

**CENTRAL ELECTRICITY REGULATORY COMMISSION  
NEW DELHI**

**No. L-1/219/2017-CERC**

**Coram:**

**Shri Gireesh B. Pradhan, Chairperson  
Shri A.K. Singhal, Member  
Shri A.S. Bakshi, Member  
Dr. M.K. Iyer, Member**

**Date of Order : 5<sup>th</sup> May 2017**

**In the matter of**

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

**ORDER**

The Central Electricity Regulatory Commission notified the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 (Grid Code). The Grid Code was amended vide notifications dated 6.3.2012, 6.1.2014, 10.8.2015 and 6.4.2016. Regulation 6.3B.6 and 6.3B.7 introduced vide amendment dated 6.4.2016 entrusted certain responsibilities to NLDC and RPCs as under:-

"6. NLDC shall prepare a Detailed Operating Procedure in consultation with the generators and beneficiaries at RPC forums within 2 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 upto the technical minimum in specific Grid conditions such as low system demand, Regulation of Power Supply and incidence of high renewables etc., based on merit order stacking

7. The RPCs shall work out a mechanism for compensation for station heat rate and auxiliary energy consumption for low unit loading on monthly basis in terms of energy charges and compensation for secondary fuel oil consumption over and above the norm of 0.5 ml/kWh for additional start-ups in excess of 7 start-ups, in consultation with generators and beneficiaries at RPC forum and its sharing by the beneficiaries."



2. POSOCO has submitted the “Detailed Operating Procedure for taking units under Reserve Shut Down” (Detailed Operating Procedure) vide its letter dated 12.8.2016 and 4.11.2016. RPCs have also finalised the “Mechanism for Compensation for Degradation of Heat Rate, Aux Energy Compensation and Secondary Fuel oil Consumption, due to Part Load Operation and Multiple Start/Stop of Unit” (Compensation Mechanism) after discussions with stakeholders.

3. The Detailed Operating Procedure submitted by POSOCO and the Compensation Mechanism submitted by RPCs have been examined. A meeting with all the RPCs, NLDC and CEA was held in the Commission on 27.10.2016 to further discuss and finalise the above said Detailed Operating Procedure and Compensation Mechanism. The Detailed Operating Procedure and the Compensation Mechanism have been finalized in consultation with NLDC, RLDCs, CEA and RPCs.

4. The Commission through this order approves the Detailed Operating Procedure and the Compensation Mechanism in terms of sub-clause 6 of the Regulation 6.3B of Grid Code. 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.

5. The RPCs are directed to provide feedback, after consultation with the stakeholders, on the operation of the Compensation Mechanism within six months from the date of issue of this order for assessment of the efficacy of the Compensation Mechanism. It is clarified that review of the Compensation Mechanism will be undertaken only if it is considered necessary based on operational experience.



6. There is already a procedure for RSD for a station in WRPC in vogue based on principle of removal of costliest stations and also provide for adjustment of allocation of power to other generating stations in the consent of beneficiaries. NLDC is of the view that same needs deliberation. NLDC is advised to deliberate the WRPC procedure in the other RPC's and submit its feasibility in 6 months from the date of issue of the procedure.

7. Based on the feedback about the operation of the DOP on RSD and Compensation Mechanism shall be reviewed by the Commission after six months.

8. The Detailed Operating Procedure and the Compensation Mechanism specified in this order shall come into force from 15.5.2017.

