



भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
उत्तर क्षेत्रीय विद्युत समिति
Northern Regional Power Committee

विषय: उ.क्षे.वि.स. की नवीकरणीय ऊर्जा उप-समिति की 2^{वीं} बैठक का कार्यवृत्त।

Subject: Minutes of the 2nd meeting of Renewable Energy Sub-Committee of NRPC.

उत्तर क्षेत्रीय विद्युत समिति की नवीकरणीय ऊर्जा उप-समन्वय उप-समिति की 2 वीं बैठक दिनांक 27.01.2025 को आयोजित की गयी थी। उक्त बैठक का कार्यवृत्त संलग्न है और यह उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट <http://164.100.60.165> पर भी उपलब्ध है।

The 2nd Renewable Energy Sub-Committee meeting of NRPC was held on 27.01.2025. The Minutes of this meeting is attached herewith and the same has been uploaded on the NRPC website <http://164.100.60.165>.

(डी. के. मीना)

निदेशक (प्रचालन)

सेवा में : उ.क्षे.वि.स. की नवीकरणीय ऊर्जा उप समिति के सभी सदस्य।

**To : All Members of Renewable Energy Sub-Committee of NRPC
(As per attached list)**

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69	Renew Surya Ravi Pvt. Ltd.	
70	Renew Surya Roshni Pvt. Ltd.	
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उत्तर क्षेत्रीय विद्युत समिति की नवीकरणीय ऊर्जा उप-समिति की 2^{वीं} बैठक का कार्यवृत्त

The 2nd Renewable Energy Sub-Committee meeting of NRPC was held on 27.01.2025 (10:30 hrs. onwards) at NRPC Secretariat, Conference Hall, New Delhi. MS, NRPC welcomed all the participants and requested for the presentation of the agenda items.

List of participants is attached as Annexure-A.

1) Confirmation of Minutes

Minutes of the 1st Renewable Energy Sub-Committee meeting of NRPC was issued on 12.12.2024. Renewable Energy Sub-Committee confirmed the minutes of the meeting.

2) Approval of protection settings by PSC Forum after FTC

2.1 EE (P), NRPC apprised that as per clause 14 (2) of IEGC 2023:

All users connected to the grid shall:

- *obtain approval of the concerned RPC for (i) any revision in settings, and (ii) implementation of new protection system;*
- *intimate to the concerned RPC about the changes implemented in protection system or protection settings within a fortnight of such changes;*

2.2 In 75th NRPC meeting (held on 28.08.2024), procedure for approval of protection settings was deliberated and approved. The same is attached as Annexure-I. Accordingly, FTC is allowed by RLDC/SLDCs based on protection philosophy (Annexure-II). Final approval of settings is done in monthly PSC meetings.

2.3 MS, NRPC conveyed that NRLDC/SLDCs provide provisional approval of the protection setting for the ISTS/intrastate elements (as applicable) during FTC. Further, after receiving the provisional approval of the protection settings, utility shall implement provisional settings and shall list an agenda in the upcoming Protection Sub-Committee for final approval of the same.

2.4 EE (P) NRPC explained in detail the procedure for approval of protection setting which has already been approved in NRPC forum.

2.5 However, MS, NRPC highlighted that it has been observed that Solar Generators are not sending the agenda for final approval of settings. Since, all RE companies are not members of NRPC. During the grant of FTC, NRLDC may mention the condition of putting agenda for approval of settings in upcoming PSC by concerned RE Generator.

- 2.6 MS, NRPC advised that RE generators may be invited to the monthly PSC meetings.
- 2.7 MS, NRPC mentioned that most of the utilities are not giving the agenda for final approval of the protection settings in line with the finalized procedure in spite of emphasizing the same regularly, following has been decided in the 54th PSC meeting (held on 25th November, 2024):

Quote

NRLDC shall give provisional protection clearance during FTC on conditional basis subject to submission of agenda in next Protection Sub-Committee meetings (not later than 2nd next PSC meeting). If utility does not put up the agenda within time, further FTC clearance would not be granted to the concerned.

Unquote

- 2.8 CGM (SO), NRLDC stated that FTCs are allowed only to facilitate timely commissioning of elements but utilities have to ensure approval of forum.
- 2.9 **MS, NRPC stated that utilities should take approval of protection settings as it is requirement of IEGC 2023.**
- 3) Submission of protection performance indices along with reason and corrective action taken for indices less than unity to NRPC Secretariat on monthly basis**
- 3.1 EE(P), NRPC apprised that as per clause 15 (6) of IEGC 2023;

➤ *Users shall submit the following protection performance indices of previous month to their respective RPC and RLDC on monthly basis for 220 kV and above (132 kV and above in NER) system, which shall be reviewed by the RPC:*

a) The **Dependability Index** defined as $D = Nc / Nc + Nf$

b) The **Security Index** defined as $S = Nc / Nc + Nu$

c) The **Reliability Index** defined as $R = Nc / Nc + Ni$

where,

Nc is the number of correct operations at internal power system faults,

Nf is the number of failures to operate at internal power system faults,

Nu is the number of unwanted operations,

Ni is the number of incorrect operations and is the sum of Nf and Nu

➤ *Each user shall also submit the reasons for performance indices less than unity of individual element wise protection system to the respective RPC and action plan for corrective measures. The action plan will be followed up regularly in the*

respective RPC.

- 3.2 In PSC meeting, it has been decided that each utility shall submit the Performance **indices of previous month by 7th day of next month.**
- 3.3 It has been observed that RE utilities are not submitting indices to NRPC Secretariat. Only TATA Power Renewable Ltd has submitted indices for December 2024.
- 3.4 Format for submission of indices is attached as Annexure-III.
- 3.5 **MS, NRPC asked RE utilities to submit the performance indices of previous month by 7th day of next month element wise along with the reason for indices less than unity and corrective action taken.**

4) Annual protection audit plan for FY 2024-25 & FY 2025-26

- 4.1 EE(P), NRPC apprised that as per clause 15 of IEGC 2023;
 - *Annual audit plan for the next financial year shall be submitted by the users to their respective RPC by 31st October. The users shall adhere to the annual audit plan and report compliance of the same to their respective RPC.*
- 4.2 In view of above, all utilities were requested to submit the annual protection audit plan for FY-2025-26 latest by 31st October 2024 in the 53rd PSC meeting. Thereafter, agenda is regularly followed up in monthly PSC meeting.

However, RE utilities have not submitted annual audit plan for FY 2024-25 & FY 2025-26.
- 4.3 Format for submission of audit plan is attached as Annexure-IV.
- 4.4 **MS, NRPC asked RE utilities to expedite and submit the Annual protection audit plan to NRPC Sectt. (at seo-nrpc@nic.in) for FY 2024- 25 & FY 2025-26.**

5) Third-party protection audit plan

- 5.1 EE(P), NRPC apprised that as per clause 15 of IEGC 2023:

All users shall also conduct third party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) once in five years or earlier as advised by the respective RPC.
- 5.2 Further, EE(P) NRPC mentioned that as per clause 15 (4) of IEGC 2023;

The third-party protection audit report shall contain information sought in the format enclosed as Annexure–1 in IEGC. The protection audit reports, along with action plan for rectification of deficiencies detected, if any, shall be submitted to the respective RPC and RLDC or SLDC, as the case may be, within a month of submission of third-party audit report. The necessary compliance to such protection audit report shall be followed up regularly in the respective RPC.

- 5.3 However, RE utilities have not submitted third party audit plan neither any report of audit conducted.
- 5.4 **MS, NRPC asked RE utilities to expedite and submit third party protection audit plan to NRPC Sectt. (at seo-nrpc@nic.in) along with the audited report and its compliance as per IEGC 2023.**
- 6) RE generation loss events in case of fault in the vicinity of RE complex and Low Voltage Ride Through (LVRT) & High Voltage Ride Through (HVRT) non-compliance by RE Generators at interconnection point:**
- 6.1 Representative from NRLDC presented the detailed analysis of RE generation loss and LVRT/HVRT non-compliance. It was highlighted that same agenda was discussed in 1st RE Sub-Committee meeting, the necessary action items for RE developers were also outlined in the last meeting, certainly some improvement can be seen however several RE generators are still LVRT/HVRT non-compliant.
- 6.2 It was deliberated that, two (2) significant events of RE generation loss (>1000MW) observed in the last quarter in December 2024, two (2) number of major grid events involving RE generation loss during fault in the RE vicinity and non-compliance of LVRT/HVRT have been observed, brief of these grid event are as follows:

S. No	Date & Time	Fault event	Quantum of RE generation drop	Voltage dip observed	DR/EL & analysis submission status
1	12.12.2024, 12:25 hrs	B-N fault on 220 KV AzurePSS41-Bhadla(PG) Ckt	1860 MW	0.716 PU	Received from Azure41 only
2	15.12.2024, 11:35 hrs	B-N fault on 220 KV AzurePSS41-Bhadla(PG) Ckt	1066 MW	0.63 PU	Received from Azure41 only

- 6.3 Both the events have been analysed in detailed based on SCADA/PMU data available at NRLDC. Based on analysis, list of LVRT/HVRT Non-compliant RE Plants, their Generation Loss quantum and details of common inverters are given as follows.

Details of Events:

Event 1: On 12.12.2024 at 12:25hrs, 220 kV Azure Power 41 Pvt. Ltd.-Bhadla(PG) line tripped on B-N phase to earth fault due to differential protection operation, total generation loss of 1860MW observed in Rajasthan RE complex.

Table-1: List of LVRT/HVRT Non-compliant RE Plants and their Generation Loss quantum for 12th Dec'24 event: (Out of 75, 16 nos. of RE plants found LVRT/HVRT Non-compliant on 12th Dec'24 event)

Event analysis of 12.12.24 RE generation loss event @12:25hrs								
RE Plant Name	Pooling Station	Total Capacity (MW)	Generation before the event (MW) (A)	Generation after the event (MW) (B)	Generation loss (MW) C = (A-B)	% Generation loss (MW) D = (C/A) *100	Inverters/WTG Make	Inverter/WTG Model No
Thar Surya Pvt. Ltd.	Bikaner (PG)	300	282	0	282	100	GAMESA	GAMESA E - 2.25MVA-SB-I
Renew Sun Waves Pvt. Ltd.	Fatehgarh-II (PG)	300	279	72	207	74	SUNGR OW	SG250HX-IN
AMP Energy Green Five Pvt. Ltd.	Bhadla-II (PG)	100	65	26	39	60	FIMER	PVS980
NTPC Nokhra	Bhadla-II (PG)	300	273	110	163	60	TBEA	TC3125KF
							SINENG	EP-3125-HA-UD
Avaada Sunrays Pvt. Ltd.	Bhadla-II (PG)	320	337	170	167	50	SINENG	SP-250K-INH
SB ENERGY FOUR PVT LTD	Bhadla (PG)	200	186	109	77	41	KEHUA	SPI3125K-B-H
NTPC Devikot Solar	Fatehgarh-II (PG)	240	218	132	86	39	TBEA	TC2500KF
Avaada Suncenergy Pvt limited	Bikaner (PG)	350	310	239	71	23	SINENG	EP-3125-HA-UD
Avaada Sustainable RJ Pvt. Ltd.	Bikaner (PG)	300	273	211	62	23	SINENG	EP-3125-HA-UD
ABC Renewable Pvt. Ltd	Bhadla-II (PG)	300	307	243	64	21	TBEA	TC3125KF
ReNew Solar Urja Pvt. Ltd.	Fatehgarh-II (PG)	300	289	238	51	18	SUNGR OW	SG250HX-IN
							TBEA	TS208KTL-HV
NTPC Kolayat	Bhadla-II (PG)	400	499	420	79	16	KEHUA	SPI3125K-B-H
Adani Hybrid Energy Jaisalmer Three Ltd.	Fatehgarh-II (PG)	300	241	203	38	16	HUAWEI	SUN2000-185KTL-INH0
							TBEA	TS208KTL-HV

Renew Surya Ravi Pvt. Ltd.	Bikaner (PG)	300	245	208	37	15	SUNGR OW	SG250HX-IN
Ayana Renewable Power Three Pvt Ltd (ARPTPL)	Bikaner (PG)	194	222	190	32	14	SUNGR OW	SG3125HV-32
SBSR Power Cleantech Eleven Pvt. Ltd.	Bikaner (PG)	300	270	234	36	13	KEHUA	SPI3125K-B-H
Total		4504	4336	2805	1531	35		

Event 2: On 15.12.2024 at 11:35 hrs, 220 kV Azure Power 41 Pvt. Ltd.-Bhadla(PG) line tripped on B-N phase to earth fault due to differential protection operation on account of broken jumper at tower location 50. At the same time 130 MVA 220/33KV ICT at 220kV Azure 34 also tripped on account of Differential relay protection, total generation loss of 1066MW observed in Rajasthan RE complex.

Table-2: List of LVRT/HVRT Non-compliant RE Plants and their Generation Loss quantum for 15th Dec'24 event: (Out of 75, 10 nos. of RE plants found LVRT/HVRT Non-compliant on 15th Dec'24 event)

Event analysis of 15.12.24 RE generation loss event @11:35hrs								
RE Plant Name	Pooling Station	Total Capacity (MW)	Generation before the event (MW) (A)	Generation after the event (MW) (B)	Generation loss (MW) C = (A-B)	% Generation loss (MW) D = (C/A)*100	Inverter s/WTG Make	Inverter/ WTG Model No
SB Energy Six Pvt. Ltd.	Bhadla(PG)	300	304	143	161	53	SINENG	EP3125-HA-UD
Avaada Sunrays Pvt. Ltd.	Bhadla-II (PG)	320	342	167	175	51	SINENG	SP-250K-INH
AMP Energy Green Five Pvt. Ltd.	Bhadla-II (PG)	100	69	39	30	43	FIMER	PVS980
NTPC Devikot Solar plant	Fatehgarh-II(PG)	240	225	135	90	40	TBEA	TC2500KF
Clean Solar Power (Jodhpur) Pvt. Ltd.	Bhadla(PG)	250	251	164	87	35	SUNGR OW	SG250HX-IN
Mega Surya Urja Pvt. Ltd. (MSUPL)	Bhadla-II (PG)	250	236	179	57	24	SINENG	EP3125-HA-UD
SB ENERGY FOUR PVT LTD, Bhadla	Bhadla(PG)	200	194	166	28	14	KEHUA	SPI3125K-B-H

Avaada Sustainable RJ Pvt. Ltd.	Bikaner (PG)	300	300	257	43	14	SINENG	EP-3125-HA-UD
ACME Chittorgarh Solar Energy Pvt Ltd	Bhadla(PG)	250	190	163	27	14	TBEA	TC3750KF
							TBEA	TC5000KF
							TBEA	TS208KTL
ReNew Solar Urja Pvt. Ltd.	Fatehgarh-II(PG)	300	283	247	36	13	SUNGR OW	SG250HX-IN
							TBEA	TS208KTL-HV
Total		2510	2394	1660	734	31		

6.4 MS, NRPC suggested to discuss the plant wise issues regarding generation loss one by one, corrective actions taken, required corrective actions along with timeline for implementing the same. Same have been deliberated as follows;

Thar Surya One Pvt. Ltd. (TS1PL):

Representative from NRLDC stated that generation loss of 282 MW occurred in Thar Surya One Pvt. Ltd. (TS1PL) on 12th Dec'2024 event. Pre-fault generation was 282MW, post-fault generation was 0MW, generation loss of complete 282 MW shows either all the Inverters were tripped or all the feeders were tripped. He further highlighted that same type of event occurred earlier in the plant (i.e. complete generation loss due to tripping of 33kV feeders on O/V despite no tripping condition as per POI voltage) however same was resolved by the plant by disabling the O/V protection of 33kV feeders, and in previous few events plant was found compliant. He further enquired whether O/V protection of 33kV feeders again enabled in plant or is there other reason of generation loss of entire 282 MW on 12th Dec'2024 event.

Representative from Thar Surya One Pvt. Ltd. (TS1PL) stated followings:

- O/V protection of 33kV feeders are disabled and No feeders tripping occurred on 12th Dec'2024 event.
- Complete generation loss of 282 MW occurred due to tripping of all the Inverters.
- Reason of Tripping: 5 voltage error detected within 60sec resulted tripping of all the Inverters. As per previous inverter setting, Inverter trips in case of more than 4 voltage error within 60sec., same has been discussed with OEM and OEM recommended to change it to 10 voltage error within a 60sec, same shall be implemented by OEM in Inverters (GAMESA make) within 10-15 days and issue will be resolved by 15.02.2025.
- DR/EL details and preliminary report was submitted in last week, RCA received from OEM and same will be share within a week. Further, changes that will be done on Inverter by OEM by 15.02.2025 will be shared by 22.02.2025.
- Earlier representative of TS1PL has been changed, nomination for new member for future communications will be shared with NRPC.

Renew Sun Waves Pvt. Ltd. (RSWPL) and Renew Surya Ravi Pvt. Ltd. (RSRPL):

Representative from NRLDC stated that generation loss of 207 MW (74%) and 37 MW (15%) occurred in Renew Sun Waves Pvt. Ltd. and Renew Surya Ravi Pvt. Ltd. respectively on 12th Dec'2024 event. He further highlighted that RSWPL and RSRPL are the repetitive non-compliant RE plants, issues pertaining to abnormal tripping of Sungrow SG250HX-IN inverters installed in both the plants have been deliberated several times in earlier meetings as well as in 1st RE Sub-Committee meeting. It is a long pending issue and it was expected to get rectified by June'2023 but not yet resolved.

Representative from Renew Power stated followings:

- No feeder level tripping occurred on 12th Dec'2024 however active power reduction (power dip) was observed.
- Recently, issues of power dips of Sungrow SG250HX-IN inverters were taken up with Sungrow (OEM), a Committee with Hero future (CSPJPL) and Adani Green (AGEL) were formed to resolve the issues expeditiously. Sungrow (OEM) brought the updation of firmware, in this update df/dt (ROCOF) and anti-islanding protections of Sungrow Inverter were disabled by OEM.
- Due to persisting issue of Sungrow SG250HX-IN inverters (i.e. abnormal tripping of Inverter on wrong zero crossing in case of any fault event), Sungrow (OEM) updated the Software & Firmware of the all Sungrow SG250HX-IN inverters in all the Renew projects which were completed on 15th Nov'2024, in this update Sungrow has disabled df/dt (ROCOF) and anti-islanding protections of Sungrow SG250HX-IN Inverters.
- After the Firmware update improvement have been observed and quantum of generation loss has been reduced, but again in Dec'24 events generation loss occurred in the Plants even after the Firmware update in Nov'24, same need to be analysed in detailed.
- As discussed with OEM, there issue in frequency protection of Inverter, there might be issue in frequency tracking algorithm of the inverter which is causing abnormal tripping.
- Regarding 12th Dec'24 and 15th Dec'24 events, data has already been shared with Sungrow (OEM), but Root cause analyses report (RCA) is awaited from OEM.
- Root causes analyses report (RCA) along with changes implemented (i.e. earlier Firmware Vs New Firmware) will be shared with NRLDC/NRPC within 7-10 days.

AMP Energy Green Five Pvt. Ltd (AEG5L):

Representative from NRLDC stated that generation loss of 39 MW (60%) and 30 MW (43%) occurred on 12th Dec'24 and 15th Dec'24 events respectively in AMP Energy Green Five Pvt. Ltd (AEG5L). He further highlighted that AMP Energy Green Five Pvt. Ltd (AEG5L) is also in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting but no improvement observed yet.

No one was present from AMP Energy Green Five Pvt. Ltd (AEG5L) in the meeting.

NTPC Nokhra, NTPC Devikot and NTPC Kolayat:

Representative from NRLDC stated followings;

- Generation loss of 163 MW (60%) occurred in NTPC Nokhra Solar plant on 12th Dec'2024 event.
- Generation loss of 86 MW (39%) and 90 MW (40%) occurred on 12th Dec'24 and 15th Dec'24 events respectively in NTPC Devikot Solar Plant.
- Generation loss of 79 MW (16%) occurred in NTPC Kolayat Solar plant on 12th Dec'2024 event.
- NTPC Devikot Solar Plant is also in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting but no improvement observed yet.

No one was present from NTPC in the meeting.

MS, NRPC directed to issue a letter from RE Sub-Committee side to ensure the participation in the meeting for deliberation in the meeting regarding corrective measures being taken at Plant end to ensure the LVRT/HVRT compliance.

Avaada Sunce energy Pvt Ltd., Avaada Sustainable RJ Pvt. Ltd. and Avaada Sunce energy Pvt Ltd.:

Representative from NRLDC stated that generation loss of 167 MW (50%) and 175 MW (51%) occurred on 12th Dec'24 and 15th Dec'24 events respectively in Avaada Sunrays Energy Pvt. Ltd. (ASEPL). He further highlighted that Avaada Sunrays Energy Pvt. Ltd. (ASEPL) is also in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting but no improvement observed yet.

He further stated that generation loss of 62 MW (23%) and 43 MW (14%) occurred on 12th Dec'24 and 15th Dec'24 events respectively in Avaada Sustainable RJ Pvt. Ltd. and generation loss of 71 MW (23%) occurred on 12th Dec'24 event in Avaada Sunce energy Pvt Ltd.

Representative from Avaada stated followings:

- Software of String Inverters (SINENG SP-250K-INH) in Avaada Sunce energy Pvt Ltd. have been updated by SINENG (OEM) on 15th Dec'2024. As both the events occurred before updation of software, hence improvement can be seen in any next event, same is under observation in case of any fault event after 15th Dec'2024 performance will be analysed and report will be submitted to NRLDC/NRPC.
- D/R have been submitted, detailed report along with reason of tripping in Avaada Plants in both the events will be submitted in one week.
- From future, timely submission of tripping details as per IEGC clause 37.2(c) shall be ensured.

ABC Renewable (RJ-01) Pvt. Ltd.:

Representative from NRLDC stated that generation loss of 64 MW (21%) occurred on 12th Dec'24 event in ABC Renewable (RJ-01) Pvt. Ltd. plant, he further highlighted that ABC Renewable (RJ-01) Pvt. Ltd. is also in the list of 15 repetitive non-complaint RE plants, issue was also deliberated in 1st RE Sub-Committee meeting but no major improvement observed yet.

Representative from ABC Renewable (RJ-01) Pvt. Ltd. stated followings:

- After continuous follow up with TBEA (OEM), they have updated the Firmware & software of TBEA TC3125KF inverters two (2) times in Sep'24 and Oct'24.
- Improvement have been observed after updation of Firmware & software of Inverters, earlier generation loss quantum was usually 80-90MW, in this event generation loss quantum was 64MW. Further, on 15th Dec'24 event plant was able to recover 90% of pre-fault active power.
- After the Non-compliance and generation loss on 12th Dec'24 event, issue was again taken up with TBEA and meeting was held with its R&D team. Based on 12th Dec'24 event, Firmware & software again updated for all the TBEA TC3125KF inverters on 10th Jan'2025, improvement can be seen in any future event.
- Details of actions taken, Firmware & software updated and the reason of tripping on 12th Dec'24 event will be shared by 15th Feb'2025.

