DRAFT OPERATING PROCEDURE

for

MADHYA PRADESH STATE GRID

MADHYA PRADESH POWER TRANSMISSION COMPANY LTD.

STATE LOAD DESPATCH CENTRE, JABALPUR

Phone : (+91-0761) 2970601, 2706800, 2701600,9425806598

Tele/Fax : (+91-0761) 2970119

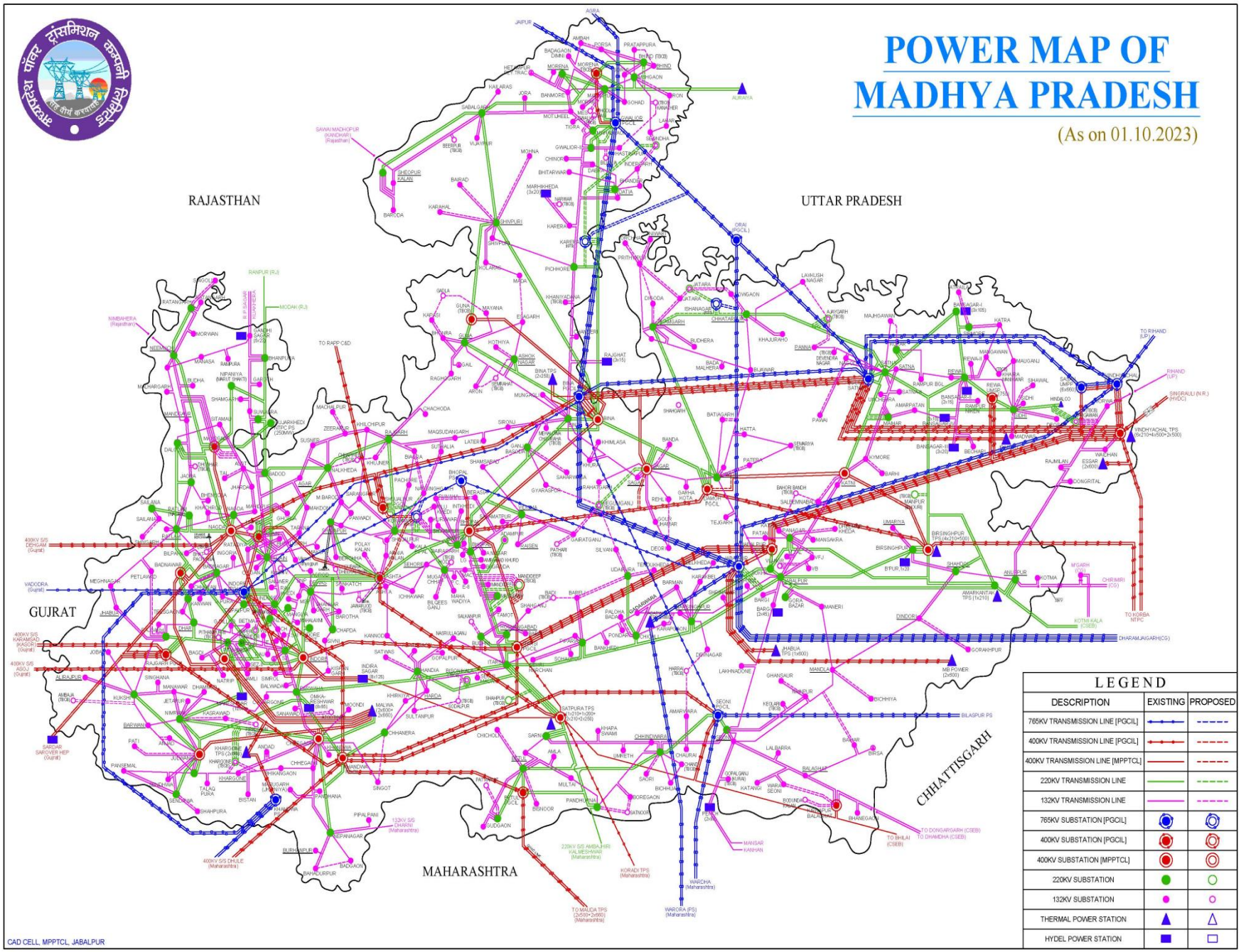
email : sldcmpjbp@gmail.com

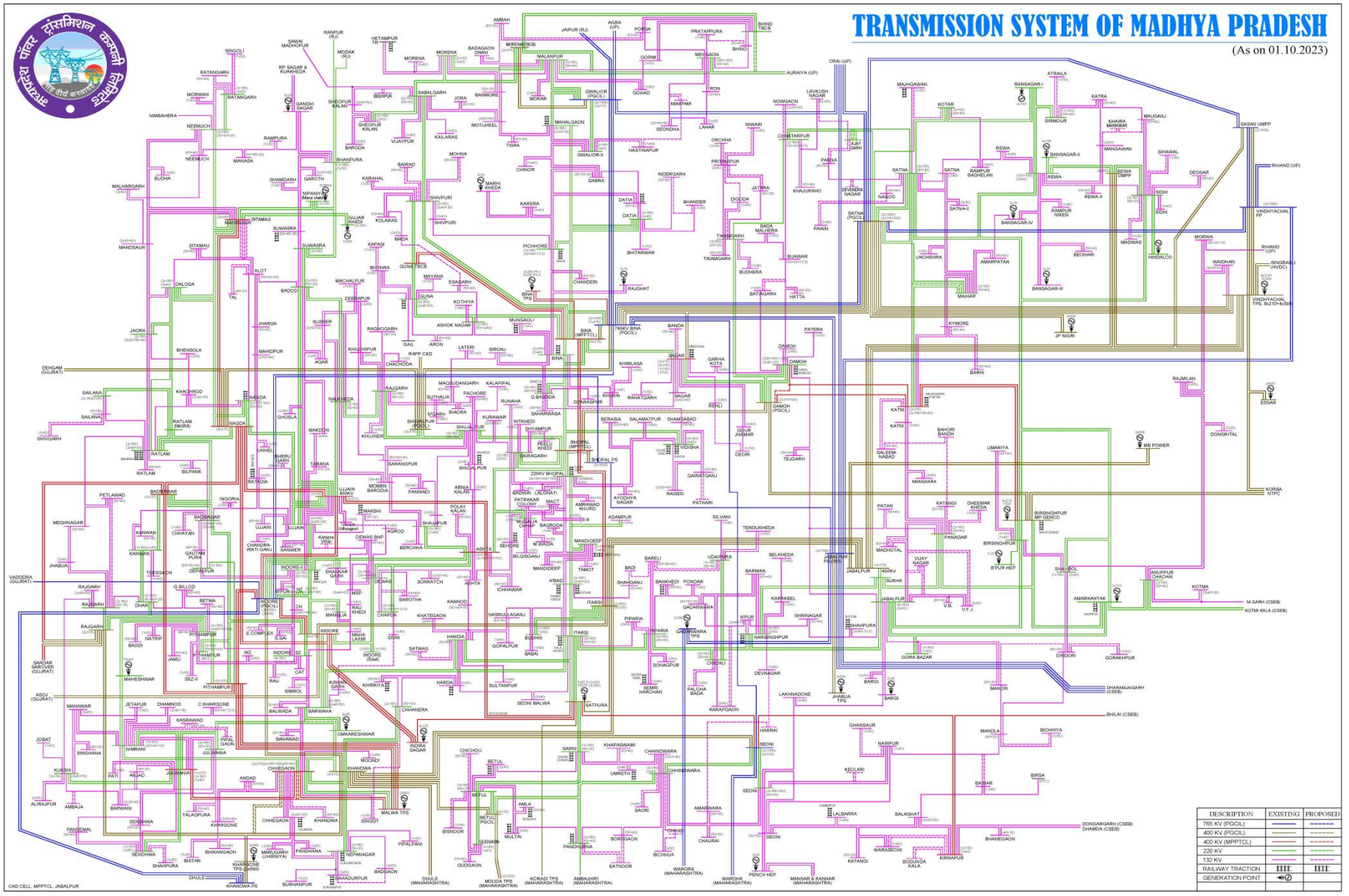
Effective from

Quality Policy

We at the State Load Despatch Centre, Jabalpur of MPPTCL are committed to:

- ***Ensure reliable and integrated power system operation in the state of Madhya Pradesh.***
- ***Ensure operational planning, demand estimation and demand control without unduly discrimination against users.***
- ***Ensure timely preparation and compliance with the schedule.***
- ***Ensure managing voltage and frequency within prescribed limits.***
- ***Exercise supervision and control over the intra state transmission system by real time monitoring and operations for grid control through secure and economic operations of the state grid in accordance with IEGC and MPEGC standards.***
- ***Ensure compliance of all applicable legal and regulatory requirements.***
- ***Achieve the above through continual improvement in effective monitoring of the processes and the Quality Management System.***
- ***The Quality Policy will be reviewed and be made available to the public and all other stake holders.***


POWER MAP OF
MADHYA PRADESH
(As on 01.10.2023)
RAJASTHAN
UTTAR PRADESH
GUJRAT
MAHARASHTRA
CHHATTISGARH
LEGEND
DESCRIPTION
EXISTING
PROPOSED
765KV TRANSMISSION LINE [PGCIL]
400KV TRANSMISSION LINE [PGCIL]
400KV TRANSMISSION LINE [MPPTCL]
220KV TRANSMISSION LINE
132KV TRANSMISSION LINE
765KV SUBSTATION [PGCIL]
400KV SUBSTATION [PGCIL]
400KV SUBSTATION [MPPTCL]
220KV SUBSTATION
132KV SUBSTATION
THERMAL POWER STATION
HYDEL POWER STATION
CAD CELL, MPPTCL, JABALPUR



Draft Operating Procedure of MP

PREFACE

The Indian Electricity Grid Code (IEGC) 2023, regulation 28(5) mandates SLDC to develop and maintain the Operating Procedure in consultation with the regional and state entities for guidance of the staff of SLDC. The Operating Procedure has to be consistent with the IEGC to enable compliance with the requirement of the IEGC.

The document tries to incorporate the required modifications in respect of scheduling of units in RSD, procedure to draw start up power from the Grid by the generating station, modified procedure for transmission line outage, updates in flow gates, FGMO list, Lines open during emergency measures, defense mechanism under AUFR and df/dt and other relevant modifications in DSM, PX and T-GNA in line with the CERC / MPERC regulations / orders, RLDC directions and decisions taken in WRPC meetings.

Disclaimer: Due to elaboration of various clauses and detailing of implementation methodologies, if any ambiguity arises in interpretation of these detailed Operating Procedure, the meaning, intent and purpose of clauses as provided in IEGC/ concerned Regulation, shall prevail.

1 Table of Contents

Chapter 1: General

1.1 Introduction

The Western Regional Power System covers the geographical areas under Madhya Pradesh, Chhattisgarh, Gujarat, Maharashtra, Goa, UT Daman & Diu and UT Dadra & Nagar Haveli. The regional grid operation is being coordinated by the Western Regional Load Despatch Centre in collaboration with the respective State Load Despatch Center The MP System covers the geographical areas under Poorv kshetra vidyut vitran company limited, Madhya kshetra vidyut vitran company limited and Pashchim kshetra vidyut vitran company limited. The state grid operation is being coordinated by the State Regional Load Despatch Centre (SLDC) in collaboration with the MPPMCL which is a holding company of the Discom's in MP.

In exercise of the powers conferred under section 31(1) of Electricity Act-2003 (Central Act-36 of 2003) the State Government has established State Load Despatch Centre (SLDC) at Jabalpur vide order no. 2489/13/04 dated 17.05.2004.

1.2 Provision in Electricity Act 2003 :

Section 31 (2) and 32 (1) of Electricity Act 2003 mandated: -

(a) The State Load Despatch Centre shall not engage in the business of trading in electricity.
(b) The State Load Despatch Centre shall be the apex body to ensure integrated operation of the power system in a State.

1.3 Role / Responsibilities of SLDC :

As per Section 32 (2)(a) of Electricity Act 2003 the role / functions of State Load Despatch Centre are as follows:

The State Load Despatch Centre shall be the apex body to ensure integrated operation of the power system in a State. The State Load Despatch Centre shall -

i. Be responsible for optimum scheduling and despatch of electricity within a State, in accordance with the contracts entered into with the licensees or the generating companies operating in that State.
ii. Monitor grid operations.
iii. Keep accounts of the quantity of electricity transmitted through the State grid.
iv. Exercise supervision and control over the intra-State transmission system.
v. Be responsible for carrying out real time operations for grid control and despatch of electricity within the State through secure and economic operation of the State grid in accordance with the Grid Standards and the State Grid Code.
vi. Ensuring adequate primary, secondary, and tertiary reserves.

vii. Ensuring must-run status of renewable sources of energy contracted by the state.

viii. To maintain the Grid parameters such as Voltages, MVARs, Frequency Deviation etc.

1.4 Powers of SLDC :

1.4.1 Section 33 of Electricity Act 2003 says :-

In accordance with section 33 of the Electricity Act 2003, the State Load Despatch Centre in a State may give such directions and exercise such supervision and control as may be required for ensuring the integrated grid operations and for achieving the maximum economy and efficiency in the operation of power system in that State. Every licensee, generating company, generating station, sub-station and any other person connected with the operation of the power system shall comply with the directions issued by the State Load Despatch Centre under subsection (1) of Section 33 of the Electricity Act, 2003 and the State Load Despatch Centre shall comply with the directions of the Regional Load Despatch Centre.

1.4.2 CERC Regulations,2023 says:-

In case of inter-state bilateral and collective T-GNA transactions having a state utility or an intra-state entity as a buyer or a seller, SLDC shall accord concurrence or no objection or a prior standing clearance, as the case may be, in accordance with the Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2023, amended from time to time.

1.5 Scope

The MP State comprises of 18 generating stations (6-Thermal Power Stations including IPPs and 12-Hydel Power Stations including NHDC) as on 1st February-2024, These are enclosed as Annexure-I(a) & I (b). This document is applicable to all the State Entities of MP. The Operating Procedures are without prejudice to the SLDC power to give directions and exercise supervision and control as stated under Sections 28 and 29 of the Electricity Act, 2003.

1.6 Objective

This document describes operating procedures in order to operate the grid in an integrated manner promoting reliability, efficiency and economy in conformation to the desired security standards of the Hon'ble Central Electricity Regulatory Commission (CERC) and Madhya Pradesh Electricity Regulatory Commission (MPERC).

The objective of this procedure is to compile various provisions in the statute and regulations for guidance of the staff of the SLDC, Discoms and Intra-state entities in the Madhya Pradesh. In case of any ambiguity arising in interpretation of these detaile3d Operating Procedure, the meaning, intent and purpose of clauses as provided in relevant regulation shall prevail.'

1.7 Maintenance of Operating Procedures

The Operating Procedure shall be maintained by MP SLDC and would be reviewed annually or earlier in order to incorporate the significant changes if any taking place in the system.

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2 Chapter 2: Demand Estimation & Control

2.1 Objective

This Chapter describes the procedures / responsibilities of the SLDC for demand estimation for both active and reactive power and also the provision to be made by SLDC to affect a reduction of demand in the event of inadequate generating capacity and / or withdrawal of external assistance in the event of breakdown or operating problems (such as frequency, voltage levels or thermal overloading) on any part of the grid.

2.2 Overview

Demand estimation plays a very important role in grid operation.

As per MPERC (Framework for Resource Adequacy) Regulations, 2023, MPPMCL prepares 1-year Short-term (ST), 5-year Medium-term (MT) and 10-year Long-term (LT) demand forecasts on a rolling basis.

The Long-term demand forecasts (MW and MWh) shall share by MPPMCL to CEA by 31st May and Short -term to SLDC by 21st May of each year for the ensuring year(s).

SLDC shall submit State-level aggregate demand forecasts for Short-term (MW and MWh) to RLDC and NLDC by 31st May of each year for the ensuring year(s).

At Madhya Pradesh, demand assessment is solely done by MPPMCL. SLDC shall carry out demand estimation as part of operational planning after duly factoring in the demand estimation done by MPPMCL.

2.3 Demand Estimation

Demand estimation shall be for both active power and reactive power incidents on the transmission system based on the details collected from distribution licensees, grid-connected distributed generation resources, captive power plants and other bulk consumers embedded within the State.

Demand estimation and control is essentially the responsibility of SLDC (As per Clause 31(2) of IEGC 2023 and WRLDC would generally not have a major role in this area except for integrating the demand value from the constituents and projecting the same as WR demand. WRLDC however, would give instructions to SLDCs and SLDC would give instruction to Discoms on demand control whenever the same has a bearing on the security of the regional grid / State grid and such instructions would have to be complied by all Discoms.

As per Draft MPEGC 2023 (8.4.1), the demand estimation/ load forecast for more than 1 year, shall be done by the DISCOMs/MPPMCL in accordance with the provisions of MPERC framework for resource adequacy 2023 regulation. SLDC/STU shall be provided with a copy of the same as and when it is finalized.

All the State Generating Stations, IPPs and REGs shall provide to the SLDC their generation estimates for the year ahead on month-basis by 30th September of current year. The Generating Stations shall also provide daily generation estimates on weekly basis by First working day of previous week and on monthly basis by Fifth day of previous month.

The 15-minute block wise day-ahead generation estimates shall be provided by Generating Stations to SLDC by 06:00 hrs. of the current day.

The demand estimation by SLDC/MPPMCL shall be done on day ahead basis with time block wise granularity for the daily operation and scheduling. In case SLDC observes a major change in demand in real time for the day, it shall immediately submit the revised demand estimate to the concerned RLDC for demand estimate correction.

2.3.1 Case-1 :Year Ahead, Month Ahead & Week ahead forecasting:

MPPMCL on behalf of Discoms shall provide to the SLDC their estimates of demand for the year ahead on month-basis by 30th September of current year. Discoms shall also provide daily demand on weekly basis by First working day of previous week and on monthly basis by Fifth day of previous month.

2.3.2 Case 2:Day Ahead Forecasting:

The 15 minute block wise day-ahead demand estimates shall be provided by MPPMCL/DISCOMs to SLDC by 07:30 hrs of the current day.

As per Draft MPEGC 2023, 8.4.7, Discoms shall provide to SLDC estimates of load that may be shed when required, in discrete blocks with the details of arrangements of such load shedding.

Discoms shall also furnish realistic category-wise demand for their respective companies along with details of essential loads, supply hours to be maintained in rural areas, details of power cuts imposed or to be imposed and specific requirements, if any.

The demand estimation shall cover active power as well as reactive power requirements forecasted for each sub-station.

SLDC shall also estimate peak and off-peak demand (active as well as reactive power) on a weekly and monthly basis for load - generation balance planning as well as for operational planning analysis, which shall be a part of the operational planning data. The demand estimates mentioned above shall have granularity of a time block. The estimate shall cover the load incident on the grid as well as the net load incident taking into account embedded generation in the form of roof-top solar and other distributed generation.

SLDC shall compute forecasting error for intra-day, day- ahead, weekly, monthly and yearly forecasts and analyze the same in order to reduce forecasting error in the future. The computed forecasting errors shall be made available by SLDC on their website.

SLDC shall estimate and ensure the adequacy of resources, identify generation reserves, demand response capacity and generation flexibility requirements with due regard to the resource adequacy framework and shall

furnish time block-wise information for the following day to the WRLDC who shall validate the adequacy of resources with due regard to the following:

(a) Demand forecast aggregated for the control area;
(b) Renewable energy generation forecast for the control area;
(c) Injection schedule for intra-State entity generating station;
(d) Requisition from generating stations;
(e) Secondary and planned procurement through Tertiary reserve requirement;
(f) Planned procurement of power through other bilateral or collective transactions, if any

As per WRLDC Operating procedure clause 2.2.5, the timeline for submission of demand estimate data by SLDCs shall be as follows:

TIMELINE FOR DEMAND ESTIMATION

Daily demand estimation	10:00 hours of previous day
Weekly demand estimation	First working day of previous week
Monthly demand estimation	Fifth day of previous month
Yearly demand estimation	30th September of the previous year

As per WRLDC Operating procedure clause 2.2.6 SLDC shall compute forecasting error for intra-day, day-ahead, weekly, monthly and yearly forecasts and analyses the same in order to reduce forecasting error in the future. The computed forecasting errors shall be made available by SLDC on their website. Error format is given below:

Yearly forecast Error (Next month of Financial year end):

Month	**MAPE(%)**	**RMSE**
Apr-XX		
.....		

Monthly forecast(Next month(by 10th) for the previous month):

Date	MAPE(%)	RMSE
01-04-XXXX		
.....		

Weekly forecast Error (Next week (Third working day) for the previous week):

Date	MAPE(%)	RMSE
01-04-XXXX		
.....		

Daily/ Intraday Forecast Error

Time Blo	Day ahead forecast	Intraday forecast	Actual	Day ahead error (Actual-Forecast)	Intraday error (Actual-Forecast)
1					
....					
96					

In SLDC MP, the Demand forecasting is being done by MPPMCL on the behalf DISCOM with the help of MP Energy Trading & Risk Management (MPETRM) portal.

2.4 Demand Control and Load Management:

Primarily the need for demand control would arise on account of the following conditions:

i) Variations in demand from the estimated or forecasted values, which cannot be absorbed by the grid,
ii) Unforeseen generation/ transmission outages resulting in reduced power availability,
iii) Heavy reactive power demand causing low voltages.

As per Draft MPEGC, 2023, clause 8.5, SLDC shall match the consolidated demands of the Discoms with consolidated generation availability from SSGS, ISGS, IPP/CPP and other sources and exercise the Demand Control to ensure that there is a balance between the energy availability and the Discoms demand plus losses plus the required reserve.

SLDC would maintain a historical database for the purpose of Demand Estimation and shall be equipped with the state-of-the-art tools such as Energy Management System (EMS) for short-term demand estimation to plan in advance, as to how the load would be met without overdrawing from the grid.

SLDC shall advice STU for planning of Automatic load shedding schemes and rotational load shedding through installation of Under Frequency Relays.

The guidelines for under frequency load shedding and df/dt relays shall be prepared, in accordance with the instructions from WRLDC/WRPC, by the Operation and Co-ordination Committee and shall be approved by the Grid Code Review Committee.

