सत्यमेव जयते

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 2री बैठक की कार्यसूची।

Subject: Agenda of the 2nd meeting of Renewable Energy Sub-committee of NRPC.

उ.क्षे.वि.स. की नवीकरणीय ऊर्जा उप-समिति की **2री** बैठक का आयोजन **27.01.2025 (10:30 बजे से)** को **एनआरपीसी सचिवालय, कांफ्रेंस हॉल, नई दिल्ली** में किया जाएगा । उक्त बैठक की कार्यसूची उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट http://164.100.60.165 पर उपलब्ध है ।

कृपया बैठक में उपस्थित होने की सुविधा प्रदान करें।

The **2nd** Renewable Energy sub-committee meeting of NRPC is scheduled to be held on **27.01.2025 (10:30 hrs. onwards)** at **NRPC Secretariat, Conference Hall, New Delhi**. The agenda of this meeting has been uploaded on the NRPC web-site http://164.100.60.165.

Kindly make it convenient to attend the meeting.

Signed by Dharmendra Kumar Meena
Date: 22-01-2025 16:57:29

(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

List of addressee (via mail)

List of Members of Rnenewable Energy Sub-committee

S. No.	Members of RE Sub-committiee	Representative Email ID
1	Ministy of New and Renewable Energy	anindya.parira@nic.in;
2	National Load Despatch Center	suhasd@grid-india.in;
3	Northern Regional Load Despatch Center	somara.lakra@grid-india.in;
4	Central Transmission Utility	Kashish@powergrid.in;
5	Powergrid Corporation of India Ltd.	naveensrivastava@powergrid.in; yashpal@powergrid.in
6	Rajasthan Rajya Vidyut Prasaran Nigam Ltd.	se.pp@rvpn.co.in;
7	Rajasthan State Load Despatch Center	se.ldrvpnl@rvpn.co.in;
8	Solar Energy Corporation of India	sanjaysharma@seci.co.in; vkumar@seci.co.in;
9	National Solar Energy Federation of India	ankur.kumar@nsefi.in; ceooffice@nsefi.in;
10	Indian Wind Power Association	secretarygeneral@indianwindpower.com ;
13	ABC Renewable Pvt. Ltd	dasopa@evrenenergy.com; achaturvedi@evrenenergy.com;
14	ACME Heeragarh powertech Pvt. Ltd	prachi.chauhan@acme.in; planthead.badisidd.solar@acme.in; ashutosh.singh@acme.in;
15	ACME Chittorgarh Solar Energy Pvt Ltd	sandeeptak@ayanapower.com; yogesh@ayanapower.com;
16	Adani Hybrid Energy Jaisalmer One Ltd.	kailash.nagora@adani.com; sanjay.bhatt@adani.com;
17	Adani Hybrid Energy Jaisalmer Two Ltd.	
18	Adani Hybrid Energy Jaisalmer Three Ltd.	
19	Adani Hybrid Energy Jaisalmer Four Ltd.	
20	Adani Renewable Energy (RJ) limited Rawara	
21	Adani Solar Energy Jaisalmer One Pvt. Ltd._450MW (Solar)	
22	Adani Solar Enegry Four Private Limited	
23	Adani Solar Energy Jaisalmer Two Private Limited	
24	Adani Solar Energy Jaisalmer Two Private Limited Project Two	
25	SB ENERGY FOUR PRIVATE LIMTED, Bhadla	

26	SB Energy Six Private Limited, Bhadla	
27	Adani Solar Enegry Jodhpur Two Limited, Rawara	
28	Adept Renewable Technologies Pvt. Ltd.	
29	Adani Solar Energy RJ Two Pvt. Ltd. (Devikot)	
30	Adani Solar Energy RJ Two Pvt. Ltd. (Phalodi)	
31	Adani Green Energy 19 Limited	
32	Altra Xergi Pvt. Ltd.	mahendra.kumar@O2power.in;
33	AMP Energy Green Five Pvt. Ltd.	vbhattacharya@ampenergyindia.com;
34	AMP Energy Green Six Pvt. Ltd.	vbhattacharya@ampenergyindia.com;
35	Amplus Ages Private Limited	manish.tak@amplussolar.com;
36	Avaada RJHN_240MW	alpesh.prajapati@avaada.com;
37	Avaada sunce energy Pvt limited	
38	Avaada Sunrays Pvt. Ltd.	
39	Avaada Sustainable RJ Pvt. Ltd.	
40	Ayana Renewable Power Three Private Limited	Venkatraman@ayanapower.com; rajeshshukla@ayanapower.com;
41	Ayaana Renewable Power One Pvt. Ltd.	
42	Azure Power Forty One Pvt limited	sourin.nandi@azurepower.com;
43	Azure Power Forty Three Pvt. Ltd._RSS	manohar.reddy@azurepower.com;
44	Azure Maple Pvt. Ltd.	sourin.nandi@azurepower.com;
45	AZURE POWER INDIA Pvt. Ltd., Bhadla	yogesh.kumar@adani.com;
46	Azure Power Thirty Four Pvt. Ltd.	manohar.reddy@azurepower.com;
47	Clean Solar Power (Jodhpur) Pvt. Ltd.	seetaram.kumhar@herofutureenergies.com; dejendra.sharma@herofutureenergies.com; atul.tomar@herofutureenergies.com; sushant.sinha@herofutureenergies.com;
48	Clean Solar Power (Bhadla) Pvt. Ltd	
49	Eden Renewable Cite Private Limited	
50	Grian Energy private limited	mehul.sharma@amplussolar.com;
51	Mahindra Renewable Private Limited	mehar.rahmatulla@mahindra.com; patil.saurabh2@mahindra.com;
52	Mega Surya Urja Pvt. Ltd. (MSUPL)	msupl_250mw_ists@mahindra.com;
53	AURAIYA Solar	rajivgupta@ntpc.co.in;
54	DADRI SOLAR	
55	SINGRAULI SOLAR	
56	Anta Solar	
57	Unchahar Solar	
58	NTPC Devikot Solar plant_240MW	
59	NTPC Kolayat_400kV	
60	Nedan Solar NTPC	
61	NTPC Nokhra_300MW	
62	One Volt energy Pvt. Ltd.	amarjeet.thakur@amplussolar.com;
63	ReNew Solar Energy (Jharkhand Three) Private Limited	purnendu.chaubey@renew.com; kailash.pandey@renew.com;
64	RENEW SOLAR POWER Pvt. Ltd.	

	Bhadla	
65	ReNew Solar Urja Private Limited	
66	Renew Sun Bright Pvt. Ltd. (RSBPL)	
67	Renew Sun Waves Private Limited (RSEJ4L)	
68	Renew Surya Partap Pvt. Ltd.	
69	Renew Surya Ravi Pvt. Ltd.	
70	Renew Surya Roshni Pvt. Ltd.	
71	Renew Surya Vihan Pvt. Ltd.	
72	Renew Surya Ayaan Pvt. Ltd.	
73	RENEW SOLAR POWER Pvt. Ltd. Bikaner	
74	Rising Sun Energy-K Pvt. Ltd.	tushar.gahlot@risingsunenergy.in;
75	Serentica Renewables India 4 Private Limited	prateek.rai@serenticaglobal.com;
76	Tata Power Green Energy Ltd. (TPGEL)	vinod.kumar@tatapower.com;
77	Tata Power Renewable Energy Ltd. (TPREL)	dhmahabale@tatapower.com; imran.khan@tatapower.com;
78	Thar Surya Pvt. Ltd.	kiran.tidke@enel.com;
79	TP Surya Pvt. Ltd.	sivanarayana@tatapower.com; sagar.potdar@tatapower.com;
80	Banderwala Solar Plant TP Surya Ltd.	arun.sahoo@tatapower.com;
81	TRANSITION ENERGY SERVICES PRIVATE LIMITED	kak@evrenenergy.com;
82	Transition Green Energy Private Limited	
83	Transition Sustainable Energy Services Private Limited	

Contents

Agenda for 2nd RE Sub-Committee Meeting of NRPC

1) Confirmation of Minutes

1.1 1st RE Sub-Committee meeting was held on 24.10.2024. Minutes of the meeting were issued vide letter dt. 23.11.2024. No comments received till now.

Decision required from Forum:

Forum may approve the minutes of 1st RE Sub-Committee meeting.

2) Approval of protection settings by PSC Forum after FTC (agenda by NRPC Secretariat)

2.1 Procedure for approval of protection setting has been approved in 75th NRPC meeting as attached as **Annexure-I.** Accordingly, FTC is allowed by RLDC/SLDCs based on protection philosophy (**Annexure-II**). Final approval of settings to be done in monthly PSC meetings.

2.2 It has been observed that RE companies are not taking final approval of protection settings in PSC. The issue was discussed in 54th PSC meeting, wherein, it was decided as:

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

Decision required by Forum:

Utilities may be informed of above procedure and may submit agenda in PSC.

3) Submission of protection performance indices along with reason and corrective action taken for indices less than unity to NRPC Secretariat on monthly basis (agenda by NRPC Secretariat)

3.1 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 earlier PSC meeting, it was 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.**

Decision required from Forum:

Forum may direct all RE utilities to submit indices of previous month by 7th day of current month at mail id seo-nrpc@nic.in

4) Annual protection audit plan for FY 2024-25 & FY 2025-26 (agenda by NRPC Secretariat)

4.1 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.**

Decision required from Forum:

Forum may direct all RE utilities to submit annual audit plan for FY 2025-26 at mail id seo-nrpc@nic.in

5) Third-party protection audit plan (agenda by NRPC Secretariat)

5.1 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 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.

Decision required from Forum:

Forum may direct all RE utilities to submit third party audit plan at mail id seo-nrpc@nic.in and reports along with compliance status of audit already conducted.