SB ENERGY FOUR PVT LTD (SBE4L), Adani Hybrid Energy Jaisalmer Three Ltd. (AHEJ3L), SBSR Power Cleantech Eleven Pvt. Ltd., SB Energy Six Pvt. Ltd. (SBE6PL) (All the plants being owned by Adani Green Energy Ltd. (AGEL)):

Representative from NRLDC stated followings;

- Generation loss of 77 MW (41%) and 28 MW (14%) occurred on 12th Dec'24 and 15th Dec'24 events respectively in SB ENERGY FOUR PVT LTD (SBE4L).
- Generation loss of 38 MW (16%) occurred on 12th Dec'24 event in Adani Hybrid Energy Jaisalmer Three Ltd. (AHEJ3L).
- Generation loss of 36 MW (13%) occurred on 12th Dec'24 event in Adani Solar Energy Jaisalmer Two Pvt. Ltd. (formerly known as SBSR Power Cleantech Eleven Pvt. Ltd.).
- Generation loss of 161 MW (53%) occurred on 15th Dec'24 event in SB Energy Six Pvt. Ltd.(SBE6PL).

Representative from NRLDC further highlighted that Adani Hybrid Energy Jaisalmer Two Ltd. (AHEJ2L) and Adani Solar Energy Jaisalmer One Pvt. Ltd. (ASEJ1L) were in the list of 15 repetitive Non-compliant RE plants. However, these two (2) plants were able to recover 90% of pre-fault active power within 1sec and enquired the actions taken at plant side for this improvement.

Representative from Adani Green Energy Ltd. (AGEL) stated followings:

- Adani Hybrid Energy Jaisalmer Two Ltd. (AHEJ2L) is having 1500 nos. of Sungrow SG250HX-IN inverters, Sungrow (OEM) has updated the firmware in all the Inverters on 5th Oct'2024. However, the details of what parameters changes have been done by OEM in the Firmware update is not yet received. Once details regarding changes made in Firmware will be received from OEM, same will be shared with NRLDC/NRPC tentative by 20th Feb'2025.
- Regarding tripping in SB ENERGY FOUR PVT LTD (SBE4L) and in SB Energy Six Pvt. Ltd. (SBE6PL), details have been shared with OEMs. Once report will come, same will be shared with NRLDC/NRPC tentative by 20th Feb'2025. Further, AGEL have planned to install the Static VAR generator (SVGs) in SB Energy Six Pvt. Ltd. (SBE6PL).
- Adani Hybrid Energy Jaisalmer Three Ltd. (AHEJ3L) is having 1563 nos. (250MW) of Wattpower inverters and 240 nos. (50MW) of TBEA TS208KTL-HV inverters.

Issue is being faced in TBEA TS208KTL-HV inverters, same is under continuous follow up with TBEA (OEM), progress report will be submitted to NRLDC/NRPC by 15th Feb'2025.

- Adani Solar Energy Jaisalmer Two Pvt. Ltd. (formerly known as SBSR Power Cleantech Eleven Pvt. Ltd.) is having 96 nos. (300MW) of KEHUA SPI3125K-B-H inverters. Issue is being faced in KEHUA SPI3125K-B-H inverters, same is under continuous follow up with KEHUA (OEM), progress report will be submitted to NRLDC/NRPC by 15th Feb'2025.

ReNew Solar Urja Pvt. Ltd. (RSUPL):

Representative from NRLDC stated that generation loss of 51 MW (18%) and 36 MW (13%) occurred on 12th Dec'24 and 15th Dec'24 events respectively in ReNew Solar Urja Pvt. Ltd. (RSUPL) solar plant. He further highlighted that ReNew Solar Urja Pvt. Ltd. (RSUPL) is also in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting but no improvement observed yet.

ReNew Solar Urja Pvt. Ltd. (RSUPL) is being owned by IndiGrid but **no one was present from IndiGrid in the meeting** to respond.

Ayana Renewable Power Three Pvt Ltd (ARPTPL) and ACME Chittorgarh Solar Energy Pvt Ltd:

Representative from NRLDC stated followings;

- Generation loss of 32 MW (14%) occurred in Ayana Renewable Power Three Pvt Ltd (ARPTPL) on 12th Dec'2024 event.
- Generation loss of 27 MW (14%) occurred in ACME Chittorgarh Solar Energy Pvt. Ltd. on 15th Dec'2024 event. (ACME Chittorgarh Solar Energy Pvt. Ltd. is being owned by Ayana Power).
- ACME Chittorgarh Solar Energy Pvt. Ltd. is also in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting but no improvement observed yet.

Representative from Ayana Power stated followings:

- Regarding Ayana Renewable Power Three Pvt Ltd (ARPTPL), details are being analysed, report will be shared in 15 days.
- Issue pertaining to ACME Chittorgarh will be checked with the concerned Plant manager and will be updated accordingly.

Clean Solar Power (Jodhpur) Pvt. Ltd.:

Representative from NRLDC stated that generation loss of 87 MW (35%) occurred on 15th Dec'24 event in Clean Solar Power (Jodhpur) Pvt. Ltd. He further stated that Clean Solar Power (Jodhpur) Pvt. Ltd. is also in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting but no improvement observed yet.

No one was present from Clean Solar Power (Jodhpur) Pvt. Ltd. (Hero future) in the meeting.

Mega Surya Urja Pvt. Ltd. (MSUPL):

Representative from NRLDC stated that generation loss of 57 MW (24%) occurred on 15th Dec'24 event in Mega Surya Urja Pvt. Ltd. (MSUPL).

No one was present from Mega Surya Urja Pvt. Ltd. (Mahindra Solar) in the meeting.

Azure Power 41 Pvt. Ltd. (AP41PL):

Representative from NRLDC stated that on both the events of 12th Dec'24 and 15th Dec'24, 220 kV AzurePSS41-Bhadla(PG) line tripped on B-N fault.

No one was present from Azure Power 41 Pvt. Ltd. (Azure Power) in the meeting.

As per the detailed deliberation, plant name, Action taken, Corrective action required / further course of action along with tentative timelines as committed in the meeting is summarized in Table-3.

Table-3: Details of LVRT/HVRT Non-compliant RE Plants on 12th Dec'24 and 15th Dec'24 fault event, Action taken, Corrective action required / further course of action along with tentative timelines as committed in the meeting

Sl. No.	Plant Name	Action Taken	Corrective action required / further course of action	Tentative Timeline
1	Renew Sun Waves Pvt. Ltd. (RSWPL)	Sungrow (OEM) brought the updation of firmware, in this update, Sungrow has disabled df/dt (ROCOF) and Anti-islanding protections of the SG250HX-IN Inverter	Again, in Dec'24 events generation loss occurred in the Plant even after the Firmware update in Nov'24, same need to be analysed in detailed and Root cause analyses report (RCA) along with changes implemented (i.e. earlier Firmware Vs New Firmware) will be shared with NRLDC/NRPC.	15.02.2025
2	Renew Surya Ravi Pvt. Ltd. (RSRPL)	Sungrow (OEM) brought the updation of firmware, in this update, Sungrow has disabled df/dt (ROCOF) and Anti-islanding protections of the SG250HX-IN Inverter	Again, in Dec'24 events generation loss occurred in the Plant even after the Firmware update in Nov'24, same need to be analysed in detailed and Root cause analyses report (RCA) along with changes implemented (i.e. earlier Firmware Vs New Firmware) will be shared with NRLDC/NRPC.	15.02.2025
3	AMP Energy Green Five Pvt. Ltd (AEG5L)	No one was present in the meeting to update any action taken at Plant end	AMP Energy Green Five Pvt. Ltd (AEG5L) is in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting, but no improvement observed yet. Plant needs to take the corrective measures and appraise the same to the forum accordingly.	
4	NTPC Nokhra	No one was present in the meeting to update any action taken at Plant end	Plant needs to take the corrective measures and appraise the same to the forum accordingly.	
5	NTPC Devikot	No one was present in the meeting to update any action taken at Plant end	NTPC Devikot is in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting, but no improvement observed yet. Plant needs to take the corrective measures and appraise the	

			same to the forum accordingly.	
6	NTPC Kolayat	No one was present in the meeting to update any action taken at Plant end	Plant needs to take the corrective measures and appraise the same to the forum accordingly.	
7	Avaada Sunrays Energy Pvt. Ltd. (ASEPL)	Software of String Inverters (SINENG SP-250K-INH) in Avaada Sunce energy Pvt Ltd. have been updated by SINENG (OEM) on 15 th Dec'2024. As both the events occurred before updation of software, hence improvement can be seen in any next event.	Same is under observation after software update, in case of any fault event after 15 th Dec'2024 performance will be analysed, and report will be submitted to NRLDC/NRPC. Detailed report along with reason of tripping in Avaada Plants in both the events of 12.12.2024 and 15.12.2024 will be submitted to NRLDC/NRPC.	10.02.2 025
8	Avaada Sustaina ble RJ Pvt. Ltd.	Reason of No absorption of Reactive power in HVRT is under discussion with OEM (SINENG).	Detailed report along with reason of tripping in Avaada Plants in both the events of 12.12.2024 and 15.12.2024 will be submitted to NRLDC/NRPC.	10.02.2 025
9	Avaada Sunce energy Pvt Ltd.	Reason of No absorption of Reactive power in HVRT is under discussion with OEM (SINENG).	Detailed report along with reason of tripping in Avaada Plants in both the events of 12.12.2024 and 15.12.2024 will be submitted to NRLDC/NRPC.	10.02.2 025
10	ABC Renewab le (RJ- 01) Pvt. Ltd.	After continuous follow up with TBEA (OEM), they have updated the Firmware & software of TBEA TC3125KF inverters two (2) times in Set'24 and Oct'24. After the Non-compliance and generation loss on 12 th Dec'24 event, issue was again	Details of actions taken, Firmware & software updated and the reason of tripping on 12 th Dec'24 event will be shared with NRLDC/NRPC. Further observations after Firmware & software on 10 th Jan'25 will be share in case of any future fault event.	15.02.2 025

		taken up with TBEA and meeting was held with R&D team. Based on 12 th Dec'24 event, Firmware & software again updated for all the TBEA TC3125KF inverters on 10 th Jan'2025		
11	SB ENERGY FOUR PVT LTD (SBE4L)	Regarding tripping in SB ENERGY FOUR PVT LTD (SBE4L), details have been shared with OEMs.	OEM is analysing the root cause, once report will come, same will be shared with NRLDC/NRPC	20.02.2025
12	SB Energy Six Pvt. Ltd. (SBE6PL)	Regarding tripping in SB Energy Six Pvt. Ltd. (SBE6PL), details have been shared with OEMs.	OEM is analysing the root cause, once report will come, same will be shared with NRLDC/NRPC	20.02.2025
13	Adani Hybrid Energy Jaisalmer Three Ltd. (AHEJ3L)	Issue is being faced in TBEA TS208KTL-HV inverters installed in the plant, same is under continuous follow up with TBEA (OEM)	Progress status report will be shared with NRLDC/NRPC	15.02.2025
14	Adani Solar Energy Jaisalmer Two Pvt. Ltd.	Issue is being faced in KEHUA SPI3125K-B-H inverters installed in the plant, same is under continuous follow up with KEHUA (OEM)	Progress status report will be shared with NRLDC/NRPC	15.02.2025
15	ReNew Solar Urja Pvt. Ltd. (RSUPL)	No one was present from IndiGrid in the meeting to update any action taken at Plant end.	ReNew Solar Urja Pvt. Ltd. (RSUPL) is in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting but no improvement observed yet. Plant needs to take the corrective measures and appraise the same to the forum	

			accordingly.	
16	Ayana Renewable Power Three Pvt Ltd (ARPTPL)	Details are being analysed	Report on Reason of generation loss and tripping of Inverter along with suggestive corrective action will be submitted to NRLDC/NRPC.	15.02.2025
17	ACME Chittorgarh Solar Energy Pvt Ltd.	No action taken yet, concerned person from Ayana attended the meeting was not aware of the generation loss event in ACME Chittorgarh.	ACME Chittorgarh Solar Energy Pvt Ltd. is in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting but no improvement observed yet. Plant needs to take the corrective measures and appraise the same to the forum accordingly.	20.02.2025
18	Clean Solar Power (Jodhpur) Pvt. Ltd.	No one was present from Clean Solar Power (Jodhpur) Pvt. Ltd. (Hero Futures) in the meeting to update any action taken at Plant end.	Clean Solar Power (Jodhpur) Pvt. Ltd. is in the list of 15 repetitive non-complaint RE plants, issue was deliberated in 1st RE Sub-Committee meeting but no improvement observed yet. Plant needs to take the corrective measures and appraise the same to the forum accordingly.	
19	Mega Surya Urja Pvt. Ltd. (MSUPL)	No one was present from Mega Surya Urja Pvt. Ltd. (MSUPL) (Mahindra Solar) in the meeting to update any action taken at Plant end.	Plant needs to take the corrective measures and appraise the same to the forum accordingly.	
20	Azure Power 41 Pvt. Ltd. (AP41PL)	No one was present from Azure Power 41 Pvt. Ltd. (AP41PL) in the meeting to update any action taken at Plant end.	Plant needs to take the corrective measures and appraise the same to the forum accordingly.	

6.5 Apart from individual plant wise discussion, following common points were deliberated pertaining to LVRT/HVRT Non-compliance and Generation loss issue:

- a) **Non submission of Tripping details:** Majority of the RE developers did not submit the required details for analysing the event and to find the reason of

generation loss and LVRT/HVRT non-compliance at POI (Non-compliance of IEGC clause 37.2(c) and clause 15.3 of CEA grid standard). All RE developers were requested for timely submission of the tripping details along with relevant supporting data in Tripping portal in case of any fault event, also prompt reply should be given upon receiving NRLDC/NRPC mail communication in this matter.

- b) **Inadequate or no reactive power response during LVRT/HVRT:** Recovery of 90% of pre-fault active power within 1sec is the one requirement of LVRT, other requirement is reactive power support during fault event. Similar, apart from riding through the high voltage other requirement of HVRT is absorption of reactive power. RE plants need to analyse the reactive power support in case of any fault event (LVRT) or post-fault high voltage (HVRT if any). In case plant is reporting tripping of Inverter on O/V plant should submit the voltage observed at Inverter terminal and reactive power absorption support came from Inverter before its tripping.
- c) **Validation of Plant level simulation model:** Validation of Plant level simulation model with actual plant response during any fault event is yet to be completed for all the existing RE plants. As per FTC procedure, RE plants needs to validate the Plant level simulation model within 3 months of commissioning. Simulation model submitted at the time of connectivity/FTC are not depicting the actual plant behaviour in real-time due to various shortcomings like no modelling of various protection of Inverter or protection of other Internal elements of plant which is implemented in field and causing abnormal tripping during any fault event. All the RE developers were requested to validate the PSSE & PSCAD simulation model as submitted during connectivity/FTC with plant's actual response during any fault event.

Forum further directed that issues of LVRT/HVRT non-compliances should be taken seriously and needs to be addressed from its root-cause as it will have serious implications on grid stability in near future when ~40-50GW capacity would be concentrated in Rajasthan RE complex.

7) Voltage Oscillation and Voltage spikes issue in RE complex

- 7.1 Representative from NRLDC stated that several events of High frequency high amplitude **voltage oscillations of magnitude 60-80kV** have been observed in Rajasthan RE complex of Northern Regional grid during the month of Nov'24 and Dec'24 and deliberated followings;
- 7.2 High-frequency, low-amplitude voltage oscillations (mainly from RE plants side) escalated into high-frequency, high-amplitude voltage oscillations when the STATCOM at Fatehgarh-II & Bhadla-II remained in Auto mode (VCM or QCM). To mitigate this, STATCOM at Fatehgarh-II (PG)/Bhadla-II(PG) were operated in manual mode (Fixed-Q) during peak solar generation period.
- 7.3 Voltage oscillation and MVar fluctuation of STATCOM were analysed for several events, it has been observed that when STATCOM mode was changed from Auto mode (VCM or QCM) to manual mode (Fixed-Q), oscillation died out.
- 7.4 Issue of voltage oscillations and translation of high-frequency, low-amplitude voltage oscillations into high-frequency, high-amplitude voltage oscillations were discussed in detailed in 1st RE Sub-Committee meeting held on 24.10.2024. In line with the MoM

of 1st RE Sub-Committee meeting, PGCIL has submitted the report on STATCOM performance/behaviour during oscillation as received from SIEMENS (STATCOM OEM)) on 12.12.2024.

- 7.5 Representative from PGCIL stated that SIEMENS submitted the detailed report addressing the concerns raised by Grid-India and CTUIL. Further as per **agenda A.11** of the 2nd RE Sub-Committee meeting, SIEMENS Team (STATCOM OEM) is also present physically in this meeting as per special invitation of NRPC for detailed deliberation on the matter and further discussion on the report submitted.
- 7.6 Detailed deliberations were made with SIEMENS Team on the “*Report on STATCOM performance/behaviour during oscillation*” received from PGCIL dated 12.12.2024. Report was prepared by SIEMENS (STATCOM OEM) based on real-time cases using Transient Fault recorder (TFR) data and PMU plots/inputs/queries received from Grid-India & CTUIL. **A.11** may be referred for the same.
- 7.7 Apart from oscillation, significant dip in RE complex voltage observed in several instances, sample for 7th Dec’2024 (Solar peak hrs.) is shown below, from the below figure voltage dip/spikes of 765kV to 680kV and then rise to 810kV can be seen, exact reason of significant voltage dip/ spikes is still unidentified but preliminary it appeared as control interaction issue under Low SCR and Low voltage condition.



- 7.8 Representative from NRLDC further stated that SCR at RE pooling S/s is certainly linked with the oscillation and voltage spikes. He further highlighted that instances of high-frequency, high-amplitude voltage oscillations and voltage dip/fluctuation have considerably reduced after charging of 765kV Bhadla-II-Sikar-II D/C line on 17.12.2024. After 17.12.2024, STATCOMs in RE pocket are mostly being operated in Auto mode only, also SCR of Fatehgarh-II & Bhadla-II system have improved slightly. 400kV Fatehgarh-II (PG) and 220kV Fatehgarh-II (PG) SCR are improved by 0.25 and 0.12 respectively.

Voltage Level (kV)	Pooling S/s	Generation being pooled (MW)	Before Charging of 765kV Bhadla-II-Sikar-II D/C line		After Charging of 765kV Bhadla-II-Sikar-II D/C line		Change in Fault level (MVA)	Change in SCR (MVA)
			3-Ph Fault MVA	SCR	3-Ph Fault MVA	SCR		
220	Fatehgarh-II_A	2490	10670	4.29	10966	4.40	296	0.12
400	Bhadla-II	3408	24128	7.08	26213	7.69	2086	0.61
400	Fatehgarh-II	5640	22892	4.06	24290	4.31	1398	0.25
400	Fatehgarh-I	2200	13737	6.24	14200	6.45	463	0.21
400	Fatehgarh-III	1380	18822	13.64	19444	14.09	622	0.45

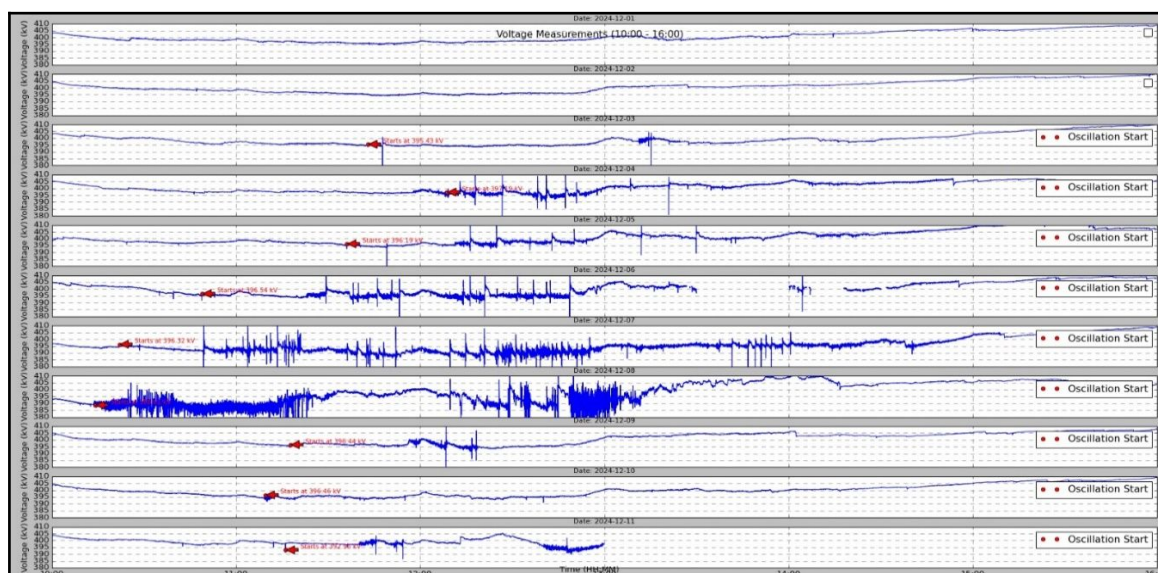
- 7.9 Representative from NRLDC further informed the forum that, further rise in solar generation without commissioning of its associated transmission system would cause the depletion of SCR in RE pooling S/s and again same issue of voltage oscillation

may come. Therefore, it is crucial to take proactive measures to identify the **root-cause of High-frequency, low-amplitude voltage oscillations originating from RE plants** and translation of high-frequency, low-amplitude voltage oscillations into high-frequency, high-amplitude voltage oscillations in case of Low SCR (Weak grid connectivity/low system strength) when STATCOMs remains in Auto mode (VCM or QCM). The issue of oscillation was previously discussed in 1st RE Sub-Committee meeting held on 24.10.2024, where all renewable energy (RE) developers were advised to investigate the issue of any oscillatory response from Inverters in case of low SCR. On enquiring about any RE plant(s) analyse the issue of oscillation at their end and status of further tuning of any Inverter/PPC parameters to avoid oscillation, No RE plant(s) responded as any study from RE plant side in case of any oscillations is not yet conducted.

7.10 Representative from NRLDC further informed the forum that repeated periodic spikes in voltage of RE pooling stations (40-50 kV peak to peak) at 400kV bus observed in Dec'24. A daily trend for 10-16 hours of voltage of 400 kV Bhadla (PG) station for the period 1st-11th Dec 2024 is shown below. It has been observed from the below plot that when voltage at 400kV bus is going below 390-395kV, spikes in voltage and then oscillation observed.

7.11 Forum requested RE plants to analyse any control interaction issue in case of low voltage with low SCR condition. Also, adequate reactive power support is required from RE plants to ensure good voltage profile at 400kV level and pending reactive power capability compliances should be ensured by the old RE plants.

400kV Bhadla (PG) S/s voltage profile (PMU) between 10-16 hours for 1st-11th Dec 2024



7.12 Representative from NRLDC requested the forum that commissioning of RE evacuating lines planned for evacuation of Phase-II & Phase-III generation needs to be expedited as nearly entire generation of Phase-II has already been commissioned and ~1000 MW of Phase-III generation has been commissioned but few Transmission elements of Ph-II is yet to get commissioned and not a single transmission element of Phase-III is commissioned yet. Delay in commissioning of Associated transmission system would lead to the situation of Weak grid

connectivity/low system strength because of penetration of additional RE generation of Phase-II & Phase-III in existing Transmission system.

