भारत सरकार/ **Government of India**
विद्युत मंत्रालय/ **Ministry of Power**
केन्द्रीय विद्युत प्राधिकरण/ **Central Electricity Authority**
ग्रिड प्रबंधन प्रभाग/ **Grid Management Division**
****

सं.: 12/एक्स/एस.टी.डी.(सी.ओ.एन.एन)/जी.एम./2023/814 दिनांक: 27.09.2023

विषय: दिनांक 29.08.2023 (मंगलवार) को अपराह्न 03:00 बजे आरई कॉम्प्लेक्स में आईएसटीएस में नए स्टेटकॉम के परिचालन संबंधित मुद्दों पर चर्चा करने के लिए आयोजित बैठक का कार्यवृत्त।

Subject: Minutes of Meeting held on 29.08.2023 (Tuesday) at 03:00 PM to discuss operational Issues w.r.t. new STATCOMs at ISTS in RE complexes – reg.

दिनांक 29.08.2023 को अपराह्न 03:00 बजे आयोजित बैठक के कार्यवृत्त आपकी जानकारी एवं आवश्यक कार्यवाही हेतु संलग्न है। **यह पत्र सक्षम अधिकारी द्वारा अनुमोदित है।**

Please find enclosed the minutes of the meeting held on 29.08.2023 at 03:00 PM. It is issued on approval of Competent Authority.

संलग्नक: यथोपरि।

चन्द्र 27/9/2023
(चन्द्र प्रकाश)
(मुख्य अभियन्ता)

बैठक के सभी प्रतिभागियों को ई-मेल द्वारा प्रेषित।

Minutes of Meeting held on 29.08.2023 (Tuesday) at 03:00 PM to discuss operational issues w.r.t. new STATCOMs at ISTS in RE complexes – reg.

A meeting was held on 29.08.2023 (Tuesday) at 03.00 P.M. with the participants from GRID India, Central Transmission Utility of India Limited (CTUIL), Power Grid Corporation of India Ltd. (PGCIL) and STATCOM OEMs to discuss operational Issues w.r.t. features for the proposed STATCOMs at ISTS in RE complexes. The list of the participants is enclosed at **Annexure-I**.

2. Chief Engineer (GM), CEA stated that in the last meeting held on 12.06.2023, the issues pertaining to installed STATCOMs were flagged by Grid-India and CTUIL and it was directed by Member (GO&D), CEA that a group comprising representative from CEA, CTU, GRID-India, POWERGRID and OEMs may be formed to examine these issues and propose the necessary changes required in RfP or regulations for future STATCOMs. Accordingly, this meeting has been called to discuss the issues with OEMs and suggest changes in specification for Future STATCOMs proposed to be installed in the ISTS sub-station having predominant loads and at those ISTS sub-stations where RE complexes are located. In this regard, the requirements for future STATCOMs as provided by GRID-India and CTUIL were already shared with OEMs. He then asked the OEMs to present their views on the requirements w.r.t future STATCOMs.

3. Executive Director, Power Grid stated that the STATCOMs to be installed at ISTS substations where RE complexes are located have to be in line with the LVRT and HVRT provisions under the CEA (Technical Standards for Connectivity to the Grid) Regulations. He proposed two sets of recommendation for the future STATCOMs i.e., (i) ISTS sub-stations having pre-dominant loads (ii) ISTS substations for the connectivity of the RE complexes.

4. The requirements of the GRID – India and the comments of the OEMs are compiled at **Annexure-II.**

5. After the deliberations on each issues flagged by Grid-India and CTUIL with OEMs, it was decided that the recommendations for technical parameters of the proposed STATCOMs shall be prepared and shared for suitably incorporation the RfP.

6. Subsequent to the meeting, additional inputs/ suggestions were shared by CTUIL which are attached at **Annexure-III.** It is requested that the inputs on the same may be provided by the OEMs at the earliest. As M/s Siemens is yet to provide the inputs on the issues discussed in the meeting, it is once again requested that the same may be provided urgently to CEA for incorporation in the recommendations by this Committee.