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 The issue of renewable energy (RE) generation loss during faults in vicinity of RE complex and non-compliance of LVRT/HVRT requirements by RE generators at the interconnection point was thoroughly discussed in the previous meetings. The necessary action items for RE developers were outlined in the last meeting as well. Additionally, two (2) significant events in the last quarter are being highlighted to address the ongoing concern of generation loss.

6.2 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 Drop of significant quantum of RE generation affect the grid security due to large excursion in grid frequency. Drop in RE generation is mainly due to LVRT non-compliance of RE plants during fault events (i.e. several RE plants failed to recover 90% of pre-fault active power within 1 sec).

6.4 After the event, NRLDC requested RE developers to share the reason of generation loss and LVRT/HVRT non-compliance along with DR/EL for analysing the event. However, **no RE developers submitted the required details for analysing the**

event and to find reason of generation loss, only Azure Power 41 Pvt. Ltd. whose line tripped during fault in both the event submitted the DR/EL. Analysis report w.r.t. LVRT operation and further remedial action taken at plant end also not received yet.

RE plants are requested to review the above-mentioned grid events and share the analysis report w.r.t. their plant. Necessary actions also need to be taken to ensure the compliance of LVRT/HVRT during any fault events.

6.5 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.

6.6 **Details of Events:**

1. **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:

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**	SUNGROW	SG250HX-IN
AMP Energy Green Five Pvt. Ltd.	Bhadla-II (PG)	100	65	26	39	**60**	FIMER	PVS98O
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	377	170	207	**55**	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 Sunce energy 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**	SUNGROW	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**	SUNGROW	SG250HX-IN
Ayana Renewable Power Three Pvt Ltd (ARPTPL)	Bikaner (PG)	194	222	190	32	**14**	SUNGROW	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**		

2. 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:

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**	**Inverters/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	PVS98O
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	SUNGROW	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	SUNGROW	SG250HX-IN
							TBEA	TS208KTL-HV
Total		**2510**	**2394**	**1660**	**734**	**31**		

6.7 Despite taking up in several earlier meetings, adequate action from RE developers to resolve the generation loss issue is yet to be implemented.

6.8 No RE developers submitted 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).

6.9 Issue pertaining to validation of Plant level simulation model with actual fault event is yet to be completed. 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 other elements which is implemented in field and causing abnormal tripping during fault event.

All RE plants as highlighted in Table-1 & Table-2 are requested to explain the reason of generation loss, failure of LVRT/HVRT and update the actions taken at plant end to ensure the LVRT/HVRT compliance. Forum may discuss the further course of action.

7) Voltage Oscillation and Voltage spikes issue in RE complex:

7.1 Several instances of high-frequency, high amplitude voltage oscillations (60-80kV) occurred in the Rajasthan RE complex of the Northern Regional grid in Nov'24 & Dec'24.

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. MS, NRPC requested PGCIL (and SIEMENS team) to submit a report on STATCOM performance/behaviour during oscillation, report received from SIEMENS team on 12.12.2024. Forum may discuss on the *"Report on STATCOM performance/behaviour during oscillation" received from* SIEMENS dated 12.12.2024 in agenda no. 6.

7.5 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.

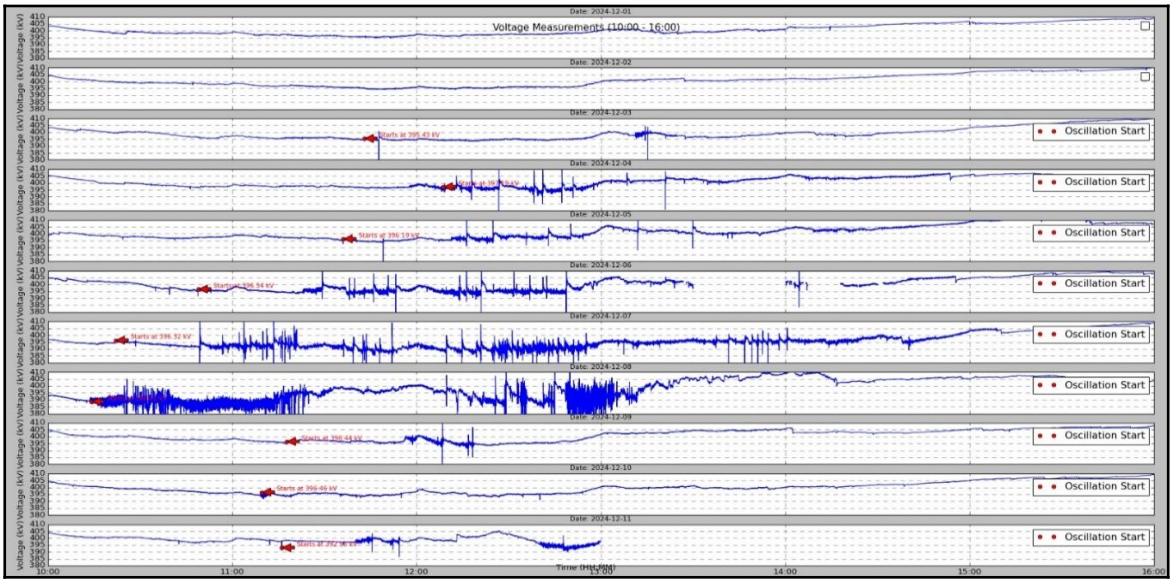
7.6 However, instances of high-frequency, high-amplitude voltage oscillations and voltage dip/fluctuation have considerably reduced after charging of 765kV Bhadla-II-Sikar-II D/C line on 17.12.2024. After 17.12.2024, STATCOMs in RE pocket are mostly being operated in Auto mode only, also SCR of Fatehgarh-II & Bhadla-II system have improved slightly.

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

7.7 With the rise in solar generation without commissioning of its associated transmission system, the SCR is bound to decline, once again increasing the system's vulnerability to oscillations in the future. Therefore, it is crucial to take proactive measures to identify the **root-cause of High-frequency, low-amplitude 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, it was suggested to all RE developers to fine tune their plants Inverter & PPC controller as per present grid condition so that oscillations could reduce in the system.

7.8 Repeated aperiodic spikes in voltage of RE pooling stations (40-50 kV peak to peak) at 400kV bus observed in Dec'24. These oscillations/spikes were observed in Northern region along with Western & Southern Region on 8th Dec 2024 and several generating units reported hunting and other issues. 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. RE plant need 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.

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



7.9 Commissioning of RE evacuating lines planned for evacuation of Phase-II & Phase-III generation needs to be expeditated 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 is 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-III in existing system**. RE generation should be commissioned in timeline matching with commissioning of its Associated transmission system.**

7.10 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***.

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

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

All RE developers are requested to share updates or findings from their respective investigations regarding voltage oscillations with the forum, further actions taken status from RE plants side may be updated to forum.

Forum may discuss further the steps that should be taken to avoid oscillation in Rajasthan RE complex in future.

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 As stipulated in Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2013, Part-II, clause B1, Sub-clause (1), (2), (3) & (4) about requirements with respect to Harmonics, Direct Current (DC) Injection and Flicker are as follows;

B1. Requirements with respect to Harmonics, Direct Current (DC) Injection and Flicker

1) *Harmonic current injections from a generating station shall not exceed the limits specified in Institute of Electrical and Electronics Engineers (IEEE) Standard 519.*
2) *The Generating station* shall not inject DC *current greater than 0.5 % of the full rated output at the interconnection point.*
3) *The generating station shall not introduce flicker beyond the limits specified in IEC 61000. Provided that the standards for flicker will come into effect from 1st April 2014.*
4) *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.*
5) *Provided that in addition to annual measurement, if distribution licensee or transmission licensee or the generating company, as the case may be, desires to measure harmonic content or DC-injection or flicker, it shall inform the other party in writing and the measurement shall be carried out* ***within 5 working days****.*

8.2 List of RE plants commissioned full capacity before 31st December'2023 and not performed power quality filed testing yet is enclosed as **Annexure-VI**. These RE plants are requested to conduct the Power Quality measurement, Harmonic analysis, DC injection and Flicker test at earliest **in presence of the concerned parties,** as they are already in violation of the compliance of aforementioned clause B1(4) (Commissioned full capacity 1 year ago as on 31st December'24).

8.3 There are **44 RE plants** whose full capacity commissioned before 31st Dec'23, out of 44 RE plant only **14 RE plants** has submitted the Power quality filed test report.

8.4 Therefore, it is requested to perform Power Quality measurement, Harmonic analysis test and Flicker test at Field in the presence of concerned parties as per CEA regulation as mentioned above and submit the Test report for Power Quality measurement, Harmonic analysis, DC injection and Flicker test showing the %THD and distortion Individual Harmonic distortion at Point of Interconnection for Voltage and Current, DC injection and Flicker at POI.

Forum may decide the Timeline to close these pending compliances related to Power Quality Norms.