<b>sd/-</b>	<b>sd/-</b>	<b>sd/-</b>	<b>sd/-</b>
<b>(Dr. M.K. Iyer)</b> <b>Member</b>	<b>(A.S. Bakshi)</b> <b>Member</b>	<b>(A.K. Singhal)</b> <b>Member</b>	<b>(Gireesh B. Pradhan)</b> <b>Chairperson</b>



**Detailed Operating Procedure for Backing Down of Coal/Lignite/Gas unit(s) of the Central Generating Stations, Inter-State Generating Stations and other Generating Stations and for taking such units under Reserve Shut Down on scheduling below Technical Minimum Schedule**

**1. General**

1.1 Central Electricity Regulatory Commission notified the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 (referred to as “Grid Code”) on 28.4.2010 and came into force from 3.5.2010. The Grid Code was subsequently amended through first, second and third amendments which came into force from 2.4.2012, 17.2.2014 and 1.11.2015. The Commission further amended the Grid Code vide Central Electricity Regulatory Commission (Indian Electricity Grid Code)(Fourth Amendment) Regulations, 2016, which was notified on 6.4.2016 (hereinafter referred to as “Amendment Regulations”). The Amendment Regulations provide to the Central Generating Stations, Inter-State Generating Stations and other Generating Stations which are Regional Entities an option to go for Reserve Shut Down (RSD) when the scheduled generation falls below Technical Minimum Schedule (TMS). As per Regulation 6.3B.6 of the Amendment Regulations, National Load Despatch Centre (NLDC) shall prepare a Detailed Operating Procedure in consultation with the generators and beneficiaries.

1.2 NLDC has submitted a draft on The “Detailed Operating Procedure for Backing Down of Coal/Lignite/Gas unit(s) of the Central Generating Stations, Inter-State Generating Stations and other Generating Stations and for taking such units under Reserve Shut Down on scheduling below Technical Minimum Schedule” (hereinafter “Detailed Operating Procedure” or “DOP”). Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010 (CEA Regulations) provide for regular load cycling and two shift operation by thermal power plants. Further, these power plants are also required to be designed for a minimum of 4000 hot starts, 1000 warm starts and 150 cold starts. After due consideration of the draft DOP in the light of the comments received from the stakeholders and the provisions of the CEA Regulations, the DOP has been approved as per the provisions delineated hereinafter.

1.3 The DOP shall come into force with effect from the date notified by the Commission in the Official Gazette.

**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 RLDCs, SLDCs, CGS and ISGS whose tariff is either determined or adopted by the Central Commission and the generating stations which are regional entities but whose tariff is neither determined nor adopted by the Commission. For those generating stations whose tariff is determined or adopted by the Commission but are scheduled by SLDCs, similar mechanism of taking such machines under RSD shall be adopted by SLDCs. Regional entities whose tariff is neither determined nor adopted by the Central Commission shall also be subject to this procedure.

### 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 or water, 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”** (OnDC) 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 water, 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. In case of a combined cycle



module of a gas/liquid fuel based stations, the installed capacity of steam turbine shall be in proportion to the on bar capacity of Gas turbines of the module.

- (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).

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 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)**

- 5.1. The generating station shall submit the following information at the time of declaration of DC 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. RLDCs shall compile the above information along with the entitlement for each State and advise the same to all beneficiaries by 0800 hours as per Grid Code and amendments thereafter. Entitlements shall be calculated based on the DC.
- 5.3. The beneficiaries shall furnish their original requisition for the next day (D-day) to their respective RLDC by 1500 hours of the current day (D-1) based on the



entitlements given by the concerned RLDC in accordance with the Grid Code, as amended from time to time.

- 5.4. Ex-Power Plant (Ex-PP) dispatch schedule of a generating station for each time block shall be computed by the respective RLDC by taking algebraic sum of requisitions of all beneficiaries of that generating station by 1800 hours and same shall be uploaded on website as revision R0 for next day (D) by 1900 hours of current day (D-1). The Ex-PP schedule shall be restricted to On Bar DC.
- 5.5. If the net EX-PP injection schedule for a generating station is less than technical minimum, the beneficiaries shall be required to review their requisition(s) and submit a revised requisition(s), by 2000 hours of current day (D-1) to the concerned RLDC.
- 5.6. Based on the revised requisitions received up to 2000 hours of current day (D-1), RLDC shall prepare revised injection schedule for the concerned generating station. If the scheduled injection is still less than technical minimum, RLDC shall review the anticipated demand pattern based on the demand forecast and grid conditions to decide on the requirement of providing technical minimum schedule to the generating station.
- 5.7. RLDC shall suo-moto revise the schedule of any generating station as per clauses 6.5.14 and 6.5.20 of the 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 regional or all India basis
  - iv. Network Congestion
  - v. Any other event which in the opinion of RLDC/NLDC shall affect the grid security.

