

**Before the**  
**MAHARASHTRA ELECTRICITY REGULATORY COMMISSION**  
**World Trade Centre, Centre No.1, 13<sup>th</sup> Floor, Cuffe Parade, Mumbai 400005.**  
**Tel. 022 22163964/65/69 Fax 22163976**  
**E-mail: [mercindia@merc.gov.in](mailto:mercindia@merc.gov.in)**  
**Website: [www.merc.gov.in](http://www.merc.gov.in)/[www.mercindia.org.in](http://www.mercindia.org.in)**

**CASE No. 15 of 2017**

**In the matter of**  
**Petition of Maharashtra State Electricity Distribution Co. Ltd. for reduction in the**  
**Technical Minimum of Generating Units in Maharashtra as per Central Electricity**  
**Regulatory Commission norms**

**Coram**

**Shri Azeez M. Khan, Member**  
**Shri Deepak Lad, Member**

Maharashtra State Electricity Distribution Co. Ltd.	Petitioner
V/s	
Maharashtra State Load Despatch Centre	Respondent No.1
Maharashtra State Power Generation Co. Ltd.	Respondent No. 2
JSW Energy Ltd.	Impleaded Respondent No. 3
RattanIndia Power Ltd.	Impleaded Respondent No. 4
Adani Power Maharashtra Ltd.	Impleaded Respondent No. 5
Tata Power Company Ltd. (Generation)	Impleaded Respondent No. 6
Reliance Infrastructure Ltd. (Generation)	Impleaded Respondent No. 7
Vidarbha Industries Power Ltd. (Generation)	Impleaded Respondent No. 8
Sai Wardha Power Ltd.	Impleaded Respondent No. 9
Emco Energy Ltd.	Impleaded Respondent No. 10
Ideal Energy Projects Ltd.	Impleaded Respondent No. 11
Abhijeet MADC Nagpur Energy Pvt. Ltd.	Impleaded Respondent No. 12
Brihanmumbai Electric Supply & Transport Undertaking	Impleaded Respondent No. 13
Tata Power Company Ltd. (Distribution)	Impleaded Respondent No. 14
Reliance Infrastructure Ltd. (Distribution):	Impleaded Respondent No. 15

## Appearance

For the Petitioner	: Shri Paresh Bhagwat
For the Respondent No. 1	: Shri A.P. Rewagad
For the Respondent No. 2	: Shri S.B. Soni
For the Respondent No. 3	: Shri Tushar Borse
For the Respondent No. 4	: Shri Nilesh Thakur
For the Respondent No. 5	: Shri Akshay Mathur
For the Respondent No. 6	: Shri Amey Mhapsekar
For the Respondent No. 7	: Shri Abaji Naralkar
For the Respondent No. 8	: Shri Madhav Tekawade
For the Respondent No. 9	: Shri Anand K. (Adv.)
For the Respondent No. 10	: Shri Alok Shankar (Adv.)
For the Respondent No. 11	: Shri Rajiv Shankar Dwivedi (Adv.)
For the Respondent No. 13	: Shri R.D. Waikar
For the Respondent No. 14	: Smt Swati Mehendale
For the Respondent No. 15	: Shri Ghanshyam Thakkar

For Authorized Consumer Representative:

Dr. Ashok Pendse, TBIA

## ORDER

**Date: 1 March, 2018**

1. Maharashtra State Electricity Distribution Company Ltd. (MSEDCL) has filed a Petition on 10 January, 2017 under Sections 33(1), 33(4) and 86 of the Electricity Act (EA), 2003 and the applicable provisions of the State Grid Code and Maharashtra Scheduling and Despatch Code.
2. MSEDCL's prayers are as follows:
  - a) *"To set the Technical minimum capacity of all Generating stations coming under the jurisdiction of MERC and having PPA with MSEDCL at uniform level of 55%.*
  - b) *To issue the directions to MSLDC for backing down the power plant to 55% while managing the demand by observing the MOD.*
  - c) *To pass any other order/relief as the Hon'ble Commission may deem fit and appropriate under the circumstances of the case and in the interest of justice;..."*
3. The Petition states as follows:-

- 3.1 One of the objectives of the EA, 2003, National Electricity Policy and Tariff Policy is to ensure availability of electricity to consumers at reasonable and competitive rates.
- 3.2 As per the Tariff Policy, a two-part tariff structure is to be adopted for long term contracts to facilitate Merit Order Dispatch (MOD).
- 3.3 As per the Commission's directions in its Availability-based Tariff (ABT) Order dated 17 May, 2007 in Case No. 42 of 2007, the Maharashtra State Load Despatch Centre (MSLDC) prepares monthly MOD Stack based on the variable charge data of the Generating Units submitted by MSEDCL and other Utilities in the State, i.e. Tata Power Company Ltd. (TPC), Brihanmumbai Electric Supply and Transport Undertaking (BEST), Reliance Infrastructure Ltd. (RInfra) and Maharashtra State Power Generation Co. Ltd. (MSPGCL).
- 3.4 To optimize generating sources, 'zero schedule' is provided by MSEDCL to the costlier Generating Station considering the demand-supply scenario and technical constraints in the transmission network. Thus, MSEDCL ensures economic power dispatch to the consumers by following the MOD principle which is prescribed in the ABT Order.
- 3.5 In furtherance of this optimization methodology, MSLDC backs down available Thermal Generating Units to match with variations in daily power demand. Such situations generally arise during the night hours when industrial, commercial and residential demand is at its lowest.
- 3.6 Since the Generating Units require certain time (4 to 24 hours) for start-up, in case of low demand they are kept at Technical Minimum loading instead of keeping them under shut-down. Due to the technical limitations, the Thermal Generating Units cannot be backed down below the Technical Minimum.
- 3.7 The Technical Minimum of Central Sector Generating Units is 55%. As per MSLDC's data, the Technical Minimum of MSPGCL's Units ranges from 55% to 74%. Also, the Technical Minimum of the Independent Power Producers (IPPs) is between 63% to 70%.
- 3.8 As per the Central Electricity Regulatory Commission (CERC) (Indian Electricity Grid Code (IEGC)) (Fourth Amendment) Regulations, 2016, the Technical Minimum level of Central Sector Generating Units (under the jurisdiction of CERC), irrespective of their capacity, life or type of technology or any such other factor, has been fixed at 55 %.

*“The technical minimum for operation in respect of a Unit or Units of a Central Generating Station of inter-State Generating Station shall be 55% of MCR loading or installed capacity of the Unit of at generating station.”*

- 3.9 Pursuant to the Commission’s directions in Order dated 27 June, 2012 in Case No. 109 of 2011, a Study was undertaken by the Central Power Research Institute (CPRI) for determination of the Technical Minimum of Generating Units (35 Units of MSPGCL and IPPs) in Maharashtra.
- 3.10 As per the CPRI Report, the Technical Minimum capacity of these Generating Stations is in the range of 55-80 % of their installed capacity.
- 3.11 The Technical Minimum of MSPGCL’s Units which are not covered in the CPRI Study is considered based on MSPGCL’s declaration.
- 3.12 Further, the Technical Minimum of the IPPs’ Generating Units in the State is in the range of 55-80% of their installed capacity, and is not verified but accepted as declared by them.
- 3.13 The Central Electricity Authority (CEA) (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010 (‘CEA Technical Standards Regulations’) provide the technical specifications for Thermal Plants which are applicable uniformly across India. If the plant and equipment is designed with these uniform specifications, the State and Central Sector Power Plants should have similar performance parameters, including Technical Minimum specifications.
- 3.14 With a uniform Technical Minimum of 55%, additional flexibility of 1703 MW capacity will be available in real-time operations. Out of these Units, about 888 MW capacity is of Rs. 2.00 to 2.50 per unit.
- 3.15 On account of the existing Technical Minimum in excess of 55%, the commercial obligation for December, 2016 is estimated as Rs. 14.68 crore, with an annual financial obligation of around Rs. 150 crore. The calculation sheet for December, 2016 is annexed with the Petition.
- 3.16 With the proposed addition of 175 GW of Renewable (RE) Generation by FY 2021-22 and the increase in Renewable Purchase Obligation (RPO), MSEDCL has to contract more and more RE generation. RE generation is infirm in nature and is not scheduled. Revision in the Technical Minimum to 55% will enhance flexibility for accommodating the increasing RE generation.