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Annexure-I

List of participants in the meeting on 29/08/2023 at 03:00 PM

Central Electricity Authority (CEA)

1. Sh. Ramesh Kumar, Chief Engineer (PSETD)
2. Sh. Chandra Prakash, Chief Engineer (Grid Management)
3. Sh. Himalaya Shubham, Deputy Director (Grid Management)
4. Sh. Sandeep Kumar, Deputy Director (Grid Management)
5. Sh. Dhruv Kawat, Assistant Director (Grid Management)

Grid-India

1. Sh. Vivek Pandey, GM
2. Sh. Priyam Jain, Manager

Central Transmission Utility of India Limited (CTUIL)

1. Sh. V. Thiagarajan, Sr. GM
2. Sh. Ajay Kumar, Asstt. Manager

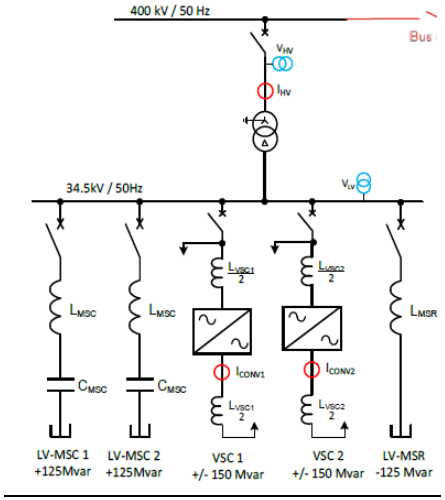
POWERGRID

1. Sh. Subir Sen, ED
2. Sh. M. Thurumala Reddy, CGM
3. Sh. M.S. Hada, Sr. DGM
4. Sh. Gautam Sharma, DGM
5. Sh. K. Deepak, Manager

Representative from STATCOM OEMs

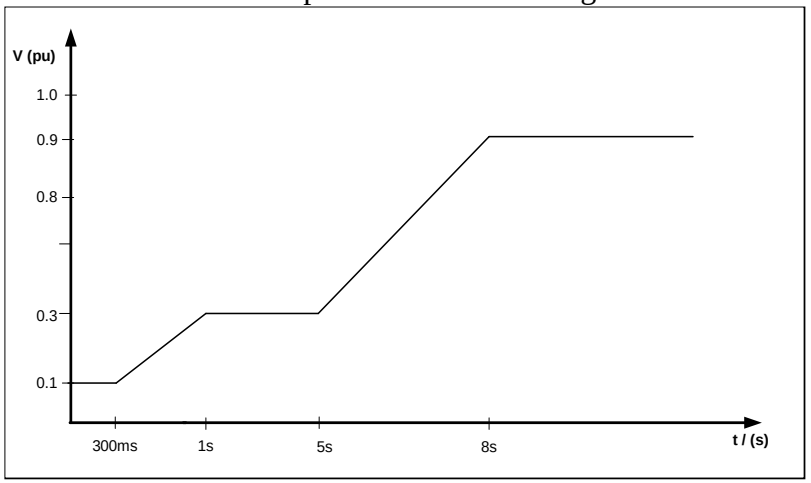
1. Siemens Ltd
2. Hitachi-Energy India Ltd
3. Hyosung

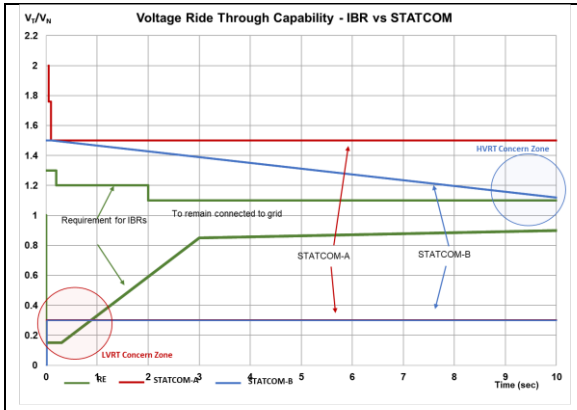
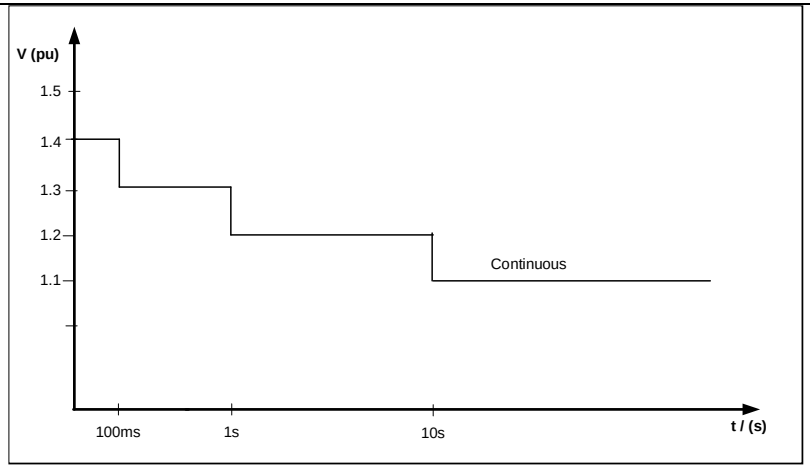
Annexure -II

