

CENTRAL ELECTRICITY AUTHORITY

(Grid Standards) Regulations, 2010, Dated: 26.06.2010

Sl. No.	Description	Summary																																																											
1.	Control Period	N.A.																																																											
2.	Applicability	These regulations shall apply to the Entities, Appropriate Load Despatch Centres, and, Regional Power Committees.																																																											
3.	Standards for Operation and Maintenance of Transmission Lines	<p>1. Make all efforts to operate at a frequency close to 50 Hz and shall not allow it to go beyond the range 49.2 to 50.3 Hz or a narrower frequency band specified in the Grid Code, except during the transient period following tripping.</p> <p>2. the permissible limit of voltage fluctuation for step changes which may occur repetitively is 1.5 percent.</p> <p>3. maintain the steady state voltage within the limits specified below in Table:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 5%;">S. No.</th> <th style="width: 25%;">Nominal System Voltage (kV rms)</th> <th style="width: 25%;">Maximum (kV rms)</th> <th style="width: 25%;">Minimum (kV rms)</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">1.</td><td style="text-align: center;">765</td><td style="text-align: center;">800</td><td style="text-align: center;">728</td></tr> <tr><td style="text-align: center;">2.</td><td style="text-align: center;">400</td><td style="text-align: center;">420</td><td style="text-align: center;">380</td></tr> <tr><td style="text-align: center;">3.</td><td style="text-align: center;">220</td><td style="text-align: center;">245</td><td style="text-align: center;">198</td></tr> <tr><td style="text-align: center;">4.</td><td style="text-align: center;">132</td><td style="text-align: center;">145</td><td style="text-align: center;">122</td></tr> <tr><td style="text-align: center;">5.</td><td style="text-align: center;">110</td><td style="text-align: center;">121</td><td style="text-align: center;">99</td></tr> <tr><td style="text-align: center;">6.</td><td style="text-align: center;">66</td><td style="text-align: center;">72</td><td style="text-align: center;">60</td></tr> <tr><td style="text-align: center;">7.</td><td style="text-align: center;">33</td><td style="text-align: center;">36</td><td style="text-align: center;">30</td></tr> </tbody> </table> <p>Ensure that the temporary over voltage due to sudden load rejection remains within the limits specified in Table:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 5%;">S. No.</th> <th style="width: 25%;">Nominal System Voltage (kV rms)</th> <th style="width: 30%;">Phase to Neutral Voltage (kV peak)</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">1.</td><td style="text-align: center;">765</td><td style="text-align: center;">914</td></tr> <tr><td style="text-align: center;">2.</td><td style="text-align: center;">400</td><td style="text-align: center;">514</td></tr> <tr><td style="text-align: center;">3.</td><td style="text-align: center;">220</td><td style="text-align: center;">283</td></tr> <tr><td style="text-align: center;">4.</td><td style="text-align: center;">132</td><td style="text-align: center;">170</td></tr> </tbody> </table> <p>Ensure that the maximum permissible values of voltage unbalance shall be as specified in Table :</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">S.No.</th> <th style="width: 25%;">Nominal System Voltage (kV rms)</th> <th style="width: 30%;">Voltage Unbalance (%)</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">1.</td><td style="text-align: center;">765 and 400</td><td style="text-align: center;">1.5%</td></tr> <tr><td style="text-align: center;">2.</td><td style="text-align: center;">220</td><td style="text-align: center;">2%</td></tr> <tr><td style="text-align: center;">3.</td><td style="text-align: center;">33 to 132</td><td style="text-align: center;">3%</td></tr> </tbody> </table>	S. No.	Nominal System Voltage (kV rms)	Maximum (kV rms)	Minimum (kV rms)	1.	765	800	728	2.	400	420	380	3.	220	245	198	4.	132	145	122	5.	110	121	99	6.	66	72	60	7.	33	36	30	S. No.	Nominal System Voltage (kV rms)	Phase to Neutral Voltage (kV peak)	1.	765	914	2.	400	514	3.	220	283	4.	132	170	S.No.	Nominal System Voltage (kV rms)	Voltage Unbalance (%)	1.	765 and 400	1.5%	2.	220	2%	3.	33 to 132	3%
