Minutes of Meeting on awareness Webinar on compliance submission in accordance with the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007 and its amendments in 2019 held on dated 07.10.2025.

In accordance with the directives received during the 14th Grid Coordination Core Committee (GCC) meeting, MSLDC conducted a Webinar on "Compliance submission in accordance with the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007 and its amendments in 2019" on dated 07.10.2025 at 11:30 hrs. Representatives from various RE Developers, Wind/Solar Generating Companies were present for the said webinar. The list of participants is attached herewith. The details of discussions held during the said webinar are as below:

A. The Executive Engineer (REMC-Op), MSLDC welcomed all the participants.

Following key points were presented & explained in detail by the MSLDC REMC (Operations) team:

- Maharashtra System overview.
- Importance of CEA Technical Standards and Regulatory Provisions.
- Requirements of test reports and certificates required to submitted by the RE Developers & Wind/Solar Generating Companies during Pre-commissioning i.e. prior to final grid connectivity/FTC and during Post-commissioning.
- Details of various scenarios to be considered while carrying out Simulation studies and Actual Field Measurement Tests for Individual Invertor/WTG and at PoI level.
- Details of studies to be carried out in EMT (PSCAD) & RMS (PSS/E) models along with scenarios to be considered while studies and submission of the models.
- Submission of Benchmarked models of individual Invertor/WTG and Plant along with benchmarking report.
- Requirement of periodic field measurements and submission of benchmarking reports based on actual field measurements.
- Methodology to be adopted for development of models for old Type -I & Type -II WTGs commissioned at old PSS and conducting Simulation Studies along with actual field measurements.
- Methodology for conducting compliance studies for PSS where mix of old type of WTGs & new types of WTGs are getting commissioned.
- The importance of installation of PQ meter and associated communication link from POI to Plant for taking the reference command from POI to PPC.
- Regulatory provisions i.e. regulation No. 12.3 for non-compliance of the CEA Technical Standards at any stage i.e. Pre-Commissioning and Post-Commissioning (Periodic).
- Directives from the Chairperson of GCC towards initiating actions against defaulting RE Developers & Wind/Solar Generating Companies in accordance with the regulatory provisions.

B. After detailed presentation by MSLDC, the session was open for discussions. Various discussion points were as below:

1. The representative of Suzlon Energy Ltd. informed that:
   a. Can PQ meter be installed at GSS end as PPC has settings through which response required at PSS can be achieved.
   b. There is no communication network between PSS & GSS. Some of the plants are having communication through PLCC. Hence, there will be delay in getting reference signal from PoI to PPC & hence, delay in providing response is expected. For new plants, there is no specific provision for fibre optic communication. Are there any standards for establishment of the same. At ISTS level, such communication is developed by the RE Developer.
   c. Old WTG doesn't having the models & type test reports then how to simulate such WTGs and carry out studies for the complete plant.

d. Prior to conducting simulation studies, various details such as PSS fault level, Harmonic Spectrum should be provided. In the absence of the same, it will be difficult to match the performance of the model with actual results.

In response to the queries raised by M/s. Suzlon, following response was provided by MSLDC team:

a. As per the CEA Standards & Working Group report, all the compliances are required at PoI. Also, the PoI is defined in the STU's Grid Connectivity Letter. If PQ meters are not installed at PoI and installed at GSS end then it will not be possible to monitor whether response is provided or not. Hence, PQ meters are mandatorily to be installed at PoI defined by STU in its Grid Connectivity Letter.

b. The reference signal is to be sought from PoI and to be integrated with PPC installed at Plant. Hence, it is the responsibility of the RE Developer to develop required communication network in this respect. The standards provided in the CEA Communication Standards should be followed.

c. For old type WTGs', as already specified in the presentation, RE Developers & Wind/Solar Generating Companies should approach academic institutes or external experts for development of the generic models & benchmarking of the same based on actual tests.

d. For conducting simulation studies, standard data for SCR, X/R, etc is to be considered in case of non-availability of actual data. Further, benchmarking can be done based on actual test results obtained during actual field measurements.

2. The representative from M/s Soregin requested to provide clarification on whether reactive support can be provided through additional invertors or SVGs are required for dynamic support.

In this respect, MSLDC team informed that it is the responsibility of the RE Developer & Wind/Solar Generating Company to mitigate any shortfall in respect to Reactive power requirements by adding external devices. However, such devices should provide required support dynamically as per the requirements specified in the CEA Standards.

C. Further, MSLDC team opined that a group can be formed in the State wherein technical discussions about various compliances, measures for mitigating shortfalls, issues observed during monitoring compliances, etc can be discussed. All the participants welcomed the opinion of MSLDC and agreed to participate the such group.

D. The Executive Director (MSLDC) in his concluding remarks highlighted that matter of non-compliance towards CEA Technical Standards has been discussed in the GCC meeting and GCC has already directed to initiate the actions against defaulting RE Developers & Wind/Solar Generating Companies. Also, considering increasing penetration of the RE generation, it is mandatory for all the RE plants to comply with the CEA Technical Standards prior to seeking Synchronization permission from MSLDC and in the event of non-compliance, synchronization permission will not be issued.

