

**CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI**

No. L-1/250/2019/CERC

Dated: 12.06.2023

Draft Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) (Third Amendment) Regulations, 2023

Explanatory Memorandum

1.0 Background

1.1 Central Electricity Regulatory Commission vide Notification No. L-1/250/2019/CERC, dated 4.05.2020 notified the Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020 (hereinafter referred to as “Sharing Regulations,2020”) effective from 1.11.2020.

1.2 The Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020, provide the different components of the inter-State transmission charges, which include the following components:

- a. National Component (NC);
- b. Regional Component (RC);
- c. Transformer Component (TC); and
- d. AC System Component (ACC).

Sharing Regulations 2020 provide the transmission charges of HVDCs other than back to back substations as 70% of the charges under the Regional Component and 30% under the National component.

1.3 The High Voltage Direct Current (HVDC) Bipole Transmission system is a cost intensive system and is generally used for long distance and bulk power transmission to facilitate the transmission of electricity from power rich regions to

power deficit regions. Therefore, the transmission charges against the HVDC transmission systems were paid by the concerned regional beneficiaries for which it was planned under the CERC (Sharing of inter-State transmission charges and losses) Regulations 2010 as well as the Sharing regulations,2020.

1.4 However, under the Sharing Regulations, 2020, 30% of the transmission charges of such bulk transfer HVDC transmission systems is considered under the National component considering the Jha Committee Report, which states that HVDC systems having control features provide flexibility and hence more stability to the overall Grid, and that bipole HVDC lines have been strategically planned for not only bulk power transfer but also to enhance the overall operational performance of the grid.

1.5 Further, the Commission in the Statement of Reasons for the Sharing Regulations 2020 mentioned as below:

“12.3.3. HVDC system covered under Regional Component have been planned to cater to requirement of drawl by a particular region. With developments in sector and change in load-generation mix, if need arises to consider the sharing based on bidirectional flow of power, the same shall be dealt with by the Commission at the appropriate time.”

As per above, an HVDC planned for the drawl requirements of a particular region may be considered for different sharing mechanisms based on bidirectional flow of power.

1.6 MoP, vide letter dated 30.05.2022, requested the Commission to consider the transmission charges of HVDC inter-regional links under the National component based on bi-directional power flow.

1.7 With the development of more RE generation in the RE rich states, a change in the pattern of the power flow in the HVDC Bipole Transmission System is being observed during the day hours, specifically during high generation periods. It is being noticed that there is also a power flow in the reverse direction.

- 1.8** Grid-India, vide its letter dated 09.12.2022, also submitted a study report regarding the bi-directional flow of the HVDC Raigarh-Pugalur-Thrissur HVDC Transmission System. Grid-India has stated that there have been significant changes in the pattern of NEW – SR corridor flow with high export from SR during high RE generation periods and that the installed capacity of Renewable Energy sources in the Southern Region has increased from 38620 MW in March 2019 to 46908 MW in March 2022.
- 1.9** The HVDC of the Raigarh-Pugalur Bipole line has been planned for drawl of power by Southern region States to transfer power from the generation rich area of Raigarh in the Western Region to the Southern region. The HVDCs also have some reverse capacity to give reliability support to the grid, and hence, despite the said HVDC being planned to cater to the Southern region, 30% of it was kept under the National component. The Maximum Capacity of HVDC Raigarh – Pugalur in the Forward direction (WR -> SR) and the Reverse Direction (SR -> WR) is 6000 MW and 3000 MW respectively, which implies only 50% capacity is there in the reverse direction as compared to capacity in the forward direction. In any case, including more than 50% of the YTC of the said HVDC in the National component is not appropriate since not more than 50% flow can happen in the reverse direction. Under the National component the charges for said HVDC shall be shared by all beneficiary states of India, such as the Eastern region, the North-eastern region, the Western region and the Northern region apart from the Southern region.
- 1.10** An analysis of the detailed power flow pattern on the Raigarh-Pugalur HVDC line has been done for the period April 2022 to April 2023, and it is noted that the Raigarh-Pugalur Bipole line is capable of carrying 6000 MW of power in the forward direction, i.e. from the surplus Western region to the SR deficit region, to cater to the demand of the SR constituents, however, on the reverse side, i.e. from SR to WR the capability is limited to the extent of 3000 MW only.
- 1.11** The detailed power flow pattern for the period April 2022 to March 2023 is tabulated below, wherein it is observed that there is continuous power flow from the Western region to the Southern Region (forward direction) in the range of 4000

MW-6000 MW which has reached up to 6600 MW in April 2023, while, power is also flowing from the Southern region to the Western region in the range of 0-3000 MW.

