MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO.LTD.
CIN NO. U40109MH2005SGC153646

Office of The Chief Engineer,
Maharashtra State Load Dispatch Center,
Thane-Belapur Road, P.O. Airoli, Navi Mumbai. Pin – 400 708.
Tele :91-22-27601765 / 1766
Fax :91-22-27601769Email: cesldc@mahasldc.in

RIGHT TO INFORMATION

Ref: MSLDC/TECH/OP/MEGC-2020/ №01036 **Date:** 10 JUN 2022

To,
As per mailing list.

Sub: System restoration procedure in case of Partial grid failure in Intra State Transmission System of Maharashtra in accordance with the provisions of the MEGC, 2020.
Ref: The MERC (State Grid Code) Regulations, 2020.

Dear Sir/Madam,

In reference to above subject, it is to inform you that Hon'ble MERC in the MEGC, 2020 has entrusted responsibilities on various Entities viz. MSLDC, STU, Transmission/Distribution Licensees, Users, etc, for development of various Procedures/Guidelines. Accordingly, as per the Regulation No. 28.2 of the MEGC, 2020, this office has prepared a "System restoration procedure in case of Partial grid failure in Intra State Transmission System of Maharashtra". The said procedure has been prepared in consultation with Operational Coordination Committee (OCC) after seeking comments/suggestions from the various Stake holders in the State. Further, the Core Group of Grid Coordination Committee (GCC) has consented the said procedure for implementation in the State.

In view of above, please find attached herewith the "System restoration procedure in case of Partial grid failure in Intra State Transmission System of Maharashtra". The copy of the same is available on MSLDC Website at

www.mahasldc.in → Regulations, Procedures & Meetings → Procedures → System restoration Procedure in case of Partial grid failure in Intra State Transmission System of Maharashtra

The Procedure shall be effective from the date of this letter. All the Stakeholders are requested to adhere to the provisions of the said procedure.

Submitted for needful please.

Encl: As above.

Yours sincerely

(Jaiee Wagh)
Chief Engineer
SLDC, Airoli

Sub: System restoration procedure in case of Partial grid failure in Intra State Transmission System of Maharashtra in accordance with the provisions of the MEGC, 2020.

Copy s.w.r.s. to:

The Chairman and Managing Director, MSETCL, Prakashganga, Mumbai.

The Director (Operations), MSETCL, Prakashganga, Mumbai.

The Executive Director, MSLDC, Airoli, Navi Mumbai.

The Executive Director (Operations), MSETCL, Prakashganga, Mumbai.

Copy f.w.c. to:

The Chief Engineer (STU), MSETCL, Prakashganga, Mumbai.

Mailing list:

All the Distribution Licensees in the State of Maharashtra

All the Transmission Licensees in the State of Maharashtra

MAHATRANSCO
Maharashtra State Electricity Transmission Co. Ltd.

Procedure for

System Restoration in case of Partial grid failure in Intra State Transmission System of Maharashtra

In accordance with

The Maharashtra Electricity Regulatory Commission

(State Grid Code) Regulations, 2020

Prepared by

Maharashtra State Load Despatch Centre

TABLE OF CONTENTS

PROCEDURE FOR SYSTEM RESTORATION FOR PARTIAL GRID FAILURE IN INTRA STATE TRANSMISSION SYSTEM OF MAHARASHTRA STATE

1. INTRODUCTION:

1.1 This procedure is herein after called " Procedure for System restoration for Partial Grid Failure in InSTS of Maharastra State.

1.2 This procedure has been developed by SLDC in co-ordination with OCC/GCC in compliance of Clause 28.2 and 43.2 of MEGC 2020.

1.3 This procedure shall be reviewed by GCC and shall be provided to all users of InSTS.

1.4 This procedure shall be kept on the websites of SLDC and STU.

1.5 The objective of this procedure is to facilitate restoration and resynchronize of affected constituent systems in the wake of grid disturbance in the shortest possible time taking into consideration all essential requirements like traction loads, industrial loads, generation capability and the operational constraints of transmission system.

