

**MADHYA PRADESH ELECTRICITY REGULATORY COMMISSION  
BHOPAL**

**Sub: Approval of the Detailed Operating Procedure for taking unit(s) under Reserve Shut Down and Mechanism for Compensation for Degradation of Heat Rate, Aux Energy Consumption and Secondary Fuel Oil Consumption, due to Part Load Operation and Multiple Start/Stop of Units under Reserved Shut Down (RSD).**

**ORDER**

**(Date of Order 29<sup>th</sup> January' 2020)**

The Madhya Pradesh Electricity Regulatory Commission (hereinafter called the Commission or MPERC) notified the Madhya Pradesh Electricity Grid Code (Revision-II), 2019 (hereinafter called Grid Code or MPEGC) on 21<sup>st</sup> June' 2019. Clause 8.8 (6) of the aforesaid Madhya Pradesh Electricity Grid Code provides as under: -

*8.8 (6). "SLDC shall prepare a Detailed Operating Procedure in consultation with the generators and beneficiaries at OCC forums within 3 months' time and submit to the Commission for approval. The Detailed Operating Procedure shall contain the role of different agencies, data requirements, procedure for taking the units under reserve shut down and the methodology for identifying the generating stations or units thereof to be backed down up to the technical minimum in specific Grid conditions such as low system demand, Regulation of Power Supply and incidence of high renewable etc., based on merit order stacking.*

*The SLDC shall work out a mechanism for compensation for station heat rate and auxiliary energy consumption for low unit loading on monthly basis in terms of energy charges and compensation for secondary fuel oil consumption over and above the norm for additional start-ups in excess of 7 start-ups, in consultation with generators and beneficiaries at OCC forum and its sharing by the beneficiaries.*

*While preparing the above Detailed Operating Procedure and working out the aforesaid mechanism, the SLDC may be guided by the Detailed Operating Procedure and mechanism approved by the Central Commission under Indian Electricity Grid Code."*

2. In compliance to the aforesaid provisions under Clause 8.8(6) of M.P. Electricity Grid Code (Revision-II), 2019, SLDC vide letter No. 07-05/TMM&RSD/MPERC/SG9/2627 dated 26.09.2019 submitted the Detailed Operating Procedure (DOP) for backing down of coal based Generating Units and mechanism for compensation due to part load operation and multiple start/ stop of units. It was mentioned by SLDC that the Detailed Operating Procedure has been prepared in line with the Detailed Operating Procedure and Mechanism for Compensation for

**Sub:Approval of the Detailed Operating Procedure for taking unit(s) under Reserve Shut Down and Mechanism for Compensation for Degradation of Heat Rate, Aux Energy Consumption and Secondary Fuel Oil Consumption, due to Part Load Operation and Multiple Start/Stop of Units under Reserved Shut Down (RSD).**

degradation of Heat Rate, Aux Energy Consumption and Secondary Fuel Oil Consumption, due to Part Load Operation and Multiple Start/Stop of Units approved by CERC.

3. The Detailed Operating Procedure and Mechanism for compensation as submitted by SLDC has been examined in light of the provisions under M.P. Electricity Grid Code and Detailed Operating Procedure issued by CERC for Inter State Generating Stations. On examination of the Detailed Operating Procedure and mechanism for compensation filed by SLDC, vide Commission's letter dated 26<sup>th</sup> October' 2019, some details / documents were sought from SLDC by 31<sup>st</sup> October' 2019.
4. Vide letter dated 31<sup>st</sup> October' 2019, SLDC filed its response along with the details/documents sought by the Commission. On perusal of the aforesaid response filed by SLDC, vide Commission's letter dated 15<sup>th</sup> November' 2019, SLDC was asked to make a presentation before the Commission on 20<sup>th</sup> November' 2019 to explain certain issues related to Detailed Operating Procedure and mechanism for compensation.
5. On 20<sup>th</sup> November' 2019, a presentation was made by senior officers of SLDC in respect of DOP for backing down of coal based SSGS and mechanism for compensation due to part load operation and multiple start/stop of units. During the course of presentation, it was observed by the Commission that the DOP for backing down of coal based SSGS and mechanism for compensation due to part load operation as submitted by SLDC need to be reviewed and reworked in light of the discussions held with the officers of SLDC. Vide letter dated 21<sup>st</sup> November, 2019, SLDC was asked to file revised Detailed Operating Procedure and mechanism for compensation at the earliest but not later than 30<sup>th</sup> November' 2019.
6. Vide letter dated 27<sup>th</sup> November' 2019, SLDC informed that a workshop has been proposed on 5<sup>th</sup> December' 2019 at the Regional Office of MPPMCL, Bhopal for discussions on preliminary Draft Detailed Operating Procedure. SLDC also informed that the representatives of Generating Stations including IPPs, MPPMCL, WRPC were invited in the workshop. SLDC submitted that based on the comments / suggestions received from the participants during the open discussions in the workshop, SLDC shall finalize the Detailed Operating Procedure and submit to the Commission as early as possible.
7. Subsequently, vide letter dated 23<sup>rd</sup> December' 2019, SLDC has filed revised Detailed Operating Procedure and mechanism for compensation with the following submission:

**Sub:Approval of the Detailed Operating Procedure for taking unit(s) under Reserve Shut Down and Mechanism for Compensation for Degradation of Heat Rate, Aux Energy Consumption and Secondary Fuel Oil Consumption, due to Part Load Operation and Multiple Start/Stop of Units under Reserved Shut Down (RSD).**

*“SLDC has prepared a revised DOP and discussed with representative from all the generators including IPPs, WRPC and MPPMCL on 5<sup>th</sup> December’ 2019 at Regional Office, MPPTCL, Bhopal. Subsequently, the DOP prepared by SLDC has also been discussed in 39<sup>th</sup> WRPC meeting held on 16<sup>th</sup> December’ 2019. Based on the discussions held during the meeting and recommendations of WRPC, SLDC has made changes in the DOP. The Member Secretary, WRPC vide email dated 23<sup>rd</sup> December’ 2019 has intimated that the DOP is in line with the CERC procedure.”*

5. The Commission through this order approves the Detailed Operating Procedure and the Compensation Mechanism in terms of sub-clause 6 of the clause 8.8 of M.P. Electricity Grid Code, 2019. The approved Detailed Operating Procedure is annexed at **Appendix-I** to this order. The approved Compensation Mechanism is annexed at **Appendix-II** to this order.
6. The SLDC is directed to provide feedback, after consultation with the stakeholders, on the operation of the compensation mechanism within one year from the date of issue of this order for assessment of the efficacy of the compensation mechanism.