The particulars of feeders or group of feeders at a STU sub-station which shall be tripped under under-frequency load shedding scheme whether manually or automatic on rotational basis or otherwise shall be placed on Notice board and will also available at the sub-station for information of the consumer(s).

Demand control can also be exercised by the SLDC through direct circuit breaker tripping affected from SLDC using RTUs and under frequency detection by SLDC SCADA or through telephonic instructions.

No demand shed by operation of under frequency relays shall be restored without specific directions from SLDC.

Rotational Load Shedding Schemes using Under Frequency Relay (UFR) shall be prepared from time to time by the Utility in accordance with the guidelines/instructions issued by WRLDC/WRPC. The STU shall inform such decisions to MPERC within seven days from the issue of instructions by WRLDC/WRPC.

To maintain the Grid discipline, as per Draft MPEGC, clause 8.6,

(a) All users/distribution licensee shall initiate action to restrict the drawal of its control area from the grid, within the net drawal schedule.
(b) All Users/distribution licensee shall ensure that requisite load shedding is carried out in its control area so that there is no over drawal.
(c) The SLDC through respective Distribution Licensees shall also formulate and implement state-of-the-art demand management schemes for automatic demand management like rotational load shedding, demand response (which may include lower tariff for interruptible loads) etc., to reduce over drawal in order to comply the Grid Code.

As per Draft MPEGC 2023,8.6 (d), in order to maintain the frequency within the stipulated band and maintaining the network security, the interruptible loads shall be arranged in four groups of loads, for scheduled power cuts/load shedding, loads for unscheduled load shedding, loads to be shed through under frequency relays/df/dt relays and loads to be shed under any System Protection Scheme identified at the RPC level. These loads shall be grouped in such a manner, that there is no overlapping between different Groups of

loads. In case of certain contingencies and/or threat to system security, the RLDC may direct SLDC to decrease drawal of its control area by a certain quantum. Such directions shall immediately be acted upon by Users/ Distribution Licensees.

SLDC shall devise standard, instantaneous, message formats in order to give directions in case of contingencies and /or threat to the system security to reduce deviation from the schedule by the Users / Distribution Licensees/ Injecting Utility at different overdrawal/ Under Drawal/ Over-Injection/Under Injection conditions depending upon the severity. The SLDC shall ensure immediate compliance of these directions and violation of SLDC's directions shall intimated to the Commission through monthly report.

All Users/distribution licensee shall comply with direction of SLDC and carry out requisite load shedding or backing down of generation in case of congestion in transmission system to ensure safety and reliability of the system. The procedure for application of measures to relieve congestion in real time as well as provisions of withdrawal of congestion shall be in accordance with Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009 and amendments thereof.

The measures taken by the Users /Distribution licensee shall not be withdrawn as long as the frequency remains at a level lower than the limits or congestion continues, unless specifically permitted by the RLDC/SLDC.

2.5 Load Crash

In the event of load crash in the system due to weather disturbance or any other reasons, the situation would be controlled by SLDC by the following methods:

(i) Backing down of hydel stations for short period immediately
(ii) Lifting of the load restrictions, if any
(iii) Exporting the power to neighboring regions
(iv) Backing down of thermal stations with a time lag of 5-10 minutes for short period
(v) Closing down of hydel units (subject to non-spilling of water and effect on irrigation)
(vi) Backing down of Renewable Energy Power Plants

In case of hydro generation linked with irrigation requirements, the actual backing down or closing down of such hydro units shall be subject to limitations on such account & to avoid spillage of water.

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3 Chapter 3: Operational Planning

3.1 Objective

This Chapter describes the procedures / responsibilities of the SLDC to develop an operational planning strategy to ensure that the shortfalls are managed efficiently through increase in availability by garnering all other resources available and by planning of load shedding on yearly basis and fine tuning every quarterly, month ahead, day-ahead and on the day of operation to account for demand forecasting errors, forced and partial outages of the generating units, transmission constraints etc.

3.2 Overview

The operational planning starts eleven months ahead for Yearly horizon, followed by quarterly, monthly & day ahead basis. To control demand, in case of less availability, it is the first step to increase generation either from Hydel or Thermal units (which are running at lower load than declared capacity). If the demand is still not met, power can be purchased from the Power Exchanges. Power from “PUShP” portal can also be availed. As a last measure, load shedding is practiced.

The day ahead planning includes demand forecasting by the Discoms, scheduling of power from ISGS, GNA as well as purchasing power through T-GNA / Power Exchanges. The demand supply mismatch is mitigated through scheduled load shedding with correction applied through planning unscheduled load shedding.

The unscheduled load shedding accounts for fluctuations in availability due to forced outages, transmission outages, fuel related problems or demand fluctuations due to weather related factors and other important events. The fine tuning of supply demand balance is achieved by availing URS power on the day of operation.

3.3 Operational Planning

3.3.1 Operational Planning on yearly horizon

i. Operational planning starts at Eleven months ahead.

ii. In the monsoon months, due to reduction of demand, most of the thermal units would be taken out for annual overhaul. Generating unit outage planning is done month wise for peak and off-peak conditions and coordinated amongst various stakeholders such that generation availability would not lead to significant load curtailment.

iii. The transmission outage planning is also coordinated with generator outage planning and a coordinated outage plan for both generation and transmission is developed as per IEGC section 32.

iv. The month-wise forecasted demand and availability would indicate the surpluses/deficits in various months utility / state-wise / Discom-wise and

Load Generation Balance Report (LGBR) is compiled for Western region by WRPC and for MP State by SLDC for the period April to March next year for peak and off-peak scenarios.

v. The LGBR as evolved forms the basis of TTC/ATC calculation for inter-regional exchanges in both the directions for advance reservation.

3.3.2 Operational planning on quarterly horizon

i. The operational planning exercise carried out for one year horizon is reviewed quarterly and monthly basis based on the more current information.

ii. The quarter, April-June is having residential and commercial loads due to summer conditions. The hydro reservoirs would be depleted and generation from run of the river hydro plants would be minimal. The forced outages from thermal generation are on the higher side due to high ambient temperature with many thermal units tripping on tube leakages. All efforts would be made to maximize generation availability to minimize the load shedding.

iii. The Second quarter, July-September signifies the monsoon season in which the demand is on the lower side due to absence of agricultural demand and is characterized by high hydro availability with some overflowing reservoirs at the end of the quarter.

iv. Such overflowing hydro is used to the full extent whereas many thermal generating stations are taken out for annual overhaul. During this quarter, the coal-based generation faces some constraints such as wet coal problem, flame failures etc.

v. The quarter, October-February (Second week) is having high demand in the grid due to onset of Rabi season when agricultural demand is predominant with many pump sets operating. This quarter, also being the festival season, commercial and residential demands are also on the higher trajectory. Most of the thermal generating sets would be brought back from planned outage and all efforts would be made to minimize thermal outages.

vi. The quarter, February-March will have high demand similar to that of previous quarter due to continuation of agricultural activities. The industrial demand would also be it its peak as this is the last quarter of the financial year and target needs to be achieved before the end of F.Y.

3.3.3 Operational planning on monthly horizon

The power supply position of the previous month and projections for next two months are discussed in the monthly Operation & Coordination Committee Meeting (OCCM) by all the States and other users to draw up coordinated action plans.

3.3.4 Operational planning on day ahead basis

i. In line with clause 31 of IEGC, under the head of 'Scheduling & Despatch Procedure, plant-wise requisitions from the Discoms are compiled to draw up schedule for each ISGS / SSGS. The day ahead operational planning exercise helps the state with large deficit to opt for un-requisitioned power in some of the ISGS plants within or outside the region.

ii. The state utilities bridge the anticipated shortfall by day-ahead Short-Term Open Access transactions/collective transactions (PX trades).

3.3.5 Day Ahead Balancing

i. The day ahead power balance can be obtained with the help of power procurement, URS and hydel power, in case of deficient power for the Discoms in the State. In case of extreme emergency load shedding may be taken up by the Discoms.

ii. Unscheduled load shedding accounts for fluctuations in availability due to forced outages, transmission outages, fuel related problems, demand fluctuations due to weather related factors and other important events.

3.3.6 Same Day Operational Planning

IEGC regulation 33 (1) mandates that operational studies shall be carried out in intra-day and real time horizon. The online EMS applications and offline simulation tools shall be used for carrying out these studies.

3.4 Load Curtailment Planning

~~3.4.1~~ Unscheduled Load Shedding

i. Unscheduled load shedding is done only during emergency conditions when there is over drawal by the state beyond acceptable level & SLDC is unable to contain drawal despite taking all other measures.

ii. Since unscheduled load shedding is not announced before hand to the public such load shedding gets maximum public resentment and should be avoided by deft planning.

iii. In case of sudden loss of generation / breach of TTC / grid contingency, distress load shedding is carried out immediately to ensure security of the grid.

iv. The distress load shedding is carried out by tripping of identified 33/132/220 KV radial feeders which are opened by emergency call from State Load Despatch Centre.

3.4.2 Automatic Under Frequency Load Shedding (AUFLS)

AUFLS is basically defence mechanism against disturbances and includes both discrete relays and trend relays.

As per draft MPEGC 2023, 6.3.14 All distribution licensees, STUs and bulk consumers shall provide automatic under- frequency relays (UFR) and df/dt relays

for load shedding in their respective systems to arrest frequency decline that could result in grid failure as per the plan given by the WRPC time to time. The default UFR settings shall be as specified in Table below:

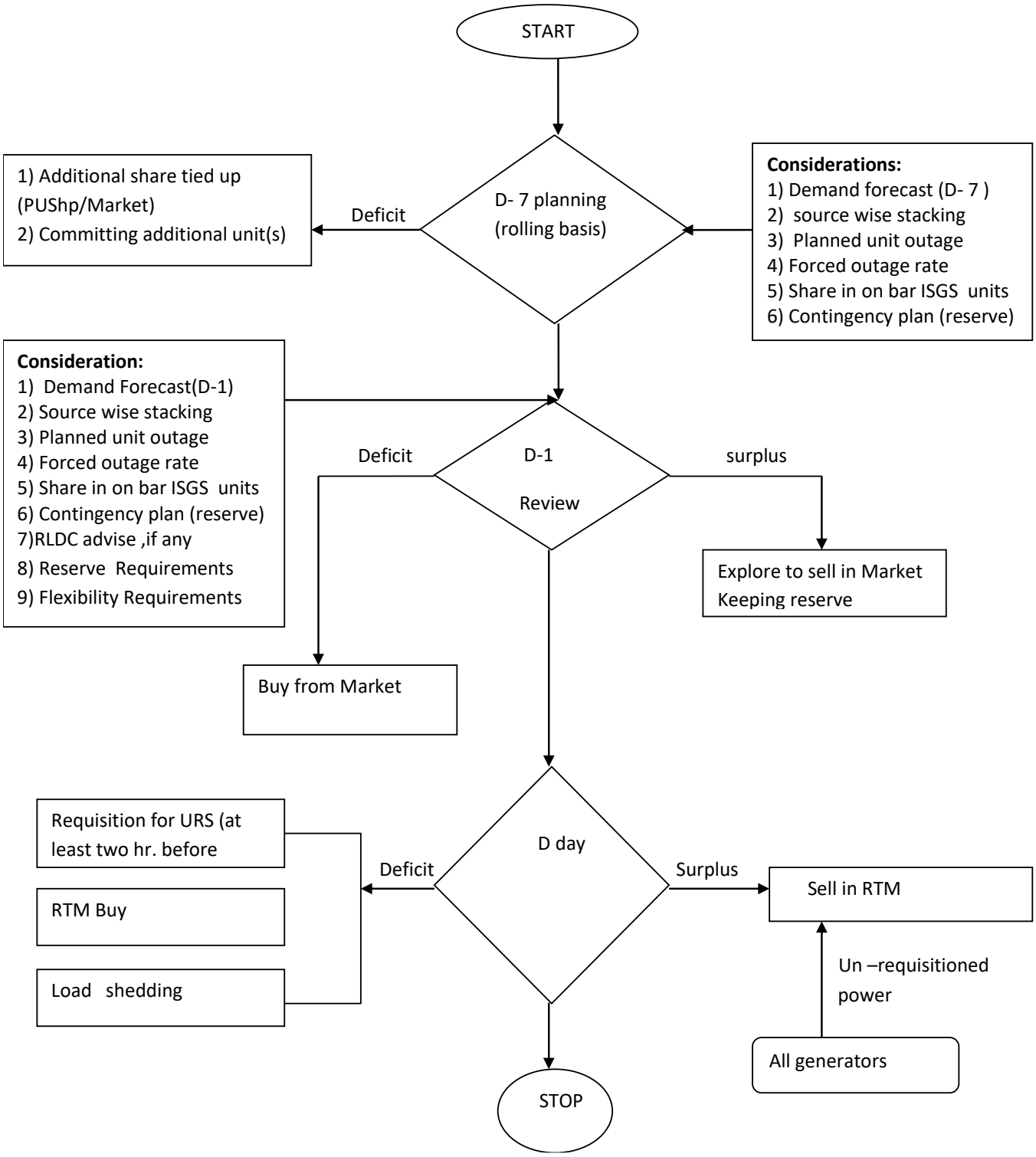
Sr. No.	Stage of UFR Operation	Frequency (Hz)
1.	Stage-1	49.40
2.	Stage-2	49.20
3.	Stage-3	49.00
4.	Stage-4	48.80

3.4.3 Emergency Measures by WRLDC

In case of continuous violation in terms of over-drawal by a constituent WLRDC shall issue alert / warning messages to the constituent to bring its drawal back within the limit as specified in the CERC (Deviation Settlement Mechanism & Related Matters) Regulations-2023. Despite repeated follow up by WRLDC if the constituent fails to comply, WRLDC shall issue instruction for manual opening of identified feeders to compel the constituent to take remedial action to control its over-drawal in view of system reliability.

In some cases WRLDC can allot power from Generators which are costlier and not brought by other constituents.

Flow chart for week–ahead /day ahead operational planning



4 Chapter 4: Network Security

4.1 Introduction

This Chapter highlights the actions required to be undertaken by system operators to keep the network secured at all times against contingencies arising inside MP grid or outside MP grid due to outage of critical corridors in National grid. It also describes the actions required to maintain system parameters close to normal values in day-to-day operation.

4.2 Background

The Indian Power Grid is operating as a single synchronous interconnection of all five regional grids in India as well as Bhutan. Indian Grid is also connected asynchronously to Nepal and Bangladesh. The MP Grid catered Maximum Demand so far 17615 MW (17.60 GW) on 26-Jan-2024 at 11.49 Hrs. The all-India synchronous Grid has already yielded various benefits by taking advantage of diversity of time, surplus / deficit management due to demand forecast errors/ weather variations, increased economic transactions, improvement in overall system security due to increase in stability margin and a stiffness of about 325 MW/Hz in MP. However, synchronization has also resulted in challenges arising from contingencies, some of which may be occurring outside the Western Region. In addition, system reliability has to be ensured even during extreme weather conditions, uneven demand growth, delay in commissioning of generators / transmission elements etc.

4.3 Network Security and Reliability

For safe and secure grid operation, it is imperative that system parameters i.e. frequency, voltage, line loadings etc., remain within IEGC band. The measures to be adopted by the System Operators at State Load Despatch Centers / State Sector Generating Stations (ISGS) / substations for demand, frequency and voltage control are described here.

4.4 Measures to ensure Network Security and Reliability

Compliance to various standards and CERC regulations is essential. In order to maintain the security of the regional power system as well as State power system.

As per the CEA Manual on Transmission Planning Criteria, March,2023 all the system parameters line voltages, loadings, frequency shall be within permissible normal limits even under N-1 or single contingency. The loading limit for a transmission line shall be its thermal loading limit. The loading limit for an inter-connecting transformer (ICT) shall be its name plate rating. Under N-1-1 conditions some equipment may be loaded up to their emergency limits. To bring the system parameters back within their normal limits, load re-scheduling of generation may have to be applied either manually or through automatic system protection schemes (SPS). Such measures shall be applied within one and a half hour (1½) after the disturbance. The emergency thermal rating represents equipment limits that can be tolerated for a relatively short time which may be one hour or two hours.

Operators at substations/ SLDC would endeavor to keep the line/ ICT loadings within operating limits and inform WRLDC / SLDC in case of overloading of any element. Special emphasis would be paid by each system operator in identifying credible system contingencies. All possible efforts shall be made to ensure that the system is secure to withstand the next contingency.

4.5 Switching of Important Elements:

a) As per IEGC clause no- 29(2)(a), No element(s) of the grid shall be isolated from the grid, except:

i) During an emergency as per the Detailed Operating Procedure(s) of WRLDC or SLDC.
ii) Safety of human life.
iii) When serious damage to a critical equipment is imminent and such isolation would prevent it.
iv) When such isolation is specifically instructed by NLDC or RLDC or SLDC, as the case may be. Any such isolation shall be reported to WRLDC or SLDC within the next 15 minutes.

b) SLDC shall obtain 'operation code' from WRLDC before carrying out any switching operation on any of the important elements under WRLDC perspective.

c) While testing of HVDC/SPS and short circuit testing at NHPTL, codes for each and every testing should be exchanged in real time with all concerned control rooms.

d) Concerned utilities shall be informed that the element will be considered as under forced outage from the time of tripping/ breakdown/forced outage due to any other reason till the revival of the element.

e) During planned Shutdown of grid elements when both ends are owned by different licensees, opportunity shutdown code may be issued from WRLDC up to 400 kV level on submission of request from utility with confirmation that work would be completed before the planned work.

f) Whenever any protection system such as Bus Bar protection, LBB protection, Auto reclose etc. at generating station or grid substation is required to be taken out of service for any maintenance work, an operational code shall be issued by SLDC. WRLDC approval is required if it comes under WRLDC important elements category.

g) Emergency switching if any have to be carried out and immediately informed to WRLDC within a reasonable time, of ten minutes. Likewise, tripping of any of these important elements shall also be informed to RLDCs within a reasonable time indicating the likely time of restoration. Before charging, all necessary precaution shall be taken care by substation and in coordination with other end substation. If above mentioned elements are coming under WRLDC important elements, WRLDC should be informed/get approval from WRLDC.

h) Lines opened on high voltage may be charged after 7-10 days to check healthiness of the same.

4.6 Important Grid Elements

Important elements of the Western regional grid, which have a bearing on the network

security, is compiled and issued by WRLDC as a separate document. The regional entities, users, STU, CTU, licensee shall obtain 'operation code' from WRLDC before carrying out any switching operation on any of the important elements of the Regional grid. Shut down of any 400 kV bus at substation needs approval of WRLDC. The same is available on https://wrldc.in/content/364_1_ImportantDocuments.aspx

4.7 **Other Precautions to be taken during Switching**:

In addition to the above, it is necessary that special attention to be paid to maintaining the reliability of the system. The following areas need careful implementation by the concerned constituents / stations:

In case of a two-bus/multi bus system at any substation it must be ensured that the segregation of feeders on the different buses is uniform. This would help in minimizing the number of elements lost in case of a bus fault.

In 765/400 kV substations having a breaker and a half scheme, it must be ensured that the two buses at such substation remain connected at least by two parallel paths so that any line / bus fault does not result in inadvertent multiple outages. In case any element, say a line or an ICT or a bus reactor, is expected to remain out for a period say beyond two hours at such substation, the main & tie breakers of such elements should be closed after opening the line side isolator. This should be done after taking all suitable precautions to avert inadvertent tripping. This of course assumes that no maintenance is planned on such breakers / isolators.

In case when circuit breaker controlling the line is under lockout it is not advisable to interrupt the charging current through an isolator the following practice to be adopted in such cases: -

a) De-energise the bus connecting the line with lockout CB and then open the isolator.

b) If due to some reason it is not possible to open the isolator in above mentioned way, then open the isolator so that no charging current is interrupted through the isolator and the charging current is diverted to other parallel path. Such switching sequence could be possible in case of breaker and half scheme or Double Breaker Scheme, which is as follows:

   i) Open the line from remote end first with direct trip (DT) disabled. With this now line remains charged from the end where CB has problem.
   ii) In case of breaker and half scheme open the isolator so that charging current is diverted to the parallel path and after that open the CB of parallel path.
   iii) In case of double breaker scheme open the isolator of the lockout breaker diverting the charging current to other CB and then open the CB.

   iv) In case of double main and transfer scheme open the isolator of lockout breaker so that divert the charging current through transfer bus coupler and then open the line through TBC circuit breaker.

c) It is also recommended that while vacating a bus in such cases, the operating engineers need to check the switching arrangement for individual feeders so as to avoid unintended loss of any feeder.

d) Single pole auto-reclose facility on 400 kV / 220 kV lines should always be in service. WRLDC/NLDCs approval would be required for taking this facility out of service.

e) All precautions shall be taken to avoid switching on to fault particularly in case of Interconnecting Transformers and generators. In order to avoid fault current through costly equipment generally the line shall be charged from the far end, wherever possible.

f) A transmission line side shall preferably be charged from the grid substation. Dead line charging by a generator shall normally be avoided except during system restoration, black start, or in case where both ends of the transmission line are terminating at a generating station.

g) During test charging of transmission line for the first time, all safety precautions shall be taken and the transmission utility owning/operating the line shall satisfy the substation utility at either ends with regards to statutory/safety clearances. During test charging if the line does not hold even after two attempts, thorough checking of protection settings and line patrolling shall be carried out.

h) Operation code issued by WRLDC/NLDC for switching shall become invalid if the switching is not completed within an hour of issue of code. In case the switching operation is not completed within an hour of the issue of operation code from WRLDC, and if there is a probability of further delay same code could be revalidated by RLDC/NLDCs within that hour.

i) Anti-theft charging of a line shall be facilitated after ensuring proper protection co-ordination.

4.8 Action under Contingencies

WRLDC and SLDC may revise the interchange schedule in case of contingencies or for better system operation as allowed by IEGC,2023 regulations 49 (3). In line with regulation, WRLDC may direct the SLDC / ISGS/other regional / Intra state entities to increase/decrease their drawal / generation in case of contingencies e.g. overloading of lines/transformers, abnormal voltages, threat to system security. Such directions shall immediately be acted upon.