7.13 Representative from NRLDC further informed the forum that on 28th December 2024, at 12:01 hrs, high-frequency voltage oscillations were detected in Rajasthan RE complex with magnitude of oscillation 80 kV Peak to peak at 765kV level. The oscillations continued till STATCOMSs at Fatehgarh-II and Bhadla -II were taken into Manual (Fixed-Q mode). ***The reactive power of the following plants is found to be in phase with the oscillating voltage in system.***

- o **Bikaner (PG):** Avada Renewable (890MW) (Avaada Sunce Pvt. Ltd._350MW, Avaada Sustainable RJ Pvt. Ltd._300MW & Avaada RJHN Pvt. Ltd._240MW).
- o **Bikaner-II:** Amplus Grian One Volt Pvt. Ltd. (300MW)
- o **Bhadla(PG):** SB Energy Six Pvt. Ltd. (300MW), Mahoba Solar Pvt. Ltd. (300MW) and Azure Power 41 Pvt. Ltd (300MW).
- o **Bhadla-II (PG):** NTPC Kolayat Solar Plant (521MW).
- o **Fatehgarh-I:** NTPC Devikot Solar Plant (296MW).
- o **Fatehgarh-II:** ReNew Solar Energy (Jharkhand Three) Pvt. Ltd. (300MW), Renew Sun Bright Pvt. Ltd. (300MW) and Adani Hybrid Energy Jaisalmer Three Ltd. (300MW).
- o **Fatehgarh-III:** Altra Xergi Power Pvt. Ltd. (380MW) and Renew Surya Vihan Pvt. Ltd. & Renew Surya Partap Pvt. Ltd.(300MW).

Voltage profile and Reactive power response of aforementioned plants showing the in phase with the oscillating voltage are given in **Annexure-V**.

7.14 It was deliberated that only **15 RE** plants out of existing 75 RE plants were oscillating In-phase with voltage and causing oscillation. Source of oscillation may be one or more RE plant(s) identified as above.

7.15 ***MS NRPC requested all 15 RE plants (as identified above) were requested to submit the report/reason of in-phase oscillation occurred on 28th Dec'24 by 15.02.2025.***

8) Power Quality measurement and Harmonic distortion analysis for all RE generating stations in line with Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2013, Part-II, clause B1, Sub-clause (1), (2), (3) & (4):

8.1 Representative from NRLDC started the discussion with harmonic related clauses of Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 and amendments thereof.

8.2 It was emphasised that measurement of harmonic content, DC injection and flicker shall be done at least once in a year in presence of the parties concerned and the indicative date for the same shall be mentioned in the connection agreement.

8.3 Several RE plants commissioned in 2019, 2020, 2021 and onwards. Those RE plants commissioned full capacity before 31.12.23 has already violated the 1-year timeline

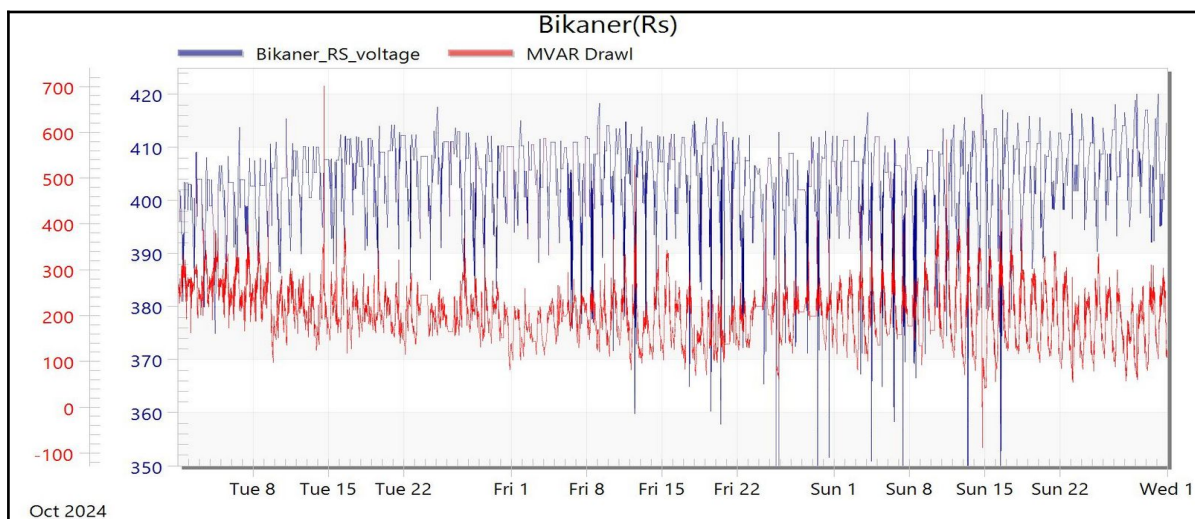
as mandated in CEA (Technical Standards for Connectivity to the Grid). List of these RE plants along with status (as on 27th Jan'24) is enclosed as Annexure-VI.

- 8.4 It was informed to the forum, as on 27.01.2025, there are 44 RE plants whose full capacity commissioned before 31st Dec'23, out of 44 RE plant only 15 RE plants have submitted the Power quality filed test report. Remaining 29 RE plants whose full capacity commissioned before 31st Dec'23 but not submitted the Power quality field test report yet were requested to submit the Power quality field test report at earliest.
- 8.5 Representative from Renew stated that Power Quality testing has been completed in all the Renew plants, reports are awaited, once report will be received same shall be submitted to NRLDC/NRPC by Feb'2025 end.
- 8.6 ***MS NRPC requested all RE developers to perform Power Quality (Harmonic, DC injection & flicker) testing at field and to submit the Power Quality test report by June'2025. Status of progress regarding Power Quality testing of RE plant shall be taken as agenda in next RE Sub-Committee meeting.***

9) Huge MVAR drawl by RVPN network

- 9.1 Representative from NRLDC stated that issue of significant reactive power drawl by Rajasthan Intra state system has been discussed several times in earlier meetings, same is being again informed that Rajasthan state control area has been drawing significant amount of Reactive power (MVAR) from the grid. This has led to very poor power factors at many 400/220kV stations in Rajasthan, causing severe low voltage issues. The issue has been repeatedly highlighted through NRLDC letters and discussions in various OCC and NRPC forums, in Quarterly operational feedback of Grid-India and in the 1st RE Sub-Committee meeting of NRPC as well.
- 9.2 He further stated that Reactive power (MVAR) drawl of Rajasthan from the grid increases further during winter season. High drawl by Rajasthan control area leads to increased dependency on STATCOM and other ISGS RE plants, as they attempt to compensate MVAR drawl by Rajasthan control area by increasing their MVAR to achieve the reference voltage. However, this pushes them towards saturation, limiting their ability to provide adequate dynamic reactive support during sudden voltage drops due to faults. Presently ~2500-3000 MVAR reactive power support is being taken from ISGS RE plants, some portion of this otherwise compensating the reactive power drawl of Rajasthan Intra-state system as system are interconnected. Moreover, low voltage conditions lead to voltage oscillations in the RE pocket. Sample plot for one S/s (i.e. 400kV Bikaner(RS)) for Voltage Vs Reactive Power drawl (300-400MVAR) is given below;

Bikaner(RS) voltage vs MVAR



- 9.3 He further highlighted that augmentation of shunt compensation capacity near load centres like Bikaner, Jodhpur, Kankani, Merta, Hindaun, Alwar etc. to improve the voltage profile as well as reduce transmission losses need to be expedited on priority basis. List of 400/220 kV substations in Rajasthan where Power factor is poor and Huge MVAR drawl from Grid have been observed were shown in the meeting is as follows;

ICTs MW drawl, MVAR drawl, Power factor and S/s voltage for Solar hours (10:00-14:00hrs) for Rajasthan Control area (01-08 Dec 2024)					
400/220 Sub-Station ICTs	ICTs Capacity (MVA)	MW Drawl	MVAR Drawl	Power factor	Voltage(kV)
Bikaner (RVPN)	2*315	100-300	150-300	0.40-0.65	375-390
Jodhpur (RRVPN)	315	400-500	200-300	0.85-0.90	375-385
Kankani (RRVPN)	(315+500)	500-700	200-300	0.87-0.90	370-385
Merta (RRVPN)	2*315	400-500	200-250	0.85-0.89	380-395
Bhinmal (PG)	2*315	500-600	200-300	0.87-0.90	360-370

- 9.4 It was requested that Rajasthan SLDC must address this issue with urgency and conduct a meeting with all intrastate thermal and RE generators, DISCOMs, STU, and other stakeholders to plan for safe and reliable grid management. To address the low voltage issue near RE pooling S/s, reactive power (MVAR) injection from RE plants may be maximize and To address the low voltage issue near load centre, reactive power (MVAR) drawal by load centre needs to be reduced/power factor need to be improved.
- 9.5 MS NRPC asked Rajasthan SLDC about the actions being taken and the future action plan on the ongoing issues of Reactive power drawl and sever low voltage at Rajasthan S/s.

9.6 Representative from Rajasthan SLDC stated followings;

- i. In majority of the Rajasthan Intra-state RE generators Power Plant controllers (PPC) is not installed, so they can't inject reactive power immediately based on given central command. As a solution of this SLDC has initiated the way out, SLDC gives the **Q-schedule = 33% of Previous day Active power of 12:00hrs.** Thus, despite absence of PPC, RE plants sets the Power factor/Q-setpoint of Individual Inverters in advance to Inject Reactive power (MVar) = 33% of previous day Active power of 12:00hrs during solar peak hours.
- ii. Some of the RE plants able to inject the reactive power as per the given Q-schedule, but some RE plants fails to do so. To address this issue continuous follow up is being taken with RE plants.
- iii. On 3rd Jan'2025, Rajasthan SLDC called a meeting of all Intra-state RE generators (connected at 132kV and above) at Vidyut Bhawan (Jaipur) and discussed the matter of Reactive power support shortfall from the RE plants by showing the plots of **Q-schedule Vs Q-actual of RE plants** as per 12.12.2024 real-time reactive power data, Rajasthan further emphasized and sensitized the RE developers regarding requirement of 33% reactive power support as per CEA Technical Standards clause B2(1).
- iv. Further, Rajasthan SLDC is taking up with the RE generators for Installation of PPC in Plants & Park and PQ meters at POI.
- v. Compliance is being ensured at Connectivity/FTC level for all the new coming RE plants, they show the compliance through PSSE based simulations study and ensure the installation of additional dynamic reactive compensation device to ensure compliance of CEA Technical Standards. However, in old plants issue is being faced, example- Saurya Urja at Bhadla (RS) is a 500MW Solar plant but it can inject only up to 72MVar against required 166MVar.
- vi. One issue is being faced with Solar Park, like plant is connected at 33kV but park is connected at 220kV or 132kV. Plant connected at 33kV says that they are ensuring compliance at 33kV but at POI compliance is being not met as reactive power injected by the RE plant connected at 33kV being consumed in 220/33kV power transformer and 220kV evacuating lines. Debate remains, who will address the reactive power consumption of power transformer and evacuating lines, will it be taken care by the plant (SPD) or by the Solar Park developer (SPPD), and issue is under deliberation.

9.7 NRLDC suggested Rajasthan SLDC for preparing the list for RE plants which are not having PPC installed in the plant, RE plants not able to inject reactive power up to 33% of active power at POI despite giving instruction from SLDC Rajasthan and to share this two list with RE Sub-Committee for further course of action.

9.8 NRLDC further enquired about the status of STATCOMs planned for Rajasthan, representative from SLDC Rajasthan stated that Rajasthan Electricity Regulatory Commission (RERC) is yet to approve the investment plan for ± 300 MVar STATCOM at 400kV Bhadla(RS) and at 765kV Jaisalmer S/s.

9.9 NRLDC further enquired about the status of installation of already approved capacitor bank, representative from SLDC Rajasthan informed that order for 500MVar capacitor bank (100 nos. of 5MVar) has already been placed, commissioning will start from July'2025 and installation shall be completed by Nov'2025.

9.10 MS-NRPC acknowledge the Rajasthan efforts and suggested to take the actions on priority basis at multiple front such as reactive power injection by RE plants and Thermal plants, timely commissioning of 500MVAR already approved capacitor bank at STU level and pursuing with DISCOM for timely commissioning of required capacitor bank, commissioning STATCOMs at Intra-state RE pooling S/s, commissioning of adequate Transmission line and ICTs commensurate with demand growth of Rajasthan.

10) Status of RE evacuation Phase-II transmission system

10.1 Representative from NRLDC informed followings to the forum;

- i. Commissioning of Planned Phase-II transmission system (which is yet to be commissioned) for RE generation evacuation from Rajasthan RE complex is essential not only for RE generation evacuation but also for improving the RE pocket's system strength making system more stable and less vulnerable to fluctuations and also for reliving the constraint of N-1 non-compliance of 765kV Jhatikara, 765kV Bhiwani and 765kV Moga S/s ICTs loading.
- ii. Phase-II transmission system needs to be expedited as commissioning of planned Phase-II generation is almost completed, also ~1000MW of phase-III generation is commissioned.
- iii. Creation of 765kV Narela S/s, commissioning of 765kV Khetri-Narela D/C line, LILO of 765kV Meerut-Bhiwani at 765kV Narela S/s and commissioning of 2 nos. of 400kV Narela-Maharanibagh D/C lines needs to be expedited. It would relive the constraint of 765/400kV Jhatikara ICTs loading, as it would divert some quantum of RE power flow from Khetri---Jhatikara path to Khetri---Narela path.
- iv. However, due to 765kV Khetri-Narela D/C line, loading on 765kV Bikaner-Khetri D/C line would increase further which is already highly loaded.
- v. Therefore, to relive the constraint of 765kV Bikaner-Khetri D/C line loading, with commissioning of Phase-III planned generation, commissioning of 765kV Bhadla-II-Sikar-II D/C line (2nd), 765kV Sikar-II-Khetri D/C line and 765kV Sikar-II-Narela D/C line is most important.
- vi. Presently ~4.5GW of RE power evacuation is being facilitated by NRLDC despite non-availability of its complete associated transmission system (ATS), further commissioning of RE projects without ATS would create the situation of bottlenecking in the complex and RE power would have to be curtailed.

10.2 Further, forum asked the status of commissioning of important evacuating line of RE complex from PGCIL to avoid future RE curtailment. PGCIL informed the expected timeline of commissioning for important Transmission line are as follows;

- i. 765kV Bhadla-II(PG)-Sikar-II D/C (2nd) (i.e. Ckt-3 & Ckt-4). (Phase-II)-By 31.03.2025
- ii. Creation of 765kV Narela S/s and 765/400kV, 2*1500MVA ICTs are 765kV Narela S/s. (Phase-II)- (Severe ROW issue at Narela end, LILO portion expected by March'25)
- iii. 765kV Khetri-Narela D/C line. (Phase-II) (Severe ROW issue at Narela end, June'25)
- iv. LILO of 765kV Meerut-Bhiwani at 765kV Narela S/s. (Phase-II) By 31.03.2025
- v. 2 nos. of 400kV Narela-Maharanibagh D/C lines. (Phase-II) By 31.03.2025
- vi. 765kV Sikar-II-Khetri D/C line. (Phase-III) By 31.05.2025
- vii. 765kV Sikar-II-Narela D/C line. (Phase-III) By 30.06.2025

10.3 MS-NRPC requested for timely commissioning of RE evacuating lines for harnessing the RE power, further ROW issues may be resolved expeditiously in coordination with concerned authority.

11) STATCOM mode of Operation and performance

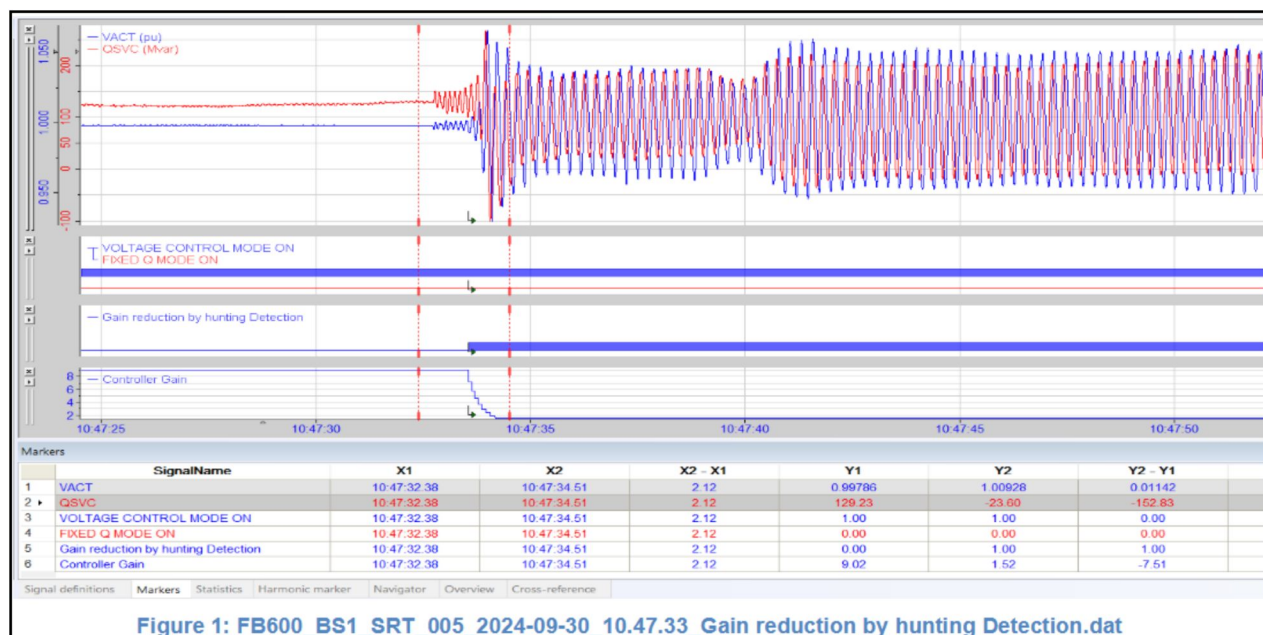
11.1 Detailed deliberations were made with SIEMENS Team on the “Report on STATCOM performance/behaviour during oscillation” received from PGCIL dated 12.12.2024. Report was prepared by SIEMENS (STATCOM OEM) based on real-time cases using Transient Fault recorder (TFR) data and PMU plots/inputs/queries received from Grid-India & CTUIL. MS NRPC, requested SIEMENS team for presentation.

11.2 Representative from SIEMENS team stated followings;

- i. STATCOM is having voltage controller, as per the typical voltage controller running in background, if voltage goes down it will inject the reactive power (MVar) and if voltage goes up it will absorb the reactive power (MVar) based on the voltage error and the VACT.
- ii. VACT is the input to the voltage controller. If grid voltage (all phases a, b & c) frequency is 50Hz, straight line can be seen for VACT.
- iii. If there is oscillation on VACT its mean oscillation in the input to the voltage controller of STATCOM. Say, if 3Hz oscillation occurs in the STATCOM terminal voltage (grid voltage) then there would be oscillation of 3Hz in VACT. Hence, there is 50Hz sinusoidal voltage VACT and on the top of that there is 47Hz and 53Hz component. Therefore, for a voltage oscillation having frequency of oscillation 3Hz, there is 50Hz component as well as 3Hz component and STATCOM will see something like Harmonic beat frequency of 47Hz and 53Hz.
- iv. STATCOM is having the feature of Transient fault recorder (TFR) which can give previous 10 sec and later 10 sec complete details of any event, thus 20 sec details of everything happening within the STATCOM like voltage and other electrical parameters can be analysed using TFR and same has been analysed by the SIEMENS team based on the input received from CTUIL & Grid-India.

SIEMENS team further explained the event wise details as included in the report, same are as follows;

- a) At 10:47:33:53 hrs on 30.09.2024, the stability controller of the STATCOM at Bhadla-II reduced the gain considerably (from 9 to 1.5) on hunting detection, subsequently increasing the magnitude of oscillations significantly



Representative from SIEMENS stated that at the very beginning before high amplitude oscillation, oscillation of frequency 8-9Hz triggered in the system before reduction of the controller gain of STATCOM. Any oscillation of frequency >4Hz, STATCOM detect it as hunting.

STATCOM is having hunting detection feature, normal power oscillation in the network having range 0.2-2Hz is considered as normal power system but any oscillation having frequency >4Hz is not considered as normal power system. Hence, whenever any oscillation of frequency >4Hz comes in the system, STATCOM detect it as hunting and by reducing the controller gain STATCOM want to stop acting on the oscillation, by reducing the controller gain STATCOM reduce the Q injection/absorption. If controller gain remains constant, then response would be like square wave of +300MVar and -300MVar.

Hunting detection is protective function of STATCOM System, and it is designed to reduce the gain if multiple consecutive changes and direction is observed in the regulating current (I_{reg}) at a frequency greater than 4Hz. By this hunting detection and reduction controller gain STATCOM don't want to participate in the oscillation, STATCOM expect the damping to be provided from the grid. Hunting detection function of STATCOM can't be disabled.

b) Immediately after this gain reduction, the magnitude of oscillations increased significantly possibly due to slow response time ~ 70 ms

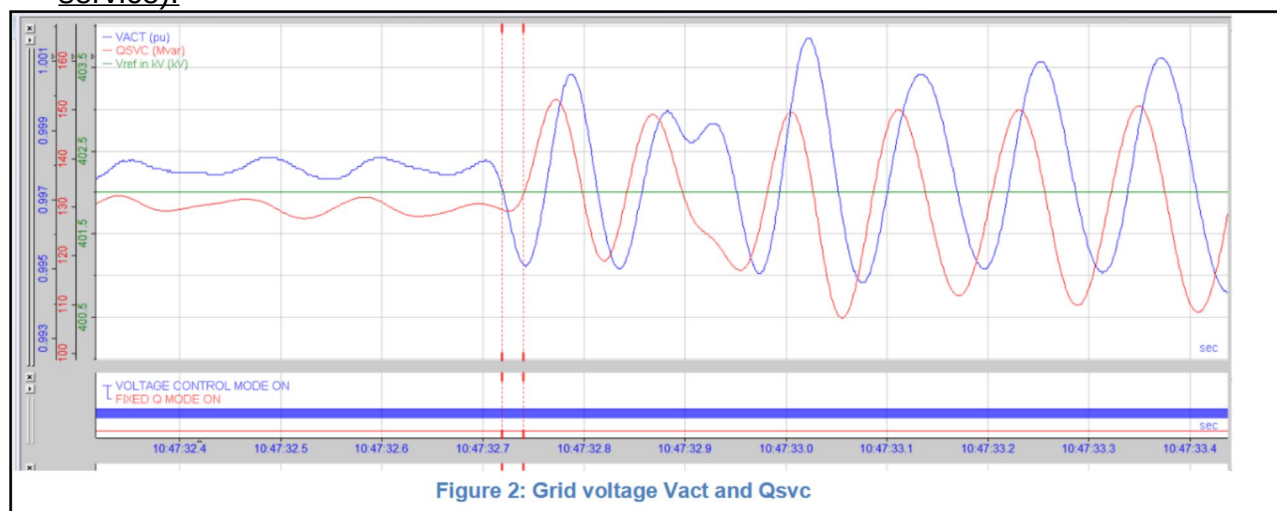
Representative from SIEMENS stated that there is some misconception in the response time, response time is measured between voltage reference and the voltage achieved by the STATCOM. Response time is basically controller response time and IEEE standards define the response time as how we tune the controller. Once controller is tuned and gain is fixed then the controller response time is fixed, here it is 30ms. If gain suddenly gets changed the response time may also get changed.