2. DEFINITIONS:

2.1 "Grid disturbance" means tripping of one or more power system elements of the grid like a generator, transmission line, transformer, shunt reactor, series capacitor and Static VAR Compensator, resulting in total failure of supply at a sub-station or loss of integrity of the grid, at the level of transmission system at 220 kV and above (110kV and above in case of Mumbai Region)

2.2 "Grid incident" means tripping of one or more power system elements of the grid like a generator, transmission line, transformer, shunt reactor, series capacitor and Static VAR Compensator, which requires re-scheduling of generation or load, without total loss of supply at a sub-station or loss of integrity of the grid at 220 kV and above (110kV and above in case of Mumbai Region).

2.3 "Cold load pick up" phenomenon happens when load is restored after 15 minutes following a disturbance due to thermostat loads. As the cooling is lost (AC & Refrigerators), the

diversity of Thermostat loads is not available and more load would come when a feeder is restored. Further these compressor loads draw starting current equivalent to seven times the full load current when restored.

2.4 FIDVR: - Fault induced Dynamic voltage recovery problems encountered while restoring the induction motor loads following the fault clearance. Due to Thermostat loads (Air conditions & refrigerators etc.), voltage dip again and voltage collapse occurs. This requires shedding of Inductive loads & switching ON of capacitive banks by sensing under voltage.

3. SCOPE:

This procedure is applicable to all generating stations, distribution licensees, STU, SLDC, Transmission licensees & Users in the state of Maharashtra.

4. GRID INCIDENCES AND GRID DISTURBANCES:

As per CEA regulations on Grid standards 2010, the Categorisation of grid incidents and grid disturbance based on severity as follows.

4.1 Categorisation of grid incidents in increasing order of severity, -

Category GI-1 - Tripping of one or more power system elements of the

grid like a generator, transmission line, transformer, shunt

reactor, series capacitor and Static VAR Compensator,

which requires re-scheduling of generation or load,

without total loss of supply at a sub-station or loss of

integrity of the grid at 220 kV (110 kV and above in case of Mumbai Region)

Category GI-2 - Tripping of one or more power system elements of the

grid like a generator, transmission line, transformer, shunt

reactor, series capacitor and Static VAR Compensator,

which requires re-scheduling of generation or load,

without total loss of supply at a sub-station or loss of

integrity of the grid at 400 kV and above.

4.2 Categorisation of grid disturbance in increasing order of severity as follows: -

Category GD-1 - When less than ten per cent. of the antecedent generation or load in a State grid is lost;

Category GD-2 - When ten per cent. to less than twenty percent of the antecedent generation or load in a State grid is lost.

Category GD-3 - When twenty per cent. to less than thirty per cent. of the

antecedent generation or load in a State grid is lost;

Category GD-4 - When thirty per cent. to less than forty per cent. of the antecedent generation or load in a State grid is lost ;

Category GD-5 - When forty per cent. or more of the antecedent generation or load in a State grid is lost.

Disturbance reporting for Mumbai – Shall be reported in case of events described in clause no 5.7 & also in case of splitting of parts of Mumbai/MMR from State grid

Explanation: For the purpose of categorisation of grid disturbances,

percentage loss of generation or load, whichever is higher shall be considered.

5. PROCEDURE AND GUIDELINES:

5.1 Events affecting a generation capacity, or a load of more than 1,000 MW shall immediately be reported in writing to the Commission by the SLDC/Transmission Licensee/User, as the case may be: Provided that the summary including brief detail of the event, extent and probable causes of the event shall be submitted to the Commission within 24 hours from the occurrence of such event.

5.2 The dispatch schedule for generating stations and net drawl schedules (including STOA) for constituents would be suspended on case-to-case basis as decided by SLDC looking into the network and generation affected. As per IEGC clause 6.5.17, scheduled generation of all the Generators and scheduled drawl of all the beneficiaries shall be deemed to have been revised to be equal to their actual generation/drawl for all the time blocks affected by the grid disturbance.