The webinar was concluded with vote of thanks.

Girish Pantoji
(I/C Chief Engineer)
MSLDC, Airoli

Encl: 1) MSLDC Presentation
2) List of participants

List of Participant Joined Webinar Dated 07.10.2025

Sr.No.	Full Name	User Action	Timestamp
1	Remc Operation	Joined	10/7/25, 11:20:42 AM
2	V V S K Chakravarthi	Joined	10/7/25, 11:21:26 AM
3	Shrikant Tehare	Joined	10/7/25, 11:22:29 AM
4	Ishwar Katakwar	Joined	10/7/25, 11:24:05 AM
5	SUBBURAYAN	Joined	10/7/25, 11:27:12 AM
6	Bhagyashri Mane	Joined	10/7/25, 11:27:47 AM
7	Date Energy	Joined	10/7/25, 11:27:50 AM
8	Mahesh Kadane	Joined	10/7/25, 11:28:29 AM
9	read.ai meeting notes	Joined	10/7/25, 11:28:53 AM
10	K M BHAYYA	Joined	10/7/25, 11:29:12 AM
11	suresh sancheti	Joined	10/7/25, 11:30:09 AM
12	Vishal Dage	Joined	10/7/25, 11:30:11 AM
13	K.M.BHAYYA	Joined	10/7/25, 11:31:06 AM
14	Amod Kulkarni [CISO Information Security]	Joined	10/7/25, 11:31:08 AM
15	Diwakar Pathak	Joined	10/7/25, 11:31:33 AM
16	VEDANJAY POWER	Joined	10/7/25, 11:31:36 AM
17	Vilas Pacharne	Joined	10/7/25, 11:31:58 AM
18	shrikant m	Joined	10/7/25, 11:32:26 AM
19	Hariharan R	Joined	10/7/25, 11:32:40 AM
20	sagar	Joined	10/7/25, 11:32:57 AM
21	Laxmana Murthy	Joined	10/7/25, 11:33:21 AM
22	Ravi C	Joined	10/7/25, 11:33:29 AM
23	Eshwar Thirlapuram	Joined	10/7/25, 11:34:02 AM
24	Subburayan R	Joined	10/7/25, 11:34:03 AM
25	Subburayan.R	Joined	10/7/25, 11:35:51 AM
26	Mrunali Shinde	Joined	10/7/25, 11:36:15 AM
27	Kedar Watve	Joined	10/7/25, 11:36:45 AM
28	VAMSI	Joined	10/7/25, 11:37:15 AM
29	Ram	Joined	10/7/25, 11:40:04 AM
30	Amar Sharma	Joined	10/7/25, 11:41:46 AM
31	Dnyneshwar	Joined	10/7/25, 11:42:11 AM
32	MAL	Joined	10/7/25, 11:42:29 AM
33	Nirav Makwana / Commercial / Ahmedabad	Joined	10/7/25, 11:43:49 AM
34	Mohammad Junaid - Avaada	Joined	10/7/25, 11:45:00 AM
35	suresh dancheti	Joined	10/7/25, 11:45:24 AM
36	Ramesh More	Joined	10/7/25, 11:46:41 AM
37	Vishal Mahadeshwar	Joined	10/7/25, 11:47:22 AM
38	Dhiren	Joined	10/7/25, 11:48:21 AM
39	Ops Reconnect	Joined	10/7/25, 11:50:13 AM
40	EEPL	Joined	10/7/25, 11:50:22 AM
41	Monitoring	Joined	10/7/25, 11:51:46 AM
42	Narsimulu Velchal	Joined	10/7/25, 11:53:25 AM
43	Tushar Dombe	Joined	10/7/25, 11:53:58 AM
44	Nagendra Sahu	Joined	10/7/25, 11:54:48 AM
45	Chandra Sekhar	Joined	10/7/25, 11:56:06 AM
46	Siddhesh Pophle	Joined	10/7/25, 12:03:33 PM
47	Gajendarsingh Gaud	Joined	10/7/25, 12:09:03 PM
48	Nitendra Kodle	Joined	10/7/25, 12:09:44 PM
49	O&M team	Joined	10/7/25, 12:19:07 PM
50	Virendra	Joined	10/7/25, 12:44:37 PM