While doing so, it is possible that the requisition of some beneficiaries may go up to ensure technical minimum. In this case, SLDCs may surrender power from some other inter-State generating station(s) or intra-State generating station(s) based on merit order. The concerned RLDC shall issue R-1 schedule accordingly and this shall be intimated to the concerned generating station, through the scheduling process.

- 5.8. If the grid conditions do not demand for providing technical minimum to a generating station, the concerned RLDC shall issue R-1 schedule based on the requisitions received. Under such situation, the generating station shall have the option to go for RSD with intimation to RLDC latest by 2100 hrs.



5.9. Before taking unit(s) under RSD, the generating station shall revise the On Bar DC (with due consideration to ramp up/down capability), Off Bar DC, DC and Ramp UP/RAMP Down rate. The generator shall ensure that the Off Bar DC is not more than the MCR less Normative Auxiliary Consumption of the machines under RSD. The beneficiaries shall continue to bear the capacity charge corresponding to Total DC.

5.10. 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.

5.11. 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 RLDC. The DC shall be reduced appropriately.

5.12. Regulation of Power Supply: When injection schedule of a CGS/ISGS falls below technical minimum due to imposition of regulation of power supply by the generating company or transmission licensee under the Central Electricity Regulatory Commission (Regulation of Power Supply) Regulations, 2010 and/or as per directions under the Commission order dated 2.9.2015 in Petition No. 142/MP/2012, the generator may endeavour to sell the surplus power through STOA or Power Exchange(s) before opting for RSD.

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

- 6.1 A beneficiary 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:



- 6.2.1 RLDC may provide technical minimum schedule considering the system conditions in accordance with Regulations 6.5.14 and 6.5.20 of the Grid Code.
- 6.2.2 In case the system condition does not require, RLDC shall direct the generating station to take any unit or the generating station under RSD. In such a scenario, RLDC shall display the station likely to go under RSD on its website. In case, the schedule is still less than the technical minimum and generating station decides to take a unit(s) under RSD, it shall inform the same to concerned RLDC.
- 6.2.3 In order to meet peak load and to maintain reserves, the generating station should endeavour to plan as far as possible the RSD in such a manner that maximum number of units are kept on bar keeping in view economy and efficiency of the units of the generating station.

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

- 7.1 Once a unit is taken out under RSD, the generating station shall notify the period for which the unit will remain under RSD and the unit can be recalled anytime after 8 hours. 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 under the Detailed Procedure for Ancillary Services Operations (Format AS-1 and AS-3 of the said Procedure).
- 7.2 One or more beneficiaries of the generating station 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 and 3 hrs for Gas based generating stations post revival. In such situations, the generating station shall revise the On Bar and Off Bar DC (with due consideration to ramp up/down capability).
- 7.3 RLDC may also advise the generating stations to revive unit(s) under RSD for better system operation (IEGC 6.5.20). In such cases, RLDC shall ensure technical minimum schedule by increasing schedule of all the beneficiaries in the ratio of under-requisition.
- 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. RLDC shall ensure that intimation is sent to the generating station sufficiently in advance keeping in view its start-up time.

