Steps to work out frequency response characteristics of control area are as follows: -

Step-1: Actual net interchange of the control area immediately before the disturbance (Point - A) = PA. Sign convention for net power imported into a CONTROL AREA is positive (+) and net power exported out of a control area is negative (-).

Step-2: Actual net interchange of the control area immediately after the disturbance (Point - B) = PB. Use the same sign convention as Step-1.

Step-3: The change in net interchange of the CONTROL AREA = (PB -PA). [For a disturbance that causes the frequency to decrease, this value should ideally be negative. The net interchange of a control area can positive within which drop in generation has occurred. Similarly, for load through off or frequency rise cases, the net interchange shall normally be positive except for the CONTROL AREA, wherein load throw off has taken place.]

Step-4: If the control area has suffered the loss, then Load or generation lost by the control area = PL. Otherwise, the loss (PL) is zero. Sign convention for Load Loss is negative (-) and Generation Loss positive (+).

Step-5: The Control Area Response $\Delta P = (PB-PA) - PL$

Step-6: The Frequency immediately before the disturbance = fA.

Step-7: The Frequency immediately after the disturbance = fB.

Step-8: Change in Interconnection Frequency from Point A to Point B = $\Delta f = (fB - fA)$

Step-9: Frequency Response Characteristic (FRC) of the Control Area = $\Delta P / \Delta f$

Step-10: Frequency Response Obligation (FRO) of each control area calculated in advance as per Clause 3 of this Annexure

Step 11: Frequency Response Performance (FRP) = Actual Frequency Response Characteristic (AFRC)/ Frequency Response Obligation (FRO)

TABLE 10: FRC CALCULATION SHEET TO BE USED BY ALL SLDC/RLDC/NLDC/CONTROL AREA

S. No	Particulars	Dimension	Control Area-1/Region
1	Actual Net Interchange before the Event (Time= hh:mm:ss)	MW	
2	Actual Net Interchange after the Event (Time= hh:mm:ss)	MW	
3	Change in Net Interchange (2 - 1)	MW	

S. No	Particulars	Dimension	Control Area-1/Region
4	Generation Loss (+) / Load Throw off (-) during the Event	MW	
5	Control Area Response (3-4)	MW	
6	Frequency before the Event	HZ	
7	Frequency after the Event	HZ	
8	Change in Frequency (7-6)	HZ	
9	Frequency Response Characteristic (5 / 8)	MW/HZ	
10	Frequency Response Obligation (FRO) of control area	MW/Hz	
11	Frequency Response Performance (FRP)(9/10)	Numeric value (upto two decimal places)	

6. Calculation of frequency response performance

(m) The performance of each control area in providing frequency response characteristic shall be calculated for each reportable event. Each control area shall separately assess their frequency response characteristic and share with RLDC along with high resolution data of at least one (1) second for regional entity generating stations and ten (10) second for state control area.

Frequency Response Performance (FRP) = Actual Frequency Response Characteristic (AFRC)/ Frequency Response Obligation (FRO)

Each control area shall be graded based on median Frequency Response Performance annually (at least 10 events) as per following criteria:

TABLE 11: FREQUENCY RESPONSE CRITERIA

S. N	Performance*	Grading
i.	FRP≥ 1	Excellent
ii.	0.85 ≤ FRP < 1	Good
iii.	0.75 ≤ FRP <0.85	Average
iv.	0.5≤ FRP < 0.75	Below Average
v.	FRP <0.5	Poor

*Provided that for wind/solar generating stations and state control areas with internal generation less than 100 MW or annual peak demand less than 1000 MW, the FRP grading would be indicative only.

ANNEXURE - 2

THIRD PARTY PROTECTION SYSTEM CHECKING & VALIDATION TEMPLATE FOR A SUBSTATION

The audit reports, along with action plan for rectification of deficiencies found, if any, shall be submitted to RPC or RLDC within a month of submission of report by auditor.