Requirements w.r.t to Future STATCOMs shared by GRID-India and CTUIL	Comments of OEMs
Sizing of STATCOM and redundancy in Coupling Transformer: **GRID–India**: - STATCOM sizing is an important aspect in view of managing the voltage changes in steady state as well as transient conditions. At present, the STATCOMs are being installed with MSC and MSR units. The requirement of providing MSC and MSR vis-à-vis complete dynamic capacity needs to be analyzed especially in RE complexes where the requirement is mainly of dynamic reactive power support.  ***Figure 1: STATCOM Components and SLD*** Further, the dynamic capacity of STATCOM is being provided in modular units, i.e. 02 units of +/-150 MVAR are being installed to meet the approved requirement of +/- 300 MVAR. Though the modular units increase the reliability to some extent (as outage of one unit would not lead to loss of complete dynamic capacity), there might be possibility of controller interactions between	**Hitachi Energy:** - Instead of writing "N-1" criteria for transfomer spare which might mis-lead in interpreting the requirement, it is suggested to clearly specify the number of spare power transformers required per STATCOM station or per site. Further it should also be clearly mentioned, How the spare transformer change over should happen replacing the faulty one (autochange over with disconnectors or manual change over). Should the spare tranformer be cold-standby or Hot stand-by. Further w.r.t to sizing of STATCOM, it submitted that due to advancement in semiconductor technology, we have IGBT cells of higher rating which are being used in the global market. In order to avoid the issues with complex control system (Master/Save) with multiple VSC branches of smaller size, it is suggested to adopt the single VSC branch of higher rating (i.e., Ex: Use single 300 MVAr branch instead of 2X150 or 4X75 MVAr) **Hyosung: -** Regarding redundancy in coupling transformer, as Hitchi mentioned that the requirement of spare power transformers needs to be incorporated in the RfP document. Further, it should also be clearly mentioned whether the spare transformer changeover would be autochange over with disconnectors or manual change over. Regarding Sizing of STATCOM, Hysoung can provide maximum 300 MVAr capacity STATCOM as a single unit however is its more than 300MVAr, then it will be provided in modular units. Similar practice is being followed in other countries and its working satisfactorily. There will be no co-ordination issues even in multiple branches of VSC as there are some countries where we have supplied even 4 and 7

these modular units. Proper tuning needs to be examined in detail through requisite studies in case of segmentation of the STATCOM capacity in smaller units. The installation of whole dynamic capacity of STATCOM as a single unit or through multiple units of smaller capacities (after requisite studies) may be brought out clearly in the transmission scheme during the planning stage. Same may also be clearly specified in the RfP documents so as to avoid any surprises at the time of commissioning. The STATCOMs are being provided with only one coupling transformer. This means that in case of any prolonged outage of coupling transformer, the complete STATCOM unit would remain out of service. The STATCOM at Lucknow PG remained under long outage from 10-07-2019 to 28-10-2019 due to failure of coupling transformer. Therefore, in order to enhance the resiliency, N-1 criteria may be made applicable to coupling transformer also. **CTUIL: -** In the new RfPs, TSPs are being given option to implement vide multiple or single units or even inbuild the entire range including MSRs and MSCs in a full dynamic range. Splitting into multiple units may offer redundancy but proper coordination through controller interaction needs to be ensured to operate as a single unit. Incorporation of the entire range including MSRs and MSCs in the dynamic range needs further deliberations.	branches. The requirement regarding the need for multiple branches need to be specified in RfP document (Technical specifications).
MSC/MSR switching logic: The STATCOMs commissioned in India are designed to follow one of the 02 philosophies for switching of MSC/MSRs (Mechanically Switched Capacitors and Reactors). Under the 1st philosophy, switching of MSC/MSR is based on value of external bus voltage and while the second philosophy is based on value of STATCOM VSC current. The 10 no. STATCOMs commissioned in NR (except 02 nos. at Bhadla-II), WR and SR follow voltage-based switching while 04	**Hitachi Energy:** - It is suggested to adopt the switching methodology as detailed in IEEE 1052. Irrespective of VSC current based switching or reference voltage based switching logic, it is recommended to provide the operation/switching philosophy of the MSC/MSR/VSC branches in the specification mentioning the features required i.e, Option to operate MSC/MSR independently, the current levels and time delay threshold levels should be able to edit from Human-Machine Interface (HMI).