Representative from SIEMENS further stated that here we are comparing the Voltage and Q (MVar) and trying to observe the response time of 30ms but observing these two quantities has nothing to do with response time, it is purely the frequency

behaviour of STATCOM. We should calculate the response time b/w V_REF (pu) and VACT (pu).

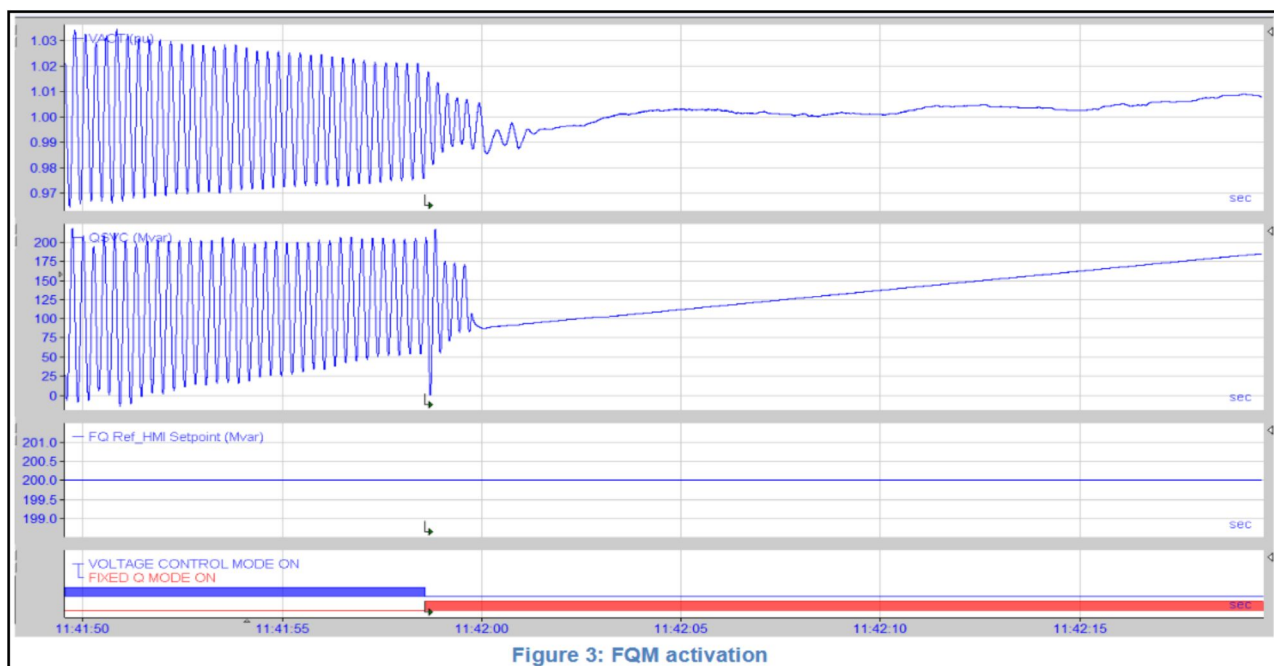
Voltage response time of 30ms Vs Frequency response time of 60ms is there in STATCOM.

- c) Not providing support through reactive power absorption even though the voltage during oscillations is crossing the Vref (possible because one MSC was still in service).



Representative from SIEMENS stated that in above figure, the actual voltage VACT crosses the Vref value, and almost at same instant Qsvc acts to stabilize the voltage near the Vref value. Without STATCOM's support through Qsvc injection, the outcome could have been more severe. The cause of phase shift is due to measurement and control loop delays, there will always be a phase shift between VACT and Qsvc. Value of phase shift is depending upon the oscillation frequency.

- d) At 11:41:58:55 hrs on 30.09.2024, the STATCOM was put in Manual (Fixed-Q) mode from Auto mode (voltage control) which resulted in damping out of the oscillations:



At 11:41:58:55 hrs, the STATCOM was put in Fixed 'Q' mode from voltage control and the magnitude of oscillations reduced immediately.

11.3 Representative from SIEMENS acknowledged the observations that putting STATCOM in Manual (Fixed-Q) mode from the Auto mode (VCM or QCM) resulted damping of oscillation. He further stated that in Manual (Fixed-Q) mode, controller response is very slow, Voltage controller gets by-passed, STATCOM not look for the Voltage oscillation, it tries to inject fixed reactive power based on the Qset of operator. As shown in above figure, the controller takes the value of 200.0 MVAR, with the Qsvc value ramping slowly towards that value. This controller exhibits a smoothing behaviour. Feature of Manual (Fixed-Q) mode is kept in STATCOM only for testing purpose, to demonstrate the full +550 MVAR injection and -425 MVAR (absorption) during commissioning stage.

11.4 Representative from SIEMENS further stated that cause and effect problem is like chicken & egg, once low amplitude high frequency oscillation comes in the grid and frequency of oscillation > 4Hz, STATCOM detects hunting (irrespective of the magnitude of the oscillation) and reduces its controller gain, but even with the reduced controller gain of 1.5, its voltage controller responds to the oscillating voltage and thus Q (MVAR) of STATCOM oscillates and results in high amplitude oscillation (translation of low amplitude high frequency oscillation to high amplitude high frequency oscillation). This can be avoided by making STATCOM Q (MVAR) injection to either zero (0) or to a fixed value. Q (MVAR) can be made zero (0) in Auto mode by reducing the gain to zero (zero contribution from STATCOM) but this can't be done. As per the specifications by the customer (PGCIL) and design of the STATCOM minimum gain is 1.5 only. Further, STATCOM Q (MVAR) injection can be made fixed irrespective of changes in voltage by making response extremely slow.

11.5 Representative from SIEMENS further stated that consistent observations in all over the world have been experienced, In Australia, Denmark, UK where there is lot of renewable and STATCOM is in the same vicinity the response of the STATCOM is extremely slow to avoid fast response of STATCOM on oscillating voltage, he opined

the same can be done here and response time of 1.5 sec may be kept to see whether oscillation is dying out or not.

11.6 Representative from NRLDC stated that how response time can be made slower if it is already specified and tested accordingly, further slower response time may help in mitigating oscillation but how STATCOM would respond during fault, would STATCOM be able to respond immediately during fault event in case of slower response time. However, same was not clarified.

11.7 Further, deliberations were made on one of the two possible mitigation action suggested by the SIEMENS in its report.

Lock the SVC output at a fixed values while oscillations are present in the system:

11.8 Representative from SIEMENS stated that, in this way SVC output will be locked to a pre-set value once STATCOM will detect hunting. Integrator won't work on any voltage error and it will freeze the controller. Thus, STATCOM Q (MVAR) remain unchanged w.r.t oscillating voltage and STATCOM would have zero contribution on the oscillating voltage. Controller can be unlocked after 7 sec, 70 sec etc. as may be specified by the PGCIL (customer).

11.9 On enquiry of NRLDC regarding mode of STATCOM during the duration SVC output is fixed (Voltage controller freeze), representative from SIEMENS answered that mode will be auto only but as long as controller is freezed STATCOM won't respond to any change in voltage. Therefore, during this duration STATCOM won't respond to support the voltage in case of any fault event in the network.

11.10 Representative from PGCIL suggested SIMENS team to explore the possibility for locking the SVC output (Voltage controller freeze) once STATCOM detects hunting (oscillation) and unlocking the SVC output (Voltage controller active) once STATCOM detects no hunting (no oscillation).

11.11 Representative from PGCIL highlighted that voltage oscillation are coming in RE complex only during morning & afternoon, it is not there in other time, further it is predominant when Rajasthan wind generation is high.

11.12 Representative from NRLDC stated addressing the query of PGCIL that system and connectivity is same i.e. fault level is same but during solar peak hours due to penetration of huge RE generation SCR value falls, and SCR at RE pooling S/s has certainly something linked with the oscillation. He further highlighted that instances of high-frequency, high-amplitude voltage oscillations and voltage dip/fluctuation have considerably reduced after charging of 765kV Bhadla-II-Sikar-II D/C line on 17.12.2024. After 17.12.2024, STATCOMs in RE pocket are mostly being operated in Auto mode only, also SCR of Fatehgarh-II & Bhadla-II system have improved slightly. 400kV Fatehgarh-II (PG) and 220kV Fatehgarh-II (PG) SCR are improved by 0.25 and 0.12 respectively.

Voltage Level (kV)	Pooling S/s	Generation being pooled (MW)	Before Charging of 765kV Bhadla-II-Sikar-II D/C line		After Charging of 765kV Bhadla-II-Sikar-II D/C line		Change in Fault level (MVA)	Change in SCR (MVA)
			3-Ph Fault MVA	SCR	3-Ph Fault MVA	SCR		
220	Fatehgarh-II_A	2490	10670	4.29	10966	4.40	296	0.12
400	Bhadla-II	3408	24128	7.08	26213	7.69	2086	0.61
400	Fatehgarh-II	5640	22892	4.06	24290	4.31	1398	0.25
400	Fatehgarh-I	2200	13737	6.24	14200	6.45	463	0.21
400	Fatehgarh-III	1380	18822	13.64	19444	14.09	622	0.45

11.13 Representative from NRLDC further requested SIEMENS team highlighting the above point that how STATCOM behaviour is getting changed with change in the system strength and up to what SCR it can perform stably.

11.14 Representative from SIEMENS stated that STATCOM is designed to operate between maximum to minimum value of SCR such that it can give guarantee response time of 30ms during fault event and it is as per the specification of customer (PGCIL). This aspect may be looked further in detailed by collecting relevant TFR.

11.15 MS NRPC stated that taking STATCOM in Manual (Fixed-Q) or automatic locking in/out the SVC during oscillation are the temporary measures, we need to arrive at permanent solution. He further requested SIEMENS team, PGCIL, CTUIL and Grid-India to ensure the permanent solution of this issue as 13 STATCOMs of SIEMENS having same technical specifications are under advance stage in RE complex.

11.16 After detailed deliberation it was decided that constitute a Committee under SE(O) comprising members from NRLDC/NLDC, PGCIL, CTUIL, Rajasthan SLDC and SIEMENS (OEM) to look into the issue of STATCOM operation in view of the oscillations observed in Northern Region. The Committee shall go through the detailed technical analysis of the events, shall carry meetings among members for better technical deliberations & arriving some conclusion and Committee may submit report within one month suggesting some corrective actions and specifications for future STATCOMs.

12) Status of submission of DR/EL and tripping report for the month of December'24

12.1 The status of receipt of DR/EL and tripping report of utilities for the month of December'24 is attached in below table. It is to be noted that as per the IEGC provision under clause 37.2 (c), tripping report along with DR/EL has to be furnished within 24 hrs of the occurrence of the event. However, it is evident from the submitted data that reporting status is not satisfactory and needs improvement. Non submission of DR/EL & tripping details further affect the grid event analysis.

S. No.	Utility	Total No. of tripping	First Information Report (Not)		Disturbance Recorder (Not Received)	Disturbance Recorder (NA) as informed by utility	Disturbance Recorder (Not Received)	Event Logger (Not Received)	Event Logger (NA) as informed by utility	Event Logger (Not Received)	Tripping Report (Not Received)	Tripping Report (NA) as informed by utility	Tripping Report (Not Received)
			Value	%	Value		%	Value		%	Value		%
1	ABC RENEWABLE_RJ01	1	1	100	1	0	100	1	0	100	1	0	100
2	ADANI GREEN ENERGY TWENTY FOUR LIMITED	1	1	100	1	0	100	1	0	100	1	0	100
3	ADANI SOLAR ENRGY RJ TWO PRIVATE LIMITED	2	2	100	2	0	100	2	0	100	2	0	100
4	ALTRA XERGI POWER PVT LTD	1	1	100	1	0	100	1	0	100	1	0	100
6	APFOL	2	2	100	2	0	100	2	0	100	2	0	100
7	ARP1PL	1	1	100	1	0	100	1	0	100	1	0	100
8	ASEJOL	1	1	100	1	0	100	1	0	100	1	0	100
26	RSDCL	1	1	100	1	0	100	1	0	100	1	0	100
Total in NR Region		10	10	100	10	0	100	10	0	100	10	0	100

- 12.2 Members may please note and advise the concerned for timely submission of the information. It is requested that DR/EL of all the trippings shall be uploaded on Web Based Tripping Monitoring System "<http://103.7.128.184/Account/Login.aspx>" within 24 hours of the events as per IEGC clause 37.2(c) and clause 15.3 of CEA grid standard. Apart from prints of DR outputs, the corresponding COMTRADE files may please also be submitted in tripping portal / through email.
- 12.3 *NRLDC representative stated that on the basis of status of submission of DR/EL & tripping reports of tripping incidents in December month, it is evident that reporting status of almost all the RE is unsatisfactory. Unavailability of tripping details from sites, affects the analysis of tripping incidents and further follow-up for remedial actions. Unsatisfactory submission of tripping details from RE stations is persistent issues.*
- 12.4 *As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event and as per IEGC clause 37.2 (e), the user shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to RLDC and RPC.*
- 12.5 *NRLDC representative requested all the RE stations to improve the status of submission of DR/EL & tripping reports. Further, it was also suggested to organize training programs for site engineers regarding DR/EL extraction and their uploading on TMS. RE stations were also requested to start preparing the detailed report of the tripping events as per timeline mentioned in IEGC 2023 and share the report with NRLDC, NRPC and PSC forum. Remedial actions taken by constituents to avoid such multiple elements tripping may also be included in the detail report.*
- 12.6 *Forum requested members to take necessary preventive measures to avoid such grid incidents / disturbances in future and report actions taken by respective utilities in OCC & PSC forum.*
- 12.7 **Forum also emphasized the importance of DR/EL & tripping report data for analysis of the tripping. Moreover, utilities may impress upon all concerned for providing the Preliminary Report, DR/EL & detailed report of the events to RLDC in line with the regulations. Members were requested to comply with IEGC 37.2(c) and submit the details in time. Members agreed to take necessary follow-up actions to improve the reporting status.**

- 12.8 **Members may please note and advise the concerned for timely submission of the information. It is requested that DR/EL of all the tripping shall be uploaded on Web Based Tripping Monitoring System “<https://postda.nrlc.in/Default.aspx>” within 24 hours of the events as per IEGC clause 37.2.(c) and clause 15.3 of CEA grid standard.**

13) Injection of infirm power in the grid

- 13.1 Representative of NRLDC apprised the forum about various clause related to injection and scheduling of infirm power stipulated in CERC (IEGC) (First Amendment) Regulations, 2024.
- 13.2 As per sub clause (c) of clause 19(2) of CERC (IEGC) (First Amendment) Regulations, 2024, Injection of infirm power shall not exceed 45 (forty-five) days from the date of first-time energization and integration (FTC) approval for REGS and ESS (except Hydro PSP ESS).
- 13.3 As per provision of clause 19(3), extension of period for injection of infirm power beyond 45 days may be allowed (a) for a period up to three months by respective RLDC on an application(s) made by REGS or ESS (except Hydro PSP ESS) to respective RLDC along with detailed reasons, at least 10 days in advance of the completion of the stipulated period.
- 13.4 NRLDC representative requested all RE generators to ensure compliance of the above regulations in case of Extension beyond 45 days is necessitated by valid reasons. In this regard applications shall be made well in advance. Failing to comply with the above may result in the denial of permission for the Injection of Infirm power for the purpose of commissioning activities.
- 13.5 In accordance with Regulations 19(1) and 19(7) of IEGC Regulations, 2023 interchange of infirm power is for the specific purposes of pre-commissioning activities, testing and commissioning. The generating station shall provide RLDC prior information relevant to specific testing, commissioning or any other activities planned to be performed during the interchange of infirm power. NRLDC representative requested all RE plants to provide the specific details of each such occasion of infirm power injection on day ahead basis.
- 13.6 NRLDC representative apprised the forum regarding the clauses mentioned in 11/SM/2024 dated 22.12.2024 which allows scheduling of power after issuance of successful trial run certificate by the RLDC.

14) Submission of Self Audit Report under Regulation 56 of Monitoring and Compliance under IEGC Regulation 2023

- 14.1 As per **Clause 56 (2) of IEGC Regulation 2023, Self –Audit** is mandated for all the concerned parties as stipulated in IEGC 2023. *The monitoring agency for users shall be the concerned RLDC or SLDC on the basis of their respective control area.* NRLDC is the monitoring agency for the ISTS connected users (Including ISTS connected RE plants) of Northern Region. Clause 56 (2) of IEGC Regulation 2023 regarding Self –Audit is quoted below;

MONITORING OF COMPLIANCE

Quote

Self –Audit:

(a) **All users, CTU, STUs, NLDC, RLDCs, RPCs and SLDCs, power exchanges, QCAs, SNAs shall conduct annual self-audits to review compliance of these regulations and submit the reports by 31st July of every year.**

(b) *The self-audit report shall inter alia contain the following information with respect to non-compliance:*

(i) Sufficient information to understand how and why the non-compliance occurred;

(ii) Extent of damage caused by such non-compliance;

(iii) Steps and timeline planned to rectify the same;

(iv) Steps taken to mitigate any future recurrence;

(c) *The self-audit reports by users, QCAs, SNAs shall be submitted to the concerned RLDC or SLDC, as the case may be.*

(f) *The deficiencies shall be rectified in a time bound manner within a reasonable time.*

(g) *The monitoring agency shall track the progress of compliances of users, and exceptional reporting for non-compliance shall be submitted to the appropriate Commission.*

Unquote

14.2 **After detailed deliberation, MS NRPC directed for timely submission of self-audit report, same may be taken as regular agenda in the RE Sub-Committee meeting and status of progress may be regularly monitored.**

15) Deviation and Ancillary Service (DAS) Pool Account

15.1 NRLDC representative apprised the forum that M/s Manikaran Analytics Limited has been done registered as first QCA at NRLDC for Fatehgarh-III ISTS Pooling station.

15.2 The Forecasting, Scheduling, Real time Operational activities, Metering, DSM & Reactive Charges payment etc of following REGS will be done by Manikaran Analytics (QCA).

Renew Surya Aayan	- 300 MW
Renew Surya Vihaan	-100 MW
Renew Surya Prataap	- 210 MW
Altra Xergi	- 380 MW
Total	- 990 MW

- 15.3 NRLDC representative has requested all entities that Payments related to Deviation and Reactive Energy Charges are to be made in the DAS Pool account strictly within due date. However, payments of some entities (Renew Power, Azure Power) are being delayed for even more than 15 days. MS, NRPC expressed his concern over delayed payment of Deviation & Reactive Energy Charges and advised all the entities to make the time as per due dates.
- 15.4 NRLDC representative further requested to RE Developers that the payment has to be made strictly as per Table-I of the DSM and Reactive Energy Statement issued by NRPC. It is observed that many a times, two separate payments are made when any account is issued along with revisions of previous weeks.
- 15.5 Payment for Deviation and Reactive Energy charges are to be made separately. At times, entities are making the combined payment for both Deviation and Reactive Energy charges.
- 15.6 RE Developers were advised to make the payments in respective accounts only. Many-a-times, payments of Deviation and Reactive Charges are made to RLDC F&C Account and vice-versa.
- 15.7 NRLDC representative apprised the forum that Many RE Developers are not signing the pool account reconciliation statement. (ACME Heergarh, ACME CSEPL, Azure, AVADA, Ayana, EDEN, Megasolis, Mega Urja, Thar Urja, Clean Solar Power etc). Reconciliation Statement is to be signed by the entities and uploaded in Reconciliation Portal (poolar.nrlcdc.in) of NRLDC within due date. The Accounts shall stand deemed reconciled in case of no response from the pool members is received within the due date.
- 15.8 NRLDC representative apprised the forum that ABC Renewable, ADEPT, AMP Green Energy six, Transition Energy have not opened LC for FY 2024-25 as per the DSM Regulation despite repeated follow up. MS, NRPC expressed his concern over this agenda and advised all the defaulting entities to open the LC in accordance with CERC Regulations at the earliest.
- 15.9 Newly registered RE developers are requested to submit the request letter from authorised signatory along with relevant documents for updation of bank account in NRLDC FAS system for receiving payments related to deviation and reactive charges.
- 15.10 **NRLDC has express concern that few RE developers are frequently changing bank account for receiving deviation charges and reactive charges. It is advised to not change the bank account unless it is absolutely necessary. In case it is to be changed, request letter from authorised signatory with proper justification along with relevant documents need to be submitted to NRLDC (Avaada, Renew, Renew, Ayana Power).**

16) Reliable Telemetry from RE Plants

- 16.1 Reliability and accuracy of SCADA data and its associated communication system is essential for monitoring and coordinating operations of a large electricity grid. It helps in visualization and management of the critical grid element failure/grid incident in real time and minimizes the possibility of any untoward incidences/disturbances. NRLDC has been regularly pursuing all for ensuring availability of real-time data.

16.2 List of stations having issues is as given below:

S.No	RE PLANT	ELEMENTS ans P/Q	P & Q	PPC	WEATHER PARAMETERS
1	ACME_IP	All Iso at 220 KV Level Bad Quality		1. Voltage droop value,2. Dead Band	Performance Ratio,Cloud Cover,Tot Inv in service
		Partial Plant Data is not reporting	YES	1. Voltage droop value,2. Dead Band	Performance Ratio,Cloud Cover,Tot Inv in service
2	AZURE_43_PSS	Complete Station Digital Data Is Bad Quality		Bad Quality	Bad Quality
				Bad Quality	Bad Quality
3	AZURE_43_RSS	Complete Station Digital Data Is Bad Quality	Wrong Data	PF Control Mode	Performance Ratio
			Wrong Data	PF Control Mode	
4	APTFI_IP		Block - 1,7,8	Voltage Setpoint, freq Set Point,voltage Feedback,Deadband	NA
5	AZURE_IP			PPC Parameter are not reporting	WMS Parameter are not reporting
6	AZURE7_IP	complete data is not reporting			
7	AZURE9_IP	complete data is not reporting			
8	MRPL_IP	ALL CBS SVG-2 CB BAY NO-22,37,23,41,SVG-1, BUS CB,CB-07,06,01,13,19		NA	NA
9	SBER5_IP	CB BAY-NO 03,09,11,14,10,15		PPC Parameter are not reporting correctl	WMS Parameter are not reporting

16.3 Plants and their Gateway Issues:

S.No	Plant Name	Gateway Issue
1	RERSH_IP	Data from both gateway are not reporting properly
2	Devikot	Gateway 1 is down and PPC data from gateway 2 not reporting
3	Essel	Both Gateway are down due to which data is not reporting
4	Renew Bikaner	Gateway 1 is permanent down and gateway 2 is continuously fluctuating
5	ACME_Ch2	Gateway are not reporting due to some fault
6	Aurayia_Ch1	
7	Aurayia_Ch2	
8	ESUCRL_Ch1	
9	ESUCRL_Ch2	
10	AZRMP_IP_CH2	
11	RNEWJ_IP_CH2	
12	RSUPL_IP_CH1	
13	DVKOT_IP_CH1	
14	MSUPL_IP_CH2	
15	AURI1_NT_CH1	
16	AURI1_NT_CH2	

17	NKHRA_NT_CH1	
18	GEPL_IP_CH2	
19	RSAPL_IP_CH2	

16.4 In the aforementioned plant, the following gateways are permanently down, and the issue remains unresolved despite regular follow-ups.

