


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

 RIGHT TO INFORMATION	<p>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 :91-22-27601769 Email: ceslde@mahaslde.in</p>
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Ref: MSLDC/TECH/OP/MEGC-2020/

No 0 2 6 6 6

Date: **31 DEC 2021**

To,
As per mailing list.

Sub: Islanding Procedure for the State of Maharashtra in accordance with the provisions of the
MEGC, 2020.

Ref: 1. 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 "Islanding Procedure for the State 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 "Islanding Procedure for the State of Maharashtra". The copy of the same is available on MSLDC Website at

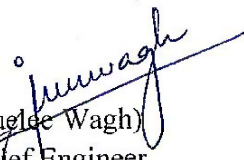
www.mahaslde.in → Regulations, Procedures & Meetings → Procedures → Islanding Procedure

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


(Jyoti Wagh)
Chief Engineer
SLDC, Airoli

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



Islanding Procedure for the State of Maharashtra

In accordance with
The Maharashtra Electricity Regulatory
Commission
(State Grid Code) Regulations, 2020

Prepared by

**Maharashtra State Load Despatch Centre
Airoli**

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ISLANDING PROCEDURE FOR THE STATE OF MAHARASHTRA

1. INTRODUCTION:

- 1.1. This Procedure herein after called “MSLDC Islanding Procedures” is prepared in compliance with Regulation No. 28.2 of the MEGC, 2020.
- 1.2. Islanding is the last resort & emergency action to protect parts of Intra State Grid (InSTS), Generating Stations, Important Urban areas from impending grid collapse.
- 1.3. Islanding schemes are required to be planned at Power stations dispersed across the state to enable fast restoration of Grid by securing vital generation in different parts of the grid in case of major Grid failures.
- 1.4. Islanding schemes are also required to ensure continued power supply and reliability to Metro cities/Urban areas when the grid is subjected to major disturbances. As decided at the national level, a review was taken by the Secretary (P), Govt. of India. Accordingly, Islanding scheme is planned for the city of Nagpur in addition to the existing islanding scheme for Mumbai city (Two islanding schemes for North and South Mumbai).
- 1.5. Following the grid disturbance on 12th Oct 2020, the Mumbai islanding scheme review was done by various committees including High Level Committee (HLC) appointed by Hon’ble MERC. A “Mumbai Islanding Group” has been formed by the Executive Director, MSLDC to fine tune various relay settings such as UFR, RPUF, ROCOF, Quantum of Load shedding during Pre & Post Islanding operation, etc. of existing Mumbai islanding scheme.
- 1.6. While preparing these procedures, various directions given by WRPC in their review meetings on existing islanding schemes and preparation of New islanding schemes have been considered. Further, national level review was taken by secretary (P), Govt. of India on 19th August 2021 and the directions thereof given have been considered.

2. DEFINITIONS:

- 2.1. **“Available Transfer Capability (ATC)”** means the transfer capability of the Inter-control area transmission system available for scheduling commercial transactions (through Long Term Access (LTA), Medium Term Open Access (MTOA) and Short-Term Open Access (STOA)) in a specific direction, considering the network security. Mathematically, ATC is the Total Transfer Capability Less Transmission Reliability Margin.
- 2.2. **“df/dt Relay”** means a relay which operates when the rate of change of system frequency (over time) goes higher than a specified limit and initiates load curtailment.
- 2.3. **“Intra State Generating Station (InSGS)”** means a generating station connected to intra-State Transmission System whose scheduling is to be coordinated by SLDC.
- 2.4. **“Intra State Transmission System” (InSTS)** means any system for conveyance of electricity by transmission lines within the area of the State and includes all transmission lines, sub-stations, and associated equipment of transmission licensees in the State excluding ISTS;
- 2.5. **“Reverse Power Under Frequency (RPUF)”** means a relay which operated when the power flow on any line or equipment is reversed and system frequency falls below a specified limit and the equipment is opened.
- 2.6. **“Start-up power”:** The start-up power is the power required for the unit auxiliaries of power stations for restoration of the generating unit.
The requirement of start-up power by various units is as follows:-
- Thermal Units: 7 to 8% of the unit capacity
 - Nuclear units: 10% of the unit capacity
 - Hydro Units: 0.5 to 1% of the unit capacity
 - Gas Units: 1.5 to 2% of the unit capacity power required for running the Auxiliary.
- 2.7. **“Spinning Reserve”** means the Capacities which are provided by the devices including generating station or units thereof synchronized to the grid and which can be activated on the

direction of the System Operator and effect the change in active power.

