सत्यमेव जयते
भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत प्रणाली योजना एवं मूल्यांकन-I प्रभाग
Power System Planning & Appraisal-I Division

विषय/ Subject: SOP for Repowering of Wind Power Projects with Mixed WTGs under the CEA Connectivity Regulations

In line with the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 (and subsequent amendments) and the National Repowering & Life Extension Policy for Wind Power Projects-2023 issued by the Ministry of New and Renewable Energy (MNRE) on 07.12.2023, the CEA hereby issues the "SOP for Repowering of Wind Power Projects with Mixed WTGs under the CEA Connectivity Regulations."

This issues with the approval of the Chairperson, CEA.

Pawan 26/10/2026
(पवन कुमार गुप्ता / Pawan Kumar Gupta)
उप निदेशक/ Dy. Director

To:

1. COO, CTUIL- For kind information and further dissemination among all relevant stakeholders
2. CMD, Grid-India- For kind information and further dissemination among all relevant stakeholders
3. Chairman, InWEA

Copy to:

1. Secretary, MoP
2. Secretary, MNRE

SOP for Repowering of Wind Power Projects with Mixed WTGs under the CEA Connectivity Regulations

This standard operating procedure (SOP) has been formulated with reference to the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 & subsequent amendments, and National Repowering & Life Extension Policy for Wind Power Projects-2023 issued by Ministry of New and Renewable Energy (MNRE) on 07.12.2023.

A. Background

MNRE vide National Repowering & Life Extension Policy for Wind Power Projects-2023 issued on 07.12.2023 outlined following eligibility criteria for wind turbines to qualify for repowering or refurbishment:

1. Turbines that are not in compliance with the quality control orders issued by the Ministry.
2. Turbines that have completed their design life, as certified under the Type Test Certificate in accordance with applicable relevant standards.
3. Turbines with a rated capacity below 2 MW.
4. Turbines that are considered based on commercial or voluntary considerations after 15 years of installation.
5. Additionally, turbines that experience malfunctions, workmanship issues, or safety concerns during their design life are also required to be repowered or refurbished.

To facilitate the Repowering of wind turbines, this SOP has been formulated to streamline with the requirement of Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 & subsequent amendments.

B. Definitions

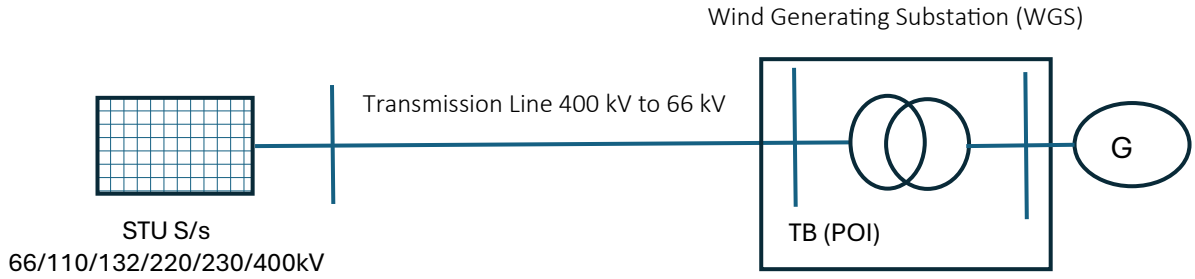
For the purpose of this SOP:

a) “Repowering” means replacement of old/ legacy WTGs with new WTGs at an existing site in accordance with the applicable MNRE/State repowering policy;
b) “Non-compliant WTG” means a WTG not meeting the technical requirements of the CEA (Technical Standards for Connectivity Regulations), 2007 & subsequent amendments;
c) “Project Life” means, for a wind energy project, the design life of the wind turbine generator as certified under its Type Test Certificate in accordance with the applicable standards;
d) "Point of Interconnection (POI)" means the substation or switchyard at which the interconnection is established between the requester and the grid as defined in the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007, as amended, from time to time.

Explanation: The Point of Interconnection in case of ISTS Connected RE plants, is the ISTS sub-station (at particular voltage level) at which connectivity has been granted under CERC GNA Regulations. In case of Intra-State/DISCOM connected RE plants, the Interconnection point/ POIs are different due to various State policies. Below are the few different cases for different POIs:

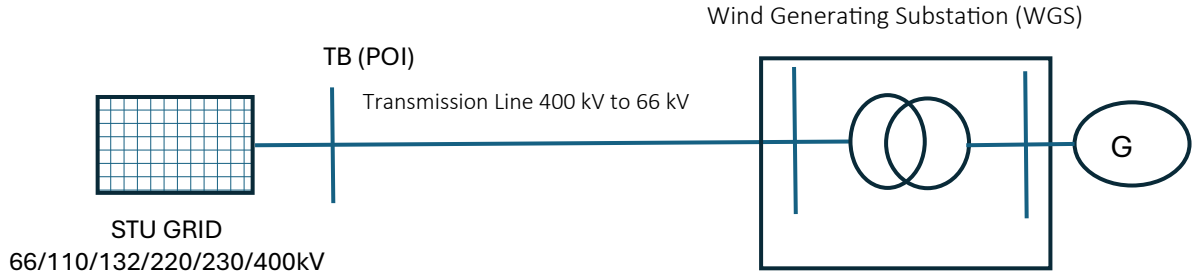
CASE(A): Terminal Bay (TB) and Transmission line connecting RE plant handed over to STU, hence POI will be at outgoing terminal bay of generator pooling substation as shown in fig.1