The third-party protection system checking shall be carried at site by the designated agency. The agency shall furnish two reports:

I. Preliminary Report: This report shall be prepared on the site and shall be signed by all the parties present.
II. Detailed Report: This report shall be furnished by agency within one month after carrying out detailed analysis.

The protection system checklist shall contain information as discussed in subsequent paras.

1) General Information (to be provided prior to the checking as well as to be included in final report):
   a) Substation name
   b) Name of Owner Utility
   c) Voltage Level (s) or highest voltage level?
   d) Short circuit current rating of all equipment (for all voltage level)
   e) Date of commissioning of the substation
   f) Checking and validation date
   g) Record of previous tripping's (in last one year) and details of protection operation
   h) Previous Relay Test Reports
   i) Overall single line diagram (SLD)
   j) AC aux SLD
   k) DC aux SLD
   l) SAS architecture diagram
   m) SPS scheme implemented (if any)

2) The preliminary report shall be drafted at site ad shall be signed by all the parties present and shall contain information not less than following:

S. No.	Issues	Remarks
1	Recommendation of last protection checking and validation	Status of works and pending issues if any
2	Review of existing settings at substation	Recommended Action
3	Disturbance Recorder out available for last 6 tripping's (Y/N)	Recommended Action
4	Chronic reason of tripping, if any	Recommended Action
5	Major non-conformity/deficiency observed	Recommended Action

3) The relay configuration checklist for available power system elements at station:
   a) Transmission Line
   b) Bus Reactor/Line Reactor
   c) Inter-connecting Transformer
   d) Busbar Protection Relay
   e) AC auxiliary system
   f) DC auxiliary system
   g) Communication system
   h) Circuit Breaker Details
   i) Current Transformer Details
   j) Capacitive Voltage Transformers Details
   k) Any other equipment/system relevant for protection system operation

4) The minimum set of points on which checking and validation will be carried out is given below. The detailed list shall be prepared by checking and validation team in consultation with concerned entity, RLDC and RPC.

   a) Transmission Line Distance Protection/Differential Protection
      – Name and Length of Line
      – Whether series compensated or not
      – Mode of communication used (PLCC/OPGW)
      – Relay Make and Model for Main-I and Main-II
      – List of all active protections & settings
      – Carrier aided scheme if any
      – Status of Power Swing/Out of Step/SOTF/Breaker Failure/Broken Conductor/STUB/Fault Locator/DR/VT fuse fail/Overvoltage Protection/Trip Circuit supervision/Auto-reclose/Load encroachment etc.
      – Relay connected to Trip Coil-1 or 2 or both
      – CT ratio and PT ratio
      – Feed from DC supply-1 or 2

- Connected to dedicated CT core (mention name)
- Other requirements for protection checking and validation

b) Shunt Reactor & Inter-connecting Transformer Protection
   - Whether two groups of protections used (Group A and Group B)
   - Do the groups have separate DC sources
   - Relay Make and Model
   - List of all active protections along with settings
   - Status of Differential Protection/Restricted Earth Fault Protection/Back-up Directional Overcurrent/Backup Earth fault/ Breaker Failure
   - Status of Oil Temperature Indicator/Winding Temperature Indicator/Bucholz/Pressure Release Device etc.
   - Relay connected to Trip Coil-1 or 2 or both
   - CT ratio and PT ratio
   - Feed from DC supply-1 or 2
   - Connected to dedicated CT core (mention name)
   - Other requirements for protection checking and validation

c) Busbar Protection Relay
   - Busbar and redundant relay makes and models
   - Type of Busbar arrangement
   - Zones
   - Dedicated CT core for each busbar protection (Yes/No)
   - Breaker Failure relay included (Yes/No), if additional then furnish make and model
   - Trip issued to both Busbar protection in case of enabling
   - Isolator indication and check relays
   - Other requirements for protection checking and validation

