**Amendment – XIV dated 29.10.2020 on the Request for Proposal and Transmission Service Agreement issued for selection of bidder as Transmission Service Provider to establish "Transmission System Strengthening Scheme for Evacuation of power from Solar Energy Zones in Rajasthan (8.1 GW) under Phase II (Part C)" through tariff based competitive bidding process**

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| | | Bus Reactor & Line Reactor)<br><br>Future Provision Space for-<br>765/400kV ICT along with bays-2<br>765kV line bays along with switchable line reactors- 10<br>400kV line bays along with switchable line reactor- 6<br>400kV bus reactor- 2 | Bus Reactor & Line Reactor)<br><br>Future Provision Space for-<br>765/400kV ICT along with bays-2<br>765kV line bays along with switchable line reactors- 10<br>400kV line bays along with switchable line reactor- 6<br>400kV bus reactor- 2 |
| | | 2. Bhadla-II PS – Sikar-II 765kV D/c line | 2. Bhadla-II PS – Sikar-II 765kV D/c line |
| | | 3. 2 no. of 765 kV line bays at Bhadla- II for Bhadla-II PS – Sikar-II 765kV D/c line<br>-765 kV line bays –2 | 3. 2 no. of 765 kV line bays at Bhadla- II for Bhadla-II PS – Sikar-II 765kV D/c line<br>-765 kV line bays –2 |
| | | 4. 1x330 MVAr switchable line reactor for each circuit at Sikar-II end of Bhadla-II PS – Sikar-II 765kV D/c line.<br>-330MVAr, 765 kV reactor- 2<br>-Switching equipment for 765 kV reactor – 2 | 4. 1x330 MVAr switchable line reactor for each circuit at Sikar-II end of Bhadla-II PS – Sikar-II 765kV D/c line.<br>-330MVAr, 765 kV reactor- 2<br>-Switching equipment for 765 kV reactor – 2 |
| | | 5. 1x240MVAr switchable line reactor for each circuit at Bhadla-II end of Bhadla-II PS – Sikar-II 765kV D/c line<br>-240 MVAr, 765 kV reactor-2<br>-Switching equipment for 765 kV reactor - 2 | 5. 1x240MVAr switchable line reactor for each circuit at Bhadla-II end of Bhadla-II PS – Sikar-II 765kV D/c line<br>-240 MVAr, 765 kV reactor-2<br>-Switching equipment for 765 kV reactor - 2 |
| | | 6. Sikar-II – Neemrana 400kV D/c line (Twin HTLS*) | 6. Sikar-II – Neemrana 400kV D/c line (Twin HTLS*) |
| | | 7. 2 no. of 400 kV line bays at Neemrana for Sikar-II – Neemrana 400kV D/c line (Twin HTLS*)<br>– 400 kV line bays - 2 | 7. 2 no. of 400 kV line bays at Neemrana for Sikar-II – Neemrana 400kV D/c line (Twin HTLS*)<br>– 400 kV line bays - 2 |
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| Sl. No. | Clause No. | Existing Clause | New / Revised Clause |
|---|---|---|---|
| | | **Note:**<br><br>i. POWERGRID to provide space for 2 no of 765 kV bays at Bhadla-II and space for 2 no of switchable line reactors at Bhadla-II substation.<br><br>ii. POWERGRID to provide space for 2 no of 400 kV bays at Neemrana.<br><br>iii. TSP shall install the 765kV Line Reactor banks at Bhadla II PS under each of the schemes (Part-B, Part-C and Part-E) and all the associated equipment required for switching arrangement viz isolators, circuit breakers, 765kV & 145kV (neutral) auxiliary buses etc., so that spare 1-ph unit, whenever provided in future, is able to replace any of the faulty unit without its physical movement. Respective TSP shall provide the equipment/facilities at Bhadla II PS such that only supply & installation of 1x80 MVAR spare unit of Reactor, associated LA, 1-Ph Circuit Breaker and extension of 765kV & 145kV buses will be required for completion of switching arrangement in future.<br><br>iv. The spare unit of 765kV, 1x110 MVAR Reactor being provided at Sikar-II PS under 'Transmission system strengthening for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part C' shall be utilized as common spare for 6x110 MVAR Switchable Line Reactors to be provided at Sikar-II PS each under 'Transmission system strengthening for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part D' and 'Transmission system strengthening for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part E'.<br>v. TSP to keep space provision for 1 no. Transfer Bus coupler bay & 1 no. Bus Coupler bay at 220kV level at Sikar-II S/s. | **Note:**<br><br>i. POWERGRID to provide space for 2 no of 765 kV bays at Bhadla-II and space for 2 no of switchable line reactors at Bhadla-II substation.<br><br>ii. POWERGRID to provide space for 2 no of 400 kV bays at Neemrana.<br><br>iii. TSP shall install the 765kV Line Reactor banks at Bhadla II PS under each of the schemes (Part-B, Part-C and Part-E) and all the associated equipment required for switching arrangement viz isolators, circuit breakers, 765kV & 145kV (neutral) auxiliary buses etc., so that spare 1-ph unit, whenever provided in future, is able to replace any of the faulty unit without its physical movement. Respective TSP shall provide the equipment/facilities at Bhadla II PS such that only supply & installation of 1x80 MVAR spare unit of Reactor, associated LA, 1-Ph Circuit Breaker and extension of 765kV & 145kV buses will be required for completion of switching arrangement in future.<br><br>iv. The spare unit of 765kV, 1x110 MVAR Reactor being provided at Sikar-II PS under 'Transmission system strengthening for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part C' shall be utilized as common spare for 6x110 MVAR Switchable Line Reactors to be provided at Sikar-II PS each under 'Transmission system strengthening for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part D' and 'Transmission system strengthening for evacuation of power from solar energy zones in Rajasthan (8.1 GW) under Phase II –Part E'. |