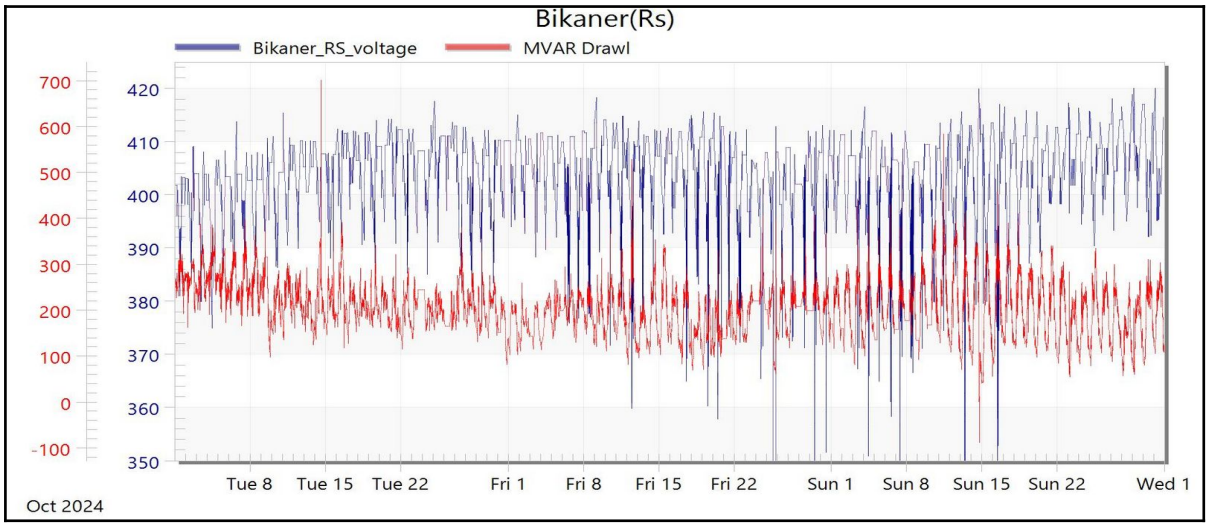
9) Huge MVAr drawl by RVPN network:

9.1 It has been noted 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 subcommittee meeting of NRPC as well.

9.2 Reactive power (MVAr) drawl of Rajasthan from the grid increases further during winter season.

9.3 High drawl by Rajasthan control area leads to increased dependency on STATCOM and other ISGS RE plants, as they attempt to compensate by increasing 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. Moreover, low voltage conditions lead to voltage oscillations in the RE pocket. Sample plot for one S/s (i.e. 400kV Bikaner(RS) is given below;

Bikaner(RS) voltage vs MVAR



9.4 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 drawal from Grid have been observed are 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

9.5 It is 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.

Rajasthan SLDC is requested to present a roadmap outlining how they intend to manage this issue in the coming months.

10) Status of RE evacuation Phase-II transmission system

10.1 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. 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.

10.2 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.

10.3 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.

10.4 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.

PGCIL is requested to provide an update on the status and the expected timeline of commissioning for following elements;

i. 765kV Bhadla-II(PG)-Sikar-II D/C (2nd) (i.e. Ckt-3 & Ckt-4). (Phase-II)
ii. Creation of 765kV Narela S/s and 765/400kV, 2*1500MVA ICTs are 765kV Narela S/s. (Phase-II)
iii. 765kV Khetri-Narela D/C line. (Phase-II)
iv. LILO of 765kV Meerut-Bhiwani at 765kV Narela S/s. (Phase-II)
v. 2 nos. of 400kV Narela-Maharanibagh D/C lines. (Phase-II)
vi. 765kV Sikar-II-Khetri D/C line. (Phase-III)

vii. 765kV Sikar-II-Narela D/C line. (Phase-III)

11) STATCOM mode of Operation and performance

11.1 As per the Minutes of Meeting (MoM) of the 1st RE Sub-Committee meeting held on 24.10.2024, SIEMENS was requested to submit the **analysis report along with suggestive remedial measures within 30days** to avoid escalations of high frequency, low amplitude voltage oscillations to high-frequency, high-amplitude voltage oscillations when STATCOM operates in Auto mode (VCM or QCM). In response, SIEMENS has submitted the report, addressing the concerns raised by Grid-India and CTUIL.

11.2 The point wise reply/report submitted by SIEMENS to the issues raised in STATCOM operation may be discussed in the forum for further clarification and future course of action with STATCOM OEM/PGCIL. STATCOM OEM (SIEMENS) may also be invited specially for further discussion.

Forum may discuss on the *"Report on STATCOM performance/behaviour during oscillation" received from* SIEMENS dated 12.12.2024.

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 (**RE plants**) 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.

Members may like to discuss.

13) Injection of infirm power in the grid

13.1 In accordance with subclause (c) of Regulations 19(2) and clause 19(3) of CERC (IEGC) (First Amendment) Regulations, 2024,

> **Subclause (c) of 19(2):**
> *Quote*
> *….. "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)."*
> *Unquote*
> ***Clause 19(3):***
> *Quote*
> *….."Provided that for REGS and ESS (except Hydro PSP ESS), extension of period for injection of infirm power beyond the stipulated period may be allowed (a) for a period up to three months by respective RLDC on an application(s) made by such generating station 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, (b) for a period beyond three months, by the Commission on an application(s) made by such generating station or ESS(except Hydro PSP ESS) along with detailed reasons, at least 15 days in advance of the completion of the stipulated period."*
> *Unquote*

13.2 It is requested 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.

13.3 Failing to comply the above may result in the denial of permission for the Injection of Infirm power for the purpose of commissioning activities.

13.4 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. All RE plants are requested to provide the specific details of each such occasion of infirm power injection on day ahead basis.

13.5 As per 11/SM 2024 dated 22.12.2024, any **scheduling of power shall be allowed only after issuance of a successful trial run certificate by the RLDC**. Prior to issuance of such a certificate, a generating station would be required to seek prior

permission of RLDC on each occasion of interchange of infirm power with details such as those relating to the specific commissioning activity, testing, and full load testing, its duration and the intended period of interchange (as per Regulation 19(7) of the Grid Code).

14) Reg-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

15) Deviation and Ancillary Service (DAS) Pool Account

15.1 M/s Manikaran Analytics Limited has been done registered at NRLDC as QCA 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 Pratap	- 210 MW
Altra Xergi	- 380 MW
Total	**- 990 MW**

15.3 Payments related to Deviation and Reactive Energy Charges to be made in the DAS Pool account **strictly within due date**. However, payments are being delayed for even more than 15 days. **(Renew Power, Azure Power)**

15.4 It is observed that many a time two separate payments are made When any account is issued along with revision of previous weeks. The amounts are different in Table-I and subsequent tables.

15.5 RE Developers have to make the payment strictly as per Table-I of the DSM and Reactive Energy Statement issued by NRPC. The table-I is prepared after taking into account the differential amount of deviation charges payable/ receivable due the revision of previous weeks.

15.6 At times, entities are making the combined payment for both Deviation and Reactive Energy charges.

15.7 The Payment for Deviation and Reactive Energy charges are to be made separately.

15.8 Reconciliation Statement is to be signed by the entities and uploaded in Reconciliation Portal (poolar.nrldc.in) of NRLDC within due date. The Accounts shall stand deemed reconciled in case of no response from the pool members.

15.9 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)**

15.10 Timely opening of LC as per the DSM Regulation. Few RE developers have not opened LC for FY 2024-25 despite repeated follow up. **(ABC Renewable, ADEPT, AMP Green Energy six, Transition Energy)**

15.11 Many-a-times, RE developers are making payment of RLDC F&C into DAS pool account and vice-versa. It is advised to make the payments carefully in correct accounts only. **(Renew, Altra Xergi)**

15.12 Few RE developers are frequently changing bank account for receiving deviation charges and reactive charges. It is requested to not changes 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	APTFL_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.

16.5 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

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

All concerned are requested to please update timelines for rectification.

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.
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

All concerned are requested to please update timelines for installation of firewalls at the earliest.

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

18.1 Status of all the RE plants who has declared COD after Oct'23 (IEGC 2023) and pending compliances as per IEGC 2023 for rated capacity demonstration and frequency response test are elaborated below.

Extract from regulation is 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:

i. *Frequency response of machines as per the CEA Technical Standards for Connectivity.*
ii. *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****.*

18.2 **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-3: 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 Demonstration date (with 0.95PF lag to lead at POI)	Frequency response test performance 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_TPSL	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	272	97.16	4-Jun-24	15-Jun-24	**Pending**	**Pending**

POWER THREE PVT LTD (ARP3PL)		97.16	24-Jul-24	10-Aug-24		
Juniper Green Cosmic Private Limited	100	100	8-Oct-24	10-Oct-24	**Pending**	**Pending**

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

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

19.1 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. Due to this, undesired trippings have also been observed.

As per IEGC clause 14.2,

Quote

All users connected to the grid shall:

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

Unquote

19.2 In view of above, RE plants are requested keep the protection settings which is approved during FTC. Any changes / revision in protection settings may only be done after approval of NRPC.

Members may like to discuss.

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):** 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. Multiple issues are observed in this plant are as follows: -

i. **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 received yet.
ii. **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.

iii. **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.

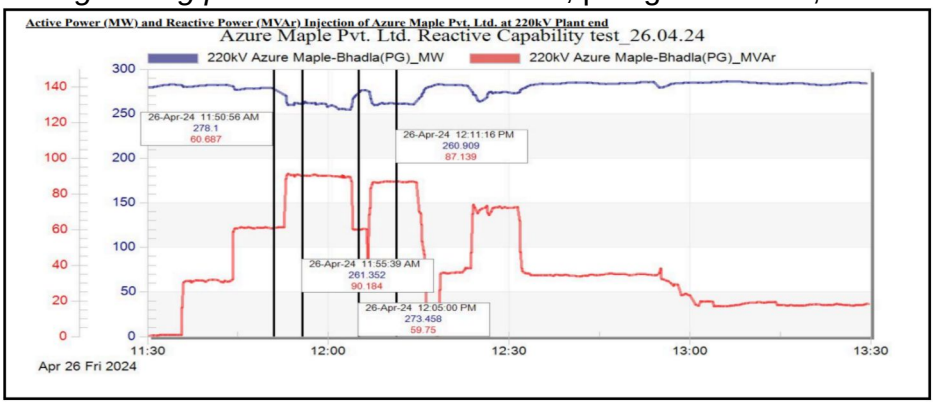
250MW Adani Bhadla (200MW Azure + 50 MW Renew) is requested to install the PPC in the plant and resolve the aforementioned pending issue.

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

Azure Mapple is a 276MW (reduced capacity) plant and connected at Bhadla (PG). Multiple issues are observed in this plant are as follows: -

i. **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.

ii. 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.

iii. **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. is requested to resolve the aforementioned pending issue.