d) AC auxiliary system
   - Source of AC auxiliary system
   - Supply changeover between sources (Auto/Manual)
   - Diesel generator (DG) details
   - Maintenance plan and supply changeover periodicity in DG
   - Single Line Diagram
   - Other requirements for protection checking and validation

e) DC auxiliary system
   - Type of Batteries (Make, vintage, model)
   - Status of battery Charger
   - Measured voltage (positive to earth and negative to earth)
   - Availability of ground fault detectors
   - Protection relays and trip circuits with independent DC sources
   - Other requirements for protection checking and validation

f) Communication system
   - Mode of communication for Main-1 and Main-2 protection
   - Mode of communication for data and speech communication
   - Status of PLCC channels
   - Time synchronization equipment details
   - OPGW on geographically diversified paths for Main-1 and main-2 relay
   - Other requirements for protection checking and validation

g) Circuit Breaker Details
   - Details and Status
   - Healthiness of Tripping Coil and Trip circuit supervision relay
   - Single Pole/Multi pole operation
   - Pole Discrepancy Relay available(Y/N)
   - Monitoring Devices for checking the dielectric medium
   - Other requirements for protection checking and validation

h) Current Transformer (CT)/Capacitive Voltage Transformer (CVT) Details
   - CT/CVT ID name and voltage level
   - CT/CVT core connection details
   - Accuracy Class
   - Whether Protection/Metering
   - CT/CVT ratio available and ratio adopted
   - Details of last checking and validation of CT/CVT healthiness
   - Other requirements for protection checking and validation
   - Other protections: Direction earth fault, negative sequence, over current, over voltage, over frequency, under voltage, under frequency, forward power, reverse power, out of step/power swing, HVDC protection etc.

5) Summary of Checking: The summary shall specifically mention minimum following points:
   - The settings and scheme adopted are in line with agreed protection philosophy or any accepted guidelines (e.g. Ramakrishna guidelines or CBIP manual based).
   - The deviations from the RPC protection philosophy, if any and reasons for taking the deviations shall be recorded.
   - All the major general deficiency shall be listed in detail along with remedial recommendations.
   - The relay settings to be adopted shall be validated with simulation based or EMTP studies and details shall be enclosed in report.
   - The cases of protection maloperation shall be analysed from protection indices report furnished by concerned utility, the causes of failure along with corrective actions and recommendations based on the findings shall be noted in the report.

ANNEXURE- 3

A. REPORTING REQUIREMENTS

S. No.	Entity Responsible	Reporting Requirement and Frequency
1.	RPC Secretariat	• Exception report of UFR *(monthly)* • Annual LGBR *(annual)* • Annual Outage Plan*(annual)* • Feedback Report to address potential violation of system operational limit *(quarterly)*
2.	RPC	• Final report on grid disturbance *(post grid disturbance)*
3.	NPC	• All India LGBR *(annual)*
4.	CTU	• All India transmission review*(yearly)* • Planned inter-regional and ISTS-STU power transfer capability for the next 3-5 years*(yearly)*
5.	NLDC	• Forecast error *(daily/day-ahead / weekly / monthly and yearly)* • Operational study (*Day-ahead/ weekly/ monthly/ yearly*) • Operational analysis *(post despatch)* • Draft report of each grid disturbance/grid *(post grid disturbance)* • Daily and monthly report of integrated grid performance *(daily and monthly)*
6.	RLDC	• Forecast error *(daily/day-ahead / weekly / monthly and yearly)* • Operational study (*Day-ahead/ weekly/ monthly/ yearly*) • Operational analysis *(post despatch)* • Draft report of each grid disturbance *(post grid disturbance)* • Integrated grid performance *(daily and monthly)*
7.	SLDC	• Exception report of UFR *(monthly)* • Forecast error *(daily/day-ahead/weekly/monthly and yearly)* • Operational study (*Day-ahead/ weekly/ monthly/ yearly*) • Operational analysis *(post despatch)* • Flash report and detailed report on any grid disturbance *(post grid disturbance)* • Details of regional entity generating stations *(quarterly)*

