

INTERNAL

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Comments on Draft Indian Grid Code-2022

Hitachi Energy India

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 **Hitachi Energy**

Chapter – 1 : Definitions

| Sr.No. | Particulars | Definition |
|--------|---|--|
| 48. | 'Flexible Alternating Current Transmission System' or 'FACTS' | means a power electronics based system and other static equipment that provide control of one or more AC transmission system parameters to enhance controllability and increase power transfer capability; |

| | | |
|-----|-------------------------|--|
| 60. | Grid-forming capability | means the capability of a Power Generating Module to generate its own voltage waveform without relying on the grid voltage to synchronize and run as a black-start resource. |
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Means a power electronics based system together with other static equipment which is controllable in nature and which provides control of one or more AC transmission system parameters to improve power system stability, increase power transfer capability in-turn lowering environmental impact, shortening construction time and fulfilling the grid code.

Means the capability of a Power Generating Module to generate its own voltage waveform without relying on the grid voltage to synchronize and counteract immediately to the changes in the grid voltage (voltage steps, phase jumps, faults etc) and to emulate the behaviour of voltage source behind the impedance.

Chapter – 5 : Commissioning and Commercial Operation code

35. REAL TIME OPERATION(Page 90)

(6) Documents and Tests Required for Energy Storage Systems:

(a) The ESS shall submit certificate confirming compliance to the CEA Technical Standards for Connectivity.

(b) The following tests shall be performed:

(i) Power output capability in MW and energy output capacity in MWh.

(ii) Frequency response of ESS.

(iii) Ramping capability as per design.

(7) Documents and Tests Required for HVDC Transmission System:

(a) The transmission licensee shall submit technical details including operating guidelines such as filter bank requirements at various operating loads and

Energy storage plants/Grid connected storage will be encouraged in future.

Grid forming and black start control feature will be useful for Transmission & overall grid.

Chapter – 6 : Operating Code

40. FIELD TESTING FOR MODEL VALIDATION (Page 101)

| | | |
|-----------------------|---|--|
| HVDC/FACTS Devices | (1) Damping capability of HVDC/FACTS Controller (2) Frequency Controller Capability of HVDC Controller (3) Reactive Power Controller (RPC) Capability for HVDC/FACTS (4) Validation of voltage dependent current order limiter (VDCOL) characteristic for ensuring proper validation of HVDC performance (5) Filter bank adequacy assessment based on present grid condition. (6) Validation of response by FACTS devices as per settings. | To all ISTS HVDC as well as Intra-State HVDC/FACTS |
|-----------------------|---|--|

Serial No 1 , 2 and 4 - Damping and frequency controller and voltage dependent current order limiter (VDCOL) periodic tests at site is not possible to perform periodically.

Propose to be done by simulation in Replica/Test facility both during FST and whenever changed parameter or environment.

Chapter – 6 : Operating Code

35. REAL TIME OPERATION(Page 90)

Power system shall be categorized under emergency state when the power system is operating with operational parameters outside their respective operational limits or equipment are above their respective loading limits. Emergency state can arise out of multiple contingencies or any major grid disturbance in the system. The power system remains intact under such emergency state. However, whenever the power system is under emergency state, the system operator, to bring back the power system to alert/normal state shall take corrective measures such as:

- extreme measures such as load shedding, generation unit tripping, line tripping or closing,
- emergency control action such as HVDC Control, Excitation Control, HP-LP Bypass, tie line flow rescheduling on critical lines, and
- automated action such as system protection scheme, load curtailment scheme and generation run-back scheme.

Following controls may be useful during dynamic condition, shall be mentioned as flexible tools as part of HVDC

- **Emergency power control**
- **Fast frequency control**
- **Inertial support**
- **Virtual Inertia support and grid forming controls(VSC HVDC and STATCOM)**

Chapter – 8 : Cyber security

48. GENERAL

(1) This chapter deals with measures to be taken to safeguard the national grid from spyware, malware, cyber-attacks, network hacking, procedure for security audit from time to time, upgradation of system requirements and keeping abreast of latest developments in the area of cyber-attacks and **cyber security** requirements.

(2) All users, NLDC, RLDCs, SLDCs, CTU and STUs shall have in place, a **cyber security** framework in accordance with Information Technology Act, 2000; CEA (Technical Standards for Connectivity) Regulations, 2007; CEA (**Cyber Security** in Power Sector) Guidelines, 2021 and any such regulations issued from time to time, by an appropriate authority, so as to support reliable operation of the grid.

49. **CYBER SECURITY** AUDIT

All users shall conduct **Cyber Security** Audit as per the guidelines mentioned in the CEA (**Cyber Security** in Power Sector) Guidelines, 2021 and any other guidelines issued by an appropriate Authority.

Periodic Cyber security audit shall be explicitly mentioned

Our recommendation is at least yearly once or whenever incident reported



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