

पश्चिमी क्षेत्र के लिए
संचालन प्रक्रिया

OPERATING PROCEDURE
FOR
WESTERN REGION



Western Regional Load Dispatch Centre,
Plot No. F-3, MIDC Area, Marol, Andheri (East), MUMBAI. Pin:400 093

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DISCLAIMER

The internal Operating Procedure for WR was developed by WRLDC in consultation with regional constituents in pursuance of clause 6.1 of then IEGC, in November 2000. Subsequently revision in the Operating Procedures carried out by WRLDC was in line with wide-ranging changes in the power sector during the intervening period.

This Operating Procedure is revision of the operating procedure issued by WRLDC in December 2010 .The revision is inline with clause 5.1(f) of IEGC 2010 and in compliance with clause 1.4 of this document

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, shall prevail.



Operating Procedure for Western Region

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CHAPTER 1

GENERAL

1.1 Introduction

In compliance to the requirement of the then IEGC clause No.5.1 (d), WRLDC developed the first internal operating procedure for WR in consultation with regional constituents in November, 2000.

With the operation of N-E-W grid w.e.f. 26th August, 2006, there was a paradigm shift in grid operation. The Indian Electricity Act, 2003 ushered in Short Term Open Access across and within the region leading to additional thrust development of Power market and on economic transactions. The coming up of power exchanges paved way for expansion of Power market and further crystallized additional economic transactions based on double sided bidding by buyers and sellers. All such factors resulted in an urgent need to revise the Internal Operating Procedures. Thus the first revision of Operating Procedures was carried out by WRLDC in June'2008. The operating procedure was revised in December 2010 after due consultations with WR constituents and WRPC. The OCC committee members discussed the procedure in 416th and 417th OCC. The procedure was approved in the meeting dated 14/12/2010.

This document is brought out in line with IEGC 2010 Clause 5.1 (f), which states that 'A set of detailed operating procedures for each regional grid shall be developed and maintained by the respective RLDCs (WRLDC in this case for WR) in consultation with the regional entities for the guidance of the staff of RLDC and shall be consistent with IEGC to enable compliance with the requirement of this IEGC'.

This updated procedure is brought out to meet a single set of procedures for guidance of all the users. The procedure was approved in the 424th OCC of WR.

1.2 Scope

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.

1.3 Objective

Objective of this document is to comply with clause 5.1(f) of IEGC 2010. Accordingly the procedures adopted for the integrated system operation and roles of each agency and their responsibilities are outlined. This document aims at operation, maintenance and development of regional power system in the most reliable, secure, efficient, and economic manner. This document also includes procedures to facilitate beneficial trading opportunities to harness bottled up power including renewable energy.

1.4 Maintenance of Operating Procedures

These procedures shall be maintained and reviewed periodically. However, in case of urgent need arising due to operating problems, the procedures can be reviewed/ revised expeditiously. WRLDC will be the coordinating agency for updating/review of Operating Procedures. All modifications/reviews will be done with the consent of all constituents, WRLDC & WRPC.

1.5 Structure of Operating Procedures

The operating procedures of Western Region have following structure:

(A) Chapters

1. General
2. Network Security
3. System Operation
4. Demand Estimation & Control
5. Outage Planning
6. Short Term Open Access



7. Scheduling and Dispatch
8. Grid disturbances and restoration
9. Event information and reporting
10. Settlement System
11. SCADA & Communication system
12. Energy Management System and other advanced power system tools

(B) ANNEXURES

Annexure No.	Description
I.	The important flow-gates of Western region with the limits (MW & Angular separation)
II.	Important elements of the Western regional grid
III.	The approved Automatic Under Frequency Load Shedding Scheme/Composite defense Plan
IV.	The Automatic Under Voltage Relay Load Shedding Scheme
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CHAPTER 2

NETWORK SECURITY

2.1 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 WR grid or outside WR grid due to outage of critical corridors in NEW grid. It also describes the actions required to maintain system parameters close to normal values in day-to-day operation.

2.2 Network Security

2.2.1 Background

The Indian Power Grid has two synchronous grids i.e., NEW grid comprising Northern, Eastern, North-Eastern & Western regions and Southern region grid. The NEW grid caters about 95,000 MW of demand with a peak shortage of 9,000 MW with about 1,73,262 MW capacity on bar. The NEW 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 2,500 MW/Hz. However, synchronisation has also resulted in evolution of different contingencies of critical nature in the grid, some of which are due to the events occurring outside the region of control, which has a potential to snowball in to credible contingency in the region.

