CENTRAL ELECTRICITY REGULATORY COMMISSION
6th, 7th and 8th Floor, World Trade Centre,
Tower B, Nauroji Nagar,
New Delhi-110029

File No. L-1/268/2022/CERC   Date: 23rd October, 2024

To,
The Chairman & Managing Director
Grid Controller of India Limited (GRID-INDIA)
B-9 (1st Floor), Qutab Institutional Area,
Katwaria Sarai, New Delhi -110016

Subject: NLDC Methodology for computation of Average Monthly Frequency Response Performance, Beta 'β'

Sir,

        Please refer GRID-INDIA's letter no. NLDC/SO/Beta/2024/97 dated 30.07.2024 submitting therewith a draft methodology on the subject mentioned above prepared by GRID-INDIA in compliance with the provisions of the Regulation 62(5) and 65(4) of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024 (Tariff Regulations, 2024) for the approval of the Commission.

2. The Commission has considered the draft methodology. Accordingly, the approved methodology for computation of Average Monthly Frequency Response Performance, Beta 'β' under the provisions of the Regulation 62(5) and 65(4) of the Tariff Regulations, 2024 is enclosed herewith for further necessary action.

                                                     Sd/-
                                          (Harpreet Singh Pruthi)
                                               Secretary

Encl: As above

Grid Controller of India Limited

(formerly Power System Operation Corporation Limited)

National Load Despatch Centre (NLDC)

Methodology
for Computation of
Average Monthly
Frequency Response Performance,
Beta 'β' for Generating Stations

October, 2024

Prepared in compliance with

Regulation 62 Clause 5 and Regulation 65 Clause 4 of

CERC (Terms & Conditions of Tariff) Regulations, 2024

1. **Background:** Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024, as notified on 15th March 2024, came into force on 01st April, 2024. This methodology for computation of Average Monthly Frequency Response Performance, Beta 'β' is in compliance with Regulation 62 Clause 5 and Regulation 65 Clause 4 of CERC (Terms and Conditions of Tariff) Regulations, 2024. The relevant regulations are quoted below:

Quote

CHAPTER – 11 COMPUTATION OF CAPACITY CHARGES AND ENERGY CHARGES

62. Computation and Payment of Capacity Charge for Thermal Generating Stations:

…(5) In addition to the AFC entitlement as computed above, the thermal generating station shall be allowed an incentive of up to 1.00% of AFC approved for a given year, which shall be billed monthly as per the following.

   Incentive = (1.00% x ß x CCy)/12

   Where,

   ß = Average Monthly Frequency Response Performance for that generating station, as certified by RPCs, which shall be computed by considering primary response as per the methodology prescribed by the NLDC with approval of the Commission, and ß shall range between 0 to 1.

   Provided that the incentive shall be payable only if the Beta value is higher than 0.30.

   CCy= Capacity Charges for the Year.

65. Computation and Payment of Capacity Charge and Energy Charge for Hydro Generating Stations:

… (4) In addition to the AFC entitlement as computed above, the hydro generating station shall be allowed an incentive of up to 3% of the Capacity Charge approved for a given year which shall be billed monthly as per the following.

   Incentive = (3% x ß x CCy)/12

   Where,

   ß = Average Monthly Frequency Response Performance for that generating station, as certified by RPCs, which shall be computed by considering primary response as per the methodology prescribed by the NLDC with approval of the Commission and beta shall range between 0 to 1.

   Provided that incentive shall be payable only if Beta value is higher than 0.30.

   CCy= Capacity Charges for the Year.

Unquote

2. **Scope and extent of application:** The scope and extent of application of this methodology shall be as per Regulation 2. (Scope and extent of application) of CERC (Terms and Conditions of Tariff) Regulations, 2024 and amendments thereof.

3. **Definitions and Terms**: The definitions and terms used in this methodology are as per CERC (Indian Electricity Grid Code) Regulations, 2023 and CERC (Terms and Conditions of Tariff) Regulations, 2024 and amendments thereof. For the purposes of this methodology, generating stations refer to those stations whose tariffs are determined by the CERC, irrespective of their control jurisdiction falls under RLDC or SLDC, as specified in Regulation 43 of the CERC (IEGC) Regulations, 2023.

4. **Steps for computation of Average Monthly Frequency Response Performance, Beta 'ß':**

4.1. NLDC shall notify the **reportable event** in accordance with CERC (IEGC) Regulations, 2023.

   a) After every event involving a sudden 1000 MW or more load or generation loss or a step change in frequency by 0.1 Hz, NLDC would get the PMUs frequency data. NLDC would also get the exact quantum of load/generation lost from the RLDC of the affected region. *{Clause 9(a)(i) of Annexure-2 of IEGC, 2023}*

   b) NLDC shall plot the frequency graph and determine the initial frequency, minimum/maximum frequency, settling frequency and time points (points A, C and B). Accordingly, frequency difference points and corresponding time to be used for FRC calculations would be informed to all RLDCs. *{Clause 9(a)(ii) of Annexure-2 of IEGC, 2023}*

4.2. Generating stations shall extract **high resolution data (1 second or better resolution)** of active power generation and frequency, as recorded at the generating station. The generating station shall furnish the extracted high resolution data (1 second or better resolution) to the concerned Load Despatch Centre (hereinafter LDC) within two (2) days of notification of reportable event by NLDC.

   a) The high resolution data to be submitted by the generating stations need to be time-stamped and should have time synchronization with GPS.

   b) The concerned LDC shall review the data furnished by generating stations and seek clarifications, if required. Generating stations shall provide the sought clarifications within two working days.