STATCOMs in Eastern Region and 02 nos. at Bhadla-II follow VSC current based switching logic. The availability of dynamic reactive reserves is critical for voltage stability as well as for effective fault ride through in the with low grid strength RE complex. In view of this, several STATCOMs are being planned to provide the necessary dynamic reactive power support during transients. In this regard, the external voltage-based switching logic of MSC/MSR provides the necessary flexibility for maintaining the maximum availability of dynamic reserves for handling contingencies. However, the current based switching makes the operation of MSC/MSRs dependent on the VSC current. In this type of arrangement, MSC/MSRs can't be operated as an independent element. The fixed compensation (MSC/MSR), therefore, cannot be used unless a part of the dynamic reactive reserve is first used; though after switching in of the MSR/MSC, corresponding dynamic reserves get automatically accumulated in the VSC. This logic constrains the availability of dynamic component. It is therefore desirable that the operation of MSC/MSR is delinked with the VSC output so as to preserve the dynamic part and provide the necessary flexibility during real-time operations. In addition, the current switching and time delay threshold values (for switch in and out of MSC/MSR) are also not configurable in the current based switching mode. This makes the coordination of settings highly complex and inflexible. The following points may, therefore, be suitably included in the RfP/Technical Specification of upcoming STATCOMs so as to ensure that the STATCOM operation and control is in line with the requirement of the grid: a) Considering the flexibility provided in operations by external voltage-based switching logic of MSC and MSR, this logic may be preferred and specified for upcoming STATCOMs. MSR, MSC and STATCOM shall be able to operate in independent mode also. Further,	**Hyosung: -** In our previous projects, we had voltage based switching however both options are available, i.e. current based switching as well as voltage based switching and these can be provided as per customer requirement.

the switch in/out voltage and time delay settings of MSC/MSR shall be kept configurable in a large range (0.1 sec to 30 sec). b) It may also be specified that rest time of MSC and MSR shall be optimized (reduced) to handle successive faults in short duration. c) MSC/MSR are slow control static devices. Therefore, in future the provision of providing STATCOMs with MSC/MSR vis-à-vis STATCOMs with only dynamic component (with configurable dead band and droop settings) may be reviewed.	
LVRT threshold values of STATCOMs The LVRT clause in the CEA Connectivity Standards categorically specifies that the RE plant shall remain connected to the grid up to a certain time (as per standard LVRT characteristics) if the voltage at the interconnection point remains above 0.15 p.u. From system reliability point of view, it is desirable that the STATCOMs envisaged in RE complex remain connected even when voltages dip up to 0.15 p.u. at the HV side of the coupling transformer and provides the necessary dynamic support during faults/voltage dip events in the vicinity of RE plants. This necessitates that the LVRT thresholds of STATCOMs are more robust (Lower voltage and higher time delay) than the thresholds mandated for RE plants in CEA technical standards for connectivity. However, it has been observed that the STATCOMs commissioned/under commissioning stage in Indian power system have their LVRT threshold in the range of 0.3-0.35 p.u. i.e. if the primary line-to-earth or line-to-line voltage drops below the voltage level of 0.3 p.u., the STATCOM output will be set to zero instantaneously. The low voltage ride through capability of RE v/s some of the STATCOMs commissioned in Indian power system are shown in figure-2 below:	**Hitachi:** At low voltages, it is not possible to provide rated reactive power capability. Instead the available current/reactive power capability can be met. The indicative curve is presented below in Fig 3: -  Fig. 3 The temporary overvoltage cycle shall be specified as a curve as the text description might lead to mis-interpretation. A typical TOV cycle is presented below in Figure 4,

 ***Figure 2: Voltage Ride Through: IBR v/s STATCOM*** In view of above, it is suggested that this aspect regarding STATCOM LVRT settings may be suitably addressed in the RfP/Technical Specification of upcoming STATCOMs.	 Fig 4 **Hysoung:-** The requirement regarding the LVRT requirements for voltages mentioned are possible to provide and can be met.
HVRT threshold values of STATCOMs The STATCOMs being installed in RE complexes shall be capable to operate on continuous basis at least up to 1.1 pu voltage (HV side), which is also the high voltage threshold of RE plants for continuous operation. Further, some additional margin above this threshold shall be kept (preferably 0.05 p.u.) so as to ensure that STATCOM output is not blocked before 1.10 pu in case of some measurement error. Also, the HVRT threshold (both voltage and time delay) for STATCOM shall be higher than the over voltage stage-2 settings of HV lines in the RE complex (refer figure-2 above). The above-mentioned aspects may be suitably considered in the RfP/Technical Specification of upcoming STATCOMs.	**Hitachi Energy: -** In RfP document please add a curve for High voltage ride through requirements.
Multiple ride-through capability There is a possibility of disconnection of STATCOM if the pre-set limit which allows the maximum number of successful ride-through events is reached in case of successive / repetitive voltage dips in a short	**Hitachi Energy: -** In RFP, please indicate the time duration between two consecutive faults.