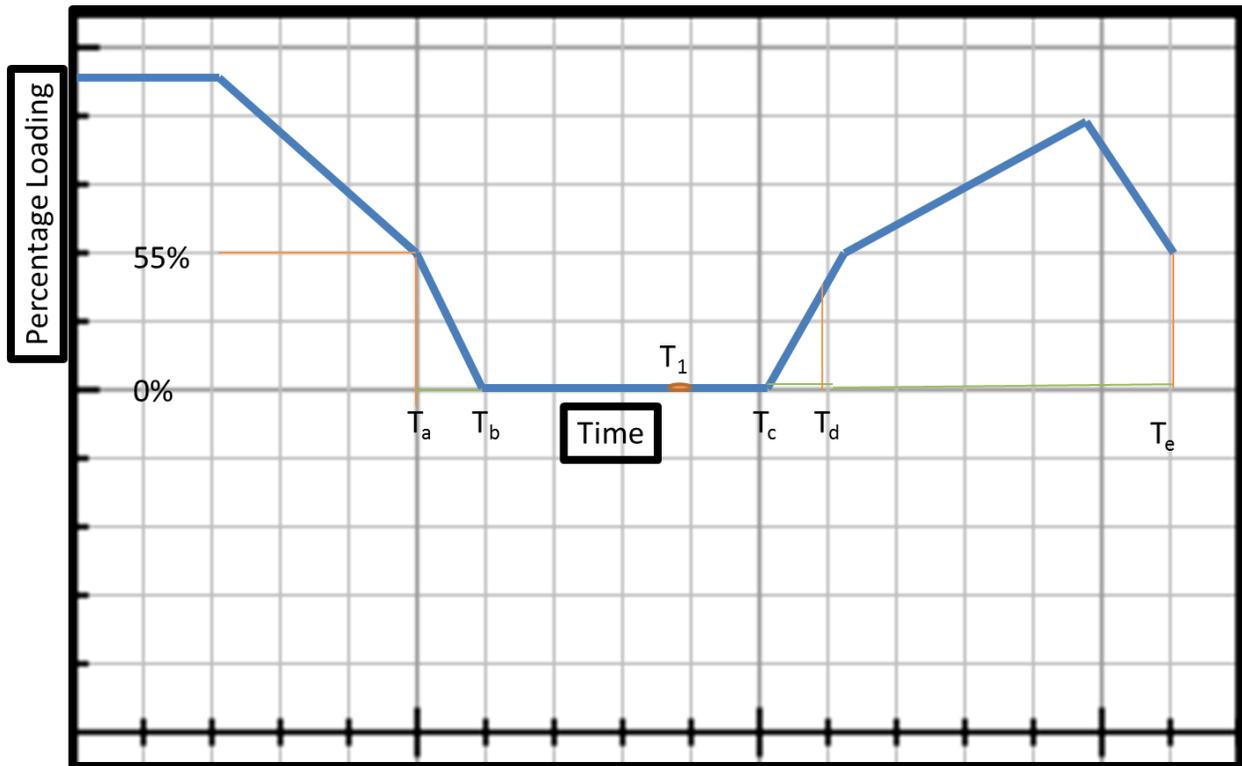


7.5. Illustrative diagram showing minimum run time and a flow chart for taking machines under RSD is given at Annexure-I and Annexure-II respectively of this DOP.

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

The Procedure shall be reviewed after six months of its notification based on feedback received from NLDC and RLDCs.





$T_a$  = 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 AS1 Form submitted under RRAS.

$T_1$  = 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 AS1 Form submitted under RRAS but less 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 RLDC. The instruction is given before  $T_1$

