Grid Controller of India limited

(Formerly Power System Operation Corporation Limited)

(A Govt. of India Enterprise)

Methodology for Computation & Declaration of Normal Rate

In accordance with

CERC Deviation Settlement Mechanism Regulations, 2022

Version-1

02nd December'2022

National Load Despatch Centre (NLDC)

New Delhi

Methodology for computation & declaration of Normal Rate in line with CERC Deviation Settlement Mechanism and Related Matters Regulations, 2022

1. Background

CERC Deviation Settlement Mechanism Regulations, 2022 (hereinafter referred to as "DSM Regulations") was notified on 14th March 2022. The date of implementation has been notified as 05.12.2022 by CERC on 31st October 2022.

This regulation provides for declaration of Normal Rate of charges for deviation which, as per the DSM Regulations, is applicable for deviation in a time block.

The methodology to be adopted for computation of normal rate of charges for deviation is summarised below.

For the period 05.12.2022 to 04.12.2023	From 05.12.2023 onwards
The normal rate of charges for deviation for a time block shall be equal to the highest of: i. the weighted average Area Clearing Price (ACP) of the Day Ahead Market segments of all the Power Exchanges; or ii. the weighted average ACP of the Real Time Market segment of all the Power Exchanges; or iii. the Weighted Average Ancillary Service Charge of all the regions for that time block. Provided further that in case of non-availability of ACP for any time block on a given day, ACP for the corresponding time block of the last available day shall be considered.	Weighted Average Ancillary Service Charge (in paise/kWh) computed based on the total quantum of Ancillary Services deployed and the net charges payable to the Ancillary Service Providers for all the Regions for that time block.

The normal rate of charges (paisa /Kwh) for deviation shall be rounded off to the nearest two decimal places.

2. Procedure for calculating the normal rate of charges:

a. The weighted average ACP of the Day Ahead Market (DAM, G-DAM) and Real Time Market (RTM) shall be calculated bid area wise considering all Power Exchanges. The list of Bid Areas and States covered under Bid-Areas is enclosed as *Annexure-1*.

b. Subsequently, as and when any new market segment is introduced in Day Ahead Market, this would be suitably incorporated in the rate computations.

c. In case of non-availability of ACP in any Power Exchange for a Bid-Area for a time block, if ACP is discovered in other exchanges/exchange, the available discovered ACP shall be considered for computing the weighted average ACP for that time block.

d. In case of non-availability of ACP for any time block on a given day in all Power Exchanges, the last available ACP for the corresponding time block shall be considered. The non-availability of ACP shall only be considered for those time blocks where the market has not cleared. In case price declared is zero by the Power Exchanges, the same shall be considered.

e. The **weighted average ACP of the Day Ahead Market** segments of all the Power Exchanges shall be computed as follows.

   The weighted average ACP of the Day Ahead Market segments shall be computed by considering the block wise, area wise price and cleared volume for Day Ahead Market (DAM) and GDAM (Green Day Ahead Market) in all the operational Power Exchanges.

   For a given time block, the following methodology shall be used for computation of the weighted average ACP in Day Ahead Market for sample bid Area A1.

DAM	
Volume IEX (Buy +Sell) = $A1_{IEX}$	Price IEX = $P1_{IEX}$
Volume PXIL (Buy +Sell) = $A1_{PXIL}$	Price IEX = $P1_{PXIL}$
Volume HPX (Buy +Sell) = $A1_{HPX}$	Price HPX = $P1_{HPX}$
GDAM	
Volume IEX (Buy +Sell) = $A1_{G-IEX}$	Price IEX = $P1_{G-IEX}$
Volume PXIL (Buy +Sell) = $A1_{G-PXIL}$	Price IEX = $P1_{G-PXIL}$
Volume HPX (Buy +Sell) = $A1_{G-HPX}$	Price HPX = $P1_{G-HPX}$

Volume in KwH and Price in paisa/KwH

Weighted Average ACP of DAM (paise/Unit) =

$$\frac{[(A1_{IEX}*P1_{IEX})+(A1_{PXIL}*P1_{PXIL})+(A1_{HPX}*P1_{HPX})+(A1_{G-IEX}*P1_{G-IEX})+(A1_{G-PXIL}*P1_{G-PXIL})+(A1_{G-HPX}*P1_{G-HPX)})]}{[A1_{IEX}+ A1_{PXIL}+A1_{HPX}+ A1_{G-IEX}+ A1_{G-PXIL}+ A1_{G-HPX)}]}$$

f. The **weighted average ACP of the Real Time Market** segment of all the Power Exchanges shall be computed as follows.