In addition, there may be events beyond the control of operators such as extreme weather conditions affecting the reliability of transmission system, uneven demand growth, delay in commissioning of generators/transmission elements etc which needs to be addressed.

2.2.2 Measures to ensure Network Security and Reliability

In order to maintain the security of the Regional power system, it is necessary to follow the various clauses mentioned in the IEGC 2010 under Chapter 5.

Particularly it is important that the planned outages of generation and transmission system in the important flow-gates are properly coordinated as detailed in IEGC 2010 clause 5.7. The important flow-gates of Western region with the limits (MW & Angular separation) are at Annex-I. Important regional grid elements of the Western regional grid which have a bearing on the network security are at Annex-II.

The annual outage planning is reviewed on quarterly and monthly basis in the OCC forum of WRPC.

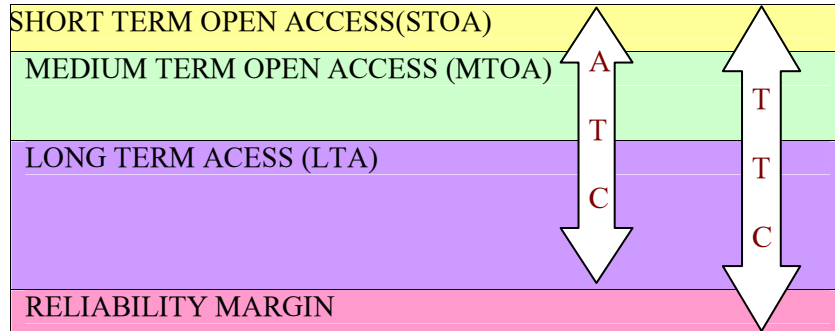
As per clause 5.2(c) of IEGC 2010 no important element shall be deliberately opened or removed from service without concurrence of WRLDC. In the event of tripping of any of the above elements, WRLDC shall be informed within ten minutes of the event or as soon as possible as per clause 5.2(d) for further necessary action.

2.2.2.1 Available Transfer Capability

Available Transfer Capability (ATC) is a measure of the transfer capability remaining in the physical transmission network for further commercial activity over and above already committed uses. It is derived from the Total Transfer Capability (TTC) after

discounting the reliability margins. Thus $ATC = TTC - \text{Reliability Margins}$. This ATC is for scheduling long term, medium term and short term transactions on the interregional links.

In other words the simultaneous net total import or export of a particular region must not exceed the ATC in the respective direction.



Reliability margins are also required to take care of the inherent uncertainties in projecting transfer capability over longer time periods. These margins are necessary for reliable transmission services to all transmission system users under a broad range of potential system conditions. Margins in the form of Transmission Reliability Margin (TRM) and Capacity Benefit Margin (CBM) must be kept aside to provide operating flexibility in real time.

Transmission Reliability Margin (TRM)

TRM as the amount of transmission transfer capability necessary to provide a reasonable level of assurance that the interconnected transmission network will be secure. TRM accounts for the inherent uncertainty in system conditions and its associated effects on ATC calculations, and the need for operating flexibility to ensure reliable system operation as system conditions change.

Capacity Benefit Margin (CBM)

CBM is defined as that amount of transmission transfer capability reserved by load serving entities to ensure access to generation from interconnected systems to meet generation reliability requirements. CBM would take into account the non-simultaneous and simultaneous over drawl/ under drawl by the state constituents resulting from demand forecast error or the sudden outage of the largest size generating unit in a control area.

In real time operation, the TRM and the CBM would actually be used up wholly or partly by utilities in the grid. However, the system operator must always ensure that the system is secure all the time for withstanding the next contingency.

It is therefore imperative that the exchanges between regions are contained to a level of ATC and in no case exceed the TTC between the regions. All the regional constituents will reduce their drawl to the level advised by WRLDC whenever such breach in TTC level among the regions takes place to ensure the grid security irrespective of frequency and schedule. The detailed calculations of TTC / ATC of Western region with Eastern region, Northern region and Southern region

2.2.2.2 Defense Mechanism

The following defense mechanism is operational in Western Region to take care of credible contingencies, splitting of system etc., so as to ensure safe and secure grid operation.

1) Automatic Under Frequency Load Shedding Scheme.