**(Shashi Bhusan Pathak)**

**Member**

**(Mukul Dhariwal)**

**Member**

**Place: Bhopal**

**Date: 29<sup>th</sup> January’ 2020**

**DETAILED OPERATING PROCEDURE**

FOR

**Backing Down of Coal Based Thermal Units of the  
State Sector Generating Stations & IPPs**

**And**

**Mechanism for Compensation for Degradation of  
Heat Rate, Aux Consumption and Secondary Fuel  
Oil Consumption, due to Part Load Operation and  
Multiple Start/Stop of Units under Reserve  
Shutdown (RSD)**

**Detailed Operating Procedure for Backing Down of Coal based unit(s) of the State Sector Generating Stations having 100% installed capacity tied up with MP Power Management/DISCOMs of MP and for IPPs as per provision in PPA with MPPMCL for taking such units under Reserve Shut Down for scheduling below Technical Minimum Schedule and part load operation (i.e. operation of the unit/(s) below normative PAF upto the technical minimum)**

**1. General**

- 1.1 Madhya Pradesh Electricity Regulatory Commission (the Commission or MPERC) notified 'Madhya Pradesh Electricity Grid Code (MPEGC)' (Revision -II), 2019 notified on 21.06.2019. As per Clause 8.8(6) of the MP Electricity Grid Code, State Load Despatch Centre (SLDC) shall prepare a Detailed Operating Procedure in consultation with the generators and MPPMCL/Discoms.
- 1.2 SLDC has prepared "Detailed Operating Procedure for Backing Down of Coal unit(s) of the State Generating Stations having 100% installed capacity tied up with MP Power Management Company/DISCOMs of MP and for IPPs as per provision in PPA with MPPMCL for taking such units under Reserve Shut Down on scheduling below Technical Minimum Schedule and part load operation" (hereinafter "Detailed Operating Procedure" or "DOP") in consultation with generators and MPPMCL/Discoms at Operating and Co-ordinating Committee(OCC) forum. Further, the procedure was also discussed in a workshop held on 5.12.2019 at MPPMCL regional office, Arera Colony, Bhopal.
- 1.3 The DOP shall come into force with effect from the date of its approval by the MP Electricity Regulatory Commission or the date of approval of amendment in PPA by the Commission wherein appropriate provision for compensation for degraded station heat rate (SHR) or Auxiliary Energy Consumption (AUX) and Reserve Shutdown (RSD) are made by way of amendment, whichever is later.

**2. Objective**

The objective of this DOP is to lay down (i) the methodology for identifying the generating stations or units thereof to be backed down in specific grid conditions such as low system demand, during regulation of power supply, incidence of high renewables etc.; (ii) the procedure for taking generating units under RSD; (iii) the role of different agencies; and (iv) the data requirements, etc.

**3. Scope**

This DOP shall be applicable to SLDC, MPPMCL, Distribution Licensee in state and State Sector Generating Stations (SSGS) having 100% installed capacity tied up with MP Power Management Co. Ltd./Discoms of MP and for IPPs as per provisions in PPA with MPPMCL, whose tariff is determined/adopted by the MPERC. In case of IPPs wherein 100% installed capacity is not tied up with MPPMCL/Discoms of MP through a long term power purchase agreement and whose tariff for only partial/contracted capacity is determined/adopted by the Commission, such generating station/company shall have to appropriately factor in the provisions in the

PPAs entered into by it with MPMPCL/Discoms for sale of power, in order to claim compensations for operating at part load or taking unit under RSD.

#### 4. Definitions

4.1 In this DOP, unless the context otherwise requires:

- (i) **“Cold Start”** in relation to steam turbine means start up after a shutdown period exceeding 72 hours (turbine metal temperatures below approximately 40% of their full load values).
- (ii) **“Declared Capacity”** or ‘DC’ in relation to a generating station means, the capability to deliver ex-bus electricity in MW declared by such generating station in relation to any time-block of the day as defined in the Grid Code or whole of the day, duly taking into account the availability of fuel, and subject to further qualification in the relevant Regulations.
- (iii) **“Off Bar Declared Capability in MW”** shall be considered as the difference between DC and On DC.
- (iv) **“On Bar Declared Capacity”** (On DC) in relation to a generating station means, the capability to deliver ex-bus electricity in MW from the units on bar declared by such generating station in relation to any time-block of the day as defined in the Grid Code or whole of the day, duly taking into account the availability of fuel and subject to further qualification in the relevant Regulations.
- (v) **“On Bar Installed Capacity”** means the summation of name plate capacities or the capacities as approved by the Commission from time to time, of all units of the generating station in MW which are on bar.
- (vi) **“Hot Start”** in relation to steam turbine, means start up after a shutdown period of less than 10 hours (turbine metal temperatures below approximately 80% of their full load values).
- (vii) **“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 Code.
- (viii) **“Warm Start”** in relation to steam turbine means start up after a shutdown period between 10 hours and 72 hours (turbine metal temperatures between approximately 40% to 80% of their full load values).
- (ix) **“Pseudo Beneficiary”** means beneficiary role of IPP, against the part capacity

of its plant which is not allocated to any other beneficiary.

4.2 Terms and abbreviations used in this DOP but not defined herein shall have the meaning assigned to them in Electricity Act, 2003 or the MP Electricity Grid Code or other Regulations of the Commission as notified from time to time.

#### **5. Methodology for taking generating station or unit(s) thereof under Reserve Shut Down (Day ahead scheduling)**

The scheduling process is adopted as per clause 8.4 to 8.7 of MP Electricity Grid Code 2019. Salient points of the same are mentioned below;

5.1. The State Sector Generating Station/IPPs shall submit the following information at the time of declaration of DC (time block-wise) and subsequent revisions, if any, in accordance with Grid Code.

- (i) On Bar Installed Capacity (MW) / Units On Bar.
- (ii) On Bar Declared Capacity (MW) (with due consideration to ramp up/down capability).
- (iii) Ramp UP/ Ramp DOWN rate (MW/min) for On Bar Installed Capacity.

5.2. SLDC shall compile the above information along-with ex-bus declared capacity of each of the SSGS/IPPs thermal Generating Station and prepare entitlement for MPPMCL under day-ahead scheduling.

5.3. Each Discom shall furnish day-ahead forecasted demand to MPPMCL. Based on the forecasted demand of Discoms, MPPMCL furnishes requisition in each SSGS/IPPs as per Merit Order Dispatch (MOD), to SLDC.

5.4. Based on the ex-Power Plant (Ex-PP) requisition submitted by MPPMCL, SLDC prepares and issue Generation Schedule in 15-minute time-block for each of the SSGS/IPPs.

5.5. If the net Ex-PP injection schedule for a generating station is less than technical minimum, MPPMCL/Discoms shall be required to review its requisition(s) and submit a revised requisition(s), to the SLDC.