4.3. Frequency Response Characteristic (FRC) of the generating stations for each reportable event shall be calculated by concerned LDC based on the submitted high resolution data from generating stations, as per NLDC "Methodology for Computation of Primary Frequency Response Obligation and Performance", prepared in compliance with CERC (IEGC) Regulations, 2023.

    a) In case of non-submission of requisite data by generating station within two working days of notification of reportable event by NLDC, FRC shall be calculated based on the Historical Data Recording (HDR) data available at LDCs.

4.4. Frequency Response Obligation (FRO) to be considered for computation of Beta 'ß':

    a) FRO of regional entity generating stations, as assessed by NLDC, as per NLDC "Methodology for Computation of Primary Frequency Response Obligation and Performance", prepared in compliance with CERC (IEGC) Regulations, 2023, shall be considered for computation of Beta by the RLDC.

    b) FRO of generating stations, whose tariff is determined by CERC and are falling under the jurisdiction of SLDCs (in accordance with the control area jurisdiction as per Regulation 43 of CERC (IEGC) Regulations, 2023), as assessed by concerned SLDC shall be considered for computation of Beta by the SLDC.

    Provided that till the methodology for Computation of Primary Frequency Response Obligation and Performance in respect of intra-State entities is notified by the respective State Commission, the FRO of generating stations, whose tariff is determined by CERC and are falling under the jurisdiction of SLDCs (in accordance with the control area jurisdiction as per Regulation 43 of CERC (IEGC) Regulations, 2023) shall be assessed by concerned SLDC in line with this methodology, for computation of Beta.

4.5. Frequency Response Performance (FRP) of the generating stations for each reportable event shall be calculated by concerned LDC, as per NLDC "Methodology for Computation of Primary Frequency Response Obligation and Performance", prepared in compliance with CERC (IEGC) Regulations, 2023.

    a) FRP of generating station for the reportable event = Actual Frequency Response Characteristic (AFRC), as calculated for the reportable event / Frequency Response Obligation (FRO) of the generating station, as applicable on the date of reportable event

$$\text{FRP (Event i)} = \frac{AFRC}{FRO}$$

where, i = the reportable event occurred during the billing month and considered for computation of Beta, 'ß'

b) FRP shall be a numeric value truncated up to two decimal places.

c) FRP of generating stations for each reportable event shall be calculated based on the high resolution data, submitted by generating station and examined by concerned LDC. In case of non-submission of requisite data by generating station within two working days of notification of reportable event by NLDC, FRC and FRP shall be calculated based on the Historical Data Recording (HDR) data available at LDCs.

d) FRC and FRP of a generating station would be calculated only when the generating station (with at least one unit on-bar) was generating during the notified reportable event.

e) The concerned LDC shall share the calculated FRC and FRP values with generating stations after each reportable event, within six (6) working days after the notification of reportable event by NLDC.

4.6. Consideration of Frequency Response Performance for each reportable event, FRP (Event i) as calculated above for the purpose of computation of Average Monthly FRP, Beta 'ß':

a) If FRP for an event is less than or equal to 0, FRP (Event i) shall be equal to 0.

b) If FRP for an event lies between 0 to 1, FRP (Event i) shall be equal to the calculated value.

c) If FRP for an event is greater than or equal to 1, FRP (Event i) shall be equal to 1.

4.7. The concerned LDC shall compute **Average Monthly Frequency Response Performance, Beta 'ß' (truncated up to 2 decimal places)**:

$$\text{Beta 'ß'} = \frac{\text{FRP (Event 1)} + \text{FRP (Event 2)} + \text{FRP (Event 3)} + \cdots\ldots + \text{FRP (Event n)}}{\textit{Number of reportable events considered for computation of Beta}}$$

i.e. $\text{Beta 'ß'} = \dfrac{\sum_{i=1}^{n} FRP\,(Event\,i)}{n}$

where,

- i = the reportable event occurred during the billing month and considered for computation of Beta, 'ß'
- n = the total number of reportable events occurred during the billing month

and are being considered for computation of Beta,

4.8. In case, there was no reportable event which can be considered for the generating station during the billing month, Average Monthly Frequency Response Performance, Beta 'ß' for that particular billing month shall be Zero (0) for that generating station for the month.

4.9. The concerned LDC would furnish Average Monthly Frequency Response Performance, Beta 'ß' computed for a billing month to respective RPC along with all relevant supporting documents latest by 15th day of the following month. The Beta 'ß', furnished by concerned LDCs will be certified and issued by the RPC through publication on its website to make it a part of commercial accounting.

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