List of Stations for which PMU data is not reporting since long is given below:

MSUPL	NR1PGMSUPL_IP001	Data valid issue for more than 6 month
Adani Hybrid 1	NR1IPADNHB_PT001	not reporting
Azure 41	NR1IPAZR41_PM001	frequent GPS lock issue

16.5 In view of the above mentioned issues all concerned are requested to please take corrective action on priority.

16.6 All concerned were requested to please update timelines for rectification.

16.7 MS NRPC expressed serious concern regarding non-availability of telemetry data and PMU data and requested all RE Plants to resolve the issues on urgent basis. All RE plants have ensured to resolve the ongoing telemetry and PMU related issue at the earliest.

17) Requirement of Firewall at Sub-station end:

17.1 The Guidelines on “Interfacing Requirements” focus on the general data acquisition systems for RTUs, SAS Gateway computers, communications and AMI metering systems required for reliable, secure and economic operations of the control centre(s) was issued by CERC in Jan 2024.

17.2 Clause 6 of the interface guidelines is as given below:

Quote

“The communication service provider while providing the interfaces for the data exchange between the control centres, between the user station and the Control Centre must comply with CERT-In, NCIIPC (National Critical Information Infrastructure Protection Centre) guidelines for the interface being provided to the end user in accordance with CEA (Technical Standards for Communication System in Power System Operations) Regulations, 2020. Necessary firewall/router as per requirement shall be provided by the respective users while connecting the remote equipment with the control centre network. Direct connectivity with the operational network be avoided while connecting the remote station and shall be through firewall with necessary VLAN configuration.”

Unquote

17.3 As per above guidelines it is essential that firewall shall be installed at Sub-station end. All new sub-stations are being connected through firewall only and same has been incorporated in connection agreement also. However, firewalls are not available at many plants as tabulated below. In this regard all RE Generators are requested to please take up for installation for necessary firewalls.

17.4 Issue was also discussed in 1st RE Meeting but still there is no progress in this regard.

FATEHGARH 1	ADANI SOLAR PSS1
	ADANI SOLAR PSS2
	ADANI WIND PSS1
	ADANI WIND PSS2
	NIDAN
FATEHGARH-2	EDEN SOLAR
	Adani Hybrid1
	Adani Hybrid2
	Adani Hybrid3
	ASERJ1 SOLAR
	WIND
BIKANER 765	RENEW BIKANER 250
	SBSR 300 MW
Bhadla	ADANI BHADLA
	AZURE MAPPLE
	CSP JODHPUR
	Saurya Urja
	ESSEL
Bhadla 2	AVADA 320

17.5 All concerned were requested to update the timelines for installation of firewalls at the earliest.

17.6 All representatives from different RE plants have assured the integration of firewalls in upcoming and existing plants.

18) Compliance regarding Rated Capacity demonstration and Performing Frequency response test

18.1 Representative from NRLDC presented the list of Solar plants

- who have demonstrated/yet not demonstrated their rated capacity as per IEGC clause 22, (b), (ii) and
- frequency response test performed/yet not performed as per IEGC clause 24, (c) to intimate the RE plants for completion of pending within time frame as per IEGC 2023 guidelines.

18.2 He further stated and read out the relevant IEGC2023 clauses as follows;

IEGC 2023 Clause 22 (3):

"If it is not possible to demonstrate the rated capacity of the plant due to insufficient solar irradiation, COD may be declared subject to the condition that the same shall be demonstrated immediately when sufficient solar irradiation is available after COD, within one year from the date of COD"

"Provided that if such a generating station is not able to demonstrate the rated capacity when sufficient solar irradiation is available after COD, the generating company shall de-rate the capacity in terms of sub-clause (h) of clause (3) of this Regulation"

The following tests shall be performed at the point of interconnection:

- Frequency response of machines as per the CEA Technical Standards for Connectivity.*
- Reactive power capability as per OEM rating at the available irradiance or the wind energy, as the case may be.*

*Provided that the generating company may submit offline simulation studies for the specified tests, in case testing is not feasible before COD, subject to the condition that tests shall be performed **within a period of one year from the date of achieving COD.***

18.3 Status of all the RE plants who has declared COD after Oct'23 (IEGC 2023) is given in below table, table shows the COD date, status of rated capacity demonstration (with 0.95 lead to 0.95 lag PF at POI) and status of Frequency response test.

Table-4: COD date, status of rated capacity demonstration (with 0.95 lead to 0.95 lag PF at POI) and status of Frequency response test of RE plants in Northern Region

Plant	Plant Capacity (MW)	Trial run capacity (MW)	Trial run certificate date	COD date	The rated capacity of the plant Demonstr	Frequency response test performance

					ation date (with 0.95PF lag to lead at POI)	ce date
Rising Sun Energy (K) Private Limited	190	164	1-Nov-23	3-Nov-23	30-Mar-24	Pending
		26	1-Apr-24	3-Apr-24		
ALTRA XERGI POWER PVT LTD	380	259.6	30-Jan-24	1-Feb-24	22-Aug-24	Pending
		120.4	7-Feb-24	9-Feb-24		
AMP ENERGY GREEN SIX PVT LTD	100	100	22-Jan-24	24-Jan-24	5-Jun-24	Pending
AMP ENERGY GREEN FIVE PVT LTD	100	100	7-Jun-24	11-Jun-24	5-Jun-24	Pending
Grian Energy Pvt. Ltd.	100	100	2-Feb-24	6-Feb-24	29-Jul-24	31-Dec-24
Onevolt Energy Pvt. Ltd.	100	100	31-Jan-24	2-Feb-24	29-Jul-24	3-Dec-24
Amplus Ages Private Limited	100	100	6-Feb-24	8-Feb-24	29-Jul-24	17-Dec-24
RENEW SURYA PRATAP PVT LTD	200	175	22-Feb-24	24-Feb-24	8-May-24	Pending
		22	31-Mar-24	2-Apr-24		
		3	16-May-24	18-May-24		
RENEW SURYA VIHAAN PVT LTD	100	50	27-Mar-24	31-Mar-24	8-May-24	Pending
		48	27-Mar-24	31-Mar-24		
		2	16-May-24	22-May-24		
RENEW SURYA AAYAN PVT LTD	300	193	27-Mar-24	31-Mar-24	18-Dec-24	Pending
		97	27-Mar-24	31-Mar-24		

		10	5-Jun-24	8-Jun-24		
ADANI SOLAR ENRGY RJ TWO PRIVATE LIMITED	180	59.95	23-Feb-24	25-Feb-24	12-Sep-24	Pending
		105.05	21-Mar-24	11-Apr-24		
		15	19-Sep-24			
ADEPT RENEWABLE TECHNOLOGY PVT LTD	110	110	1-Mar-24	3-Mar-24	18-Apr-24	Pending
TRANSITION ENERGY SERVICES PRIVATE LIMITED	84.4	60	4-Mar-24	6-Mar-24	28-May-24	Pending
		24.4	8-Mar-24	15-Mar-24		
Transition Green Energy Private Limited	100	100	5-Jun-24	7-Jun-24	28-May-24	Pending
Transition Sustainable Energy Services Private Limited	50	50	30-May-24	1-Jun-24	24-May-24	Pending
RENEW SURYA ROSHNI PRIVATE LIMITED	400	285	31-Mar-24	11-Apr-24	Pending	Pending
		95	18-Jun-24	21-Jun-24		Pending
BANDERWALA_TPS L	300	200	27-Mar-24	31-Mar-24	9-Sep-24	Pending
		100	13-Sep-24			
Anta Solar Power Plant NTPC Ltd	90	57	19-Apr-24	26-Apr-24	29-May-24	Pending
		33	31-May-24	31-May-24		
SERENTICA RENEWABLES INDIA 4 PRIVATE LIMITED(SRI4PL)	180	125	14-May-24	18-May-24	Pending	Pending
		37	12-Jun-24	15-Jun-24		
		6	6-Sep-24	8-Sep-24		

Phalodi Solar Plant ASERJ2PL	150	92.5	28-Jun-24	1-Jul-24	21-Jun-24	Pending
		57.5	28-Jun-24	1-Jul-24		
AYANA RENEWABLE POWER THREE PVT LTD (ARP3PL)	272	97.16	4-Jun-24	15-Jun-24	Pending	Pending
		97.16	24-Jul-24	10-Aug-24		
Juniper Green Cosmic Private Limited	100	100	8-Oct-24	10-Oct-24	Pending	Pending

18.4 All RE plants were requested to perform the pending testing of Reactive power capability and Frequency response within one year of COD.

18.5 Forum suggested to take it as regular agenda for regular follow-up in the meetings and major non-compliance may be informed to commission as it is a compliance requirement of IEGC.

19) Intimation and approval of NRPC during any revision of protection setting at site:

19.1 NRLDC representative highlighted that during analysis of some of the grid events, protection settings different from what was approved during FTC was found at some of the RE stations. Major observations was that RE stations revise the protection settings mainly voltage & current protection settings in discussion with OEM without intimation & approval from NRPC & NRLDC.

19.2 As per IEGC clause 14.2,

“ All users connected to the grid shall:

- furnish the protection settings implemented for each element to respective RPC in a format as prescribed by the concerned RPC;
- obtain approval of the concerned RPC for (i) any revision in settings, and (ii) implementation of new protection system;
- intimate to the concerned RPC about the changes implemented in protection system or protection settings within a fortnight of such changes;
- ensure correct and appropriate settings of protection as specified by the concerned RPC.
- ensure proper coordinated protection settings.”

19.3 NRLDC requested all the RE stations to keep the protection settings which is being approved during FTC of elements. In case any changes in protection settings are required then matter may be bring in notice to NRPC & NRLDC.

19.4 Forum requested RE stations to keep the protection settings which is approved during FTC. Any changes / revision in protection settings may only be done after approval of NRPC.

20) Challenges in REMC Operation

20.1 Low Peak/low CUF/PPC not installed/Non-reporting of tripping & AvC submission issue in 200MW Azure(Adani-Bhadla):

Representative from NRLDC gave brief description about 250MW Adani Bhadla solar park, that 200MW solar Azure plant is connected at 250MW Adani pooling station along with 50MW Renew solar plant. Adani pooling station is further connected to Bhadla (PG) through 220kV Adani Bhadla-Bhadla (PG) D/C line. He further stated that multiple issues are being observed in this plant and explained the followings:

1. **Low CUF and low day-peak generation as compared to other plants at same pooling station:** -Low CUF and low day-peak generation is observed in the plant compared to other plants connected with same pooling station. Despite continuously followed up with the plant, appropriate response is not received yet.
2. **PPC not installed:** - PPC is yet to be installed at this plant. Due to unavailability of PPC, plant is unable to provide the desired reactive power support whenever required. Similar issue is with 50MW Renew solar plant connected at same pooling station. Most of the time these two plants are absorbing MVARs and not complying NRLDC instruction when issued. It is a non-compliance of clause B2(1) of CEA technical standards for grid connectivity.
3. **Non-reporting of tripping and submission of AvC accordingly:** - There was a tripping/breakdown of some IDTs/Inverters on 16 Sept,2024. The incident was not reported to NRLDC and reduced AvC also not submitted. It is a violation of IEGC grid code 2023, **clause 29 2(d)**. On continuous enquiring about low CUF/low generation, the plant informed the tripping and reduced its AvC to 190MW.

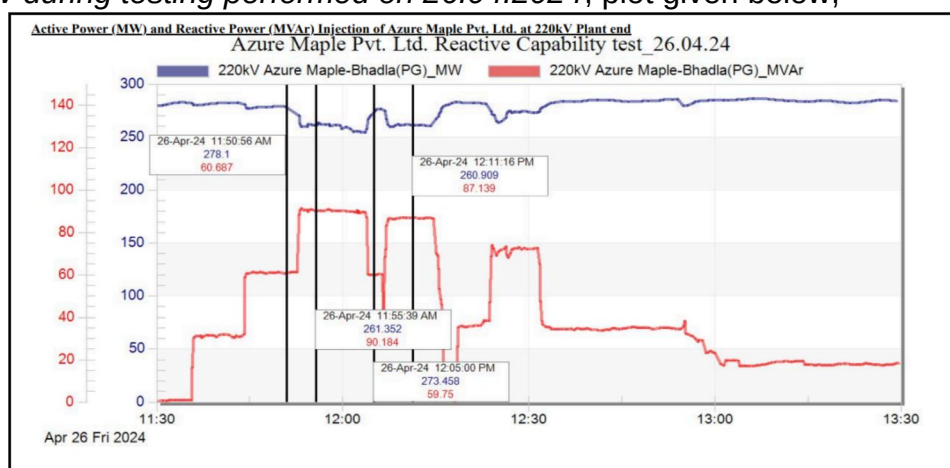
Followings were deliberated:

- Representative from NRLDC informed that 250MW Adani Bhadla is the only ISGS RE plant in Northern Region which is not having PPC and requested for earliest installation of the PPC.
- Representative from 250MW Adani Bhadla Solar Park informed that PPC installation is pending in 200MW Azure, same has been followed but no updated received from Azure.
- Representative from Renew stated that PPC is there in 50MW Renew plant in this Adani Bhadla Park at 33kV as Renew is having connectivity at 33kV.
- Representative from NRLDC stated that compliance has to be ensured by connectivity grantee (i.e. Adani Bhadla Solar Park) at POI, and Park need to coordinate with the underlying plant. PQ meter shall be installed at 220kV Bhadla(PG), PPC shall take the reference from POI and shall control the 200MW Azure and 50MW Renew plant.
- **Representative from Adani Green Energy Ltd. stated that PPC shall be installed by 31st March'2025 in 200MW Azure Plant.**

20.2 Low Peak/low CUF issue/AvC issue and demonstration of reactive power capability for 276MW in real time for Azure Mapple:

Representative from NRLDC stated that Azure Mapple is a 276MW plant and connected at Bhadla (PG). Multiple issues are observed in this plant are as follows: -

1. **Low CUF and low day-peak generation as compare to other plants at same pooling station:** -Low CUF and low day-peak generation is observed in the plant compare to other plants connected with same pooling station. Despite continuously followed up with the plant, appropriate response is not yet received. Generally, 5-6% less CUF is observed compare to other plants at Bhadla.
2. With the installation of 24MVA extra inverters in addition to existing 300MVA inverters on March'24 and based on the revised steady state simulation model & report submitted by Azure Power Maple Pvt. Ltd. dated 05.06.24, the plant capacity was revised from 253MW to 276MW (92.5MVA with 1754Nos. of inverter in service) w.e.f 14.06.2024 onwards. However, in real-time plant failed to demonstrate the reactive power capability corresponding to 276MW. *Plant successfully injected reactive power up to 90MVar, but active power reduced to 262MW during testing performed on 26.04.2024, plot given below;*



Despite continuous follow-ups and reminders, the reactive power capability for 276MW is yet to be demonstrated.

3. **Long pending telemetry issue:** At present total 1724 nos. of inverters are installed and commissioned at the plant. Whereas the telemetry of total no. of inverters is not reflecting correctly since long time. This data is required for AvC validation in case of discrepancy. Further, it is also observed that total no of inverters in service is not matching with AvC submitted.

Azure Mapple power Pvt. Ltd. was requested to resolve the aforementioned pending issue.

No one was present from Azure in the meeting

20.3 Issue pertaining to 225MW TPGEI and 110MW TPSL (Tata Power) at Bikaner(PG)

Representative from NRLDC stated followings;

1. **Low Peak/CUF issue at 110 TPSL (Bikaner):** 110MW TPSL solar plant is connected at 225MW TPGEI plant which is further connected to Bikaner (PG) substation through 220kV TPGEI-Bikaner (PG) S/C line. Low day-peak and low

CUF is being continuously observed in this plant. On enquiring the plant has submitted the following reasons through mail communication: -

- a. As per the analysis submitted by our engineering team, the plant is designed for the annual CUF of 25% as per the terms of the PPA.
 - b. The DC capacity installed at the plant is 140 MWp against rated capacity of 110 MW (AC) that is in the ratio of 1 is to 1.27.
 - c. Hence during summers, where the module temperature (i.e. over 72 deg C) is high, the plant is not able to reach the rated capacity. The same was observed in the PVSYST model.
2. **TPGEL is a 225MW plant and connected at Bikaner (PG).** Plants peak generation is low with respect to installed capacity of plant. On enquiring, plant submitted the following reason through mail communication: -
- a) As the site is located at remote location and sand dunes are present in the site premises, observed frequent sand storm within the site due to which soiling losses are very higher side as compared to other nearby sites.
 - b) After the sand storm, It will take minimum 10-15 Days to clean entire plant, during cleaning there are frequent sand storm which are creating more issue related to module cleaning, to mitigate this soiling issue and losses we have recently deployed 26 Nos. of Module Cleaning Robot, and its results can be seen from current month.
 - c) Because of the recent heavy sand storm, facing issues of boundary collapsing at different locations which was allowed cattle entry inside the plant, which had resulted in unwanted DC string Outage and module damage, Fencing restoration work is going on and will be completed in DEC24.

Followings were deliberated with Tata Power:

- Representative from Tata Power stated that DC/AC ratio is 1.27 in 110MW TPSL, due to which plant achieve peak power only sometimes but fails to achieve the peak power majority of the time.
- Representative from NRLDC stated that in other Tata Power project DC/AC ratio is above 1.45, i.e. in 300MW TPREL at Bhadla(PG) and 300MW Banderwala TPSL at Bikaner-II DC/AC ratio are 1.46 and 1.48 respectively and enquired the reason of such low DC/AC ratio in 110MW TPSL.
- Representative from Tata power informed that it is as per PPA, whereas low CUF has been agreed.
- Representative from NRLDC stated that as plant has declared the COD for full 110MW and 225MW and declared the same AVC, same is being added as national resource capacity, if capacity is not available most of the time, then it will a challenge for Resource adequacy and to plan the short term LGB.
- Representative from Tata Power stated that Tata power is already in the process of installing additional DC capacity to ensure the availability of generation as per its installed capacity.

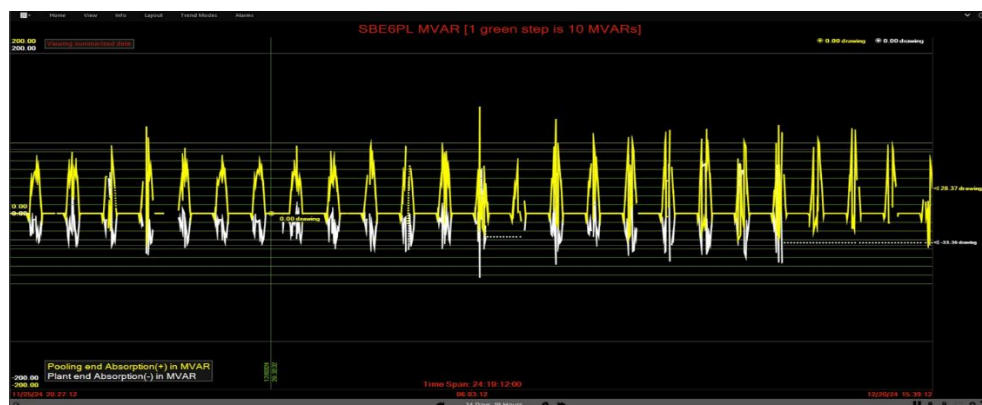
20.4 Huge MVAR drawl by 300MW plant SBE6PL:

Representative from NRLDC stated followings;

300MW SBE6PL solar plant is connected at ESSEL Park Bhadla which is connected to Bhadla (PG) pooling station through 220kV ECUSRL-Bhadla (PG) S/c line. There are two major issues in the plant as follows;

1. Huge MVAR drawl from the grid

Plant is **absorbing huge MVARs in the order of 80 to 100MVARs** from the grid on daily basis. However, the plant is being given the NRLDC real-time operational code for injection up to 50 MVARs during high solar generation but the plant is not providing the desired response, non-compliance of CEA clause B2(1) (Reactive power capability) and non-compliance of NRLDC Real-time code, reactive power absorption plot given below;



2. Telemetry issues at site for a long time.

The complete telemetry of the plant is also not available for a long time. Due to which, performance of the plant can't be checked properly. Despite continuous follow-ups these issues are yet to be resolved.

Representative from Adani Green Energy Ltd. stated that Static VAR generator (SVG) has been planed and same shall be installed by 31st March'2025 and PQ meter installation at POI along with complete SCADA integration for control at POI shall be completed by 15th Feb'2025.

20.5 Reactive power capability testing to be done in MSRPL and MSUPL for newly installed SVGs

Each MSRPL and MSUPL has installed 2X40MVAR (80 MVARs SVG) for reactive power compliance by 16.03.2024. Whereas the plants have not demonstrated their respective reactive capabilities even after continuous follow ups. Further this matter was also raised in same forum as 1st Renewable Energy Sub-Committee meeting of NRPC held on 24th Oct'24 and chaired by MS, NRPC.

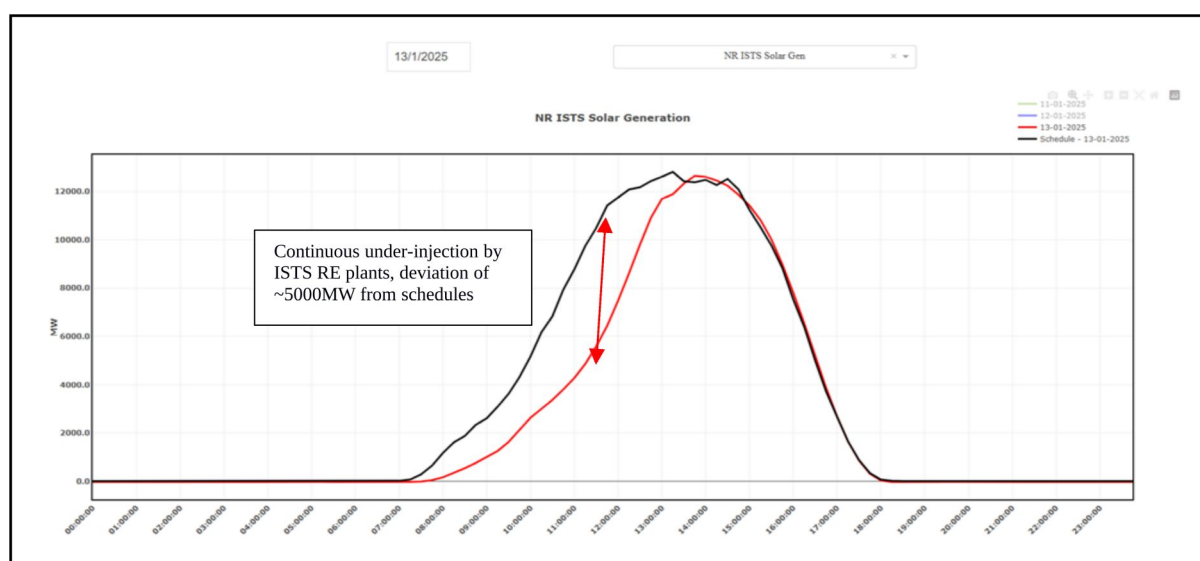
Mahindra Renewable was requested to update on the status of Reactive power capability testing for newly installed SVG and reason for delay of ~10 months.