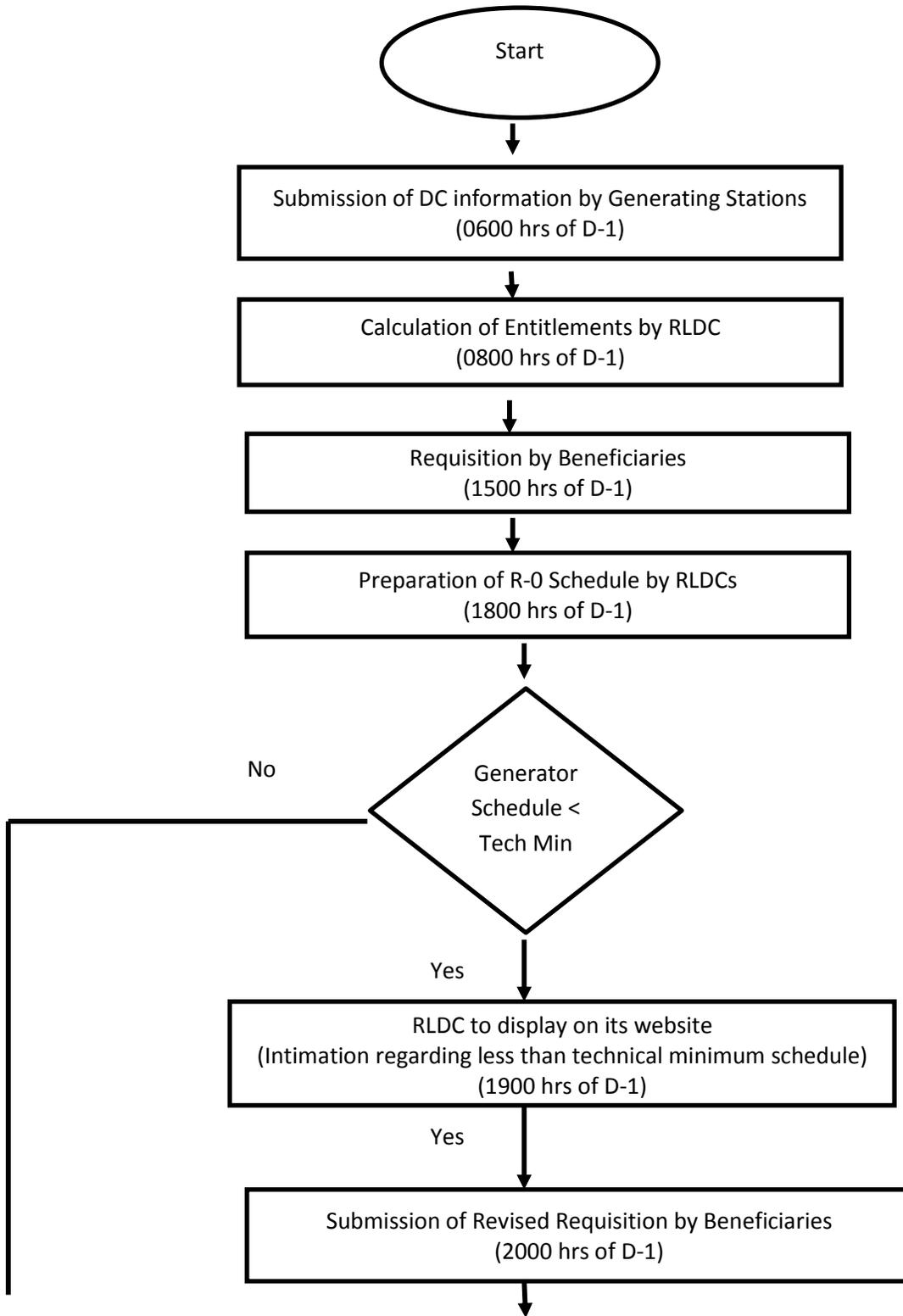
$T_d - T_c$  = Based on Ramp up rates as per AS1 Form submitted under RRAS.