2.8. **“Survival power”:** Survival power means the power needed for avoiding the damage to the equipment in case of supply failure. This power may be required by thermal power stations for:

- Turbine emergency oil pump
- Jacking oil pumps
- Barring gear of the turbine
- Lubricating oil pumps
- Compressors for ABCB operation
- Emergency lighting
- Battery chargers of Units, Stations, Communication & Telemetry system.
- Ensuring cooling of nuclear reactor and its auxiliaries.

2.9. **“Total Transfer Capability (TTC)”** means the amount of electric power that can be transferred reliably between two control areas by the InSTS under a given set of operating conditions.

2.10. **“Under Frequency Relay (UFR)”** means a relay which operates when the system frequency falls below a specified limit and initiates load curtailment.

3. SCOPE:

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

4. DESIGN PROTOCOL:

4.1. The islanding schemes required for the State of Maharashtra shall be conceptualised by SLDC and would be discussed in State OCC or any special committee of OCC or any committee nominated by the Executive Director, MSLDC.

Thereafter, the islanding schemes would be placed before GCC, Maharashtra for approval. Post approval from the GCC, the islanding scheme would be put up for discussion and approval before WRPC Protection committee meeting.

The islanding scheme devised as per the above procedure shall be implemented by STU/Generating station/Transmission /Distribution licensees or any agency as approved by WRPC.

- 4.2. The islanding schemes in the state shall be reviewed after every operation or once in two years whichever is earlier.
- 4.3. The Relay settings, Frequency settings, Load Shedding Quantum, etc shall be reviewed based on simulation studies.
- 4.4. Automatic Under frequency Load shedding (AUFLS) scheme comprising of under frequency and ROCOF (df/dt) load shedding shall be implemented in accordance with WRPC directives. The existing approved AUFLS scheme and implemented in the State is enclosed at **ANNEXURE - 1**. The list shall be updated on yearly basis or as and when changes are made.
- 4.5. The required load relief shall be computed considering the Load Factor of LV Feeders (33kV or 22kV or 11kV) as 70% to ensure that required load relief would be available under major disturbances.
- 4.6. The loads in the island shall be categories in different priorities viz.
 - **Super-critical (Priority-1):**
Highest priority load and all attempts to be made to keep it in service. (eg. Hospitals, Airport, Traction, Metro, Refineries, Ports, Important Govt. establishments viz. Mantralaya, Raj Bhavan, etc.)
 - **Critical (Priority-2):**
Sheddable load under extreme conditions. (eg. Govt. Offices, Data Centres, Important Organizations having Essential Services, Telephone Exchanges & hospitals with Generator Back-up, Water Pumping Stations, etc.)
 - **Non-critical (Priority-3):**
Sheddable load (eg. All residential, commercial consumers including malls, theatres, shops, etc.)
- 4.7. All the loads under Priority-3 & Priority-2 shall be wired up in Islanding Scheme. However, loads under Priority-2 shall be curtailed only after exhausting the quantum of loads under Priority-3.
- 4.8. In Priority-1 & Priority-2 categories, non-essential loads shall be available in addition to essential loads, hence, non-essential loads can be identified by installing Smart Meters for

disconnection by the distribution licensee. These measures would act as dynamic spinning reserve during the islanded operation.

- 4.9. To avoid loss of supply to Super-critical loads during islanding operation (Pre & Post), such loads shall have DG back-up. This measure shall be essential in case of failure of the islanding operation.
- 4.10. The Under-frequency load shedding shall comprise of four steps viz. 49.4Hz, 49.2Hz, 49.0Hz & 48.8Hz. While ROCOF load shedding shall be implemented with settings of 49.9Hz, 0.1Hz/sec; 49.9Hz, 0.2Hz/sec; 49.9Hz, 0.4Hz/sec.