- 3.17 During the monsoon season, and that too at night, Wind Energy generation is substantial, and 3000 MW is injected into the grid without schedule. When infirm energy of such high quantum is injected, issues such as grid stability as well as economic operation arise. If the Technical Minimum level of Thermal Generating Stations is reduced, there will be more scope to accommodate RE with better grid stability as well as in an economical manner.
- 3.18 Thus, there is an opportunity to utilize this stranded low-cost power capacity. The reduction in Technical Minimum to 55% will facilitate running low-cost Units at full capacity by reducing the high-cost Units' generation to their Technical Minimum capacity. In turn, this will be helpful for integration of RE economically and, at the same time, cheaper power will be available to consumers.
- 3.19 MSEDCL's demand during the night off-peak period drops to 11500 to 12000 MW, while its peak demand during the evening goes upto 17000 to 17500 MW. Thus, there is a substantial variation of about 5500 MW between peak and off-peak demand. If Technical Minimum is brought down to 55% , MSEDCL can back down required generation with fewer Plants kept on bar, and this will give more flexibility to take out even more Generators out for zero scheduling, leading to further optimization of available generation.
4. In its Reply dated 8 March 2017, MSPGCL has stated as follows:
- 4.1 Presently, the Technical Minimum load considered by MSLDC for Generating Units in the State ranges between 65% to 75%.
- 4.2 MSEDCL has quoted from the CERC Order dated 28 May, 2013 in Petition No. 142/MP/2012 referring to the CEA communication regarding control range and operating capability generally specified in the technical specifications as per the CEA Technical Standards Regulations, 2010.
- 4.3 The term "Technical Minimum" is not defined in the EA, 2003, or in any of the Regulations of CERC or this Commission. No manufacturer specifies such Technical Minimum load for the Units supplied by it either.
- 4.4 "Technical Minimum" is the minimum load to be maintained on the Unit to run it in a safe and reliable manner. The vintage of the Units, technology used and, especially, steam Generator design, status of automation of boiler equipment, etc. play an important role in stability of the boiler operation during load variations and are critical, especially during low load conditions. On the contrary, what has been

specified by the CERC as “Technical Minimum” is the lower limit for scheduling a Thermal Unit.

- 4.5 The approach of the CERC in specifying 55% as Technical Minimum on the basis of CEA recommendations is more idealistic and less practical.
- 4.6 MSPGCL opposes MSEDCL’s prayer for prescribing an ad-hoc loadability limit of 55 % as Technical Minimum. Such ad-hoc fixation should be avoided, as specifying a Technical Minimum load lower than one measured scientifically will have obvious adverse impact on Plant performance and Unit stability.
- 4.7 MSEDCL has quoted only a part of the CEA comments regarding the control range and operating capability. The extract of the Explanatory Memorandum to the Fourth Amendment to IEGC regarding the communication from CEA is reproduced below:

*“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."*

- 4.8 Thus, even though the CEA Technical Standards Regulations, 2010 mentions the operating capabilities as continuous operation without oil support above 30% and control load range of 50% to 100% TMCR, the CEA itself also accepts that, due to operating constraints or the recommendations of the Original Equipment Manufacturer (OEM), the Units may have different control limits than specified in the Regulations. Hence, the CEA has mentioned that this can be brought out to the appropriate authority with proper justification.

- 4.9 The National Thermal Power Corporation (NTPC) also raised similar concerns during the proceedings in Petition No. 142/MP/2012 before the CERC. As mentioned in the Explanatory Memorandum to the Fourth Amendment to IEGC, NTPC had 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, cyclic load fluctuation would also cause the operational parameters to vary, and would have an adverse impact on the machine health and life.
- 4.10 Regarding the operating capability stipulated under the CEA Technical Standards Regulations for continuous operation without oil support as 30% MCR load, NTPC had submitted that 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 an ideal/controlled operating environment.
- 4.11 MSPGCL had raised the issue regarding the Technical Minimum load for different Units during the proceedings of Case No. 109 of 2011 (MSPGCL's Petition for consideration of the expected variation in the performance parameters for its Power Stations on account of backing down instructions from MSLDC). In its Order dated 27 June, 2012, the Commission had stated as follows:

*“16.3 The Commission observed that in the light-load periods, the thermal Units could be backed down only up to their respective technical minimum, beyond which there would be risk of taking extensive oil support, risk of forced outages and subsequent possibility of not being available to come back on line and take load as per the generation schedule in the subsequent period.*

*...23.2 The Commission observes that there cannot be a common definition statement applicable to all thermal plants regarding technical minimum as the said limiting value is the lower limit of carrying load safely, without support or with minimal support of secondary fuel and the load from which effortless bouncing back to higher loads is possible for the thermal plant. Plant operational patterns are bound to vary from plant to plant and it is not a definition statement but ascertaining the accurate value of such technical minimum is essential to implement MOD accurately.*

*Therefore, the Commission observes that ascertaining technical minimum and verifying it through a competent third party is absolutely essential for correct implementation of the MOD and hence, the Commission has initiated such an exercise wherein MSLDC holds the pivotal role and CPRI is identified as the competent third party for ascertaining and validating technical minimum for all thermal generating Units in the state.”*

- 4.12 Thus, keeping in view the Plant-specific practical constraints, the Commission had clearly stated that there cannot be a common definition of Technical Minimum applicable to all Thermal Plants; and, as Plant operational patterns will impact on the stability state of each Unit, the Technical Minimum needs to be ascertained for each Plant and not at some fixed level. Accordingly, the Commission had engaged CPRI to undertake a study of the Technical Minimum levels for all the existing Thermal Generating Units in the State.
- 4.13 CPRI conducted tests at the various coal-based Thermal Generating Units in the State which were in service during December, 2012 and January, 2013. CPRI had submitted its Study Report to the Commission on 28 January 2013. As per the CPRI Study Report, which has been accepted by the Commission, the Technical Minimum load is defined as the load at which the Unit can be operated on primary fuel alone without secondary fuel support (i.e., fuel oil in the case of coal-fired Units).
- 4.14 Out of the 31 currently operating Thermal Generating Units of MSPGCL, the Technical Minimum load for 18 Units was actually tested by CPRI. Presently, MSLDC is considering the Technical Minimum for various Thermal Generating Units in the State as per the CPRI Study Report accepted by the Commission.
- 4.15 The remaining 13 MSPGCL Units for which the Technical Minimum load is yet to be tested are tabulated below, along with the rationale for present consideration of Technical Minimum load for scheduling purposes.

<u>Station</u>	<u>Rationale for present consideration of Technical Minimum load</u>
Bhusawal Unit No.4 & 5 (500 MW)	Same as per Study Report for Khaperkheda Unit # 5, as the technology, design, make and vintage are same as of Khaperkheda Unit # 5
Chandrapur Unit No. 8 & 9(500 MW)	
Nashik Unit No. 4 (210 MW)	Same as per Study Report for other 210 MW Units with same vintage and technology
Koradi Unit No. 5, 6 and 7 (210 MW)	
Parli Unit No, 7 & 8 (250 MW)	Same as per Study Report for Parli Unit # 6 with same vintage and technology
Koradi Unit No. 8, 9 & 10 (660 MW)	Self-declaration

- 4.16 Thus, only in the case of the new 660 MW Units at Koradi is there is no practical test reference data available for the Technical Minimum of these Units.
- 4.17 Thus, even though the importance and authority of CEA recommendations cannot be denied, the sanctity of the CPRI Study Report also should not be neglected as the Report is based on scientifically conducted experiments. Therefore, MSPGCL opposes MSEDCL's prayer for prescribing an ad-hoc loadability limit of 55 % as Technical Minimum. Such ad-hoc fixation should not be accepted, as specifying a Technical Minimum load lower than the one measured scientifically will have obvious adverse impacts on Plant performance and Unit stability.
- 4.18 Low load operation has obvious impacts on Plant performance by way of increase in heat loss, increase in Auxiliary Consumption due to excess air, destabilized furnace, etc. Coal quality and coal mill combination available at the time of such low load operation is also critically important in deciding the Unit stability and impact on Plant performance parameters.
- 4.19 CERC has also accepted this fact, and has mentioned the following in the Explanatory Memorandum for the IEGC Fourth Amendment 2010:

*"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."*

- 4.20 Keeping in view the adverse impacts on Plant performance parameters due to low load operation, CERC has provided for compensation for increase in Station Heat Rate (SHR) and Auxiliary Consumption. However, although MSEDCL in its Petition has referred to the Technical Minimum load limit as per the CERC Regulations, it has remained silent about the compensation to be paid to the

Generator, and has tried to project that the provision for reducing the Technical Minimum limit is intended to reduce the power purchase cost.