20.3 **Low Peak/CUF issue at 110 TPSL(Bikaner):** 110MW TPSL solar plant is connected at 225MW TPGEL plant which is further connected to Bikaner (PG) substation through 220kV TPGEL-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.

20.4 **TPGEL is a 225MWplant 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.

Tata Power is requested to resolve the aforementioned pending issue in TPSL and TPGEL at (Bikaner (PG)).

20.5 **Huge MVAR drawl by 300MW plant SBE6PL:**

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;

i. **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;

ii. **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.

SB Energy Six Pvt. Ltd. and ESUCRL is requested to resolve the aforementioned pending issue

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

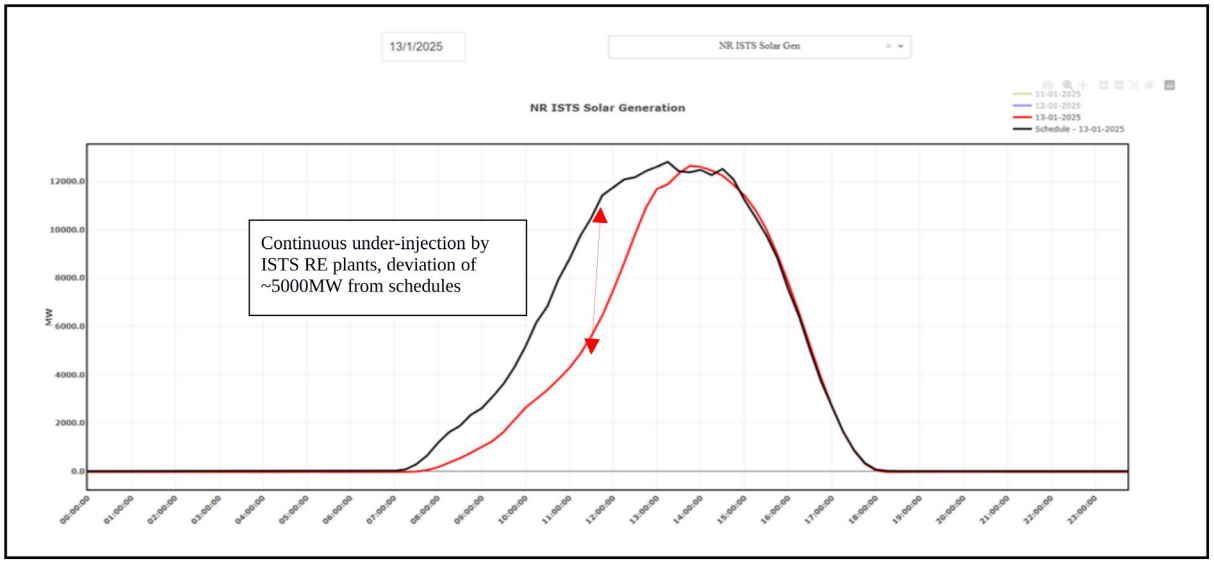
Each MSRPL and MSUPL has installed 2x40MVAR (80 MVARs SVG) for reactive power compliance by 16.03.2024. Whereas the plants have not demonstrated their respective reactive capabilities even after continuous follow ups. Further this matter was also raised in same forum as 1st Renewable Energy sub-committee meeting of NRPC held on 24th Oct'24 and chaired by MS, NRPC.

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

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

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 are 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.

Annexure-I

सत्यमेव जयते

उत्तर क्षेत्रीय 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.

*****

~~Annexure~~

Annexure-II

सत्यमेव जयते

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~~

Contents

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)*

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. I2/I1 ≥ 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.

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: i. faults in cables/composite ii. Breaker Fail Relay iii. Line Reactor Protections iv. O/V Protection v. Received Direct Transfer trip signals vi. Busbar Protection vii. Zone 2/3 of Distance Protection viii. Circuit Breaker Problems. CB Pole discrepancy relay time:1.5 sec; for tiebreaker: 2.5 sec

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.

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 (Imax) may be considered as 1.5 times the thermal rating of the line or 1.5 times the associated bay equipment current

		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 (Vmin) 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

1	**Lines with Series and other compensations inthe 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 suchthat relay trips instantaneously in Zone-1 on carrierreceive. • 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 copewith 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%.

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.

4. Local Breaker Back-up

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% In LBB time delay = 200ms In case of variation in CT ratio, setting may be done accordingly.

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 ≤ 1/(% impedance at nominal tap)
6	Max. ratio of 2nd harm. to fundamental harm dif. curr. in %	I2/I1Ratio = 10 - 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

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 x (RCT + 2RL) RSTAB = (VSTAB / IREF)*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 currentCharacteristics: 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

*****

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

~~Annexure-IX~~
Annexure-IV

Format

Internal Protection Audit Calendar

(for elements connected at 220 kV and above)

FY 2023-24

Name of Utility:……..

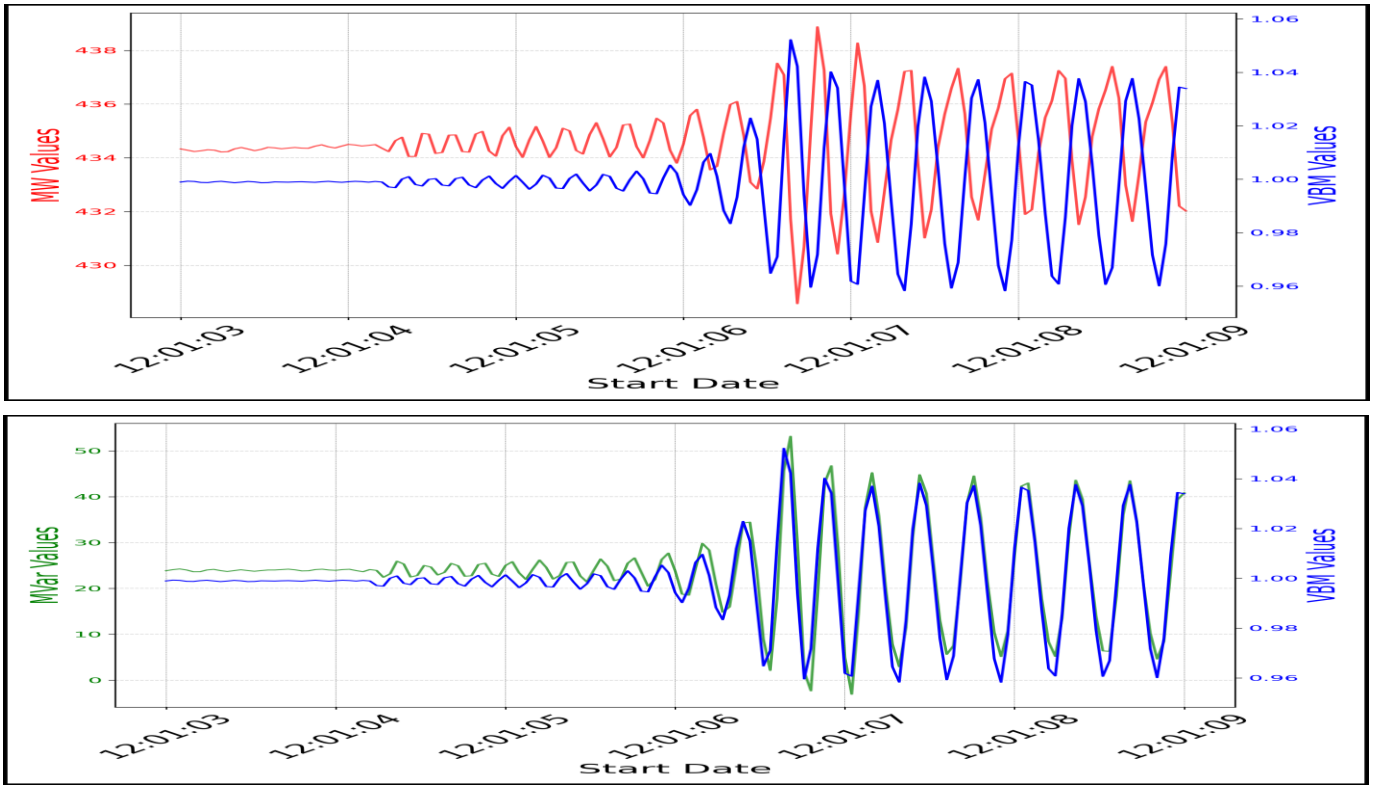
S.N.	Name of Sub-station	Voltage level	Next Internal Audit schedule	Last Audit conducted (Month/Year)
1				
2				