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		<p>Operate the system in a such a way that the Grid System is capable of withstanding one of the following contingencies without experiencing loss of stability.</p> <ul style="list-style-type: none"> • outage of one single largest generating unit of the system or • outage of a 132 kV Double circuit line or • outage of a 220 kV Double circuit line or • outage of a 400 kV Single circuit line or • outage of a 400 kV Single circuit line with series compensation or • outage of 765 kV Single circuit line without series compensation or • outage of one pole of HVDC Bipolar line or • outage of an Interconnecting Transformer 																				
		<p>Operate the system in a such a way that under any one of the following contingencies, the system remains stable and sustains integrity so that no generator loses synchronism and no part gets isolated from the rest of the system:</p> <ul style="list-style-type: none"> • tripping of a single largest generating unit; or • transient ground fault in one phase of a 765 kV Single Circuit Line close to the bus; or • a permanent single phase to ground fault in 400 kV single circuit line followed by 3 pole opening of the faulted line; or • a permanent fault in one circuit of a 400 kV Double Circuit Line when both circuits were in service in the pre-contingency period; or • a transient single phase to ground fault in one circuit of a 400 kV Double Circuit Line when the second circuit is already under outage; or • a three-phase permanent fault in a 220 kV or 132 kV line; or • a permanent fault in one pole of HVDC bipolar in a HVDC Converter Station. 																				
		<p>The transmission licensee shall ensure that the voltage wave-form quality is maintained at all points in the Grid by observing the limits given in Table</p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>System Voltage (kV rms)</th> <th>Total Harmonic Distortion (%)</th> <th>Individual Harmonic of any particular Frequency (%)</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>765</td> <td>1.5</td> <td>1.0</td> </tr> <tr> <td>2.</td> <td>400</td> <td>2.0</td> <td>1.5</td> </tr> <tr> <td>3.</td> <td>220</td> <td>2.5</td> <td>2.0</td> </tr> <tr> <td>4.</td> <td>33 to 132</td> <td>5.0</td> <td>3.0</td> </tr> </tbody> </table>	S. No.	System Voltage (kV rms)	Total Harmonic Distortion (%)	Individual Harmonic of any particular Frequency (%)	1.	765	1.5	1.0	2.	400	2.0	1.5	3.	220	2.5	2.0	4.	33 to 132	5.0	3.0
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4.	Coordination in Operations	<ol style="list-style-type: none"> 1. No Entity shall introduce or take out the element of the grid without the concurrence of the Appropriate Load Despatch Centre except in case of imminent risk of safety of plant and personnel in which case it must intimate Appropriate Load Despatch Centre giving reasons therefore. 2. The Appropriate Load Despatch Centre shall inform all affected parties of the outage. 																				
5.	Instructions by Regional Load Despatch Centres and State Load Despatch Centres to be recorded	<p>All operational instructions given by Regional Load Despatch Centres and State Load Despatch Centres through telephone, Fax, e-mail, etc shall be given a unique operating code number and every Regional Load Despatch Centre and State Load Despatch Centre shall maintain a voice recorder for recording and reproduction of conversation with time tag or stamp.</p>																				
6.	Automatic under Frequency Relay	<ol style="list-style-type: none"> 1. All Entities shall set their under- frequency (UF) Relays and rate of change of frequency with time Relays in their respective systems, in accordance with the plan made by the Regional Power Committee, to provide adequate load relief for grid security and ensure the operation of these relays at the set frequencies. 2. All constituents shall submit a detailed report of operation of these Relays at different frequencies to Regional Load Despatch Centre and Regional Power Committee on daily basis and the Regional Power Committees shall carry out 																				