Month	Quantum of Power Flow in Fwd. direction (WR to SR) in MW		No. of days/ hours of power flow in fwd. direction	Quantum of Power Flow in rev. direction (SR to WR) in MW		No. of days/ hours of power flow in rev. direction
	Max.	Min.		Max.	Min.	
Apr-22	5628	143	29.58 days	999	307	10 hours
May-22	3287	127	11 days	3006	157	20 days
Jun-22	2408	424	6 days	3005	201	24 days
Jul-22	2880	141	9 days	3001	148	22 days
Aug-22	3001	149	9 days	3002	61	22 days
Sept-22	3509	149	14 days	2883	144	16 days
Oct-22	2001	149	26 days	2402	279	5 days
Nov-22	4500	301	30 days	Nil	Nil	Nil
Dec-22	4414	149	19 days	2878	138	12 days
Jan-23	5505	149	26 days	2401	142	05 days
Feb-23	5008	150	27.8 days	577	281	04 hours
Mar-23	6137	151	30.40 days	1444	138	14 hours
Apr-23	6600	600	30 days	Nil	Nil	Nil

1.12 From the above table, it is observed that, during the months May 2022 to September 2022, there was a considerably high order of power flow in the reverse direction (from the Southern Region to the Western Region). However, as the demand increases in the Southern Region from November 2022 onwards, there is a continuous high order of forward direction power flow (from the Western to the Southern region). This indicates that the Raigarh-HVDC Bipole line is very critical for meeting the demands of SR constituents.

1.13 With the integration of additional renewable generation in the Southern Region, Western Region, and Northern Region, the HVDC Bipole Lines will play an important role in the flow of renewable power in other parts of the country by providing flexibility in power flow, both quantum and direction, under various scenarios of load-generation balance.

1.14 As discussed in the above paragraphs, a similar type of power flow pattern may be seen in other HVDC Bipole lines where there is power flow in both directions. In this regard, it is pertinent to mention here that all the HVDC Bipole lines are generally planned for the transfer of power to the power deficit region, but 30% of its tariff is already considered under the National Component as per the existing Sharing Regulations 2020, irrespective of utilization in the reverse direction, as they provide flexibility and stability to the grid.

1.15 However, considering that there is also power flow in the reverse direction in some HVDCs, which may vary based on the nature of use, it is desirable that the sharing of the transmission charges under the National Component should be linked to the nature and quantum of power flow in the reverse direction.

1.16 Accordingly, the following provision is proposed to be inserted under sub-clause (a) of Clause (1) of Regulation 6 of the Principal regulations:

“Provided that where an interregional HVDC transmission system planned to supply power to a particular region is operated to carry power in reverse direction due to system requirements, the percentage Yearly Transmission Charges of such transmission system to be considered in the regional component and the National component shall be calculated as follows:

HVDCr (in %) =

$$\frac{\sum_{k=1}^n \text{Maximum power flow in reverse direction (in MW) in any timeblock on } k\text{th day} \times 100}{\text{Capacity of HVDC transmission system in forward direction (MW)} \times \text{number of days in a month}}$$

Where k, is a day of a month with total ‘n’ days

where HVDCr >30%, the Yearly Transmission charges corresponding to HVDCr shall be considered in the National component and the balance in the regional component.

where HVDCr is ≤ 30%, 30% of Yearly Transmission Charges shall be considered in the National component and 70% in the Regional component.”

2.1 Consequential changes are also proposed in the other Regulations.