4.9 Declaration of congestion in real-time:

Real time power flow in the corridor shall be monitored for which TTC has been declared shall be uploaded on NLDC website.

I) A corridor shall be considered congested under the following circumstances:

Grid voltage at the important nodes downstream/ upstream of the corridor is beyond the operating range specified in the IEGC and/or

II) The real time power flow along a corridor is such that N-1 or N-1-1 criteria as applicable may not be satisfied.

III) One or more transmission lines in the corridor are loaded beyond the normal limit specified in CEA Manual on Transmission Planning Criteria.

Whenever actual flow on inter/ intra-regional link/ corridor exceeds ATC and security criteria as mentioned above are violated NLDC/WRLDC may issue a warning notice. In case SLDC observes congestion within the intra State grid it shall inform WRLDC which in turn shall inform the NLDC. The notice for congestion shall be communicated to all the Regional entities telephonically / e-mail and through postings on website and making the same available on the common screen at NLDC/ RLDCs/ SLDCs.

If the power flow on the corridor is as per the schedule, but the congestion has been caused by forced outages of a transmission line in the corridor, which occurs after the drawal schedule has been fixed, then open access transactions shall be curtailed in the priority given in the Central Electricity Regulatory Commission (Grant of Connectivity, GNA in inter-State Transmission and related matters) Regulations (as indicated below) followed by revision of TTC, TRM and ATC.

When, flow of electricity on an inter-regional/intra-regional corridor/link used for transfer of electricity cross the ATC of such corridor/link, the NLDC/RLDC shall issue a warning notice to the defaulting entities.

If violation of TTC limits persists for 2 time-blocks not counting the time-block in which warning notice was issued by WRLDC and no affirmative action by the defaulting agency is taken, NLDC/ WRLDC shall issue a notice for application of congestion charge. This notice shall be communicated to all the concerned Regional entities telephonically or through postings on website and making available the same at the common screen at NLDC/ RLDCs/ SLDCs.

4.10 Congestion Management

Congestion Management in a real time system done as per CERC Regulation.

In line with these regulations, WRLDC in coordination with NLDC and other RLDCs shall assess the Total Transfer Capability (TTC). Transmission Reliability Margin (TRM) and availability Transfer Capability (ATC) to facilitate non-discriminatory open access in transmission. The assessed TTC, TRM, ATC shall be posted in WRLDC/NLDC website. ATC= TTC-Reliability Margin.

As per the Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022 and amendments, General Network Access or “GNA” is the nondiscriminatory access to the ISTS granted by the CTU to an Applicant for an estimated maximum injection / drawal for a specified period.

ATC for Advance T- GNA = TTC-RM-GNA

ATC for FCFS T- GNA = TTC–RM-GNA-Approved Advance T- GNA

Schedule Exchange between regions/Intra state Control area have to be maintained within ATC. In case of congestion in Real-Time or in case of violation of security criteria congestion management would be done as per the ‘Detailed Procedure for Relieving Congestion in Real Time Operation’ as approved by the CERC vide order dated 22.04.2013.

The summary of relevant provisions are as below:

Congestion Charge shall be applicable to Regional entities as per the CERC (Measures to relieve congestion in real time operation) Regulations and orders on rate of congestion charge as applicable from time to time.

Congestion charge would be levied for over-drawal or under-injection in the importing control area and under-drawal or over-injection in the exporting control area.

Congestion charges may also become applicable for an intra-regional corridor of one region, if the congestion is attributable to other regional entities of another region. Congestion charge shall be applicable only after two-time blocks from the time of issuing the notice, not counting the time block in which notice is issued.

Congestion charge shall be withdrawn after the power flow on the affected transmission link/ corridor has come down to the ATC and remains at this level for one-time block. NLDC/ RLDC shall communicate to all concerned Regional entities telephonically or through fax message/ e-mail and through postings on website and making available the same on the common screen available at NLDC/ RLDCs/ SLDCs for lifting of congestion charge.

Applicability of Congestion Charge: Congestion charge shall be applicable to Regional Entities as per the CERC (Measures to relieve congestion in real time operation) Regulations and orders on rate of congestion charge as applicable from time to time. Congestion charge shall be levied for over drawal or under- injection in the importing control area and under-drawal or over-injection in the exporting control area.

Rate of congestion charge: The Commission may, from time to time, by order specify the rate of congestion charge applicable to whole or a part of the region.

Notice for application of congestion charge: In case congestion is observed, a warning notice shall be issued by NLDC. If the congestion persists for 2-time blocks not-counting the time-block in which warning notice was issued by RLDC and no affirmative action is taken by the defaulting agency, NLDC/ RLDC (s) shall issue a notice for application of congestion charge.

Notice for withdrawal of congestion charge: When in the opinion of the National / Regional Load Despatch Centre, flow of electricity on the affected- transmission link /corridor has come down to the ATC and remains at this level for one time block, it may, after notice through fax/voice message and through posting on its website and the common screen available on the Energy Management System, withdraw congestion charge from a particular time-block.

The notices received from NLDC shall be mailed to all regional entities and also uploaded on the home page of WRLDC website.

4.11 Operational Areas of Importance

The following areas needs careful implementation by all the concerned / Power System Users:

a. In case of a 2-bus system, at any sub-station, it must be ensured that the segregation of feeders on the different buses is uniform. It would help in

minimizing the effect on the system in case of a bus fault.

b. In 400kV substations having one and half breaker scheme, it must be ensured that the two buses at such substation remain connected at least by two parallel paths so that any line / bus fault does not result in inadvertent multiple outages. In case any element, say a line or an ICT or a bus reactor, is expected to remain out for a prolonged period at such substation, the main and tie breakers of such elements should be closed after opening the line side isolator.

c. The substation operators must ensure the operation even when any lightly loaded line is opened to control high voltage. Such opening of lines is generally superimposed over other line outages on account of faults created by adverse weather conditions resulting in reduced security of the system.

d. Single pole auto reclosure facility on 400 and 220kV lines should always be in service. Operation code shall be taken from SLDC shall be informed before taking this facility out of service, likewise, in case any transfer breaker at any 400kV/220kV substation having two main and transfer bus scheme is engaged, the same would be informed to SLDC.

e. In order to damp out the low frequency oscillations in the system, the power system stabilizers on the generating units above 50 MW capacities shall be tuned by the owner as per a plan prepared by the State Transmission Utility (STU)/ Planning.

f. All constituents would endeavour to operate the connected generation and reactive power management devices such as Capacitors, Reactors, Synchronous Condensers, Fixed Series Capacitors (FSCs), Static VAR Compensators (SVCs), TCSCs etc. in a manner which enables stable voltage behaviour at various points of the grid under different operating conditions.

g. All Discom’s would also ensure healthiness of defence mechanism, SPS, U/F & U/V load shedding, AVRs, Operating reserves, emergency back- up power supplies etc., and ensure that the operational security standards are maintained for reliable and secured operation of the interconnected system.

h. IEGC 2023 mandated FGMO. In MP restricted governor mode of operation (RGMO) is in operation. The details of generators eligible for RGMO status in Madhya Pradesh is given at Annexure-IV.

i. Switching diagrams of all generating stations (100 MW and above) and all substations of 400kV and important 220kV and 132kV substations especially those involved in the evacuation of generation shall be kept at concerned SLDCs, Sub-LDC and GCC to enable to co-ordinate the system operation, outages, system restoration and operational analysis. The same shall be updated from time to time.

j. As per draft MPEGC,2023 Clause 6.3.27, All Generating Units with capacity of

200 MW and above, sub-stations with operating voltage of 400 kV & above and important 220 kV sub-stations with 220/132 kV transformation capacity above 250 MVA shall be provided with the facilities of Disturbance Recorders (DRs) and Event Loggers (ELs). STU shall submit time-bound plan to install DRs wherever it is required as per this Grid Code. All such places shall have a common time reference whose authenticity shall be ensured by periodic verification and validation procedure to be developed and monitored by SLDC.

k. Each Discom's and entities constituent shall provide adequate and reliable communication facility internally and with other Discom's / SLDC / WRLDC to ensure exchange of data / information necessary to maintain reliability and security of the grid. All the agencies shall provide systems to telemeter power system parameters such as power flow, voltage and status of switches/transformer taps etc., in line with interface requirements and other guidelines made available to RLDC / SLDCs at least before the date of commercial operation of the generating stations or substation/line being connected to the ISTS.

l. In line with Central Electricity Authority (Technical Standards for Connectivity to Grid) Regulations 2007, the requester and user shall provide necessary facilities for voice and data communication and transfer of online operational data such as voltage, frequency, line flows and status of breaker and isolator position and other parameters as prescribed by the appropriate Load Despatch Centre and agree to maintain the communication system in good condition.

m. For a high degree of service reliability under normal and emergency operation, at least one main telecommunication channel with an alternate backup channel shall be provided.

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5 Chapter 5: Frequency and Voltage Control

5.1 Introduction

For safe and secure grid operation, it is imperative that system parameters i.e., frequency, voltage, MVAR, Load flows etc., remain close to nominal values.

This section highlights the measures to be adopted by the System Operators at WRLDC / SLDCs / Sub-SLDCs / GENCOs/ TRANSCOs at their stations for frequency and voltage control

5.2 Frequency Control Procedures:

State Transmission System normally operates in synchronism with the Western Region Grid and WRLDC has the overall responsibility of the integrated operation of the Western Regional Power System. The constituents of the Region are required to follow the instructions of WRLDC for the backing down generation, regulating loads, MVAr drawal etc. to meet the objective.

SLDC shall accordingly instruct Generating Units to regulate Generation/Export and hold reserves of active and reactive power within their respective declared parameters. SLDC shall also regulate the load as may be necessary to meet the objective.

As per Central Electricity Regulatory Commission (Ancillary Services) Regulations, 2022

" It is desirable in the interest of grid security that adequate reserves are maintained locally at the State level for each state control area as per the Grid Code or the State Grid Code as the case may be, these regulations aim to provide mechanisms for procurement, through administered as well as market-based mechanisms, deployment and payment of Ancillary Services at the regional and national level for maintaining the grid frequency close to 50 Hz, and restoring the grid frequency within the allowable band as specified in the Grid Code and for relieving congestion in the transmission network, to ensure smooth operation of the power system, and safety and security of the grid."

This procedure is applicable to all the DISCOMs and intra-state entities in Madhya Pradesh.

It is the responsibility of SLDC to ensure that monitoring of system frequency is done on real time basis. SLDC shall make all possible attempts to encourage that all the three DISCOMs adhere to the agreed procedure system frequency can be controlled only if all parties involved fulfill their respective responsibilities to frequency control.

5.3 Frequency Standards

The reference frequency of operation in Indian grid is 50.0 Hz. All utilities shall make all possible efforts to maintain grid frequency within the normal IEGC band that is 49.90 Hz to 50.05 Hz as per IEGC Clause 30(2).

Distribution Control Centre (DCC) of all the three DISCOMs shall make all efforts to keep their drawals as per the drawal schedule given by SLDC a day ahead.

To maintain the system frequency within permissible limit there should be a Automatic under frequency load shedding scheme (AUFLS) connected in all the three DISCOMs. SLDC/WRLDC as decided in operation and coordination committee meeting of WRPC/SLDC time to time.

If the required load relief is not obtained by AUFLS, then manual load shedding has to be implemented as per the unscheduled load shedding plan approved by State Govt / MPERC.

All the DISCOMs should prepare their own schedule load shedding plan to avoid over drawal at low frequency.

5.4 Reserves

As per Ancillary Service Regulations 2022, estimation of Reserves by the Nodal Agency

(1) The Nodal Agency shall, in coordination with RLDCs and SLDCs, estimate the quantum of requirement of SRAS and TRAS at the regional level after factoring in the reserves for each state control area, for such period and based on such methodology as specified in the Grid Code and publish the same on its website: Provided that until specific provisions in this regard are specified in the Grid Code, the Nodal Agency shall propose an interim methodology for estimation of reserves for approval of the Commission, within two months from the date of notification of regulations.

(2) The Nodal Agency shall re-assess the quantum of requirement of SRAS and TRAS on day ahead basis and incremental requirement, if any, on real time basis and update the same on its website.

(3) The requirement of SRAS shall be estimated on regional basis.

As per draft MPEGC 2023 (10.4), There shall be reserves as under:

(a) Primary, Secondary and Tertiary reserves:

i) Primary, Secondary and Tertiary reserves shall be deployed for the purpose of frequency control, reducing area control error and relieving congestion.

ii) Secondary reserves including automatic generation control and demand response shall be deployed by the control area as per these regulations or the Ancillary Services Regulations or the respective regulations on Ancillary Services of the State, as the case may be.

iii) Tertiary reserves shall be deployed by the control area as per the Ancillary Services Regulations or the respective regulations on Ancillary Services of the State, as the case may be.

(b) Black Start reserves:

Generating stations having black start capability, ESS and HVDC Station based on

VSC shall be identified by NLDC and RLDCs in consultation with SLDC(s) at the inter-State level and by SLDC at the State level, to act as black start reserves.

(c) Voltage Control reserves:

Voltage Control reserves shall be deployed for controlling the voltage at a bus or sub-system through reactive power injection or drawal.

The reserves shall be operated as Ancillary Services, namely-

(i) Primary Reserve Ancillary Service (PRAS);

(ii) Secondary Reserve Ancillary Service (SRAS);

(iii)Tertiary Reserve Ancillary Service (TRAS);

(iv)Black Start Ancillary Services; and

(v) Voltage Control Ancillary Services.

The mechanism of procurement and deployment of PRAS shall be as specified in this Grid Code or in the Ancillary Services Regulations, as the case may be.

The mechanism of procurement, deployment and payment of SRAS and TRAS shall be as specified in the Ancillary Services Regulations.

The primary response of the generating units shall be verified by the State Load Despatch Centre (SLDC) during grid events. The concerned generating station shall furnish the requisite data to the SLDC within two days of notification of reportable event by the SLDC/RLDC.

(d) Measures during high frequency conditions

In case the frequency is high (above 50.05Hz) and is in increasing trend then the following actions may be initiated:

i) SLDC shall ascertain from the WRLDC whether the high frequency condition is due to the heavy under- drawal by any entity within the region or by neighboring regions.

ii) SLDC would check the possibility of any backing down of the reservoir based hydro stations within state system.

iii) SLDC would revise the state’s drawal schedule from costly ISGS generation as per merit order by taking adequate support from SCADA.

iv)If any SSGS (other than must run) is generating more than their schedule, advise the SSGS to reduce the over injection and advised for backing down.

v)In case any Discom utility is under drawing, SLDC may advice to maintain the schedule.

vi)If the frequency is still high, and action from under drawing Discom utility is not forthcoming, SLDC shall Suo-motto reduce the generation schedule of SGS with corresponding downward revision of schedule of the concerned Discom utility.

vii)Backing down of the spilling hydro units or the small hydro units for short duration may also be considered if all other options are exhausted.

viii)Under rising frequency conditions, SLDC shall take appropriate action to issue instructions to the generators under control area of SLDC in co-ordination with WRLDC, to arrest the rising frequency and restore frequency within permissible range. SLDC shall also issue instructions to Discoms and Open access users in coordination with WRLDC to lift Load shedding (if exists) in order to take additional load.

(e) Measures during low frequency conditions

All constituents shall carry out day ahead operational planning by balancing availability from all sources and expected demand. Any deficit may be managed through day-ahead T- GNA and (PX) collective transactions. SLDC has to check the availability of “list of radial feeders (pre-identified)” and assess load relief obtainable, when the system frequency is below 49.9 Hz and in the decaying trend.

Based on the schedule, hydro pick up, change in T- GNA schedules and load ramp ups, SLDC & WRLDC shall anticipate possible frequency down trend at the beginning of each hour and initiate advance actions.

Under falling frequency conditions, SLDC shall take appropriate action to issue instructions, in co-ordination with WRLDC to arrest the falling frequency and restore it to be within permissible range. Such instructions may include despatch instruction to the generators under control area of SLDC and/or instruction to Discoms and Open access users to reduce load demand by appropriate manual and/or automatic load shedding.

5.5 Restricted / Free Governor Mode of Operation (RGMO /FGMO)

As per the IEGC 2023, it is mandatory that all thermal generating units of 200 MW and above and all hydro units of 25 MW and above, which are synchronized with the grid, irrespective of their ownership, shall have their governors in operation at all times in accordance with the provisions of FGMO. It is enforcing adequate frequency response from all the control areas to the Indian grid through availability of primary response from all generating stations in the Grid.

The summary of units eligible for RGMO along with their capacity and other details are given at Annexure-IV, as Generators in MP are still adhering to RGMO.

5.6 Voltage Control Procedures:

System voltages at different 400/220/132 KV substations should be maintained within specified security standards of the MP System. As per IEGC guidelines system voltages should be maintained well within +-5% & +-10% of the rated value. Specifically, if lower side voltage at any substation goes down, steps should be started at –5% so as to avoid further lowering down the voltage.

As defined in the IEGC Section 5.2(s), the operating range of the voltages at various voltage levels of the grid is as follows:

NOMINAL kV (rms)	MAXIMUM kV (rms)	MINIMUM kV (rms)
400	420	380
220	245	198
132	145	122

765 lines of PGCIL within MP –GRID is looked after by the WRLDC.

5.7 Guidelines for voltage standards

Under normal system condition it is not desirable to transmit reactive power. It should be locally met i.e. should be generated/ compensated.

Generally, system voltage is also affected both by frequency & reactive power management of the system. High voltage problem in the system occurs during high frequency & low voltage problem occurs during low frequency. Therefore, all possible measures will be taken to regulate system frequency in accordance with frequency control procedures.

The availability / healthiness of generators, SVCs, Synchronous condensers, capacitor banks, tertiary reactors shall be maintained at all the times. Bus reactors/Line reactors should be ensured at all times wherever possible particularly during system contingencies.

Automatic voltage regulators provided in all thermal/hydel units at power stations should be in service to minimize the voltage hunting in the system. Power system stabilizers (PSS) of generating units should be properly tuned for better performance.

5.8 Use of generators for voltage management-

During Rabi-season, reactive power requirement of the system should be shared by the generators by running them at lagging power factor within designed/recommended safe limit for which generating voltages may be increased to the maximum allowed values. During low load demand (Rainy Seasons), leading reactive requirement should be compensated by minimizing the generating voltage & sharing of leading MVARs.

5.9 Voltage management by reactors-

Switching in/out of all 400 KV line reactors/Bus reactors & tertiary reactors of ICTs shall be carried out as per the requirement of system i.e. during rabi season all reactors should be out of service & during rainy season/ low load days all reactors should be in service. During high voltage in the system, wherever possible double circuit lines should be made single.

5.10 Remedial actions by SLDC –

5.10.1 In Case of High Voltage

SLDC should co-ordinate with Generators / STU / DISCOMs to implement following measures where ever applicable.

a) Absorption of maximum leading MVAR on running units of power stations.
b) Switch off capacitor banks/series capacitors in the field substation.
c) Switching on of bus/line reactors where ever possible.
d) Switching out one circuit of lightly loaded D/c line.
e) Switching out feeders where alternate supply is available.

5.10.2 In case of Low Voltage

SLDC should take the following steps to overcome the low voltage problem in the system.

a) Switch out bus/switchable line reactors & tertiary reactors.
b) All the capacitor banks & series capacitors should be taken in to service.
c) All the power stations particularly nearer to the load centers should be asked to share maximum lagging MVAR on the units within permissible limits defined by the capability curve.
d) Run maximum no. of Hydel units in the system because it can run to share maximum MVAR.
e) Restoration of lines under outage

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6 Chapter 6: Outage Planning

6.1 Outage Planning Procedures:

Outage planning of generating units & transmission elements is done by SLDC in consultation with GENCO & TRANSCO and in co-ordination with the DISCOMs & keeping in view the system operating conditions & maintaining load generation balance in the system. Outage planning data has to be sent to WRLDC/NLDC well in advance.

Outage Planning -

1. Annual outage of generating units should be planned by GENCO in a phased manner considering our monthly system demand of DISCOMs for the whole financial year in advance & submit to the SLDC. It may be reviewed during the year on quarterly & monthly basis.

2. Outage planning of units proposed by GENCO are discussed in OCC Meeting with SLDC, STU & DISCOMs for reviewing the outages proposed on quarterly/monthly basis.

3. Outage planning of 400 KV and interstate transmission lines are approved in OCC Meeting of WRPC and outage planning of 220 KV lines of MPPTCL are approved by SLDC.

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7 Chapter 7: First Time Charging and interconnection

(For Intrastate Elements only)

7.1 Modalities for first time energization, integration of new elements:

The modalities for First Time Energization and Integration of new or modified power system elements as approved by Hon'ble CERC shall be referred. This Chapter provides a broad overview for the benefit of the Users. In case of any inconsistency with the contents of this Chapter, the procedure approved by CERC shall prevail.

First time energization and integration of new or modified intrastate power system elements shall be facilitated as per detailed procedure prepared by SLDC.

7.1.1 User Registration

All generating companies, distribution licensees, intra-State transmission licensees, traders, sellers and buyers intending to avail the Grid Access are required to be registered as a "User" with WRLDC as per Regulation-4 of CERC (Fees and Charges of Regional Load Despatch Centre & other related matters) Regulations-2019 after paying registration charges.

7.1.2 Interconnection Studies

As per IEGC 33 (9) SLDC shall undertake a study on the impact of new elements to be commissioned in the intrastate system in the next six (6) months on the TTC & ATC for the state and share the results of the studies with WRLDC.

7.1.3 Data Submission requirements

The User shall submit the necessary technical and modelling data and models of new power system elements six (6) months before the expected date of first energization as per prescribed formats of the First Time Energization and Integration Procedure for carrying out Inter-Connection Studies, as per Clause 10 of IEGC 2023:

On receipt of information regarding expected commissioning of new elements the inter connection studies shall be carried out by SLDC as per procedure of modalities for carrying out inter connection studies for new power system elements.