In line with clause 5.2(n) of IEGC, all SEBS, distribution licenses /STUs shall provide Automatic Under Frequency and df/dt load shedding in their respective system to arrest frequency decline that could result in a collapse / disintegration of the grid as per the scheme formulated by WRPC forum and shall ensure its effective application at all times to prevent cascade tripping of generating units in case of any contingency. All SEBs, distribution licencess SLDC etc shall ensure the above under frequency and df/dt load shedding/ islanding schemes are always functional. SLDC shall furnish monthly report of UFR and df/dtr relay operation in their respective systems to the WRPC. WRLDC shall inform WRPC Secretariat about instances when the desired load relief is not obtained through these relays in real time operation. WRPC Secretariat shall carry out periodic inspection of U/F relays and maintain proper records of the inspection. WRLDC shall keep a comparative record of expected load relief and actual load relief obtained in Real time system operation. A monthly report on expected load relief vis-à-vis actual load relief shall be sent to the RPC and the CERC.

It is extremely important that there should be no overlapping between the areas covered by under frequency load shedding and that included in the manual load shedding plan as part of demand control. The approved Automatic Under Frequency Load Shedding Scheme (AUFLS) and df/dt scheme is at Annex-III.

2) Automatic Under Voltage Relay Load Shedding Scheme

In addition to AUFLS and df/dt scheme, Automatic Under Voltage Relay Load Shedding Scheme to prevent voltage collapse in the system is deployed in WR as given at Annex-IV.

3) Islanding Scheme

To avoid total black out of the grid during system disturbances and for early normalisation, the procedure for islanding of systems and major generating stations with associated loads may be developed constituent-wise. The islanding schemes shall be developed/reviewed in OCC/PCC of WRPC. The details of such schemes shall be available with WRLDC, concerned SLDCs and WRPC. The details of present island schemes which are operational in WR are provided at Annex-V.

4) Contingency Action

It is desirable to have a ready reckoner which suggests remedial actions in case of credible contingencies which would assist the system operator to take quick and informed decisions. Such ready reckoner may be prepared and reviewed by WRLDC at regular intervals. The present ready reckoner available at WRLDC is enclosed at Annex-VI.

2.2.2.3 Congestion Management:

Congestion Management in a real time system is tackled as per CERC regulation No. L-7/139(159)/2008, dated 22nd December 2009.on “measures to relieve congestion in real time operation”,

The relevant applicable provisions are briefed below:



2.2.2.3.1 Applicability of Congestion Charge.

(1) To relieve congestion in the real time, a congestion charge shall be applied as a commercial measure. The congestion charge will be payable by a Regional entity or entities causing congestion in the inter-regional link or intra-regional link and receivable by a Regional entity or entities relieving congestion.

(2) Congestion charge may be imposed on any Regional entity or entities in any Region or Regions for causing congestion and paid to any Regional entity or entities in any Region or Regions for relieving congestion as per the detailed procedure under these regulations formulated by NLDC and approved by the Commission.

(3) The congestion charge shall be payable by the overdrawing regional entity in addition to the Unscheduled Interchange charges which would be payable as per Central Electricity Regulatory Commission (Unscheduled Interchange charges and related Matters) Regulations, 2009 or any reenactment thereof.

2.2.2.3.2 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.

2.2.2.3.3

Notice for application of congestion charge. When, in the opinion of the National/Regional Load Dispatch Centre, flow of electricity on an interregional/intra-regional corridor/ link used for transfer of electricity has crossed the ATC of such corridor/link, the NLDC/RLDC shall issue a warning notice to the defaulting entities. If the flow of electricity on the inter-regional /intra-regional corridor/ link exceeds the TTC, the NLDC/RLDC may, after notice through fax/voice message and through posting on its website and the common screen available on the Energy Management System, which is common to NLDC, RLDC and SLDCs, decide to apply congestion charge on the defaulting entities from a particular time-block in accordance with regulation 4: Provided that notice of at least two clear time blocks shall be given by the Regional Load Dispatch Centre before congestion charge becomes applicable, not counting the time block in which the notice is issued.

2.2.2.3.4

Notice for withdrawal of congestion charge. When in the opinion of the National / Regional Load Dispatch Centre, flow of electricity on the affected- 5 -transmission link /corridor has come down to the ATC, 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: Provided that notice of one time block shall be given by the Regional Load Dispatch Centre before congestion charge is withdrawn, not counting the time block in which the notice is issued.