No one was present from Mahindra in the meeting

20.6 Under-injection by RE plants during inclement weather condition (Fog)

Representative of NRLDC stated that several times it has been observed that there is a huge deviation with respect to schedule due to inclement weather such as Fog, cloud cover. Last year also such huge deviations were observed. Regarding this, many communications have already been sent and also mater taken up several times in different meetings. NRLDC control room also sending messages in real-time to control such huge deviations.

One of the recent incidents occurred on 13.01.2025. On this day there was sustained huge deviations for a significant time. Most of the RE plants were under-injecting significantly with respect to schedule. It clearly indicates that the forecast of the generation and thus the schedule are way beyond the actual generation. Total cumulative ISTS under-injection went up to ~5000MW at around 11:24Hrs on 13.01.2025. With such a huge deviation it becomes difficult for grid operator to manage the frequency of the grid. Below plot shows the Schedule Vs Actual generation of NR ISTS Connected solar Plant for 13th Jan'2025.



List of RE plants having major deviation and impacted the grid severely is enclosed as **Annexure-VII**.

All RE plants as mentioned in Annexure-VII were requested to explain the reason of significant deviation and update the action taken at plant end along with action plan for future to address this long pending repetitive issue.

RE plants cited the reasons as moving cloud and forecast inaccuracy for these large deviations, further few developers stated that as per new regulations, scheduled has to be revised 7-time block prior, and forecasting of moving cloud ahead of 7-time block is difficult.

MS NRPC express the serious concerns for ~5000MW deviation and requested all RE developers to explore all the possibility for improving the forecasting and considering the fog, cloud, rain, moving cloud other weather parameters etc in forecasting for prices He further requested prompt actions from RE plants in real-time in schedule revision 7-time block prior for avoiding any major deviations.

The Meeting ended with a vote of thanks to the Chair.

Participants for the 2nd RE Sub-Committee Meeting of NRPC on 27.01.2025			
S. No.	Name	Designation	Organization
1	V.K. Singh	Member Secretary	NRPC
2	D. K. Meena	Suprintending Engineer (O&P)	NRPC
3	Reeturaj Pandey	Executive Engineer (Protection)	NRPC
4	Omkishor	Executive Engineer	NRPC
5	Vipul Kumar	Executive Engineer	NRPC
6	Somara Lakra	Chief General Manager	NRLDC
7	Pankaj Kumar	Manager	NRLDC
8	Manas R. Chand	Deputy General Manager (SO)	NRLDC
9	Pushpa Damhare	General Manager	NRLDC
10	Aman Gautam	Manager	NRLDC
11	Kamaldeep	Deputy General Manager	NRLDC
12	Rahul Negi	Assistant Manager	NRLDC
13	Nitin Yadav	Chief Manager	NRLDC
14	Deepak Kumar	Deputy Manager	NRLDC
15	Priyanshi Aggarwal	Deputy Manager	NRLDC
16	Subrat Susmay Nayak	Assistant Manager	NRLDC
17	Bikas Kumar Jha	Deputy General Manager	NRLDC
18	Paritosh Patnayak	Manager	NRLDC
19	Abhijeet Prakash	Chief Manager	NRLDC
20	Mohit Kumar Gupta	Chief Manager	NRLDC
21	Sunil Aharwal	General Manager (SO)	NRLDC
22	M. P. Sharma	Executive Engineer (SOLD)	SLDC, Rajasthan
23	Vijay Gupta	AEN (SOLD)	SLDC, Rajasthan
24	Rajeev Virdi	Chief Manager	SIEMENS LIMITED
25	Shobhit Rajput	Chief Manager	SIEMENS LIMITED
26	Deepak Verma	System Engineer	SIEMENS LIMITED
27	D. V. Kumar	Tech Manager	SIEMENS LIMITED
28	Arindam Chowdhary	Software Engineer	SIEMENS LIMITED
29	Vineet Kumar	Deputy General Manager	SECI
30	R. K. Agarwal	Consultant	SECI
31	R. P. S. Rana	General Manager (AM), CC	POWERGRID
32	Yashpal Choudhary	Deputy General Manager, Bikaner	POWERGRID
33	A. K. Dixit	Chief General Manager	POWERGRID, DELHI
34	K. Deepak	Chief Manager, Engineer-S/S	POWERGRID
35	Imaran Khan	Station Head	TATA POWER RENEWABLE
36	Rajesh Pawar	Head Testing	TATA POWER RENEWABLE
37	Sivanarayana. Gavadhakatla	General Head-F&S	TATA POWER RENEWABLE
38	Sandeep Kumawat	Deputy General Manager	CTUIL
39	Ankita Singh	Chief Manager	CTUIL
40	Agam Kumar	Assistant General Manager, Regulatory	RENEW
41	Sumit Kumar	Senior Manager	RENEW
42	Sanjay Bhatt	AVP	ADANI GREEN
43	Shiv Verma	Assistant General Manager	ADANI
44	P. P. Sharma	XEN (PSP)	RVPN, SEC (PSP)
45	Kapil Gupta	AEN	RVPNL
46	Chandan Banerjee	Deputy General Manager	AVAADA ENERGY
47	Rajesh Shukla	Deputy Manager	AYANA RENEWABLE
48	Rinku Yadav	Senior Manager	AYANA POWER
49	Suresh Mistri	Manager	AGEL

50	A. S. Parira	Scientist-E	MNRE
51	Prachi Chauhan	Deputy Manager	ACME
52	Aman Chaturvedi	Assistant Manager	ABC Renewable Energy RJ-01 Pvt. Ltd.
53	Rahul Gupta	BD & Regulatory	Every Energy/ ABC Cleatech



उत्तरक्षेत्रीय विद्युत समिति
NORTHERN REGIONAL POWER COMMITTEE

**Procedure for Approval of Protection
Settings in Northern Region**

(In reference to regulation 14 of IEGC 2023)

Version: 1.0

(Approved in 75th NRPC meeting held on 28.08.2024)

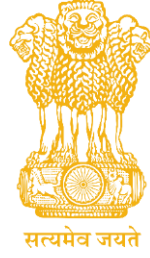
August, 2024

A. Procedure in case of new element charging

1. ISTS users shall submit the protection settings to NRPC and NRLDC for every new element to be commissioned one month in advance through mail.
In case of intrastate elements, users shall submit the protection settings to NRPC and concerned SLDC for every new element to be commissioned one month in advance through mail.
2. NRLDC based on the above information and the First Time Charging (FTC) request by user through Outage Management System (OMS) portal of NRLDC, shall allow integration of new element in the system as per NRLDC FTC procedure with the prevailing practice to avoid any delay in charging of the new element. The settings shall be treated as provisional arrangement till approval in PSC (Protection Sub-Committee).
In case of intrastate elements, SLDC shall allow integration of new element in the system. This shall be treated as provisional arrangement till approval in PSC.
3. NRLDC/SLDCs may ask any other relevant data/information from concerned utilities during scrutiny of settings.
4. Users will be responsible for any revision in settings of the existing element required due to charging of new element. The settings shall be treated as provisional arrangement.
5. The concerned utility shall put up the agenda for getting final approval in next PSC.
6. NR PSC will review and approve the final settings based on the inputs submitted by the utility. In case of any change required in final protection settings of the new element than the provisional one, as decided by the committee, the same shall be implemented within 7 days by the concerned utility.
7. Utility shall intimate to NRPC Secretariat and NRLDC/SLDC (as applicable) within fortnight after implementation of settings for record in regional protection settings database.

B. Procedure in case of revision of settings of any existing element (without any changes in network configuration):

1. Any change in the existing protection settings shall be carried out only after prior approval from PSC Forum of NRPC.
2. The concerned utility (both ISTS and intrastate) shall put up an agenda regarding any changes required in existing protection settings due to integration of new element in the existing system or otherwise, in PSC.
3. Utility shall intimate to NRLDC/SLDC (as applicable) and NRPC about the changes implemented in protection system or protection settings within 15 days of such changes.



उत्तर क्षेत्रीय विद्युत समिति

NORTHERN REGIONAL POWER COMMITTEE



Protection Philosophy/Protocol of Northern Region

(Developed in compliance of IEGC 2023)

Version: 2.0

(approved in 71st NRPC meeting held on 29.01.2024)

January 2024

Protection Philosophy/Protocol of Northern Region
(approved in 71st NRPC meeting held on 29.01.2024)

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1. Transmission line & Cable

S.N.	Protection Setting/ Protocol	Mandated Setting for transmission lines
1	Protection Scheme	220kV and above: Independent Main-I and Main-II protection (of different make OR different type/different algorithm) of non-switched numerical type is to be provided with carrier aided scheme. 132kV and below: One non-switched distance protection scheme and, directional over current and earth fault relays, should be provided as back up.
2	Distance Protection Zone-1	Reach: 80% of the protected line; 110% of the protected line (In case of radial lines) TimeSetting: Instantaneous.
3	Distance Protection Zone-2	Reach: Single Circuit Line: 120% of length of principle line section. Double circuit line: 150% coverage of line to take care of underreaching due to mutual coupling effect. Time setting: i. 0.35 second (considering LBB time of 200mSec, CB open time of 60ms, resetting time of 30ms and safety margin of 60ms) ii. 0.5-0.6 second (For a long line followed by a short line)

*Protection Philosophy/Protocol of Northern Region
(approved in 71st NRPC meeting held on 29.01.2024)*

4	Distance Protection Zone-3	Reach: Zone-3 should overreach the remote terminal of the longest adjacent line by an acceptable margin (typically 20% of highest impedance seen) for all fault conditions. Time Setting: 800-1000 msec If zone-3 reach transcends to other voltage level, time may be taken upto 1.5 sec.
5	Distance Protection Zone- 4	The Zone-4 reverse reach must adequately cover expected levels of apparent bus bar fault resistance. Time may be coordinated accordingly. Where Bus Bar protection is not available, time setting: 160 msec.
6	Power Swing Blocking	Block tripping in all zones, all lines. Out of Step tripping to be applied on all inter-regional tie lines. Deblock time delay = 2s
7	Protection for broken conductor	Negative Sequence current to Positive Sequence current ratio more than 0.2 (i.e. $I_2/I_1 \geq 0.2$) Alarm Time delay: 3-20 sec. Tripping may be considered for radial lines to protect single phasing of transformers.
8	Switch on to fault (SOTF)	Switch on to fault (SOTF) function to be provided in distance relay to take care of line energization on fault.
9	VT fuse fail detection function	VT fuse fail detection function shall be correctly set to block the distance function operation on VT fuse failure.
10	Carrier Protection	To be applied on all 220kV and above lines with the only exception of radial feeders.

Protection Philosophy/Protocol of Northern Region
(approved in 71st NRPC meeting held on 29.01.2024)

11	Back up Protection	1. On 220kV and above lines with 2 Main Protections: • Back up Earth Fault protections alone to be provided. • No Over current protection to be applied. 2. At 132kV and below lines with only one Main protection: • Back up protection by IDMT O/C and E/F to be applied.
12	Auto Reclosing with dead time.	AR shall be enabled for 220 kV and above lines for single pole trip and re-closing. Dead time = 1.0s. Reclaim time = 25.0s Auto-recloser shall be blocked for following: - faults in cables/composite - Breaker Fail Relay - Line Reactor Protections - O/V Protection - Received Direct Transfer trip signals - Busbar Protection - Zone 2/3 of Distance Protection - Circuit Breaker Problems. CB Pole discrepancy relay time:1.5 sec; for tiebreaker: 2.5 sec

Protection Philosophy/Protocol of Northern Region
(approved in 71st NRPC meeting held on 29.01.2024)

13	Line Differential	For cables and composite lines, line differential protection with built in distance back up shall be applied as Main-I protection and distance relay as Main-II protection. For very short line (less than 10 km), line differential protection with distance protection as backup (built- in Main relay or standalone) shall be provided mandatorily as Main-I and Main-II. Differential protection may be done using dark fiber (preferably), or using bandwidth.
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*Protection Philosophy/Protocol of Northern Region
(approved in 71st NRPC meeting held on 29.01.2024)*

14	Over Voltage Protection	FOR 765kV LINES/CABLE: Low set stage (Stage-I): 106% - 109% (typically 108%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds. 400kV LINES/CABLE: Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds. FOR 220 KV LINES: High set stage: 140% - 150% with a timedelay of 100 milliseconds. (OPTIONAL) FOR 220 KV CABLE/COMPOSITE: Low set stage (Stage-I): 110% - 112% (typically 110%) with a time delay of 5 seconds. High set stage (Stage-II): 140% - 150% with a time delay of 100 milliseconds. Drop-off to pick-up ratio of overvoltage relay: better than 97% Grading: Voltage as well as time grading may be done for multi circuit lines/cable.
15	Resistive reach setting to prevent load point encroachment	Following criteria may be considered for deciding load point encroachment: Maximum load current (I_{max}) may be considered as 1.5 times the thermal rating of the line or 1.5 times the associated bay equipment current

Protection Philosophy/Protocol of Northern Region
(approved in 71st NRPC meeting held on 29.01.2024)

		rating (the minimum of the bay equipment individual rating) whichever is lower. (Caution: The rating considered is approximately 15minutes rating of the transmission facility). • Minimum voltage (V_{min}) to be considered as 0.85pu (85%).
16	Direct Inter-trip	To be sent on operation of following: i. Overvoltage Protection ii. LBB Protection iii. Busbar Protection iv. Reactor Protection v. Manual Trip (400 kV and above) vi. Cable Fault (in composite lines)
17	Permissive Inter-trip	To be sent on operation of Distance Protection

2. Series Compensated lines

Protection Philosophy/Protocol of Northern Region
(approved in 71st NRPC meeting held on 29.01.2024)

1	Lines with Series and other compensations in the vicinity of Substation	• Zone-1:FSC end: 60% of the protected line. Time: Instantaneous; Remoted end: 60% of the protected line with 100ms-time delay. POR Communication scheme logic is modified such that relay trips instantaneously in Zone-1 on carrier receive. • Zone-2: 120 % of uncompensated line impedance for single circuit line. For Double circuit line, settings may be decided on basis of dynamic study in view of zero sequence mutual coupling. • Phase locked voltage memory is used to cope with the voltage inversion. Alternatively, an intentional time delay may be applied to overcome directionality problems related to voltage inversion. • over-voltage stage-I setting for series compensated double circuit lines may be kept higher at 113%.
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3. Busbar protection

1	Busbar protection	To be applied on all 220kV and above sub stations with the only exception of 220kV radial fed bus bars.
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4. Local Breaker Back-up

Protection Philosophy/Protocol of Northern Region

(approved in 71st NRPC meeting held on 29.01.2024)

1	Local Breaker Backup (LBB)	For 220 kV and above level substations as well as generating stations switchyards, LBB shall be provided for each circuit breaker. LBB Current sensor $I > 20\% I_n$ LBB time delay = 200ms In case of variation in CT ratio, setting may be done accordingly.
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5. Power Transformer

5.1 Differential Protection

1	Id min (sensitivity) i.e. multiple of trans. HV side rated current	Default: 0.2 pu Or If tap range is -X% to +Y%, then (X+Y)% may be kept as setting.
2	First Slope	0 - 10%. In case of differential relay with only two slopes, this slope is considered as zero.
3	Second Slope	20% to 40%
4	Third Slope	60% to 80%
5	Unrestrained operation level	Unrestrained differential current $\leq 1/(\%$ impedance at nominal tap)
6	Max. ratio of 2nd harm. to fundamental harm dif. curr. in %	$I_2/I_1 \text{ Ratio} = 10 - 15\%$
7	Max. ratio of 5th harm. to fundamental harm dif. curr. in %	$I_5/I_1 \text{ Ratio} = 25\%$
8	Second and fifth harmonics restrain feature	Enabled
9	Cross block feature	Enabled

5.2 Restricted earth fault (REF) protection

1	Pick up current (IREF)	10 – 15 % of Full load current (IFL).
2	Stabilizing resistor (RSTAB)	stabilizing resistor (RSTAB) is obtained by dividing stabilizing voltage (VSTAB) by pick-up current. Stabilizing voltage $VSTAB = IF \times (RCT + 2RL)$ $RSTAB = (VSTAB / IREF) \times k$ Where: IF = Maximum through fault current, RCT = CT resistance, RL = CT circuit lead resistance, k = Multiplying factor (1-1.5)

5.3 Over Current Protection

1	Scheme	To be implemented on both sides of ICT
2	Low set Directional	Pick up: 110-150% of full load current Characteristics: IDMT Co-ordination: to be coordinated with distance relay zone 3 settings of outgoing feeders.
3	High Set Non-Directional	Pick Up: 100-110% of the through fault level of the transformer Characteristics: DT; 0 to 50 msec For IV side of 220 kV transformer only Pick Up: 70-100% of the through fault level of the transformer Characteristics: DT; 100 to 150 msec

5.4 Earth Fault Protection

1	Scheme	To be implemented on both sides of ICT
2	Low set Directional	Pickup: 20-80% of rated full load current Characteristics: IDMT Co-ordination: to be coordinated with earth fault relay setting of outgoing feeders.
3	High Set Non-Directional	Pick Up: 100-110% of the through fault level of the transformer Characteristics: DT; 0 to 50 msec For IV side of 220 kV transformer only Pick Up: 70-100% of the through fault level of the transformer Characteristics: DT; 100 to 150 msec

5.5 Overexcitation protection:

In case of non-availability capability curve by OEM, Shall be provided on both HV and LV sides as below:

U/F %	Time set (s)
110	9000
118	90
126	49.5
134	18
142	4
150	1

***Over excitation setting curve should be as per capability curve provided by OEM. The setting should be well below capability curve and continuous operating limit. However, it must be ensured that Over excitation setting provided by OEM are not be over-sensitive.

6. Shunt Reactor protection

6.1 Differential Protection

1	Id min (sensitivity)	Default: 0.2 pu
2	First Slope	0 - 10%. In case of differential relay with only two slopes, this slope is considered as zero.
3	Second Slope	20% to 40%
4	Third Slope	60% to 80%
5	Unrestrained operation level	2 pu
6	Max. ratio of 2nd harm. to fundamental harm dif. curr. in %	I2/I1Ratio = 15%
7	Max. ratio of 5th harm. to fundamental harm dif. curr. in %	I5/I1Ratio = 25%
8	Second and fifth harmonics restrain feature	Enabled
9	Cross block feature	Enabled

6.2 Impedance/ Zone protection

1	Setting	60% of reactor impedance
2	Time setting	1.2 sec

6.3 Phase overcurrent

1	DT	setting of 6-10 times rated current with a time delay of 0.1s
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Format No.-PI-01

Reporting of performance indices for protection system

(for elements connected at 220 kV and above)

Name of Utility:

Month:

S.N.	Sub-station	Unit (SPS/Line/ICT/GT/ etc)	Nc	Nf	Nu	Ni	Dependability Index (D)	Security Index (S)	Reliability Index (R)

Justification for less than one index may be attached separately.

