

**CENTRAL ELECTRICITY REGULATORY COMMISSION  
NEW DELHI**

**Petition No: 144/MP/2017**

**Coram:**

**Shri P.K. Pujari, Chairperson**

**Dr. M.K. Iyer, Member**

**Shri I. S. Jha, Member**

**Date of Order: 9<sup>th</sup> April, 2019**

**In the matter of**

Petition under Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Fourth Amendment) Regulations 2016 and Central Electricity Regulatory Commission's DOP on Reserve Shutdown and Compensation Mechanism dated 5.5.2017 for seeking upward revision of the Technical Minimum fixed for schedule of operation of NLCIL lignite based Generating Stations (TPS I Expn, TPS II stage 1 & 2, TPS II Expn) and other related issues.

**And**

**In the matter of**

NLCIL  
(a joint venture of NLC & TANGEDCO)  
Harbour Estate, Tuticorin-628004

**.... Petitioner**

**Vs.**

1. Tamilnadu Generation and Distribution Corporation Limited  
NPKRR Maaligai, 144,  
Annasalai, Chennai – 600002

2. Kerala State Electricity Board  
Vaidyuthi Bavanam, Pattom  
Thiruvananthapuram – 695004

3. Puducherry Electricity Department  
137, NSC Bose Salai  
Puducherry – 605001

4. Power Company of Karnataka Limited  
KPTCL Complex, Kaveri Bhawan  
Bangalore – 560009

5. APTRANSCO / APPCC,  
Vidyut Soudha, Khairatabad,  
Hyderabad - 500 082

6. TSTRANSCO / TSPCC,  
Vidyut Soudha, Khairatabad,



Hyderabad - 500 082

7. Southern Regional Load dispatch Centre,  
Power System Operation Corporation Ltd.,  
29, Race Course Cross Road,  
Bengaluru – 560 009.

8. Southern Regional Power Committee,  
29, Race Course Cross Road,  
Bengaluru – 560 009

...Respondents

**Parties present :**

Shri M.G. Ramachandran, Advocate, NLCIL  
Ms. Ranjitha Ramachandran, Advocate, NLCIL  
Ms. Anushree Bardhan, Advocate, NLCIL  
Shri J. Dhanasekaran, NLCIL  
Shri K. Ravikumar, NLCIL  
Shri S. Vallinayagam, Advocate, TANGEDCO  
Shri Ashok Rajan, SLDC

**ORDER**

The present petition has been filed by the Neyveli Lignite Corporation of India Limited (hereinafter to be referred as (“the Petitioner”) seeking upward revision of the Technical Minimum fixed for schedule of operation of NLCIL lignite based Generating Stations. The Petitioner has made the following prayers:

- a) To review the Technical Minimum of 55 % of MCR loading or installed capacity of a generating unit, fixed and consider revising the same for the lignite fired Stations of NLCIL under power to remove difficulties and Power to relax as follows to *ensure reliable, safe and stable operation of the units on a sustained basis*:
- *TPS- I Expansion Units: Technical minimum is to be fixed at 70% MCR.*
  - *TPS-II, Stage-1 & Stage-2 Units: Technical minimum is to be fixed at 70% MCR.*
  - *TPS II Expansion Units: Exemption may be granted from technical minimum operation.*
  - *NLCIL Power Plants should be exempted from Reserve shut down provision.*
- b) To consider the URS sold in market shall be treated independently and allowed over and above the technical minimum schedule of 70%.



## **Submission of the Petitioner**

2. The petitioner has submitted as follows:-

(a) The implementation of Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Fourth Amendment) Regulation, 2016, which provides for technical minimum of 55 % is affecting the reliability of operation of Units of the Petitioner's power plants due to resultant unstable conditions.

(b) Provision of fuel oil support leads to mixed firing and this is injurious to the furnace in the long run, as slagging on the furnace gets accelerated due to this and use of water lancing is also not possible during low load operation of the Unit.

(c) As a result of lower utilization of lignite for power generation, utilization of linked mines capacity of the petitioner is getting affected, resulting in huge revenue loss to the petitioner.

(d) To mitigate the effects of low load operation of Units, reserve shut down of the Units can be taken but, this affects the performance of the Units in the long run, as these Units are not designed for frequent shut down and start up.

3. The Petitioner has further submitted that its pulverized lignite fired plants i.e. Thermal Power Station II – Stage I (3 x 210 MW), Stage II (4 x 210 MW) and Thermal Power Station I Expansion (2 x 210 MW) are also facing following technical problems encountered during low load operation :-

(a) Four (4) Mills need to be kept in service while operating the Unit at low loads, as three (3) Mill operations will lead to Unit tripping in the event of tripping of any one mill. With the necessity to operate the Units at low load on a continuous basis due to URS schedule given by beneficiaries in most of the time blocks of the day, operating the Unit with 3 mills in service warrants fuel oil support, as otherwise, this will lead to tripping of Unit on any slightest disturbance. This results in mixed firing for prolonged



durations and this leads to formation of slagging on the furnace walls. Water lances also could not be taken into service during low load conditions due to furnace pulsations. Further, shifting of fire ball in the furnace also occurs due to operation of less number of mills, leading to instability.