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**Existing Clause**

| | | | | | |
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| | 400kV (1x125 MVAR) and 765 kV (2x330 MVAr) bus reactor. | | | commissioned simultaneously as their utilization is dependent on commissioning of each other. | |
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| 7. | 2 no. of 400 kV line bays at Neemrana for Sikar-II – Neemrana 400kV D/c line | | | | |

**New / Revised Clause**

| | | | | | |
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| | 400kV (1x125 MVAR) and 765 kV (2x330 MVAr) bus reactor. | | | commissioned simultaneously as their utilization is dependent on commissioning of each other. | |
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<tr><td></td><td>Neutral bushing</td><td>mm</td><td>3625</td></tr>
</table>
……
</td><td>
2.3 420 kV, 3-Phase Shunt reactor<br>……..
<table>
<tr><th>Sl. No.</th><th>Description</th><th>Unit</th><th>Technical Parameters</th></tr>
<tr><td>23 vi)</td><td>Minimum creepage distance</td><td></td><td>(Specific Creepage Distance: of 31mm/kV corresponding to highest line to line voltage)</td></tr>
<tr><td></td><td>Line bushing</td><td>mm</td><td>13020</td></tr>
<tr><td></td><td>Neutral bushing</td><td>mm</td><td>4495</td></tr>
</table>
……
</td></tr>
<tr><td>8.</td><td>Contents Table of TSA</td><td>Schedule: 9 Appendix III to V of Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014</td><td>Schedule: 9 <u>Appendix II & III of Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2019</u></td></tr>
<tr><td>9.</td><td>Article:1 of TSA Definition</td><td>“Availability” in relation to the Project or in relation to any Element of the Project, for a given period shall mean the time in hours during that period the Project is capable to transmit electricity at its Rated Voltage and shall be expressed in percentage of total hours in the given period and shall be calculated as per the procedure contained in <u>Appendix –III to Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014</u> attached herewith in Schedule 9;</td><td>“Availability” in relation to the Project or in relation to any Element of the Project, for a given period shall mean the time in hours during that period the Project is capable to transmit electricity at its Rated Voltage and shall be expressed in percentage of total hours in the given period and shall be calculated as per the procedure contained in <u>Appendix –II to Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2019</u> attached herewith in Schedule 9;</td></tr>
</table>