5.6. SLDC shall suo-moto revise the schedule of any generating station as per clauses 8.6 and 8.7 of the MP Electricity Grid Code to operate at or above technical minimum in the ratio of under-requisitioned quantum (with respect to technical minimum) in the interest of smooth system operation under the following conditions:

- i. Extreme variation in Weather Conditions
- ii. High Load Forecast
- iii. To maintain reserves on State level basis
- iv. Network Congestion
- v. Any other event which in the opinion of SLDC/RLDC shall affect

the grid security.

- 5.7. If the grid conditions do not demand for providing technical minimum to a generating station, under such situation, the SSGS/IPPs shall have the option to go for RSD with intimation to SLDC.
- 5.8. Before taking unit(s) under RSD, the generating station shall revise the On Bar DC (with due consideration to ramp up/down capability) and Off Bar DC. The generator shall ensure that the Off Bar DC is not more than the MCR less Normative Auxiliary Energy Consumption of the machines under RSD. The MPPMCL shall continue to bear the capacity charge corresponding to Total DC.
- 5.9. When the machine is going under RSD:
  - i. In case the total requisitioned power can be supplied through other units in the same generating station on bar, the generator shall be scheduled according to the requisitions received.
  - ii. In case total requisitioned power cannot be supplied through other units in the same generating station on bar, the requisition from the beneficiaries shall be reduced in the ratio of requisitioned power.
  - iii. In the special case of a generating station where the only running machine is going under RSD, the beneficiaries who have requisitioned power will not get any power from that generating station. In such cases, the beneficiaries may make arrangement from alternative sources.
- 5.10. No maintenance activities on unit under RSD shall be undertaken by the generating station so that the RSD unit is always readily available for revival/synchronization. If a generating station requires maintenance on any machine under RSD, then the same shall be done in due consultation with SLDC. The DC shall be reduced appropriately.

## **6. Methodology for taking generating station or unit(s) thereof under Reserve Shut down (Real Time Schedule Revision)**

- 6.1 MPPMCL can surrender its part or full entitlement during the day of operation in accordance with the relevant provisions of Grid Code.
- 6.2 In case, the schedule of a generating station goes below technical minimum, due to this surrender of power:
  - (i) SLDC may provide technical minimum schedule considering the system conditions in accordance with Clause 8.8(2) of the MP Electricity Grid Code.
  - (ii) In case the system condition does not require, the generating station may take any unit or the generating station, as the case may be, under RSD.

## **7. Methodology for revival of generating station or unit(s) from RSD**

- 7.1 Once a unit is taken out under RSD, the unit can be recalled any time after 8 hours. The RSD period may vary depending upon instruction for revival receipt by the generator from SLDC. In case of system requirements, the generating unit can be revived before 8 hrs as well. The time to start a machine under different conditions such as HOT, WARM and COLD shall be as per the



declaration given by the generating station in the **Format F-1** annexed herewith this procedure.

7.2 MPPMCL as well as the generating station may decide for revival of unit(s) under RSD with commitment for technical minimum schedule with minimum run time of 8 hrs for Coal based generating stations post revival.

7.3 SLDC may also advise the generating stations to revive unit(s) under RSD for better system operation (MPEGC Clause 8.8.(2)). In such cases, SLDC shall ensure technical minimum schedule by increasing schedule of MPPMCL.

7.4 In case the machine is not revived as per the revival time declared by the generating station under different types of start, the machine shall be treated under outage for the duration starting from the likely revival time and the actual revival time. SLDC shall ensure that intimation is sent to the generating station sufficiently in advance keeping in view its start-up time.

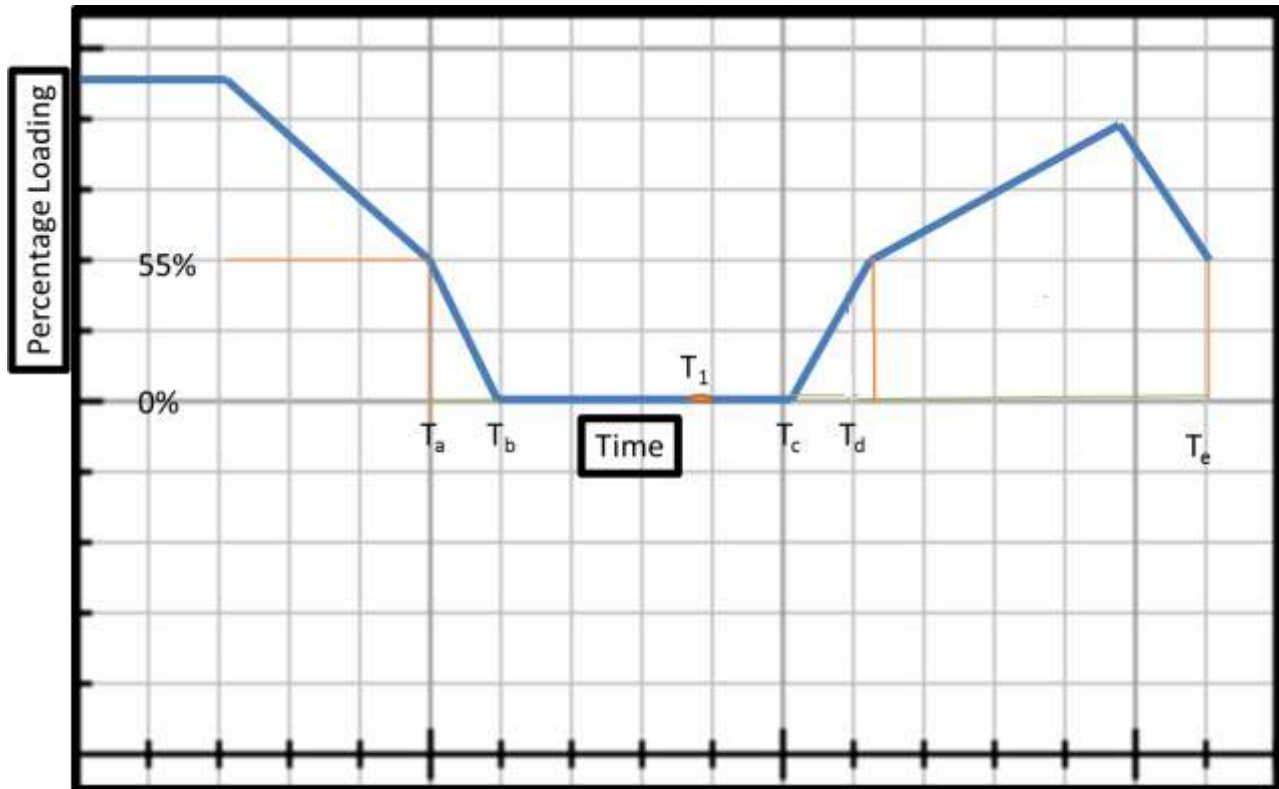
7.5. Illustrative diagram showing minimum run time and a flow chart for taking machines under RSD is given at Annexure-A and Annexure-B respectively of this DOP.