~~Annexure-I~~

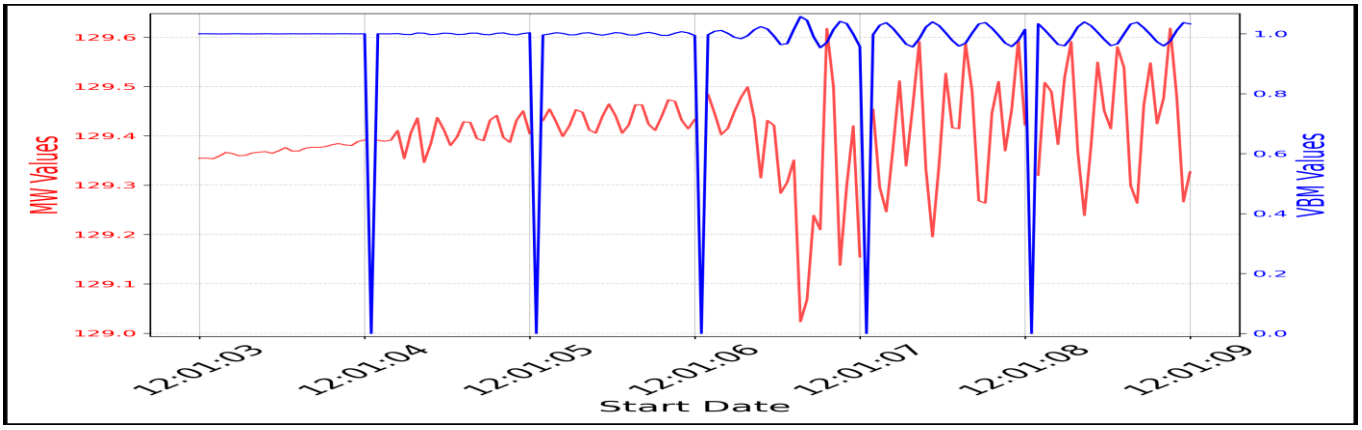
Annexure-V

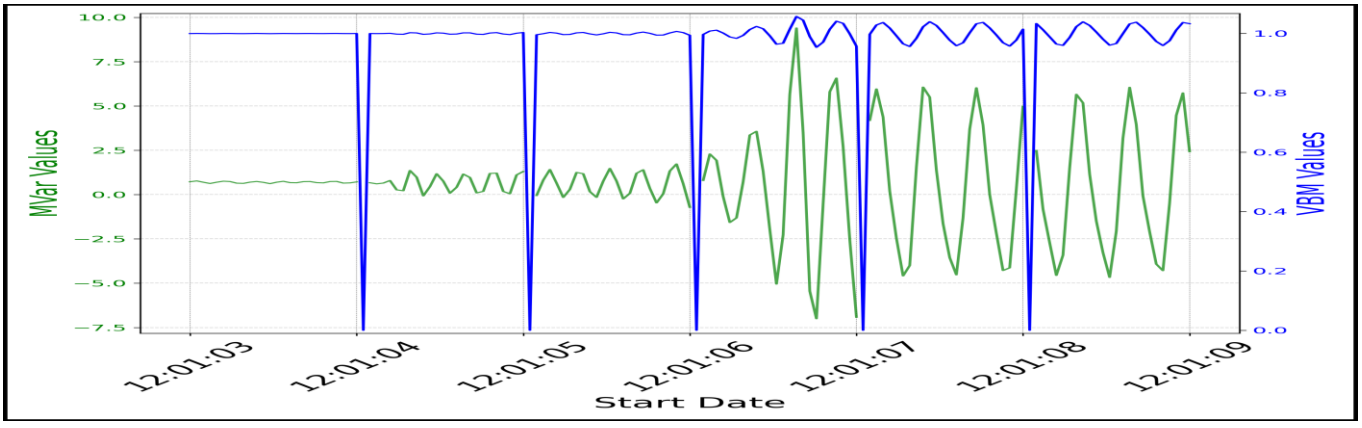
Plants MVAr oscillation in phase with the oscillating grid voltage

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



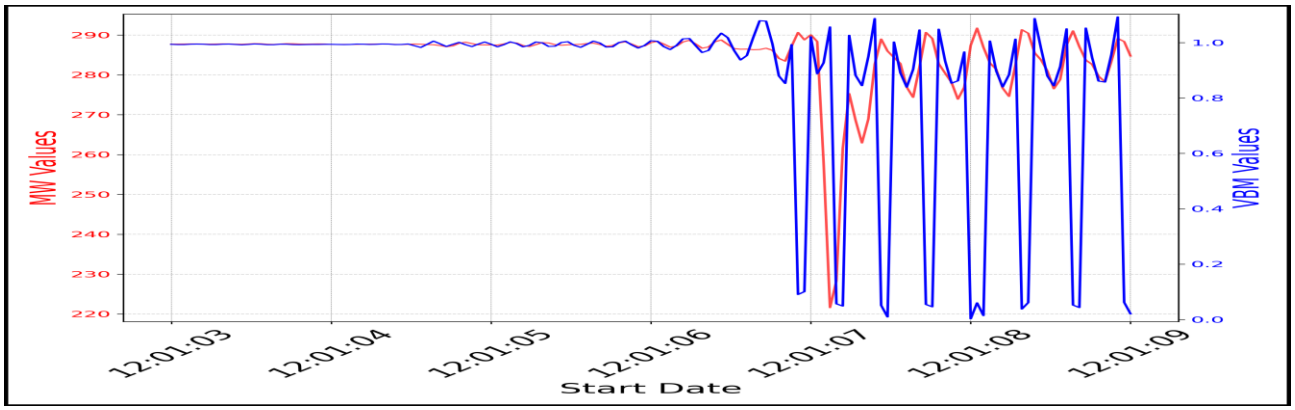
Amplus Grian One Volt Pvt. Ltd. (300MW)_Bikaner-II (PG)

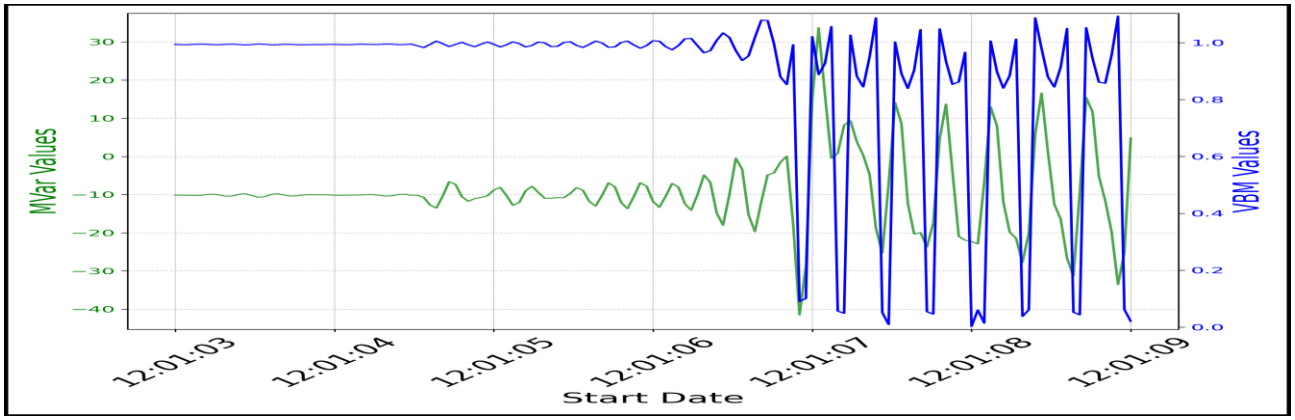




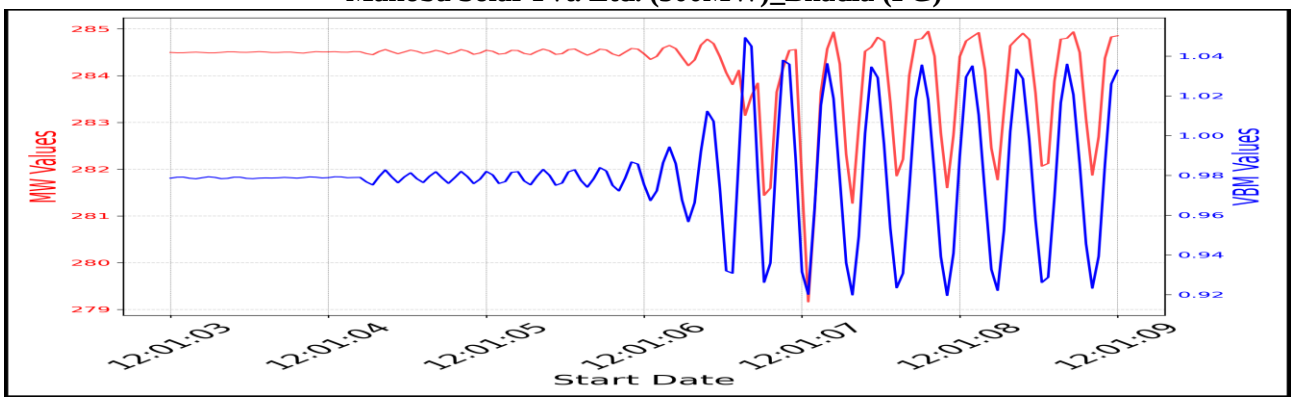
~~Annexure-I~~

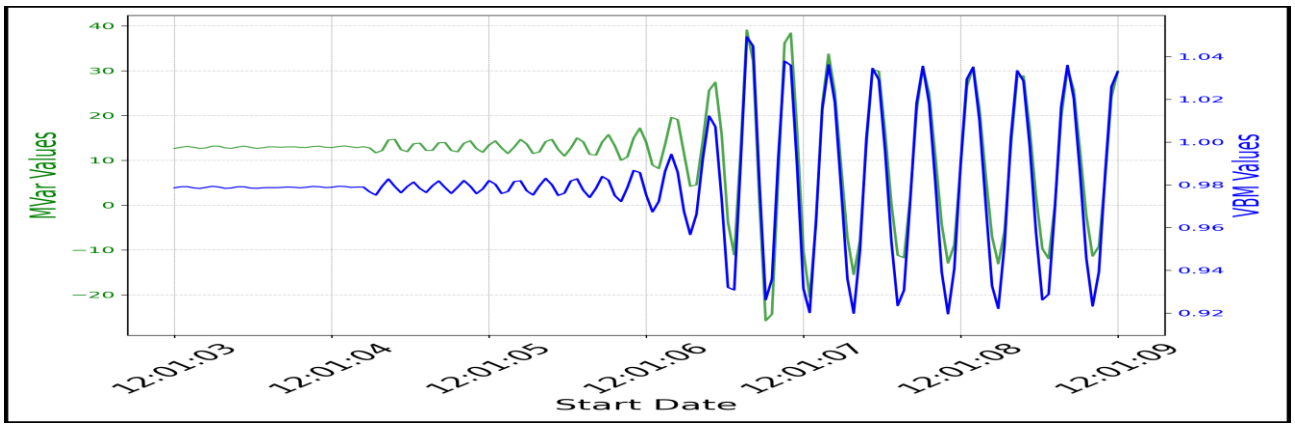
SB Energy Six Pvt. Ltd. (300MW)_Bhadla (PG)