   The weighted average ACP of the Real Time Market (RTM) segment of all the Power Exchanges shall be computed by considering the block wise, area wise price and volume of RTM in all the operational Power Exchanges.
   In case of non-availability of ACP for any time block on a given day in all Power Exchanges, ACP for the corresponding time block of the last available day shall be considered. The non-availability of ACP shall only be considered for those time blocks where the market has not cleared. In case price declared is zero by the Power Exchanges, the same shall be considered.

For a given time block, the following methodology shall be used for computation of the weighted average ACP for Real Time Market for a sample bid Area A1

RTM	
Volume IEX (Buy +Sell) = $A1_{IEX}$	Price IEX = $P2_{IEX}$
Volume PXIL (Buy +Sell) = $A1_{PXIL}$	Price PXIL = $P2_{PXIL}$
Volume HPX (Buy +Sell) = $A1_{HPX}$	Price HPX = $P2_{HPX}$

Volume in KwH and Price in paisa/KwH

Weighted Average ACP of RTM (paise/Unit) =

$$\frac{[(A1_{IEX}*P2_{IEX}) +(A1_{PXIL}*P2_{PXIL}) +(A1_{HPX}*P2_{HPX})]}{[A2_{IEX}+ A2_{PXIL}+A2_{HPX}]}$$

g. The **weighted average Ancillary Service Charge** shall be computed as follows.

The weighted average Ancillary Service Charge of all the regions for that time block shall be computed duly considering the RRAS (Regulation Up and Regulation down) and SRAS (Up and down) despatched on all India basis.

The following shall be used for computation for a sample time block:

RRAS	SRAS
RRAS_Up Volume (Mwh) = $RRASUP_{v1\ldots vn}$ Variable Cost (Rs/Unit) = $VC_{1\ldots n}$ Fixed cost (Rs/Unit)= $FC_{1\ldots n}$ Mark Up (Rs/Unit)= 0.5 RRAS_UP(Rs) = $(FC_1+ VC_1+0.5)*1000*$ $RRASUP_{v1}+\ldots +(FC_n+ VCn+0.5)*1000* RRASUP_{vn}$ n= number of stations	SRAS_Up Volume 15 min (Mwh) = $SRASUP_{v1(15)\ldots vn(15)}$ Energy charge/compensation charge(Rs/Unit) = $VC_{1\ldots n}$ Mark Up (Rs/Unit= $M_{1\ldots y}$ SRAS Up price= $SRASUP_{P1\ldots pn}$ SRAS_Up(Rs) $=(VC_1* SRASUP_{v1(15)}+\ldots+ VC_n* SRASUP_{vn(15)})$ $*1000$ n= number of stations
RRAS_Down Volume (Mwh) = $RRASDN_{v1\ldots vn}$ Variable Cost (Rs/Unit) = $VC_{1\ldots n}$ RRAS_Down (Rs) = $(RRASDN_{v1}*0.75*VC_1+\ldots +$ $RRASDN_{v1}*0.75* VC_n)*1000$	SRAS_Down Volume 15 min (Mwh) = $SRAS\text{-}DN_{v1(15)\ldots vn(15)}$ Energy charge/compensation charge(Rs/Unit) = $VC_{1\ldots n}$ SRAS_Down(Rs)=$(SRAS\text{-}DN_{v1(15)}*VC_1+\ldots+SRAS\text{-}DN_{vn(15)}*VC_n)*1000$

	SRAS_Incentive
	  SRAS Incentive Rate (Rs/Unit)=P_{1-6}
	  SRAS_Up Volume 05 min (Mwh) = $SRASUP_{v1(5)\ldots vn(5)}$
	 SRAS_Down Volume 05 min(Mwh) = $SRAS\text{-}DN_{v1(5)\ldots vn(5)}$
	
	  P_1= 0.5, P_2= 0.4, P_3= 0.3, P_4= 0.2, P_5= 0.1, P_6= 0;
	 SRAS_Incentive=$(|SRASUP_{v1(5)}|+ |SRAS\text{-}DN_{v1(5)}|) * P_{1-6}$ $+\ldots+(SRASUP_{vn(5)}+ SRAS\text{-}DN_{vn(5)}) * P_{1-6}$

SRAS performance would be measured on a daily basis to arrive at the Incentive Rate which would be used for computing the incentive for the block for the station.