User shall intimate the SLDC before 10 days of expected first time energization and integration of power system elements by submitting the following documents-

a) Annexure A1: Intimation by User regarding expected first time energization and integration of the power system element(s) along with the list of the desired documents being submitted.

b) Annexure A2: List of elements to be charged and their details.

c) Annexure A3: Single line diagram of the concerned sub stations, along with status of completion of each dia/bus/breakers clearly indicating which elements are proposed to be charged.

d) Annexure A4: List of SCADA points to be made available to SLDC (SLDC would need all MW and MVAr data, voltage and frequency of all the buses, all the breaker and isolator positions, OLTC tap positions, Main-1/Main-2 protection operated signals, DC side SCADA data in case of HVDC station, data for FACTS Devices/ESS/Bulk Consumers as per requirement).

e) Annexure A5: Type and Location of Energy meters as per relevant CEA regulations, as per the Format II.

f) Annexure A6: Connection Agreement, site responsibility schedule wherever applicable along with all annexures.

g)Technical details and modelling data, as applicable.

In case of any changes in the formats submitted at the time of interconnection studies, revised Annexures- A1 – A3 and model data (in respective formats of Procedure of First time Energization and Interconnection of new/modified power system elements) shall be submitted.

Other than the documents mentioned above following additional documents, as applicable needs to be submitted to SLDC-

i. CEA Registration Certificate for generating units.

ii. STU charging instructions. It shall clearly mention about the assumptions and connectivity considered in the studies.

iii. Safety Clearance issued by appropriate government (CEA/State Electrical Inspector) for energization, as per Central Electricity Authority (Measures Relating to Safety & Electric Supply) Regulations, 2023 and amendments thereof.

iv. Power and Telecommunication Coordination Committee (PTCC) clearance certificate for protection against electromagnetic interference.

After submission of above formats and information or documents by the User, SLDC shall verify the documents and seek clarifications, if any. The User shall submit the desired information /documents to the SLDC, at the earliest.

7.1.4 Request for first time energization, integration and Notice for trial run:

The request for first time energization and integration of new power system element(s) and notice towards start of the trial run as per Format III of the Procedure of First Time Energization and Interconnection of new/modified power system elements shall be submitted by the User to the SLDC, not less than seven (7) working days (as per Clause 21 of IEGC 2023) from the proposed date of the trial run. There could be a separate schedule for test charging and the final schedule for trial run, which may be mentioned in the Format-III of Procedure of

First Time Energization and Interconnection of new/modified power system elements. The User shall submit the following documents in this regard:

a) Annexure B1: Request by the User for first time energization and integration and Notice for Fresh/Repeat Trial Run, as per Format -III

b) Annexure B2: Undertaking in respect of Protection systems, as per Format - III A

c) Annexure B3: Undertaking in respect of Telemetry and communication, as per Format-III B

d) Annexure B4: Undertaking in respect of Energy metering, as per Format - IIIC

e) Annexure B5: Undertaking in respect of Statutory clearances, as per Format-III D

f) Annexure B5 (a): Undertaking in respect of Cyber security requirement

The above formats are attached in Annexures List.

7.1.5 Issuance of approval for first time energization and trial run:

On the designated day, the power system element should be energized. Trial run should be conducted as per the proposed timeline mentioned in Format III and as per the approval by SLDC. All attempts would be made by the real time operating personnel at the concerned SLDC to facilitate first time energization and trial run of the new power system element, subject to availability of real time SCADA data and favourable system conditions.

7.1.6 Issuance of approval for first time energization and trial run:

On the designated day, the power system element should be energized. Trial run should be conducted as per the proposed timeline mentioned in Format III and as per the approval by SLDC. All attempts would be made by the real time operating personnel at the concerned SLDC to facilitate first time energization and trial run of the new power system element, subject to availability of real time SCADA data and favourable system conditions.

7.1.7 Submission of information by the User after completion of trial run

Trial run of power system elements shall be performed in compliance with Clauses 21, 22 and 23 of IEGC 2023 and amendments thereof. After completion of trial run, following documents shall be submitted by the User to the concerned SLDC:

a. Annexure C1: Submission of information for completion of trial run and Request for issuance of certificate of successful trial run, as per Format IV of Procedure of First Time Energization and Interconnection of new/modified power system elements.

b. Annexure C2: SCADA values of the active and reactive power flows and related voltages during the trial run period.

c. Annexure C3: Interface Energy meter readings for the trial run period

d. Annexure C4: Outputs of Numerical relay or Disturbance Recorder (DR) and Station Event Logger (EL) during the trial run period, with time synchronized and in the standard format, as per RPC guidelines.

In case any objection by any concerned beneficiary is not received to the SLDC within two (2) working days of completion of trial run, it shall be deemed that there is no objection by any of the concerned beneficiaries, regarding the trial run.

7.1.8 Issuance of certificate of successful trial run:

After submission of the information and documents as per Format-IV of Procedure of First Time Energization and Interconnection of new/modified power system elements, SLDC shall check the submitted data/document and seek clarifications /rectifications, if any.

After submission of the information and documents as per Format-IV or clarifications /rectifications by the User, whichever is later, SLDC shall issue the certificate of successful trial run of the power system element with electrical load.

7.1.9 Jurisdiction for issuance of Certificate of successful Trial Run

SLDC- All power system elements falling under the scope of this procedure other than the elements under RLDC/NLDC jurisdiction, owned by Intrastate transmission licensees and SSGS entities.

7.2 Modalities for Energization of Altered(modified/replaced/upgraded) Elements.

7.2.1 Procedure applicability:

This procedure is applicable for charging/energization of already commissioned power system elements under following cases:

i) Charging/Energization of power system elements after continuous outage for more than 6 months.

ii) Charging/Energization of transmission line/bay after alteration (including modification/ replacement/ upgradation) under Planned/Emergency/Forced outage:

a) Replacement and/or upgradation of substation equipment- CB (Permission of Electrical Inspector Charging Approval is exempted for: CT/PT/CVT/Isolator/LA/ Bushing/Wave trap)

b) Replacement of one phase of a failed Transformer/Reactor with spare unit which is yet to be commissioned (not applicable on already commissioned and live spare units)

c) Replacement of failed 3-ph Transformer/Reactor with new Transformer / Reactor,

iii) Charging/Energization of transmission line after restoration of damaged/collapsed towers at the same location

iv) Restoration and charging/energization of transmission line through Emergency Restoration System

v) Charging/Energization after re-conductoring, re-bundling or similar other alterations involving change in nature of power flow in the line.

vi) Charging / Energization of cold spare of ICT/Reactor.

vii) Charging/Energization of transmission line after upgradation/increase in voltage level or line rearrangements including Loop-In-Loop-Out

viii) Charging/Energization of transmission line after alterations (including diversion/modification/ tower height modification) involving change in course of transmission line.

ix) Anti-theft charging of already commissioned /new transmission line

a) Idle charging (for anti-theft) of a section of new transmission line which is not terminated at both ends

b) Charging/Energization of already commissioned transmission line (complete line length or a section) which is under breakdown/ outage

7.2.2 Application for energization of altered elements:

The application for charging/energization of altered (including modified/replaced/upgraded) Power system elements shall be submitted by user/asset owner to the SLDC, at least three (03) working days prior to the date of charging/energization. The following documents (as applicable) shall be enclosed along with the applications:

a) Annexure B6: Undertaking by the User for energization and integration of transmission line/bay after alteration (including modification/ replacement / upgradation)

b) Annexure B7: Undertaking by the User for Energization and Integration of Transmission Line after Alteration (including Diversion/Modification/Tower height modification /ERS)

c) Annexure B8: Undertaking by the User for Anti-Theft Charging of Transmission Line. The specific requirements for charging/energization of altered (including modified/replaced/ upgraded) power system elements has been tabulated.

7.2.3 Approval by SLDC for energization of altered elements

The user shall submit the documents to SLDC control room in real time. After submission of above documents and statutory clearances, as applicable by the

user/asset owner, SLDC Control Room shall issue code for charging or seek clarifications, if required.

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8 Chapter 8: Defence Mechanisms

8.1 Introduction

Well designed and healthy defence mechanism is a pre-requisite for secure operation of the interconnected system.

8.2 Protection System

In line with the regulation 3(e) of the CEA (Grid Standards) regulation 2010 all regional entities shall provide standard protection systems having reliability, selectivity, speed and sensitivity to isolate the faulty equipment and protect all components from any type of faults, within the specified fault clearance time.

The users shall coordinate protection settings as per the protection protocol developed by the concerned Regional Power Committee in line with IEGC regulation 13 (3). Protection audit of the substations shall be carried out by the respective utilities on a regular basis as advised in Protection coordination committee meetings.

As per 3(e) of CEA (Grid Standard) regulation 2010, the fault clearance time shall be within the time mentioned in table below:

S.No	Nominal System Voltage (kV rms)		Maximum fault clearing time (ms)
1	765	400	100
2	220	132	160

All substations of 220 kV and above shall be equipped with breaker fail protection and bus bar protection schemes. Non-clearance of the fault by a circuit breaker within the time limit mentioned above, the breaker fail protection shall initiate tripping of all other breakers in the concerned bus-section to clear the fault in next 200 milliseconds.

8.3 Under frequency, rate of change of frequency, under voltage based relays

8.3.1 In line with clause 29(12) of IEGC, all distribution licensees, STUs and bulk consumers shall provide automatic under-frequency relays (UFR), df/dt relays for load shedding in their respective systems to arrest frequency decline.

8.3.2 The default UFR settings shall be as per regulation 29 (12) of IEGC-2023.

8.3.3 Under voltage-based load shedding scheme shall be devised to arrest voltage collapse.

8.3.4 As mandated in Regulation 29(12) of IEGC, all Entities shall set their under frequency (UF) Relays, rate of change of frequency Relays and under voltage-based relays in their respective systems, in accordance with the plan made by the Regional Power Committee, to provide adequate load relief for grid security and ensure the operation of these relays at the set frequencies.

8.3.5 Pumped storage hydro plants operating in pumping mode or ESS operating in charging mode shall be automatically disconnected before the first stage of UFR as per the scheme approved by respective WRPC/NRPC.

8.3.6 As per Regulation 29(13), there shall be a uniform spatial spread of feeders selected for UFR and df/dt disconnection and demand disconnection shall not be set with any time delay in addition to the operating time of the relays and circuit breakers.

8.3.7 As per Regulation 29(13)(d), SLDC shall ensure that telemetered data of feeders (MW power flow in real time and circuit breaker status) on which UFR and df/dt relays are installed is available at its control centre. SLDC shall monitor the combined load in MW of these feeders at all times. SLDC shall share the above data with the respective WRLDC in real time and submit a monthly exception report to the respective RPC. A SCADA display as per Format-I in WRLDC_Annexure_VIII shall be made for monitoring the telemetry of feeders with UFR and df/dt relays.

8.3.8 WRLDC shall inform SLDCs as well as the concerned RPC on a quarterly basis, durations during the quarter when the combined load in MW of these feeders was below the level considered while designing the UFR scheme by the RPC (as per Format-II in WRLDC_Annexure_VIII). SLDC shall take corrective measures within a reasonable period and inform to the WRLDC and WRPC, failing which suitable action may be initiated by the WRPC.

8.3.9 As per Regulation 29(13)(f): SLDC shall report the actual operation of UFR and df/dt schemes and load relief to the WRLDC and WRPCs in Format-III in WRLDC_Annexure_VIII and publish the monthly report on its website.

8.3.10 The interruptible loads in a control area shall be arranged in following groups of loads.

i. loads to be shed through (df/dt) relays and UFR

ii. Loads to be shed under any System Protection Scheme identified at the RPC level.

iii. Load to be shed through Under Voltage base load shedding.

8.3.11 These loads shall be grouped in a manner, that there is no overlapping between different groups of loads. This would ensure that the automatic relief through these relays would be available to the system under all conditions.

8.4 System Protection Scheme

8.4.1 System Protection Schemes shall be identified in line with regulation 29 (14) of IEGC 2023. The details of SPS schemes in operation shall be maintained by respective SLDC, RLDC and NLDC as per their respective jurisdiction.

8.4.2 SPS for identified system shall have redundancies in measurement of input signals and communication paths involved up to the last mile to ensure security and dependability. Load flow studies for evaluation of effectiveness of operational SPS shall be carried out as per regulation 16(2) of IEGC 2023.

8.4.3 The performance of SPS shall be assessed as per the protection performance indices specified in these Regulations. In case, the SPS fails to operate, the concerned User shall take corrective actions and submit a report on the corrective actions taken to the WRPC within a fortnight.

8.5 System islanding scheme

Islanding schemes shall be developed, implemented and monitored as per regulation 29 (10) of IEGC-2023. Mock drill shall be carried out as per reg 29 (11) of IEGC-

2023.MP has prepared an islanding scheme of Jabalpur City along with Amarkantak Thermal Power Station and is in implementation stage.

8.6 Reporting of operation of defence schemes

Operation of defence schemes shall be reported immediately by the Users to the SLDC/WRLDC. A detailed report on operation of UFR and df/dt shall be submitted to WRLDC and Regional Power Committee on monthly basis. Report about the operation of SPS and islanding scheme shall be submitted within three days of operation to the WRPC/WRLDC in the format specified by WRPC.

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9 Chapter 9: Scheduling & Despatch Procedures

9.1 Introduction

This procedure has been prepared and issued in accordance with the provisions of MPEGC 2023, Chapter-9, Schedule & Despatch.
The demarcation of responsibilities between various Users and SLDC in Scheduling & Despatch has been described.
The basic idea behind scheduling is to match the supply and demand on a daily basis at least one day in advance.

9.2 Objective

The objective of this Chapter is to deal with the procedures to be adopted for scheduling of ISGS, SSGS, IPPs, Joint Ventures, CPPs, Open Access Customers and REGs in detail and responsibility of SLDC in preparing & issuing daily schedule of despatch / drawal of generators and Discoms. It also provides methodology of issuing real time despatch /drawal instructions and rescheduling, if required to SSGS & Discoms along with the commercial arrangement from deviation from the schedules.

9.3 General Principles of Scheduling

All the Scheduling will be done on 15 minutes time block. For this purpose of scheduling each day starting from 00:00 hrs. to 24:00 hrs. is divided into 96 time blocks each of 15 minutes duration. SLDC shall compile and intimate each DISCOMs the Drawal Schedule and to each SSGS and IPPs the Generation Schedule in advance.

The Users connected exclusively to the intra-State transmission systems shall be under the control area jurisdiction of SLDC for scheduling and despatch of electricity.
The Users connected to both inter-State transmission systems and intra-State transmission systems shall be under the control area jurisdiction of RLDC, if more than or equal to 50% of the quantum of connectivity is with ISTS, and if more than 50% of the quantum of connectivity is with intra-State transmission system, it shall be under the control area jurisdiction of SLDC.

The SSGS and IPPs shall make an advance declaration of ex-power plant MW and MWh capabilities foreseen for the next day, i.e., from 0000 hrs. to 2400 hrs. During fuel shortage condition, in case of thermal stations, they may specify minimum MW, maximum MW, MWh capability and declaration of fuel shortage. The generating stations shall also declare the possible ramping up / ramping down in a block.

The declaration of the generating capability by hydro SSGS and IPPs should include limitation on generation during specific time periods, if any, on account of restriction(s) on water use due to irrigation, drinking water, industrial, environmental considerations etc. The State Load Despatch Centre shall periodically check that the generating station, is not manipulating the declaration of the capacity and energy with the intent of making undue money through DSM.

The SSGS and IPPs shall be required to demonstrate the declared capability of its generating station as and when asked by the State Load Despatch Centre. In the event of the SSGS and IPPs failing to demonstrate the declared capability, the capacity charges due to the generator shall be reduced as a measure of penalty.

Discoms or M. P. Power Management Company Limited on behalf of Discoms (on receipt of requisition from Discoms) will give their requisitions on day ahead and real time basis as per individual Merit Order i.e. in ascending order of the cost of energy (i.e. variable cost) of generating stations excluding hydro, nuclear and REGs.

The net drawal schedule of any DISCOM issued by SLDC would be sum of ex-power plant schedules from different SSGS /IPP and joint sector project, share from ISGS and any bilateral exchange agreed by the DISCOMs with any other agency inside / outside the region and drawal / injection on behalf of Open Access Customers.

The generation schedule of each SSGS shall be sum of the requisitions made by each DISCOM, restricted to their entitlement and subjected to maximum and minimum value criteria or any other technical constraints indicated by SLDC.

Generation Schedules and Drawal Schedules issued/ revised by SLDC shall become effective from designated time block, irrespective of communication success/ failure.

For any revision of Scheduled Generation of GENCO, including post facto deemed revision, there shall be a corresponding revision of Scheduled Drawals of the DISCOMs.

A procedure for recording the communication regarding changes to schedules duly taking into account the time factor shall be evolved by SLDC (voice recorder with time stamping).

Generator to ensure that Declared Capacity during peak should not be less than during off. peak period of the day except tripping / re-synchronization of units due to forced outage.

Forecasting shall be done by wind /solar generators, Hybrid of Wind and Solar Generating Stations and Energy Storage System (ESS) as well as by SLDC.

The SLDC may engage forecasting agency and prepare a schedule for such generating stations. The forecast by the SLDC shall be with the objective of ensuring secure grid operation. The forecast by the wind and solar generator shall be generator centric. The wind and solar generators have the option of accepting the SLDC’s forecast for preparing its schedule or provide the SLDC with a schedule based on its own forecast. Any commercial impact on account of deviation from schedule based on the forecast chosen by the wind and solar generator shall be borne by it in terms of MPERC (Forecasting, Scheduling, Deviation settlement Mechanism and related matters of wind and Solar generating stations) Regulations, 2018 and amendments thereof.

For calculating the net drawal Schedules of DISCOMs, the transmission losses shall be apportioned in proportion to their drawal schedules.

9.4 Responsibilities of State Load Despatch Centre

The State Load Despatch Centre in discharge of its functions under the Act and for stable, smooth and secure operation of the integrated grid, shall be responsible for the following in its control area:

(a) Forecasting demand for its control area for each time block on day-ahead and intra-day basis;

(b) Forecasting of generation from wind /solar generators, Hybrid of Wind and Solar Generating Stations and Energy Storage System (ESS) under its jurisdiction for each time block on day-ahead and intra-day basis:

9.5 Scheduling Process

By 06:00 hrs. everyday each SSGS/IPPs/REGs will intimate SLDC the station wise ex-power plant MW and MWH capabilities foreseen for the next day i.e. between 00:00 hrs. to 24:00 hrs. of the following day, at 15 minute intervals. The Generating Stations shall submit the following information:

(i) Generating Station based on coal and lignite:

(a) Time block-wise On-bar Declared Capacity (MW) for on-bar units.
(b) Time block-wise Off-bar Declared Capacity (MW) for off-bar units.
(c) Time block-wise Ramp up rate (MW/ min) for on-bar capacity.
(d) Time block-wise Ramp down rate (MW/min) for on -bar capacity.
(e) MWh capability for the day.
(f) Minimum turndown level (MW) and in percentage (%) of ex-bus capacity on-bar.

(ii) Generating Station based on hydro energy:

(a) Time block-wise ex-bus declared capacity.
(b) MWh capability for the day.
(c) Ex-bus peaking capability in MW and MWh.
(d) Time block-wise Ramp up rate (MW/min) for on-bar capacity.
(e) Time block-wise Ramp down rate (MW/min) for on-bar capacity.
(f) Unit-wise forbidden zones in MW and percentage (%) of ex-bus installed capacity.
(g) Minimum MW and duration corresponding to requirement of water release for irrigation, drinking water and other considerations.
(h) Unit-wise maximum MW along with probable combination of unit maximum in case adequate water is not available.

(iii) Generating Station based on wind / solar, hybrid of wind & solar and ESS including pumped storage through QCA shall submit aggregate available capacity of the pooled generation and forecast / schedule.

By 07:00 hrs. on D-1 day WRLDC sends MW and MWH entitlement schedule in each 15 minutes block from ISGS stations and other generating stations in accordance with the contracts entered between buyers and sellers of the 'D' day.

On the basis of above information, SLDC will compile Generator-wise availability for ISGS/ other agreements, IPPs, REGs & SSGS and MW and MWH entitlement of each Discom / MPPMCL for the 'D' day at 15 minutes interval and shall intimate to MP Power Management Co. Ltd on behalf of DISCOMs, Railways and SEZ by 07.15hrs on D-1 day.

After receipt of information in regard to the availability from different ISGS, SSGS, IPPs, REGs and other agreements, MPPMCL on the basis of demand forecast submitted by Discoms, will furnish requisition to SLDC in each ISGS, other agreements, IPPs & SSGS stations by 07:30 hrs.

The MPPMCL shall also advise SLDC allocation to each Discom from the total requisition. The Railways and SEZ will also furnish their requisition by 07:30 hrs.

By 07:45 hrs. M. P. Power Management Company Limited, (on behalf of State Discoms), Railways and SEZ shall intimate to State Load Despatch Centre, other GNA and approved TGNA transactions.

By 08:00 hrs. SLDC shall convey the requisition of MP to WRLDC for ISGS, Inter-State IPPs and GNA approved transactions, on D-1 basis.

WRLDC shall convey the generating station-wise drawal schedule of MP by 09:00 hrs. on D-1 day and final drawal schedules for TGNA grantees by 9:45 hrs.

By 12:00 hrs. SLDC shall finalize the generation schedule for generators and Discom-wise drawal schedule.

SLDC will intimate the ex-power plant Generation Schedule to SSGS/IPPs & other State Generators including wind /solar generators, Hybrid of Wind and Solar Generating Stations and Energy Storage System (ESS).

SLDC shall intimate Discom-wise Drawal Schedule to MP Power Management Co. Ltd.
SLDC shall intimate the total drawal schedule to the Railway and SEZ at MP periphery.

Following shall be taken into account while performing scheduling process:

(a) The drawal schedule i.e. the schedule at MP Periphery after apportionment of inter-state transmission Losses. (sum of schedule from SSGS, IPPs, REGs, ISGS and other Generating Stations having agreement with MPPMCL / Discoms) for monitoring of drawal at real time demand in MW.