Figure – 1



CASE(B): Terminal Bay (TB) and Transmission line connecting RE plant belongs to RE plant; hence POI will be at incoming terminal bay of STU substation as shown in fig.2

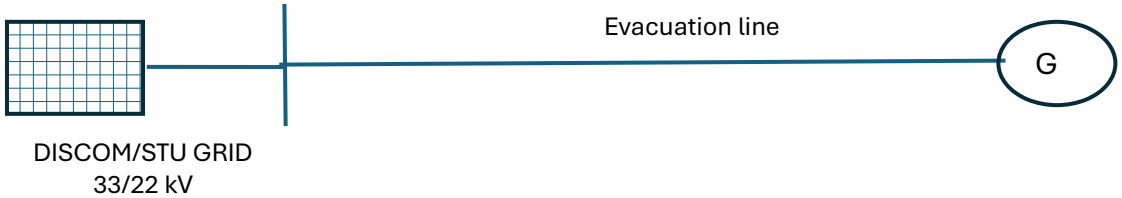
Figure – 2



CASE(C): 33 kV or 22 kV Evacuation line & Terminal Bay (TB) handed over to STU/DISCOM, hence POI will be at outgoing terminal bay at RE plant or HV side of WTG transformer in fig.3

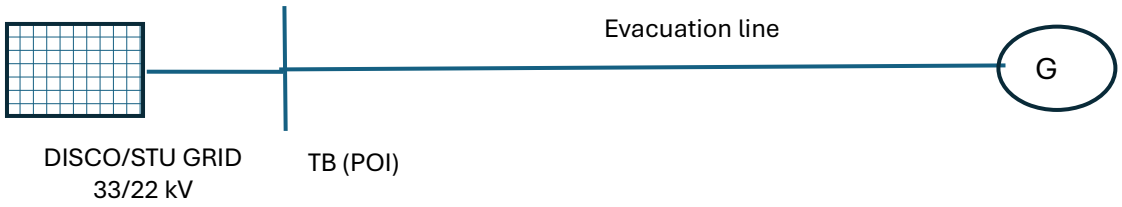
In case of multiple WTG being repowered via the same 33 kV line through tapping without any common bus to facilitate measurement, in such case compliances can only be verified at Discom/STU S/s bus, as it is close feasible common point where measurements can be made. In such cases, compliances are required to be verified at S/s bus.

Figure-3



CASE(D): 33 kV or 22 kV Evacuation line & Terminal Bay (TB) belongs to RE plant, hence POI will be at incoming terminal bay of STU/Discom substation as shown in fig.4

Figure-4



Case Number	Voltage level	POI location
Case A	66/110/132/220/230/400kV	HV side of Generator Pooling Station
Case B	66/110/132/220/230/400kV	STU/DISCOM Sub-station end
Case C	33kV or 22kV	At outgoing terminal bay at RE plant or HV side of WTG transformer DISCOM/STU Sub-station end (In case of tapping)
Case D	33kV or 22kV	STU/DISCOM Sub-station end

Note: The variation in POI across Cases (A)-(D) arises from the ownership of the Terminal Bay/transmission line as recognized under the applicable State Grid Code and the connectivity agreement and not from any variation in the CEA definition itself, which is applied uniformly at whichever point such ownership places it.

C. Applicability of SOP

1. Applicable for all the repowering renewable energy generation plant across the country governed by MNRE's Repowering Policy for Wind Power Projects.

2. Applicable for all the partially commissioned renewable energy generation plant for utilisation of their connectivity up to the connectivity quantum granted by CTUIL/STU. However, this shall be subject to consultation with respective stakeholders i.e. DISCOM or STU or CTU as applicable, for assessment and confirmation of system feasibility, availability and prevailing network conditions.

3. WTGs commissioned on or before CEA (Technical Standards for Grid Connectivity) Regulations, 2019 for Legacy/Old/Vintage/Non DFIG-Type I & II (pre-CEA 2019 amendment). Such Legacy WTGs should be grandfathered under and are not required to be retrofitted to meet current standards except as provided under this SOP.
   However, WTGs commissioned prior to the coming into effect of the aforesaid 2019 amendment are required to comply with the regulatory provisions applicable at the time

of their commissioning and this SoP does not grant any relaxation in this regard. Nevertheless, compliance assessment of such WTGs through simulation studies shall not be undertaken at present stage. Notwithstanding the above, these WTGs shall continue to meet the applicable regulatory requirements during real-time operation of the power system.