- 4.21 MSPGCL agrees that presently there is a power surplus in the State and, with expected huge RE capacity addition, especially from Solar generation during the day time, there would be more continuous backing down of Thermal Generating Units. In such a situation, if the Commission decides to bring down the scheduling limit even below the certified Technical Minimum for MSPGCL Units, it should also provide for compensation by increase in Energy Charge on account of adverse impact on performance parameters under such low load conditions.
- 4.22 Also, in such cases also the Technical Minimum load will need to be ascertained for those Units for which the actual tests have not yet been conducted and for which there is no reference data available, by actual study by a competent third party similar to the one conducted by CPRI.
- 4.23 Under Regulation 44.10 of the MERC (Multi Year Tariff) Regulations ('MYT Regulations'), 2015, the Commission has already provided a dispensation for increase in Gross Station Heat Rate (SHR) on a case to case basis at the time of truing up, when a Generating Station or Unit is directed by MSLDC to operate below normative loading but at or above Technical Minimum schedule on account of grid security or due to the lower schedule given by the Beneficiaries. The Commission can also specify the allowable percentage impact on the normative SHR as given in IEGC Fourth Amendment.
- 4.24 As the lower loadability will result in higher Auxiliary Consumption, compensation by way of increase in normative Auxiliary Consumption, similar to that provided in the IEGC Fourth Amendment, should also be specified.
- 4.25 The operation below the certified Technical Minimum load will affect the specific oil consumption. In case of sub-critical Units, due to increase in instability of Boiler operation in low load condition, additional secondary oil support (as compared to normative level of operations) would be required to ensure flame stability, ultimately resulting in increase in specific oil consumption much higher than the normative consumption. In the case of the super-critical Units, even though the secondary oil usage will not increase significantly, the specific oil consumption factor (ml/kWh) will increase due to lower gross generation as compared to the normative gross generation. Therefore, there is a need to provide compensation for this increase in specific oil consumption by way allowing appropriate increase in normative Specific Oil consumption for such low load operation.

- 4.26 Thus, revision in Technical Minimum should be done only after providing necessary compensation to the Generator for the adverse impact on performance parameters.
- 4.27 Regarding the submission by MSEDCL about the annual financial obligation of around Rs. 150 crore, MSEDCL has not elaborated the methodology for this computation. Its correctness can be ascertained only when the detailed methodology and assumptions are elaborated.
- 4.28 As a sample case, MSPGCL has computed the compensation that may be required to be paid to it for December, 2016 if the minimum scheduling limit is lowered to 55 %, considering the allowable increase in SHR and Auxiliary Consumption as per the IEGC Fourth Amendment. The total compensation needed on account of adverse impact on performance parameters due to backing down up to 55 % may be Rs. 17.31 crore. As against this, the financial obligation for December, 2016 due to the existing Technical Minimum level operation, as estimated by MSEDCL, is Rs.14.68 crore which, as per MSEDCL, will be the saving in cost of power purchase if Units are allowed to be backed down up to 55 %. Thus, any decision regarding the appropriate minimum scheduling limit should be taken keeping in view the net impact on the cost of power purchase.
- 4.29 The prayer of MSEDCL should be rejected. If the Commission is inclined to reduce the minimum scheduling limit for Thermal Generating Units to a level below the Technical Minimum as per the CPRI Study Report, appropriate compensation should be provided for the adverse impact on the performance parameters, specifically SHR, Auxiliary Consumption and Specific Oil Consumption due to such low load operations.
5. In its Reply dated 27 March 2017, Adani Power Maharashtra Ltd. (APML) stated as follows:
- 5.1 APML has executed PPAs with MSEDCL. MSEDCL has requested issue of directions to MSLDC for backing down of the Power Plants under these PPAs to 55% as per CERC Regulations. APML would be entitled to claim compensation for any subsequent changes that qualify as Change in Law in accordance with PPA provisions.
- 5.2 The CERC Regulations should be implemented in totality considering all other provisos under Regulation 6.3B rather than limiting it to proviso 1 of Regulation 6.3B.

- 5.3 CERC has considered the commercial and technical implications and addressed all the concerns relating to partial loading in Regulation 6.3B. That Regulation provides appropriate compensation to the Generators for operating at such Technical Minimum and other operation aspects. The Commission may consider adoption/implementation of the entire Regulation 6.3B of the CERC Regulation in totality and not on a stand-alone basis as sought by MSEDCL.
- 5.4 In its Petition, MSEDCL has referred to the CPRI Study Report on determination of Technical Minimum of Generating Stations in Maharashtra. As APML has no access to that Report, the Commission may direct MSEDCL to share a copy.
- 5.5 MSEDCL has provided calculation of the available capacity in case the Technical Minimum is considered at 55% for all the Plants supplying power to it. MSEDCL has also provided details of the commercial obligation due to consideration of the prevailing Technical Minimum instead of 55%. The calculations of MSEDCL are hypothetical and cannot lead to any conclusion in isolation.
6. JSW Energy Ltd. (JSWEL), in its Reply dated 12 April 2017, has stated as follows:
- 6.1 Pursuant to the direction of the Commission, CPRI had determined the Technical Minimum of JSWEL's Unit No. 1 at 200 MW load (net basis), i.e. as 66%. This test Report has been accepted by all concerned and, as such, there is no reason or basis for a downward revision of the Technical Minimum, especially on the sole ground that the CERC proposes to apply a Technical Minimum of 55% to all Inter-State Generating Stations (ISGS).
- 6.2 Each Unit, depending on various factors, would have a different Technical Minimum, and the suggestion that a Technical Minimum of 55% be applied across the board is highly arbitrary. Reliance on Regulation 6.3B of the CERC Regulations by MSEDCL for fixing a Technical Minimum of 55 % is erroneous as the provisions regarding Technical Minimum in the IEGC Fourth Amendment have still not come into force. As per the notification dated 6 April, 2016, the IEGC Fourth Amendment shall come into force from the date of its publication in the Official Gazette, except for Regulation 6.3 B which shall come into force on such date as the CERC may notify. CERC has not yet notified any date from which Regulation 6.3 B shall come into force. Therefore, the Commission may not accept 55% as the Technical Minimum across the board, but accept the Technical Minimum as tested by CPRI and accepted by MSEDCL and MSLDC.
- 6.3 However, a detailed mechanism to compensate Generators for the efficiency and operational loss suffered by them for operating below the normative plant Load Factor (PLF)/Availability of 85% and upto the Technical Minimum has to be

provided in the Regulations because operation of Thermal Generating Stations at Technical Minimum has commercial implications for the Generator in terms of increase in SHR, secondary fuel oil consumption and Auxiliary Consumption which increases the actual Energy Charges.

- 6.4 If the Commission is inclined to refer to the amended CERC Regulations, it may issue necessary orders for the inclusion of compensatory provisions, akin to the above, in the State Grid Code, in accordance with Section 86 (1) (h) of the EA, 2003, to compensate the Generators for the efficiency and operational loss suffered by them for operating below the normative PLF/Availability of 85% and upto the Technical Minimum of the respective Unit(s).
7. Prayas (Energy Group) ('Prayas'), an Authorised Consumer Representative, stated as follows in its submission dated 28 April, 2017:
- 7.1 CERC conducted a comprehensive review on the issue and also noted the value of 50% of maximum continuous rating as the Technical Minimum specified in the CEA Technical Standards Regulations which have to be followed by all Power Plants in India.
- 7.2 With reduction in the Technical Minimum limit from presently about 70% to 55%, system flexibility would increase by 1700 MW. Such flexibility is needed to take care of various system requirements, including diurnal and seasonal load variations, least cost operation of generation fleet and integrating increasing share of variable RE generation.
- 7.3 Prayas is part of the Grid Integration Review Committee set up under the "Greening the Grid" Programme, which is a joint initiative of the United States Agency for International Development (USAID) and Ministry of Power, Government of India. On behalf of USAID, a team of US Department of Energy National Labs have been working with Power System Operation Corporation Ltd. (POSOCO), Power Grid Corporation of India Ltd. (PGCIL), CEA and a few States (including Maharashtra) to develop a Unit commitment and despatch model for different RE (175 GW) scenarios for FY 2011-22. While the final study results will soon be made public, draft interim results and discussions from meetings find that improved MOD scheduling and despatch (including RE), when optimized regionally, is the largest driver to reduce integration costs. Lowering minimum operating levels of coal Plants is the biggest driver to reduce RE curtailment. Modeling results indicate that Technical Minimum is more influential than faster thermal generation ramp rates in lowering the projected level of RE curtailment.