| Sl. No. | Clause No. | Existing Clause | New / Revised Clause |
|---|---|---|---|
| 10. | **Article:8 of TSA Availability** | 8.1<br>Calculation of Availability for the Elements and for the Project, as the case may be, shall be as per **Appendix III of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014**, as applicable seven (7) days prior to the Bid Deadline and as appended in Schedule 9 | 8.1<br>Calculation of Availability for the Elements and for the Project, as the case may be, shall be as per **Appendix –II of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2019**, as applicable seven (7) days prior to the Bid Deadline and as appended in Schedule 9 |
| 11. | **Article:11 of TSA Force Majeure** | **11.7 Available Relief for a Force Majeure Event**<br>**a…….**<br>**b……..**<br>**c.** For the avoidance of doubt, it is clarified that the computation of Availability of the Element(s) under outage due to Force Majeure Event, as per Article 11.3 affecting the TSP shall be as per **Appendix III to the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations 2014,** as on seven (7) days prior to the Bid Deadline. For the event(s) for which the Element(s) is/are deemed to be available as per **Appendix III to the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations 2014,** then only the Non Escalable Transmission Charges, as applicable to such Element(s) in the relevant Contract Year, shall be paid by the Long Term Transmission Customers as per Schedule 5, for the duration of such event(s). | **11.7 Available Relief for a Force Majeure Event**<br>**a…….**<br>**b……..**<br>**c.** For the avoidance of doubt, it is clarified that the computation of Availability of the Element(s) under outage due to Force Majeure Event, as per Article 11.3 affecting the TSP shall be as per **Appendix II to the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations 2019**, as on seven (7) days prior to the Bid Deadline. For the event(s) for which the Element(s) is/are deemed to be available as per **Appendix II to the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations 2019,** then only the Non Escalable Transmission Charges, as applicable to such Element(s) in the relevant Contract Year, shall be paid by the Long Term Transmission Customers as per Schedule 5, for the duration of such event(s). |
| 12. | **Schedule:5 of TSA Computation of Transmission Charges** | **1.1 g)**<br>The Availability shall be calculated as per the procedure specified in **Appendix III of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014** as notified by CERC and as attached herewith. | **1.1 g)**<br>The Availability shall be calculated as per the procedure specified in **Appendix II of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations 2019** as notified by CERC and as attached herewith. |

| Sl. No. | Clause No. | Existing Clause | New / Revised Clause |
|---|---|---|---|
| 13. | **Schedule:9 of TSA** | **Appendix III of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014** | **Appendix II of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations 2019 as Attached at Annex-A herewith.** |

**Annex-A**

**Appendix II of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations 2019**

**Procedure for Calculation of Transmission System Availability Factor for a Month**

1. Transmission system availability factor for nth calendar month ("TAFPn") shall be calculated by the respective transmission licensee, got verified by the concerned Regional Load Dispatch Centre (RLDC) and certified by the Member-Secretary, Regional Power Committee of the region concerned, separately for each AC and HVDC transmission system and grouped according to sharing of transmission charges. In case of AC system, transmission System Availability shall be calculated separately for each Regional Transmission System and inter-regional transmission system. In case of HVDC system, transmission System Availability shall be calculated on consolidate basis for all inter-state HVDC system.

2. Transmission system availability factor for nth calendar month ("TAFPn") shall be calculated by consider following:

   i) **AC transmission lines:** Each circuit of AC transmission line shall be considered as one element;
   ii) **Inter-Connecting Transformers (ICTs):** Each ICT bank (three single phase transformer together) shall form one element;
   iii) **Static VAR Compensator (SVC):** SVC along with SVC transformer shall form one element;
   iv) **Bus Reactors or Switchable line reactors:** Each Bus Reactors or Switchable line reactors shall be considered as one element;
   v) **HVDC Bi-pole links:** Each pole of HVDC link along with associated equipment at both ends shall be considered as one element;
   vi) **HVDC back-to-back station:** Each block of HVDC back-to-back station shall be considered as one element. If associated AC line (necessary for transfer of inter-regional power through HVDC back-to-back station) is not available, the HVDC back-to-back station block shall also be considered as unavailable;
   vii) **Static Synchronous Compensation ("STATCOM"):** Each STATCOM shall be considered as separate element.