5.3 The Generation schedules and drawl schedules issued/revised by WRLDC shall become effective from designated time block irrespective of communication success to inform all such revisions. The SLDC will be vigilant regarding all revisions and developments in power supply position from time to time

5.4 As per the provision of these Regulations MEGC,2020 or IEGC, in case of any grid disturbance, the scheduled generation of all the generating stations and scheduled drawl of all the beneficiaries shall be deemed to have been revised to be equal to their actual generation/drawl for all the time blocks affected by the grid disturbance. As per MERC State Grid Code Regulations, 2020 53.2.6, duration and certification of such grid disturbance would be declared by WRLDC or SLDC as the case may be (Grid disturbance would be declared within 24 hours by SLDC). A notice to this effect shall be posted at RLDC/SLDC website. The issue of notice at RLDC/SLDC website shall be considered as declaration of disturbance by RLDC/SLDC. All state entities shall take note of the disturbance & take appropriate action at their end. Provided, that, in case of partial backing down or loss of identified Unit due to operation of Special Protection Scheme (SPS), the declared capacity (D.C.) shall be deemed available for the event period as declared by SLDC.

5.5 If only one substation or one InSGS is affected, the schedules would not be suspended but only revised.

5.6 Curtailment shall be done by MSLDC, in case of transmission constraints or congestion in InSTS, when for the reason of transmission constraints e.g., congestion or in the interest of grid security, it becomes necessary to curtail power flow on a transmission corridor, the transactions already scheduled may be curtailed by SLDC after taking all possible measures like increasing embedded generation etc.

The short-term Open Access transactions shall be curtailed first followed by the medium-term Open Access transactions, followed by the long-term Open Access transactions and amongst the consumers of a particular category, curtailment shall be carried out on pro rata basis shall be as per the MERC TOA/DOA Regulations.

5.7 In case of any disturbance causing split of state grid in to parts, Islanding of Mumbai, Islanding of North Mumbai (AEML), Islanding of South Mumbai (TPC & BEST), or collapse of these parts, or collapse of part/s of the rest of state grid, MSLDC shall suspend the DSM Mechanism of the state pool for affected

entities only. In all such events Centralised MoD shall take over Decentralised Scheduling Mechanism. The DSM Mechanism shall be revived again by MSLDC after the normalcy declared by MSLDC.

5.8 In case of generation loss events, MSLDC shall calculate FRC, ACE and document the details for determination of frequency Bias, Determination of frequency Bias requires 150 to 300 generation loss events.

5.9 Pickup of spinning reserve by the generators shall be monitored by MSLDC based on the reports furnished by the generating station as per data logged by generation SCADA. The cross checking of the compliance is verified using the data logged by SCADA of MSLDC and using the PMU Data logged by the PMUs commissioned at the generating stations.

6. SYSTEM REIVAL:

The recovery of the system shall be carried out in line with the document 'Recovery Procedure for "Maharashtra Region'.
The general guidelines and precautions to be followed during system revival are indicated below:

6.1 While building up the system, it would be ensured that the voltage at the charging end remains within limits by taking reactive support from Generators and ensuring all Bus reactors/ line reactors in service.

6.2 Security of the network being built up would be strengthened at the earliest by closing the parallel lines available in the restoration path.

6.3 Priority would be accorded for extending supply to all the loads classified under Super critical category in 'Protocol for Demand curtailment and restoration in MMR and Mumbai region'

6.4 All switching instructions for a particular system have to emanate from a single agency i.e., SLDC/ALDC as the case may be. For synchronization of two systems, MSLDC would be the coordinating agency.

6.5 During revival, only authorized personnel would be present in Control room of substation / power station / SLDC so as to expedite restoration.

6.6 In line with section 5.8(e) of IEGC, all communication channels for restoration process shall be used for operational communication only until the grid normalcy is restored.

6.7 Free Governor Mode of Operation and generators with excitation control would help in proper frequency/voltage control.

6.8 Synchronizing facility available at major grid substations will be used so as to have flexibility in choosing the point of synchronization

6.9 All SLDCs / ISGS/ISTS / RLDC and other users shall make available a copy of the latest 'Recovery Procedures for Western Region' for ready reference to their operating staff in Control room.

6.10 Detailed plans and procedures for restoration post partial/total blackout of each user system within a region shall be developed by the concerned user in coordination with SLDC. The procedure shall be reviewed and revised once every year. Mock trial runs of the procedure for different sub-systems including black-start of generating units along with VSC based HVDC black-start support shall be carried out by the user at least once a year under intimation to the SLDC.

