions to arrive at operating procedures to be followed in certain specific grid conditions such as sudden load throw off or unit tripping significantly endangering grid security. Such an operating procedure for backing down of thermal generating stations based on merit order despatch/

staking may be developed in two months time and adopted at respective RPC forum.

40. The generating companies are also required to keep a record of the emission levels from the plant due to part load operation and submit a report to the commission every year.

41. Accordingly, provisions relating to technical minimum are proposed to be suitably incorporated in the IEGC.