(b) Single stream operation could not also be followed due to difficulty in ramping up the load when there is requirement as per schedule and unreliable operation of the Unit, as tripping of any equipment (Fan, mill etc.,) will lead to Unit tripping.

(c) Increase in mill outlet temperature also leads to unsafe operation. Lignite is dried in the mill using hot flue gas using flue gas drawn from the furnace through Resuction duct due to self ventilation of the beater wheel Mill and the temperature of the lignite – gas mixture is to be maintained at 120-180 °C as per OEM recommendation. Hot air is used to reduce the flue gas temperature so as to control the After Mill Temperature (AMT). The air admission has to be kept at optimum level so as to maintain the oxygen levels at safer limits to avoid pre ignition and possible explosions in the mill outlet duct. When the lignite flow is reduced, AMT goes beyond the limits, resulting in unsafe operation and endangering safety. The vibration levels in the mill also go high because of the increase in AMT.

(d) There are restrictions in use of Water Lances, which is used for furnace deslagging. Water jet at a pressure of minimum 18 Ksc is sprayed on to the furnace walls to remove the slag deposits. This process is unique for only Lignite Fired Boilers. At low loads, heavy fluctuations develop in the furnace if water lances are taken into service, leading to furnace instability as water quenches the fire ball and eventually results in tripping of the Unit. Since technical minimum schedule is given for most of the time blocks, the water lances could not be pressed into operation. If water lances are not operated for a few days continuously, heavy deposition of slag



takes place on the furnace walls as well as at the Mills Resuction Duct Mouth. Dislodging of this heavy mass of slag from furnace subsequently using water lance and fall of the same from heights result in damages to furnace hopper (S panel area) and bottom ash handling systems like After Burning Grates and slag conveyor, which are located below the furnace. Fall of heavy mass of slag had created explosions in the Slag bath in the earlier days and repeat of the same cannot be ruled out if the present situation continues. Unit has to be eventually stopped for attending to the above problems.

(e) Low load operation results in furnace instability because of flame failure, leading to eventual tripping of Unit on Fire ball protection, even under optimised air flow condition. The turbulence created for effective combustion of pulverized lignite in tangential firing is uncontrollable when the fuel/air mixture is lean, especially during tripping of running mill/feeder. The after effect on such occasions is violent due to spontaneous combustion of lignite particles at other elevated locations. In other words, there is no more combustion but only explosion. Such incidences are unpredictable and the only effective way to control this is to take precautionary steps. Hence oil burners are necessarily to be taken into service to ensure fireball/furnace stability, resulting in avoidable mixed firing.

(f) Mixed firing on a continuous basis, coupled with non-operation of water lances, leads to slag formation in the furnace.

(g) Keeping RGMO in service during low load operation also causes difficulties. Any sudden increase / decrease in load / lignite flow affects the furnace stability very much.

(h) Reserve shut down of Unit(s) will lead to further under-utilisation of lignite mines feeding the Power Plants. Moreover, the Units are designed for base load



operation only and frequent shut down / start up will tell upon the performance of the Units in the long run.

4. The Petitioner has submitted that apart from the aforesaid problems, the following additional station specific technical problems are being faced in different Plants of Petitioner during operation at technical minimum load:

(a) **Technical problem specific to Thermal Power Station I Expansion ( 2 x 210 MW):-** HRH temperature goes as low as 520 degree celcius even with no RH spray. Sustained low operation of the Unit will damage the LP Turbine last stage blades in the long run.

(b) **Technical problem Specific to Thermal Power Station II Stage I & Stage II:** Increased RH & SH attemperation flow and furnace temperature due to possible furnace fouling effect.

(c) **Technical problem Specific to TPS II Expansion:** The petitioner w.r.t. TPS II Expansion has submitted that this station has Circulating Fluidised Bed Combustion (CFBC) boilers of 250 MW rating which are the first of its kind in the country. After overcoming numerous technical problems faced in these boilers, only from 4<sup>th</sup> quarter of 2016-17, we are able to run the Units at more than 200 MW and the availability of the Units is also showing steady improvement. The quantum of refractory used in the boiler is more than 5000 Tonnes and because of the constant circulation of hot bed materials along with lignite, many peculiar problems are being faced in these boilers compared to conventional PF fired boilers. Varying the load as per schedule and lowering the load up to Technical Minimum schedule pose lot of technical problems and some of them seriously affect the safe operation of the boilers. Variations in critical parameters are encountered, affecting the stable operation of the boiler. Any outage of the Unit due to any small disturbance results in forced outage of Unit for a minimum period of 15 days. Since, more time is required for the cooling of refractory for the people to enter inside to take up the works.