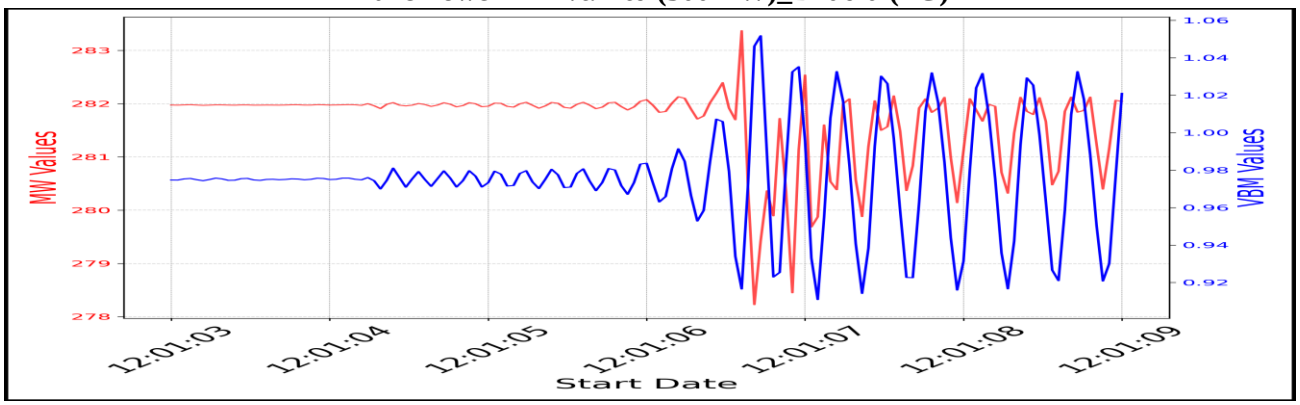
Mahoba Solar Pvt. Ltd. (300MW)_Bhadla (PG)

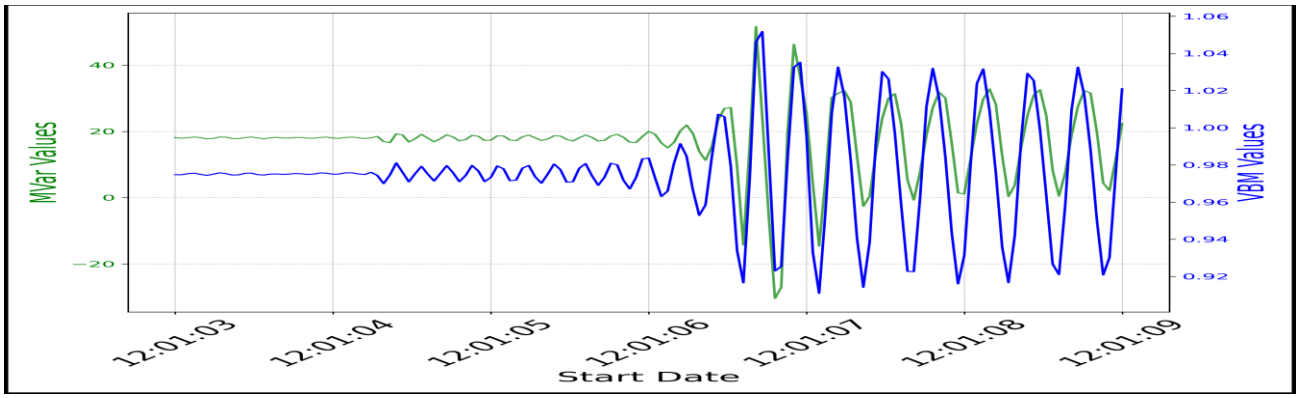




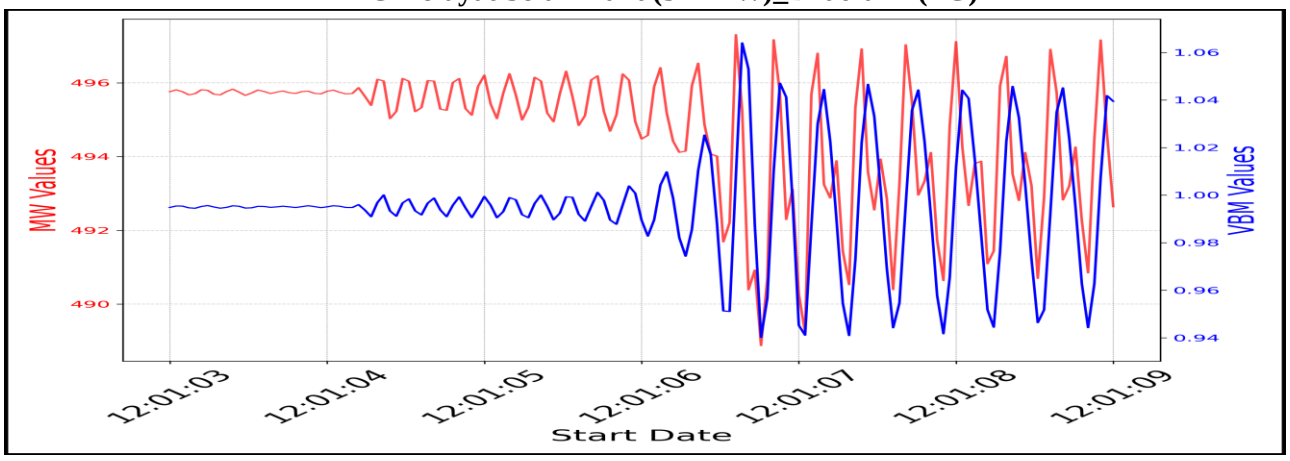
~~Annexure-I~~

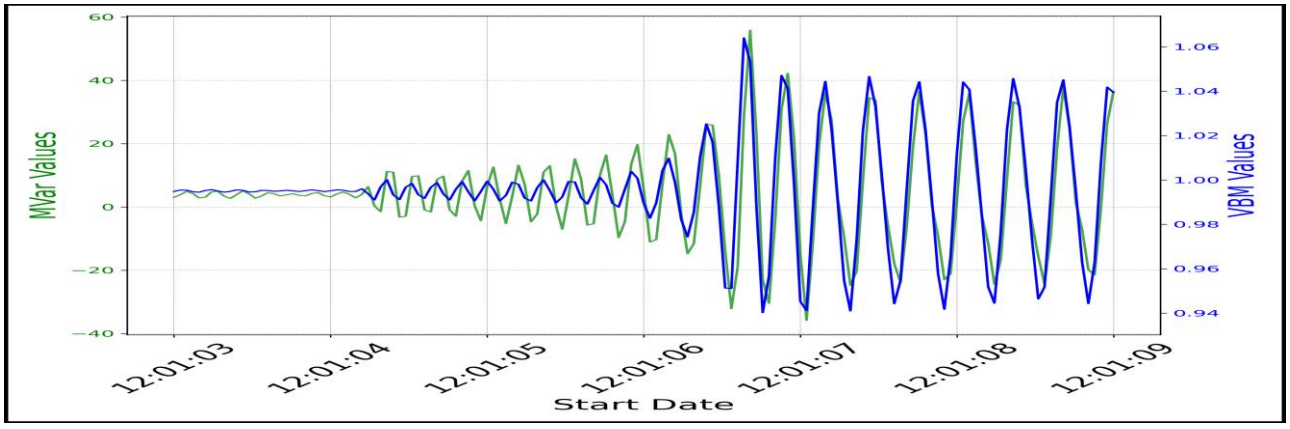
Azure Power 41 Pvt. Ltd (300MW)_Bhadla (PG)





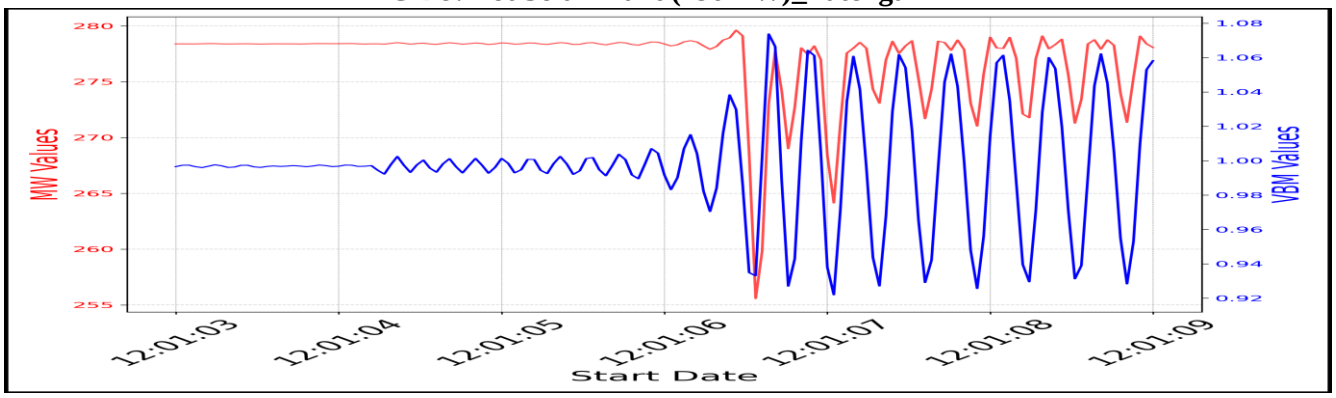
NTPC Kolayat Solar Plant (521MW)_Bhadla-II (PG)