- 7.4 Technical Minimum is a very important parameter which will strongly influence the system's ability to cost-effectively integrate high shares of variable RE, contribute to system flexibility to meet load variations and allow for more optimal least-cost generation.
- 7.5 In principle, Prayas agrees with MSEDCL's submissions. In fact, this technical requirement should be made applicable to all Plants under the Commission's jurisdiction and not just a subset of those having a PPA with MSEDCL. Appropriate changes in the MOD operation methodology would have to follow as a result.
- 7.6 A regular monitoring Report ascertaining the Technical Minimum parameters being followed in the MOD operation may be placed by MSLDC on its website at an interval of 3-6 months.
8. In its Rejoinder dated 19 June 2017, MSEDCL stated as follows:
- 8.1 MSPGCL has referred to NTPC's objections regarding reducing the Technical Minimum of its Generating Units. However, it has to be taken into consideration that CERC has amended the IEGC only after accommodating NTPC's view. As such, MSPGCL has not brought out any new facts which the CERC Regulations has not addressed. All the facts and objections brought out by CEA as well as NTPC are in the public domain and were given due consideration by CERC during the process of amendment of the IEGC. The points raised by MSPGCL are not valid grounds for not replicating in Maharashtra one of the best regulatory practices notified by CERC
- 8.2 MSPGCL has stated that the reduction of Technical Minimum is "idealistic". However, this is far from the facts. The IEGC and its subsequent amendments are in force and applicable to all Central Sector Generators. All these Generators which are connected to the Central Transmission Utility (CTU) are already following the norms of Technical Minimum laid down under the IEGC. MSEDCL cannot find any grounds for not applying the practical norms which are followed by all Central Sector Utilities.
- 8.3 MSPGCL has stated that there is no standard definition of Technical Minimum. Vide its Order No. L-1/219/2017-CERC dated 5 May, 2017 on approval of the detailed procedure for taking Unit(s) under Reserve Shut Down and mechanism for compensation for degradation of Heat Rate, Auxiliary Compensation and Secondary Fuel Consumption due to part-load operation and multiple start/stop of Units, CERC has defined 'Technical Minimum'.
- 8.4 MSPGCL has stated that, for its 18 Units, the Technical Minimum norms are defined by CPRI. However, MSPGCL has not taken into consideration that the CPRI

prepared the Report in 2012 and at that time a different set of Regulations was in force. CERC and this Commission have been modifying their Regulations taking into consideration new dynamics emerging in the ever-modernizing power sector. Accordingly, CERC has revised the Technical Minimum level to 55% for the Central Sector Plants. There is scope to revise the earlier norms for Technical Minimum in Maharashtra too. The need to change the norms for Technical Minimum become even more relevant considering the CERC has already revised its norms in the 4th Amendment of the IEGC.

- 8.5 MSPGCL has accepted that there are no norms for 13 of its Plants. These 13 Plants/Units should also be provided with operating norms for Technical Minimum.
- 8.6 MSEDCL is also following similar norms and having Standards of Performance (SoP) Regulations. Similarly, better norms for Technical Minimum will also help MSEDCL to tackle the surplus capacity and financial implications.
- 8.7 In their Replies, APML and JSWEL have stated that MSEDCL should provide compensation as reduction in Technical Minimum would affect the performance parameters of their Plants. However, APML and JSWEL have been selected under Section 63 of the EA, 2003 as per a competitive bidding process on the basis of the bids offered by them. As such, APML and JSWEL have to maintain the performance parameter of their Plants over the range of changing operating and loading conditions. Providing any compensation for revised operating parameters is against the very spirit of the competitive bidding mechanism and is, hence, not in line with the EA, 2003. Further, as per the provisions regarding metering, scheduling and despatch as well as Availability in the PPAs, APML and JSWEL are bound to follow the regulatory provisions and maintain the discipline mentioned in the IEGC.
- 8.8 JSWEL in its Reply has stated that 55% Technical Minimum is not yet notified. However, in fact the Regulation has been notified on 29 April, 2016 in the Gazette of India, Extraordinary (Part-III, section-IV No 162). In practice, the Technical Minimum level has been reduced to 55% for Central Sector Plants and MSEDCL's Load Management Cell has been scheduling their Plants at 55% of the respective capacities as and when necessary.
9. At the hearing held on 20 June, 2017:
  - 9.1 MSEDCL, MSPGCL, APML and JSWEL re-iterated their respective submissions.
  - 9.2 APML suggested that an Approach Paper be published covering all the issues involved and seeking comments from stake-holders. Thereafter, new Regulations may be framed.

- 9.3 MSLDC suggested that other Generating Companies such as Tata Power Co. Ltd. (TPC-G), Reliance Infrastructure Ltd. (RInfra-G) and Vidarbha Industries Power Ltd. (Generation) (VIPL-G) should also be impleaded. Flexibility in grid operations would be improved if Technical Minimum is set at 55% and MSLDC has no objection to the revision in Technical Minimum proposed by MSEDCL.
- 9.4 The Commission asked whether MSLDC had ever directed MSPGCL to operate its Generating Units below the CPRI-certified Technical Minimum. MSLDC replied that no such direction was given. In extreme surplus situations, MSLDC adopts zero scheduling or reserve shutdown to maintain grid stability.
- 9.5 Dr. Ashok Pendse, on behalf of Thane-Belapur Industries Association (TBIA), an Authorized Consumer Representative, stated that revision in Technical Minimum is necessary to address the issues of RE integration and maintain grid stability; and also that the Technical Minimum limit for MSPGCL's new Generating Units and for other IPPs needs to be ascertained, if not done so far.
- 9.6 The Commission observed that changes, if any, adopted by NTPC to achieve the above norms in respect of operating parameters, Unit/system modifications or other procedural changes may require to be examined, and MSEDCL may discuss and obtain these details from NTPC.
- 9.7 MSEDCL stated that MSPGCL's new Units need to follow the CEA Technical Standards Regulations. The Commission observed that reduction in Technical Minimum may result in economic benefits. However, Technical Minimum being an operational parameter for Generating Units, it may require technical consideration also. The Commission also observed that, if grid stability is the prime consideration for the present Petition, then ideally MSLDC should have approached the Commission and not MSEDCL.
- 9.8 To a query of the Commission about compensating the Generating Companies for deterioration of performance parameters, MSEDCL did not respond. The Commission observed that there are other options such as zero scheduling or reserve shutdown available for optimization of power purchase expenses. The Commission also observed that improved demand forecasting by MSEDCL may mitigate the issue to a greater extent.

- 9.9 The Commission directed that the Generators, i.e. TPC-G, RInfra-G, VIPL-G, Sai Wardha Power Ltd. (SWPL), EMCO, Ideal Energy Projects Ltd. (IEPL), Abhijeet MADC Nagpur Energy Pvt. Ltd. (AMNEPL), and RattanIndia Power Ltd. (RPL) as well as BEST, Tata Power Company (Distribution) (TPC-D) and Reliance Infrastructure Ltd. (Distribution) (TPC-D) be impleaded. MSEDCL shall serve the Petition to them within one week. The Impleaded Parties shall submit their Replies within two weeks thereafter.
10. In its Reply dated 11 July, 2017, RPL has stated as follows:
- 10.1 The Regulation referred to by MSEDCL is applicable only for Central Generating Stations and Inter-State Generating Stations.
- 10.2 Technical Minimum is the minimum load which is to be maintained on the Unit to run it in a safe and reliable manner. Further, the CERC has referred to its observations in its Order dated 28 May, 2013 in Petition No 142/MP/2012 while finalizing its Regulation on Technical Minimum as follows:
- “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....”*
- 10.3 As per CERC, the technical parameters as categorically penned out in the above extract, i.e., ‘SH & RH steam temperature control range and minimum load without oil support’ are required to be examined for fixing Technical Minimum for each Unit. The technical specifications of RPL’s Generating Units as under control range for rated SH & RH steam temperature of 540+/- 5 Degree Celsius is from 60% of Turbine Maximum Continuous Rating (TCMR) to 100% Boiler Maximum Continuous Rating (BMCR). Oil support removal is at 50% of the rated load. During Performance Guarantee (PG) test, Bharat Heavy Electricals Ltd. (BHEL) proved it at 50% BMCR.
- 10.4 Accordingly, based on real time operational data, RPL arrived at Technical Minimum at Ex-Bus-UAT injection point as 64.4%. This was reviewed by CPRI and its views are also enclosed as per its performance testing.
- 10.5 RPL’s Units were supplied by BHEL. Units supplied by BHEL with capacities of 250 MW of KWU/German design have similar technical features as the 270 MW Unit installed at RPL’s Plant at Amravati, like Turbine Load Governor (ramp up / ramp down rate), Excitation & AVR system, Specific Heat Rate of Turbine, fuel firing system in Boiler, Auxiliary Power consumption, etc. It is not disputed that the

Technical Minimum of 250MW Units supplied by BHEL to Dahanu (RInfra-G), Parli, Paras (MSPGCL) and Trombay (TPC-G) was found to be between 66.8% to 70.08% as per the testing done by a team of CPRI, MSLDC and the Generating Stations. Hence, it can be said that, since RPL's installed Units of 270 MW have similar technical specifications as the 250 MW Units supplied by BHEL, the Technical Minimum should also remain the same, and 66.8% may be considered as the appropriate load to run the Unit safely and efficiently. However, RPL has declared its Technical Minimum as 64.4%, which is 2.4% less than that of similar Units as certified by CPRI.