State Load Despatch Centre, Maharashtra

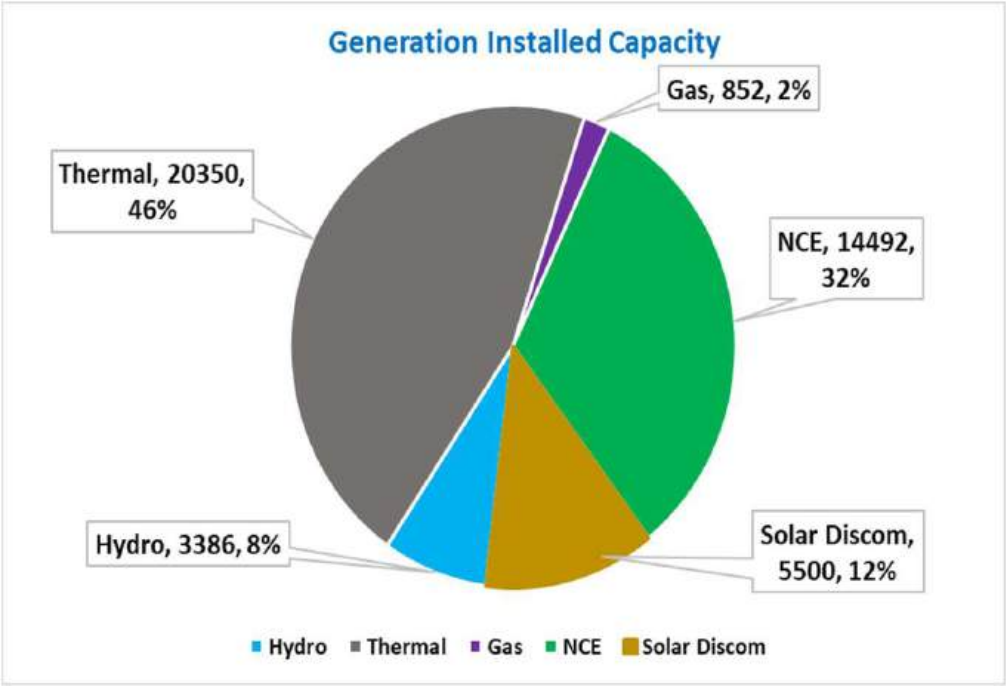
Webinar on CEA Compliance Regulations

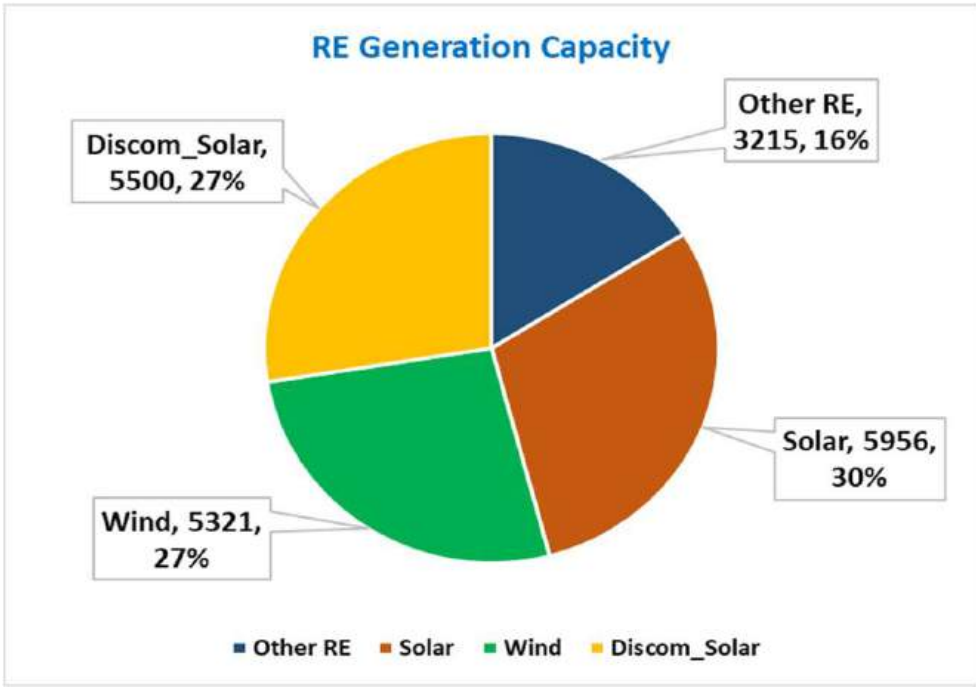
07-10-2025

Overview of Maharashtra System:

Maharashtra is:

- Having largest Intra-State Generation Installed Capacity of 40 GW.
- Having highest catered demand of 30 GW, which contributes to around 12 % of the Country's demand
- Having largest Intra-State Transmission network (789+ Sub-stations above 100kV, 56,000+ ckm EHV lines & 160 GVA transformation capacity
- One among the 7 RE rich state in the Country
- Serving 124 Million people in the State





Importance of CEA Technical Standards:

To meet the National target of 500GW, RE Capacity is increasing exponentially in the State

With the increasing penetration of RE, the energy mix of the State is changing dynamically

System Inertia is reducing due to limited availability of the conventional generators

Limited availability of Conventional Generators poses restricted support which needs to be provided by RE Plants

Objective of the Technical Standard for Connectivity

- To ensure the safe operation, integrity and reliability of the grid.
- New connection shall not cause any adverse effect on the grid.
- The grid shall continue to perform with specified reliability, Security and quality as per the Grid Standards
- A requester is required to be aware, in advance, of the standards and conditions his system has to meet for being integrated into the grid.