6.11 As per section 5.8(b) of IEGC the DG sets at stations identified for black start shall be tested on weekly basis by the station and test reports shall be sent to SLDC on a quarterly basis. Diesel generator sets or other standalone auxiliary supply source used for black start shall be available at ALDC, Ambazari and control centres of TPCL & AEML and all 400KV/220KV/132/110 KV substations. The healthiness of DG sets or other standalone auxiliary supply source and availability of fuel to be ensured all the time. Measures to be taken to ensure that DG sets are periodically tested.

7. RESTORATION OF LOADS FOLLOWING PARTIAL GRID DISTURBANCE:

7.1 At Certain Sub-Stations (to be identified) where motor load (IM) is significant and few other Sub-Stations have significant thermostat-based load (Refrigeration & Air Conditioning). Restoring such loads may lead to constraints due to cold load pick up phenomenon and FIDVR (Fault Induced Dynamic Voltage Recovery).

7.2 The substation loads from each transformer have to be restored in a slow & well-co-ordinated manner considering load characteristic so as to avoid sudden jump in the load and FIDVR Issues.

7.3 In case of FIDVR, an under-voltage relay would detect the issue of dynamic voltage recovery problem and shed loads. The

voltage should recover to 0.9PU within one second following disturbance. U/V relay shall have to be set accordingly.

7.4 When thermostat loads are restored immediately after a disturbance within 10 to 15 minutes, then load diversity is not available and the compressors of all thermostat loads would pick up simultaneously (starting current is about seven times the full load current). Without the diversity, overloading of the feeders or transformers (if multiple feeders are restored) occurs and leads to further tripping.

7.5 In case of an area isolated from the National Grid and if the isolated area has some embedded generation, the start-up power can be supplied from the grid and while transferring the plant auxiliaries from grid supply to generator supply, care should be taken and usually done through "Fast-Transfer" Synchronisation of generator has to be done using synchronisation facility comprising the synchroscope & synchro check relay.

7.6 In case, plant auxiliaries are fed from a black started generator, first the largest motor to be recovered followed by other larger plant auxiliaries to avoid jerk and voltage dips.

7.7 All synchronising locations should be telemetered and even SPA (Standard Phase angle) across the breakers used for synchronisation should be telemetered using Angle Transducers and synchro phasor data (PMUs).

7.8 Synchronisation of split system can be done using PMU based data to guide the S/s operator from MSLDC.

7.9 While restoring Railway loads on say R-Y phase, some B phase city/Urban load should also be restored to avoid unbalancing and avoid tripping of generators on negative phase sequence currents.

7.10 Restoration of Generators: -

Priority should be given to restore generators to enable hot start of Thermal units, to avoid poisoning out of nuclear reactors and hydro generator (with reservoir/pondage) which can pick up full load in two minute and help in load restoration.

7.11 Nuclear units should be supplied start up power within 30 minutes to avoid poisoning out of reactors.

7.12 Thermal unit's recovery depends upon consideration of hot start, warm start & cold start. Preference to supply start up power to be given to hot start.

8. RESTORATION OF LOAD:

8.1 Distribution Licensees or Users with essential loads shall separately identify nonessential components of such loads, which may be kept off during system contingencies. Distribution Licensees shall draw up an appropriate schedule with corresponding load blocks in each case and assign relative priority in the restoration of essential loads. The non-essential loads shall be put on only when system normalcy is restored, as advised by SLDC.

8.2 Urban loads are divided (Mumbai City) into critical, Non critical, super critical loads and priority was set for these loads and SOP available with system operator of MSLDC.

8.3 All substations, 66kV and above shall have arrangements for survival power through DG sets and station batteries for operation of Relays/CB's/Isolators and for lighting purpose.

8.4 In all Super-Critical loads, there is some portion of non-essential loads for load shedding. The endeavour shall be made by Discom to shed this load in emergency by using latest technology such as Smart Meters, etc.