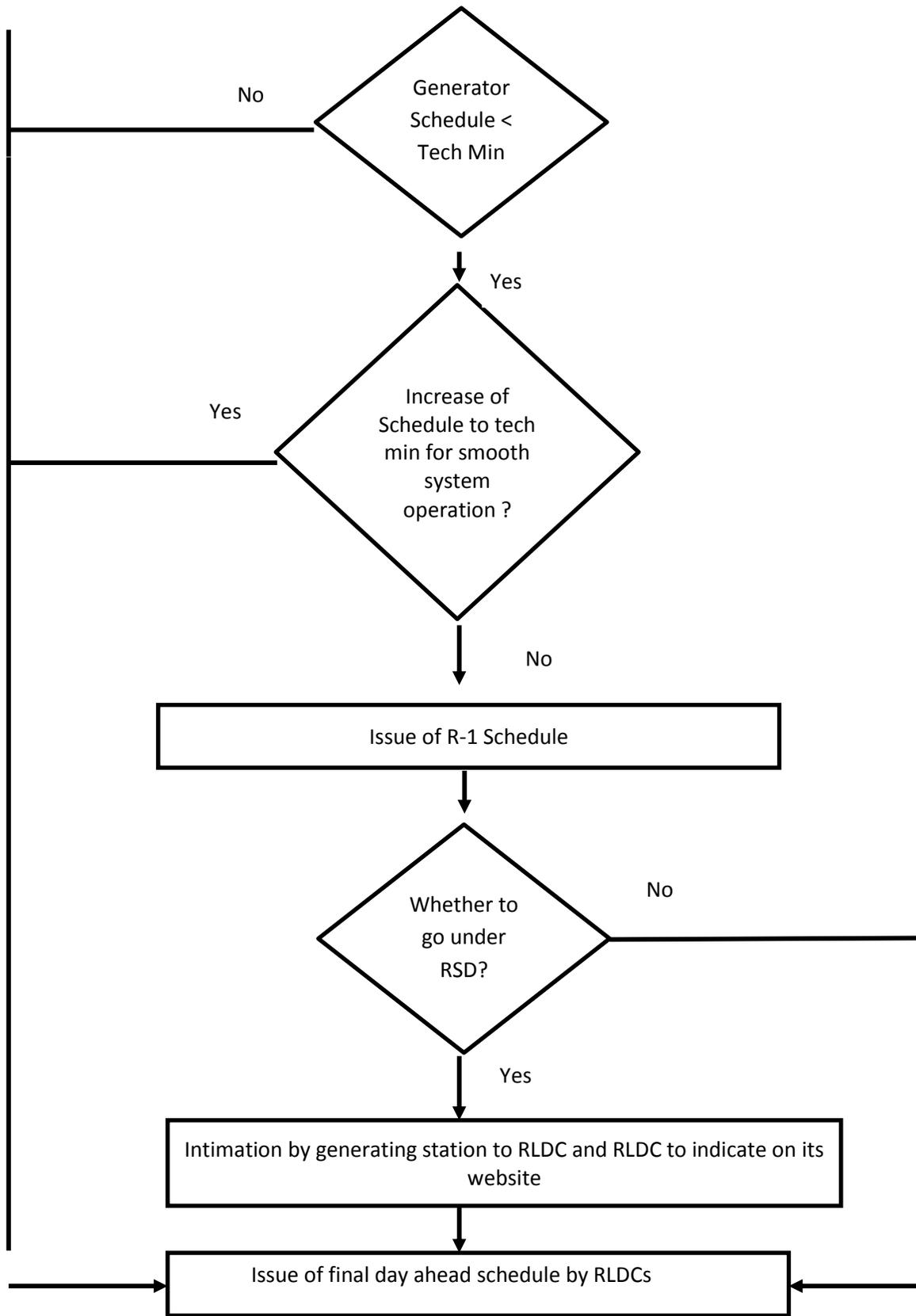
$T_e$  = Time at which Generator unit(s) can be given schedule below 55%.

$T_e - T_d > 8$  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 Units**

#### **1. Introduction**

Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Fourth Amendment) Regulations, 2016, (hereinafter "Amendment Regulations") was notified on 6<sup>th</sup> April 2016. The Amendment Regulations inter-alia contained provisions relating to Technical Minimum Schedule for operation of Central Generating Stations (CGS) and Inter-State Generating Stations (ISGS), whose tariff is either determined or adopted by the Central Commission. The Amendment Regulations further provided for compensation to Generating Stations for degradation of Heat Rate, Auxiliary Consumption and Secondary Fuel Oil consumption due to part load operation and multiple start-ups of units. Sub-regulation 7 of Regulation 6.3B of the Amendment Regulations mandates RPCs to work out a mechanism for compensation for station heat rate and auxiliary energy consumption for low unit loading and for secondary fuel oil consumption for additional start-ups in excess of 7 start-ups (hereinafter referred to as "Compensation Mechanism"). The Compensation Mechanism has been framed hereunder to fulfil aforesaid requirement.