- 10.6 Hence, the Commission may to reject the Petition seeking uniform Technical Minimum of 55%.
- 10.7 Presently, the Technical Minimum considered by MSLDC for the Generating Units in the State ranges from 65% to 75%.
- 10.8 Each Unit has its own Technical Minimum, which is dependent on various factors. However, the Petitioner's prayer is technically not viable for stable running of Units commercially on regular basis. It would not be correct to arbitrarily assume a uniform Technical Minimum level for different types of Units having different makes and different parameters.
- 10.9 In case of operation of the Units below normative Plant Availability Factor (PAF) but at or above Technical Minimum, the Central or Inter-State Generating Stations may be compensated depending on the average Unit loading on monthly basis. The Regulations have considered Heat Rate degradation and Auxiliary Energy consumption degradation. Where the scheduled generation falls below the Technical Minimum, the concerned Stations shall have the option to go for reserve shut-down. In such cases, start-up fuel cost over and 7 start/stops in a year shall be considered for additional compensation in terms of oil consumption per start-up under hot/warm/cold condition.
- 10.10 The CERC Regulations are applicable only to the Central and Inter-State Generating Stations, and no reference has been made as to its applicability to Intra-State IPPs. Moreover, even for the former, the proviso lays down the compensatory mechanism for the losses incurred by the Generators for operating below normative PLF but at or above Technical Minimum. However, MSEDCL has wants to make only a part of the Regulation applicable to the Generators, with no reference to the compensatory mechanism required/suggested for the losses that the Generators would incur for operating at 55% Technical Minimum.
- 10.11 In neither case can IPPs be differentiated from Central Sector or Inter-State

Generators when it comes to compensating the affected party for losses incurred due to new Regulations/provisions. Two Generators generating power from a similar type of fuel cannot be differentiated on the basis of being a privately-owned Plant or being run by a Government Entity. Such differentiation would be against the concept of competitive bidding (Section 63) and the EA, 2003 as a whole.

- 10.12 The CERC Regulations relied upon by MSEDCL not only provide for reducing the Technical Minimum to 55%, but also for appropriate compensation to the Generators for operating at such Technical Minimum and the operational aspects.
- 10.13 If the Commission is inclined to declare a uniform Technical Minimum of 55% for all Thermal Generating Units operational within the State, the entire Regulation as notified needs to be adopted and not just a part of it as prayed by MSEDCL. A detailed mechanism to compensate Generators for efficiency and operational loss suffered by them for operating their Units below the normative PLF/ Availability and up to the Technical Minimum has to be provided in the Regulations. Operating Thermal Stations below the presently declared Technical Minimum will have commercial implications for Generators in terms of reduction in thermal efficiency, increase in SHR, increased equipment damage and increased wear and tear of components, thereby leading to adverse impact on machine health and life, higher Auxiliary Consumption, increase in Operation and Maintenance (O&M) requirements. Further, operating Units at lower PLF would result in more unstable operation, leading to frequent tripping, and extra costs will also be incurred in frequent start/stop of Units and would lead to drastic reduction in Plant life.
- 10.14 The PPAs between RPL and MSEDCL are under Section 63 of the EA, 2003 and were signed in 2010, whereas CERC's IEGC Regulations (4<sup>th</sup> Amendment) were notified in 2016. If the CERC Regulations are applied to Licensees who have executed PPAs under Section 63 in the State, it would qualify as a 'Change in Law' event since the Regulations did not exist 7 days prior to the Bid deadline and would now result in a recurring expenditure to the Seller (RPL). As per the definition of 'Change in Law', the affected party is required to be restored to the same economic position as if such Change in Law had not occurred.
- 10.15 The tariff quoted by the Generator under the given arrangement consists of two components, i.e., capacity/fixed charge and energy/variable charge. Though the Generator quotes its tariff taking into consideration various factors/components like term of the PPA, prevailing market conditions, project viability and future returns, etc., the reduction in Technical Minimum would disturb all such components and result in significant increase in energy charges from that quoted during the competitive bidding in 2010. As such, it would result in the revision of operating parameters, which are significantly detrimental to the Generator's revenue and are

left unaddressed in absence of some compensatory mechanism whereby the interests of the Generators are also taken into account.

10.16 The Commission, if inclined to refer to the CERC Regulations while dealing with this Petition, may issue necessary directions for inclusion of compensatory provisions in the State Grid Code to compensate the Generators for the efficiency and generation losses suffered by them for operating below the normative PLF/ Availability of 85% and up to the Technical Minimum of the respective Units or accord an in-principle approval of this Regulation as being a 'Change in Law' event.

**11.** RInfra-D, in its Reply dated 18 August, 2017 has stated as follows:

11.1 Reducing the Technical Minimum will allow MSLDC to schedule a cheaper Generating Station, which will result in reduction in overall cost of power purchase and may be considered by the Commission.

11.2 Whether to run any Plant at Technical Minimum of 55% should be decided based on the trade-off between savings in power procurement cost and the avoidable cost due to running of the Plant at lower Technical Minimum. If the net impact is positive, it will be prudent to run the Plant at a lower Technical Minimum.

11.3 At present, MSLDC is following the Technical Minimum as certified by CPRI for each Generating Unit in Maharashtra. Therefore, from the reliability point of view, it is necessary to study whether these Generating Units can sustain performance or the performance is deteriorated when run at 55% Technical Minimum as MSLDC has never directed any Unit to run at that low level loading. It has resorted to zero scheduling or reserve shutdown to maintain grid stability.

11.4 Based on the study of individual Generating Stations by an expert body like CPRI, a chart with the pre-defined amount that will have to be compensated to a Generating Station if it is run at Technical Minimum of 55% should be prepared and MSLDC should accordingly take decision to back down such Unit if the compensation to be given to is less than the savings accruing from backing down such Station.

**12.** RInfra-G, in its Reply dated 18 August, 2017 has stated as follows:

12.1 There would be operational constraints as well as performance-related aspects which will arise if Technical Minimum is reduced.

12.2 Operational aspects:

- a. CERC has finalized the norm of 55% as Technical Minimum based on submissions made by the CEA during the proceedings of the amendment of the IEGC Regulations.
- b. The CPRI had carried out studies in Generating Stations of Maharashtra to certify the “Technical Minimum Limit” based on experimental measurements. As per CPRI, the Technical Minimum for RInfra-G’s Dahanu Thermal Power Station (DTPS) is 67.29% at ex-Bus (UAT + ST) (% of MCR). For other Plants in Maharashtra, the range is between 64%-74%.
- c. As the Technical Minimum norms were decided by CPRI after carrying out technical study, it may not be reduced further. However, if the need to reduce Technical Minimum is felt, it may be done after conducting a similar study and on a case to case basis after considering the specific operational constraints of the Generating Unit/Station, as recommended by the CEA.

### 12.3 Specific Operational issues in case of DTPS:

- a. Most of the power Plants in India have “Vertical Bowl Mills” while DTPS has “Ball & Tube Mills” which is different from other Mills.
- b. Since 1998, DTPS is firing blended coal, generally in the ratio of 80:20 (Indian washed coal: Imported). “As-fired Gross Calorific Value (GCV)” is maintained at around 4000 Kcal/Kg throughout the year to extract maximum performance on Heat Rate, Auxiliary Consumption, efficiency and environment parameters. The operation with “Ball & Tube Mill” and higher GCV coal on low load will have the following practical constraints.
- c. DTPS has 6 Ball & Tube Mills, 3 for each Unit. Two Mills are always required to run to cater to full load operation and one is on stand-by. Each Mill has 2 feeding ends which feed pulverized coal to two consecutive elevations of Boiler. It is mandatory to run 2 Mills even on lower load.
- d. With this type of Mill, it has been experienced that, if as-fired GCV is maintained around 4000Kcal/Kg, it is difficult to operate the Unit below 190 MW. This has been witnessed by representatives of MSLDC and CPRI.
- e. Therefore, to attain 140 MW loading (55% loading), DTPS will have to give up the use of imported coal to bring down the GCV of as-fired coal to 3800 Kcal/Kg to enhance the rate of coal flow in the Mill so that it can sustain at lower load.

- f. To run the Unit on 55% loading, coal feeding of 21 tons per hr. per elevation is envisaged. This will reduce air requirement to 28 tons per hr. per elevation. It has been experienced in the past that pulverized coal pipe chokes invariably due to less air flow. This may cause furnace pressurization due to sudden release of coal.
- g. Soot blowing will not be possible at low load as per OEM guidelines which may lead to clinker formation.
- h. In RGMO, if negative correction takes place due to sudden rise in frequency, then this may lead to load throw of 12 MW. Further, the flame will get disturbed and Unit may trip.
- i. In case of top four coal elevations, main steam and hot re-heat steam temperature would be maintained on higher side due to less steam flow. This will lead to:
  - i) Increase in the metal temperature and will affect the life of the boiler pressure parts;
  - ii) Use of re-heater spray, and affect the efficiency adversely.

12.4 In view of the above, in line with the CEA recommendation, MSLDC should verify the operating condition for each Unit under low load (@ 55% loading and thereafter decide the Technical Minimum (below the present value) for each Unit of DTSPS.

12.5 Performance aspects:

If Technical Minimum is reduced and the Plant is run at low load, the performance parameters will get affected as given below:

- a. The SHR rate will increase due to efficiency reduction at part loading. Thermal Plants are designed to operate at full load, where they are most efficient.
- b. The Auxiliary Consumption will increase due to running of common auxiliaries required, which is independent of Plant loading.

12.6 On efficient operation of the Plant, it is entitled to efficiency gains as per the present Regulations. In case of increase in SHR and Auxiliary Consumption, the efficiency gains will reduce. In fact, it could turn into efficiency losses, if there are many more instances of running the Plant with further reduced Technical Minimum. This is likely to impact the per unit rate due to lower or negative efficiency gains.