(b) The above drawal schedule will also contain the net drawal schedule i.e. the schedule at the periphery of DISCOMs after deducting the apportioned estimated inter-state transmission losses and MP transmission losses (sum of schedule from SSGS, IPPs, REGs, ISGS and other Generating Stations having agreement with MPPMCL / Discoms) for DSM computation.

After finalization of schedules for exigencies application and declaration of balance transmission corridors by WRLDC at 14:00 hrs. of D-1 day, the MPPMCL/ Distribution Licensees may inform to SLDC for revision in schedules of Inter State Transactions under any contract within its GNA or for exigency applications or in real time market. The SLDC shall convey the same to WRLDC at the earliest.

The SSGS, Intra-state IPPs and other generators including wind /solar generators, Hybrid of Wind and Solar Generating Stations and Energy Storage System (ESS) may inform the revision, if any, in their DC for D-1 day to SLDC by 21:30 hrs.

The MPPMCL and other Distribution Licensees may inform the modifications to be made in their requisitions in SSGS and Intra-State IPPs by 21:45 hrs.

After receipt of final drawal schedule of Inter State Transactions from WRLDC at 23:35 hrs. of D-1 day and taking into account all the modifications requested by MPPMCL and other Distribution Licensees, SLDC shall issue the final Generation/Drawal Schedule to each SSGS, Intra-state IPPs, MP Power Management Co. Ltd. and other Distribution Licensees by 23:45 hrs.

The Discoms may also give standing instructions to the SLDC such that the SLDC itself may decide the best drawal schedules for the States.

SLDC shall prepare the day ahead generation schedule by keeping in view the following aspects:

(a) Transmission system constraints from time to time.
(b) Hourly load requirements as estimated by SLDC.
(c) Need to provide operating margins and reserves required to be maintained.
(d) Availability of generation from SSSG and ISGS together with any constraint in each case.
(e) Any other, necessary for maintaining the Grid Reliability and Security.

9.6 Rules for revision in schedule in real time operation:

(i) In case of forced outage of a unit, SLDC will revise the schedules on the basis of revised declared capability by the generator. The revised schedule will become effective from 4th time block, counting the time block in which the revision is advised by the generator to be the first one.

(ii) In the event of a situation arising due to bottleneck in evacuation of power due to transmission constraint, SLDC shall revise the schedule which shall become

effective from the time block, counting the time block in which the transmission constraint has been brought to the notice of SLDC as the first one. During the first three time blocks also the schedule shall be deemed to have been revised to be equal to the actual generation by the SSGS and actual drawal by the DISCOMs.

(iii) In case of any grid disturbance, the Scheduled Generation of all the generating stations and Scheduled Drawal of all the DISCOMs shall be deemed to have been revised to be equal to their actual generation/ drawal for all the time blocks affected by grid disturbance. The certificate of grid disturbance and its duration shall be declared by SLDC/RLDC and the same will be binding on all intra-State transmission system users.

(iv) Revision of Declared Capability by SSGS and requisitions by DISCOMs for the remaining period of the day will be permitted with advance notice. Revised schedules / Declared Capability in such cases shall become effective from the 4th time block, counting the time block in which the request for revision has been received in SLDC to be the first one.

(v) To discourage frivolous revisions, SLDC may, at its sole discretion, refuse to accept schedule/capability changes of less than two (2) percent of previous schedule/capability. The schedule of thermal generating stations indicating fuel shortage while intimating the Declared Capacity to the SLDC shall not be revised except in case of forced outage of generating unit.

(vi) If, at any point of time SLDC observes that there is a need for revision of its schedule in the interest of better system operation, it may do so on its own and in such cases, the revised schedule shall become effective from 4th time block, counting the time block in which the revised schedule is issued by SLDC to be the first one.

(vii) If a revision is received from any ISGS stations, RLDC will flash the information in real time basis containing all the relevant information needed to revise the schedule based on which SLDC will parallel process the revision. The implementation time of revision will be same for RLDC and SLDC.

(viii) While availability declaration by SSGS/IPPs/REGs shall have a resolution of one decimal (0.1) MW and one decimal (0.1) MWh, all entitlements, requisitions and schedules shall be rounded off to the nearest two decimals at each control area boundary for each of the transaction, and shall have a resolution of 0.01 MW.

(ix) The schedule by wind, solar generators, hybrid of wind and solar generators and Energy Storage System (ESS) including pump storage may be revised by giving advance notice to the SLDC. Such revisions shall be effective from 4th time block, the first being the time-block in which notice was given. There may be one revision for each time slot of one and half hours starting from 00:00 hours of a particular day subject to maximum of 16 revisions during the day.

9.7 Implemented Schedule

After the operating day is over at 24.00 hours, the Schedule finally implemented during the day (taking into account all before-the-fact changes in Despatch Schedule of Electricity Generating Stations and Drawal Schedule of the other Intra-State Entities) shall be issued by State Load Despatch Centre within three days or on receipt of Western Regional Load Despatch Centre implemented schedule. Further, implemented schedule may be revised by State Load Despatch Centre if Ex-post facto revision in implemented schedule is made by Western Regional Power Committee. These Schedules shall form the basis for commercial accounting. The average Ex-bus capability for each State Area Generating Station and Independent Power Producers shall also be worked out based on all before-the-fact advice to State Load Despatch Centre.

9.8 Scheduling from alternate source of power by a generating station

A generating station may supply power from alternate source in case of (i) Unit Shut Down (USD) or (ii) forced outage of unit(s) or (iii) a generating station other than REGS replacing its scheduled generation by power supplied from REGS irrespective of whether such identified sources are located within or outside the premises of the generating station or at a different location.

The methodology for scheduling of power from alternate sources covered under Unit Shut Down (USD) or forced outage of unit(s) shall be as per the following steps:

(a) The generating station may enter into contract with alternate supplier under bilateral transaction or collective transaction.
(b) In case of bilateral transaction, the generating station shall request SLDC to schedule power from such alternate supplier to its beneficiaries which shall become effective from 4th time blocks.
(c) The power scheduled from alternate supplier shall be reduced from the schedule of the generating station.
(d) In case of alternate supply is arranged through collective transactions, the transacted quantum shall be reduced from the scheduled generation of the generating station.
(e) The generating station shall not be required to pay the transmission charges and losses for such purchase of power to supply to the buyer from alternate sources.

The methodology for scheduling of power from alternate sources for a generating station other than REGS replacing its scheduled generation by power supplied from REGS shall be as per the following steps:

(a) The generating station shall enter into contract with REGS for supply of power from alternate sources.

(b) The generating station shall request SLDC to schedule power from such alternate source to its beneficiaries which shall become effective from 4th time blocks.

(c) The power scheduled from alternate source shall be reduced from the schedule of the generating station.

(d) The generating station shall not be required to pay the transmission charges and losses for such purchase and supply from alternate sources to the buyer.

(e) In case of a generating station whose tariff is determined by the Commission under Section 62 of the Electricity Act 2003, supply of power by such generating station to its buyer from an alternate source, shall be subject to sharing of net savings as specified in the Tariff Regulations.

(f) In case of a generating station other than whose tariff is determined by the Commission under Section 62 of the Electricity Act 2003, supply of power by such generating station to its buyer from an alternate source, shall be in accordance with the contract with the buyer and in the absence of a specific provision in the contract, in terms of mutual consent including on sharing of net savings between the generating station and the buyer.

9.9 Tech. Min. Schedule for operation of Thermal Generating Stations

The technical minimum for operation in respect of a unit or units of a State Sector Generating Station having 100% installed capacity tied up/contracted with M.P. Power Management Co. Ltd./ Discoms of MP through long term PPA and whose tariff is determined by MPERC, shall be 55% of the MCR of the said unit or such other minimum power level as specified in the CEA (Flexible Operation of coal based Thermal Generating Units) Regulations, 2023 and amendments thereof, whichever is lower:

Provided that the Commission may fix through an order a different minimum turndown level of operation in respect of specific unit(s) of a thermal generating station:
Provided further that such generating station on its own option may declare a minimum turndown level below the minimum turndown level specified in this clause:

Provided also that the thermal generating stations whose tariffs are determined under Section 62 or Section 63 of the Act, shall be compensated for part load operation, that is, for generation below the normative level of operation, in terms of the provisions of the contract entered into by such generating stations with the beneficiaries or buyers, or in the absence of such provision in the contract, as per the mechanism to be specified by the Commission through separate regulations or through Order:

Provided also that till the mechanism of part load compensation is notified by the Commission, the mechanism in this regard already in force under the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 shall continue to be in operation.

The generating stations like SSGS which are having 100% installed capacity tied up/contracted with M.P. Power Management Co. Ltd./ Discoms of MP through long term PPA and whose tariff is determined by MPERC may be directed by SLDC to operate its unit(s) at or above the technical minimum but below the normative plant availability factor on account of grid security or due to the fewer schedules given by the beneficiaries.

Where the SSGS having 100% installed capacity tied up/contracted with M.P. Power Management Co. Ltd./ Discoms of MP through long term PPA and whose tariff is determined by the MPERC, is directed by the SLDC to operate below normative plant availability factor but at or above technical minimum; the SSGS may be compensated depending on the average unit loading duly taking into account the forced outages, planned outages, PLF, generation at generator terminal, energy sent out ex-bus, number of start-stop, secondary fuel oil consumption and auxiliary energy consumption, in due consideration of actual and normative operating parameters of station heat rate, auxiliary energy consumption and secondary fuel oil consumption etc. on monthly basis duly supported by relevant data verified by SLDC.

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10 Chapter 10:Procedures for Energy Accounting and Settlement

(INTER-COMPANY ENERGY ACCOUNTING)

10.1 Introduction

This procedure has been prepared and issued in accordance with the provisions of draft Madhya Pradesh Electricity Balancing and Settlement Code, 2023. This procedure shall be read in conjunction with Indian Electricity Grid Code (IEGC) 2023, draft Madhya Pradesh Electricity Grid Code (MPEGC) 2023. As per Section 32(c) of Electricity Act 2003, SLDC has to keep the accounts of energy transmitted through the State Grid. Madhya Pradesh Electricity Regulatory Commission (MPERC) has notified the Madhya Pradesh Electricity Balancing and Settlement Code, 2015, MPERC (Forecasting, Scheduling, Deviation Settlement Mechanism and related matters of Wind and Solar generating stations) Regulations, 2018 and amended which specify that SLDC shall prepare and issue State Energy Account (SEA), State DSM Account (SDSMA) , State Reactive Account (SRA) & RE DSM account respectively to all Intra State Entities.

10.2 Objective

The objective is to define the procedures for preparation of State Energy Account (SEA), State DSM Account (SDSMA) & State Reactive Account (SRA). The procedure also covers the practices that shall be employed for Energy Accounting under Intra State ABT. On the basis of State Energy Account (SEA), capacity charges (fixed charges) and energy charges are payable by the beneficiaries to the generating stations. Deviation charges are payable / receivable by all Intra State Entities based on State DSM Account (SDSMA). Reactive energy charges payable / receivable by beneficiaries based on State Reactive Account.

10.3 Structure of Energy Accounting and Settlement Procedure –

This procedure contains the following sections –

1. Energy Accounting
2. State Energy Account (SEA)
3. Transmission Losses
4. State DSM Account (SDSMA)
5. State Reactive Account (SRA)
6. REG / DSM Account.

10.4 Energy Accounting

Energy accounting including RE is statement of allocation, availability, energy scheduled and active / reactive energy injected and drawn which forms the basis for payment/ receipt among the intra state constituents. It consists of monthly State Energy Accounts and State Deviation & Reactive energy weekly accounts. The energy accounting is done on the basis of Implemented Schedules issued by SLDC to State Sector Generating Stations (SSGS), IPPs, Discoms, Open Access Customers / Generators and Regional Energy Account issued by Western Region Power Committee (WRPC). State Deviation and State Reactive accounts are prepared on the basis of implemented schedules issued by SLDC and actual ABT meter data of the interface points. The scheduling process and meter data collection and processing are as per the Procedure of "Scheduling & Despatch" and "Metering" which are briefly described below –

10.4.1 Scheduling & Despatch under ABT

The basic idea behind the scheduling is to match the supply and demand of energy. Scheduling & Despatch process has been described in detailed under Scheduling and Despatch procedure issued separately. In brief, it includes the following major activities –

Day ahead scheduling – It includes the preparation of requisition to WRLDC for ISGS based on requisition of MPPMCL / Discoms, Injection Schedules of SSGS / RE Generators/CPP and Drawal Schedule of various Distribution Companies and OAC/OAG's on day ahead basis by 08:00 Hrs.

Real Time Revisions – In real time operation, any Discoms / Generating Station can seek revision in Drawal Schedule / Generation Schedule in the event of any contingency.

Implemented Schedule - After completion of the day of operation by 24.00 hrs, the final implemented schedule taking all ex-post facto revisions into account during the day shall be issued by the SLDC within three (3) days or on receipt of Implemented schedule of MP from WRLDC whichever is later.

10.4.2 Energy Metering

For preparation of weekly State DSM including RE Accounts and State Reactive Energy Accounts, ABT compliant energy meters are installed at all the interface points for computation of actual net KWh Injection / drawal on 15-minute time block and KVArh injection / drawal on daily basis. Activities involved in energy metering process have been described in detail in Metering Procedure. In brief, it includes the following activities.

i. ABT Compliant Energy Meters are installed for recording active and reactive energy at all the interface points between –
    a. Generating Stations and Transmission Utility.
    b. Transmission and Distribution Utility.
    c. Generating Stations and Distribution Utility.
    d. Inter Distribution Utilities.
    e. Inter State Transmission Utilities.
    f. Open Access Generator / Customers.

ii. ABT meter data of all the interface points are downloaded through AMR system installed at SLDC or communicated to the SLDC through email by the MPPTCL / MPPGCL / Discoms / Intra -State Utility in whose area of jurisdiction ABT meter is installed.

iii. SLDC verify and validate the meter data received. In case of missing data, SLDC substitute the check meter data or assess meter data on weekly consumption basis and as per pattern of consumption if required.

iv. Authentic / valid meter data of all the meters in 15 minutes' time block is processed.

10.5 State Energy Account (SEA)

Monthly State Energy Account (SEA) is prepared by SLDC for the billing and settlement of Capacity Charges and Energy Charges. Monthly SEA comprises of availability of generating stations and Ex-Bus energy scheduled to Discoms from generating stations.

10.5.1 Monthly Charges payable by Discoms –

On the basis of monthly State Energy Account, the beneficiaries / Discoms shall pay to the respective ISGS and SSGS the capacity charges corresponding to plant availability and energy charges for the scheduled energy (on Ex-Bus basis).

10.5.2 Capacity Charges –

This is payable by the beneficiaries based on the capacity allocated to them; irrespective of the amount of power they draw or scheduled to draw. This fixed cost element covers the interest on loan, return on equity, depreciation, O&M expenses, insurance, taxes, interest on working capital. The Capacity Charges are calculated on the basis of Plant Availability Factor achieved during the month. 100% capacity charges are recoverable at Normative Annual Plant Availability Factor (NAPAF) specified by the respective State Commission for the current financial year. For less availability, less capacity charges and for higher availability higher capacity charges are recoverable. At zero availability, no capacity charges are payable.

10.5.3 Plant Availability Factor

In relation to a generating station for any period means the average of the daily average Declared Capabilities (DC's) for all the days during that period expressed as a percentage of installed capacity of the generating station reduced by the normative auxiliary energy consumption in MW, and shall be computed in accordance with the following formula:

$$PAF = 10000 \times \sum_{i=1}^{N} DC_i \; / \; \{ N \times IC \times (100 - AUX_n) \}\%$$

Where,

IC = Installed Capacity of the generating station in MW,

DCi = Average declared capacity (in MW) for the ith day of the period.

N = Number of days during the period, and

AUXn = Normative Auxiliary Energy Consumption as a percentage of gross generation.

i. **Thermal Power Station** – Declared Capacity (DC) shall mean the capability of the Generating Station to deliver the EX -Bus electricity in MW declared by such Generating Station for the day duly taking into account the availability of fuel. In case of fuel shortage, the Generating Company may propose to deliver higher MW during peak load hours. Average DC in such event shall be taken to be equal to the maximum peak-hour Ex-Bus schedule specified by the SLDC for that day.

ii. **Hydel Power Station** – DC means the Ex-Bus capacity in MW expected to be available from the Generating Station over the peaking hours of not less than 3 hours of the next day, as declared by the Generating Station, taking into account of restrictions on water use due to irrigation, drinking water, industrial, environmental considerations etc.

10.5.4 Energy Charges –

All the scheduled energy is charged as per the Variable Energy Charges of the station from which power is being scheduled. The energy cost covers the landed fuel cost of primary fuel and cost of secondary fuel oil consumption. The energy charges are payable to respective ISGS / SSGS /IPP's for the Ex-Bus drawal schedules of Discoms issued by SLDC.

The State Load Despatch Centre shall prepare and issue (to all Intra-State Entities) provisional monthly State Energy Account (SEA) by 7th day of the next month or on later date after issue of Regional Energy Account (REA) by Western Region Power Committee. The State Load Despatch Centre shall revise the State Energy Account as and when required from time to time. SEA shall broadly contain the following information:

1. Details of PAFM (Plant Availability Factor achieved during the Month in %) for each State Area Generating Station/ Independent Power Producer and any other generating station underTwo part Tariff: Provided that IPPs having part capacity tied up with MPPMCL do not keep their unit on bar despite technical minimum schedule provided by the beneficiary for their contracted capacity, the unit shall be treated under forced outage and PAF shall be computed accordingly.

   a. Details of mis-declaration of Declared Capability by State Area Generating Station/ Independent Power Producer and any other Generating Station under Two Part Tariff (if any);

   b. Details of Energy scheduled to Discoms from Inter State Generating Station and State Area Generating Station /Independent Power Producer and any other generating station under Two part Tariff.

c. The details of energy injection of Renewable Energy Generators (REG) at common metering point, energy purchased by Madhya Pradesh Power Management Company Limited and energy wheeled to Discoms for own use / third party sale as furnished by respective Discoms/ Madhya Pradesh Power Transmission Company Limited.

d. Details of energy scheduled to discoms from STOA /collective transction.

e. Any other details which State Load Despatch Centre feels necessary to complete the State Energy Account;

2. Energy purchased by MPPMCL from non- conventional sources such as Wind Electric Generators (WEG's), Solar Generators, Small Hydro and Bio-Mass etc shall be apportioned to all three Discoms in proportion to their actual drawal.

3. Energy Injection of Gandhisagar, RP Sagar, Jawahar Sagar and Rajghat shall be taken on share basis. Excess (+) / Less (-) drawal from the bilateral Inter State Projects i.e Chambal Complex and Rajghat Hydro Electric Plant (HEP) shall be apportioned to the Discoms as per weighted average capacity allocation. The 40.32 % Share of UP in Rajghat has been scheduled as per CERC order. Accordingly excess / less drawal by MP from Rajghat HEP shall be computed as per agreement.

4. Discoms (through Madhya Pradesh Power Management Company Limited) shall pay to the respective Inter State Generating Station Capacity Charges corresponding to Plant Availability and Energy Charges and PLF incentives (if any) for the Scheduled Despatch (on ex-Power Plant basis), as per the relevant notifications and orders of Central Electricity Regulatory Commission. The bills for these charges shall be issued by the respective Inter State Generating Station to each Discom (through Madhya Pradesh Power Management Company Limited) on monthly basis.

5. Discoms (through Madhya Pradesh Power Management Company Limited) shall pay to the respective State Area Generating Station/Independent Power Producers Capacity Charges corresponding to Plant Availability and Energy Charges for the Scheduled Despatch (on ex-Power Plant basis), as per the relevant notifications and orders of Madhya Pradesh Electricity Regulatory Commission. The bills for these charges shall be issued by the respective State Sector Generating Station to each Discom (through Madhya Pradesh Power Management Company Limited) on monthly basis.

6. Discoms (through Madhya Pradesh Power Management Company Limited) shall receive / pay the energy charges for the energy sold / purchased under Short Term Open Access through Bilateral / Collective transactions.

7. Payment against excess / less drawal by MP in Chambal Complex and Rajghat shall be settled by the MPPMCL on behalf of Discoms as per State Energy Account issued by SLDC.

8. The payment to Renewable Energy Generators selling power to MPPMCL as indicated in monthly State Energy Account issued by SLDC shall be made by MPPMCL.

10.6 Transmission Losses

10.6.1 Overview :

On the basis of monthly State Energy Account, the beneficiaries / Discoms's shall have pay to the respective ISGS and SSGS the capacity charges corresponding to plant availability and energy charges for the Schedule Despatch (on Ex-Bus basis). Thus, Discoms have to bear –

i) Injection and Withdrawal losses as per POC methodology applicable on Inter State transactions from 02nd December 2020.
ii) Discom wise Losses

10.6.2 Calculation Procedure of Transmission Losses :

For calculating the Net Drawal Schedules of Buyers at their periphery, the weekly Point of Connection losses as computed by National Load Despatch Centre in accordance with Central Electricity Regulatory Commission (Sharing of Inter State Transmission Charges and Losses) Regulations, 2020 as amended and Weekly computed Transmission Losses of Madhya Pradesh, state Discomswise transmission losses (applicable for Discoms) and Distribution / Other losses, if applicable, shall be apportioned in proportion to their Drawal Schedules.

Following process shall be adopted to compute weekly MP transmission losses and Discomswise transmission losses:

(a) State Transmission loss for a given Week = (Total net injection into the State Grid in a week) - (Total net Drawal from the State Grid in a Week).

(b) State discomwise loss loss for a given Week = (Total net injection into the State discom at M.P. periphery in a week) - (Total net Drawal by the State discom from the State Grid in a Week).