The relevant formats are given at Annex-XII



2.2.2.4 Operational Areas of Importance

The following areas need careful implementation by the concerned constituents / stations:-

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.

i) 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. This should be done after taking all suitable precautions to avert inadvertent tripping.

ii) The substation operators must ensure the above condition even when any lightly loaded line is opened to control over 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.

iii) Single pole auto re-energise facility on 765 and 400 kV lines should always be in service. WRLDC shall be informed for taking this facility in real time operation out of service. . Likewise, in case any transfer breaker at any 400kV substations having two main and transfer bus scheme is engaged, the same would be informed to WRLDC.

iv) 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 Central Transmission Utility (CTU)/ WRPC. At present a PSS Tuning is carried out as per WRPC approved plan for 210 MW units and above.

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

vi) All constituents would also maintain in good operating conditions of all control measures such as defense mechanism, SPS, U/F & U/V load shedding, AVRs, PSS, RGMO, 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.

vii) In line with sections 5.2(f), 5.2(g) 5.2(h) and 5.2(i) of the IEGC, the generating units should ensure restricted governor mode of operation. The list of eligible units as per the new IEGC is at Annexure-VII

(C) Switching Diagram:

One copy of switching diagrams of all generating stations (100 MW and above) and all substations of 765 kV and 400kV, important 220kV and 132kV substations especially those involved in the evacuation of generation shall be kept at concerned



SLDCs, WRLDC, CPCC and WRPC Secretariat to enable to co-ordinate the system operation, outages, system restoration and operational analysis. The same shall be updated from time to time.

2.2.2.5) Recording Instruments, Voice and Communication Facilities

i) The recording instruments such data acquisition system, disturbance recorder, event logger, fault locator, time synchronization equipment, voice recorder and any other such equipment in each generating station / sub-station / control centre / SLDCs / WRLDC shall be kept in good working condition in order to record the events and sequence. 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 WRPC Secretariat.

ii) Each regional constituent shall provide adequate and reliable communication facility internally and with other constituents / RLDC 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.

iii) 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 Dispatch Centre and agree to maintain the communication system in good condition.

iv) In line with Central Electricity Authority (Technical Standards for Connectivity to Grid) Regulations 2007, every generating station and substation connected to the grid at 220kV or above shall be provided with disturbance recording (DR) and event logging facilities. All such equipment shall be provided with time synchronization facility for common time reference.

v) 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.



CHAPTER 3

GRID OPERATION

3.1 Grid Operation

For safe and secure grid operation, it is imperative that system parameters i.e., frequency, voltage etc., remain close to nominal values. This section highlights the measures to be adopted by the System Operators at WRLDC / SLDCs / ISGS / substations for frequency and voltage control.

3.1.1 Frequency Control

3.1.1.1 Frequency Band

All the regional constituents would make all possible efforts to ensure the maintenance of grid frequency within the normal IEGC band that is 49.5 to 50.2 Hz. This would be ensured by implementing following measures.

- i) Each SLDC shall regulate the load / own generation under its control so that it may not draw more than its schedule whenever the system frequency is below 49.5 Hz and less than its drawl whenever frequency is above 50.2 Hz.
- ii) Each of the interstate generating stations (ISGS) shall maintain generation such that it may not generate more than its schedule whenever the system frequency is above 50.2 Hz and less than its schedule whenever frequency is below 50.0 Hz.
- iii) In case of shortfall situation in any State constituent even after requisitioning full entitlement, it shall strive to bridge the shortfall through STOA or power exchange. In case of surplus situation in any State constituent, it may reduce requisition or sell through STOA / power exchange.
- iv) In no case, a constituent would resort to over drawal at a frequency of 49.5 Hz and below. Similarly, no constituent would under drawl or ISGS generate more than schedule at frequency above 50.2 Hz.
- vi) Whenever frequency falls below 49.5 Hz, all partly loaded generating units, particularly of overdrawing constituents shall pick up additional load to come back declining system frequency.
- vii) As per clause 5.2(j) IEGC 2010, Sudden reduction in generator output by any constituent by more than 100 MW without consent of WRLDC shall be avoided except under emergency or to prevent imminent damage to costly equipment, particularly when frequency is falling or is below 49.50 Hz. Similarly any user/SEB shall not cause a sudden variation of load by more than 100 MW without consent of WRLDC.