Depending upon the location of the problem, dismantling / recasting of refractory also becomes necessary and in which case, outage time is still higher. The difficulties being faced are summarized as under:

- i. **High Combustor Differential Pressure (DP)** : While reducing the firing of lignite, the Combustor differential pressure increases, affecting the fluidization of the bed material and disturbing the evaporation. The high differential pressure also reduces the primary air flow through nozzles and sometimes completely blocks the air flow, resulting in fire out in boiler. High DP also leads to shifting of bed material from one pant leg to another, affecting the combustor stability. To normalize the above situation and to re-establish the primary air flow, huge quantity of very high hot bed material has to be drained directly through combustor drain to atmosphere, leading to very unsafe operation endangering the safety of the nearby equipment and also people working around. If DP in the combustor is not reduced by draining the material, lignite feeders will trip, leading to Unit tripping. During normal operation, combustor DP is controlled by draining the bed material through ash coolers.
- ii. **Non-Fluidization of Fluidized Bed Heat Exchanger (FBHE) & Low SH/ RH steam temp**: The SH and RH coils are located in the Fluidized Bed Heat Exchangers (FBHEs) in the boiler of TPS II Expansion and there are 4 FBHEs per boiler. During reduction of firing while ramping down, non fluidization of combustor affects the circulation of hot bed material through FBHE and this causes disturbances in the fluidization process in FBHE, which in turn lowers SH / RH steam temperature. Ramping down specifically affects RH steam temperature, which goes as low as 486 deg C even at 165 MW
- iii. **High SH/ RH Tube Metal Temperature:-** The partial load operation often raises SH/RH tube metal temperature. Frequent variation in firing



causes thermal stress in SH/RH coils, resulting in tube failure and the restoration time for any outage is normally minimum 15 days.

- iv. **Refractory failure:-** Frequent variation in firing causes thermal shock in refractory material (5000T) resulting in failure of refractory and dislodging from its position. This in turn leads to loss of heat due to radiation. Failure of refractory in FBHEs results in penetration of bed material through damaged refractory voids causing erosion of Super heater and Re heater tubes, ending in tube leakage which warrants forced outage of Boiler. Any repair of coils in FBHE takes minimum of fifteen days including cooling and repairing of pressure parts and refractory.
- v. **Lower Ramping Rate:** During ramping up also, load could be raised only for 3 to 4 blocks and thereafter firing could not be raised continuously due to faster rise in temperature in combustor, cyclone and back pass. Further, increase in back pass temperature also leads to increase in Steam Cooled wall temperature, leading to eventual tube puncture and shut down of the Unit.
- vi. In addition to the above Low load operation results
  - (a) Increase in Heat rate.
  - (b) Reduction in Boiler Efficiency.
  - (c) Increase in auxiliary consumption.
  - (d) Increase in specific fuel consumption.
  - (e) Heavy shock in refractory lining
  - (f) High strain in Pressure parts due to increase of metal temperature in SH/RH tubes since these are of high chrome material A 213 T91.

5. The petitioner regarding under-utilization of Neyveli Pit head mines has submitted as under:

- (i) NLC being an integrated mine-cum-power company, scaling down of generation in the thermal power plants due to technical minimum necessitates



significant reduction in the lignite production resulting in decrease in the capacity utilization of the linked mines.

(ii) Since the coming in vogue of technical minimum of 55%, heavy surrender of power by the beneficiary States of the Southern Region is being experienced resulting in heavy back down of generation.

(iii) If capacity utilisation of Neyveli mines becomes lesser than 85%, there will be under recovery of lignite cost as the annual fixed charges of lignite cost is recovered at 85 % of capacity utilization of Neyveli mines.

(iv) Lignite cannot be transported over long distances as it is susceptible to spontaneous ignition and hence has to be consumed at the point of excavation.

(v) Due to issues in surrender of power by the beneficiary States, full quantum of power is not made available to the Generator before hand to undertake trading. This is also resulting in under utilization of available thermal capacity and is getting wasted.

(vi) Under the above circumstances scaling down the technical minimum to 55 % would result in enormous reduction of power generation by NLCIL Power Plants vis – a vis lignite production, which ultimately would lead to under utilisation of mines and under recovery of lignite cost and cascading impact on the financials of the Company.

**6.** The petitioner has submitted that, the Petitioner had made a presentation to the Central Commission during the process of amendment of the Grid Code on the technical difficulties that the Petitioner's power plants would face due to reduction of technical minimum to 55% of installed capacity. In this regard the Petitioner had also filed a Petition no 132/MP/2016, seeking upward revision of the Technical Minimum fixed for operation of



Central Generating Stations and Inter-State Generating Stations. However the Petition was withdrawn by the Petitioner, but a detailed representation dated 13.12.2016 to that effect was made to the Commission.

**7. Sale of URS in Market:-** Further, the petitioner for the sale of URS in market has submitted that as facilitated by Tariff Policy, ISGSs are permitted to trade the URS power of beneficiaries in the Power Market. Quantum of URS Power traded in the Power exchange is included by the RLDCs while notifying the Technical minimum schedule, and this defeats the very purpose of the Tariff Policy which facilitates trading of surplus power. The petitioner has prayed to the Commission that URS sold in the market should be treated independently and allowed over and above the technical minimum schedule of 70%.

### **Replies and Rejoinders**

**8.** The respondent TANGEDCO vide affidavit dated 18.9.2017 has submitted that as per the Notification dated 19.5.2016 of the Ministry of Power, the Central Generating Stations are given the option of sale of un-requisitioned power at the power exchange due to surrender of power by the State Utilities and TANTRANSCO has given "No objection Certificate" to the Central Generating Stations for sale of URS power in the power exchanges. Further, on one side the Central Generating Stations are benefitted by collecting the capacity charges from the beneficiary utilities according to the share allocated in the respective generating station, on the other, by sale of URS power through exchanges, the Central Generating Stations are once again getting the capacity charge and energy charge from 3<sup>rd</sup> party purchasers. In other words, the CGS by selling URS power benefits itself of double capacity charges in addition to the energy charge.