duration. The discharging/charging time of capacitor in case of successive faults may be an issue. Events with successive faults in a short duration are already being experienced in the Indian grid during inclement weather conditions. In view of above, it is suggested that requirement of successful ride-through in case of successive /multiple voltage dips in a short duration may be specified in the RfP so as to ensure that the situation in case of inclement weather conditions is managed reliably.	
Other settings The dynamic reactive power compensation device like STATCOM shall have following basic features for providing the necessary flexibility in operation: • Fixed 'Q' Control • Voltage Control with following configurable parameters: ➢ Vref ➢ Deadband ➢ Droop ➢ PID Controller Gains Without deadband in voltage control mode, there is high possibility of exhausting the dynamic reserve of STATCOM even with small changes in grid voltage, thereby leaving no reserve for providing voltage support during contingencies. Some of the upcoming STATCOMs in RE Complex do not have the feature of setting a deadband. The feature of keeping a configurable deadband (at least ± 0.05 p.u.) may be specified in the RfP of upcoming STATCOMs so as to ensure availability of dynamic reactive power reserve for contingencies.	**Hitachi Energy: -** These parameters are settable and can be provided in the STATCOM. Further, the significance of term "Dead Band" to be defined in specification. What action to be taken within dead band and outside dead band shall also be clearly mentioned in the RFP.
Response time of STATOM: The STATCOMs are being planned in large RE complexes to provide the necessary dynamic reactive power support during transients. In order to achieve the same, it is imperative that the STATCOMs provide the necessary dynamic reactive power support within a very short	**Hitachi Energy: -** The response time mentioned can be provided.

duration i.e. **response time of ≤ 30 ms.** The fast response time would not only help during transients but would also ensure that the STATCOM provides positive damping during oscillations. In case of one recently commissioned STATCOM, the response time of STATCOM during oscillations has been observed to be on the higher side 80 ms – 120 ms which may be resulting in enhancing the oscillations. In view of above, it is suggested that STATCOM response time of ≤ 30 ms may be specified in the technical standards.	
Interconnection study for STATCOM: Most of the upcoming STATCOMs are being installed in large RE complexes where the system strength is on the lower side. Low frequency oscillations are also being observed in some of these RE complexes, root-cause analysis for which is under progress. In order to ensure that the new STATCOM provides the necessary damping in these conditions and doesn't deteriorate the situation (by enhancing the oscillations), it is of utmost importance that a detailed study on prevailing system conditions may be carried out before interconnection of the STATCOM so as to ensure desired performance from the device. In case of one of the recently commissioned STATCOM in NR, STATCOM was observed to potentially enhance the oscillations. In order avoid such situations, following is suggested: a) A detailed study on prevailing system conditions may be carried out by the respective TSP/OEM (before interconnection of the STATCOM) to assess the performance of the STATCOM. b) Parameter tuning to avoid any adverse impact on the grid with integration of the STATCOM shall also be identified and implemented at this stage. c) Tuning of POD along with an interaction study with nearby HVDC/FACTS controllers. **CTUIL**	**Hitachi Energy:** - The contingency cases which involve the power oscillations should be highlighted in RFP, where POD can be tuned to damp such oscillations. W.r.t CTUIL points, the FACTS models can only be shared by TSP with CEA, CTU & Grid-India. As per clarifications released by BPC in package F and C1, the models will be shared with CEA, CTU & Grid-India where confidentially will be maintained by CEA, CTU & Grid-India. In the RFP the list of signals that shall be exchanged or coordinated between two TSPs shall be clearly specified. **Hyosung:** - It is not possible to install two different STATCOMs in same substation as the controlling and communication will be difficult.

The TSP implementing the FACTS device (incl. STATCOM) / HVDC shall share all necessary information (incl. control inputs, device models, etc.) with any future TSP implementing another FACTS device(s) / HVDC in its vicinity so that all the FACTS devices (incl. STATCOM) / HVDC operate as coordinated units and shall also update control settings, where required, in coordination with new TSP. In case, new STATCOM is planned in a sub-station which has a STATCOM already commissioned in the same/other Bus section, RfP provisions should mandate that the incumbent TSP installing the new STATCOM would ensure necessary controller interaction/tuning so that all the STATCOMs operate as a coordinated unit. For this purpose, the incumbent TSP should ensure that the new STATCOM being installed should be able to exchange control inputs from the old STATCOM so as to operate in a coordinated fashion. This provision is necessary to prevent any uncoordinated reactive injections/absorption by the STATCOMs leading to possible oscillations.	
Provision of Transient Fault Recorder (Disturbance recorders) STATCOM shall be enabled with multiple channels to view the three-phase current, sequence current, voltages etc. Further, the DR shall be able to open in standard output software.	**Hitachi Energy:** - It can be provided however the format of files needs to be specified in RfQ.
Availability of PMU at STATCOM Stations: At present, the PMU is available only in 09 out of total 16 STATCOM stations. The installation of PMUs at the STATCOM station (HV side of coupling transformer) is of utmost importance to monitor the dynamic performance of the device. The recommendations of the NPC sub-committee on URTDSM also suggests that the installation of PMUs on "HV side of coupling transformer of SVC/STATCOM for measurement of HV Bus voltage and current of coupling transformer". Therefore, the requirement of installing PMU at these stations shall be included in the substation package (RfP) itself for advance information to prospective bidders/implementation agencies.	**Hitachi Energy:** - It can be provided as it has been installed in some previous projects.