#### **2. Applicability**

This Compensation Mechanism is applicable to Coal/Gas based Central Generating Stations and Coal/Gas based Inter-State Generating Stations, whose tariff is either determined or adopted by the Central Commission (hereinafter "designated generating stations"). In case of generating stations whose tariff is neither determined nor adopted by the Commission but which is a regional entity, they shall be required to make appropriate provisions in their PPAs or any other supplementary agreement in the light of the Compensation Mechanism.

#### **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%

$$= \frac{\text{Effective Generation of Station (in MWhr)}}{\text{Effective capacity(in MWhr)} \times (1 - \text{Normative Auxiliary Consumption})} \times 100$$

- (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. After coming into effect of this procedure, the first Calculation period will cover from 15.5.2017 to 31.5.2017.
- (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 AEC 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 AEC 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 AEC.
- (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 AEC based on average unit loading.
- (vii) "Effective Capacity" in MWhr means maximum possible generation from a station during calculation period and shall be calculated as :  
Total Installed Capacity of the designated generating station (in MWhr) minus Installed Capacity (MW) of the Unit(s) of the said station under outage (planned or forced outage) and under reserve shut down during the calculation period X outage time .
- (viii) "ECR (Comp)" means increase in normative Energy Charge Rate in rupees/kWh for the calculation period considering degraded SHR and AEC based on average unit loading.
- (ix) "ECR (DC)" means Energy Charge Rate in ₹/kWh based on degraded SHR and AEC 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 AEC 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 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 Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014 as amended from time to time or any subsequent enactment thereof.

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**

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

- (i) The mechanism is based on relevant provisions of Grid Code and 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 AEC 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.
- (iv) The Normative Auxiliary Consumption of competitively bid projects shall be considered based on the normative AEC 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) For Gas based generating stations, degraded SHR and AEC shall be decided based on the characteristic curve provided by manufacturer. If the characteristic curve is not provided for the entire range of the operating range i.e. up to 55% of module rating, then the extrapolation of the curve provided by the manufacturer shall be done to extend the curve up to 55% of module loading.
- (vi) Average Unit loading shall be used for getting increase in SHR and AEC in accordance with the Regulations and for gas based generating station as per step (v) above



Provided that no compensation for SHR degradation or increase in AEC shall be payable if the Average unit loading for the generating station for the computation period works out more than or equal to 85%.

- (vii) Based on the values of increased SHR and AEC arrived at step (vi), 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:

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 AEC:

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

- (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:

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

Note: Model PPA notified by Gol 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:

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

- (viii) 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 AEC should be to the account of CGS/ISGS:

Provided that for generating stations whose tariff has been adopted by 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)= ECR quoted or variable Charge quoted 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)

(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)

(ix) The compensation to be paid to CGS/ISGS for the calculation period ending  $n^{\text{th}}$  month shall be difference in the ECR (SE) and ECR (DC) for that period. ECR (Comp) for the calculation period ending  $n^{\text{th}}$  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 over all considerations of all PPAs after due prudence by RPC Secretariat.



- (x) The compensation  $Comp_n (P)$  payable to CGS/ISGS for the calculation period ending  $n^{th}$  month shall be calculated as below:

$$Comp_n (P) = (Total\ Generation\ Schedule\ (Energy)\ to\ its\ original\ beneficiaries\ excluding\ RRAS\ \&\ bilateral\ sale/collective\ sale\ under\ open\ access) * ECR_n (Comp)$$

- (xi)  $ECR_n (A)$  for the calculation period shall be calculated using actual values of SHR and Aux Consumption furnished by CGS/ISGS at the end of the calculation period and normative secondary fuel oil consumption as per CERC Tariff Regulation for which the requisite information shall be submitted by the generating station to the concerned RPCs Secretariat.