**9.** The respondent no.7 SRLDC vide affidavit dated 10.2.2018 has submitted that the request of NLCIL for raising the technical minimum to 70% was already raised during the



feedback on draft fourth amendment to the Grid Code and the Commission after considering the views of all stakeholders has decided the technical minimum of 55%. The technical minimum of 55% is very helpful to the system operator in managing the grid as well as managing the growth of renewable energy variation and unexpected demand variation. SRLDC has further submitted that technical minimum of 55% may be maintained and has requested to treat the URS sold in the market as part of technical minimum only.

**10.** The Petitioner, vide affidavit dated 20.2.2018 in its rejoinder has submitted that inferior quality lignite power stations need to be considered due to unique nature of Modus operandi and technical difficulties and further reiterated its contention that URS sold in the market shall be treated independently and should be allowed over and above the technical minimum schedule of 70%.

#### **Response of CEA and replies of respondents on CEA report**

**11.** The Commission referred the issues raised by the Petitioner to CEA vide letter dated 26.3.2018, seeking suitable advice. The CEA vide its report dated 12.9.2018 on upward revision of the Technical Minimum of NLCIL's thermal generating stations has given its recommendations supported with analysis.

**12.** The final recommendations of CEA are as under:-

(i) CERC notified the 4th Amendment to CERC (Indian Electricity Grid Code) Regulations, 2010 on 06.04.2016 vide which technical minimum was fixed to 55% MCR of the Thermal units operating with coal and lignite as primary fuel. Subsequently, CERC vide order dated 05.05.2017 notified the Detailed Operating Procedures on reserve shutdown mechanism, due to part load operation and multiple Start/Stop of the units consequent to implementation of technical minimum.

(ii) *The specific technical aspects of pulverized lignite based plants having bearing on technical minimum load have been examined in detail including design*



aspects, constructional features, OEM recommendations, operational practices etc. and the same are indicated in enclosed Appendix-1 (along with its annexures).

(iii) Based on consideration of factors given in Appendix-1 including operational issues brought out M/s NLCIL during visit in CEA officials to their plant, survey of international literature/ studies on the issue, we are of the opinion that M/s NLCIL may be allowed to operate its conventional pulverized lignite fired units at the technical minimum load of 65% MCR vis-à-vis that set at 55% MCR for coal based plants. However, if in future, the technical minimum load of coal based power plants is set below the present level of 55% MCR, the technical minimum load of NLCIL's lignite based power plants shall also be considered for appropriate reduction from the present proposed 65% MCR.

(iv) Regarding NLCIL TPS-II (Expansion) 2x250 MW which is based on CFBC technology, it is stated that these are the first set of 250 MW CFBC units installed in the country and modifications are being carried out by them to improve their performance. The detailed aspects in this respect are indicated in enclosed Appendix-2 (along with its annexures). They have indicated that a time period upto 30.06.2019 is required for completing the modifications and test the sustainability of operation of both the units. Based on consideration of the factors indicated in Appendix-2, the request of NLCIL for exemption from compliance of technical minimum load of 55% for these units upto 30.06.2019 seems to be reasonable. The same is recommended to be favourably considered by CERC.

**13.** CEA has given its further analysis /observations on upward revision of the Technical minimum from 55% to 70% in respect of NLCIL's pulverized lignite fired thermal generating stations and CFBC boilers stated as follows:-

**14.** Considering the GCV and the moisture content, the design conditions of fuel for lignite based plants are inferior to that for coal based plants. In comparison to the boilers for



indigenous coal which are designed for a typical GCV of 3800 kcal/kg with moisture content in the range 10- 15%, the design calorific value of lignite on NCV basis is 2350 kcal/kg with moisture content as 52% for TPS-1 Expansion units, and gross GCV of 2800 kcal/kg with moisture content of 48.5% for TPS-II, Stage-I units.

**15.** CEA's standard technical specifications for coal based sub- critical 500 MW units provide for control range of boiler as 50% TMCR to 100% BMCR. This requirement is expected to be similar for coal based sub- critical 210 MW units also. The design steam parameters are to be maintained up to 60% load in case of pulverized lignite power plant and up to 50% load in case of conventional pulverized coal plants. Moreover, as per the O&M manual of TPS-II Stage-I main steam, hot reheat steam, cold reheat steam temperatures shall be controlled within close tolerances between 60 to 100% boiler load.

**16.** The CEA in comparison to 210 MW conventional coal fired boiler with 210 MW lignite fired boiler has analysed that low load operation of lignite fired boilers with reduced number of operating mills results in displacement of the fire ball and has implication of disturbance to stable operating conditions as compared to conventional coal fired boilers. Further, the combustion stability gets adversely affected at low load for lignite fired boilers due to very high moisture content as the flue gas is used for heating the lignite and transporting it to boiler and there is no regulation on flue gas drawn, however, in conventional coal fired boilers, air heated by flue gas in APH is used to dry the coal and transport it to the boiler.