## **8. Review of the Procedure**

The Detailed Operating Procedure shall be reviewed in Operation & Coordination Committee of MP after one year of its approval. Recommendations of the Operation & Coordination Committee, if any, shall be submitted to the Commission for needful.

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## Annexure-A



$T_a$  = Time at Which Generator unit(s) ramps down for Reserve Shut

down.  $T_b$  = Time at which Generator unit(s) reaches Reserve Shut down.

$T_b - T_a$  = Based on Ramp down rates as per F1 Form submitted.

$T_1$  = Time at which Generator should start its activity to synchronize its unit(s) at  $T_c$  to achieve 55% loading for  $T_d$ .

$T_d - T_a$  = Based on the Condition of the unit(s) (Cold, Warm, Hot) and as specified by F1 Form submitted but more than 8 Hours.

$T_c$  = Time at which Generator unit(s) synchronize.

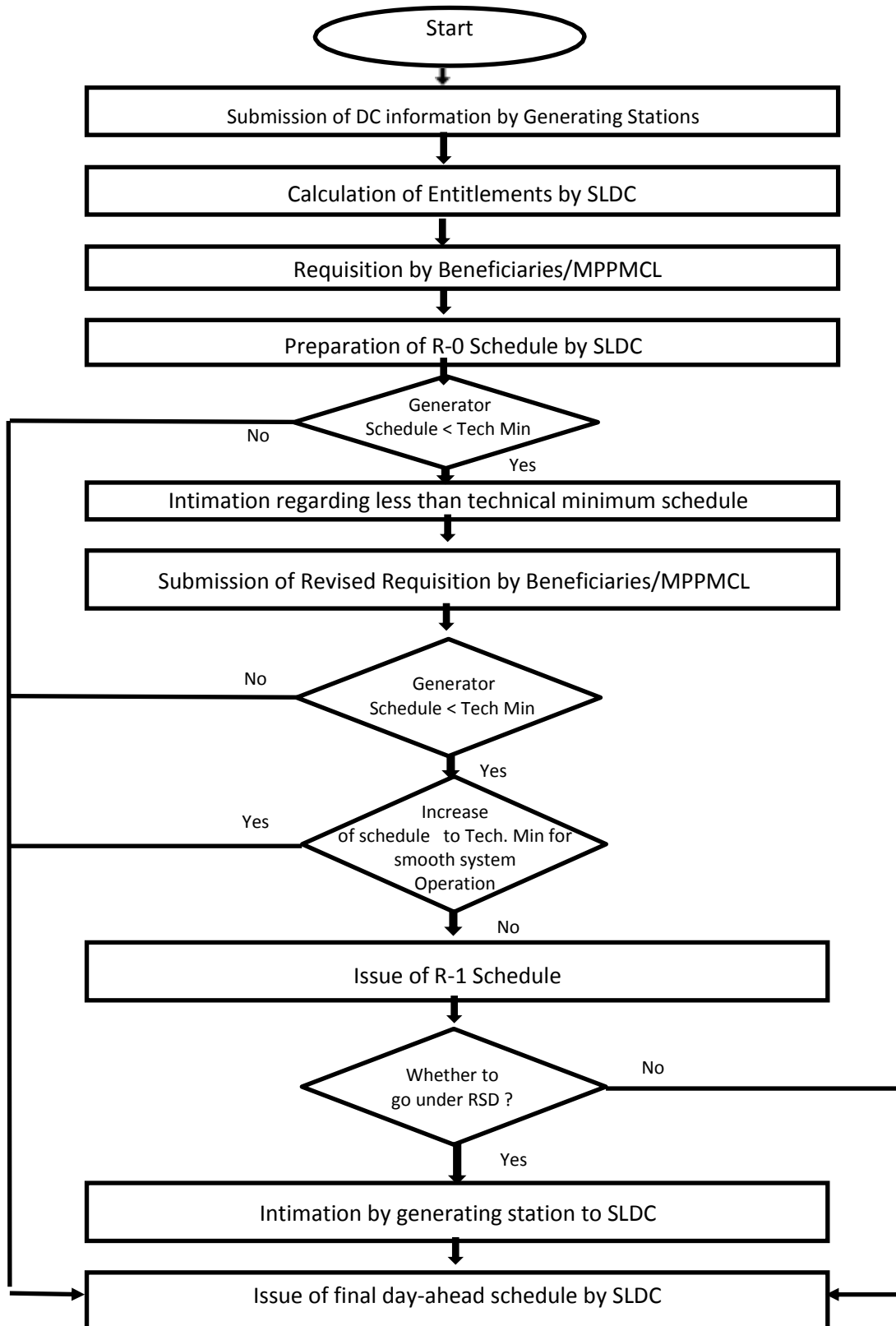
$T_d$  = Time at which Generator unit(s) reaches schedule above 55% after RSD as per the instruction given to the generator by SLDC. The instruction is given before  $T_1$

$T_d - T_c$  = Based on Ramp up rates as per F1 Form submitted.

$T_e$  = Time at which Generator unit(s) can be given schedule below 55%.

$T_e - T_d > 8$  hours.

**Flow Chart for taking machines under Reserve Shut Down**



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

### **1. Introduction:**

MP Electricity Regulatory Commission notified 'The Madhya Pradesh Electricity Grid Code' (Revision -II), 2019 notified on 21.06.2019. As per clause 8.8(3) of the MP Electricity Grid Code, where SSGS is directed by State Load Despatch Centre (SLDC) to operate below Normative plant Availability Factor but at or above Technical Minimum, the SSGS may be compensated depending on average unit loading, duly taking into account the forced outages, planned outages, PLF, generation at Generator terminal, energy sent out, ex-bus, number of start/stop, secondary fuel oil consumption and auxiliary energy consumption, in due consideration of actual and normative operative parameters of station heat rate, on monthly basis duly supported by relevant data verified by SLDC.

SLDC has prepared "The Mechanism for Compensation for Degradation of Heat Rate, Auxiliary Energy Consumption and Secondary fuel oil consumption due to part load operation and multiple start/stop of coal based thermal unit(s) of the State Generating Stations having 100% installed capacity tied up with MP Power Management Co. Ltd. and IPPs having tied up part capacity with MPPMCL/Discom" (hereinafter called "Compensation Mechanism") in consultation with generators and MPPMCL/Discoms at OCC forum.