- 12.7 The actual deterioration in performance and the increase in fuel cost will depend on the number of hours the Plant is run on Technical Minimum. However, even with the same number of instances of running at Technical Minimum as at present, reduction in Technical Minimum would cause performance deterioration and increase in fuel cost and the net effect would be a loss of performance efficiency.
- 12.8 The Commission may assess the operational constraints on a case to case basis and also provide for relaxation in the performance norms of SHR, Auxiliary Consumption, Specific Oil Consumption, etc. so that the efficiency gains of such Stations are not adversely affected. The Commission may ensure that the interest of the consumers is balanced with the interest of the stakeholders by retaining sufficient incentive in the regulatory regime for efficiently run businesses.
- 13.** VIPL-G, in its Reply dated 23 August 2017, stated as follows:
- 13.1 It would not be prudent to blindly adopt the Technical Minimum defined by CERC for NTPC Generating Stations. CERC has defined the Technical Minimum for NTPC Generating Stations as 55% after undertaking due consultation and obtaining comments from NTPC. Therefore, the Commission may define Technical Minimum on a case to case basis only after due consultation.
- 13.2 Defining Technical Minimum of a Generating Station is a technical exercise which varies for each Plant depending on its design and operating condition.
- 13.3 Operating machine at less than 70% load levels would affect the reliability as well as efficiency and economy of operation. In the long run, it would have an adverse impact on the machine's health and life. This would also increase the capital expenditure requirement. Therefore, keeping in view the deterioration in Plant performance, a proper compensation mechanism should be defined during the low load operations.
- 13.4 CERC has finalized the norm of 55% as a Technical Minimum based on submissions made by CEA during the proceedings of the amendment of the IEGC Regulations in 2016. CEA has also stated that any specific operating constraints brought out or recommendation of OEM with proper technical justification should also be considered while deciding the Technical Minimum.
- 13.5 The Commission in Case No. 109 of 2011 had accepted that there cannot be a blanket statement of Technical Minimum for all Thermal Generating Stations as the Plant operational parameters are bound to vary from Plant to Plant.

- 13.6 The Commission may publish an approach paper covering all the issues and seeking comments from stake-holders, and thereafter notify new Regulations.
14. TPC-G, in its Reply dated 15 November, 2017, has stated that:
- 14.1 The issue of Technical Minimum level of Thermal Generators in Maharashtra was deliberated in the proceedings of Case No. 109 of 2011.
- 14.2 It is pertinent to note the comments of the Commission while appointing the CPRI.
- 14.3 It is implicit that the Technical Minimum cannot be applied to any Generating Station without giving due consideration to the specific operating conditions of every individual Generating Unit.
- 14.4 The present operating Technical Minimum levels of Generating Stations in Maharashtra were ascertained by the CPRI as per the directives of the Commission in its Order in Case No. 109 of 2011.
- 14.5 The Technical Minimum load at which various Thermal Generating Units of TPC-G can be operated without Fuel Oil support was certified by the CPRI on 16 January, 2013 in the presence of MSLDC representatives after conducting due tests on each Unit. For instance, as certified by the CPRI, the 500 MW Unit 5 can be operated at a Technical Minimum Load of 291.6 MW (ex-Bus) without oil support, which comes to around 58% of MCR which is marginally higher than the limit specified by the CERC.
- 14.6 Further, the following operational limitations were observed for further load reduction without oil support in Unit 5 :
- A) Lower Flame stability: There have been instances of Unit tripping on flame failure at low load. Minimum oil has to be consumed for ensuring the flame stability.
- B) Safety of Furnace: Furnace to wind box delta P (differential pressure) becoming very low (near zero). This increases the probability of fire in wind box.
- C) Temperature cycling and load cycling increases the maintenance frequency of the major equipment.
- D) OEM's Recommendations: As per the OEM's recommendations, load should not be dropped below 60%. The Design Heat Balance Diagrams (HBDs) provided by the OEM is up to 60% of its MCR rating.

E) Adverse impact on Unit Heat rate and Auxiliary Consumption at low load.

Hence, considering the above, lowering the Technical Minimum Operational Load of Unit 5 of Trombay would impact reliability and increase inefficiency of operation, and it needs to be retained at its existing level as determined by CPRI through actual Plant tests.

- 14.7 The Technical Minimum operating level of 55% of MCR Load as mentioned in the definition referred to by MSEDCL cannot be applied to all Generators on ad hoc basis without proper study and test for each individual Generating Unit.
- 14.8 Technical Minimum level of 55% as defined by the CERC cannot be applied as it is. Any reduction in the present CPRI certified Technical Minimum level specified for the Generators will lead to operational issues and increase in Heat Rate and Auxiliary Consumption of the Unit. This will in turn impact Availability of the Unit and lead to reduction in reliability and efficiency of its operations and may require additional capital expenditure.
- 14.9 While specifying the revised Technical Minimum Load level of 55% of MCR, the CERC has also made provision for compensating the Generator for the possible financial impact.
- 14.10 In case the Commission intends to revise the Technical Minimum of the Generating Units, the Commission it may undertake a study through a competent authority like CPRI to determine i) Whether the individual Units can operate effectively at the Technical Minimum of 55% and, if yes, ii) the compensation to be provided in terms of operating parameters, loss in Availability and efficiency gain/loss.
- 14.11 The Commission may give due consideration to the facts and OEM recommendations before allowing the prayers of MSEDCL on ad hoc basis.
- 15.** In its Reply dated 15 November, 2017, TPC-D stated as follows:
- 15.1 The reduction in Technical Minimum to 55% would help the Distribution Licensees to lower their cost of power purchase in overall terms. Hence, the Commission may consider it in the interest of consumers.
- 15.2 The decision of lowering the Technical Minimum from existing levels to a standard 55% should be made based on the net impact to the Distribution Licensees as it is

likely to adversely affect the operating parameters, cost as well as the reliability of operation of the Generating Unit.

- 15.3 The present operating Technical Minimum level of Generating Stations in Maharashtra was ascertained by CPRI as per the directives of the Commission in its Order in Case No. 109 of 2011. Further, as per MSLDC, the Generating Units have never run below this level, and hence it is crucial from the Grid stability point of view to study whether these Units can operate and sustain the performance level.
- 15.4 A comprehensive approach has to be taken while determining the reduction in Technical Minimum taking into consideration availability, reliability of operation of Generating Units and ensuring that no net additional impact is passed on to the Distribution Licensees on account of reduction in Technical Minimum level to 55%.
16. In its additional submission dated 27 November 2017 has stated as follows:
- 16.1 As directed by the Commission in its daily Order dated 20 June, 2017, MSEDCL has served its Petition on the other Generators and Distribution Licensees by e-mails dated 4 and 6 July, 2017.
- 16.2 The Commission had also directed MSEDCL to confirm whether NTPC has changed any operating parameter to achieve 55% Technical Minimum loading for its Thermal Generating Stations. Vide e-mail dated 10 November, 2017, NTPC has informed that it has not undertaken any special Plant modifications for the new Technical Minimum norm of 55%.
- 16.3 Vide Order dated 5 May, 2017, CERC has stipulated the Technical Minimum level as follows:

*“Technical Minimum” for operation in respect of a unit(s) of a thermal Generating Station shall be 55% of Maximum Continuous Rating or MCR Loading or installed capacity of the Units on bar at the generating station after deducting the normative Auxiliary Energy Consumption plus Auxiliary Energy Consumption compensation as per the provisions of the Grid. (Annexure – V).”*

Hence, the contention of MSPGCL that there is no definition of Technical Minimum is wrong.

- 16.4 In its Reply dated 15 November, 2017, TPC-G has stated that its Unit 5 (500 MW) can be operated at a Technical Minimum load of 291.6 MW (ex-Bus) without any oil support. That comes to around 58% of MCR, which is marginally higher than the limit specified by the CERC.