**17.** The O&M manual also indicates that mill outlet temperature is to be in the range 120 to 180 deg C (140 deg C at 100% MCR). The technical details of mill & lignite burner system as furnished by NLCIL also indicate that temperature of fuel/ gas mixture at the classifier is to be maintained within 120 - 180 deg C. Further, on technical constraints of milling circuit, it has been indicated that if temperature after the mill increases above 180 deg C, the mill must be immediately stopped. NLCIL made a control desk demonstration to



CEA on 25/26 May 2018. Initially, the unit was operating at near full load of about 207 MW with 5 mills in operation and the outlet temperature of the mills was in the range 154-164 deg C. Slowly and gradually load was reduced to 170 MW with 4 mills in operation and mill outlet temperature increased to the range of 168-180 deg c. The load was further reduced to 160 MW, the mill outlet temperature was in the range of 140-165 deg c however, the combustion stability deteriorated with disturbance in the 2 flame scanner. With further reduction of load up to 135 MW the combustion was very poor and intensity of 3 flame scanners deteriorated with mill outlet temperature in the range of 146-183 deg c. The petitioner NLCIL at this juncture has stated that for further reduction of load one more mill needs to be taken out and oil gun needs to be cut in. However, the same was not attempted as tripping of any mill on any account would have resulted in tripping of the unit.

**18.** The CEA in its observations has mentioned various international references which mention that technical minimum load achievable by lignite fired thermal power plants are higher than corresponding minimum load achievable by coal based thermal power plants.

**19.** Considering all the factors given above , CEA is of the opinion that the petitioner NLCIL may be allowed the technical minimum load of 65% MCR with a condition that if in future, the technical minimum load of coal based power plant is set below the present level of 55% MCR, than the technical minimum load of NLCIL lignite based power plant shall also be considered for appropriate reduction from the present proposed of 65%.

**20.** CEA in its technical analysis of operation of TPS-II expansion has observed that from design consideration, there is no limitation in plant operation up to stipulated technical minimum load of 55%. However, the petitioner NLCIL in its request to CERC has submitted that they are facing technical difficulties in stabilisation of its units and it would require exemption from operating the unit under technical minimum till a stable operation level is achieved. The technical difficulties faced by the petitioner NLCIL are as under:-



- (a) Combustor differential pressure – High
- (b) Non-Fluidization of Fluidized Bed Heat Exchanger (FBHE) & SH/RH steam temp, low.
- (c) SH/ RH/ Tube high metal temperature
- (d) Refractory Failure:
- (e) Back Pass Hanger Tube Failures.
- (f) Ramping up and ramping down:
- (g) Other impacts of low load operation i.e. Heavy shock in refractory lining, High strain in Pressure parts due to increase of metal temperature in SH/RH.

**21.** CEA has observed that main problems faced by CFBC based units of NLCIL TPS-II expansion are increase in combustor differential pressure requiring draining of 860°C bed material to control the same, significant drop in temperature of HRH steam and disturbance in Fluidized Bed Heat Exchanger (FBHE) fluidization & drop in its temperature. Although COD of both the units has been achieved in 2015 (Unit- 1 on 4.7.2015 and Unit- 2 on 22.4.2015), even after 3 years of COD, these units have not been able to achieve the stable and sustained operation due to various reasons including equipment design deficiency. The PG test has not been carried out for any unit as yet.

**22.** As per CEA, there is improvement in the performance of the units over the years. Modifications are also being carried out in FBHE-coil with the support by BHEL, to improve the performance. Accordingly, arrangements are also being made to conduct the PG test. Hence, time is required for the stabilisation of the units.

**23.** The Commission, on request of respondents shared the report of CEA with the petitioner and respondents for their comments

### **Replies and Rejoinders on CEA report**

**24.** TANGEDCO vide affidavit dated 28.12.2018 and 10.01.2019 has filed its reply with respect to the report of CEA. TANGEDCO vide affidavit dated 10.1.2019 has submitted as under :

- (a) The Commission has notified the Fourth Amendment to Grid Code in 2016 which is binding on the petitioner and cannot be challenged before this Commission. However, the same can be challenged in the appropriate forum.



(b) On technological aspects of the TPS-II expansion of NLCIL, has submitted that CFBC technology was adopted by the petitioner for its characteristics of excellent vertical and lateral mixing and capability of optimum carbon burn out resulting in high combustion efficiency with simple operation and quick start-up. However, the TPS-II Expansion has not able to achieve its full capacity from the date of commercial operation (i.e.) 4.7.2015, till date.

(c) The petitioner is seeking to modify the operational parameters for the purpose of technical minimum to suit its convenience after the amendment of the Grid Code following due process of law. In the light of settled law, once the recommendations of CEA and the comments of all the stakeholders are considered and an amendment is notified by CERC under Section 178 of the Act and the same legislation cannot be altered to suit a particular generator of Government of India Undertaking relying on the recommendation of CEA.