8.5 All Users shall pay special attention to follow the Recovery Procedures so that secondary collapse due to undue haste or inappropriate loading is avoided. Despite the urgency of the situation, careful, prompt, and complete logging of all operations and operational messages shall be ensured by all the Users to facilitate subsequent investigation into the incident and the efficiency of the restoration process. Such investigation shall be conducted promptly after the incident.

9. REPORTING OF GRID INCIDENCE / GRID DISTURBANCES:

9.1 User or Transmission Licensee, after having initially reported about the event orally to the SLDC, shall provide a written report within two days of the occurrence of the event to the SLDC in accordance with Regulation 46.1.1 of MEGC 2020

9.2 SLDC, after having initially reported about the event orally to the Users/Transmission Licensees, shall provide a written report within two weeks of the occurrence of the event to the concerned Users/Transmission Licensees.

9.3 A written report shall be sent to SLDC or Users/Transmission Licensees, as the case may be, and shall confirm the oral notification together with the following details of the event:

a) Time and date of the event.

b) Location;

c) Plant and/or Equipment directly involved;

d) Description and cause of event; Antecedent conditions;

e) Demand and/or Generation (in MW) interrupted and duration of interruption;

f) All relevant system data including copies of records of all recording Instruments including Disturbance Recorder, Event Logger and Data Acquisition System;

g) Sequence of tripping with time;

h) Details of Relay Flags;

i) Remedial measures;

j) Any other related information.

Provided that SLDC shall develop standard reporting, formats and as agreed by the GCC. Such formats shall be made available on the SLDC website.

9.4 Declaration of System Normalization

System normalization will be declared by MSLDC as follows:

a) All major sub-systems have been synchronized and

b) 100% of Supercritical (P1) & Critical (P2) and a minimum of around 50% of Non-critical (P3) load has been revived and start up power extended to affected ISGS and InSGS stations during the incident.

9.5 Disturbance Recorders

Following are the provisions in various statutes related to disturbance recorders:

• IEGC clause No. 4.6.3

• IEGC clause No. 5.2 (r)

• IEGC clause No. 5.9.6 (c) VI

• CEA grid standards Regulation Clause 15(3) and 15(4)

• CEA Technical standard for connectivity to the grid Regulation clause No. 7.

• CEA technical standard for construction of electrical plants and electrical lines– clause

No. 4(d).

• MEGC 2020 clause 29.15

9.6 As per above statutes the Compliance Requirements are as follows:

a) Disturbance Recorders shall be provided and shall always be kept in working condition by all the users of ISTS, STUs and CTUs.

b) All the Users, and transmission licenses shall furnish Disturbance Recorder /SER Outputs to MSLDC upon request or by exception following disturbance within 24 hrs. No user of transmission licensee shall block any data /information required By SLDC and WRLDC for maintaining reliability and security of the state or regional grid

c) Disturbance Recorders shall be kept in healthy condition so that under no condition important data is lost. The data from DRs is dumped into PC for enabling DRs to capture more events. Analog triggering of DRs shall be enabled for U/F, O/F, U/V & O/V. MSLDC may advise on specific settings.

d) Disturbance Recorders shall be time-synchronized.

These provisions are applicable to:

a) The above Compliance requirement applies to sub-stations of above 100 kV and above and all users connected to the grid at 100 kV and above.

b) All HVDC terminals, back-to-back stations and lines.

c) Generating stations.

9.7 Event Reporting for GD/GI events:

In compliance to Section 5.9.6 of IEGC and sction46 of MEGC 2020 MSLDC will report any GI/GD event to all users of state grid and WRLDC in the form of a flash report after getting first-hand information from the site over phone / email. Subsequently a detailed analysis of the event shall be carried out by MSLDC on receiving relevant data (Disturbance Recorder output/Event Logger output/Sequence of Events (SOE) data/Relay & Window indication etc.) from site and a detailed report be prepared and communicated to all SLDCs/STUs/users/NLDC. The Disturbance Recorder output files shall comprise of .cfg, .dat, .inf,.hdr, .dg4,. rio files. In the event of tripping of Generating units including renewables, relevant data from the DCDS/ Controller logs also shall be provided. The utility in whose system the incident (GI/GD) has occurred shall furnish the requisite information to MSLDC as

specified in section 5.9.6(c) of IEGC / 46.2.3 of MEGC 2020 within 24 hrs. of the occurrence.