In case of major disturbances in Indian grid, AUFLS is the first line of defence. However, in certain major disturbances or in case of splitting of National grid in parts (bypassing of AUFLS monitored by SLDC), System collapse is likely to occur. Hence, the islanding schemes which are subset of Special Protection Scheme (SPS) are set to actuate after the last stage of AUFLS. Since the last stage of AUFLS is at 48.8Hz & considering frequency transient/overshoot, the preparatory load shedding within an island area will be at 48.4 Hz. Further it is prudent to have islanding schemes with settings for disconnection from the grid at 48.0Hz.

- 4.11. After operation of islanding scheme, the islanded part may be subjected to active power imbalance till corrective actions are implemented in islanded part through further automatic under frequency load shedding/generation run back/automatic load restoration.

During the frequency transient, the frequency should not go below the setting of under frequency tripping of generators which may lead to collapse of the island. All actions taken to achieve the active power balance shall be taken based on these considerations.

After formation of the island, reactive power imbalance could also pose a major problem for which under voltage load shedding relays may have to be deployed along with UF relays.

- 4.12. Islanding schemes are planned to protect the part of the Grid (eg. Mumbai islanding scheme) from various power system phenomena. Islanding schemes can also be like Frequency Instability, Transient Instability, TTC/ATC considerations etc. In case of tripping of evacuating lines from Generating station, to

increase the transfer capability margins required to avoid the transient instability, fast run back of generation/tripping of some generators may be required while islanding the generating station (eg. CGPL islanding scheme). Islanding schemes to protect from frequency instability required to operate at 48.4Hz and below. Islanding schemes can also be planned based on TTC/ATC violations where corrective actions are not possible.

- 4.13. The islanding scheme for Nagpur has already been conceptualised by MSLDC. The Nagpur city comprising of around 500-600 MW load can be islanded with the Khaperkheda Power Station (4 x 210MW). With this scheme, two important Metro cities viz. Mumbai & Nagpur, have been taken care of and for additional important cities islanding schemes shall be conceptualized subsequently.

- 4.14. For carrying out fast restoration of Maharashtra grid, more islanding schemes are required at the generating station level.

The Western part of Maharashtra has several Hydel & Gas based power stations viz. Koyna, Uran, Ghatghar, Bhira, Bhivpuri, Khopoli and Trombay 7A, having black-start facilities.

As other parts of the States such as Vidarbha, Marathwada & Khandesh, no any generation plant is having black-start facilities, it is an important requirement to plan islanding schemes. Hence, smaller, generating plant specific islanding schemes need to be formulated in these areas.

- 4.15. In reference to clause no. 4.14, one or two generating units can be islanded with auxiliaries and radial loads to ensure the survival of generating stations to help in faster restoration in smaller islanding area. Some of the islanding schemes based around generating stations can be conceptualized around power stations of Bhusawal, Parli, Paras, Nasik, etc.
- 4.16. While selecting one unit in a generating station for island, one unit can be selected dynamically (to account for planned/forced/Partial outages). Typically, the dynamic selection of unit can also be based on the unit with best process parameters (Temperature, Pressure, availability of adjacent coal mills etc.)
- 4.17. The power stations selected for devising islanding schemes shall have HP/LP bypass in operation (tested), adequate radial load, DG set/battery back up to take care of survival power.

- 4.18. The successfully islanded power station would give priority to restore other units within power station and to extend start up power to the neighbouring power stations. The Resynchronization to the grid shall be preferably at generating station or at predefined synchronising location with Synchroscope/Synchrocheck facilities/experienced man power.
- 4.19. Tripping of other side breaker should be considered in the logic of Islanding Scheme. Also, locations of Grid Synchronization need to be finalized. The Angular transducers or PMUs or numerical relays having synchro check facility can be provided at both the ends of the Synchronizing breaker. With such scheme, the angular data can be available to Control Centres of concerned utilities & SLDC.
- 4.20. Existing Uran islanding scheme need to be reviewed considering inclusion of Uran generation in Mumbai islanding, frequency settings etc.
- 4.21. For better monitoring, post mortem analysis and control of the island in future from Wide Area Monitoring and Protection Control Centre (WAMPC) or for including adaptive features (Protections, load, locations, etc.) Phasor Measurement Units (PMUs) may be installed and integrated with SLDC synchrophasor system.

5. OPERATIONAL PROTOCOL:

- 5.1. Managing the island and securing the islanded part till it is resynchronised with the grid is a major responsibility of SLDC. This responsibility is to be fulfilled by MSLDC in co-ordination with Transmission/Distribution Licensees and other Control Centres in the State.