Sharing of validated dynamic models The availability of accurate simulation models (both RMS and EMT) of STATCOMs is of utmost importance for interconnection study, for identifying settings to achieve optimal response and for post despatch analysis of grid events. Out of 16 nos. STATCOMs commissioned at present, RMS dynamic model data has been received for 12 no. STATCOMs while EMT model data has been received only for 06 no. STATCOMs. In two cases, the submitted model data is either not working or the response is not matching with real-time response. OEMs/Asset owners insist for signing of Non-Disclosure Agreement for sharing of modelling data with CTUIL and Grid-India despite the CEA technical standards for connectivity mandating sharing of mathematical models for integration of elements in the grid. The signing of confidentiality agreement by statutory bodies for each equipment separately would significantly delay the integration of these elements in the grid. The TSOs/ISOs internationally specify in their respective regulations/rules that the information (modelling data) shared by the NSP or Generator with ISO shall be treated as confidential information by all parties. Similar approach may be followed in the Indian power system also through the following measures: a) The provision of submission of modelling data without signing of NDA may be explicitly mentioned in the RfP itself. b) A suitable clause on maintaining the confidentiality of the submitted data/models by the statutory bodies may also be included in the RfP document.	**HYOSUNG:** - Some Generic models can be provided for simulation studies but for certain source codes NDA needs to be signed.

1) Voltage ride through requirements

The STATCOM Station shall be capable of ride through for voltage disturbances (dips/swells) at PCC/POI as per the Voltage versus time characteristics as depicted in Table-1 and Figure-1. For a given voltage, the STATCOM Station shall not trip/block until the time duration at this voltage exceeds the specified minimum ride-through time duration. The required minimum ride-through time duration is a cumulative time within a 10-sec time window for one or multiple voltage dips/swells.

However, for voltage beyond LVRT/HVRT curve, STATCOM can block/trip. STATCOM Station shall have the capability for continuous operating in 0.9 to 1.1pu voltage.

Table 1 Voltage ride through requirements at POI/PCC

Voltage range (pu) at POI/PCC (1pu = 400kV, L-L rms)	Minimum ride through time (Seconds)
Switching over-voltages	
Upto 2.5pu	Few milliseconds
Temporary over voltages	
LVRT Conditions	
V < 0.90	10 seconds
V < 0.30	05 seconds
V < 0.135	300 milliseconds
HVRT Conditions	
V > 2.0	50 milliseconds
V > 1.76	100 milliseconds
V > 1.50	10 seconds
V > 1.10	Continuous