Provisions of Regulation:

CEA Technical standards for connectivity to the Grid, Regulations-2007	• **General connectivity conditions for all power system elements.**
CEA Technical standards for connectivity to the Grid, Regulations (Amendment)-2013	• Requirements for Solar & Wind generators included • Interconnection point, inverter etc. defined • Major requirements • Power Quality (Harmonic Current, DC current, Flicker). • Dynamically varying Reactive Power Support in the range of $\pm$ 0.95p.f. • LVRT for wind generation connected at 66kV or above voltage level
CEA Technical standards for connectivity to the Grid, Regulations (Amendment)–2019	• More focus on Requirements for Invertor-based sources viz. Solar & Wind generation. • LVRT & HVRT requirements for Invertor-based sources. • Other requirements for Active Power & Frequency control of Invertor-based sources.

Objectives & Requirements of Regulations:

Objectives:

- To ensure the safe operation, integrity and reliability of the grid.
- New connection shall not cause any adverse effect on the grid.
- The grid shall continue to perform with specified reliability, Security and quality as per the Grid Standards
- A requester is required to be aware, in advance, of the standards and conditions his system has to meet for being integrated into the grid.

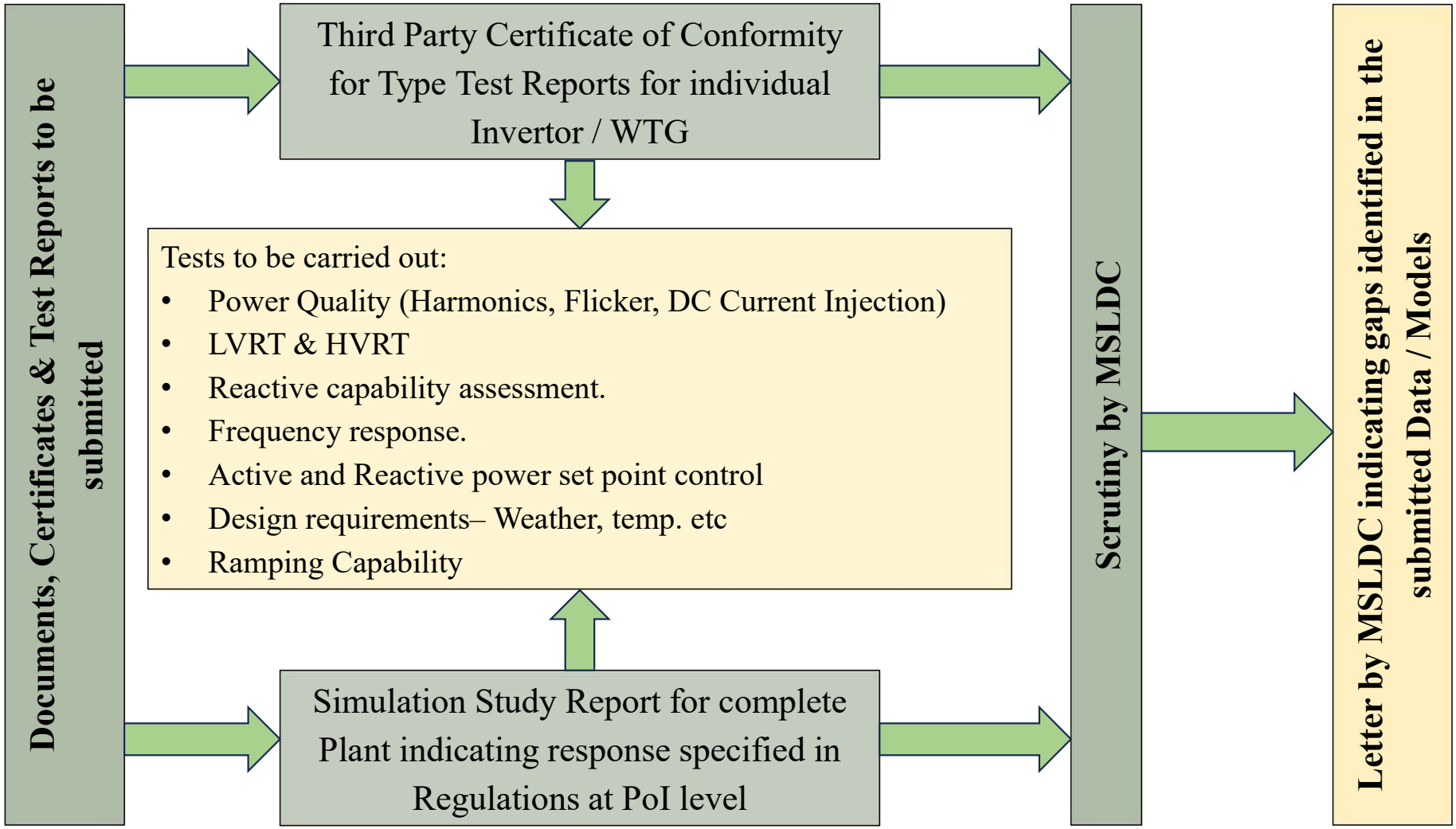
Requirements:

- Inter connection point / Point of inter connection.
- Reactive capability assessment.
- Voltage Ride through requirements (Low & High).
- Frequency response.
- Active and Reactive power set point control.
- Design requirements– Weather, temp. etc.
- Ramping Capability.
- Power Quality.