Additional Engineers need to be deployed for each Island during restoration of the grid who will monitor various Island Parameters. These engineers shall be responsible for ensuring restoration of loads in small steps along with monitoring of frequency changes (Dynamic monitoring of Stiffness-MW/Hz) and voltage fluctuations (Dynamic monitoring of fault levels), Re-Synchronization with the grid/other islands, etc.

- 5.2. In case of bypassing of islanding scheme by generating station or Transmission Licensee for the purpose of maintenance/testing/protection audit prior permission of MSLDC shall be mandatory.

- 5.3. It is the responsibility of generating station/distribution licensee/Transmission licensee to ensure proper communication with MSLDC during islanded operation. The telemetered data from the island should be available at MSLDC during islanded operation.
- 5.4. One nodal officer from each licensee i.e. generating station / Transmission licensee / Distribution Licensee shall be nominated and details should be intimated to SLDC. In case of changes in the details of Nodal Office, the same shall be communicated to MSLDC immediately.
- 5.5. It shall be the responsibility of Distribution & Transmission Licensees to maintain the list of Sub-Station-wise Priority-wise Loads for each island. The said list shall be updated on half yearly basis and to be submitted to MSLDC for review.
- 5.6. MSLDC shall circulate the consolidated list of Priority-wise loads among all the Stakeholders.
- 5.7. It shall be the responsibility of the Generating Station/Transmission Licensee to maintain the healthiness of synchronising scheme, which shall be checked on half yearly basis & the report shall be submitted to MSLDC.

6. MECHANISM FOR MONITORING COMPLIANCE:

- 6.1. **The event of breach or default of the procedure i.e. in complying with the following provisions:**
 - 6.1.1. Non-submission of Sub-Station-wise, Feeder-wise Priority-wise list of Loads in the Island.
 - 6.1.2. Non-nomination and non-updating details of the Nodal Officers for communication in the matters of Islanding Operation.
 - 6.1.3. Bypassing any relays, schemes, LTS, Communication links or equipments etc. covered under Islanding Scheme without prior permission from MSLDC.
 - 6.1.4. Diluting features of islanding scheme given under design protocol (Clause no.4) may lead to failure or sub optimal operation of islanding schemes which may lead to failure of last resort of emergency grid management.
 - 6.1.5. Non-compliance of any of the terms/conditions/rules outlined under this procedure.

6.1.6. Non-compliance of any of the directives issued by MSLDC as per the provisions of the MEGC-2020.

6.2. Consequences for event of default:

6.2.1. In case of defaults for above conditions, appropriate action as per Section – 33 (Compliance of Directions) of the Electricity Act, shall be initiated by MSLDC by giving prior notice for a period not less than 15 days and adequate opportunity shall be given to the concerned Generators, Transmission/Distribution Licensees, Control Centres or Users, etc to represent the case before MSLDC.

6.2.2. In case concerned Generators, Transmission/Distribution Licensees, Control Centres or Users fails to address/rectify the breach expressed by MSLDC in the Notice within stipulated time, the MSLDC shall proceed in accordance with the appropriate provisions of the Act, Regulations.

7. GRIEVANCE REDRESSAL:

7.1. 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.

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

7.3. 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.

8. REMOVAL OF DIFFICULTIES:

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

8.2. If any deviations from this procedure are required while designing/Implementations, it will be routed through SLDC to WRPC for further ratification.

9. GENERAL:

9.1. All costs/expenses/charges associated with the implementation of Islanding Schemes shall be borne by the concerned Generators, Transmission/Distribution Licensees, Control Centres or Users.

- 9.2. The concerned Generators, Transmission/Distribution Licensees, Control Centres or Users shall abide by the provisions of the Electricity Act, 2003, Indian Electricity Grid Code and MERC (State Grid Code) Regulation - 2020, and applicable CERC and MERC regulations as amended from time to time.
- 9.3. This procedure aims at prompt and pragmatic implementation of Islanding Schemes considering the Grid security as a main objective. However, some teething problems may still be experienced. The various implications would be known only after practical experience is gained by way of implementing these procedures. In order to resolve the same, this procedure shall be reviewed or revised by the MSLDC with prior approval of GCC.

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