### **2. Applicability:**

This Compensation Mechanism is applicable to Coal based State Generating Stations, having 100% installed capacity tied up with MP Power Management Co. Ltd. whose tariff is determined or adopted by the MPERC. In case of generating stations other than SSGS, wherein 100% installed capacity is not tied up with MPPMCL through a long term power purchase agreement or whose tariff for only partial/contracted capacity is determined/adopted by the Commission (hereinafter called "designated generating stations"), such generating station/company shall have to appropriately factor in the provisions in the PPAs entered into by it with MPPMCL for sale of power, in order to claim compensations for part load operation and multiple start/stop under RSD.

### **3. Definitions and abbreviations:**

**3.1** In this Compensation Mechanism, unless the context otherwise requires :

- (i) "Average Unit Loading (AUL) of the station" (in %) means loading of the station during the Calculation Period determined as follows:

Average Unit Loading (AUL) in %

$$= \frac{\text{Effective Generation of station (in MW hr)}}{\text{Effective Capacity (in MW hr) X (1- Normative Auxiliary Energy Consumption)}} \times 100$$

- (ii) "Calculation Period" means the period for which compensation calculation shall be carried out. Generally, there shall be twelve calculations during a financial year. The first calculation shall be done for one month (i.e. month of April) at the beginning of the financial year. The second calculation shall be done by considering cumulative of two months (i.e. months of April and May) and so on.
- (iii) "Comp(F)" means reconciled compensation in rupees to be received by a generator during the calculation period based on actual and normative parameters including degraded SHR and AUX based on average unit loading.
- (iv) "Comp(P)" means compensation in rupees computed for the calculation period based on the normative parameters and actual degraded SHR and AUX based on average unit loading.
- (v) "EC(A)" means total energy charges in rupees computed for a designated generating station during the calculation period on actual parameters of SHR and AUX.
- (vi) "EC(N)" means total energy charges in rupees computed for a designated generating station during the calculation period on normative parameters considering degraded SHR and AUX based on average unit loading.
- (vii) "Effective Capacity" in MW hr means maximum possible generation from a station during calculation period and shall be calculated as :  
  
Total Installed Capacity of the designated generating station (in MW hr) minus Installed Capacity (MW) of the Unit(s) of the said station under outage (planned or forced outage) and under reserve shut down during the calculation period X outage time.
- (viii) "ECR(Comp)" means increase in normative Energy Charge Rate in rupees/kWh for the calculation period considering degraded SHR and AUX based on average unit loading.
- (ix) "ECR(DC)" means Energy Charge Rate in Rs/kWh based on degraded SHR and AUX considering average Declared Capacity (DC) as average unit loading during the calculation period.
- (x) "ECR(SE)" means Energy Charge Rate in rupees/kWh based on degraded SHR and AUX considering average unit loading of generating station during the

calculation period.

- (xi) "Effective Generation of the Station" in MWhr means the actual generation ex-bus of the designated station or the Schedule generation excluding the schedule under Reserve Regulation Ancillary Services (RRAS) and bilateral sale/collective sale under open access during the calculation period whichever is higher.
- (xii) "RRAS Regulation" means Central Electricity Regulatory Commission (Ancillary Services Operations) Regulations, 2015.
- (xiii) "Tariff Regulation" means Madhya Pradesh Electricity Regulatory Commission (Terms and Conditions for determination of Generation Tariff) Regulations, as applicable from time to time or any subsequent amendment thereof.
- (xiv) "SHR/GHR" means Station Heat Rate/Gross Station Heat Rate means the heat energy input in kCal required to generate one kWh of electrical energy at generator terminals of a thermal generating station.

**3.2** Terms and abbreviations used in this Compensation Mechanism but not defined herein shall have the meaning as assigned to them in Electricity Act, 2003 or the Grid Code or other Regulations of the Commission as notified from time to time.

#### **4. Mechanism for working out Compensation:**

##### **Compensation Mechanism for Generating Stations having 100% capacity tied-up with MPPMCL/ Discoms-**

##### **4.1 Compensation for degradation of Heat Rate (SHR) and Auxiliary Energy Consumption (AUX)**

- (i) The mechanism is based on relevant provisions of MP Electricity Grid Code and Generation Tariff Regulations of the Commission, as notified from time to time.
- (ii) The Compensation shall be worked out for a month on cumulative basis considering degradation in SHR and AUX based on Average Unit Loading, subject to reconciliation at the end of the year.
- (iii) Energy scheduled under RRAS Regulations shall be taken as +ve for up-regulation and –ve for down regulation, whenever regulation of RRAS comes into force.
- (iv) The Normative Auxiliary Energy Consumption of competitively bid projects shall be considered based on the normative AUX of similar units as per Tariff Regulation of the Commission or the difference between the Installed Capacity and the ex-bus Contracted Capacity as a percentage of Installed

capacity of the generating station, whichever is less.

- (v) Average Unit Loading shall be used for getting increase in SHR and AUX in accordance with the Regulations Provided that no compensation for SHR degradation or increase in AUX shall be payable if the Average Unit Loading for the generating station for the computation period works out to be more than or equal to Normative Annual Plant Availability Factor defined in Generation tariff regulation of MPERC.
- (vi) Based on the values of increased SHR and AUX, Energy Charge Rate (ECR) for Average Unit Loading i.e. ECR(SE) for the station shall be calculated using the formula specified in Tariff Regulations of the Commission. The same is reproduced below:

*For Coal based Units, Energy Charge Rate (ECR) in Rupees per kWh on ex-power plant basis shall be determined to three decimal places in accordance with the following formulae:*

$$ECR = \frac{\{(GHR - SFC \times CVSF) \times LPPF / CVPF + SFC \times LPSFi\} \times 100}{(100 - AUX)}$$

*Where,*

*AUX = Normative auxiliary energy consumption in percentage.*

*CVPF = (a) Weighted Average Gross calorific value of coal as received, in kCal per kg for coal based stations*

*(b) In case of blending of fuel from different sources, the weighted average Gross calorific value of primary fuel shall be arrived in proportion to blending ratio.*

*CVSF = Calorific value of secondary fuel, in kCal per ml.*

*ECR = Energy charge rate, in Rupees per kWh sent out.*

*GHR = Gross station heat rate, in kCal per kWh.*

*LPPF = Weighted average landed price of primary fuel, in Rupees per kg, during the month. (In case of blending of fuel from different sources, the weighted average landed price of primary fuel shall be arrived in proportion to blending ratio)*

*SFC = Normative Specific fuel oil consumption, in ml per kWh.*

*LPSFi = Weighted Average Landed Price of Secondary Fuel in Rs./ml during the month*