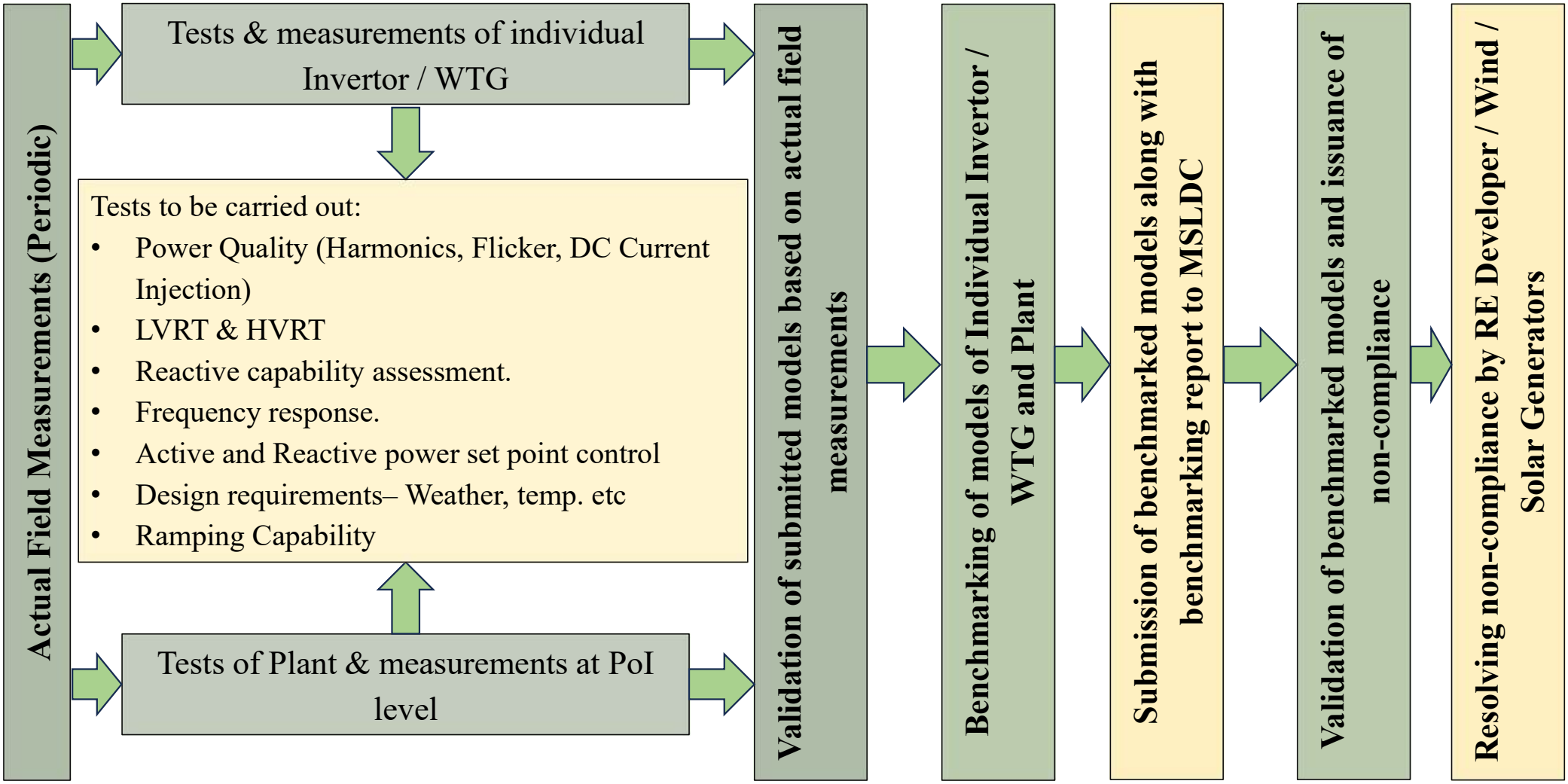
Pre-Commissioning (Prior to Final Grid Connectivity / FTC)

Post-Commissioning (Periodic)

Requirements_Pre-Commissioning:



Requirements_Post-Commissioning:



Various Scenarios for Simulation Studies & Test to be Carried out:

Details of various scenarios to be considered while simulation studies

Details of various Tests to be carried out during actual field measurements

List of studies to be done by RE developers.docx

Monitoring of Non compliance:

- **The regulation 12 of the said CEA regulations is reproduced below:**

  "12. Compliance of regulations.-

  (1) The licensee shall ensure that before connectivity to the grid, all the provisions with regard to the connectivity specified under these regulations are complied with by the requester.

  (2) Before allowing connectivity to the requester, the compliance of the provisions laid down under sub-regulations (2), (3) and (5) of regulation 6 shall be verified by the licensee and the verification of compliance of provisions of other regulations shall be in the form of self-declaration in the proforma of connection agreement which shall be checked and verified by the concerned licensee on sample basis.