Similarly,  $ECR_n(N)$  shall be calculated using normative values of SHR and Aux Consumption and normative secondary fuel oil consumption as per CERC Tariff Regulation furnished by CGS/ISGS.

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

- (xii) Now, following values shall be calculated:

- (a) Total Energy Charges payable to CGS/ISGS based on actual parameters

$$EC_n (A) = ECR_n (A) \times (Total\ Generation\ Schedule\ (Energy)\ to\ its\ beneficiary\ excluding\ RRAS\ \&\ bilateral\ sale/collective\ sale\ under\ open\ access\ during\ the\ calculation\ period\ ending\ n^{th}\ month)$$

- (b) Total Energy Charges payable to CGS/ISGS based on Normative parameters

$$EC_n (N) = ECR_n (N) \times (Total\ Generation\ Schedule\ (Energy)\ to\ its\ beneficiary\ excluding\ RRAS,\ bilateral\ sale/collective\ sale\ under\ open\ access\ during\ the\ calculation\ period\ ending\ n^{th}\ month)$$

- (xiii) Compensation payable for the calculation period ending  $n^{th}$  month to CGS/ISGS 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 CGS/ISGS

- (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 CGS/ISGS for the calculation period ending  $n^{th}$  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 CGS/ISGS for the calculation period ending  $n^{th}$  month

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

(xiv) Final Compensation payable by  $k^{th}$  beneficiary for the calculation period ending  $n^{th}$  month

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

(b) The compensation amongst other beneficiaries shall be shared in the ratio of un-requisitioned energy below 85% of their entitlement i.e. compensation payable by  $k^{th}$  beneficiary for the calculation period ending  $n^{th}$  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 85% of its entitlement during the calculation period ending  $n^{th}$  month.

(xv) 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 CGS/ISGS to the beneficiary 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 is equal to or less than 7 x 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 CGS/ISGS for the year due to degradation of Secondary Fuel Oil Consumption shall be calculated by multiplying no. of start-ups exceeding 7 per unit and solely attributable to reserve shut-downs with the appropriate value of additional secondary oil consumption specified in Regulation.
- (iii) Compensation payable to CGS/ISGS shall be restricted such that Oil Consumption based on Norms plus Compensation calculated in step (b) 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 (b) and average landed price of Secondary fuel oil for the year.
- (v) Each start-up due to reserve shutdown shall be attributed to the beneficiaries, 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 i*

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

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 CGS/ISGS 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 respective RPC Secretariat shall review the secondary oil consumptions of plants on quarterly basis along with concerned RLDC and CGS/ISGS 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. 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 beneficiaries alongwith its monthly bill which shall be subject to adjustment based on compensation statement issued by RPC Secretariate subsequently.
- (ii) Generating station shall submit the requisite data alongwith compensation calculation to RPC secretariat as prescribed in Annexure-I to Appendix II for a month by 15th day of the following month. The data to be submitted is for the month and reconciled up to the month.

**6. Issuance of compensation statement**

- (i) RPC secretariat will issue the compensation statement along with final REA for the month.
- (ii) In case any anomaly or discrepancy is noticed by any Utility, the same may be brought to the notice of Member Secretary of the concerned RPC within 15 days of issuance of Compensation Statement.

**7. Review of the Procedure:**

The Procedure shall be reviewed after six months of its notification based on feedback of RPCs.



**Information to be submitted by CGS and ISGS to the RPC Secretariat by 15<sup>th</sup> of each month (say in May) for the previous month (say of April)**

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 or Net SHR as the case may be					
5	Normative SFC					
6	CVSF					
7	LPPF					
8	LPSFi					
9	Normative LC					
10	LPL					
11	Normative Aux. Cons					
12	Actual GHR/SHR					
13	Actual SFC					
14	Actual LC					
15	Actual Aux. Cons					
16	RSD start /stop in the month					
17	RSD start/stop cumulative					
18	Total no. of Start /stop during year					
19	CVPF					