Provided that for generating stations, whose tariff has been adopted by Commission under Section 63 of the Act, the ECR(SE) shall be worked out as per the following formula:

(a) Where ECR is quoted without specifying SHR and AUX:

$ECR(SE) = \text{quoted ECR or quoted Variable Charge} \times (1 + \% \text{ degradation in heat rate based on unit loading corresponding to Effective Generation}/100) / (1 - \% \text{ degradation in Aux Consumption based on unit loading corresponding to Scheduled Energy}/100)$

(b) Where ECR is computed based on normative net Heat Rate and PPA already provides for energy charge payment corresponding to degradation in net station heat rate:

$ECR(SE) = \text{ECR worked out based on net station heat rate (without \% degradation in heat rate based on unit loading) corresponding to Effective generation} / (1 - \% \text{ degradation in Aux Consumption based on unit loading corresponding to Effective generation}/100)$

Note: Model PPA notified by GoI provides for energy charge payment corresponding to degradation in net station heat rate and hence as such no separate compensation is allowed under this procedure.

(c) Where ECR is computed based on normative net Heat Rate and PPA does not provide for energy charge payment corresponding to degradation in net station heat rate:

$ECR(SE) = \text{ECR worked out based on net station heat rate} \times (1 + \% \text{ degradation in heat rate based on unit loading corresponding to Effective generation} /100) / (1 - \% \text{ degradation in Aux Consumption based on unit loading corresponding to Effective generation} /100)$

(vii) ECR corresponding to average Declared Capacity (DC) i.e. ECR(DC) for the calculation period shall also be calculated using the formula specified in Tariff Regulations of the Commission and used as reference for calculating compensation. This is because, the effect of less declaration (with respect to normative ex-bus Installed capacity), if any, on the SHR and AUX should be to the account of SSGS:

Provided that for generating stations whose tariff has been adopted by The Commission under Section 63 of the Act, the ECR(DC) shall be worked out as per following formula:

(a) Where ECR is quoted without specifying Heat Rate or Aux Consumption:

$ECR(DC) = \text{ECR quoted or variable Charge quoted} \times (1 + \% \text{ degradation in heat rate based on unit loading corresponding to DC}/100) / (1 - \% \text{ degradation in Aux Consumption based on unit loading corresponding to DC} /100)$

(b) Where ECR is computed based on net Heat Rate and PPA already



provides for energy charge payment corresponding to degradation in net station heat rate:

ECR (DC)= ECR worked out based on net station heat rate (without % degradation in heat rate based on unit loading) corresponding to DC / (1- % degradation in Aux Consumption based on unit loading corresponding to DC /100)

Note: Model PPA already provides for energy charge payment corresponding to degradation in net station heat rate as such no separate compensation under this procedure.

(c)Where ECR is computed based on normative net Heat Rate and PPA does not provide for energy charge payment corresponding to degradation in net station heat rate:

ECR(DC)= ECR worked out based on net station heat rate x (1+ % degradation in heat rate based on unit loading corresponding to DC /100) / (1- % degradation in Aux Consumption based on unit loading corresponding to DC/100)

- (viii) The compensation to be paid to SSGS for the calculation period ending n<sup>th</sup> month shall be difference in the ECR(SE) and ECR(DC) for that period. ECR (Comp) for the calculation period ending n<sup>th</sup> month shall be calculated as:

$$ECR_n(\text{Comp}) = ECR_n(\text{SE}) - ECR_n(\text{DC})$$

Provided that the ECR(Comp) shall be worked out separately for each PPA of the station but annual reconciliation shall be on overall considerations of PPAs after due prudence by SLDC.

- (ix) The compensation  $Comp_n(P)$  payable to SSGS for the calculation period ending n<sup>th</sup> month shall be calculated as below:

$$Comp_n(P) = \frac{\text{(Total Generation Schedule (Energy) to its original beneficiaries/MPPMCL excluding RRAS and bilateral/Collective sale under Open Access)*}}{ECR_n(\text{Comp})}$$

- (x)  $ECR_n(A)$  for the calculation period shall be calculated using actual values of SHR and AUX Consumption furnished by SSGS at the end of the calculation period and normative secondary fuel oil consumption as per MPERC Tariff Regulation for which the requisite information shall be submitted by the generating station to the SLDC.

Similarly,  $ECR_n(N)$  shall be calculated using normative values of SHR and Aux Consumption and normative secondary fuel oil consumption as per

MPERC Tariff Regulation furnished by SSGS.

Provided that in case of generating stations whose tariff has been adopted by The Commission under Section 63 of the Act,  $ECR_n(N)$  shall be calculated using Normative net SHR or ECR quoted for the relevant month as the case may be.

(xi) Now, following values shall be calculated:

(a) Total Energy Charges payable to SSGS based on actual parameters

$EC_n(A) = ECR_n(A) \times (\text{Total Generation Schedule (Energy) to MPPMCL during the calculation period ending } n^{\text{th}} \text{ month})$

(b) Total Energy Charges payable to SSGS based on Normative parameters

$EC_n(N) = ECR_n(N) \times (\text{Total Generation Schedule (Energy) to MPPMCL during the calculation period ending } n^{\text{th}} \text{ month})$

(xii) Compensation payable for the calculation period ending  $n^{\text{th}}$  month to SSGS would be decided based on following criteria:

(a) If  $EC_n(A)$  is less than or equal to  $EC_n(N)$ :

No compensation shall be payable to SSGS

(b) If  $EC_n(A)$  is more than  $EC_n(N)$ :

(b1) If  $Comp_n(P)$  is less than or equal to  $EC_n(A)$  minus  $EC_n(N)$  then final compensation amount payable to SSGS for the calculation period ending  $n^{\text{th}}$  month:

$$Comp_n(F) = Comp_n(P)$$

(b2) If  $Comp_n(P)$  is more than  $EC_n(A)$  minus  $EC_n(N)$ , then final compensation amount payable to SSGS for the calculation period ending  $n^{\text{th}}$  month

$$Comp_n(F) = EC_n(A) - EC_n(N)$$

(xiii) Final Compensation payable by MPPMCL for the calculation period ending  $n^{\text{th}}$  month

No compensation shall be payable by MPPMCL if it has requisitioned at least power up-to Normative PAF of its entitlement during the calculation period.

In case of more than one beneficiary, the compensation shall be shared in the ratio of un-requisitioned energy below Normative PAF of their entitlement i.e. compensation payable by  $k^{\text{th}}$  beneficiary for the calculation period ending  $n^{\text{th}}$  month.

$$FCB_{kn} = Comp_n(F) \times \frac{UE_{kn}}{\sum_k UE_{kn}}$$

Where  $UE_{kn}$  is un-requisitioned energy of  $K^{th}$  beneficiary below Normative PAF of its entitlement during the calculation period ending  $n^{th}$  month.