		inspection of these Relays as and when required.
7.	Islanding Schemes	For the purposes of this regulation 'Islanding Scheme' means a scheme for the separation of the Grid into two or more independent systems as a last resort, with a view to save healthy portion of the Grid at the time of grid disturbance.
8.	Reporting of Grid Disturbance	<ol style="list-style-type: none"> 1. The Regional Load Despatch Centre shall inform occurrence of the grid disturbance to the constituents immediately and to the concerned Regional Power Committee at the earliest. 2. The grid disturbance resulting in failure of power supply to large areas in a State shall also be reported by the Regional Load Despatch Centre to the Authority within twenty four hours of the occurrence of the grid disturbance.
9.	Operational Data during normal operation and during grid incidents and grid disturbances	<ol style="list-style-type: none"> 1. All operational data, including disturbance recorder and event logger reports, for analysing the grid incidents and grid disturbance and any other data which in its view can be of help for analysing grid incident or grid disturbance shall be furnished by all the Entities within twenty four hours to the Regional Load Despatch Centre and concerned Regional Power Committee. 2. All equipment such as disturbance recorders and event loggers shall be kept in healthy condition, so that under no condition such important data is lost. 3. A real time operation display of the grid position shall also be made available to the Regional Power Committee by Regional Load Dispatch Centre.
10.	Operational Data Records	<ol style="list-style-type: none"> 1. Operational data including equipment and system parameters logged manually and electronically shall be preserved for at least three years. 2. Logbooks shall be maintained by every manned switchyard and sub-station or at the control centre responsible for operation of the unmanned switchyard and sub-station. 3. A compendium of grid disturbances, indicating details such as the date and time of the disturbance, the sequence of tripping, the cause, and the sequence of restoration, remedial measures taken to avert recurrence of such incidents and disturbances shall be maintained by the respective Regional Power Committee.
11.	Communication Facilities	The communication facilities installed by the transmission licensees shall be in accordance with Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and shall be maintained in good operating condition.
12.	Maintenance Procedures	The Entity shall prepare maintenance procedures for each equipment in line with the manufacturer's recommendations and prudent utility practices.
13.	Hot Line Methods	<ol style="list-style-type: none"> 1. The hot line techniques for maintenance of critical transmission lines and sub-stations shall be adopted wherever possible. 2. Only trained staff shall be used for the hot line techniques and the tools employed in such techniques shall have necessary certification from a national or international accredited laboratory before usage.
14.	Emergency Restoration System	Each transmission licensee shall have an arrangement for restoration of transmission lines of 400 kV and above and strategic 220 kV lines through the use of Emergency Restoration System in order to minimise the outage time of the transmission lines in case of tower failures.
15.	Inspection and Patrolling	All essential parameters, which indicate the healthiness of the equipment in a sub-station, shall be inspected by the shift engineer once in each shift and periodically by the officer-in-charge.
16.	Maintenance schedules	<ol style="list-style-type: none"> 1. In case of time based maintenance, the periodicity of maintenance of lines shall be fixed based on whether they are passing through normal area or polluted area or coastal area and the transmission lines and sub-stations in polluted or coastal areas shall be maintained more frequently. 2. The maintenance of lines passing through and sub-stations located in such areas should be completed once before onset of winter so as to minimise tripping under conditions of fog or due to salt deposit on insulator discs in coastal areas and once before onset of summer.

9.	Thermo-vision scanning	The Thermo-vision scanning for hot spots on all overhead lines and sub-station equipment at voltage level of 220 kV and above shall be carried out at least once a year and necessary remedial measures shall be taken where hot spots are detected.
10.	Failure analysis	All failures of equipment and tower collapse shall be analysed by the Entity to avoid recurrence and a copy of the report shall be submitted to the Regional Power Committee and the Authority.
11.	Residual life Assessment	The residual life assessment shall be carried out for all major equipments including transformers, reactors, breakers, as envisaged by the relevant standards specified by the Bureau of Indian Standards, manufacturer's instruction or industry best practices and suitable remedial action for breach of the same shall be taken by the management of the Entity.
12.	Disaster management	<ol style="list-style-type: none"> 1. The maintenance staff shall be trained in disaster management and a detailed procedure for the same shall be developed by the Entity and displayed prominently. 2. The maintenance staff shall be trained in emergency restoration procedures for managing major failures and breakdowns.
13.	Training	<ol style="list-style-type: none"> 1. Every person involved in operation and maintenance of transmission lines shall be trained at the induction level and at least once in a year. 2. Every grid operator shall undergo training in real time digital simulator and a refresher course at least once in two years.