3.1.1.2 Measures during high frequency conditions

Based on the scheduled load shedding programme, hydro pick up, change in STOA schedules and load ramp ups, SLDCs & RLDCs shall anticipate possible frequency rises at the beginning of each hour and initiate advance actions. When the system frequency is above 50.2 Hz and in the rising trend:

- i) WRLDC will coordinate with neighboring regions to maximize export of UI power.
- ii) All ISGS shall endeavor to restrict their actual net injection to within their scheduled dispatch. All constituents shall follow frequency linked dispatch guidelines.
- iii) All the constituents shall endeavor to ensure that their drawl from the grid is not less than their schedule by following actions:-

- Phase out scheduled load shedding
- Surrender relatively high cost entitled power from ISGS through revision of schedules.
- Follow merit order and conserve fuel by reducing or shutting down high cost generators including IPPs.
- Explore additional export through STOA.

- iv) All constituents shall stagger their loading pattern to make the load curve as flat as possible so as to arrest stiff high frequency excursions during load changeover period.



v) In case of persistent (based on merit order) high frequency, all constituents may resort to shutting down of generators in the event of threat to grid security as per directions of WRLDC.

3.1.1.3 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 STOA and (PX) collective transactions. Inform WRLDC about the unscheduled load shedding planned to manage the deficits on day-ahead basis. For distress load shedding, all SLDCs to check the availability of “list of radial feeders (pre-identified)” and assess load relief obtainable. When the system frequency is below 49.5 Hz and in the decaying trend:

- i) WRLDC will coordinate with neighboring regions to maximize import of UI power.
- ii) All ISGS shall endeavor to maintain their actual net injection to as per their scheduled dispatch.
- iii) All the constituents shall endeavor to ensure that their drawl from the grid is not more than their schedule by maximizing generation in line with frequency linked dispatch guidelines, implement unscheduled/distress load shedding. They may arrange to buy power through STOA to ensure drawl as per schedule. The over drawal messages in format A/B/C will be issued as per the philosophy discussed in 411th OCCM held on 13/05/2010. The details are given at Annex-VIII.
- iv) WRLDC would advise any constituent overdrawling below 49.7 Hz to restrict its drawal within its schedule with a message of Type A in the format given at Annex-IX.
- v) If frequency further deteriorates and goes below 49.5 Hz and the over drawal of the constituent continues, WRLDC shall issue the IEGC violation message of Type B & C in the format given at Annex-X and Annex-XI.
- vi) Each regional constituent shall make arrangements that will enable manual demand disconnection to take place as instructed by WRLDC/SLDCs under normal and contingent conditions.
- vii) The measures undertaken to reduce the drawl from the grid shall not be withdrawn as long as the frequency / voltage remain at a low level unless specially permitted by WRLDC.
- viii) In case of certain contingencies and / or threat to system security, WRLDC may direct SLDCs to decrease its drawl by a certain quantum. Such directions shall immediately be acted upon.
- ix) A comprehensive defense plan of Western region is enclosed at Annex-III. SLDCs to implement measures under the comprehensive defense plan and inform WRLDC accordingly.

In line with Central Electricity Authority (Grid Standards) Regulations 2010, regulation 9&10, the utilities shall make arrangements for automatic load shedding and islanding schemes to ensure system security.

3.1.1.4 Restricted Governor Mode of Operation (RGMO)

Constituent would ensure that the generating units synchronized with the grid are operated on Restricted Governor Mode of Operation in line with section 5.2(f) of IEGC

The summary of eligible units and their capacity with other details are given at Annexure-VII

3.1.1.5 Inter-regional Exchanges

WRLDC shall endeavor to exchange power with the neighboring regions on opportunity basis in addition to the inter-regional bilateral agreements under STOA and collective transactions. However, during the process of transfer of STOA or UI power from/to other regions at times, there could be a possibility of negative UI i.e., UI power flowing from lower frequency to higher frequency in situations like:

- Ramping up/down of HVDC
- Load changeover period of either of the regions
- Network contingent conditions in either of the regions
- Wheeling of other regions power during contingencies
- Testing / maintenance of important elements
- Providing power assistance during emergency



Inter regional exchanges more than schedule at low frequency will be intimated to NLDC for corrective action as per the format given at Annex-XIII.

In case of TTC violation on inter regional corridor, TTC violation message will be issued to NLDC for corrective action as per the format given at Annex-XIV.

Incase violation is caused by injection of generation by WR constituents, TTC message will be issued to defaulting constituents.