S. No.	Entity Responsible	Reporting Requirement and Frequency
8.	User	• Flash report and detailed report on any grid disturbance *(post grid disturbance)* • PSS tuning report by generators *(based on tuning requirements)*

B. PROCEDURE DRAFTING REQUIREMENTS

S. No.	Entity Responsible	Drafting Responsibilities
1.	RPC	• Common outage planning procedure
2.	CTU	• All India transmission review • Planned inter-regional and ISTS-STU power transfer capability for the next 3-5 years
3.	NLDC	• Detailed procedure covering modalities for first time energization and integration of new or modified power system elements • Operating procedure • PSS tuning procedure • Quantum of secondary/Tertiary reserves • Assessment of Secondary/Tertiary control • Procedure for operational planning analysis, real-time monitoring, real-time assessments and format for data submission and updating • Restoration Procedure • Timeline for scheduling activities
4.	RLDC	• Operating procedure • Procedure for operational planning analysis, real-time monitoring, real-time assessments and format for data submission and updating • Restoration Procedure
5.	SLDC	• Detailed procedure covering modalities for first time

S. No.	Entity Responsible	Drafting Responsibilities
		energization and integration of new or modified power system elements • Operating procedure • Restoration Procedure
6.	Governing board of certifying agency	• Periodic capacity building, certification and recertification for system operators at NLDC, RLDC, SLDC and sub-LDC

ANNEXURE - 4

A. REACTIVE POWER COMPENSATION

(1) Reactive power compensation should ideally be provided locally, by generating reactive power as close to the reactive power consumption as possible. The regional entities except generating stations are therefore expected to provide local VAr compensation/generation such that they do not draw VArs from the EHV grid, particularly under low-voltage condition. To discourage VAr drawals by regional entities except generating stations, VAr exchanges with ISTS shall be priced as follows:

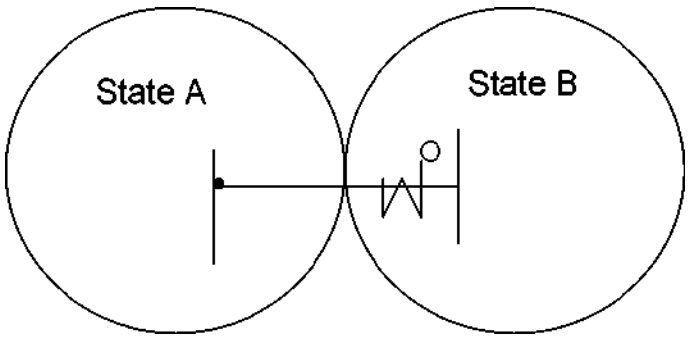
- The regional entity except generating stations pays for VAr drawal when voltage at the metering point is below 97%
- The regional entity except generating stations gets paid for VAr return when voltage is below 97%
- The regional entity except generating stations gets paid for VAr drawal when voltage is above103%
- The regional entity except generating stations pays for VAr return when voltage is above 103%

Provided that there shall be no charge/payment for VAr drawal/return by a regional entity except generating stations on its own line emanating directly from an ISGS.

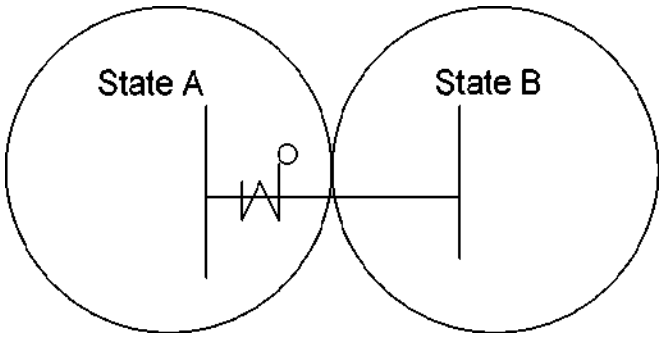
(2) The charge for VArh shall be at the rate of 12.61 paise/kVArh and this will be applicable between the regional entity, except generating stations, and the regional pool account for VAr interchanges. This rate shall be escalated at 0.6paise/kVArh per year thereafter, unless otherwise revised by the Commission.