**25.** The petitioner in its rejoinder vide affidavit dated 19.2.2019, has submitted that, the objections raised by TANGEDCO on the maintainability of the petition is, misconceived as the Petitioner is not challenging the provisions of Grid Code but it has only sought for relief from the Commission in exercise of the powers to remove difficulties and power to relax, which are provided in the Grid Code itself. Further, the petitioner has submitted that the report submitted by CEA was after examining all the aspects and difficulties faced by the generating station during operation, hence, there is no legal ground for TANGEDCO to challenge the maintainability of the petition filed by NLC.

### **Analysis and Decision**

**26.** After considering the submissions of the parties, the following issues arise for our consideration :

**Issue No. 1: Whether the present Petition is maintainable?**

**Issue No.2: Whether any direction is required to be issued pertaining to upward revision of technical minimum to 70% for pulverized lignite fired plants based in the technical difficulties faced by the Petitioner?**



**Issue No. 3: Whether any exemption may be granted to generating stations based on CFBC technology. ?**

**Issue No. 4 : Whether the Petitioner's generating station should be made exempted from Reserve Shut Down provision ?**

**Issue No.5 : Whether URS sold in the market should be treated as independently over and above the technical minimum schedule?**

**Issue No. 1 : Whether the present Petition is maintainable ?**

27. TANGEDCO has submitted that the present petition is not maintainable as the amendment in Grid Code was brought after following the due procedure of giving opportunities to the affected parties. The review of Technical minimum of 55% MCR of the generating units is a direct challenge to the Fourth Amendment of Grid Code. TANGEDCO has further submitted that, the petitioner can challenge the amendment to the Regulation before the appropriate forum. It has stated that on one hand the Central Generating Stations are benefitted by collecting the capacity charges from the beneficiary utilities according to share allocation and on the other hand, they are getting capacity charge and energy charge from the purchasers by sale of URS power through power exchange. The Central Generating Stations are adequately compensated and therefore imposition of compensation charge are the unwarranted burden on the beneficiaries.

28. Regulation 54 and Regulation 55 of the Grid Code deals with "Power to Remove Difficulty" and "Power to Relax". The said provision have been put in place to cater to the specific difficulties faced by a particular stake holder including any generator as well beneficiaries in application of certain regulations. The Power to Relax and Power to remove difficulties may be exercised in appropriate cases and it does not amount to the amendment of the Regulation. The Appellate Tribunal in its judgment dated 25.3.2011 in Appeal No.130 of 2009 (RGPPL V CERC & ors) had held that the power to remove difficulties is to be exercised when there is difficulty in effecting the Regulations and not when difficulty is caused due to application of the Regulations. In M. U. Sinai Vs Union of India (1975) 2 SCR 640, the Hon'ble Supreme Court had held as under:-



*“The existence or arising of a difficulty is the sine qua non for the exercise of power. If this condition precedent is not satisfied as an objective fact, the power under this clause cannot be invoked at all. Again, the “difficulty” contemplated by the clause must be a difficulty arising in giving effect to the provisions of the Act and not a difficulty arising all under, or an extraneous difficulty. Further, the Central Government can exercise the power under the clause only to the extent it is necessary for applying or giving effect to the Act etc., and no further. It may slightly tinker with the Act to round off angularities, and smoothen the joints or remove minor obscurities to make it workable, but it cannot change, disfigure or do violence to the basic structure and primary features of the Act. In no case, can it, under the guise of removing a difficulty change the scheme and essential provisions of the Act.”*

29. In the present case the Petitioner is facing specific difficulties while operating its lignite based stations at technical minimum of 55% as notified by the commission for thermal units and therefore, is seeking relaxation by invoking power of relaxation under Regulation, 55 and power to remove difficulty under Regulation, 54. It is observed that only lignite fired thermal stations, are facing technical problems in operating at the technical minimum of 55%. Therefore, the Commission is empowered to exercise its Power to Remove Difficulty" and "Power to Relax" under Grid Code based on the merits.

30. We are not inclined to accept the contention of TANGEDCO that the present petition is not maintainable.

**Issue No.2 : Whether any direction is required to be issued pertaining to upward revision of technical minimum to 70% for pulverized lignite fired plants based in the technical difficulties faced by the Petitioner ?**

31. With regard to the issue of upward revision of technical minimum to 70 % for pulverized lignite fired plants as prayed by the petitioner based on technical difficulties being faced by these units of the petitioner, the Commission has observed the following from the report of CEA:

a) Design conditions of fuel for lignite based plants are inferior to that for coal based plants. Boilers for indigenous coal are designed for a typical GCV of 3800 kcal/kg with moisture content in the range 10- 15%, the design calorific value of lignite on NCV basis is 2350 kcal/kg with moisture content as 52% for TPS-1 Expansion units, and gross GCV of 2800 kcal/kg with moisture content of 48.5% for TPS-II, Stage-I units.