3. The Availability of AC and HVDC portion of Transmission system shall be calculated by considering each category of transmission elements as under:

**TAFMn (in %) for AC system:**

$$= \frac{o \text{ X } AVo)+(p \text{ X } AVp) + (q \text{ X } AVq) + (r \text{ X } AVr)+(u \text{ X } AVu)}{(o + p + q + r+u)} \text{x}100$$

Where,

| | | |
|---|---|---|
| o | = | Total number of AC lines. |
| AVo | = | Availability of o number of AC lines. |
| p | = | Total number of bus reactors/switchable line reactors |
| AVp | = | Availability of p number of bus reactors/switchable line reactors |
| q | = | Total number of ICTs. |
| AVq | = | Availability of q number of ICTs. |
| r | = | Total number of SVCs. |
| AVr | = | Availability of r number of SVCs |
| u | = | Total number of STATCOM. |
| AVu | = | Availability of u number of STATCOMs |

**TAFMn (in %) for HVDC System:**

$$= \frac{\sum_{x=1}^{s} Cxbp(act) \text{ X } AVxbp + \sum_{y=1}^{t} Cy(act)btb \text{ X } AVybtb}{\sum_{x=1}^{s} Cxbp + \sum_{y=1}^{t} Cybtb} \text{ x } 100$$

Where

| | | |
|---|---|---|
| Cxbp(act) | = | Total actual operated capacity of $x^{th}$ HVDC pole |
| Cxbp | = | Total rated capacity of $x^{th}$ HVDC pole |

| | | |
|---|---|---|
| AVxbp | = | Availability of $x^{th}$ HVDC pole |
| Cybtb(act) | = | Total actual operated capacity of $y^{th}$ HVDC back-to-back station block |
| Cybtb | = | Total rated capacity of $y^{th}$ HVDC back-to-back station block |
| AVybtb | = | Availability of $y^{th}$ HVDC back-to-back station block |
| s | = | Total no of HVDC poles |
| t | = | Total no of HVDC Back to Back blocks |

3. The availability for each category of transmission elements shall be calculated based on the weightage factor, total hours under consideration and non-available hours for each element of that category. The formulae for calculation of Availability of each category of the transmission elements are as per **Appendix-III**. The weightage factor for each category of transmission elements shall be considered asunder:

(a) For each circuit of AC line – Number of sub-conductors in the line multiplied by ckt-km;
(b) For each HVDC pole- The rated MW capacity x ckt-km;
(c) For each ICT bank – The rated MVA capacity;
(d) For SVC- The rated MVAR capacity (inductive and capacitive);
(e) For Bus Reactor/switchable line reactors – The rated MVAR capacity;
(f) For HVDC back-to-back station connecting two Regional grids- Rated MW capacity of each block; and
(g) For STATCOM – Total rated MVAR Capacity.

4. The transmission elements under outage due to following reasons shall be deemed to be available:

i. Shut down availed for maintenance of another transmission scheme or construction of new element or renovation/upgradation/additional capitalization in existing system approved by the Commission. If the other transmission scheme belongs to the transmission licensee, the Member Secretary, RPC may restrict the deemed availability period to that considered reasonable by him for the work involved. In case of dispute regarding deemed availability, the matter may be referred to Chairperson, CEA within 30 days.

ii. Switching off of a transmission line to restrict over voltage and manual tripping of switched reactors as per the directions of concerned RLDC.

5. For the following contingencies, outage period of transmission elements, as certified by the Member Secretary, RPC, shall be excluded from the total time of the element under period of consideration for the following contingencies:

i) Outage of elements due to acts of God and force majeure events beyond the control of the transmission licensee. However, whether the same outage is due to force majeure (not design failure) will be verified by the Member Secretary, RPC.A reasonable restoration time for the element shall be considered by Member Secretary, RPC and any additional time taken by the transmission licensee for restoration of the element beyond the reasonable time shall be treated as outage time attributable to the transmission licensee. Member Secretary, RPC may consult the transmission licensee or any expert for estimation of reasonable restoration time. Circuits restored through ERS (Emergency Restoration System) shall be considered as available;

ii) Outage caused by grid incident/disturbance not attributable to the transmission licensee, e.g. faults in substation or bays owned by other agency causing outage of the transmission licensee's elements, and tripping of lines, ICTs, HVDC, etc. due to grid disturbance. However, if the element is not restored on receipt of direction from RLDC while normalizing the system following grid incident/disturbance within reasonable time, the element will be considered not available for the period of outage after issuance of RLDC's direction for restoration;

Provided that in case of any disagreement with the transmission licensee regarding reason for outage, same may be referred to Chairperson, CEA within 30 days. The above need to be resolved within two months:

Provided further that where there is a difficulty or delay beyond sixty days, from the incidence in finalizing the recommendation, the Member Secretary of concerned RPC shall allow the outage hours on provisional basis till the final view.