B. PAYMENT FOR REACTIVE ENERGY EXCHANGES ON STATE-OWNED LINES

Case – 1: Interconnecting line owned by State-A Metering Point: Substation of State-B

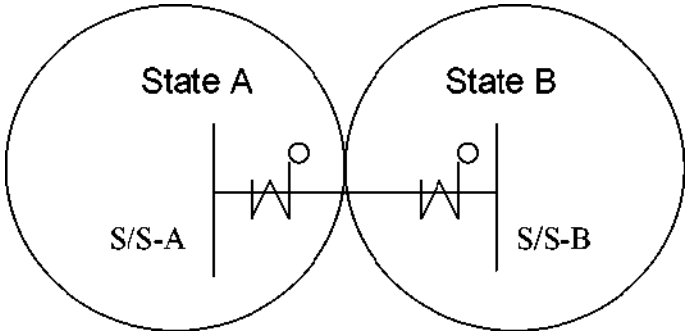


Case - 2: Interconnecting line owned by State-B Metering point: Substation of State-A



Note: Net VArh and net payment may be positive or negative

Case – 3: Interconnecting line is jointly owned by States-A and –B. Metering points: Substations of State-A and State-B



Net VArh exported from S/S-A, while voltage < 97% = X_1 Net VArh exported from S/S-A, while voltage > 103% = X_2 Net VArh imported at S/S-B, while voltage < 97% = X_3 Net VArh imported at S/S-B, while voltage > 103% = X_4

(i) State-B pays to State-A forX_1 or X_3, whichever is smaller in magnitude, and
(ii) State-A pays to State-B forX_2 or X_4, whichever is smaller in magnitude.

Note:

I. Net VArh and net payment may be positive or negative.
II. In case X_1 is positive and X_3 is negative, or vice-versa, there would be no payment under (i) above.
III. In case X_2 is positive and X_4 is negative, or vice-versa, there would be no payment under (ii) above.

ANNEXURE – 5

MINIMUM TURNDOWN LEVEL FOR OPERATION OF REGIONAL ENTITY GENERATING STATIONS

(1) Where the regional entity generating station/ISGS, is directed by the concerned RLDC/SLDC to operate below normative plant availability factor, the regional entity generating station/ISGS may be compensated for increase in the unit heat rate and the auxiliary energy consumption depending on the unit loading in each time block duly taking into account the forced outages and planned outages of the units, generation at generator terminal, energy sent out ex-bus, and in due consideration of degraded and normative operating parameters of station heat rate, auxiliary energy consumption and secondary fuel oil consumption etc. on monthly basis duly supported by relevant data verified by RLDC or SLDC, as the case may be. The compensation shall be applicable to all regional entity generating stations/ISGS whose tariff is determined under section 62 or under section 63.

Provided that:

(i) In case of coal / lignite based generating stations, following station heat rate degradation shall be considered for the purpose of compensation:

S. No.	Unit loading as a % of installed capacity of the unit	Increase in SHR (for supercritical units) (%)	Increase in SHR (for sub-critical units) (%)
1	85 and above	Nil	Nil
2	80	0.66	0.76
3	75	1.19	1.45
4	70	1.96	2.40
5	65	2.84	3.56

S. No.	Unit loading as a % of installed capacity of the unit	Increase in SHR (for supercritical units) (%)	Increase in SHR (for sub-critical units) (%)
6	60	3.67	4.79
7	55	4.92	6.59
8	50	6.15	8.60
9	45	7.40	10.21
10	40	8.81	12.14

(ii) In case of coal / lignite based generating stations, the following auxiliary energy consumption (AEC) degradation shall be considered for the purpose of compensation:

Sl. No	Unit loading (% of MCR)	% degradation in AEC admissible
1	85 and above	Nil
2	80	0.10
3	75	0.25
4	70	0.40
5	65	0.55
6	60	0.75
7	55	0.95
8	50	1.20
9	45	1.55
10	40	2.10

(iii) Where the scheduled generation falls below the minimum turndown level, the concerned regional entity generating station shall have the option to go for reserve shut down and in such cases, start-up fuel cost over and above seven (7) start / stop in a year shall be

considered as additional compensation based on following norms or actual, whichever is lower:

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

(iv) In case of gas based regional entity generating station, following station heat rate degradation shall be considered for the purpose of compensation:

S. No.	Unit loading as a % of installed capacity of the unit	Increase in SHR (%)
1	85 and above	Nil
2	80	0.91
3	75	2.50
4	70	4.17
5	65	6.33
6	60	8.54
7	55	10.68
8	50	13.63

(v) In case of gas based regional entity generating station, the following auxiliary energy consumption (AEC) degradation shall be considered for the purpose of compensation:

S. No.	Unit loading as a % of installed capacity of the unit	% degradation in AEC admissible
1	85 and above	Nil
2	80	0.12
3	75	0.29
4	70	0.47
5	65	0.68
6	60	0.88
7	55	1.09
8	50	1.34

(vi) Compensation for the station heat rate and auxiliary energy consumption shall be worked out in terms of energy charges. The degradation in SHR and AEC on account of part load operation shall be carried on pro-rata basis up to second decimal place.

For instance, if SHR and AEC have to be calculated for a sub-critical plant unit operating at 77% loading factor, the methodology shall be as follows:

(a) Station Heat Rate:

Degradation in station heat rate at 80% + pro-rate degradation at 77% calculated between 80% and 75%

= [0.76 + (1.45-0.76)] * 3÷5 = 1.17%

(b) Auxiliary Energy Consumption:

Degradation in AEC at 80% + pro-rate degradation at 77% calculated between 80% and 75%

= [0.10 + (0.25-0.1)] *3÷5 = 0.19%

(vii) The compensation so computed shall be borne by the entity who has caused the plant to be operated at schedule lower than corresponding to normative plant availability factor based on the compensation mechanism as per Annexure – 6. In case of part untied capacity of a plant for which there is no long term or medium-term PPA, the compensation for backing down corresponding to the unutilized capacity shall be to the account of the generating company.

(viii) Compensation shall be calculated in each month as per the detailed procedure as in Annexure-6. In case the energy charges calculated based on actual SHR and AEC is less than the sum of energy charges calculated based on normative SHR and AEC or quoted energy charges/SHR as the case may be, and compensation payable for that month to the generating station, then such gains over the actual energy charges, restricted to compensation payable to generating station, shall be shared between generating station and beneficiaries in the ratio of 60:40.

(ix) The change in schedule of power under the provisions of Central Electricity Regulatory Commission (Ancillary Services Operations) Regulations, 2015 and Automatic Generation Control (AGC) as per order in Petition No. 319/RC/2018 dated 29th Aug, 2019 shall not be considered for compensation.

(x) The compensation on account of change in schedule under the provisions of Security Constrained Economic Despatch (SCED) shall be as per the detailed procedures.

(2) 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 for additional start-ups in excess of 7 start-ups, shall be as per Annexure – 6.

(3) The detailed operating procedure for taking units under reserve shut down containing 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 minimum turndown level in specific grid conditions such as low system demand, regulation of power supply and incidence of high renewables etc., based on merit order stacking is given at Annexure – 7.

ANNEXURE – 6

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

The Grid Code inter-alia contains provisions relating to Technical Minimum Schedule for operation of Regional Entity Generating Stations / ISGS. The Grid Code further provides 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. This mechanism is 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”).

2. Applicability

This Compensation Mechanism is applicable to Coal/lignite/Gas based Regional Entity Generating Stations/ISGS, (hereinafter “designated generating stations”).