  (3) The user may be disconnected from the Grid by the licensee for non-compliance of any provision of these regulations and any non-compliance of the provisions of these regulations shall be reported by the licensee or the State Load Dispatch Centre or the Regional Load Dispatch Centre, as the case may be, to the appropriate Commission"

- According to these regulations, submission of Simulation Study report along with PSSE & PSCAD files prior to synchronization of the generation is one of the compliance.
- Vide notification dated 15.06.2023, MSLDC has already requested all the RE Generators & Developers to adhere to the CEA Regulations and submit compliances to MSLDC.
- While seeking Synchronization permission, it is observed that some of the RE Developer/Generators are complying the requirements whereas some are seeking time extension stating that the report will be submitted within 6 months.
- In case of time extension cases, some of the RE Developer/Generators are not following their own commitments.
- Issue was discussed in the 14th GCC meeting, wherein the Chairperson of GCC has directed MSLDC to:
  - Sensitize RE Developers/ Generators about importance of the CEA Regulations & requirements,
  - Initiate action as per the regulatory provisions for non-compliance

Modeling of Old Plants:

- The majority of the old PSS are having WTGs of Type – I and Type – II
  - Non availability of PSSE & PSCAD models
  - Non availability of Type Testing reports of individual WTGs
- New WTGs compliant with CEA Standards are being connected to old PSS
- RE Developers / Wind & Solar Generators shall:
  - Approach academic institutes or expert consultants for development of generic models of such old WTGs.
  - Carry out Simulation Studies for the complete plant based on generic models
  - Carry out actual field measurements of the Plant at PoI level
  - Identify shortfall as per CEA Standards at PoI level and resolve the shortfall
- MSLDC is in discussion with IIT-B for development of generic model for such old Type – I and Type – II WTGs

PQ Meter Installation of POI:

- The Power Plant Controller (PPC) shall take reference command from PoI for compliance of the CEA technical connectivity regulations.
- The installation of PQ meter at PoI is essential for taking the reference command from PoI to PPC
- Based on the reference received from PQ meters, the RE Plant should be operated at various control modes
- PQ Meter shall be of Class-A with TCP/IP protocol

Q & A

A. List of tests to be conducted at plant level.

1. Power Quality tests:

a) Evaluation of current harmonics at POI (Harmonic Load Flow model)

Test No.	Relevant Regulation Clause	Default Active Power (pu)	EMT (PSCD)	RMS (PSS/E)
1	CEA TSCG: Part-II.B1(2)	P=1.0	Yes	No
2		P=0.9	Yes	No
3		P=0.8	Yes	No
4		P=0.7	Yes	No
5		P=0.6	Yes	No
6		P=0.5	Yes	No
7		P=0.4	Yes	No
8		P=0.3	Yes	No
9		P=0.2	Yes	No
10		P=0.1	Yes	No

b) DC Current injection at POI

Test No.	Relevant Regulation Clause	Default Active and Reactive power dispatch (pu)	EMT (PSCD)	RMS (PSS/E)
11	CEA TSCG: Part-II.B1(2)	P=1.0; Q=0	Yes	No

c) Flicker study at POI (Pst & Plt)

Test No.	Relevant Regulation Clause	Default Active and Reactive power dispatch (pu)	EMT (PSCD)	RMS (PSS/E)
12	CEA TSCG: Part-II.B1(2)	P=1.0; Q=0	Yes	No

2. Reactive power capability test

Test No.	Relevant Regulation Clause	**POI Voltage (pu)**	Supplemental device(if any) (In service/out of service)	EMT (PSCD)	RMS (PSS/E)
13	CEA TSCG:Part-II B2(1)	1	In service	No	Yes
		0.95		Yes	Yes
14		1.05		Yes	Yes
15		1	Out of service	No	Yes
		0.95		Yes	Yes
16		1.05		Yes	Yes

3. Capability to operate in frequency range: 47.5Hz to 52Hz with +/-5% voltage variation

Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	Active Power dispatch (pu)	POI Voltage (pu)	Power factor (pf)	PPC Frequency Flag	EMT (PSCAD)	RMS (PSS/E)
17	CEA TSCG: Part-II.B2(2)	50 to 47.5	P=1.0	1.0	Any	Off	Yes	Yes
18		50 to 52					Yes	Yes

4. **Capability to provide rated output in frequency range of 49.5Hz to 50.5Hz with +/-5% voltage variation**

Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	POI Voltage (pu)	Power factor (pf)	Active Power dispatch (pu)	PPC Freqency Flag	EMT (PSCAD)	RMS (PSS/E)
19	CEA TSCG: Part-II.B2(2)	50 to 49.50	0.95	0.95 lag	1.0	Off	Yes	Yes
20			1.05	0.95 lead			Yes	Yes
21		50 to 50.50	0.95	0.95 lag			Yes	Yes
22			1.05	0.95 lead			Yes	Yes