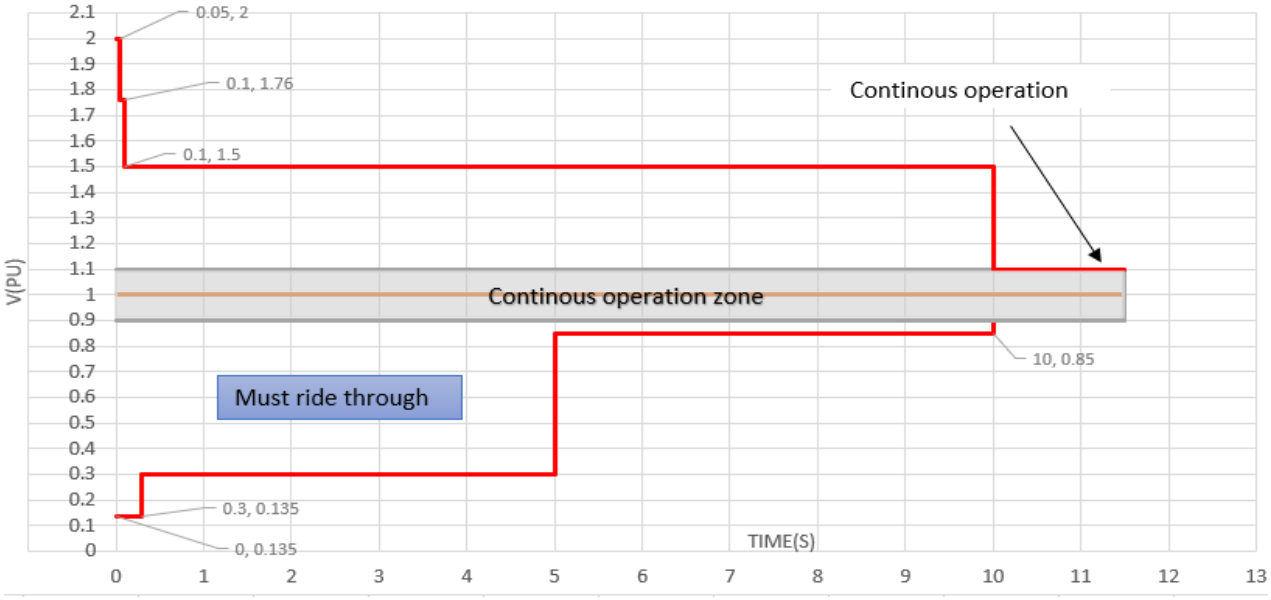


Figure 1 STATCOM Station Voltage ride through characteristics

The Voltage ride-through requirements specified in these provisions shall be applicable at POI/PCC. Accordingly the LVRT/HVRT settings at the corresponding VSC unit shall be coordinated so as to meet the ride-through requirements at PCC/POI. The Voltage versus time curve for LVRT/HVRT capability is given at Fig.1.

The voltage ride through curve to be considered in RFP may be finalized after taking views of other members:

2) Multiple LVRT Capabilities

The provisions with respect to multiple ride through capabilities for IBR are recommended in IEEE 2800-2022, excerpts of IEEE 2800-2022 Standards are given below:

***"7.2.2.4 Consecutive voltage deviations ride-through capability**:*

The IBR plant shall ride through multiple excursions outside of the continuous operation region with exception of the conditions and situations specified below, for which the IBR plant may trip to protect equipment integrity from the cumulative effects of successive voltage deviations:

- *The IBR plant may trip for disturbances for which the cumulative duration of voltage deviations within the applicable time window specified in 7.2.2.1 (i.e., 10 s or 3600 s) exceeds (i.e., under voltages less than or over voltages greater than) the ride-through durations specified in Table 11 or Table 12, as applicable.*
- *The IBR plant **may trip for more than four deviations of the applicable voltage** at the RPA outside of the continuous operation region within any 10-s period.*
- *The IBR plant may trip for more than six deviations of the applicable voltage at the RPA outside of the continuous operation region within any 120-s period.*
- *The IBR plant may trip for more than ten deviations of the applicable voltage at the RPA outside of the continuous operation region within any 30-min (1800-s) period.*
- *The IBR plant may trip for any voltage deviation outside of continuous operation region that follows the end of a previous deviation by less than 20 cycles of the system fundamental frequency.*
- *The IBR plant may trip for **more than two individual deviations of the applicable voltage at the RPA below 50%** of the nominal voltage (inclusive of zero voltage) within any 10-s period.*
- *The IBR plant may trip for more than three individual deviations of the applicable voltage at the RPA below 50% of the nominal voltage (inclusive of zero voltage) within any 120-s period.*
- *For WTG-based IBR plants, individual IBR units (WTGs) may trip to self-protect for consecutive voltage deviations that result in stimulation of mechanical resonances exceeding equipment limits."*

Considering the fact that Inverter Based Resources (IBR) resources and STATCOMs are a matching technology, accordingly, the following provisions w.r.t multiple ride through (voltage) can be inserted in RFP after considering views of OEMs and other member:

a) The STATCOM **may trip/block for more than four deviations of the voltage at the POI/PCC upto 50%** of the nominal voltage outside of the continuous operation region within any 10-s period.

b) The STATCOM **may trip/block for more than two individual deviations of the voltage at the POI/PCC below 50%** of the nominal voltage within any 10-s period.