- b) The design steam parameters are to be maintained up to 60% load in case of pulverized lignite power plant and up to 50% load in case of conventional pulverized coal plants.
- c) As per O& M manual of TPS-II Stage-I main steam, hot reheat steam, cold reheat steam temperatures shall be controlled within close tolerances between 60 to 100% boiler load.
- d) Low load operation of pulverized lignite fired boilers with reduced number of operating mills results in displacement of the fire ball and has implication of disturbance to stable operating conditions as compared to conventional coal fired boilers. Further, the combustion stability gets adversely affected at low load for lignite fired boilers due to very high moisture content as the flue gas is used for heating the lignite and transporting it to boiler and there is no regulation on flue gas drawn, however, in conventional coal fired boilers, air heated by flue gas in APH is used to dry the coal and transport it to the boiler.
- e) While in operation, in case temperature after the mill increases above 180 degree celcius, the mill must be immediately stopped. NLCIL made a control desk demonstration to CEA on 25/26 May 2018. Initially, the unit was operating at near full load of about 207 MW with 5 mills in operation and the outlet temperature of the mills was in the range 154-164 deg C. Slowly and gradually load was reduced to 170 MW with 4 mills in operation and mill outlet temperature increased to the range of 168-180 degree celcius. The load was further reduced to 160 MW, the mill outlet temperature was in the range of 140-165 degree celcius. However, the combustion stability deteriorated with disturbance in the 2 flame scanner. With further reduction of load up to 135 MW (around 65% MCR) the combustion was very poor and intensity of 3 flame scanners deteriorated with mill outlet temperature in the range of 146-183 degree celcius. The Petitioner at this juncture



has stated that for further reduction of load, one more mill needs to be taken out and oil gun needs to be cut in. However, the same was not attempted as tripping of any mill on any account would have resulted in tripping of the unit.

f) Accordingly, CEA has recommended as follows with respect to upward revision of technical minimum for pulverized lignite fired plants:

*"Based on consideration of factors given in Appendix-1 including operational issues brought out M/s NLCIL during visit in CEA officials to their plant, survey of international literature/ studies on the issue, we are of the opinion that M/s NLCIL may be allowed to operate its conventional pulverized lignite fired units at the technical minimum load of 65% MCR vis-à-vis that set at 55% MCR for coal based plants. However, if in future, the technical minimum load of coal based power plants is set below the present level of 55% MCR, the technical minimum load of NLCIL's lignite based power plants shall also be considered for appropriate reduction from the present proposed 65% MCR."*

**33.** After consideration of the above observations based on the technical issues as brought out by the petitioner in the petition and as submitted by CEA in its report, we are of the view that technical minimum of 55% as per the Fourth Amendment of the Grid Code is not sustainable for pulverized lignite fired units and is leading to unstable and unsafe operation with shifting of fire ball and possible tripping of mills/units. Accordingly, the Commission in line with the recommendation of CEA that technical minimum of 65% may be allowed for pulverized lignite fired units of NLCIL, allows technical minimum of 65% for TPS-II, Stage-1 & Stage-2 Units and TPS- I Expansion Units of NLCIL.

**34.** However, CEA in its report has also recommended that if in future, the technical minimum load of coal based power plants is set below the present level of 55% MCR, the technical minimum load of Petitioner's lignite based power plants shall also be considered for appropriate reduction from the present proposed 65% MCR. In the light of this, NLC may explore with Original Equipment Manufacturer, the possibilities to run these units at technical minimum of 55% and below, with suitable modifications if required.

**Issue No. 3 : Whether any exemption may be granted to generating stations based on CFBC technology?**



**35.** Regarding NLCIL TPS-II (Expansion) 2x250 MW which is based on CFBC technology, the Commission, based on difficulties as brought out by the petitioner in the petition and based on CEA report has made following observations:

- a) The CFBC units of NLCIL are the first set of 250 MW CFBC units installed in the country and modifications are being carried out by them to improve their performance.
- b) During low load operation , the units face following operational problems i) increase in combustor differential pressure is observed which requires draining of 860°C bed material to control the same, ii) significant drop in temperature of HRH steam and iii) disturbance in Fluidized Bed Heat Exchanger (FBHE) fluidization & drop in its temperature.
- c) Although COD of both the units has been achieved in 2015 (Unit- 1 on 4.7.2015 and Unit- 2 on 22.4.2015), even after 3 years of COD, these units have not been able to achieve the stable and sustained operation due to various reasons including equipment design deficiency.
- d) Accordingly, CEA has advised as follows with respect to exemption of CFBC based TPS-II (Expansion) from technical minimum operations:

*"Based on consideration of the factors indicated in Appendix-2, the request of NLCIL for exemption from compliance of technical minimum load of 55% for these units upto 30.06.2019 seems to be reasonable. The same is recommended to be favourably considered by CERC."*

**36.** After consideration of the above observations based on the technical issues as brought out by the petitioner in the petition and as submitted by CEA in its report, we are of the view that low load operation of CFBC based units of NLCIL is not sustainable as it is causing operational difficulties as brought out above and leading to low availability and forced outages. CEA has observed that with the modifications being carried out in FBHE coil with the technical support of BHEL, trend of improvement in performance has been



observed. CEA has finally observed that time is required for stabilization of units. Accordingly, Commission in line with the recommendation of CEA allows CFBC based plant of NLCIL i.e TPS II Expansion, exemption from technical minimum of 55% till 30.06.2019. The Technical Minimum for such plants shall be 65% till 30.06.2019.