Nc is the number of correct operations at internal power system faults

Nf is the number of failures to operate at internal power system faults

Nu is the number of unwanted operations

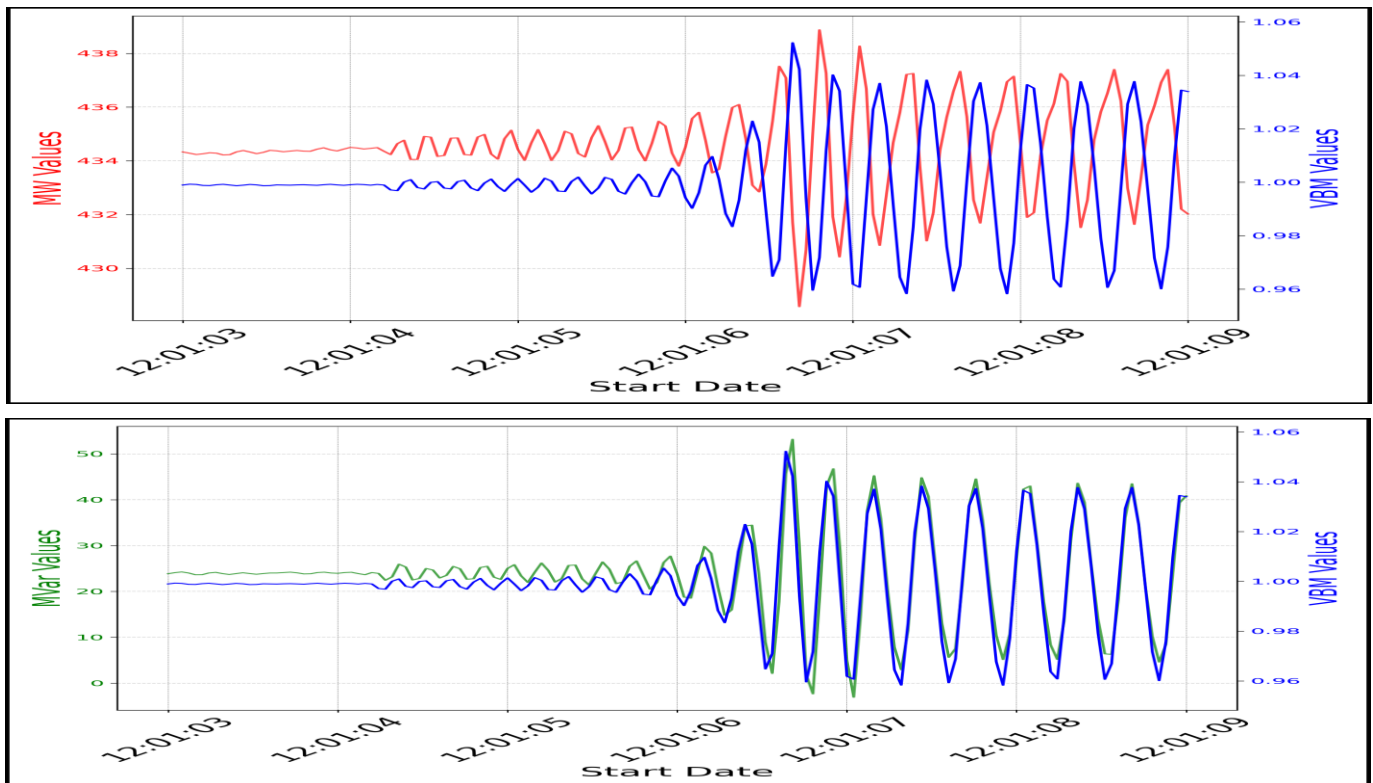
Ni is the number of incorrect operations and is the sum of Nf and Nu

Format**Internal Protection Audit Calendar****(for elements connected at 220 kV and above)****FY 2023-24****Name of Utility:.....**

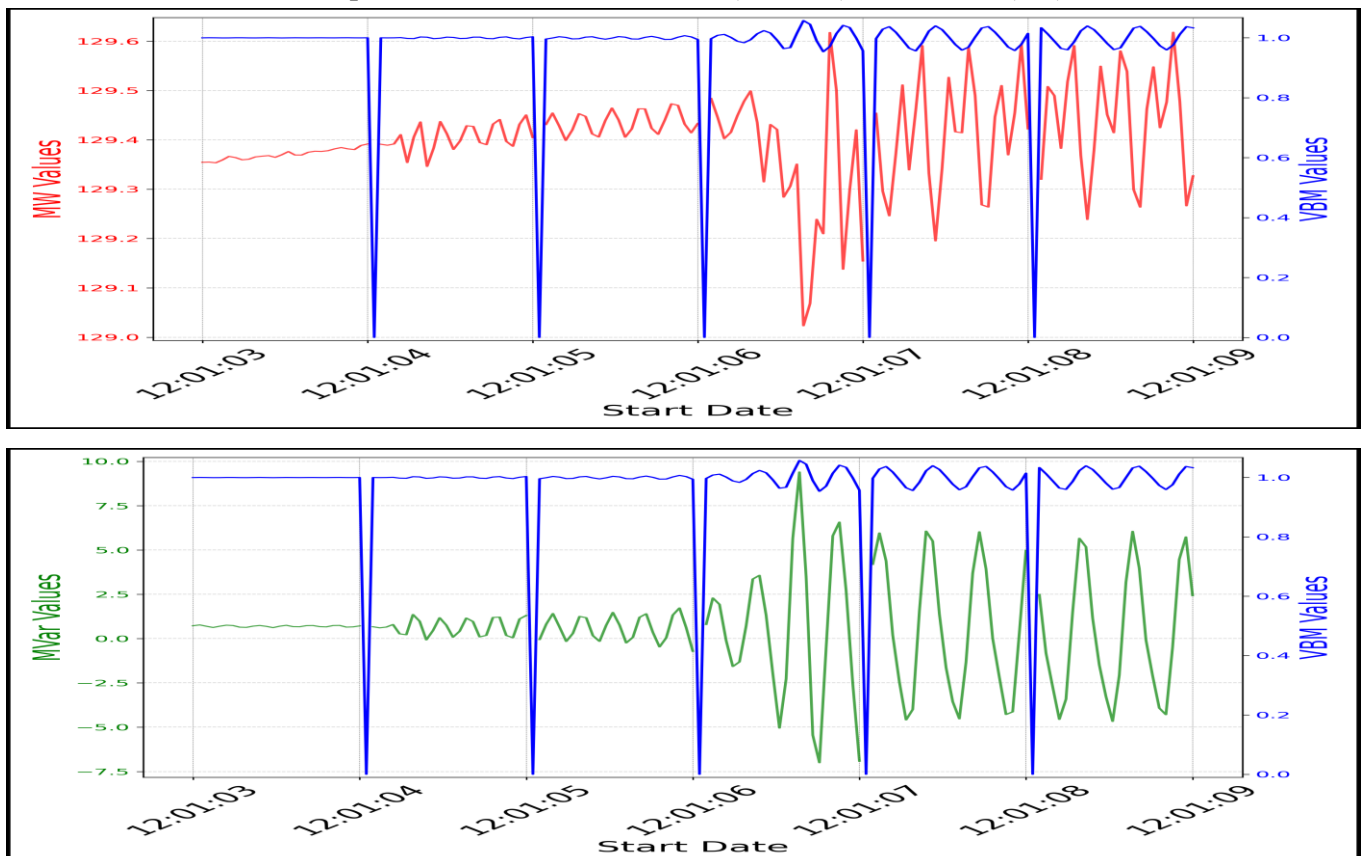
S.N.	Name of Sub-station	Voltage level	Next Internal Audit schedule	Last Audit conducted (Month/Year)
1				
2				

Plants MVar oscillation in phase with the oscillating grid voltage

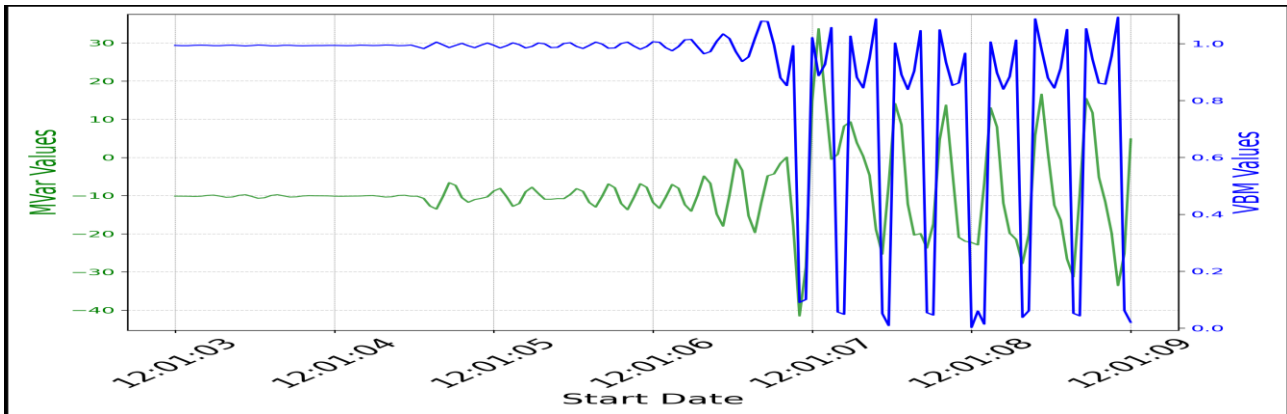
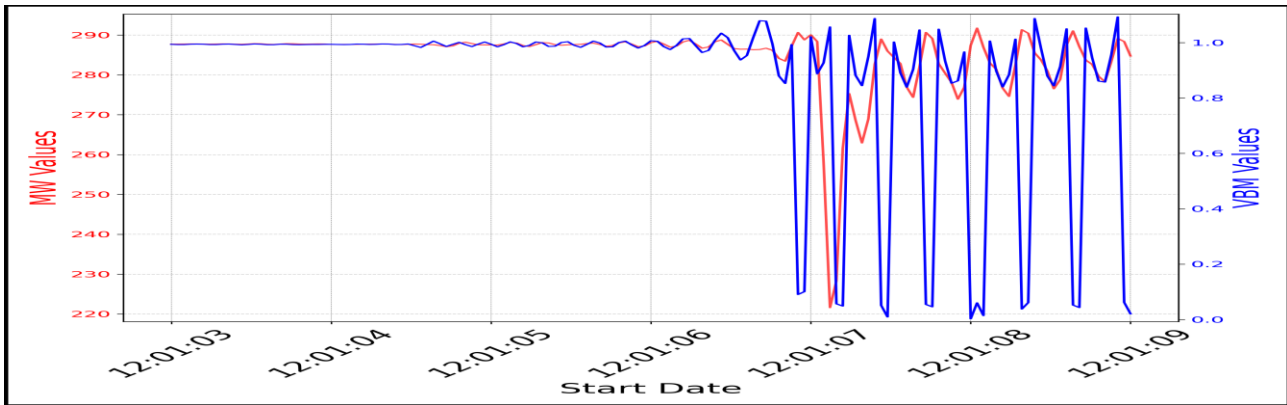
Avada Renewable (890MW)_ Bikaner(PG) (Avaada Sunce Pvt. Ltd._350MW, Avaada Sustainable RJ Pvt. Ltd._300MW & Avaada RJHN Pvt. Ltd._240MW).



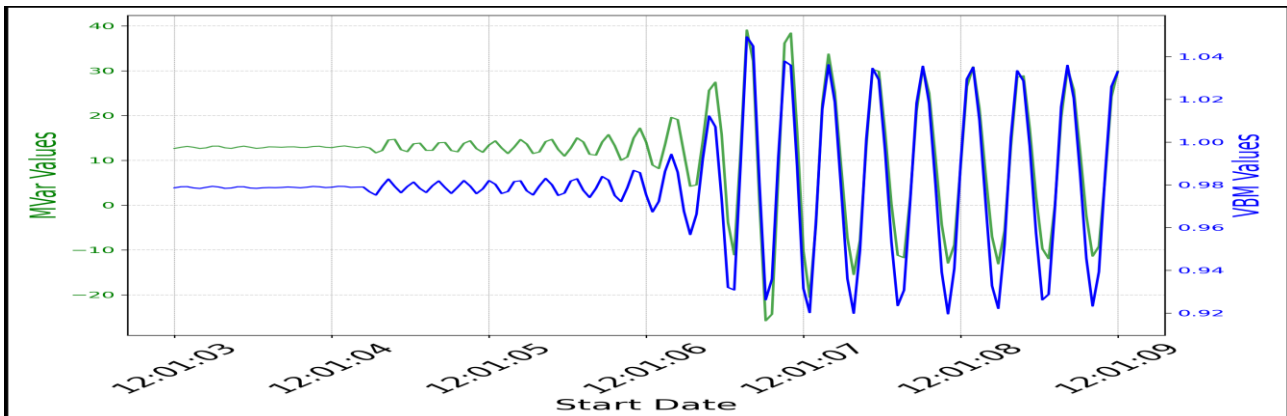
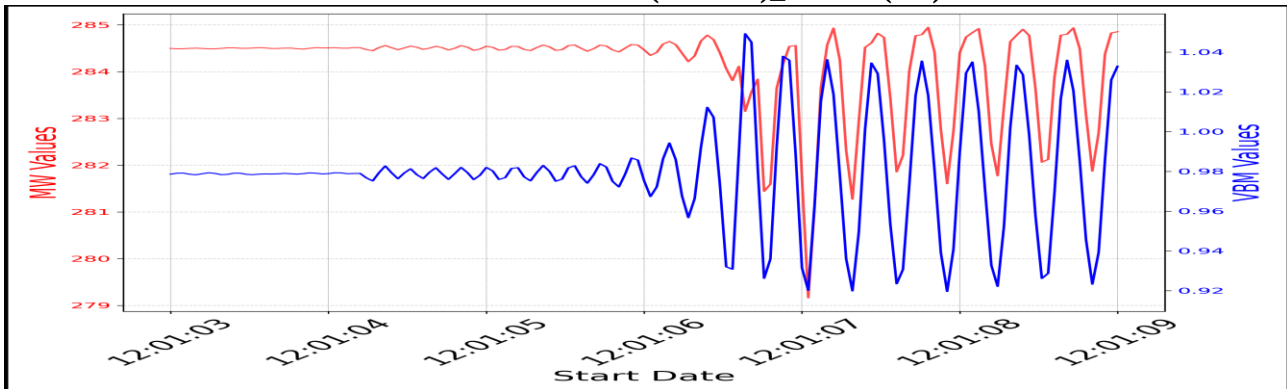
Amplus Grian One Volt Pvt. Ltd. (300MW)_Bikaner-II (PG)



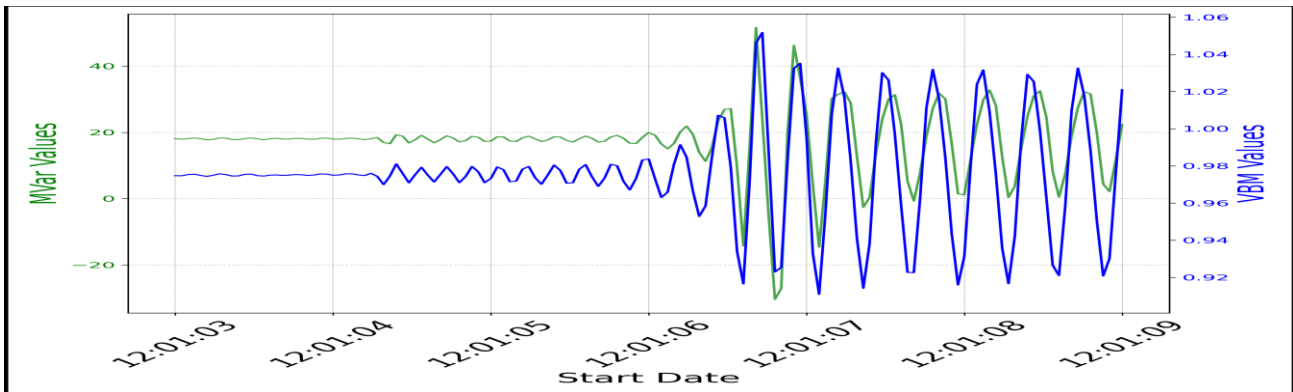
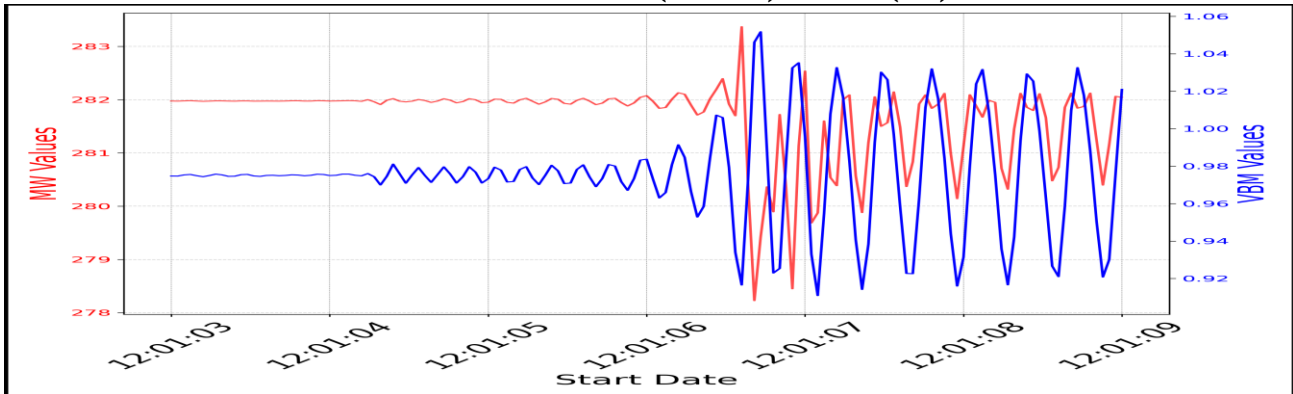
SB Energy Six Pvt. Ltd. (300MW)_Bhadla (PG)



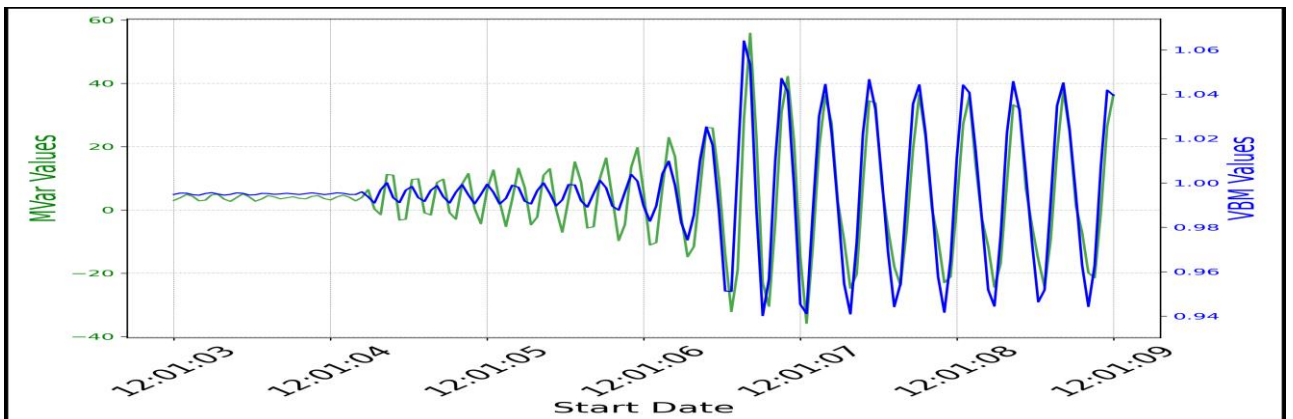
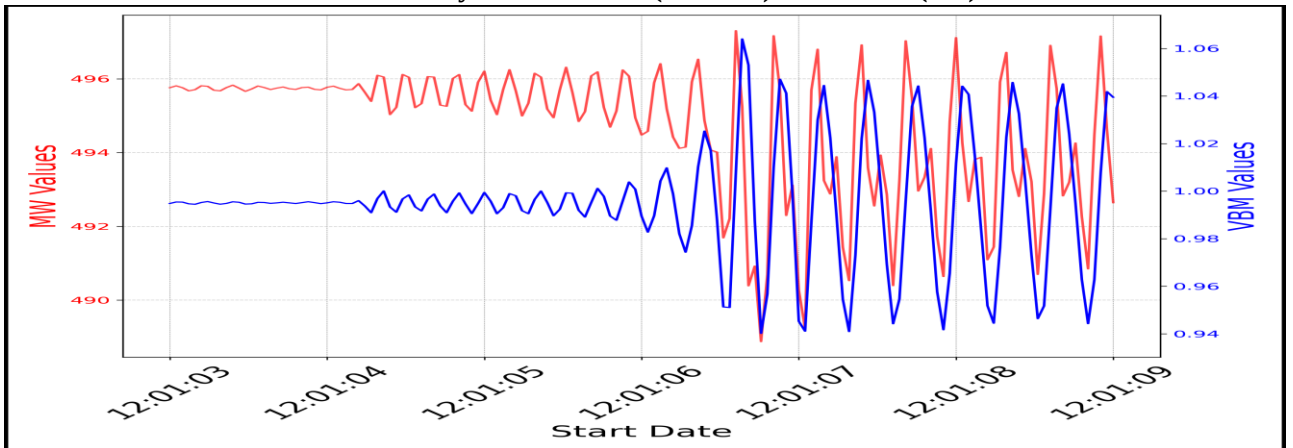
Mahoba Solar Pvt. Ltd. (300MW)_Bhadla (PG)



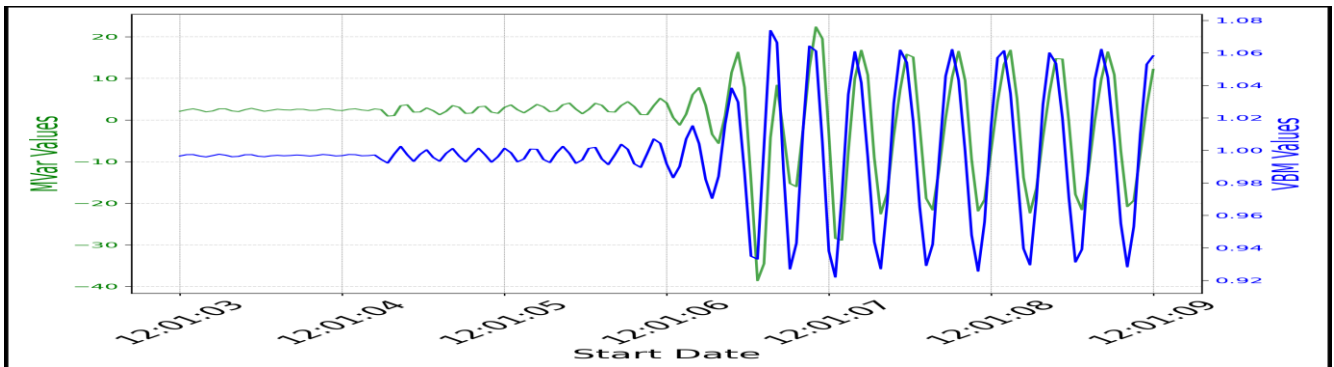
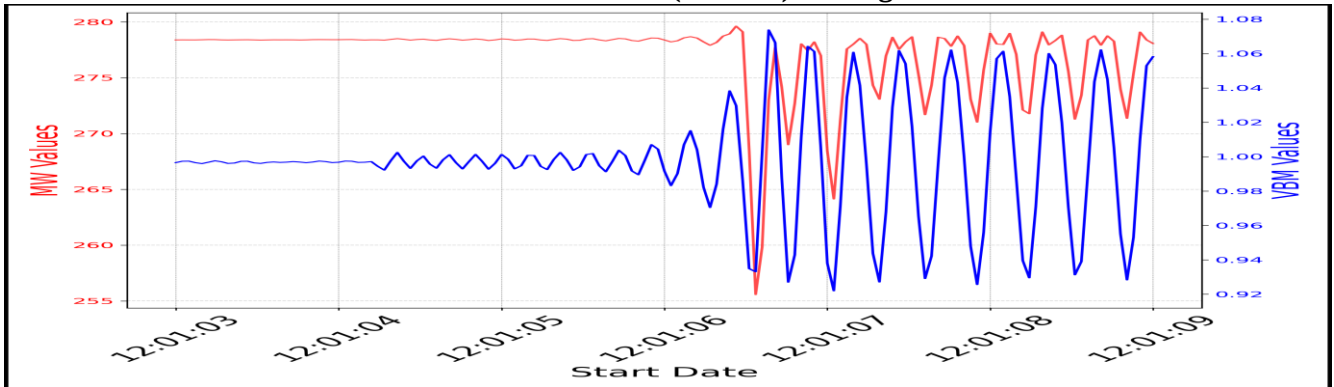
Azure Power 41 Pvt. Ltd (300MW)_Bhadla (PG)