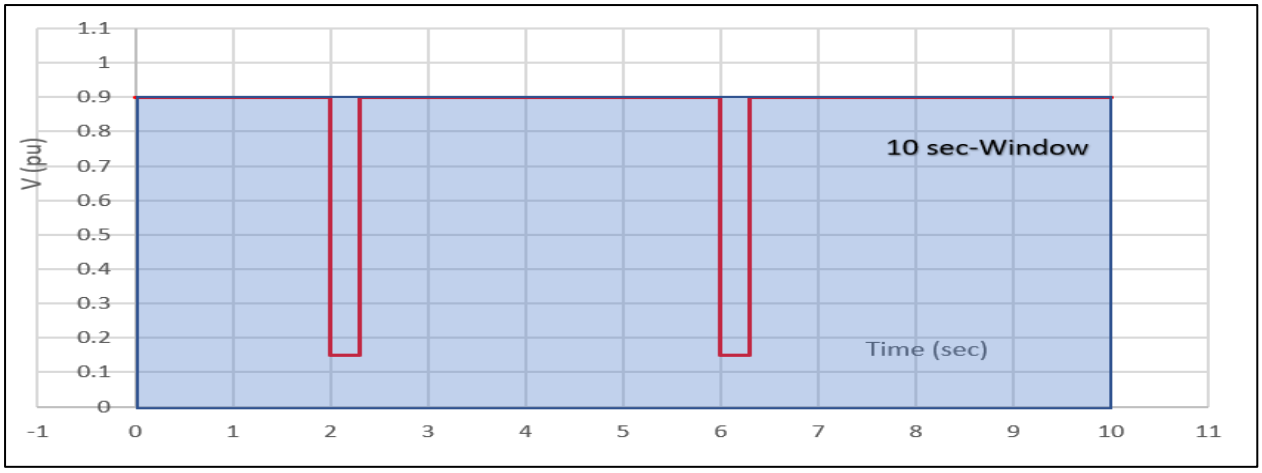


Figure 2 Multiple ride through requirements for voltage less than 0.5pu

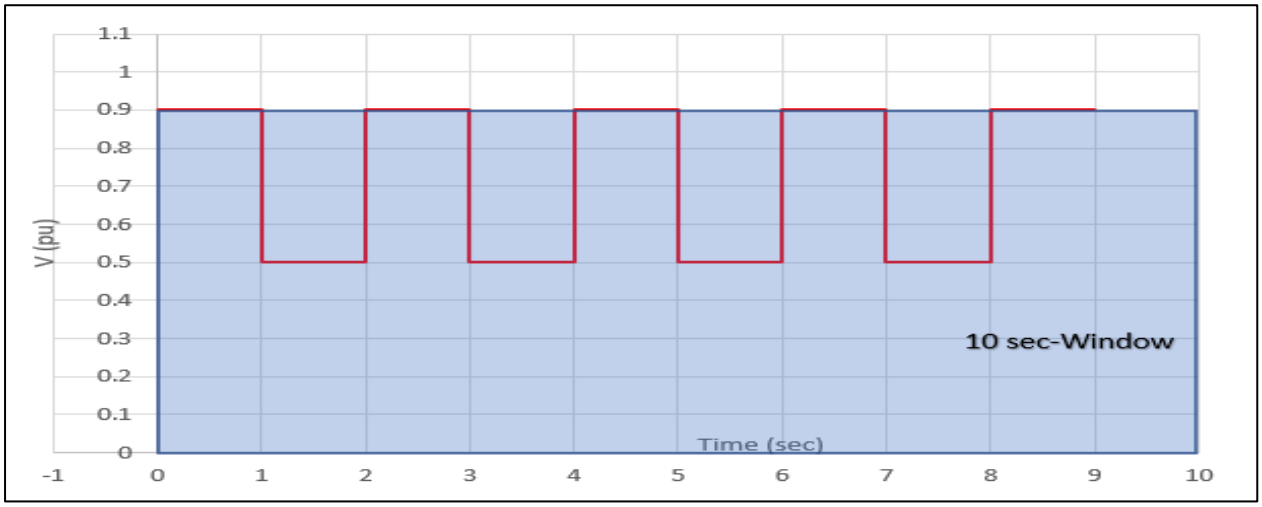


Figure 3 Multiple ride through requirements for voltage above 0.5pu

Since, the inception of subsequent fault occurrence cannot not be anticipated, therefore the time gap between subsequent voltage dips is not specified therein.

3) Coordinate operation of multiple STATCOM on the same bus/ with sectionalizer:

New STATCOM can be planned in a sub-station which has a STATCOM already commissioned in the same/other Bus section. RfP provisions should mandate that the incumbent TSP installing the new STATCOM would ensure necessary controller interaction/tuning so that all the STATCOMs operate as a coordinated unit. Incumbent TSP and TSP of existing STATCOM Station shall exchange data/signals required for operation of different STATCOMs as a single coordinated unit.

In this context, OEMs were requested to share the minimum data signals/other requirements to be declared upfront for TBCB licensee to use different STATCOMs in a coordinated manner.

4) Non-Disclosure Agreement (NDA) for Sharing of Simulation Models of STATCOM:

CTUIL expressed that models need to be provided without signing of NDA agreement. There can circumstances, wherein there is requirement of sharing data with external utility/agency e.g. after a Grid disturbance event or consequent to direction from

appropriate authority. To cater to such conditions Generic Model sharing is required without any NDA. However, there is also a requirement of supplying User Defined Models(UDM). User defined Models are required at network level to be used for specific studies which shall not be shared outside the organization. Hence, there is a requirement of supplying both generic as well as User defined Models(UDM).

Accordingly, it should be mandated that both generic and UDM shall be supplied and there shall not be any requirement of signing NDA for both type of models.