Format for written report to be sent to MSLDC is in compliance of section 46.2.3 of MEGC 2020 and details to be provided in the report are given at **Annexure-I (Reporting formats)**

10. GRIEVANCE REDRESSAL:

a. MSLDC shall refer the Complaints regarding unfair practices, delays, discrimination, lack of information, supply of wrong information or any other matters to the Commission for redressal.

b. Any disputes between concerned Generators, Transmission/Distribution Licensees, Control Centres or Users shall be resolved in GCC Forum subject to jurisdiction of the MERC.

c. Pending the decision of the State Commission, the directions of the MSLDC shall be complied by the concerned Generators, Transmission/Distribution Licensees, Control Centres or Users.

11. REMOVAL OF DIFFICULTIES:

In case of any difficulty in implementation of this procedure, MSLDC/STU may approach the GCC through OCC for review or revision of the procedure with requisite details.

12. GENERAL:

a. The concerned Generators, Transmission/Distribution Licensees, Control Centres or Users shall abide by the provisions of the Electricity Act, 2003, the MERC Regulations, Indian Electricity Grid Code and MERC (State Grid Code) Regulation - 2020, and applicable CERC and MERC regulations as amended from time to time.

b. This procedure shall be reviewed once in a year.

Annexure I (Reporting Formats)

FORMAT-1

EVENT – BLACKOUT / PARTIAL SYSTEM BLACKOUT

(To be filled & Submitted by Sub-Station In-charge)

S. No.	Description	Details
1	Classification of the event- Category (GD-1/GD-2/GD-3/GD-4)	
2	Name of the Sub Station	
3	Control Room Contact No.	
4	Date and Time of Event	
5	Antecedent conditions (Load/Generation of Sub-Station, Frequency)	
6	Brief Description and probable cause of Event / Occurrence	
7	Area / Load affected	
8	Weather Conditions prevailing	
9	Sequence of tripping with time in details	
10	Protection Relay indications	
11	Current Status and likely restoration time	
12	Course of action to restore normalcy	
13	Remarks, if any	

Sign of Sub-Station In-charge:

Name of Sub-Station In-charge:

Date:

Time:

FORMAT-2

EVENT – SYSTEM ISLANDING / SYSTEM SPLIT

(To be filled & Submitted by Sub-Station In-charge)

S. No.	Description	Details
1	Classification of the event- Category (GD-1/GD-2/GD-3/GD-4)	
2	Stations involved in event	
3	Contact Nos. of Control Rooms involved.	
4	Date and Time of the Occurrence	
5	Antecedent conditions (Load/Generation of Sub-Station, Frequency)	
6	Brief Description and probable cause of Occurrence	
7	Area / Load affected	
8	Weather Conditions prevailing	
9	Sequence of event - Logs	
10	Protection Relaying Log Status	
11	Current Status and likely time to normalcy	
12	Course of action to restore normalcy	
13	Remarks, if any	

Sign of Sub-Station In-charge:

Name of Sub-Station In-charge:

Date:

Time:

FORMAT-3

EVENT – LOSS OF MAJOR GENERATING UNIT

(To be filled & submitted by Generation Plant In-charge)

S. No.	Description	Details
1	Name of the generating Station	
2	Classification of the event- Category (GI-1/GI-2/GD-1/GD-2/GD-3/GD-4/GD-5)	
3	Installed Capacity of Generating Station (MW) with number of units	
4	Contact Nos. of Control Rooms involved.	
5	Date and Time of Generating unit tripping	
6	Prefault Frequency	
7	Frequency after 15 Sec.	
8	Minimum frequency touched (Data preferably from PMUs nearest to the generating plant	
9	df/dt (preferably PMU data)	
10	Area affected / Load shedding if any	
11	Window & Relay Indications	
12	Details of Number of Generating units tripped / bus fault etc	
13	Antecedent Condition (Pre-fault Generation, Frequency)	
14	Reason of tripping	
15	Brief description of the incident	
16	Details of latest Preventive maintenance & diagnostic tests carried out	
17	Fault indication details along with sequence of event log	
18	Likely time for restoring normalcy	
19	Restoration Details	