- 16.5 Irrespective of type, technology, age or capacity or such other parameter, a Thermal Generating Unit can run upto a Technical Minimum of 55% which has been adopted by CERC in 2016.
- 16.6 The situation of bringing Units to the Technical Minimum arises for limited periods of the day and on only a few occasions in the year. Hence, the contention of MSPGCL that revision of Technical Minimum to 55% will affect the performance of the Plant and stability of the Units is flawed as, even today, the CGS and ISGS are running at this Technical Minimum as per system requirements.
- 16.7 The Commission may take a comprehensive approach while determining the reduction in Technical Minimum so that no net additional financial impact is passed on to the Distribution Licensees.
17. GMR Warora Energy Ltd. (GWEL) (formerly EMCO Energy Ltd.), in its Reply dated 28 November, 2017, has stated as follows:
- 17.1 The Regulatory Commissions have both adjudicatory and regulatory functions, and no direction can be issued by the Commission to itself while exercising its adjudicatory powers. The procedure for making Regulations (and/or any amendment) is entirely different and, therefore, the Petition of MSEDCL is not maintainable and is liable to be dismissed.
- 17.2 GWEL is an Inter-State Generating Station supplying power to several States, including Maharashtra, Tamil Nadu and the Union Territory of Dadra and Nagar Haveli under separate PPAs.
- 17.3 Thus, as per Section 79(1)(b) of the EA, 2003, the appropriate Commission for the adjudication of the issues raised by MSEDCL is the CERC and not the State Commission. According to the Supreme Court in its Judgment in Energy Watchdog vs. CERC & Ors.,
- “22. ....The State Commission’s jurisdiction is only where generation and supply takes place within the State. On the other hand, the moment generation and sale takes place in more than one State, The Central Commission becomes the Appropriate Commission under the Act.”*
- 17.4 GWEL, being an Inter-State Generator, is a Regional entity under the IEGC and is regulated by the Regional Load Despatch Centre (RLDC). Therefore, its generation and despatch can only be scheduled by the Western RLDC and not by MSEDCL and/or by MSLDC.

17.5 The Commission itself in its Daily Order dated 20 June, 2017 has recorded that:

*“11. MSEDCL stated that MSPGCL’s new Units need to follow the CEA Regulations, 2010. The Commission observed that reduction in technical minimum may result in economic benefits. However, technical minimum being an operational parameter for Generating Units, it may require technical consideration also. The Commission also observed that, if grid stability is the prime consideration for filing the present Petition, then ideally MSLDC should have approached the Commission and not MSEDCL.”*

17.6 The Technical Minimum at which the Unit of GWEL’s Plant can run safely is 70% (i.e. 210 MW). Operating below that level would ultimately make the machines unstable and can lead to frequent boiler tripping and breakdown of the Units, which might further deteriorate the performance of the Plant. Also, operating below the Technical Minimum can cause significant increase in cost of generation in terms of increased O&M costs and cost of environmental compliance, and not just increase the cost of generation.

17.7 The decision to direct a Central Sector or Inter-State Generating Station to operate its Units(s) at or above Technical Minimum but below the normative Plant Availability lies with the concerned RLDC. Such direction may be on account of grid security or lower scheduling by the Beneficiaries. Further, the direction to operate below the normative Load Factor entitles the Generating Company under Regulation 6.3B (iii) and (iv) to claim compensation on account of increased heat rate, Auxiliary Consumption and oil consumption.

17.8 The IEGC provides that, in situations where such direction to operate below normative Plant Availability is given, the Generating Station may be entitled to compensation for losses as per the conditions specified by the RLDC and borne by the entity on whose account the Plant was directed to operate at schedule lower than normative PAF. MSLDC would not, therefore, be empowered to compensate GWEL in case of any direction to reduce generation.

17.9 GWEL would be subjected to the following consequences in case of default in performance due to a lower Technical Minimum:

- a. Loss of capacity charges payable under the PPA.
- b. Penalty for not meeting the Availability requirement under the PPA.
- c. Under-recovery of Energy Charges due to increased cost of generation on account of increased Heat Rate, Auxiliary consumption and oil consumption.
- d. Increased O&M costs on account of technical issues.

- 17.10 MOD has no connection with the Technical Minimum level of operation. Also, MSLDC cannot give directions for backing down to Central Sector Inter-State Generating Stations as they are in the domain of the RLDC.
- 17.11 The generation of a Plant cannot be shut down because of the supply-demand scenario at a particular moment and is required to factor in issues such as the start-up time, grid stability, efficiency etc. The technology of each Generating Station is as per the prevailing conditions at the time of its construction/ commissioning. Technical Minimum, therefore, has to be the lowest level at which the Plant can run, subject to its operational parameters and grid security. The Technical Minimum of each Plant would have to be considered taking into account the design parameters of the machine.
- 17.12 The normative Technical Minimum of 55% is for the purpose of scheduling by the RLDC, which has a more complete picture of the prevailing conditions in the grid. The RLDC is aware of the other obligations of the Generating Stations and takes into account the individual technical limits of each Plant on descriptive basis. The Regulation 6.3B of the IEGC Regulations was notified only on 15 May, 2017, whereas many of the existing Plants were constructed (or were under construction) long before that and may not be able to meet the Technical Minimum as stipulated in the amended IEGC Regulations. Thus, the role of RLDC is most relevant, as it is the authority to consider circumstances on the ground, and allowing such liberty to the MSLDC would be against consumer interest.
- 17.13 There is unlikely to be any scenario in which all the Thermal Generating Stations which supply to MSEDCL would be operating at the Technical Minimum. Thus, the additional flexibility calculation does not take into account practical grid operation scenarios.
- 17.14 The lowering of the technical limit will provide more scope to accommodate RE with better grid stability and economical manner.
- 18.** IEPL, in its Reply, dated 28 November, 2017, has stated that:
- 18.1 Technical Minimum load is the load with which the Unit can perform without oil support.
- 18.2 While scheduling power, the Technical Minimum is considered by MSLDC. Presently, the Technical Minimum load considered by MSLDC is between 65% to 75%.

- 18.3 The EA, 2003 does not have any provision on the term ‘Technical Minimum’ and none of the Regulations have a specific definition of the term either. The OEMs also do not give a definition of Technical Minimum. However, the load at which a Unit is stabilized without oil support is only guaranteed during the performance test. That is Unit-specific and may vary from Unit to Unit depending upon its composition, technology adopted and quality of coal.
- 18.4 Therefore, IEPL opposes MSEDCL’s demand for prescribing an ad hoc limit of 55% as Technical Minimum, as it will have adverse technical and commercial impacts.
- 18.5 In Case No. 109 of 2011, the Commission has observed that there cannot be a common specification applicable to all Thermal Plants regarding Technical Minimum.
- 18.6 In case of RPL’s Amravati Units 1 to 5, the Technical Minimum is 172 MW, i.e. 64%. The configuration of the IEPL Unit is same that of RPL (270 MW BHEL make) and, therefore, the Technical Minimum percentage will be at the most or equal to that of RPL’s Amravati Unit, i.e. 64%.
- 18.7 The entire claim of MSEDCL for a Technical Minimum of 55% is based on proviso 1 of Regulation 6.3B of the CERC Regulations. MSEDCL has submitted that implementation of such Technical Minimum is essential for flexibility to accommodate more RE generation with better grid stability as well as help reducing overall cost of generation by utilizing low-cost generation efficiently. In the Petition, there is nothing to show as to what is the availability of power from RE sources so as to warrant any reduction of the Technical Minimum to 55%.
- 18.8 The CERC Regulations should not be implemented in part but in totality considering all the provisions of Regulation 6.3B.
- 18.9 Reduction of the Technical Minimum to 55% will lead to adverse technical and commercial implications to the Generators. It will lead to reduction in thermal efficiency, increased equipment damage, and increased wear and tear of components thereby leading to adverse impact on machine health and life, higher Auxiliary Consumption, increased O & M requirements and increased usage of secondary fuel. It will also lead to commercial implications including but not limited to deterioration in SHR, increased O&M costs, increased Auxiliary Consumption, higher secondary fuel costs, etc. Also, the Generators need to be compensated against losses due to operation at such reduced loading

- 18.10 While notifying the 4th amendment to IEGC, CERC has considered these aspects in detail and addressed all the concerns relating to partial loading in Regulation 6.3B of its amended Regulations.
- 18.11 MSEDCL has mentioned the CPRI Report on determination of Technical Minimum of Generating Stations in Maharashtra. As IEPL does not have access to this Report, the Commission may direct MSEDCL to share a copy.
- 18.12 MSEDCL has provided calculation of available capacity in case the Technical Minimum is considered at 55% for all the Plants supplying power to MSEDCL. It has also provided details of commercial obligations due to consideration of prevailing Technical Minimum instead of 55%. The calculations of MSEDCL are hypothetical and cannot lead to any conclusion in isolation.
- 18.13 The Technical Minimum of 55% should be allowed with implementation of all provisos of Regulation 6.3B of the CERC Regulations.
- 19.** At the hearing held on 28 November, 2017:
- 19.1 MSEDCL stated that:
- i. All Inter-State Generating Stations and Central Sector Generating Stations are following the revised norm of 55% Technical Minimum as per the amended CERC Regulations, and it should be made applicable in Maharashtra as well. This will help MSEDCL to manage its extreme varying demand and reduce the power purchase cost.
  - ii. The situation of bringing the Generating Units to the Technical Minimum arises for limited periods of the day and on only few occasions in the year. Therefore, the financial impact on the Generating Companies may not be significant and can be checked at the time of truing up.
- 19.2 TPC-G re-iterated its written submissions, and stated that it is incorrect to say that the Generating Units are operated at Technical Minimum for limited periods of time. Rather, the Units are required to operate at Technical Minimum daily during night off-peak hours. To a query of the Commission, TPC-G stated that it is not advisable to operate the Units below the CPRI-tested Technical Minimum as there is likelihood of loss of stability and tripping.
- 19.3 TPC-D stated that there should not be any additional financial burden on the Distribution Licensees due to revised Technical Minimum norms, and that the

impact on the stability and the operating life of the Generating Units is also important as it affects the reliability of supply to the consumers.