(c) Loss of nth Week shall be computed by the 5th day of the (n+1)th Week;

(d) This loss figure shall then be used in the Scheduling process from the beginning of the (n+2)th Week;

(e) State Load Despatch Centre shall round-off actual loss of nth Week to nearest 0.01% for the purpose of Scheduling for the (n+2)th Week (e.g. 4.705% is rounded-off to 4.71%, 3.442% is rounded off to 3.44% and so on);

(e) Events in the Grid of an exceptional nature could result in abnormally high or low losses in any Week. This could be either a Load crash in the State due to a Weather disturbance or closure of any Major Hydro Power Station during the monsoon for flushing of silt/debris from the Reservoir or Outage of any major Transmission Lines etc. The losses for these abnormal weeks shall generally be ignored as far as the Scheduling process is concerned. State Load Despatch Centre decision in this regard will be final.

10.7 State Deviation Settlement Mechanism Account (SDSMA)

10.7.1 Adherence to schedule and Deviation:

i. For a secure and stable operation of the grid, every grid connected regional entity shall adhere to its schedule as per grid code and shall not deviate from its schedule.

ii. Any deviation shall be managed by the Load Despatch Centre as per the Ancillary services Regulation and the computation charges and related matters in respect of such deviation shall be dealt with as per the following provisions of this regulation.

10.7.2 General Notes on DSM Account:

DSM rates and methodology for computation of DSM Charges are as per CERC (Deviation Settlement Mechanism and related matters) Regulations 2022. The applicability of DSM Rates and methodology considered as per CERC(DSM) Regulations 2022 and subsequent orders dated 26th Dec 2022 & 06th Feb 2023 is given below –

i. Three separate DSM Rate (Reference Rate (energy charges), Contract Rate and Normal Rate) are applicable for Sellers.

ii. Normal Rate of Deviation Charges is the Time Block wise highest rate discovered in Power Market (Day Ahead Market (DAM) /Real Time Market (RTM)/ Ancillary Service Market (ASM)) and declared by NLDC. The Normal

Rate of Charges for Deviations are subjected to the cap of Rs. 10 per Kwh w.e.f. 01.04.2023.

iii. Reference Charge Rate in respect of general seller whose tariff determined by the commission is energy charge rate and daily weighted avarge ACP of DAM for general seller whose tariff is not determined by commission.

iv. The Deviation in a time block for Seller and Buyer is computed as under:

Deviation-general seller (in KWh) = [(Actual injection in KWh) – (Scheduled generation in KWh)].

Deviation- buyer (in KWh) = [(Actual drawal in KWh) – (Scheduled drawal in KWh)].

v. General Seller:

When frequency is between 49.95 Hz and 50.03 Hz:

The Deviation Charges are receivable by General Seller in case of over Injection upto 10% or 100 MW, whichever is less at the reference charge rate, no charges are receivable for deviation beyond 10% or 100MW whichever is less. The Charges payable by General Seller in case of under injection at the reference charge rate upto 10% or 100 MW, whichever is less and at 120% of normal rate for deviation beyond 10% or 100 MW, whichever is less and at 150% of normal rate for Deviation beyond 15% or 150 MW, whichever is low.

Irrespective of volume limit when system frequency is at 50.03 Hz and above:

In case of over injection, seller shall be paid back for deviation by way over injection at the rate of 50% of reference charge rate when frequency is more than 50.03 Hz and less than 50.05 Hz and no Deviation Charges are receivable by General Seller when frequency => 50.05Hz. In case of under injection, the charges are payable by General Seller at the rate of 75% of reference charge rate when when frequency is more than 50.03 Hz and less than 50.05 Hz and at the rate of 50% of reference charge rate when frequency => 50.05Hz.

Irrespective of volume limit when system frequency is at 49.95Hz or below:

In case of over injection, seller shall be paid back for deviation by way over injection at the rate of 120% of reference charge rate when frequency is less than 49.95 Hz & more than 49.90 Hz and 150% of reference charge rate when frequency=< 49.90Hz. In case of under injection, the charges are payable by General Seller at the rate of 150% of reference charge rate or 120% of normal rate of charge for deviation, whichever is higher, when frequency is less than 49.95 Hz & more than 49.90 Hz and 200% of reference charge rate or 150% of normal rate of charge for deviation, whichever is higher, when frequency =< 49.90Hz.

vi. The Deviation Charges are payable by the Generating Unit for drawal of start-up power before COD or for drawal of power to run the auxiliaries during shut-down of a Unit at the reference charge rate of charges for deviation.

vii. Buyers:

When frequency is between 49.95 Hz and 50.03 Hz:

The Deviation Charges are receivable by Buyers (being an RE Rich) for under drawal at 90% of normal rate for deviation upto 200MW and at 50% of normal rate of charges for deviation beyond 200MW and upto 300MW, and no charges are receivable for deviation beyond 300MW. The Deviation Charges are payable by the Buyers (being an RE rich) for over drawal at normal rate for deviation upto 200MW and at 120% of normal rate for deviation beyond 200MW and upto 300MW, and at 150% of normal rate for deviation beyond 300MW.

The Deviation Charges are receivable by Buyers (with schedule upto 400MW) for under drawal at 90% of normal rate for deviation upto 20% or 40MW which ever is lower and no charges are receivable for deviation beyond 20% or 40MW. The Deviation Charges are payable by the Buyers (with schedule upto 400MW) for over drawal at normal rate for deviation upto 20% or 40MW whichever is lower, and at 120% of normal rate for deviation beyond 20% or 40MW which ever is lower.

Irrespective of volume limit when system frequency is at 50.03 Hz and above:

In case of under drawal, buyer shall be paid back for deviation at the rate of 50% of normal rate of charge when frequency is more than 50.03 Hz and less than 50.05 Hz and no Deviation Charges are receivable by buyer when frequency => 50.05. In case of over drawal, the charges are payable by buyer at the rate of 75% of normal rate of charge for deviation, when frequency is more than 50.03 Hz and less than 50.05 Hz and no Deviation Charges are payable by buyer when frequency => 50.05.

Irrespective of volume limit when system frequency is at 49.95Hz or below

In case of under drawal, buyer shall be paid back for deviation at the rate of 120% of normal rate of charge when is less than 49.95 Hz & more than 49.90 Hz) and 150% of normal rate of charge when frequency =< 49.90. In case of over drawal, the charges are payable by buyer at the rate of 150% of normal rate of charge when frequency is less than 49.95 Hz & more than 49.90 Hz) and 200% of normal rate of charge when frequency =< 49.90.

After block wise computation of Deviation Charges of all Intra State entities, the day wise imbalance settlement / pool balancing of Deviation Charges is done in accordance with M.P. Electricity Balancing & Settlement Code 2015 and subsequent amendments.

As per Clause 7.9 of the MPERC Balancing & Settlement Code 2015 and subsequent amendments, DSM shall not be applied to multipurpose Hydro Power Stations of MPPGCL. Accordingly the Generation Schedules of these

Hydro Generators have been replaced with actual meter data and Deviation charges has not been computed.

In accordance with clause 7(b) of MPERC (Cogeneration and Generation of Electricity from Renewable Sources of Energy) Regulations 2021 (Revision-II) the Biomass Plants with capacity upto 15MW and Municipal Solid Waste based Plants are out of the purview of Merit Order Despatch Principles. Accordingly the Generation Schedules of these Generators have been replaced with actual meter data and Deviation charges has not been computed.

Deviation charges of Open Access Customers availing Short Term Open Access has been computed as per Clause 7.10 of the MPERC Balancing & Settlement Code, 2015 and subsequent amendments.

The Deviation Charges of each State Discoms (East Discom, Central Discom and West Discom) is computed in accordance with the methodology specified in CERC (Deviation Settlement Mechanism and related matters) Regulations 2022 for Buyer (being an RE Rich State) and subsequent amendments.

viii. Wind and Solar Energy Generators are governed by the MPERC (Forecasting, Scheduling and DSM of Wind and Solar Generating Stations and related matters) Regulations 2018 and subsequent amendments thereof.

10.8 State Reactive Account (SRA)

The State Load Despatch Centre shall prepare and issue Weekly State Reactive Account (SRA) complying with the requirements of Indian Electricity Grid Code and Madhya Pradesh Electricity Grid Code within ten days from the last day of the Week or on later date after availability of state reactive charges amount in Western Regional Load Despatch Centre website. The State Load Despatch Centre shall revise the SRA as and when required from time to time.

State Reactive Account shall broadly contain the following information: -

(a) Details of day-wise net Reactive Energy Injection/Drawal during low Voltage (<97%) and high Voltage (>103%) for each Discom;

(b) Summary of weekly total net Reactive Energy Injection/Drawal during low Voltage (<97%) and high Voltage (>103%) for each Discom;

(c) Summary of Reactive Charges payable/receivable by the Discom [Note: Rate of reactive energy shall be taken as per Indian Electricity Grid Code and subsequent amendment thereof] and

(d) Any other details which State Load Despatch Centre feels necessary to complete the State Reactive Account.

10.9 RE DSM Account

The MPERC (Forecasting, Scheduling, Deviation Settlement Mechanism and related matters of Wind and Solar generating stations) Regulations, 2018 dated 12 April 2018 and amendment thereof is applicable to Seller(s) involved in the transactions facilitated through short-term open access or medium-term open access or long term open access in intra-state transmission or distribution of electricity (including intra-state wheeling of power), as the case may be, in respect of all wind power generators having a combined installed capacity of 10 MW & above and solar power generators having installed capacity of 5 MW & above including those connected via pooling stations and selling power within the State. Provided that these Regulations is also be applicable to all wind & solar generators selling power outside the State under open access and having combined installed capacity of 1 MW and above.

i) "Actual injection" in a time-block means electricity generated or supplied by the seller, as the case may be, measured by the Interface meters

ii) "Scheduled Generation" at any time or for a time block or any period means schedule of generation in MW or MWh ex-bus given by the concerned Load Despatch Centre

iii) "Deviation-RE (also termed as Absolute Error')" shall mean the absolute value of the error in the actual generation of wind or solar generators which are state entities with reference to the scheduled generation and the 'Available Capacity' (AvC), as calculated using the following formula for each 15-minute time block:

Error (%) = 100 X [Actual Generation– Scheduled Generation] / (AvC)

10.10 Deviation Charges for Wind/Solar Generating Stations

Table – I: Deviation Charges in case of under injection by Wind/Solar Generating Stations as State Entities undertaking Inter-state transactions

S. No.	Absolute Error in the 15-min time block	Deviation Charges payable to State Deviation Pool Account
1.	<= 15%	At the Fixed Rate for the shortfall energy for absolute error upto 15%

S. No.	Absolute Error in the 15-min time block	Deviation Charges payable to State Deviation Pool Account
2.	>15% but <=25%	(At the Fixed Rate for the shortfall energy for absolute error upto 15%) + (110% of the Fixed Rate for balance energy beyond 15% and upto 25%)
3.	>25% but <=35%	(At the Fixed Rate for the shortfall energy for absolute error upto 15%) + (110% of the Fixed Rate for balance energy beyond 15% and upto 25%) + (120% of the Fixed Rate for balance energy beyond 25% and upto 35%)
4.	>35%	(At the Fixed Rate for the shortfall energy for absolute error upto 15%) + (110% of the Fixed Rate for balance energy beyond 15% and upto 25%) + (120% of the Fixed Rate for balance energy beyond 25% and upto 35%) + (130% of the Fixed Rate for balance energy beyond 35%)

Table – II: Deviation Charges in case of over injection by Wind/Solar Generating Stations as State Entities undertaking Inter-state transactions

S.No.	Absolute Error in the 15-minute time block	Deviation Charges receivable from State Deviation Pool Account
1.	<= 15%	At the Fixed Rate for the excess energy upto 15%
2.	>15% but <=25%	(At the Fixed Rate for the excess energy upto 15%) + (90% of the Fixed Rate for excess energy beyond 15% and upto 25%)
3.	>25% but <=35%	(At the Fixed Rate for the excess energy upto 15%) + (90% of the Fixed Rate for excess energy beyond 15% and upto 25%) + (80% of the Fixed Rate for excess energy beyond 25% and upto 35%)
4.	>35%	(At the Fixed Rate for the excess energy upto 15%) + (90% of the Fixed Rate for excess energy beyond 15% and upto 25%) + (80% of the Fixed Rate for excess energy beyond 25% and upto 35%) + (70% of the Fixed Rate for excess energy beyond 35%)

Table – III: Deviation Charges in case of under-injection or over injection, by Wind/Solar Generating Stations commissioned after date of Notification of MPERC (Forecasting, Scheduling, Deviation Settlement Mechanism and related matters of Wind and Solar generating stations) Regulations, 2018 for sale of power within State

S.No.	Absolute Error in the 15-minute time block	Deviation Charges payable to State Deviation Pool Account
1.	<= 10%	None
2.	>10% but <=20%	(At the Rs 0.50 per unit for shortfall or excess energy for Absolute Error beyond 10% and upto 20%)
3.	>20% but <=30%	(At the Rs 0.50 per unit for shortfall or excess energy for Absolute Error beyond 10% and upto 20%) + (At the Rs 1.00 per unit for balance energy beyond 20% and upto 30%)
4.	>30%	(At the Rs 0.50 per unit for shortfall or excess energy for Absolute Error beyond 10% and upto 20%) + (At the Rs 1.00 per unit for shortfall or excess energy beyond 20% and upto 30%) + (At the Rs 1.50 per unit for balance energy beyond 30%)

Table – IV: Deviation Charges in case of under-injection or over injection by Wind/Solar Generating Stations commissioned prior to date of Notification of MPERC (Forecasting, Scheduling, Deviation Settlement Mechanism and related matters of Wind and Solar generating stations) Regulations, 2018, for sale of power within State

S.No.	Absolute Error in the 15-minute time block	Deviation Charges payable to State Deviation Pool Account
1.	<= 15%	None
2.	>15% but <=25%	(At the Rs 0.50 per unit for shortfall or excess energy for Absolute Error beyond 15% and upto 25%)
3.	>25% but <=35%	(At the Rs 0.50 per unit for shortfall or excess energy for Absolute Error beyond 15% and upto 25%) + (At the Rs 1.00 per unit for balance energy beyond 25% and upto 35%)

S.No.	Absolute Error in the 15-minute time block	Deviation Charges payable to State Deviation Pool Account
4.	>35%	(At the Rs 0.50 per unit for shortfall or excess energy for Absolute Error beyond 15% and upto 25%) + (At the Rs 1.00 per unit for shortfall or excess energy beyond 25% and upto 35%) + (At the Rs 1.50 per unit for balance energy beyond 35%)

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11 Chapter 11: Procedures for Energy Metering

11.1 Introduction

This procedure has been prepared and issued in accordance with the provisions of Draft Madhya Pradesh Electricity Balancing and Settlement Code, 2023. This procedure shall be read in conjunction with Indian Electricity Grid Code (IEGC), Madhya Pradesh Electricity Grid Code (MPEGC), Central Electricity Authority (Installation and Operation of Meters) Regulations 2006 and subsequent amendments and Balancing & Settlement Code (BSC). Part –V, Section 16 of MPEGC details a uniform policy in respect of metering for State Transmission Utility (STU), Generating Companies, Open Access Customers (OAC's) and Non-Conventional Energy Sources using State Transmission System and Distribution System. This section describes the procedure for energy metering of interface points of Transmission – Distribution Utilities, Generating Companies – Transmission / Distribution Utilities, Inter Distribution Utilities, Open Access Customers and Non-Conventional Energy Sources.

11.2 Objective

The objective is to define the minimum acceptable metering standards as per regulatory requirements and procedure for collection of ABT compliant energy meter data, communication to SLDC, checking for correctness & completeness and processing of raw data for the purpose of accounting, commercial billing and settlement of electrical energy. The procedure also covers the practices that shall be employed and the facilities that shall be provided for the measurement and recording of various parameters like active / reactive energy, frequency etc.

11.3 Procedure for collection of ABT compliant energy meter data-

As per Draft MPEGC 2023, 17.13, all concerned Intra-State Entities (in whose premises the Special Energy Meters are installed) shall provide Automatic Meter Reading (AMR) facility for transmitting ABT meter data to SLDC remotely. If the weekly data of Special Energy Meter is not received through AMR system installed at SLDC, the same may be downloaded and transmitted to the SLDC by the owner of the ABT meter or entities who have been authorized to take energy meter reading.

11.4 Location and Application of Metering System

11.4.1 Metering at Generating Stations

All the Main meters, Check meters and Standby meters, will be installed at location specified in CEA Metering Regulations 2006 and subsequent amendments thereof. Commercial settlement shall be based on the energy meters installed at interface points as defined in the electricity grid code or applicable agreement.

11.4.2 Metering at Non-conventional Energy Sources:

All the Main meters, Check meters and Standby meters, will be installed at location specified in CEA Metering Regulations 2006 and subsequent amendments thereof. However, in case of RE generators where pooling of generation is at common pooling station, meters shall be installed at outgoing feeders of pooling stations.

11.4.3 Metering between State Transmission Utility –Distribution Licensee:

(a) For measurement of power delivered by State Transmission Utility to Distribution Licensee, Main metering shall be provided on the LV side of EHV Power Transformer i.e. 33kV side of 220/33 kV, 132/33kV and 11kV side of 132/11kV transformers installed in EHV sub-stations. The standby metering shall be provided on the HV side of EHV Power Transformer i.e. 220/33 kV, 132/33kV and 132/11kV transformers installed in EHV sub-stations.

Operational meters shall also be provided on all outgoing 33kV and 11kV feeders for energy audit on feeder and reconciliation of energy with respect to energy measured on LV side of EHV Power Transformer.

(b) In case of EHV industrial consumers of Distribution Licensee directly fed from 220kV or 132 kV sub-station of respective transmission licensee, tariff metering shall be provided on outgoing feeder emanating from EHV sub-station of respective transmission licensee. In case of railway traction, main and check meter shall be provided on traction sub-station (TSS) and standby meter shall be at respective transmission licensee sub-station.

11.4.4 Metering between two Distribution Licensees:

The energy metering shall be provided at such points of the power lines connecting any two Distribution Systems owned by different Distribution Licensees so that the measured energy gives correct measurement of consumption by either Distribution Licensee.

11.4.5 Sub-station Auxiliary Consumption Metering:

The State Transmission Utility sub-stations auxiliary consumption shall be recorded on LV side of station auxiliary transformers. If such transformer(s) is feeding other local load (colony quarters, street lights etc.) apart from sub-station auxiliary load, separate metering shall be provided on individual feeders.

11.4.6 Open Access Customer (OAC):

In case of Generator availing / seeking open access, the metering equipments shall be installed on outgoing feeders emanating from the generating station.

In case of CPP having parallel operation, permission and connected through dedicated feeder with grid but not the consumer of Discom and availing / seeking open access to sell power, the metering equipment shall be installed in Transmission Licensee’s premises. If the CPP is connected through tapped feeder, the metering equipment shall be installed at CPP end.

In case of EHV/HV consumer having contract demand/standby support with Discoms and availing /seeking open access metering equipment shall be installed in the premises of Open Access Consumer.

In case of EHV/HV consumer with CPP having contract demand/standby support with Discoms and availing /seeking open access metering equipment shall be installed in the premises of Open Access Consumer.

In case of any Distribution Licensee availing/seeking open access, metering equipment shall be installed at each supply point interfacing with transmission network.

11.5 Procedure for Assessment of Consumption for Defective/stuck-up Meter

As per Draft MPEGC 2023, 17.19.

i) Whenever a meter goes defective, the consumption recorded by the check meter shall be referred for a period agreed mutually. The details of the malfunctioning along with date, time and snap-shot parameters along with load survey shall be retrieved from the main meter. The exact nature of the mal-functioning shall be brought out after analyzing the data so retrieved and the consumption / losses recorded by the main meter shall be assessed accordingly.

ii) If main as well as check metering systems become defective, the assessment of energy consumption for the outage period shall be done by the concerned parties as mutually agreed or at the level of Transmission Metering Committee or as per Balancing and Settlement Code, 2015 and amendments thereof.

11.6 Mechanism for Dispute Resolution

As per Draft MPEGC 2023, 17.21, any disputes relating to inter-utility metering between State Transmission Utility and any Generating Company / Distribution Licensees / Transmission Licensees /Users shall be settled in accordance with procedures given under relevant Power Purchase Agreements (PPA) / Connection Agreement or relevant Agreement, as the case may be. In case of unresolved dispute, the matter may be referred to the Commission.

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12 Chapter 12: National Open Access Registry

12.1 Introduction

This procedure is issued under Regulation 27 and 39.2 of Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-state Transmission system) Regulations.

National Open Access Registry (NOAR) shall be a common electronic platform for facilitating the T-GNA applications in inter-State transmission system (ISTS) and shall-

i. Provide a single point electronic interface for all the stakeholders, availing TGNA in inter-State transmission system including T-GNA customers, state distribution utilities, state/central/IPP generators, trading licensees, Power Exchanges, National Load Despatch Centre (NLDC), Regional Load Despatch Centres(RLDCs), State Load Despatch Centres(SLDCs) and Regional Power Committees (RPCs);

ii. automate the administration of the T-GNA in inter-State transmission system;

iii. act as a repository of information related to T-GNA in inter-State transmission and facilitate market monitoring by the Market Monitoring Cell (MMC) of CERC;

iv. exchange data with the scheduling software applications of the RLDCs and SLDCs and exchange data with TGNA application software of SLDCs, if any;

v. interface with the Power Exchange(s) for data exchange and validation of standing clearance to facilitate processing of transactions through the Power Exchange(s);

vi. provide audit trail of the T-GNA applications and standing clearances, dash board facility summarizing at any point of time, the details of the applications made for T-GNA to RLDCs or SLDCs, applications approved or rejected by RLDCs or SLDCs and applications pending with RLDCs or SLDCs;

vii. be the platform for conducting e-bidding for congestion management as per regulations;

viii. provide a payment gateway for making payments related to T-GNA transactions and disbursement, facilitate financial accounting and tracking of the T-GNA transactions and reconciliation of such payments;

ix. provide facility to generate MIS reports for NLDC,RLDCs and SLDCs ;and

x. undertake any other function, as assigned by the Central Commission from time to time.