- (xiv) However, adjustments shall be carried out for compensation already paid for calculation period ending  $(n-1)^{th}$  month

Net compensation payable/receivable by  $k^{th}$  beneficiary for the  $n^{th}$  month

$$NCB_{kn} = FCB_{kn} - FCB_{k(n-1)}$$

If  $NCB_{kn}$  is negative, this is amount payable by SSGS to the MPPMCL and vice versa. This way reconciliation would automatically take place at the end of the Financial Year.

#### 4.2 **Calculation for Secondary Fuel Oil consumption:**

- (i) No compensation for degradation of Secondary Fuel oil consumption is payable for the year if total number of start-ups (against RSD) is equal to or less than  $7 \times$  no. of units in the generating station or the Actual Secondary Fuel Oil consumption is less than Normative Fuel Oil Consumption.
- (ii) Compensation (in terms of KL of Secondary Oil) shall be payable to SSGS for the year due to degradation of Secondary Fuel Oil Consumption shall be calculated by multiplying no. of start-ups exceeding 7 per unit and solely attributable to reserve shut-downs with the appropriate value of additional secondary oil consumption specified in MP Electricity Grid Code.
- (iii) Compensation payable to SSGS shall be restricted such that Oil Consumption based on Norms plus Compensation calculated in step (ii) above does not exceed actual Secondary Fuel oil consumption for the year.
- (iv) Compensation in terms of Rupees shall be calculated by multiplying compensation in terms of KL as calculated in step (ii) and average landed price of Secondary fuel oil for the year.
- (v) Each start-up due to reserve shutdown shall be attributed to the MPPMCL, who had requisitioned below 55% of their entitlement.
- (vi) Compensation (in terms of Rupees) shall be shared amongst the beneficiaries in the following manner:-

Compensation payable by beneficiary:

$$= (N_i \times \frac{A_i}{\sum(N_i \times A_i)}) \times \text{Compensation payable to Generators}$$

Where

$N_i$  = Number of start-ups attributable to the beneficiary i.

$A_i$  = Weightage Average Percentage share of the beneficiary in the generating station.

(vii) The SSGS is to take all due care to keep a check on secondary oil use during part operations and during start-ups to the extent possible. The SLDC shall review the secondary oil consumptions of plants on quarterly basis along with SSGS to find out high consuming plants and reasons for high consumption and for suggesting measures to mitigate excess use of secondary oil to the extent possible.

**4.3** In case generating station runs below technical minimum schedule it shall be entitled for compensation corresponding to technical minimum schedule.

## **5. Compensation Mechanism for IPPs having part capacity tied-up with MPPMCL/ Discoms-**

**5.1** The Independent Power Producers generating station having 100% capacity tied up with MPPMCL / Discoms, the compensation mechanism for Degradation of Heat Rate, Aux Consumption and Secondary Fuel Oil Consumption, due to Part Load Operation and Multiple Start/ Stop of Units, shall be same as methodology defined earlier for SSGS having 100% installed capacity tied up with MPPMCL/ Discoms.

**5.2** Some of the IPPs having part capacity tied up with MPPMCL/Discoms are Inter State entities and compensation of Inter State IPPs shall be computed by WRPC as per provisions factored in PPA between MPPMCL / Discoms and IPP. The draft Detail Operating Procedure prepared by SLDC was discussed as an agenda item in 39th WRPC meeting. Based on the discussions and recommendations of the Committee, this procedure has been finalized.

**5.3** The Independent Power Producers generating station having part capacity tied up with MPPMCL/Discoms, the compensation mechanism for Degradation of Heat Rate, Aux Consumption and Secondary Fuel Oil Consumption, due to Part Load Operation and Multiple Start/ Stop of Units, shall be computed with same methodology as defined for SSGS having 100% installed capacity tied up with MPPMCL/Discoms, subject to following :-

(i) In case of IPPs, wherein the 100% installed capacity is not tied up with MPPMCL/Discoms of MP through a long term power purchase agreement or whose tariff for only partial/ contracted capacity is determined by the Commission, such generating station/company shall have to appropriately factor

in the above provisions in the PPAs entered into by it with M.P. Power Management Company / Discoms for sale of power, in order to claim compensations for degraded values of SHR and AUX and for RSD over and above 7 start-ups solely attributable to reserve shut-downs caused due to less requisition by MPPMCL

- (ii) Power tied up by IPP(s) with beneficiary(ies) through PPA under Medium Term Open Access shall also be considered as a beneficiary for computing compensation for part load operation.
- (iii) The compensation mechanism for IPPs having part capacity tied up with MPPMCL/Discoms shall come into force from the date of approval of amendment in PPA by the Commission wherein appropriate provision for compensation for degraded station heat rate (SHR), auxiliary energy consumption (AUX) and Reserve Shutdown (RSD) have been made or the date of approval of DOP and mechanism for compensation by Commission, whichever is later.
- (iv) Energy Charge Rate (ECR) of IPPs for a particular month shall be computed with the formula given in the applicable Regulation of the Commission.
- (v) In order to compute AUL for IPPs having part contracted capacity tied up with MPPMCL/ Discoms under Long Term Agreements, merchant power shall be considered as pseudo beneficiary and power tied up with other beneficiary(ies) through long term agreements shall be treated at par with that of MPPMCL. For computation of AUL, pseudo beneficiary shall be treated as Long Term Beneficiary.
- (vi) All the beneficiaries including pseudo beneficiary of IPP shall be responsible for maintaining technical minimum generation of the generating unit(s). All the beneficiaries are required to give technical minimum requisition of their share in the IPP's unit(s), in case unit(s) is required to be kept on bar for smooth operation of the Grid. If the unit(s) of IPP is able to operate on technical minimum with the requisition of other beneficiary(ies), then MPPMCL is not bound to give requisition for maintaining technical minimum operation of the unit(s). In this case, MPPMCL shall pay compensation for degraded SHR and Auxiliary Energy Consumption for operation of units below normative PAF as per formula mentioned in compensation mechanism for SSGS.
- (vii) If MPPMCL requisitions technical minimum of its share, other Long Term Beneficiary(ies) also requisitions technical minimum of its share but pseudo beneficiary does not sell at least technical minimum of power available with IPP and if IPP stops the unit due to less scheduling, the unit(s) shall not be treated

under RSD.