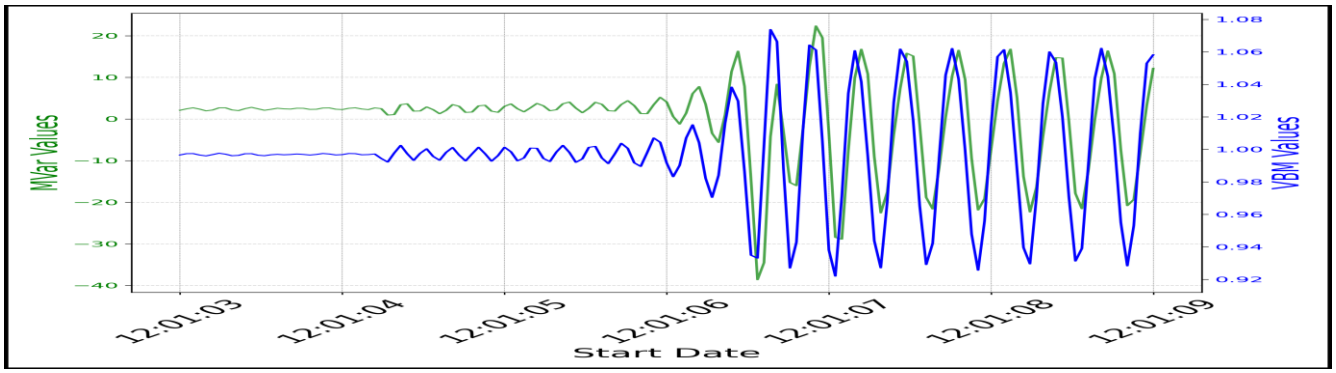




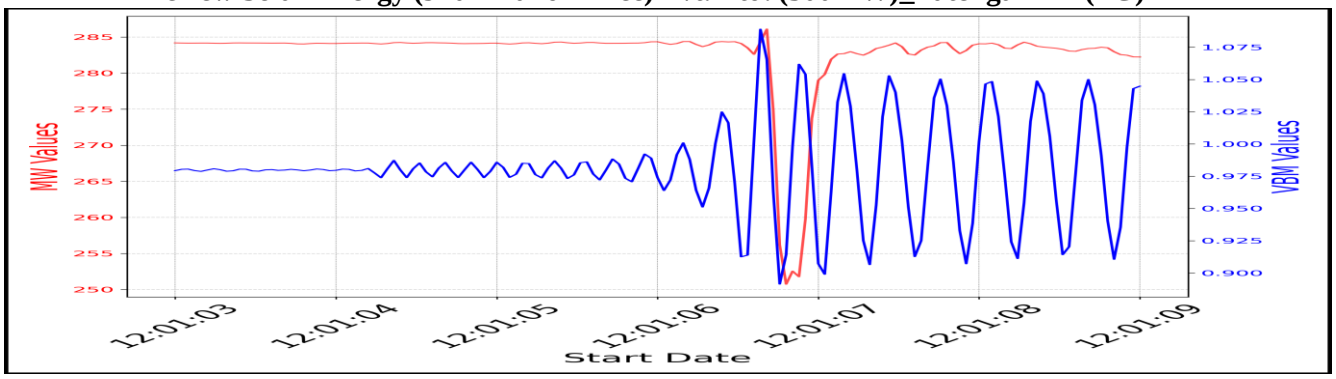
~~Annexure-I~~

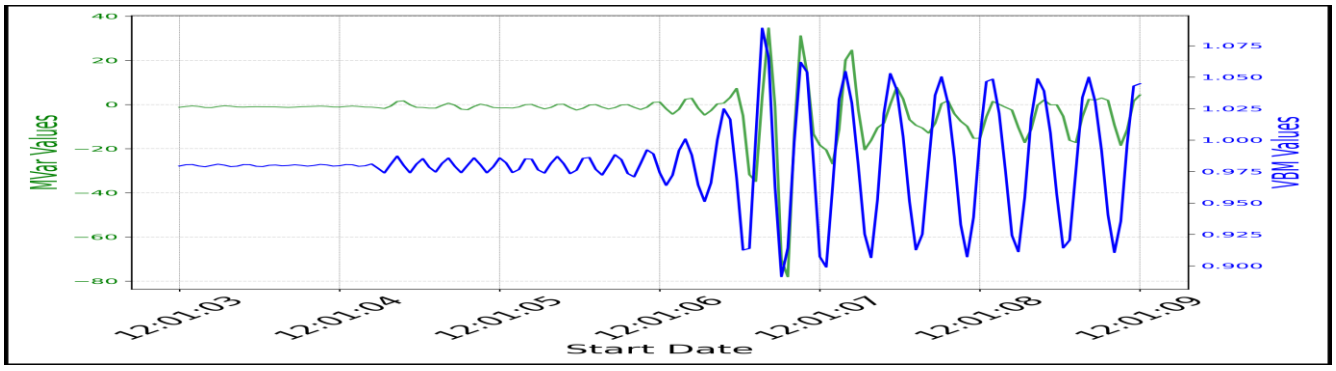
NTPC Devikot Solar Plant (296MW)_Fatehgarh-I





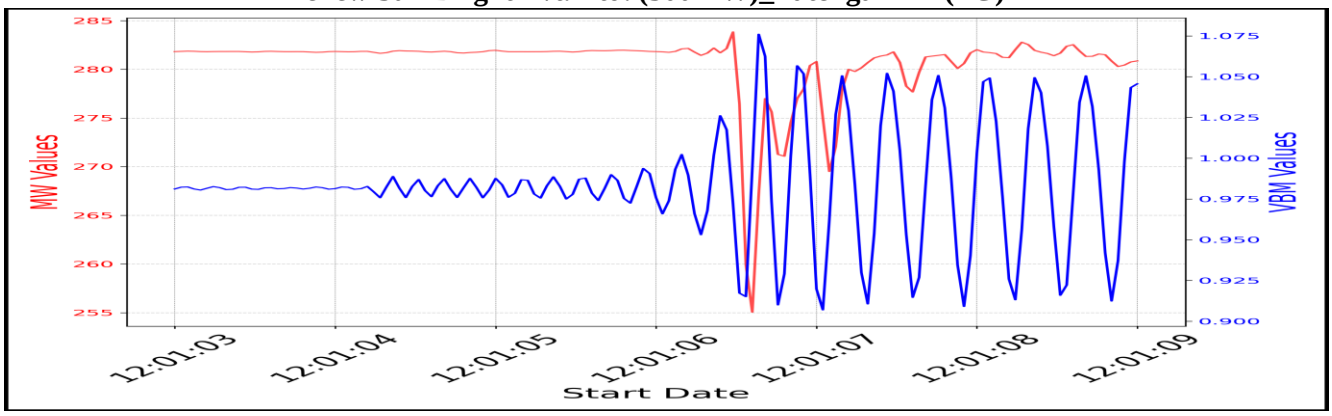
ReNew Solar Energy (Jharkhand Three) Pvt. Ltd. (300MW)_Fatehgarh-II (PG)