12.2 Definitions

a) 'Host RLDC' means the RLDC under whose jurisdiction the scheduling and accounting of the regional entity falls and RLDC of the region in which the intra-State entity is located

b) 'Host SLDC' for an entity means the SLDC under whose jurisdiction the scheduling and accounting of the intra-State entity falls;

c) "T-GNA Grantee" means a person as defined under Regulation 2(ap) of the CERC Connectivity and GNA Regulations;

d) "standing clearance' shall mean and include 'concurrence', 'no objection' and 'prior standing clearance' referred to in the Principal regulations.

12.3 Functions of SLDC

The SLDC shall:

a) process registrations of all T-GNA customers which are intra-State entities through NOAR;

b) give standing clearance through NOAR for the T-GNA customers under its control area jurisdiction;

c) update respective State Transmission Utility (STU) transmission charges and SLDC operating charges in NOAR;

d) update the status of waiver of charges for intra-State transmission system and SLDC scheduling charges for T-GNA customers which are intra-State entities in NOAR;

e) incorporate T-GNA transactions for the T-GNA customers which are intra-State entities in the daily schedules issued by them;

f) make available export and import TIC,RM and ATC of the respective state in NOAR, if determined by SLDC;

g) registration for TGNA procedure ofT GNA recently submitted to CERC by NLDC may be followed for registration process;

h) A T-GNA customer shall be able to make an application for seeking standing clearance or applying for T-GNA transaction, both bilateral and Collective, only after successful registration on the NOAR platform.

12.4 The process of registration:

a) Any T-GNA customer which intends to avail T-GNA in inter-State transmission system through Bilateral or Collective Transaction or both shall get registered in the NOAR.

b) The applicant shall e-verify the filled-in application on the NOAR platform.

c) The applicant shall set a username and password after completion of the above process. These credentials shall be used by the applicant for accessing NOAR platform for applying for standing clearance or TGNA transaction.

d) In case of a T-GNA customer which is a regional entity, the application shall be processed by the host RLDC and for a T-GNA customer which is an intra-State entity the application shall be processed by the host SLDC. In case of inter-State.

Trading licensees and Power Exchanges, the application shall be processed by NLDC.

e) After the receipt of application for registration, SLDC, shall conduct a preliminary scrutiny to ensure application form is complete in all respect along with the necessary documents and applicable processing fees. In case of any discrepancy or requirement of any further information, the SLDC, shall communicate the applicant through NOAR for rectification of the same within 1(one) working day of receipt of the application. In case the applicant does not respond to the requirements of rectification within 2 (two) working days to the SLDC, the registration request shall be rejected and reasons for such rejection shall be communicated to the applicant through NOAR. The registration fees paid, shall stand forfeited.

f) Host RLDC shall register a T-GNA customer which is regional entity within 7 (seven) working days of receipt of complete application for new applications and within 3 (three) working days for renewal of registration through NOAR, provided that the registration fees have been deposited and the application is complete in all respect and grant registration or otherwise.

g) Host SLDC shall process the application for registration of a T-GNA customer which is intra-State entity within 5 (Five) working days of receipt of complete application for new applications and within 2 (two) working days for renewal of registration through NOAR, for completion of registration by Host RLDC, provided that the registration fees have been deposited and the application is complete in all respect and grant registration or otherwise.

h) Host RLDC shall register the TGNA customer which is intra-State entity within two (2) working days for new applications and within one (1) working day for renewal of registration through NOAR, after the receipt of inputs from the host SLDC.

i) NLDC shall register inter-State electricity trader and a power exchange, within 7 (seven) working days for new applicants and within 3 (three) working days for renewal of registration through NOAR, provided that the registration fees have been deposited and the application is complete in all respect and grant registration or otherwise.

j) In case of any change in the information provided by the T-GNA customer, it shall be incumbent upon the applicant to update the information in the NOAR.

k) In case of a change of a name of the T-GNA customer already registered in NOAR, such entity shall inform, along with relevant documents from the appropriate authority such as Registrar of Companies or National Company Law Tribunal or any other Court, to the NLDC or the host RLDC, which shall upon verification of documents, update such change in its records and update the NOAR within 5 (five) working days. The concerned T-GNA customer shall settle all outstanding financial liabilities, as the case may be.

l) The T-GNA customer shall ensure that all details are correct and accurate, failing which, the registration may be cancelled or renewal may be denied by The SLDC, as the case may be, with reasons communicated through NOAR.

m) The Nodal Agency shall maintain a centralised database of registered T-GNA customers based on registrations carried out by RLDCs and NLDC.

12.5 Standing Clearance Procedure of TGNA:

"Standing clearance by Load Despatch Centre for interstate and intrastate entity:" part may be modified accordingly.

a) The TGNA customer who has been successfully registered on NOAR shall apply through NOAR, to the host load despatch centre for the issuance of a 'standing clearance' for availing open access in inter-State transmission.

b) Prior to submitting the application for standing clearance, the TGNA customer shall confirm and update if required the contact details (phone number and email etc.) furnished at the time of registration.

c) For intra-State entities, the consent of DISCOM, if any, shall be uploaded in the NOAR by SLDC or T-GNA customers.

d) For T-GNA customer which is an intra State entity, the application for standing clearance shall be forwarded to the host SLDC for verification and approval who shall process the application for grant of standing clearance or refusal in accordance with Regulation 8 within 7 (seven) working days from the date of receipt of application for the new grid connected entity and within 3 (three) working days from the date of receipt of application for an existing gird connected entity.

d) In case the host SLDC finds that the application for standing clearance is incomplete or defective in any respect, it shall communicate the same to the entity within 2 (two) working days from the date of receipt of such application.

e) In cases where the host SLDC has communicated any deficiency or defect in the application, the date of receipt of application shall be considered as the date on which the application has been received duly completed after removing the deficiency or rectifying the defects, as the case may be and the period of 7 (seven) working days for the new grid connected entity and 3 (three) working days for an existing gird connected entity under Clause 6.4 of this Procedure shall be reckoned from such date.

f) The issuance of standing clearance shall be communicated to the TGNA customer once the SLDC approves the application.

g) In case the host SLDC fails to communicate issuance or refusal of standing clearance within the specified period of 3 (three) working days or 7 (seven) working days, as applicable, the standing clearance shall be deemed to have been granted.

h) In case the application has been found to be in order but the host SLDC refuses to issue the standing clearance on the grounds in accordance with Regulation 8(1) of Principal Regulations then such refusal shall be communicated to the TGNA customer through NOAR along with reasons for such refusal.

i) The host SLDC may withdraw the standing clearance or revise the quantum (MW) or period of the standing clearance issued in respect of any TGNA customer in case of transmission constraint or in the interest of grid security.

j) Standing Clearance obtained by the T-GNA customer from the State Load Despatch Centre can be used for collective transaction for day ahead on any Power Exchange(s).

k) The T-GNA customers to whom the standing clearance has been issued or deemed to have been issued,shall ensure that aggregate quantum in each time block of 1S minutes for all the bid(s) under any of the categories of bilateral and collective transactions in OTC market and/or Power Exchange(s) market shall not exceed the quantum of standing clearance or deemed standing clearance, as the case may be.

l) The list of debarred T-GNA customer shall be displayed on the NOAR platform.

12.6 Scheduling

a) An application for scheduling of bilateral transaction through T-GNA in the inter-State transmission system shall be made through NOAR only by the T-GNA customer registered in NOAR and having a valid standing clearance at least for the period of which an application is being made.

b) For each application the sum of total quantum under GNA, already approved T-GNA transactions and the T-GNA quantum applied shall be within the limit of the approved quantum as per standing clearance for the applied period, which shall be checked through NOAR.

c) In case of any violation of the approved quantum as per standing clearance for the applied period, the same shall be electronically intimated to the concerned TGNA customer.

12.7 Cross Border transaction

Scheduling of cross border transactions shall be done through NOAR in accordance with CERC (Connectivity and General Network Access to the inter-state Transmission System) Regulations, 2022 and CERC (Cross Border Trade of Electricity) Regulations, 2019 as amended from time to time.

Treatment of transmission charges and losses

The transmission charges and losses in the ISTS for both bilateral and collective transactions shall be facilitated through NOAR in accordance with CERC (Sharing of Inter State Transmission Charges and Losses) Regulations,2020 as amended from time to time.

12.8 Commercial Arrangements in New TGNA procedure

12.8.1 Terms of Payment-

a) All payments associated with bilateral and collective transactions shall be made by the applicant electronically through the payment gateway of NOAR.

b) No retrospective adjustments for T-GNA rates shall be made for the already approved TGNA bilateral and collective transactions.

12.8.2 Default in Payment

The list of persistent defaulters (more than three such events) shall be displayed on the NOAR platform.

12.8.3 Disbursement of Charges

Nodal agency shall disburse the transmission charges and operating charges as per extant regulations, through NOAR.

12.8.4 Standing Clearance

"Standing Clearance' shall mean and include 'concurrence', 'no objection' and 'prior standing clearance' referred to in the Principal regulations.

12.8.5 Reporting and Management Information System (MIS)

NOAR shall have facility for MIS reports for the stakeholders and authorities.

12.9 Miscellaneous

a) All costs, expenses, charges associated with the application, such as transaction cost associated with payment gateway etc. shall be borne by the T-GNA customer.
b) The list of T-GNA customers which are regional entities and the intra-State entities shall be displayed through NOAR.
c) It shall be the responsibility of all the T-GNA customers which are registered in NOAR to maintain the confidentiality of the login credentials issued to them to prevent any possible misuse.

12.10 GOAR: Green Energy Open Access Registry

The Ministry of Power has notified the Electricity (Promoting Renewable Energy through Green Energy Open Access) Rules, 2022 on 06th June 2022 and amendments thereof with the aim of accelerating India's ambitious renewable energy programmes. Ministry of Power vide notification dated 08th July, 2022 notified Power System Operation Corporation (POSOCO) now Grid-India as Central Nodal Agency to set up and operate a single window green energy open access system for renewable energy under these Rules. National Portal will serve the consumers from all over the country.
To participate in the Green Energy inter-state open access, the procedure and methodology is same as described in the National Open Access Registry Chapter.

Although to participate in the Green Energy intra-state open access, the entity should register in the GOAR portal with the same procedure as described in the above Chapter.

The entity can apply for only bilateral application for T-GNA and intra-state open access through the GOAR portal.

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13 Chapter 13: Grid Disturbance and Revival Procedure

(SYSTEM RESTORATION PROCEDURES)

13.1 Definition of Grid Disturbance and Blackout State:

13.1.1 Grid Disturbance:

As per CEA (Grid Standards) Regulations, 2010, “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 (132 kV and above in the case of North- Eastern Region).

13.1.2 Power System Alert Categorization

As per IEGC 2023, power system can be categorized under normal, alert, emergency, extreme emergency and restorative state depending on the type of contingencies and value of operational parameters of the power system by RLDC, NLDC or SLDC, as the case may be. “Blackout state” means a condition at a specific time where a part or all the operations of the power system have got suspended.

13.2 Classification of Grid Disturbance

The classification of grid disturbances in increasing order of severity as per CEA Grid Standards is given below: -

i. Category-GD-1: When less than ten percent of the antecedent generation or load in a regional grid is lost;

ii. Category-GD-2: When ten percent to less than twenty percent of the antecedent generation or load in a regional grid is lost.

iii. Category-GD-3: When twenty percent to less than thirty percent of the antecedent generation or load in a regional grid is lost.

iv. Category-GD-4: When thirty percent to less than forty percent of the antecedent generation or load in a regional grid is lost.

v. Category-GD-5: When forty percent or more of the antecedent generation or load in a regional grid is lost.

vi. Category-Near Miss: Near miss event means an incident of multiple failures that had the potential to cause a grid disturbance, power failure or partial collapse but did not result in a grid disturbance. Such incidents proactively analysed and reported to have a better control on grid on any eventuality.

13.3 Declaration of Grid disturbance

a) As per Reg. 49 (5), Certification of such grid disturbance and its duration shall be done by the RLDC. The declaration of grid disturbance shall be done by WRLDC at the earliest. A notice to this effect shall be posted at its website by WRLDC of the region in which the grid disturbance has occurred which shall be considered as declaration of the grid disturbance.

b) All regional entities shall take note of the grid disturbance and take appropriate action at their end.

c) The scheduling and settlement of transactions during grid disturbance category GD-5 shall be as per regulation 49 (5).

d) Grid disturbance report shall be prepared by WRLDC/NLDC as per IEGC Reg. 37(2) (f).

e) As per regulation 32(3(h)), In case of grid disturbances, system isolation, partial black- out in a State or any other event in the system that may have an adverse impact on the system security due to a proposed outage,

f) NLDC, RLDC or SLDC, as the case may be, shall have the authority to defer the planned outage.

13.4 Restoration Strategies

System restoration shall be facilitated by the State Load despatch Centre in coordination with Generators, Transmission, Distribution utilities and other users.

During any restoration one of the major roles is played by black start resources. These include generating unit(s) and its associated set of equipment which has the ability to be started without support from the System.

In power system there are two major approaches utilized for power system restoration. These are bottom-up, top-down and combination approaches**.**

13.4.1 Bottom-up approach:

It refers to formation of power system islands utilizing black start generators. In this approach black start resources are self-started followed by utilizing pre-defined cranking path or critical load restoration path. After this, island is expanded with adding more load and generation in phase wise manner by controlling voltage as well as frequency. At the ends multiples islands are synchronized. This is the only approach which can be used when full system shutdown occurs and there is no outside assistance available. Each power system always needs to ensure such plan are in place and a part of power system planning exercise.

13.4.2 Top-Down approach:

This approach utilizes restoration of power system based on assistance of power from outside system. In this start-up power has to be imported from neighbouring regions/surviving systems and extended to all the generating stations on priority basis while restoring few loads and transformers for voltage control. Based on the startup of some major power plants, other power plants in system are extended power and more generation is brought for restoring loads. This approach is usually selected when neighbouring interconnection assistance is available.

13.4.3 Combination Approach:

During a partial blackout in power system, effective way is to use a combination approach that utilizes both bottom-up as well as top-down approaches. It is the quickest way to restore critical auxiliary power to generating stations and light and power to substations. It can restore several areas of the system at the same time and loads connected to outside world are very stable as these systems will be having high inertia and strength so low voltage/frequency fluctuations. In addition, long transmission lines can be charged from neighbouring systems with lesser system constraints.

13.5 Protocols during system restoration

Following major protocols are essentially required for quick restoration of power supply after a blackout:

a) The start-up procedure for generating units should be available in control room and shift duty personnel/ working-level personnel should be familiar with the procedure, and they should start the machines (other than technical and safety issues of the machine) as per the direction given by SLDC/RLDC.

b) Shift duty personnel should remain present till the restoration process is completed before handing over charge to the next shift.

c) Survival / Auxiliary / Start-up power should be provided on a priority basis to the collapsed system and power should be utilized for other purposes only after meeting these power requirements.

d) Priority should be accorded in restoration as under:

i) The main priorities are to restore power supply to the generating stations and load despatch centres, formation of self-sustaining islands around the generating station.

ii) Extending start-up power to thermal power plants.

iii) Extending start-up power to non-self-starting hydro power plants.

iv) Restoration of traction power supply.

e) Building up subsystems and synchronizing with each other. Restoration of supply to other essential loads such as mines, Hospitals etc. Loading of

generator supplying the start-up power should not exceed 80% of its capacity. Efforts should be made to keep the generator operating on lagging side and if it is not possible then it should operate at least near to unity power factor All communication channels required for restoration process shall be used for operational communication only, till grid normalcy is restored.

13.6 Essential load to be restored on priority

The restoration procedure shall have the details of essential loads and railway traction loads

i) Railway Traction Details
ii) Continuous process industries such as Aluminium, Iron etc.
iii) Important Public facilities such as Hospitals, Oxygen plants Etc.
iv) Other Essential Loads

13.7 Start up Power

Interstate transmission lines connecting the thermal/Hydel power stations of MP for startup power are listed below:

13.7.1 For Thermal Power Stations:-

A) **Satpura TPS Sarni**

i) 400 KV Satpura TPS -Koradi (single ckt.)
ii) 400 KV Satpura TPS -ISP (single ckt.)
iii) 400 KV Bhilai- Seoni(PG) -Satpura TPS

B) **Amarkantak TPS Chachai**

i) 220 KV Amk-Annuppur-Kotmi Kalan.
ii) 220 KV Amk-Annuppur then 132 KV Annuppur- Rajmilan- Waidhan-Vindhyachal (There are two ckts. Between Vnidhyachal & Waidhan. One ckt. through a separate bus at Waidhan goes to Morwa and one ckt. through other bus goes to Rajmilan)

C) **SGTPS TPS Birsinghpur.**

i) 220 KV Birsinghpur-Amk-Annuppur-Kotmi Kalan-Korba West (double ckt.)

D) **SHRI SINGAJI TPS**

i) 400 KV Asoj- Indore- Indore (PG)- Pithampur- SSTPS
ii) 765 KV Vadodra-Indore (PG)- 400 KV Pithampur- SSTPS
iii) 220 KV OSP – Chhegaon-SSTPS
iv)220 KV Khandwa (PG)-Chhegaon-SSTPS

13.7.2 Diesel Generator capacity at Thermal Power Stations-

The details of capacity of Diesel generating sets installed at thermal power stations is indicated hereunder:

SN	Name of Power Station	Diesel Generator Capacity (KVA)
1	Satpura Thermal Power Station-IV	250
2	Sanjay Gandhi TPS – I	1000
3	Sanjay Gandhi TPS – II	1000
4	Sanjay Gandhi TPS – III	2x1500
5	Amarkantak TPS – III	750
6	Shri Singaji TPS #1	2x1750
7	Shri Singaji TPS #2	2x1750
8	JP Bina TPS	2x1000
9	BLA Power Ltd.	500

13.7.3 For Hydel Power Stations:-

In MP system. in the event of total collapse in the state/Western Region, when the supply in the neighboring state is not available, the start-up power to the thermal power station is extended through Hydel Power Stations.

12.8.4 Diesel Generator capacity at Hydel Power Stations The name of Hydel Power Stations of MP equipped with black start facilities i.e. DG sets are mentioned as hereunder: -

SN	Name of Power Station	Installed Capacity (MW)	Diesel Generator Set Capacity (KVA)
1	Indirasagar Hydro Power Station	8x125	2x1000
2	Omkareshwar HPS	8x65	2x1010
3	Tons HPS	3x105	250 x1 & 1x500
4	Pench HPS	2x80	250
5	Bargi HPS	2x45	250

6	Gandhisagar HPS	5x23	250
7	Rajghat HPS	3x15	200
8	Madhikheda HPS	3x20	250
9	Birsinghpur HPS *	1x20	250
10	Jhinna HPS	2x10	250
11	Silpara HPS	15x2	275

The detailed procedure to extend start-up supply from Hydel power stations to thermal power stations is given as hereunder:

1) Indira Sagar Hydro Power Station (8X125 MW):- **Power extended up to Satpura TPS-**

Indira Sagar Project (ISP) functions under NHDC Ltd. The NHDC Ltd. is a joint venture of MP Government and NHPC. The installed capacity of ISP is 8x125 MW. The ISP is connected with STPS, 400 KV S/s Nagda and 400 KV S/s Indore through 400 KV lines.

ISP generation is evacuated through 400 KV ISP-Indore I & II, 400 KV ISP-Nagda & 400 KV ISP-STPS lines. Further 400 KV S/s Indore is connected to 765 KV Indore (PGCIL S/s), 400 KV S/s Asoj, 400 KV S/s Nagda & 400 KV S/s Itarsi. It is situated in Khandwa district. This is one more source to provide start-up power to Satpura TPS. With the help of D.G. set one unit of ISP can be started & 400 KV supply can be extended through 400 KV ISP-Satpura line & by charging of 500MVA ICT, supply extended to 220KV PH Bus at satpura also.

2) Bargi HEP (2X45 MW):- **Power extended up to AMK & Birsinghpur TPS-**

This power house is located at about 40 Kms from Jabalpur This power house is a source to start-up supply to Amk. TPS. Both units of this Power Station can easily be started with the help of D.G. set. This power station is connected with 132 KV bus of 220 KV S/s Jabalpur through 132 KV Bargi-Jabalpur ckt. This power house is also connected with Seoni 132 KV S/s through 132 KV Bargi- Lakhnadaun line (single ckt.). Start-up power to Amk. TPS can be fed through 220 KV Jabalpur-Amk ckt. and then Start-up power to Birsinghpur TPS also extended through 220KV Amk-Birsinghpur ckt.

During the grid collapse of 30.7.02, supply to Bargi HPS could not be taken by Amk. TPS because of very high voltage observed at Amk. end after charging one ckt. of 220 KV Jabalpur- Amk. Based on this experience possibility may be explored to put suitable bus reactor at Amk. PH to control the bus voltage.

3) Tons HEP (3X105 MW):- **Power extended up to Birsinghpur STPS-**

This power house is about 40 Kms from Rewa commissionary. The power station is connected with Kotar 220 KV S/s, 220 KV Sirmaour and with Rewa 220 KV S/s

through 220 KV lines one unit of Tons HEP can be easily started with the help of DG set. Thereafter supply to SGTPS Birsinghpur can be extended through 220 KV Tons-Satna- Birsinghpur line or through 220 KV Tons-Rewa-Sidhi-Amk-Birsinghpur line.

4) Birsinghpur Hydel Power Station (1x20 MW):- **Power extended up to Birsinghpur TPS**

This station is equipped with black start facility. As soon as Hydel unit starts, 220 KV Hydel bus got energized. Then 220 KV supply can be extended through 220 KV line for Thermal Power Station auxiliary supply.

However, Birsinghpur Hydel unit is of 20 MW only, which do not cater the load of auxiliaries of Sanjay Gandhi thermal power station. Hence load of colony & Pali can be met by this power.

5) Omkareshwar Hydro Power Station (8X65 MW):- **Power extended up to Singhaji STPS**

Omkareshwer Project (OSP) functions under NHDC Ltd. The NHDC Ltd. is a joint venture of MP Government and NHPC. The installed capacity of OSP is 8x65 MW. The OSP is connected with 400KV S/s Khandwa, 400KV S/s Julwania, 400KV S/s Chhegaon and 220KV S/s Burwaha & Nimrani through 220 KV lines.