6. Time frame for certification of transmission system availability: (1) Following schedule shall be followed for certification of availability by Member Secretary of concerned RPC:

- Submission of outage data by Transmission Licensees to RLDC/ constituents
  - By 5th of the following month;
- Review of the outage data by RLDC / constituents and forward the same to respective RPC – by 20th of the month;
- Issue of availability certificate by respective RPC – by 3rd of the next month.

## Appendix-III

## FORMULAE FOR CALCULATION OF AVAILABILITY OF EACH CATEGORY OF TRANSMISSION ELEMENTS

**For AC transmission system**

AVo(Availability of o no. of AC lines) = $\frac{\sum_{i=1}^{o} Wi(Ti - TNAi)/Ti}{\sum_{i=1}^{o} Wi}$

AVq(Availability of q no. of ICTs) = $\frac{\sum_{k=1}^{q} Wk(Tk - TNAk)/Tk}{\sum_{k=1}^{q} Wk}$

AVr(Availability of r no. of SVCs) = $\frac{\sum_{l=1}^{r} Wl(Tl - TNAl)/Tl}{\sum_{l=1}^{r} Wl}$

AVp(Availability of p no. of Switched Bus reactors) = $\frac{\sum_{m=1}^{p} Wm(Tm - TNAm)/Tm}{\sum_{m=1}^{p} Wm}$

AVu(Availability of u no. of STATCOMs) = $\frac{\sum_{n=1}^{u} Wn(Tn - TNAn)/Tn}{\sum_{n=1}^{u} Wn}$

$AV_{xbp}$(Availability of an individual HVDC pole) = $\frac{(Tx - TN\ \ )}{Tx}$

$AV_{ybtb}$ (Availability of an individualHVDC Back-to-back Blocks) = $\frac{(Ty - TNAy)}{Ty}$

**For HVDC transmission system**

For the new HVDC commissioned but not completed twelve months;

For first 12 months: [($AV_{xbp}$ or $AV_{ybtb}$)x95%/85%], subject to ceiling of 95%.

Where,

| | | |
|---|---|---|
| o | = | Total number of AC lines; |
| AVo | = | Availability of o number of AC lines; |
| p | = | Total number of bus reactors/switchable line reactors; |
| AVp | = | Availability of p number of bus reactors/switchable line reactors; |
| q | = | Total number of ICTs; |
| AVq | = | Availability of q number of ICTs; |
| r | = | Total number of SVCs; |
| AVr | = | Availability of r number of SVCs;. |
| U | = | Total number of STATCOM; |

| | | |
|---|---|---|
| AVu | = | Availability of u number of STATCOMs; |
| W*i* | = | Weightage factor for *i*th transmission line; |
| W*k* | = | Weightage factor for *k*th ICT; |
| W*l* | = | Weightage factors for inductive & capacitive operation of *l*th SVC; |
| Wm | = | Weightage factor for mth bus reactor; |
| Wn | = | Weightage factor for nth STATCOM. |

| | |
|---|---|
| T*i*, , T*k*, T*l*, , - T*m*, T*n*, *Tx*, *Ty* | The total hours of i$^{th}$ AC line, k$^{th}$ ICT, l$^{th}$ SVC, *m*$^{th}$ Switched Bus Reactor & n$^{th}$ STATCOM, x$^{th}$ HVDC pole, y$^{th}$ HVDC back-to-back blocks during the period under consideration (excluding time period for outages not attributable to transmission licensee for reasons given in Para 5of the procedure) |
| $T_{NA}i$ , $T_{NA}k$ - $T_{NA}l$, $T_{NA}m$, $T_{NA}n$, $T_{NAx,}$ $T_{NA}y$ | The non-availability hours (excluding the time period for outages not attributable to transmission licensee taken as deemed availability as per Para 5 of the procedure) for i$^{th}$ AC line, *k*$^{th}$ ICT, l$^{th}$ SVC , *m*$^{th}$ Switched Bus Reactor, n$^{th}$ STATCOM, x$^{th}$ HVDC pole and y$^{th}$HVDC back-to-back block . |