5. **Low voltage ride through**

Test No.	Relevant Regulation Clauses	**LVRT Target Voltage (pu)**	Duration of voltage dip (sec)	Pre-fault Active Power dispatch (pu)	Nature of voltage dip	EMT (PSCAD)	RMS (PSS/E)
23	CEA TSCG: Part-II.B2(3)	0.85	3.0	1.0	Balanced Three phase	Yes	Yes
24		0.5	1.65				
25		0.15	0.3				
26		0.85	3.0		Unbalanced (LL)	Yes	No
27		0.5	1.65				
28		0.15	0.3				
29		0.85	3.0		Unbalanced (LG)	Yes	No
30		0.5	1.65				
31		0.15	0.3				
32		0.85	3.0	0.5	Balanced Three phase	Yes	Yes
33		0.5	1.65				
34		0.15	0.3				
35		0.85	3.0		Unbalanced (LL)	Yes	No
36		0.5	1.65				
37		0.15	0.3				
38		0.85	3.0		Unbalanced (LG)	Yes	No
39		0.5	1.65				
40		0.15	0.3				
41		0.85	3.0	0.25	Balanced Three phase	Yes	Yes
42		0.5	1.65				
43		0.15	0.3				
44		0.85	3.0		Unbalanced (LL)	Yes	No
45		0.5	1.65				
46		0.15	0.3				
47		0.85	3.0		Unbalanced (LG)	Yes	No
48		0.5	1.65				
49		0.15	0.3				

6. **Rate of change of active power:**

Test No.	Relevant Regulation Clause	**Change in active power dispatch**	POI Voltage (pu)	Power factor (pf)	EMT (PSCAD)	RMS (PSS/E)
50	CEA TSCG: Part-II.B2(4)(i)	Active power set-point and Ramp up test (ramp rate < 10% per minute)	1.0	Unity	Yes	Yes
51		Active power set-point and Ramp down test (ramp rate < 10% per minute)			Yes	Yes

7. **Frequency response test (any droop in range of 3 - 6%):**

Test No.	Relevant Regulation Clauses	**Freq. change (Hz)**	Active Power dispatch (pu)	POI Voltage (pu)	Power factor (pf)	PPC Freq.Flag	EMT (PSCAD)	RMS (PSS/E)
52	CEA TSCG: Part-II.B2(4)(ii,iii)IEGC:30(10)	50 to 50.15	1.0	1.0	Unity	On	Yes	Yes
53			0.5					
54			0.1					
55		50 to	1.0					
56			0.5					
57			0.1					
Note: During the above test, frequency shall be first changed upto dead band limit to show its								

8. **Demonstration of immediate (within 1 second) real power primary frequency response of at least 10% of maximum Alternating Current active power capacity for frequency deviation in excess of 0.3 Hz:**

Test No.	Relevant Regulation Clause	**Change in frequency (Hz)**	Active Power dispatch (pu)	POI Voltage (pu)	Power factor (pf)	EMT (PSCAD)	RMS (PSS/E)
58	CEA TSCG: Part-II.B2(4)(ii, iii)	Greater than 0.3Hz (upwards)	0.9	1.0	Unity	Yes	Yes
59		Greater than 0.3Hz (downwards)				Yes	Yes

9. High voltage ride through:

Test No.	Relevant Regulation Clause	**HVRT Target Voltage (pu)**	Duration of voltage rise (sec)	Initial Active Power dispatch (pu)	Nature of voltage rise	EMT (PSCAD)	RMS (PSS/E)
60	CEA TSCG: Part-II. B2(7)	1.3	0.2	1.0	Balanced Three phase	Yes	Yes
61		1.2	2				
62		1.1	Continuous				
63		1.3	0.2		Single phase	Yes	**No**
64		1.2	2				
65		1.1	Continuous				
66		1.3	0.2	0.5	Balanced Three phase	Yes	Yes
67		1.2	2				
68		1.1	Continuous				
69		1.3	0.2		Single phase	Yes	**No**
70		1.2	2				
71		1.1	Continuous				
72		1.3	0.2	0.25	Balanced Three phase	Yes	Yes
73		1.2	2				
74		1.1	Continuous				
75		1.3	0.2		Single phase	Yes	**No**
76		1.2	2				
77		1.1	Continuous				

B) List of tests to be incorporated in Unit IBR RMS & EMT Benchmarking report

The objective of Unit IBR benchmarking in EMT & RMS domain is to demonstrate that the IBR performance as given in the type test report is matching with model.

Entity shall submit the unit benchmarking report containing following tests:

1. PQ Capability Curve of IBR / WTG				
Test No.	Relevant Regulation Clause	**POI /PCC Voltage (pu)**	**EMT**	**RMS**
1	CEA TSCG: Part-II.B2(1)	1.0	Yes	Yes
2		0.95	Yes	Yes
3		1.05	Yes	Yes

2. Capability to operate in frequency range: 47.5Hz to 52Hz with +/-5% voltage variation						
Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	POI Voltage (pu)	Power factor	**EMT**	**RMS**
4	CEA TSCG: Part-II.B2(2)	50 to 47.5	1.0	Any	Yes	Yes
5		50 to 52			Yes	Yes

3. Capability to provide rated output in frequency range of 49.5Hz to 50.5Hz with +/-5% voltage variation							
Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	POI /PCC Voltage (pu)	Power factor (pf)	Active Power dispatch (pu)	**EMT**	**RMS**
6	CEA TSCG: Part- II.B2(2)	50 to 49.5	0.95	Lag (0.95)	1.0	Yes	Yes
7			1.05	Lead(0.95)		Yes	Yes
8		50 to 50.5	0.95	Lag (0.95)		Yes	Yes
9			1.05	Lead (0.95)		Yes	Yes