- (viii) If IPP maintains Technical Minimum Generation on unit(s) with the merchant capacity available with the generator plus technical minimum schedule from other beneficiary(ies), MPPMCL do not have any obligation for Technical Minimum Operation of the unit(s). However, MPPMCL shall pay compensation of degraded SHR and Auxiliary Energy Consumption for the operation between normative PAF and technical minimum, applicable to its contracted capacity only.
- (ix) SLDC shall compute the compensation of IPP for degraded SHR and Auxiliary Energy Consumption for operating unit below normative PAF in accordance with Clause-8.8.3 of MPEGC (Revision-II)-2019.
- (x) Intra-State IPP shall calculate the compensation as specified in these procedures and bill the same to MPPMCL along with its monthly bill which shall be subject to adjustment based on compensation statement issued by SLDC subsequently.
- (xi) IPPs shall submit the requisite data along with compensation calculation to SLDC as prescribed in Format F-2 for a month by 15<sup>th</sup> day of the following month.
- (xii) Inter-State IPP shall calculate the compensation as specified in these procedures and bill the same to MPPMCL along with its monthly bill which shall be subject to adjustment based on compensation statement issued by WRPC subsequently.
- (xiii) The computation of Compensation (in terms of KL of Secondary Oil) payable to IPPs for the year due to degradation of Secondary Fuel Oil Consumption on Reserve shutdown, shall be calculated by multiplying no. of start-ups exceeding 7 per unit and solely attributable to reserve shut-downs caused due to less requisition by MPPMCL shall be as per clause 8.8(iii) of MP Electricity Grid Code. In case of generators having installed capacity below 200MW, the oil consumption shall be considered as that of 200MW capacity generators.
- (xiv) MPPMCL shall be responsible to pay the compensation for secondary oil fuel consumption, only for RSD attributed due less requisition by MPPMCL.

## **6. Calculation of Compensation, Billing and Submission of Data by the Generator:**

- (i) Generating station shall calculate the compensation as specified in these procedures and bill the same to MPPMCL along with its monthly bill which shall be subject to adjustment based on compensation statement issued by SLDC subsequently.
- (ii) Generating station shall submit the requisite data along with compensation calculation to SLDC as prescribed in Format F-2 for a month by 15<sup>th</sup> day of the following month. The data to be submitted is for the month and reconciled up to the month.

(iii) Inter-State IPP shall calculate the compensation as specified in these procedures and bill the same to MPPMCL along with its monthly bill which shall be subject to adjustment based on compensation statement issued by WRPC subsequently.

**7. Issuance of compensation statement:**

(i) SLDC will issue the compensation statement for the month on 21<sup>st</sup> of next month.

(ii) In case any anomaly or discrepancy is noticed by any Utility, the same may be brought to the notice of SLDC within 15 days of issuance of Compensation Statement.

**8.** A sample computation of compensation for a typical IPP of 200 MW capacity having part load capacity tied up with beneficiaries A, B, C and D, where Beneficiary D is pseudo beneficiary i.e. merchant power available with the IPP, is given in **Annexure-C**

**9. Review of the Procedure:**

The Procedure shall be reviewed in Operation & Coordination Committee of MP after one year of its approval. Recommendations of the Operation & Coordination Committee, if any, shall be submitted to the Commission for needful.

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**Format F1: Generator Details**

**From:** (Name of Generating Station) / (Name of Owner Organization)

**To:** SLDC, MPPTCL, Jabalpur

**Validity of the Information**      **From:** 16/mm/yyyy      **To:**15/mm/yyyy

**Date:**    dd/mm/yyyy

<b>S.No.</b>	<b>Title/Parameters</b>	<b>Values/Data</b>
a)	Number of Generating Units    (e.g. 1 x 210 MW + 2 x 500 MW)	
b)	Total Installed Capacity (MW)	
c)	Capacity(ies) tied up with other beneficiary(ies) (please add more rows if required)	
d)	Maximum possible Ex-bus injection (MW) (including overload if any)	
e)	Technical Minimum (MW)	
f)	Type of Fuel	
g)	Fixed Cost (paise / kWh upto one decimal place)	
h)	Variable Cost (paise / kWh upto one decimal place)	
i)	Ramp-Up Rate (MW/Min) for each unit	
j)	Ramp-Down Rate (MW/Min) for each unit	
k)	Start-up Time of each unit from (in hh:mm) i)      Cold Start ii)     Warm Start and iii)    Hot start	
l)	Any other information	

Signature of Authorized Signatory (with Stamp) Name:

Designation:



**Format-F2**

**Information to be submitted by SSGS to the SLDC for a month by 15<sup>th</sup> of next month**

Sr. No (a)	(b)	Unit No 1 (c)	Unit No 2 (d)	Unit No 3 (e)	Unit No 4 (f)	Total (g)
1	Installed capacity/MCR					
2	Planned outage/Tripped (Hrs)					
3	On bar hrs					
4	Normative SHR					
5	Normative SFC					
6	CVSF					
7	LPPF					
8	LPSFi					
9	Normative Aux. Cons					
10	Actual GHR/SHR					
11	Actual SFC					
12	Actual Aux. Cons					
13	RSD start /stop in the month					
14	RSD start/stop cumulative					
15	Total no. of Start /stop during year					
16	CVPF					

Signature of Authorized Signatory (with Stamp) Name:

Designation:

**SAMPLE CALCULATION:**

<b>Compensation for Degradation of Heat Rate and Aux Consumption due to Part Load Operation Units</b>					
Plant Details	No of Units	Unit Size MCR	Plant Capacity MW		
	1	200	200		
<b>Beneficiary Details</b>					
<b>Name of Beneficiary</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>Total</b>
Contracted Capacity in %	30	20	25	25	100
in MW	60	40	50	50	200
TMM in MW	33	22	27.5	27.5	110
Monthly Energy to meet 100% of their entitlement (MWhr)	43200	28800	36000	36000	144000
Monthly Energy to meet 85% of their entitlement (MWhr)	36720	24480	30600	30600	122400
Requisitioned Energy in a Month (MWhr)	25000	26000	28000	21000	100000
Un-requisitioned Energy below 85% of their entitlement (MWhr)	11720	-1520	2600	9600	
Monthly Effective Generation in MWhr	100000				
Monthly Effective Capacity in MWhr	144000				
Average Unit Loading	69%				
Compensation Amount Say Rs.	100000				
Distribution Among Beneficiary Rs.	48997	0	10870	40134	
<b>Compensation for Secondary Fuel Oil Consumption, due to Multiple Start/Stop of Units</b>					
TOTAL NUMBER of RSD in one year	20				
NUMBER of RSD Qualified for Compensation in one year	13				
Total Compensation for Secondary Fuel Oil for RSD Say Rs.	50000				
No of RSD attributed to beneficiary	4	0	3	6	
Secondary Fuel Oil Compensation Payable by Beneficiary Rs.	17391	0	10870	21739	