37. Regarding the submission of SRLDC that Grid Code limit of 55% may be maintained in order to have flexibility for accommodating RE generation, inadvertent deviation and other incidents like abnormal weather conditions etc., it is observed that upward revision of technical minimum of only specific generators based on the technical difficulties would not take away the flexibility for accommodating RE generation which is available to system operators in terms of going down to technical minimum of 55% for all inter-State generating stations. As such, we do not find merit in the submission of SRLDC.

**Issue No. 4 : Whether the Petitioner’s generating station should be made exempted from Reserve Shut Down provision ?**

38. The third proviso to clause (3) of Regulation 6.3 B of the Grid Code reads as under :

*“Where the scheduled generation falls below the technical minimum schedule, the concerned CGS or ISGS shall have the option to go for reserve shut down and in such cases, start-up fuel cost over and above seven (7) start / stop in a year shall be considered as additional compensation based on following norms or actual, whichever is lower:”*

Unit Size (MW)	Oil Consumption per start up (Kl)		
	Hot	Warm	Cold
200/210/250 MW	20	30	50
500 MW	30	50	90
660 MW	40	60	110

39. It is observed that on one hand the Petitioner has put forward various operational issues its generating stations face during low load operation based on which its prayer of considering technical minimum of 65% has been accepted for its pulverized lignite fired stations and exemption has been granted to its CFBC generating station and on the other hand it prays to remain out of reserve shutdown if the scheduled generation falls below the technical minimum schedule. In this regard, the Grid Code has given option to the generators for going for Reserve Shut Down, if the scheduled generation falls below the



technical minimum schedule. In case the generator decides not to go for RSD and keeps on operating at the technical minimum, the difference between the actual generation and scheduled generation would be accounted under DSM mechanism. As such, the prayer of the petitioner for exemption from RSD is not allowed.

**Issue No. 5 : Whether URS sold in the market should be treated as independently over and above the technical minimum schedule ?**

40. The Petitioner has prayed that the URS sold in the market should be treated independently and be allowed over and above the technical minimum schedule of 70 %. In this regard the respondent SRLDC has submitted that the URS sold in the market should be treated as a part of technical minimum only and URS should not be treated independently as it narrows down the margin to flex the sudden variation.

41. URS Power includes (i) the quantum of power which has not been dispatched by the power plant owing to the original procurer not dispatching the same; (ii) the quantum of power which has not been taken within two hours by procurers entitled to exercise their first right to receive the quantum not dispatched by the original procurer; and (iii) the said quantum of power not being able to be sold to third parties.

42. In this regard, we are agreeable with the contention of SLDC that URS should not be treated independently i.e. over and above the technical minimum otherwise it would defeat the very purpose of allowing the RLDCs/SLDCs to call for operating the generators on technical minimum to accommodate sudden variation and for accommodating the RE generation to its full potential. We therefore, hold that URS shall be treated as a part of technical minimum schedule only.

43. Further, we are not inclined to accept the submission of TANGEDCO that generators are collecting double capacity charges as well as energy charges by way of sale of URS power in the market, based on consent of beneficiaries. The clause 6.5 (A) (c) of IEGC (fifth Amendment) Regulation, 2017 provides as under:



"6.5(A) Scheduling and commercial settlement of energy exchanged under Ancillary services including Spinning Reserves and URS:

(a).....

(b).....

(c) In case of sale of share of original beneficiaries in market by ISGS for which consent has been given, the realized gains shall be shared between the ISGS and the concerned beneficiary in the ratio of 50:50 or as mutually agreed by the ISGS and concerned beneficiary in the billing of the following month. This gain shall be calculated as the difference between selling price of such power and fuel charge including incidental expenses.

Provided that such sale of power by ISGS shall not result in any adverse impact on the original beneficiary (ies) including in the form of higher average energy charge vis-à-vis the energy charge payable without such sale:

Provided also that, the liability of fixed charge in such cases shall remain with original beneficiary (ies) as determined in accordance with the Tariff Regulations notified by the Commission from time to time

**44.** The provision of Grid Code (Fifth Amendment) Regulation, 2017 clearly provides for sharing the gains in the ratio of 50:50 in case of sale in open market. It is observed that provision of sharing of the revenue, earned over and above the fuel cost, with the beneficiaries takes due care of the interests of the beneficiaries. Hence, the contention of the TANGEDCO that generating stations are recovering two capacity charges by selling URS is devoid of any merits.

**45.** In view of the above discussions, the decisions of the Commission are summarised as under:

(a) TPS- I Expansion Units: Technical minimum of 65% MCR is allowed.

(b) TPS-II, Stage-1 & Stage-2 Units: Technical minimum of 65% MCR is allowed.

*(Provided, with a condition that if in future, the technical minimum of coal based generating station is set below the present level of 55%, than the technical minimum load of NLCIL lignite based power plant shall also be revised appropriately.)*

(c) TPS II Expansion Units: Exemption is granted from technical minimum operations up to 30.06.2019.



(d) The prayer of the petitioner that NLCIL Power Plants should be exempted from Reserve shut down provision is not allowed.

(e) URS shall be treated as a part of technical minimum only.

43. The Petition No. 144/MP/2017 is disposed of in terms of the above.

**Sd/-  
(Dr. M.K.Iyer)**

**Member**

**Sd/-  
(I. S. Jha)**

**Member**

**Sd/-  
(P.K. Pujari)**

**Chairperson**