3. Definitions and abbreviations:

1) In this Compensation Mechanism, unless the context otherwise requires:

(i) “Block Unit Loading (BUL) of the Station” (in %) means loading of the station during a particular Time Block of Calculation Period determined as follows:

$$BUL(\%) = \left\{ Higher\ of\ (AG\ or\ Basic\ SG) \Big/ \quad Effective\ Capacity\ in\ Block\ x\ (1 - AEC) \right\} x100$$Where

AG means *Actual Generation (Ex Bus) of Station in MWhr for a Time Block*

Basic SG (Scheduled Generation) means *Only ISGS Part of Schedule given by RLDC i.e., Excluding Open Access (Bilateral), Collective (Exchanges), Any URS Sales, RRAS, AGC, SCED MW parts, expressed in MWhr for a Time Block*

AEC means *Normative Auxiliary Energy Consumption*

(ii) "Calculation Period" means the month for which compensation calculation shall be carried out.

(iii) "Comp (F)" means reconciled final compensation in rupees to be received by a generator during the calculation period based on actual, normative parameters and degraded SHR and AEC based on block unit loading.

(iv) "Comp (P)" means provisional compensation in rupees computed for the calculation period based on the normative parameters and degraded SHR and AEC based on block unit loading.

(v) "EC (A)" means total energy charges in rupees computed for a designated generating station during the calculation period on actual furnished parameters of SHR and AEC and sum of basic scheduled energy for all blocks in that calculation period.

(vi) "EC (N)" means total energy charges in rupees computed for a designated generating station during the calculation period on normative parameters and sum of basic scheduled energy for all blocks in that calculation period.

(vii) “Effective Capacity” in MWhr means maximum possible generation from a station during a time 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 time period X outage time.

(viii) “ECR (Comp)” means increase over normative Energy Charge Rate in Rupees/kWh considering degraded SHR and AEC based on block unit loading.

(ix) “ECR (DC)” means Energy Charge Rate in Rupees/kWh based on degraded SHR and AEC considering unit loading corresponding to Declared Capacity (DC) of the block

(x) “ECR (SE)” means Energy Charge Rate in Rupees/kWh based on degraded SHR and AEC considering block unit loading of generating station.

(xi) “Effective Generation” in MWhr means the actual generation ex-bus of the designated station or the Generation for Basic SG Schedule as in (i) 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, 2019 as amended from time to time or any subsequent enactment thereof.

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

1) Compensation for degradation of Heat Rate (SHR) and Auxiliary Energy Consumption (AEC)

(i) The Compensation shall be worked out at the end of each month considering degradation in SHR and AEC based on Block Unit Loading (%).

(ii) Energy scheduled under RRAS Regulations shall be taken as +ve for up-regulation and –ve for down regulation. Similarly, energy scheduled under AGC, SCED shall be taken as +ve for increase and –ve for decrease.

(iii) 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. For projects where entire capacity is not tied up in long term or medium-term contracts, the Normative AEC shall be considered based on the normative AEC of similar units as per the Tariff Regulations of the Commission.

(iv) Compensation for part load operation shall be calculated based on fifteen (15) minute block of unit loading %, to work out incremental SHR and AEC in accordance with the Annexure – 5.

(v) Based on the values of increased SHR and AEC arrived above, Energy Charge Rate (ECR) for Block Unit Loading %, i.e. ECR (SE) for the station shall be calculated for a time block using the formula specified in Tariff Regulations of the Commission:

Provided that for generating stations whose tariff has been determined 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:

ECR(SE) = quoted ECR or quoted Variable Charge x (1+% degradation in heat rate based on block unit loading corresponding to Effective Generation/100) / (1- % degradation in Aux Consumption based on block unit loading corresponding to Effective Generation /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) = ECR worked out based on net station heat rate (without % degradation in heat rate based on block unit loading) corresponding to Effective generation) / (1- % degradation in Aux Consumption based on block 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) = ECR worked out based on net station heat rate x (1+ % degradation in heat rate based on block unit loading corresponding to Effective generation /100) / (1- % degradation in Aux Consumption based on block unit loading corresponding to Effective generation /100)