4. Low Voltage Ride Through (LVRT)

[Other partial active power levels in place of 25% and 50% may also be considered]
[For WTGs, full load test may be conducted at any power level between 90-100%]
[Test for voltage dip up to 0.5 p.u. may be conducted for any other voltage dip also between 0.15 p.u. to 0.85 p.u. The time duration shall be considered as per the LVRT curve in CEA TSCG]

Test No.	Relevant Regulation Clause	**LVRT Target Voltage (pu)**	Duration of voltage dip (sec)	Pre - fault Active Power dispatch (pu)	Nature of voltage dip	**EMT**	**RMS**
10	CEA TSCG: Part-II.B2(3)	0.85	3.0	1.0	Balanced Three phase	Yes	Yes
11		0.5	1.65			Yes	Yes
12		0.15	0.3			Yes	Yes
13		0.85	3.0		Unbalanced (LL)	Yes	No
14		0.5	1.65			Yes	No
15		0.15	0.3			Yes	No
16		0.85	3.0		Unbalanced (L)	Yes	No
17		0.5	1.65			Yes	No
18		0.15	0.3			Yes	No
19		0.85	3.0	0.5	Balanced Three phase	Yes	Yes
20		0.5	1.65			Yes	Yes
21		0.15	0.3			Yes	Yes
22		0.85	3.0		Unbalanced (LL)	Yes	No
23		0.5	1.65			Yes	No
24		0.15	0.3			Yes	No
25		0.85	3.0		Unbalanced (L)	Yes	No
26		0.5	1.65			Yes	No
27		0.15	0.3			Yes	No
28		0.85	3.0	0.25	Balanced Three phase	Yes	Yes
29		0.5	1.65			Yes	Yes
30		0.15	0.3			Yes	Yes
31		0.85	3.0		Unbalanced (LL)	Yes	No
32		0.5	1.65			Yes	No
33		0.15	0.3			Yes	No
34		0.85	3.0		Unbalanced (L)	Yes	No
35		0.5	1.65			Yes	No
36		0.15	0.3			Yes	No

5. Active power set-point and Rate of change of active power						
Test No.	Relevant Regulation Clause	**Change in active power dispatch**	POI/PCC Voltage (pu)	Power factor (pf)	**EMT**	**RMS**
37	CEA TSCG: Part-II.B2(4)(i)	Active power set-point and Ramp up test (ramp rate < 10% per minute)	1.0	Unity	Yes	Yes
38		Active power set-point and Ramp down test (ramp rate < 10% per minute)			Yes	Yes

6. Frequency response test (any droop in range of 3 - 6%) [In place of step change of 0.15 Hz, any other step change for tests may also be considered] [Other partial active power levels in place of 10% and 50% may also be considered]							
Test No.	Relevant Regulation Clauses	**Frequency change (Hz)**	Active Power dispatch (pu)	POI/PCC Voltage (pu)	Power factor (pf)	**EMT**	**RMS**
39	CEA TSCG: Part-II.B2(4)(ii,iii) IEGC: 30(10)	50 to 50.15	0.9-1.0	1.0	Unity	Yes	Yes
40			0.5			Yes	Yes
41			0.1			Yes	Yes
42		50 to 49.85	0.5			Yes	Yes
43			0.1			Yes	Yes
Note: During the above test, frequency shall be first changed upto dead band limit to show its insensitivity to active power change							

7. Demonstration of immediate (within 1 second) real power primary frequency response of at least 10% of maximum Alternating Current active power capacity for frequency deviation in excess of 0.3 Hz:

Test No.	Relevant Regulation Clause	**Change in frequency (Hz)**	Active Power dispatch (pu)	POI/PCC Voltage (pu)	Power factor (pf)	**EMT**	**RMS**
44	CEA TSCG: PartII.B2(4) (ii, iii)	Greater than 0.3Hz (upwards)	1.0	1.0	Unity	Yes	Yes
45		Greater than 0.3Hz (downwards)				Yes	Yes

8. High Voltage Ride Through (HVRT)
[For WTGs, full load test may be conducted at any power level between 90-100%] [Other partial active power levels in place of 25% and 50% may also be considered]

Test No.	Relevant Regulation Clause	**HVRT Target Voltage (pu)**	Duration of voltage rise (sec)	Initial Active Power dispatch (pu)	Nature of voltage rise	**EMT**	**RMS**
46	CEA TSCG: Part-II.B2(7)	1.3	0.2	1.0	Balanced Three phase	Yes	Yes
47		1.2	2			Yes	Yes
48		1.3	0.2		Single phase	Yes	No
49		1.2	2			Yes	No
50		1.3	0.2	0.5	Balanced Three phase	Yes	Yes
51		1.2	2			Yes	Yes
52		1.3	0.2		Single phase	Yes	No
53		1.2	2			Yes	No
54		1.3	0.2	0.25	Balanced Three phase	Yes	Yes
55		1.2	2			Yes	Yes
56		1.3	0.2		Single phase	Yes	No
57		1.2	2			Yes	No