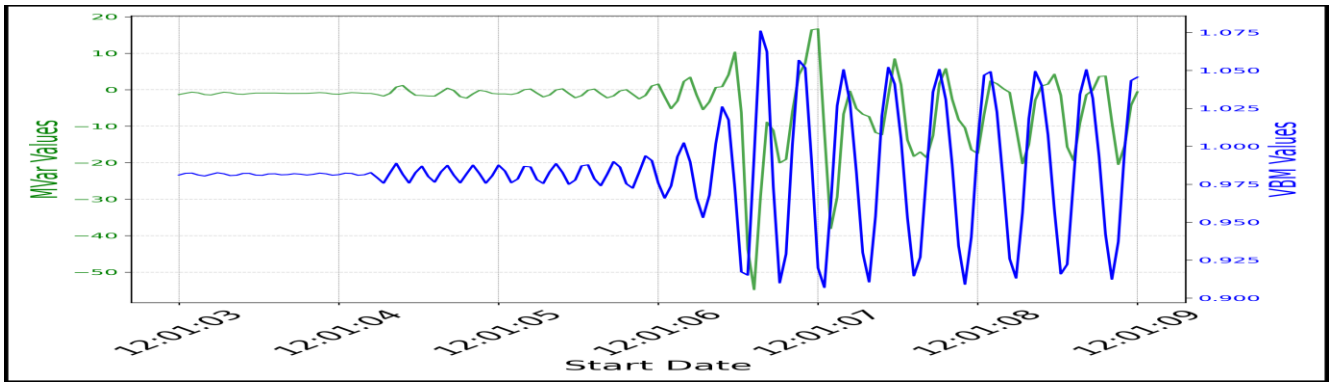




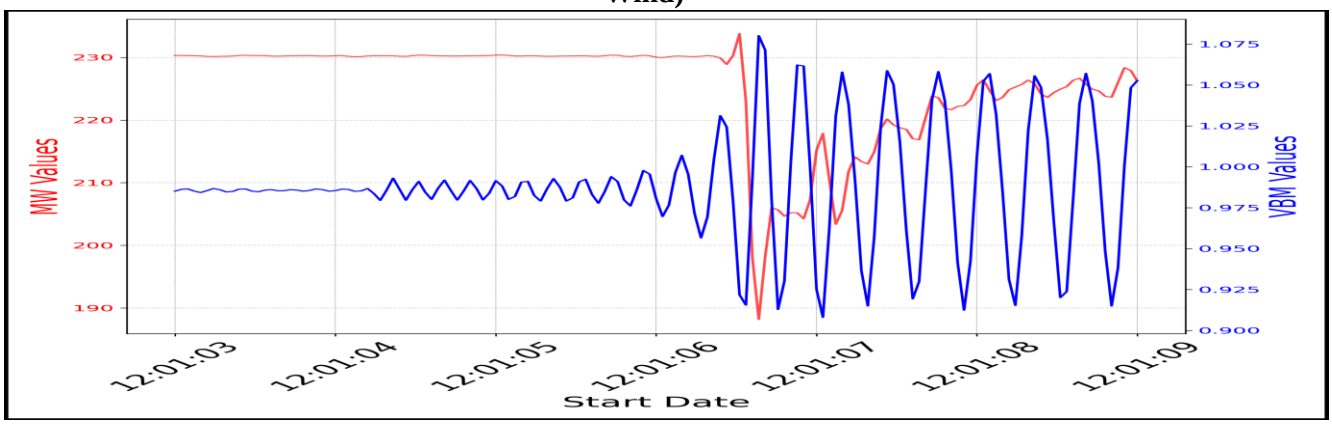
~~Annexure-I~~

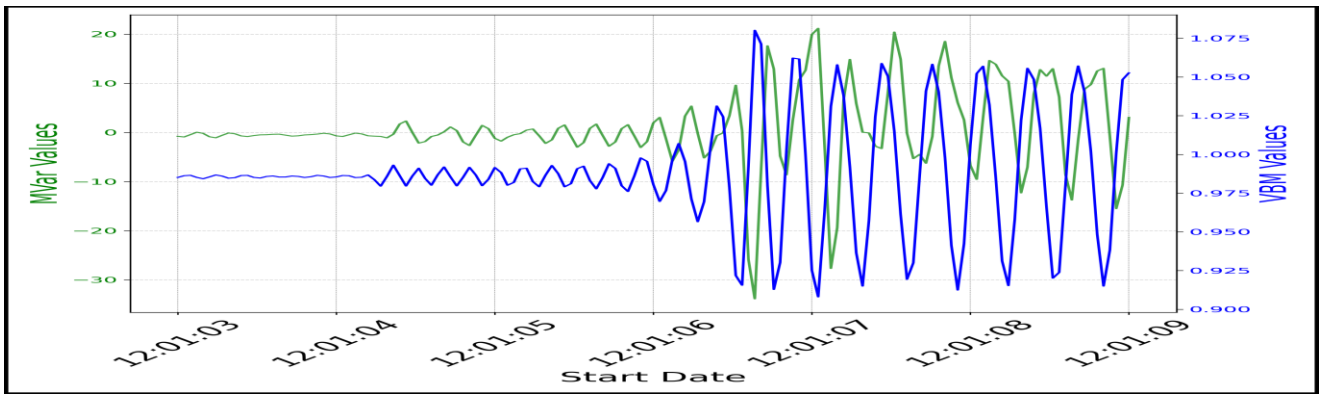
Renew Sun Bright Pvt. Ltd. (300MW)_Fatehgarh-II (PG)





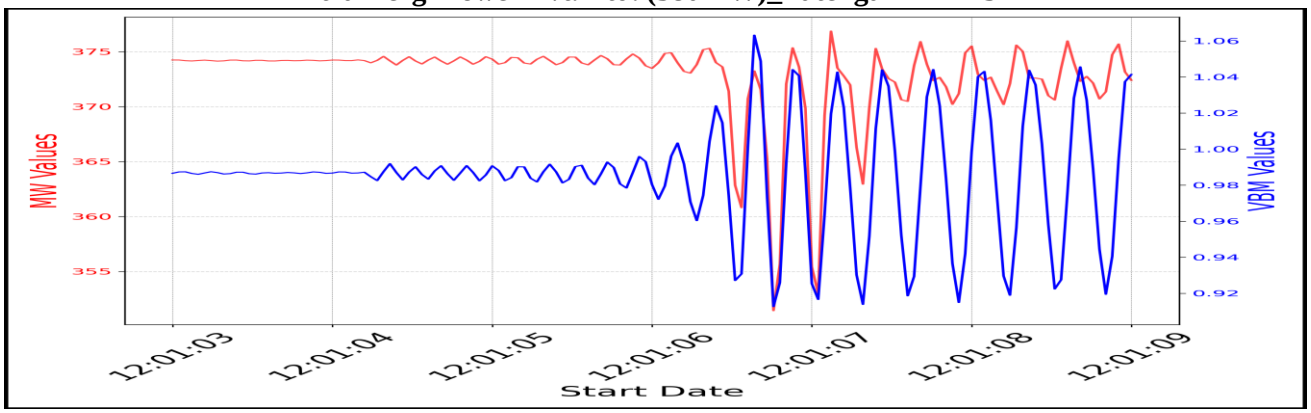
Adani Hybrid Energy Jaisalmer Three Ltd. (300MW)_Fatehgarh-II (PG) (300MW Solar+75MW Wind)

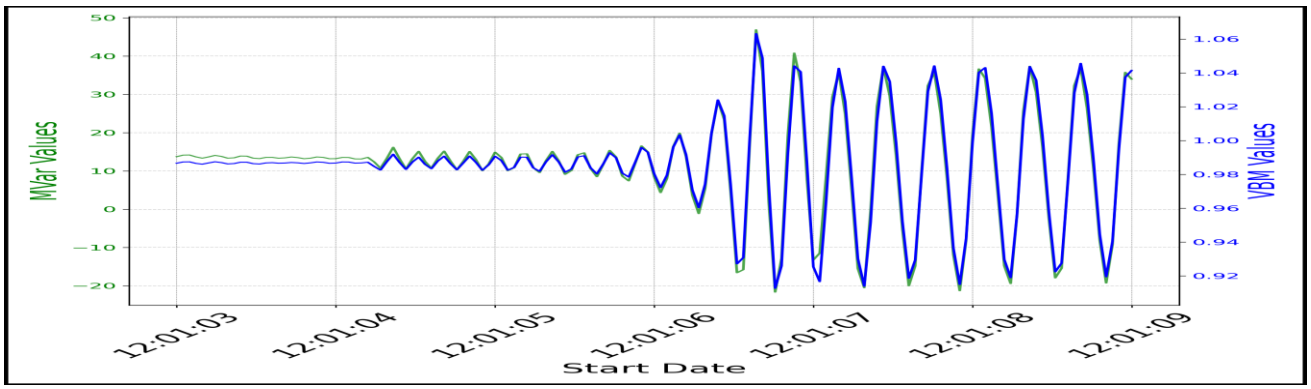




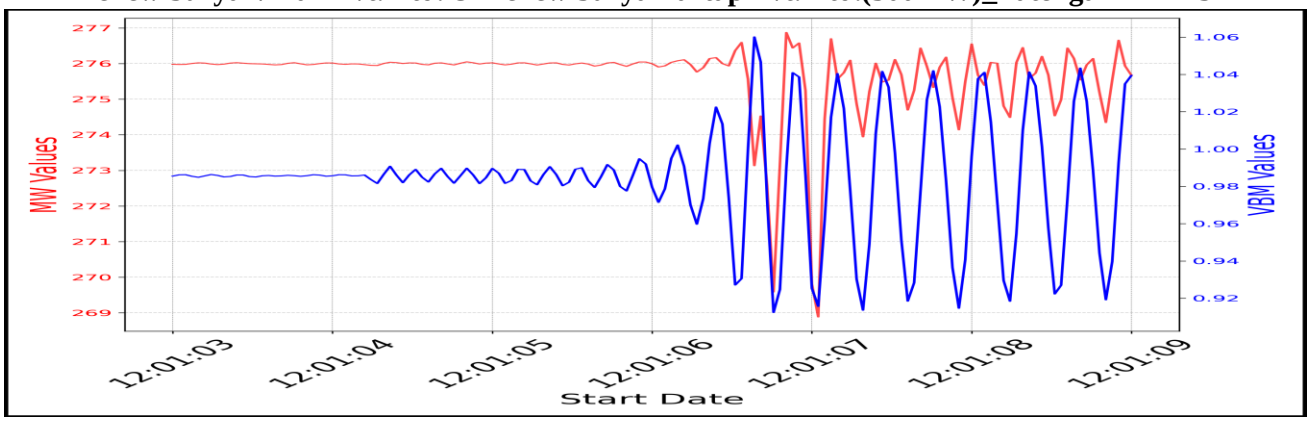
~~Annexure-I~~

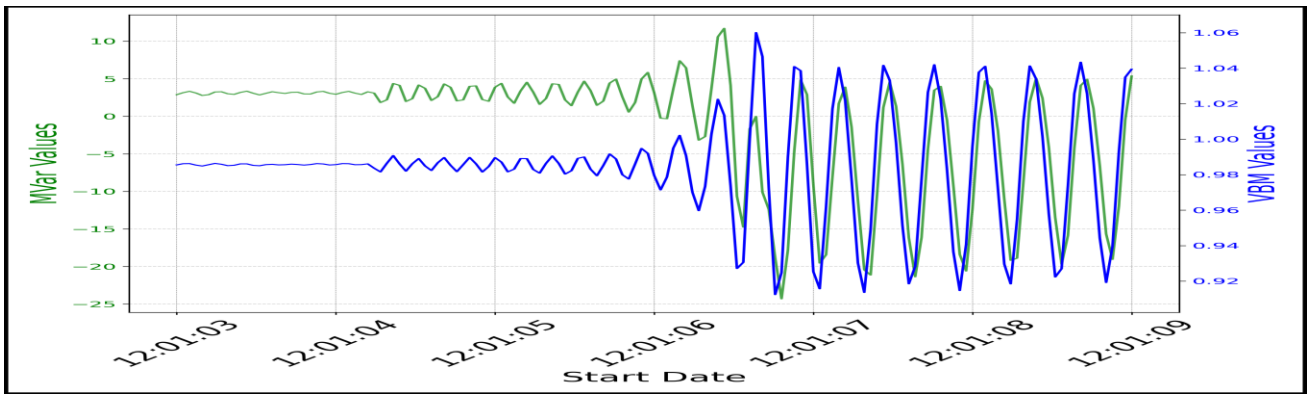
Altra Xergi Power Pvt. Ltd. (380MW)_Fatehgarh-III PS





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





~~Annexure-II~~
Annexure-VI

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 Date (mm/dd/yyyy)	Power quality field test report submitted to NRLDC
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 LIMTED, 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**

~~Annexure-II~~

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**

~~Annexure-III~~
Annexure-VII

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