(viii) ECR corresponding to Declared Capacity (DC) i.e. ECR (DC) for the Time Block 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 regional entity generating station/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 block unit loading corresponding to DC/100) / (1- % degradation in Aux Consumption based on block 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 block 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 block unit loading corresponding to DC /100) / (1- % degradation in Aux Consumption based on block unit loading corresponding to DC/100)

The compensation to be paid to designated stations for each Time Block, ECR (Comp) shall be difference in the ECR (SE) and ECR (DC) for that Block.

$ECR_n(Comp) = ECR_n(SE) – ECR_n(DC)$

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~~ regional entity generating station/ISGS for a month shall be calculated as below:

$$\boldsymbol{Comp\ n\ (P)} = \sum_{\boldsymbol{for\ all\ time\ blocks\ of\ \ month\ n}} \boldsymbol{Basic\ SG\ in\ kWhr\ x\ ECR\ n\ (Comp)}$$

(xi) ECR_n (A) for the calculation period at the end of month n shall be calculated using actual values of SHR and Aux Consumption furnished by regional entity generating station/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 regional entity generating station/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 for the station computed on actual parameters

$$EC\ n\ (A) = ECR\ n\ (A)\ x \sum_{for\ all\ time\ blocks\ of\ month\ n} Basic\ SG\ in\ kWhr$$

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

$$EC\ n\ (N) = ECR\ n(N)\ x \sum_{for\ all\ time\ blocks\ of\ month\ n} Basic\ SG\ in\ kWhr$$

(xiii) Compensation payable for the calculation period to regional entity generating station/ISGS would be shared with beneficiaries as per following:

(a) If $EC_{\mathbf{n}}(A) \leq$ Sum of $\{EC_{\mathbf{n}}(N)$ and $Comp_{\mathbf{n}}(P)\}$, then such gain i.e., difference between the sum of $\{EC_{\mathbf{n}}(N)$ and $Comp_{\mathbf{n}}(P)\}$ and $EC_{\mathbf{n}}(A)$ amount restricted to $Comp_{\mathbf{n}}$ (P), shall be shared between generating station and beneficiaries in the ratio

of 60:40. In that case Comp n(F) for the month shall be Comp n (P) less the amount of gain to be shared with the beneficiary.

(b) If EC_n (A) is more than the sum of $\{EC_n$ (N) and $Comp_n$ (P)$\}$, there shall be no sharing of compensation between the generating station and the beneficiary and Comp n (P) shall be Comp n (F) for the month.

(xiv) Compensation payable for the calculation period to Final Compensation payable by k^{th} beneficiary for the calculation period:

(a) No compensation shall be payable by 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 entitlement during the calculation period.

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

Where UE_{kn} is un-requisitioned energy of k^{th} beneficiary below 85% of its entitlement during the calculation period.

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/Regional Entity Generating Station 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 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.

(iv) Any saving on account of oil, limited to amount received from the compensation, shall be shared with the beneficiaries in 60:40 ratio.

(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:

$$Compensation\ payable\ by\ beneficiary\ i = \left(N_i \times \frac{A_i}{\sum(N_i \times A_i)}\right) \times \text{Compensation payable to CGS/ISGS}$$

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

(vi) The CGS/ISGS/ Regional Entity Generating Station 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.

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 along with its monthly bill which shall be subject to adjustment based on compensation statement issued by RPC Secretariat subsequently.

(ii) Generating station shall submit the requisite data along with compensation calculation to RPC secretariat as prescribed in Annexure-I to this procedure for a month by 15th day of the following month. For stations where the PPAs are not unit-wise, the information for the station shall be furnished. 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.

Annexure-I

Information to be submitted by CGS and ISGS to the RPC Secretariat by 15th 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					