19.4 RInfra-G suggested that a study be undertaken on case to case basis if the Technical Minimum is to be reviewed. As per CEA, Units with specific operating constraints or where there are different OEM recommendations with proper technical justification should be excluded.

19.5 RInfra-D stated that it is necessary to study whether the Units can sustain their performance at 55%. An independent body like CPRI may be engaged for the study, based on which a chart indicating the compensation amount vis-à-vis the Unit loading should be prepared so that MSLDC, in real time, can decide about backing down the Units or otherwise based on economics.

19.6 MSPGCL stated that:

- i. MSEDCL is silent on the provision of compensation mentioned in the CERC Regulations.
- ii. There may be issues relating to safety and stability if the Generating Units are brought to 55% Technical Minimum.
- iii. As pointed out earlier by MSPGCL, the compensation payable to the Generating Companies will be more than the saving in power purchase cost. Hence, there will be an additional burden on the consumers.
- iv. Also, the performance parameters like Auxiliary Consumption, Heat Rate, and specific oil consumption will be affected.

19.7 GWEL stated as follows:

- i. The Technical Minimum of its Generating Unit is specified as 70% based on OEM recommendations.
- ii. Operation of the Unit below this limit would not be advisable due to stability issues and extensive oil support required.
- iii. There are provisions regarding compensation in CERC Regulations. However, it is likely that the compensation payable to the Generating Companies may be contested by the Distribution Licensees, citing the provisions of the PPAs.

- iv. MSEDCL's contention that additional flexibility of 1703 MW would be achieved due to revised Technical Minimum is based only on assumptions, and it may not be possible to achieve flexibility to that extent.
- 19.8 IEPL stated that Generating Units may have their own issues, and Plant shutdown may result in the Generating Company going bankrupt. BEST stated that there should not be any additional burden on the common consumers. RPL, APML and JSWEL stated that they had nothing to add to their written submissions.
- 19.9 SWPL stated that:
- i. Technical Minimum of 70% has been specified for its Generating Units based on OEM recommendations and CEA certification.
  - ii. Operation of its Unit below this limit may not be sustainable and there will be degradation of the Boiler and generator.
  - iii. Also, extensive oil support may be required.
- 19.10 MSLDC stated that it had no objection to revision in Technical Minimum up to 55%. NTPC Units are being scheduled at 55% and Units are running at that level without any problem.
- 19.11 Dr. Ashok Pendse of TBIA stated as follows:
- i. As per his information, NTPC is charging additional variable charge whenever its Units are operated below the normative Availability and upto the Technical Minimum of 55%.
  - ii. The PPAs between the Generating Companies and the Distribution Licensees may require amendment so that compensation as per the CERC Regulations can be given to the Generating Companies.
  - iii. Technical Minimum of a Unit of a particular make may not be appropriate for Units supplied by other manufacturers.
  - iv. Life of the Units may be affected due to the revised Technical Minimum.
  - v. Net saving on the power purchase cost depends upon the extent of additional compensation payable to the Generating Companies.

- 19.12 The Commission asked MSEDCL whether it was ready to bear the additional cost on compensation payable to the Generating Companies, to which MSEDCL did not respond.
- 19.13 The Commission observed that the operation of a Generating Unit upto the Technical Minimum of 55% may have an adverse impact on the operating life of the boiler and machine, and these technical aspects cannot be ignored. There are also other options like zero scheduling or reserve shutdown available for optimization of power purchase expenses. MSEDCL should consult MSLDC and STU and explore different permutation/combinations for a practicable solution for managing extreme variations in demand.

### **Commission's Analysis and Ruling**

20. **MSEDCL has sought revision in the Technical Minimum of all Generating Units under the Commission's jurisdiction and with which it has PPAs to a uniform level of 55% of its MCR loading or installed capacity, citing the 4th Amendment to the IEGC Regulations notified by CERC:**

*“...6.3B – Technical Minimum Schedule for operation of Central Generating Stations and Inter-State Generating Stations*

*1. The technical minimum for operation in respect of a unit or units of a Central Generating Station of inter-State Generating Station shall be 55% of MCR loading or installed capacity of the unit of at generating station...”*

**MSEDCL has stated that is Technical Minimum is now being followed by the Central Sector and Inter-State Generating Stations. MSEDCL contends that the downward revision of Technical Minimum to 55% would reduce the power purchase cost of Distribution Licensees in Maharashtra. It would also provide greater flexibility in the operation of Generating Units and thereby help accommodate the increasing RE generation.**

21. **While the IEGC Regulations have been amended by CERC after due consultation and the revised Technical Minimum norms are apparently being followed by the Central Sector and Inter-State Generating Stations, the Commission notes the views of the CEA recorded in CERC's Explanatory Memorandum:**

*“34. ...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."*

Thus, the CEA did not recommend the blanket application of a Technical Minimum level of 55% uniformly to all Generating Units.

22. In its Order dated 27 June, 2012 in Case No. 109 of 2011, the Commission had dealt with the issue of the Technical Minimum of Generating Units in Maharashtra as follows:

*"23.4 ...The Commission observes that there cannot be a common definition statement applicable to all thermal plants regarding technical minimum as the said limiting value is the lower limit of carrying load safely, without support or with minimal support of secondary fuel and the load from which effortless bouncing back to higher loads is possible for the thermal plant. Plant operational patterns are bound to vary from plant to plant and it is not a definition statement but ascertaining the accurate value of such technical minimum is essential to implement MOD accurately...*

*...the Commission observes that none of the Public sector nor the Private sector generating companies in the State, have accurately ascertained "technical minimum" of each of its generating Units and the value available at MSLDC is just a common value such as 70% or 75% across the board.*

*Therefore, the Commission observes that ascertaining technical minimum and verifying it through a competent third party is absolutely essential for correct implementation of the MOD and hence, the Commission has initiated such an exercise wherein MSLDC holds the pivotal role and CPRI is identified as the competent third party for ascertaining and validating technical minimum for all thermal generating Units in the state."*

Accordingly, CPRI, an apex technical organisation, conducted an exercise in FY 2012-13 to ascertain the Technical Minimum of each of 35 Units at 13 Generating Stations in Maharashtra, which is now on MSLDC's website for scheduling and SMP calculations. The Technical Minimum derived by CPRI after testing and technical study is not uniform but varies across Generating Units, and is being followed while scheduling and backing down these Units since then. The CPRI-determined Technical Minimum of most of these Units is significantly higher than the uniform level of 55% now proposed by MSEDCL. The Technical Minimum of several subsequent Generating Units, though not independently assessed, is also higher than 55% considering the level determined earlier by CPRI for similar Units or the level applied by MSLDC/Generators.

23. At para. 16.3 of its Order in Case No. 109 of 2011, the Commission had also observed that

*“...in the light-load periods, the thermal Units could be backed down only up to their respective technical minimum, beyond which there would be risk of taking extensive oil support, risk of forced outages and subsequent possibility of not being available to come back on line and take load as per the generation schedule in the subsequent period.”*

The Technical Minimum of a Generating Unit depends on a host of factors arising from their vintage and design and technical parameters. Where, as in the case of many of the Generating Units studied by CPRI, the Technical Minimum resulting from these factors is significantly higher, the operation of a Unit at a Technical Minimum of 55% may adversely affect the operating life of major associated equipment, including the turbine itself. It may also have other cost implications as the Unit may require further oil support to ensure flame stability. Several other potential impacts have been flagged by Generators during these proceedings.

24. According to MSEDCL, the proposed reduction in Technical Minimum to 55% would reduce its power purchase cost and, consequently, the consumer tariffs. However, MSPGCL and other Generators have pointed out that the IEGC Amendment also provides for compensation for the deterioration of performance parameters of the Generating Stations, which has not been considered by MSEDCL while calculating the savings in power purchase cost. MSEDCL was non-committal when the Commission asked whether it was prepared to compensate the Generators correspondingly. In this context, as also brought out in these proceedings, there may be further implications arising from related provisions of the MYT Regulations and the terms of the PPAs entered into under 63 of the EA, 2003. The Commission also notes that various

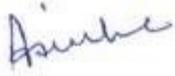
**options, including zero scheduling and reserve shut-downs in consultation with MSLDC, are available to help MSEDCL manage variations in demand.**

25. **In view of the foregoing, the Commission is not inclined to uniformly apply a Technical Minimum of 55% to all Generating Units with PPAs with MSEDCL and others within its purview.**

The Petition of Maharashtra State Electricity Distribution Company Ltd. in Case No.15 of 2017 stands disposed of accordingly.

**Sd/-  
(Deepak Lad)  
Member**

**Sd/-  
(Azeez M. Khan)  
Member**

  
**(Ashwani Kumar Sinha)  
Secretary**