Ancillary Services Net Cost (Rs) AS_{NET} **(Rs):**

   [RRAS_UP – RRAS_Down + SRAS_Up+ SRAS_Incentive- SRAS_Down]

If AS_{NET}>0

   Weighted Average Ancillary Service Charge of All India (paise/Unit) =

$$\frac{100*AS_{NET}}{[\ (\text{RRAS\_Up Volume+ SRAS\_Up Volume(15min) -RRAS\_Down Volume- SRAS\_Down Volume(15min))} *1000]}$$

If AS_{NET}<0

   Weighted Average Ancillary Service Charge of All India (paise/Unit) =

$$(-)\left[\frac{100*AS_{NET}}{[\ (\text{RRAS\_Up Volume+ SRAS\_Up Volume(15min) -RRAS\_Down Volume- SRAS\_Down Volume(15min)})*1000]}\right]$$

h. **Normal Rate of Charges (paise/Unit) of an area** for a time block =
   Maximum of
   - weighted average ACP of DAM of that area
   - weighted average ACP of RTM of that area
   - Weighted Average Ancillary Service Charge of All India

3. Normal rate of charges for deviation for inter-regional deviation and cross-border transactions.

   a. Inter-regional corridors are interconnected through different bid areas and neighboring countries are also connected to different bid areas in India. To simplify the settlement of inter-regional and cross-border deviations, the highest of the weighted average price of the unconstrained market clearing price (UMCP) of DAM, RTM of all Power Exchanges & weighted average Ancillary Services charges shall be considered for computing the normal rate of charges for deviation.

   b. In case of non-availability of UMCP for any time block on a given day in all Power Exchanges, the last available UMCP for the corresponding time block shall be considered.

   The following shall be used for computation for weighted average UMCP of DAM for a sample time block:

DAM	
Volume IEX (Buy +Sell) = V_{IEX}	UMCP IEX = P_{IEX}
Volume PXIL (Buy +Sell) = V_{PXIL}	UMCP PXIL= P_{PXIL}
Volume HPX (Buy +Sell) = V_{HPX}	UMCP HPX = P_{HPX}

GDAM	
Volume IEX (Buy +Sell) = $V_{G\text{-}IEX}$	UMCP IEX = $P_{G\text{-}IEX}$
Volume PXIL (Buy +Sell) = $V_{G\text{-}PXIL}$	UMCP IEX = $P_{G\text{-}PXIL}$
Volume HPX (Buy +Sell) = $V_{G\text{-}HPX}$	UMCP HPX = $P_{G\text{-}HPX}$

Volume in KwH and Price in paisa/KwH

weighted average UMCPP of DAM (paise/unit) =

$$\frac{[(V_{IEX}*P_{IEX})+(V_{PXIL}*P_{PXIL})+(V_{HPX}*P_{HPX})+(V_{G\text{-}IEX}*P_{G\text{-}IEX})+(V_{G\text{-}PXIL}*P_{G\text{-}PXIL})+(V_{G\text{-}HPX}*P_{G\text{-}HPX}))]}{[V_{IEX}+V_{PXIL}+V_{HPX}+V_{G\text{-}IEX}+V_{G\text{-}PXIL}+V_{G\text{-}HPX})]}$$

The following shall be used for computation for weighted average UMCP of RTM for a time block

RTM	
Volume IEX (Buy +Sell) = V_{IEX}	Price IEX = P_{IEX}
Volume PXIL (Buy +Sell) = V_{PXIL}	Price PXIL = P_{PXIL}
Volume HPX (Buy +Sell) = V_{HPX}	Price HPX = P_{HPX}

Volume in KwH and Price in paisa/KwH

weighted average UMCPP of RTM (paise/unit) =

$$\frac{[(V_{IEX}*P_{IEX})+(V_{PXIL}*P_{PXIL})+(V_{HPX}*P_{HPX})]}{[V_{IEX}+V_{PXIL}+V_{HPX}]}$$

4. Validity of the procedure:

This procedure is valid for one year from 05.12.2022 to 04.12.2023. The procedure shall be reviewed prior to completion of one year or in case of any regulatory changes or based on the experience gained.

5. Time line for publication of normal rate of charges for deviation:

NLDC shall publish the normal rate of charges for deviation on weekly basis by Thursday of the current week for the previous week (Monday to Sunday).

Normal rate of charges shall not be revised after declaration as per the timeline above. No post facto revision in the DSM account would be carried out due to any revision of normal rate of charges for deviation or contract rate or reference charge rate already used for DSM computation.

Annexure-1:   Bid Areas and States covered under Bid-Areas

Sr. No.	Bid Area	Region	States covered under Bid Area
1	N1	NR	Jammu and Kashmir, Himachal Pradesh, Chandigarh, Haryana
2	N2	NR	Uttar Pradesh , Uttaranchal, Rajasthan, Delhi
3	N3	NR	Punjab
4	E1	ER	West Bengal, Sikkim, Bihar, Jharkhand
5	E2	ER	Orissa
6	W1	WR	Madhya Pradesh
7	W2	WR	Maharashtra, Gujarat, Daman and Diu, Dadar and Nagar Haveli, North Goa
8	W3	WR	Chhattisgarh
9	S1	SR	Andhra Pradesh, Telangana, Karnataka, South Goa
10	S2	SR	Tamil Nadu, Puducherry
11	S3	SR	Kerala
12	A1	NER	Tripura, Manipur, Mizoram, Nagaland
13	A2	NER	Assam, Arunachal Pradesh, Meghalaya