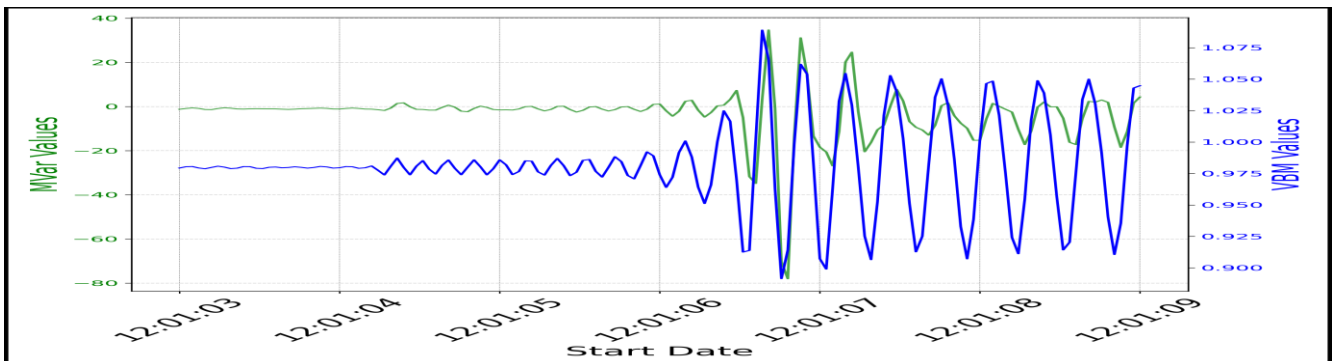
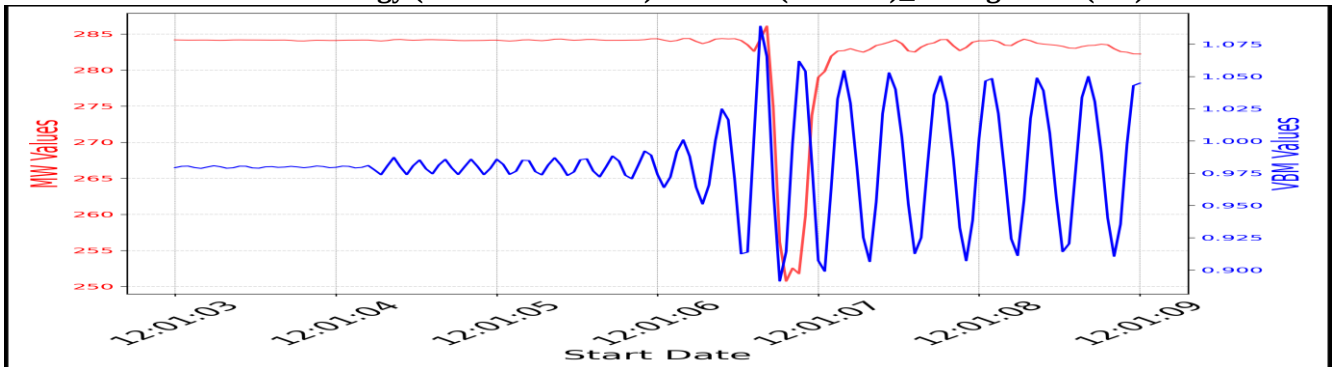
NTPC Kolayat Solar Plant (521MW)_Bhadla-II (PG)



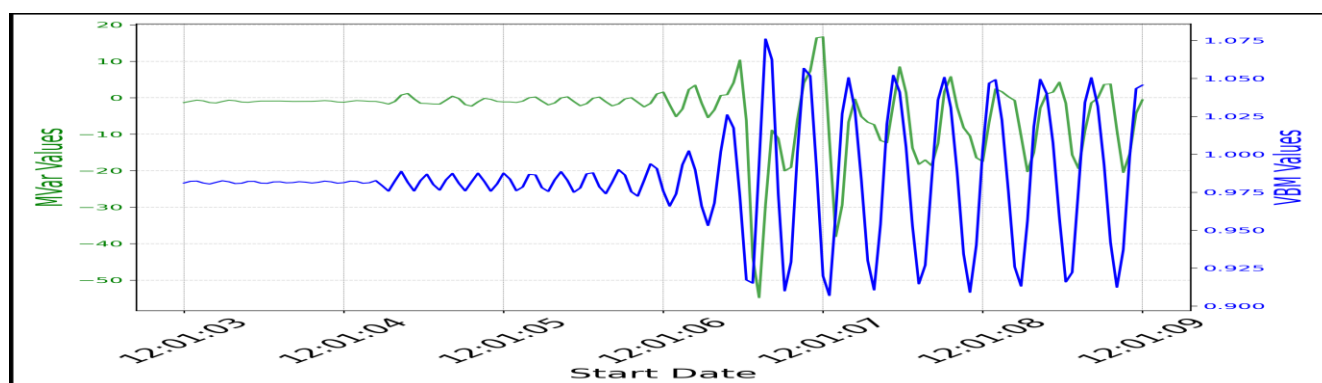
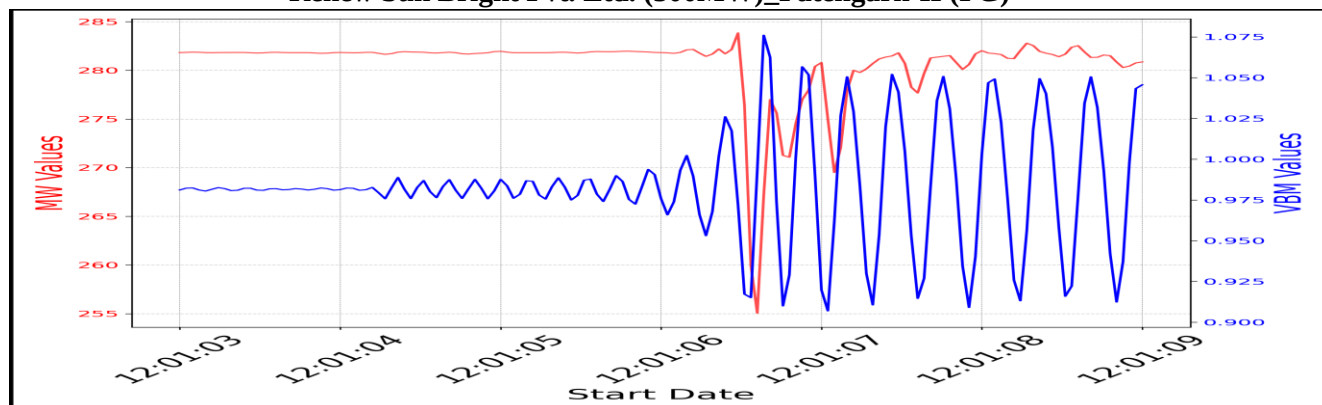
NTPC Devikot Solar Plant (296MW)_Fatehgarh-I



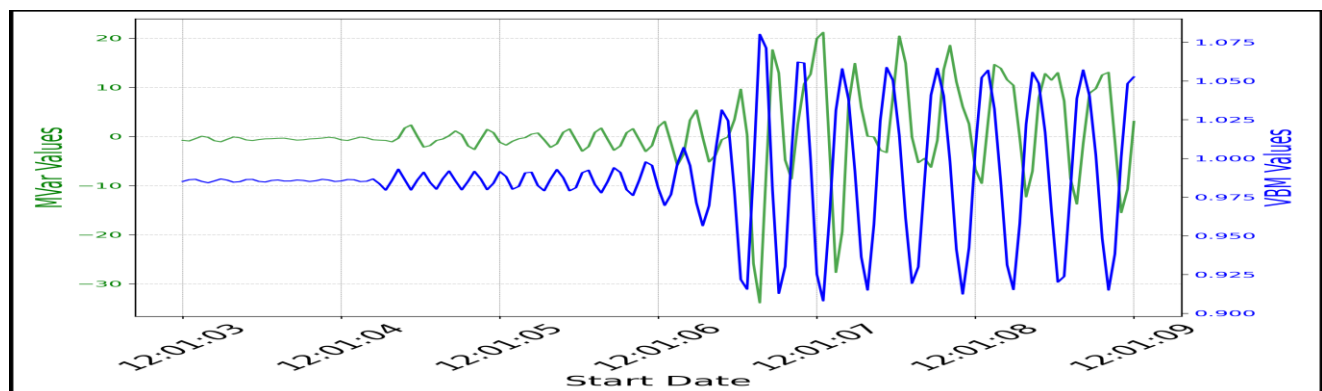
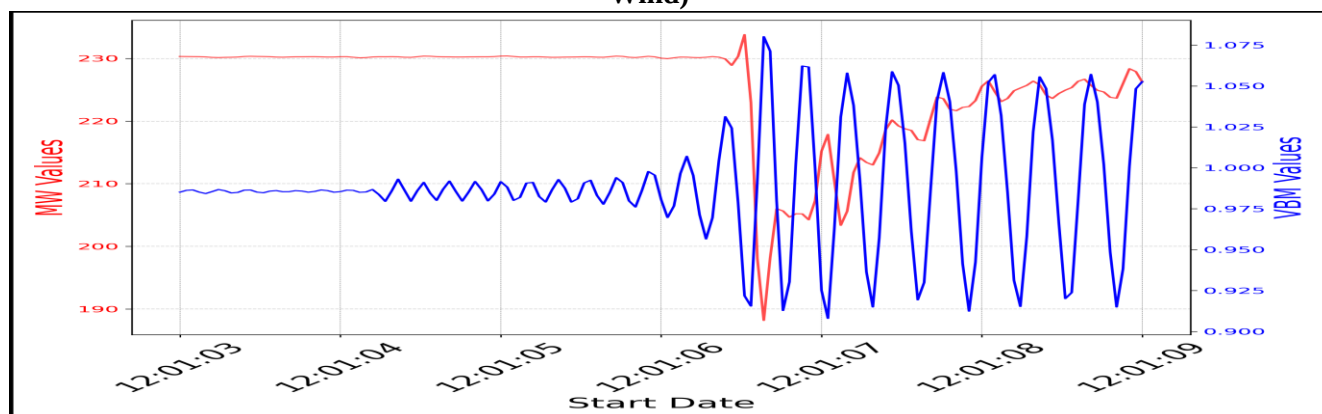
ReNew Solar Energy (Jharkhand Three) Pvt. Ltd. (300MW)_Fatehgarh-II (PG)



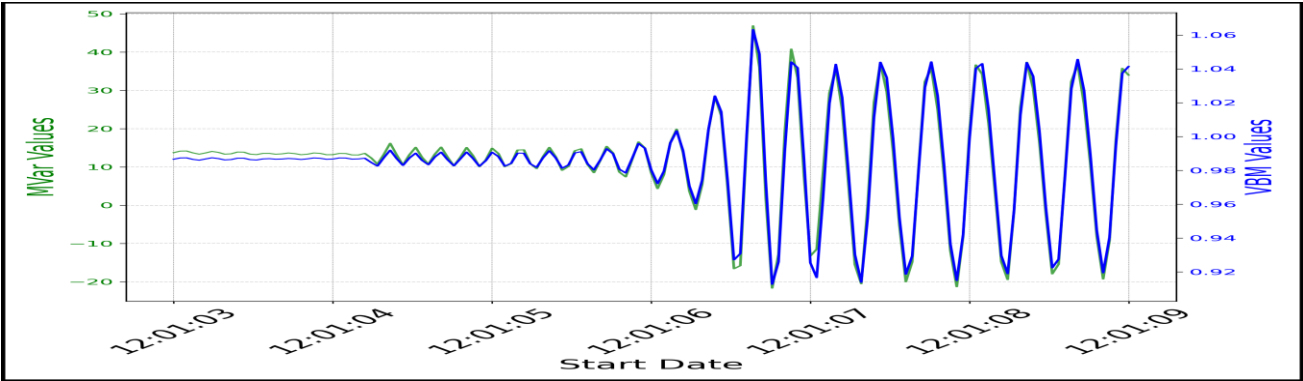
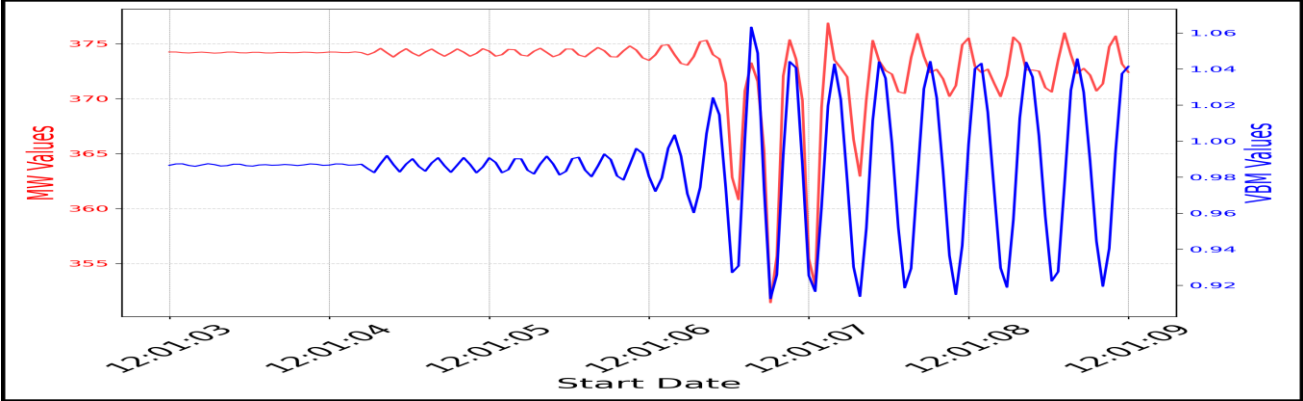
Renew Sun Bright Pvt. Ltd. (300MW)_Fatehgarh-II (PG)



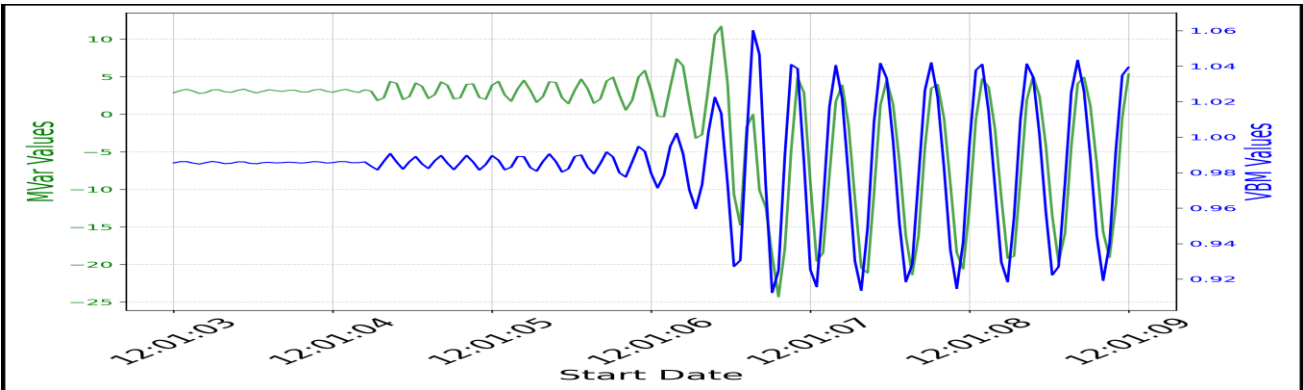
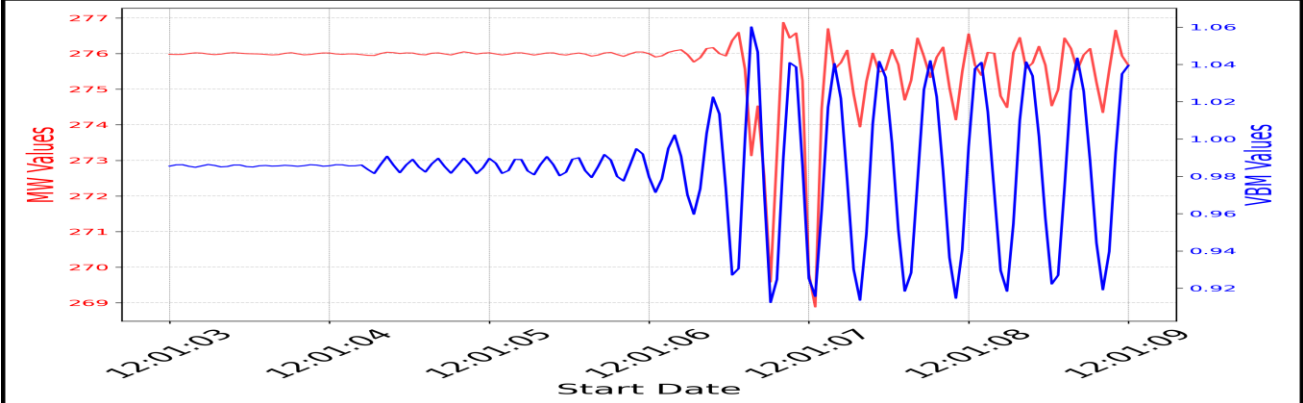
Adani Hybrid Energy Jaisalmer Three Ltd. (300MW)_Fatehgarh-II (PG) (300MW Solar+75MW Wind)



Altra Xergi Power Pvt. Ltd. (380MW)_Fatehgarh-III PS



Renew Surya Vihan Pvt. Ltd. & Renew Surya Partap Pvt. Ltd.(300MW)_Fatehgarh-III PS



List of RE plants commissioned full capacity before 31st December'2023 and not performed power quality filed testing yet

Sl. No.	Name of the plant	Capacity (MW)	Pooling station	Last capacity commissioned	Power quality field test report submitted to NRLDC
				Date (mm/dd/yyyy)	
1	RENEW SOLAR POWER Pvt. Ltd. Bhadla	50	Bhadla(PG)	5/5/2019	NO
2	AZURE POWER INDIA Pvt. Ltd., Bhadla	200	Bhadla(PG)	5/5/2019	NO
3	SB ENERGY FOUR PRIVATE LIMITED, Bhadla	200	Bhadla(PG)	5/17/2019	NO
4	Adani Renewable Energy (RJ) limited Rawara	200	Bhadla(PG)	8/23/2019	Yes
5	Azure Power Thirty-Four Pvt. Ltd.	130	Bhadla(PG)	09/09/2019	NO
6	RENEW SOLAR POWER Pvt. Ltd. Bikaner	250	Bikaner	10/28/2019	NO
7	ACME Chittorgarh Solar Energy Pvt Ltd	250	Bhadla(PG)	1/3/2020	Yes
8	Clean Solar Power (Bhadla) Pvt. Ltd	300	Bhadla(PG)	2/29/2020	NO
9	Adani Solar Energy Four Private Limited	50	Bhadla(PG)	4/19/2020	NO
10	Adani Solar Energy Jodhpur Two Limited, Rawara	50	Bhadla(PG)	9/13/2020	NO
11	Azure Power Forty-Three Pvt. Ltd._RSS	300	Bikaner	2/10/2021	NO
12	SB Energy Six Private Limited, Bhadla	300	Bhadla(PG)	6/18/2021	NO
13	Eden Renewable Cite Private Limited	300	Fatehgarh-II(PG)	8/14/2021	Yes
14	Mahindra Renewable Private Limited	250	Bhadla(PG)	8/20/2021	NO
15	Tata Power Renewable Energy Ltd. (TPREL)	300	Bhadla(PG)	8/24/2021	NO
16	Renew Sun Waves Private Limited	300	Fatehgarh-II(PG)	10/8/2021	NO
17	Renew Sun Bright (RSEJ4L)	300	Fatehgarh-II(PG)	11/18/2021	NO
18	ReNew Solar Energy (Jharkhand Three) Private Limited	300	Fatehgarh-II(PG)	12/11/2021	NO
19	ReNew Solar Urja Private Limited	300	Fatehgarh-II(PG)	12/20/2021	NO
20	Azure Power Forty-Three Pvt. Ltd._PSS	300	Bikaner	1/1/2022	NO
21	Ayaana Renewable Power One Pvt. Ltd.	300	Bikaner	1/2/2022	YES
22	Azure Power Forty-One Pvt limited	300	Bhadla(PG)	3/9/2022	NO
23	Avaada Sunce energy Pvt limited	350	Bikaner	4/8/2022	NO
24	Clean Solar Power (Jodhpur) Pvt. Ltd.	250	Bhadla(PG)	4/23/2022	NO
25	Avaada Sustainable RJ Pvt. Ltd.	300	Bikaner	5/12/2022	NO
26	Avaada RJHN_240MW	240	Bikaner	5/12/2022	NO
27	ACME Heergarh Powertech Pvt. Ltd	300	Bhadla-II(PG)	5/25/2022	Yes
28	Adani Hybrid Energy Jaisalmer One Ltd.	390	Fatehgarh-II(PG)	5/27/2022	Yes
29	ABC Renewable Pvt. Ltd	300	Bhadla-II(PG)	6/5/2022	YES
30	Mega Surya Urja Pvt. Ltd. (MSUPL)	250	Bhadla-II(PG)	6/25/2022	NO
31	Tata Power Green Energy Ltd. (TPGEL)	225	Bikaner	8/2/2022	NO
32	Nedan Solar NTPC	296	Fatehgarh-I	8/5/2022	Yes
33	Adani Hybrid Energy Jaisalmer Two Ltd.	300	Fatehgarh-II(PG)	9/29/2022	Yes
34	Adani Hybrid Energy Jaisalmer Three Ltd.	300	Fatehgarh-II(PG)	9/29/2022	Yes

35	Adani Hybrid Energy Jaisalmer Four Ltd.	700	Fatehgarh-I	10/7/2022	NO
36	Adani Solar Energy Jaisalmer One Pvt. Ltd.	450	Fatehgarh-II(PG)	10/23/2022	Yes
37	Thar Surya Pvt. Ltd.	300	Bikaner	11/26/2022	YES
38	Avaada Sunrays Pvt. Ltd.	320	Bhadla-II(PG)	12/14/2022	NO
39	NTPC Devikot Solar plant_240MW	240	Fatehgarh-II(PG)	12/15/2022	NO
40	Azure Maple Pvt. Ltd.	300	Bhadla(PG)	3/30/2023	NO
41	Renew Surya Ravi Pvt. Ltd.	300	Bikaner	3/31/2023	NO
42	Tata Power Green Energy Ltd. (TPGEL)	110	Bikaner	5/29/2023	Yes
43	NTPC Nokhra_300MW	300	Bhadla-II(PG)	6/30/2023	NO
44	ADANI SOLAR ENERGY JAISALMER TWO PVT. LTD. (SBSR)	300	Bikaner	10/7/2023	Yes

RE plants having major deviation and impacted the grid severely

Plant name	Simultaneous plant deviation(under-injection) (MW)	Pooling S/s
Eden	210	Fatehgarh-II (PG)
RSWPL	208	Fatehgarh-II (PG)
AHEJOL	192	Fatehgarh-II (PG)
RSEJ3PL	192	Fatehgarh-II (PG)
ABCREL	176	Bhadla-II (PG)
TPSL(Banderwala)	165	Bikaner-II (PG)
TPGEL	159	Bikaner (PG)
ACME Phalodi	158	Fatehgarh-I
AHEJ4L	157	Fatehgarh-I
Kolayat	149	Bhadla-II (PG)
ACME Raisar	145	Fatehgarh-I
AGE25PL	144	Bhadla-II (PG)
ACME Dhaulpur	139	Fatehgarh-I
Devikot	136	Fatehgarh-II (PG)
ACME Deogarh	130	Fatehgarh-I
RSUPL	128	Fatehgarh-II (PG)
ARP1PL	127	Bikaner (PG)
ARP3PL	123	Bikaner (PG)
TPREL	109	Bhadla (PG)
CSP Jodhpur	109	Bhadla (PG)
MSRPL	106	Bhadla (PG)
MSUPL	104	Bhadla-II (PG)
Nokhra	99	Bhadla-II (PG)
AHEJ3L	95	Fatehgarh-II (PG)
ASERJ2PL_FTG2	89	Fatehgarh-II (PG)
ACME Chittorgarh	72	Bhadla (PG)
AHEJ2L	72	Fatehgarh-II (PG)
TPSL	68	Bikaner-II (PG)
RSEKPL	66	Bhadla-II (PG)
ARERJL	58	Bhadla (PG)
RSRPL_BKN	52	Bikaner (PG)
RSBPL	50	Fatehgarh-II (PG)
ACME Heergarh	48	Bhadla-II (PG)
Nidan	36	Fatehgarh-I