20	Remarks, if any	

Sign of Generation Plant In-charge:

Name of Generation Plant In-charge:

Date:

Time:

FORMAT-4

EVENT – SEVERE EQUIPMENT PROBLEM RELATING TO CIRCUIT BREAKER, TRANSFORMER, BUS-BAR OR EHV TRANSMISSION LINE TOWER COLLAPSING

(To be filled & Submitted by In-charge of Sub-Station or Line)

S. No.	Description	Details
1	Name of Substation	
2	Equipment involved	
3	Type and make of Equipment & Date of Comm.	
4	Nature of problem	
5	Details of latest Preventive maintenance & diagnostic tests carried out	
6	History of equipment	
7	Corrective action initiated and likely time of restoration	
8	Details on system impact due to such equipment problem	
9	Relevant data / Logs	
10	Remarks, if any	

Sign of Sub-Station/Line In-charge:

Name of Sub-Station/Line In-charge:

Date:

Time:

FORMAT-5

EVENT – POWER SYSTEM INSTABILITY

(To be filled & submitted by In-Charge of Control Centre or Sub-Station)

S. No.	Description	Details
1	Name of Control Centre / Station Observed the system instability	
2	Time and Date of observation	
3	Nature of system instability	
4	Critical line loadings, Voltage profile, bus angles and oscillation in system observed – brief description	
5	Whether timely intimation given to grid major players (by Control Room) about the system instability	
6	Corrective action initiated /to be initiated to bring back system to normalcy	
7	Likely time of restoration	
8	Remarks, if any	

Sign of Authorized Officer of Control Centre/Sub-Station:

Name of Authorized Officer of Control Centre/Sub-Station:

Date:

Time:

FORMAT-6

EVENT – TRIPPING OF ANY ELEMENT OF THE STATE GRID

(To be filled & Submitted by In-charge of Sub-Station)

S. No.	Description	Details
1	Name of Sub-station	
2	Control Room Contact No	
3	Time & Date of Event	
4	Cause of Occurrence	
5	Weather conditions	
6	Area / Load affected or Gen. loss	
7	Sequence of tripping with time	
8	Type of fault / Phase indication / Fault distance / Fault current	
9	Current status (Whether restored or not)	
10	Further action required	
11	Remarks, if any	

Sign of Sub-Station/Line In-charge:

Name of Sub-Station/Line In-charge:

Date:

Time:

FORMAT-7

SPINNING RESERVE PICK UP BY GENERATORS (as recorded by GEN.SCADA)

(To be filled & submitted by Generation Plant In-charge)

TIME : -

DATA : -

EVENT : -

PART (A)

Sr.No.	Name of Power Station	FGMO Provided / Operated / did not operate	Generation pick up due to FGMO Operation

Note: Please enclose frequency and generation plots upto 5 min. (Preferably one second updates)

PART (B)

Sr.No.	Name of Power Station	Secondary Response provided/Picked up	Generation pick up due to secondary response

Note: Please enclose frequency and generation plots up to 30 min. (Preferably 10 second updates)

Sign of Generation Plant In-charge:

Name of Generation Plant In-charge:

Date:

Time:

FORMAT-8

FORMAT FOR FREQUENCY RESPONSE CHARACTERISTIC (FRC) / AREA CONTROL ERROR (ACE) CALCULATION

Sr.No.	Description	Details
1	Loss of Generation (ΔL)	
2	Initial Frequency (f0)	
3	Minimum Frequency touched (fmin)	
4	Frequency after 15 Sec (f1)	
5	Frequency deviation (f0-f1=Δf)	
6	Drawl from WR P at t=0 & P at t=15 sec; ΔP=P15-P0	
7	Change in generation State Gen at t=0 & State Gen at t=15 sec; ΔG=Gen15-Gen0	
8	FRC=(ΔL-ΔG-ΔP)/Δf Δf = f1-f0	
9	ACE at t=15sec Drawl change (O/D or U/D at 15 sec after incident) = Tact-Tsch = ΔT1; Δf= fsch - f15 B=4% of real time demand ACE=ΔT1+B(fsch-f15), where fsch = 50Hz	