OSP generation is evacuated through 220 KV OSP-Khandwa, 220 KV OSP-Julwania, 220KV OSP-Burwaha, 220KV OSP-Burwaha (Tapped Nimrani) and 220KV OSP-Chhegaon feeder.

This power house is a source to start-up supply to Singhaji STPS. With the help of D.G. set one unit of OSP can be started & 220 KV supply can be extended through 220 KV OSP-Chhegaon then after charging 400/220KV ICT Start-up power to Singaji STPS also extended through 400KV Chhegaon-Singaji ckt.

13.8 Restoration Sequence in MP SYSTEM

13.8.1 Satpura TPS:

As soon as one unit of PH-IV (Unit #10 or #11) synchronized with the Hydel supply of Gandhisagar or Pench or ISP (Through 400/220KV 500 MVA ICT at Satpura) start-up power to unit no. 10 & 11 is extended. Thereafter system normalization is done as follows:-

A) First, 220 KV Sarni-Itarsi ckt. No.1 is to be charged from Satpura end then ask Itarsi to charge both 220/132 KV ICTs & put some load looking to the system frequency & voltage. So that Railway traction at Kala Akhar will get supply.

B) Meanwhile all efforts will be made to synchronize all our 400 KV S/s i.e. Indore, Bhopal & Bina with the supply if made available in the Vindhyachal- Jabalpur-Itarsi & Vindhyachal-Satna-Bina corridor.

C) After synchronization of unit no 10 & 11, 400 KV Satpura-Indore & 400 KV Satpura-Itarsi lines will be synchronized.

D) As soon as the Indore 400 KV S/s energized, supply to be extended to Nagda S/s through one ckt. of 400 KV Indore-Nagda (2nd ckt. will be charged a later stage). After charging of 400/220 KV ICTs at both Indore (4 no. 315 MVA) & Nagda (4 no. 315 MVA) 400 KV S/s, all 220 KV links e.g. 220 KV Indore-Pithampur-Ratlam, 220 KV Ujjain-Nagda, 220 KV Burwaha-Indore, 220 KV Burwaha-Indore-Ujjain at Bhopal-Dewas should be syncrhonised one by one.

E) After charging of all 220 KV, S/s in Indore & Ujjain area, all 132 KV lines in this area will be normalized gradually.

F) 220 KV Itarsi-Jabalpur & 220 KV Itarsi-Narsinghpur will be charged from Itarsi 220 KV S/s for synchronization with Amk-Birsinghpur-Tons supply if available, since 220 KV Itarsi & 220 KV Jabalpur S/s are also having synchronizing facility.

13.8.2 Amarkantak TPS:-

After getting start-up supply at 220 KV bus, the boilers of 210MW Unit no.5 will be lighted-up & units will be synchronized. Thereafter the Auto X'mer should be charged to extend supply to 132 KV bus & supply will be extended as hereunder:

i) 220 KV Amk-Anooppur -I & II will be charged.

ii) 220 KV Amk-Jabalpur and Amk-Sukha both ckt. Will be charged & ask. Jabalpur 220 KV S/s to put some load by charging 220/132 KV ICTs.

iii) If 132 KV supply is already available from Bargi Hydel Power Station at 132 KV bus of 220 KV S/s Jabalpur , then Bargi HPS & Amarkantak TPS supplies may be synchronized through 220 KV Amarkantak-Jabalpur ckt, synchronization facility is available at Jabalpur as well as ATPS end.

iv) Both 40 MVA X'mer should be charged & all 33 KV feeders should be normalized supplying power to coal mines area.

v) 220 KV supply to SGTPS Birsinghpur should be extended/ synchronized.

13.8.3 SGTPS Birsinghpur:-

During most of the system disturbances occurred in the past, supply of Birsinghpur Hydel Power Station when extended to the Thermal Power Station, could not be established due to voltage hunting. Therefore all efforts be made to extend supply to SGTPS, Birsinghpur from Amarkantak/ Tons Power House.

After getting established supply, first of all, 220 KV Nouroazabad traction feeders will be normalized. In the meantime boilers of all four units will be lighted-up & units will be synchronized.

13.8.4 Shri Singaji STPS :-

This OSP power house is a source to start-up supply to Singaji STPS. With the help of D.G. set one unit of OSP can be started & 220 KV supply can be extended through 220 KV OSP-Chhegaon then after charging 400/220KV ICT Start-up power to Singaji STPS also extended through 400KV Chhegaon-Singaji ckt. Thereafter system normalization is done as follows:-

1. 400 KV SSTPS - Julwania Ckt will be charged.
2. 400 KV SSTPS - Pitampur Ckt I&II will be charged.
3. 400/220 KV ICTs charged then
4. 220 KV SSTPS- Chheagaon ckt I&II will be charged.

13.9 Conclusion

In present scenario black-start activities are based on various parameters. If complete black-start is there, activities would be different and in case of partial black-start they are different. In complete black-start different islands need to be created with the help of Hydel units, capable of black-start and power needs to extend to thermal power Plants. Once thermal plants are on bar, load can be extended to various load centres, thus reviving the system. In case of portion black-start power can be taken from the area which is not dark and can be extended to thermal power plants. Simultaneously, Hydel units with black-start facility shall also be taken on bar for forming islands. Later on, all the islands need to be joined for forming the grid.

In present scenario, RE generators can also play a vital role in black- start activities .If system grid fails in the day time, power from solar generators or wind - generators (if available) may be extended to thermal plants and once thermal plants are available on bar, power can be extended to all load centres. In case grid fails in night hours wind generators can be of immense help.

Thus, it is clear that there cannot be one sure-shot method for black-start activities. It will depend upon grid failure/ tripping and availability of power in surroundings.

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14 Chapter 14: Cyber Security

14.1 Cyber intrusion attempts and Cyber-attacks:

In any critical sector are carried out with a malicious intent. In Power Sector it's either to compromise the Power Supply System or to render the grid operation in-secure. Any such compromise, may result in maloperations of equipment damages or even in a cascading grid blackout. Cyber Security deals with measures to be taken to safeguard the State grid from spyware, malware, cyber-attacks, network hacking, procedure for security audit from time to time, upgradation of system requirements and keeping abreast of latest developments in the area of cyber-attacks and cyber security requirements. The gain of sensitive operational data through such intrusions may help the Nation/State sponsored or non-sponsored adversaries and cyber attackers to design more sinister and advanced cyber-attacks. Central Electricity Authority (Cyber Security in Power Sector) Guidelines, 2021 are been followed at SLDC MP.

14.2 CERT-IN:

Government of India has set up the Indian Computer Emergency Response Team (CERTIn) for Early Warning and Response to cyber security incidents and to have collaboration at National and International level for information sharing on mitigation of cyber threats. CERT-In regularly issues advisories on safeguarding computer systems and publishes Security Guidelines which are widely circulated for compliances. All Central Government Ministries/ Departments and State/Union Territory Governments have been advised to conduct cyber security audit of their entire Cyber Infrastructure including websites at regular interval through CERT-In empanelled Auditors so as to identify gaps and appropriate corrective actions to be taken in cyber security practices. The **Responsible Entity** must submit Reports of Cyber Audit of cyber security controls, architecture, vulnerability management, network security and periodic cyber security drills to sectoral CERT as well as CERT-In. Team of experts shall review these reports and shortcomings if any in the compliances shall be flagged by them. SLDC MP acquired ISO/IEC 27001 certification.

14.3 Responsible Entity:

CEA (Cyber Security in Power Sector) Guidelines, 2021 defined 'Responsible Entity'

a) Transmission Utilities as well as Transmission Licensees,

b) Load despatch centres (State, Regional and National),

c) Generation utilities (Hydro, Thermal, Nuclear, RE),

d) Distribution Utilities

e) Generation Aggregators,

f) Trading Exchanges,

g) Regional Power Committees, and

h) Regulatory Commissions.

These guidelines are applicable to all Responsible Entities as well as System Integrators, Equipment Manufacturers, Suppliers/Vendors, Service Providers, IT Hardware and Software OEMs engaged in the Indian Power Supply System. SLDC MP nominated Chief Information Security Officer for proper execution of guidelines.

14.4 Sectoral CERTs in Power Sector:

On Central Electricity Authority (Cyber Security in Power Sector) Guidelines, 2021, Ministry of Power has created 6(six) sectoral CERTs namely Thermal, Hydro, Transmission, Grid Operation, RE and Distribution for ensuring cyber security in Indian Power Sector. Each Sectoral CERT has prepared their sub-sector specific model Cyber Crisis Management Plan(C-CMP) for countering cyber-attacks and cyber terrorism. Each Sectoral CERT has circulated their model C-CMPs for preparation and implementation of organization specific C-CMP by each of their Constituent Utility.

14.5 Objective of issuing Guideline:

a) Creating cyber security awareness,
b) Creating a secure cyber ecosystem,
c) Creating a cyber-assurance framework,
d) Strengthening the regulatory framework,
e) Creating mechanisms for security threat early warning, vulnerability management and response to security threats,
f) Securing remote operations and services, g) Protection and resilience of critical information infrastructure,
g) Reducing cyber supply chain risks,
h) Encouraging use of open standards,
i) Promotion of research and development in cyber security,
j) Human resource development in the domain of Cyber Security,
k) Developing effective public private partnerships,
l) Information sharing and cooperation
m) Operationalization of the National Cyber Security Policy

SLDC MP strictly adhere to framed cyber security policy:

i. Isolation of the OT Systems from any internet facing IT system is done.
ii. As per guidelines, kept only one the IT systems with internet & is isolated from all OT zones.
iii. Downloading/Uploading of any data/information from their internet facing IT system is done only through an identifiable whitelisted device followed by scanning of both for any vulnerability/malware and for all such activities digital logs are maintained and retained under the custody of CISO for at least 6 months.
iv. List of whitelisted IP addresses for each firewall is maintained by CISO and each firewall is configured for allowing communication with the whitelisted IP addresses only.
v. The Responsible Entity shall be ISO/IEC 27001 certified (including sector specific controls as per ISO/IEC 27019).
vi. SLDC MP have a Cyber Security Policy drawn upon the guidelines issued by NCIIPC.

vii. SLDC MP officials used to attend Cyber Security training programs regularly conducted by NPTI and shall maintain the list of the Participants successfully completing the course.

viii. SLDC MP ensure that none of their newly hired or the current Personnel have access to the Critical System.

14.6 Mechanism of Reporting:

i. The following cyber security incidents must be reported to CERT-GO/NCIIPC in a pre defined format within one hour of occurrence of the incident or noticing the incident. The incident reporting format have been referenced from CERT-In & NCIIPC website.

ii. Targeted scanning/probing of critical networks/systems like SCADA/EMS,ABT,OA& MIS system.

iii. Compromise of critical systems/information

iv. Unauthorised access of IT system/data

v. Defacement of website or intrusion into a website and unauthorised changes such as inserting malicious code, links to external websites etc.

vi. Malicious code attacks such as spreading of virus/worms/Trojan/Botnet/Spyware

vii. Attack on servers such as Database, Data Server and network devices such asrouters

viii. Identity Theft, spoofing and phishing attacks

ix. Denial of Service (DoS) and Distributed Denial of Service (DDoS) attacks.

14.7 Cyber Security Audit:

Cyber Security Audit is being conducted at SLDC MP as per the guidelines mentioned in the CEA (Cyber Security in Power Sector) Guidelines, 2021

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15 Chapter 15: Grid Disturbances

Risk Number:	**1**
Risk Name/ Title:	**Grid Disturbances**
Department:	**SLDC**
Risk Category:	**Operational**
Risk Rating:	**Very Low/Low/Medium/High/Very High**

S. No.	Description of Risk	Mitigating measures	Future Course of Action, if any
1.	• Redundancy in the system.	• Redundancy has been built In the transmission systems In most cases.	• Areas in which network needs strengthening should be identified and new projects should be commissioned post agreement with MPERC and beneficiaries.
2.	• Non-maintenance of grid discipline by utilities. - Grid Frequency Grid voltage with intolerance limit. - Complying with directives w.r.t drawal of power by the utilities. - Load and generation imbalance.	• All constituents are required to abide by the directives of RLOCs to ensure efficient Grid Functioning. • Real time monitoring of actual demand, availability and drawal is done at RLDCs/NLDCs to ensure that utilities maintain Grid balance. • In case of non-compliance by constituents, escalation mechanism is in place to different levels like MoP/CEA. Penalties may be enforced for noncompliance. • MPPTCL employs modern load despatch and communication systems	• MPPTCL has initiated a Smart Grid process to assist in following- - Manage load generation balance -Active and Reactive power management -Voltage control etc. - Self healing grid • The company-has started-WideArea Monitoring system (WAMS) by deploying Phaser Measurement Units {PMU) in order to have a dynamic view of the Grid at all times.

S. No.	Description of Risk	Mitigating measures	Future Course of Action, if any
		and methods to ensure Grid discipline, • Automatic load shedding equipments have also been installed. • Special protection schemes have been developed for system protection.	
3.	• Non adherence to Operating norms. • Natural calamities like floods /river changing course l fog etc. • Pollution deposit on porcelain insulators on transmission lines and substations during winters.	• Operating norms are defined by MPERC, adherence is monitored by utilities themselves and also by RLDCs, if required. • Disaster Management Committees have been formed to develop action plans in case of exigencies. Company has Emergency Restoration System (ERS) in place to be applied in case of such emergency to temporarily restore the line while the repair work is in progress. • Mock drills are done periodically for the action plans developed. • Phased replacement of porcelain insulators with polymer insulators having better performance under pollution. • Live line washing of the insulators is also being carried out at least twice in a year.	
	• Functioning of critical systems	• State-of-the-art Unified Load Despatch	

S. No.	Description of Risk	Mitigating measures	Future Course of Action, if any
	(SCADA, load despatch system). • Absence of BCP/DRP plan for Grid management. • Non upgradation of existing technologies and back up for data centers. • Lack of protection against cyber crimes.	& Communication (ULDC) schemes are in place to bring quality and economy in operation of power system besides improving data availability, visibility and transparency. • Modernization of SLDC along with state/sub state load despatch centers and dedicated communication schemes in all regions. SLDC linked with all the 3 Sub-LDCs and also has the 'backup'. For protection against cyber crimes Firewalls have been installed and data redundancy has also been kept in place.	
	• Growing complexities in Power System. • Handling obsolescence of equipment. • Phased upgradation may lead to System integration issues.	Periodic upgrades in technology, systems and manpower capabilities are being done.	• Policy decision on 'the method of upgradation of old/obsolete equipments at the same time may be taken. • Efforts may be made for development of new vendors for support in case inability by the original supplier. • Proactive communication with SEBs/ SLDCs may be required as upgradation needs to be done in coordination with the states.

S. No.	Description of Risk	Mitigating measures	Future Course of Action, if any
	• Lack of proper physical security of the Control Center and Power System.	• There are security guards at all critical locations in and around the Control center. • All restricted areas have been clearly demarcated in the centre. • Regular surveillance is being done by way of CCTV installed at all critical points.	
	• Lack of proper cyber security measures.	• Adequate firewalls have been installed and adequate data redundancy has been built in a system.	
	• Lack of control over relevant data abuse.	• There are adequate measures in places for control over relevant data.	
	• Liability due to loss of business by third party.	• MPPTCL has included indemnification in all its contracts with third parties and has adequate Insurance cover as well. • O&M procedure, safety guidelines and technical circulars are issued to ensure safe efficient and reliable operations.	

CYBER SECURITY RISKS

Risk Number:	**2**
Risk Name/ Title:	**Information Technology Loss/ Leakage of ation data**
Department:	**SLDC**
Risk Category:	**Operational**
Risk Rating:	**Very Low/Low/Medium/High/Very High**

S. No.	Description of Risk	Mitigating measures	Future Course of Action, if any
1.	Cyber-attack on IT & OT systems of SLDC (SCADA/EMS system, URTDSM/REMC/AMR, ABT and Communication system).	• All the IT & OT systems of SLDC are declared as Critical Information Infrastructure (CII) and monitored through Information Security Steering Committee (ISSC) having NCIIPC as member. • Cyber Crisis Management Plan (CCMP) is implemented after due approval from CERT-In. • All the guidelines of CERT, NCIIPC, CSK, CEA is followed strictly. • Periodic Cyber Security Audit, VAPT and Risk assessment is conducted regularly and action as per audit observation is taken whenever required.	Formation of Information Security Division (ISD) along with Security Operation Centre (SOC) is under consideration.
2.	**Legacy in OT systems: -**	Implemented network segmentation to	Periodic upgradations of OT Systems are done

S. No.	Description of Risk	Mitigating measures	Future Course of Action, if any
	Integration of legacy OT(such as Unsupported Windows OS ,patches are not updated by OEMs and various application dependencies) with traditional IT systems can introduce vulnerabilities.	isolate critical OT components, conduct thorough risk assessments before integration, and consider upgrading or replacing outdated systems when feasible.	such as replacement/upgradation of SCADA/EMS system is under progress.
3.			
4.			
5.			

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16 Chapter 16: ISO Quality Management System Certification

STANDARD ISO 9001 : 2015

ISO implementation and certification

The Ministry of Power (MOP), Government of India, has formulated a committee on Manpower, Certification and Incentives for System Operation and Ring fencing of Load Despatch Centres. As per the recommendation of the committee, SLDCs are required to obtain ISO certification In 2011, M/s Integrated Quality Certification Pvt. Ltd. Bangalore, a certification body having accreditation with National Accreditation Board of Certification Bodies (NABCB), accessed the Quality Management System of State Load Despatch Centre and certified that MP SLDC conforms the quality management system standard ISO 9001 : 2015 (Previously ISO 9001: 2008) for “operation of Integrated Grid Services with a focus on reliable, Secure and Economic Operations in accordance with Grid Standard laid down in the Grid Codes”. Copy of Certificate is given below. In addition to this SLDC MP has been awarded ISO 27001:2013 for ISMS (Information Security Management System) in 2019 by M/s KVQA Certification Services Pvt Ltd, Noida.

www.iqcglobal.com

QM 004, EM 016
OHSMS 004

Certificate of Compliance

INTEGRATED QUALITY CERTIFICATION PVT. LTD.

Hereby certifies that the quality management systems of

State Load Dispatch Centre
(M.P. Power Transmission Company Limited)

State Load Despatch Centre,
MPPTCL, Nayagaon, P.O Vidyut Nagar,
Rampur, Jabalpur - 482 008,
Madhya Pradesh, INDIA.

has been assessed and conforms to the
quality management systems standard
ISO 9001 : 2008

Scope: Operation of Integrated Grid Activities with a Focus on Reliable, Secure and Economic Operations in Accordance with Grid Standards and Grid Codes.

EA/NACE	: 25/40.12	Initial issue date	: 15.03.2011
Exclusion(s)	: 7.3, 7.5.4	Current issue date	: 04.07.2014
Certificate number	: IND/QMS/NAB-C1999/RC1/1561	Valid from	: 04.07.2014
Attachment(s)	: None	Valid till	: 03.07.2017

H. Narasimhaiah
Director

This certificate is valid subject to periodic surveillance audits of the quality management systems within the above defined scope as per the agreed contract terms and conditions. The organisation shall provide written notification to Integrated Quality Certification Pvt. Ltd. of any significant changes which have impact on the scope of this certificate of compliance.

Corporate Office : Platinum City, G/13/03, Site # 02, Next to CMTI, HMT Road, Yeshwanthpur Post, Bangalore - 560 022, INDIA. Tel : +91(80) 41172752, 41277353 Fax : +91(80) 41280347
Email : iqccorporate@iqcglobal.com Website : www.iqcglobal.com

Please visit www.iqcglobal.com and / or www.jas-anz.com
to verify the authenticity and validity of this certificate of compliance

ABBREVIATIONS

ABT	------	Availability Base Tariff
AMR	------	Automatic Meter Reading
ATC	------	Availability Transfer Capability
AUFLS	------	Automatic Under Frequency Load Shedding
BSC	------	Balancing & Settlement Code
CEA	------	Central Electricity Authority
CERC	------	Central Electricity Regulation Commission
DCCs	------	Distribution Control Centre's
DSM	------	Deviation Settlement Mechanism
Dtb	------	Deviation in Time Block
EA 2003	------	Electricity Act 2003
FGMO	------	Free Governor Mode of Operation
FSCs	------	Fixed Series Capacitors
GCC	------	Generation Control Centre
HVDC	------	High Voltage Direct Current
ICT	------	Inter Connecting Transformer
IEGC	------	Indian Electricity Grid Code
IPPs	------	Independent Power Producers
ISTS	------	Inter State Transmission System
ISGS	------	Inter State Generating Stations
JMR	------	Joint Meter Reading
LTOA	------	Long Term Open Access
MPEGC	------	Madhya Pradesh Electricity Grid Code
MPERC	------	Madhya Pradesh Electricity Regulation Commission
MPOCCM	------	Madhya Pradesh Operation & Coordination Committee Meeting
MPPGCL	------	Madhya Pradesh Power Generating Company Limited
MPPMCL	------	Madhya Pradesh Power Management Company Limited
MPPTCL	------	Madhya Pradesh Power Transmission Company Limited
MRI	------	Meter Reading Instrument
NLDC	------	National Load Despatch Center

NPC	------	National Power Committee
OAC	------	Open Access Customer
OAG	------	Open Access Generator
PSS	------	Power System Stabilizers
RGMO	------	Restricted Governor Mode of Operation
SDSMA	------	State Deviation Settlement Mechanism Account
SEA	------	State Energy Account (Previously known as Inter Company Energy Account)
SEMS	------	Special Energy Meter System
SLDC	------	State Load Despatch Center
SPS	------	System Protection Schemes
SRA	------	State Reactive Account
SSGS	------	State Sector Generating Stations
T- GNA	------	Short Term Open Access
STU	------	State Transmission Utility
SVCs	------	Static VAR Compensators
TRM	------	Transmission Reliability Margin
TTC	------	Total Transfer Capability
WRLDC	------	Western Load Despatch Center
WRPC	------	Western Region Power Committee