4. This SOP shall be applicable exclusively for the repowering of old WTGs with new WTGs as referred in point 1 & 2 above. In cases where the dedicated infrastructure is being shared with any other type of Generating plant i.e. Solar/Storage (BESS), then demonstration of compliances shall be as per the extant CEA Regulations, modelling requirements and verification procedure for compliance verification.

D. Installation of Disturbance Recorders (DR), Digital Fault Recorder (DFR) and Power Quality Meters (PQM) in line with Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Amendment Regulations, 2026

1. Power Quality Meter (PQM) meter be installed at the TB(POI) for all cases to ensure accurate measurements and compliance assessment in line with extant CEA (Technical Standards for Connectivity to Grid), Regulations.
2. The RE plant shall install Disturbance Recorder (DR) or Digital Fault Recorder (DFR) either at the POI or at each new WTG (COD after CEA Technical Standards for Connectivity February 2019 amendment) to facilitate disturbance and fault event monitoring.
3. Space for installation of PQM and DR/DFR to be decided by STU or DISCOM in consultation with developer, in cases, where these equipment are required to be installed at the Discom/STU Terminal Bay (TB).

E. Methodology of RE Plant Simulation Studies

1. Active Power & Reactive Power injections from old WTGs which are not compliant to the present CEA Regulations should be considered with zero injection for the purpose of steady state simulation studies. This treatment shall apply only up to completion of any one of the following, whichever is earlier:

    a) Repowering completion
    b) Project Life
    c) Expiry of valid PPA/ EWA timeline

    beyond which all WTGs in the plant, whether replaced or not, shall be required to demonstrate full compliance with the applicable CEA (Technical Standards for Connectivity to grid) Regulations or be decommissioned/ repowered, notwithstanding anything else contained in this SOP.

For this purpose, RE Generator shall submit certification with documentary support.

2. Steady State Simulation Studies of proposed plant with new & old WTGs in the existing RE plant shall be carried out by considering above point no. 1, for reactive power adequacy and power quality assessments. RE plant developer shall submit the study reports and EMT (Electromagnetic Transient) and RMS (Root Mean Square/PDT (Phasor Domain Transient) simulation models in line with CTU List of Studies to be conducted by RE Generators/Parks in process of submission of final technical connection data for demonstrating compliance with CEA (Technical Standards for Connectivity to the Grid) Regulations. The details of studies are as below:

Sl. No.	Nature of Model	Aggregated/Detailed	Objective
1	RMS	Detailed	Reactive Power Assessment
2	EMT	Detailed	Power Quality Assessment

3. Dynamic studies of new proposed WTG additions in existing RE plant shall be carried out by considering point nos. 1 and 2 above and shall submit the following plant level simulation models:

Sl. No.	Nature of Model	Aggregated/Detailed	Objective
1	RMS	Aggregated	Dynamic Simulations
2	EMT	Aggregated	Dynamic Simulations

4. RE plant with respect to new proposed WTGs shall submit the plant level and unit level model(s), study reports, benchmarking reports, test reports, Statement of Compliance/Conformity Statement and other technical details in line with the Report of the Working Group in respect of Data Submission Procedure & Verification of Compliance to CEA Regulations on Technical Standards for Connectivity to the Grid by RE Generators available at https://ctuil.in/uploads/assets/168864401979Final%20Report%20of%20the%20Working%20Group%20(July%202022).pdf and CTU List of Studies available at https://ctuil.in/uploads/assets/174149678682List%20of%20studies%20to%20be%20done%20by%20RE%20developers%20to%20CTU.pdf.

5. New WTG being installed in the RE plant shall comply with the design temperature requirements related to delivery of rated power during designated temperature as per extant MoP/CEA guidelines.

6. Based on the simulation studies, the RE Plant shall install additional supplementary devices, including additional reactive power resources, harmonic filters, etc., as may be required, to ensure that the RE Plant (WTGs/group of new WTGs) complies with the CEA (Technical Standards for Connectivity to the Grid) Regulations at the designated POI.

For replacement of harmonic filters, the compliance may be achieved on a batch-wise basis after replacement WTGs with batch comprising an aggregate capacity of minimum 33% of the installed capacity of the wind project.
Until the requisite compliance is achieved, the plant shall be permitted to schedule injection at the POI only to the extent of the compliant capacity.

7. RE plant developer shall ensure that all mitigation measures (if needed) are installed prior to its physical interconnection with the Grid. RE plant developer(s) should proceed with the installation of additional/supplemental devices (if any) required for meeting the compliances (for new WTGs at POI) based on their own assessment, without waiting for the completion of model verification activities by nodal agency.

F. AS-BUILT RE Plant Model validations

1. Validation of the complete RE plant simulation model with new WTG installations may not be feasible at this stage. Validation shall be performed after competition of repowering of each batch of minimum 33% of the installed capacity of the wind project.

2. During the interim period, in lieu of full as-built model validation, the RE plant shall submit periodic PQM/DR/DFR data to applicable transmission utility and grid operator to provide the visibility into plant performance and shall carry out partial/phased validation of the simulation model at each WTG replacement milestone, with full and final validation to be completed and submitted upon completion of the entire repowering.

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