3.1.2 Voltage Control

3.1.2.1 Operating Range

a) 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:

(Voltage in rms kV)

NOMINAL kV	MAXIMUM kV	MINIMUM kV
765	800	728
400	420	380
220	245	198
132	145	122

The maximum and minimum values in the above table are the outer limits and all the constituents who endeavor to maintain the voltage level within the above limits.

b) For voltage control, action would be initiated to take in Bus Reactors at a Bus, whenever voltage at the Bus goes above 410 kV and is on rising trend. Similarly, take out Bus Reactors at a Bus, whenever voltage at the Bus goes below of 390 kV and is on lowering trend.

3.1.2.2 AVRs of Generators

All generating units shall keep their Automatic Voltage Regulators (AVRs) in operation and shall be tuned in line with clause 5.2(k) of IEGC.

3.1.2.3 VAR Exchange by constituents for Voltage and Reactive Control

Each constituent shall provide for the supply of its reactive requirements including appropriate reactive reserves, and its share of the reactive requirements to support safe and secure power transfer on interconnecting transmission circuits. VAR compensation shall be met locally. The constituent states shall take action in regard to VAR exchange with the grid looking at the topology and voltage profile of the exchange point. In general, the beneficiaries shall endeavor to minimize the VAR drawl at interchange point when the voltage at that point is below the nominal value and shall not inject VARs when the voltage above the nominal value. In fact, the beneficiaries are expected to provide local VAR compensation so that they do not draw any VARs from the grid during low voltage conditions and do not inject any VARs to the grid during high voltage conditions.

3.1.2.4 VAR generation / absorption by generating units

In order to improve the overall voltage profile, the generators shall run in a manner so as to have counter balancing action corresponding to low/high backbone grid voltage and to bring it towards the nominal value. In order to achieve the same, all generators shall generate reactive power during low voltage conditions and absorb reactive power during high voltage conditions as per the capability limit of the respecting generating units. The online tap changes (OLTC) on the generator transformer wherever possible may also be used to achieve this when ever required. Off load tap changes should be used to take care of the seasonal variations in the voltage profile.



3.1.2.5 Transformer Taps

In line with IEGC clause 6.6.5, the transformer tap positions on different 765 and 400 kV class ICTs shall be changed as per requirements in order to improve the grid voltage. WRLDC shall coordinate and advise the settings of different tap position and any change in their positions shall be carried out after consultation with WRLDC.

3.1.2.6 Control of Voltage at grid substations/generating stations

Following corrective measures shall be taken in the event of voltage going high / low:-
i) In the event of high voltage (when the voltage goes above 410 kV), following specific steps would be taken by the respective grid substation/generating station at their own, unless specifically mentioned by WRLDC/SLDCs.

- The manually switchable capacitor banks be taken out
- The bus reactor be switched in
- The switchable line/tertiary reactor are taken in
- All the generating units on bar shall absorb reactive power within the capability curve
- Operate synchronous condensers wherever available for VAR absorption
- Operate hydro generator / gas turbine as synchronous condenser for VAR absorption wherever such facilities are available
- Bring down power flow on HVDC terminals so that loading on parallel EHV network goes up resulting in drop in voltage.
- Optimize the filter banks at HVDC terminal

ii) Open lightly loaded lines in consultation with WRLDC ensuring security of the balanced network.

iii) In the event of low voltage (when the voltage goes below 390kV), following specific steps would be taken by the respective grid substation/generating station at their own, unless specifically mentioned by WRLDC/SLDCs.

- Close the lines which were opened to control high voltage in consultation with WRLDC.
- The bus reactor be switched out
- The manually switchable capacitor banks be switched in.
- The switchable line/tertiary reactor are taken out
- Optimize the filter banks at HVDC terminal
- All the generating units on bar shall generate reactive power within capability curve.
- Operate synchronous condenser for VAR generation
- Operate hydro generator / gas turbine as synchronous condenser for VAR generation wherever such facilities are available
- Increase power flow on HVDC terminals so that loading on parallel EHV network goes down resulting in rise in voltage.

3.1.2.7 Load Management for controlling the Voltage

All the state constituents shall identify the radial feeders in their areas which have significant reactive drawals and which can be disconnected in order to improve the voltage conditions in the event of voltage dropping to low levels. The details of all such feeders shall be kept ready in the respective control rooms and standing instruction would be given to the operating



personnel to ensure the relief in the hour of crisis by disconnecting such feeders. Automatic under voltage load shedding shall commence at 360 kV.

3.1.2.8 Switching off the line reactors in case of low voltage

In the event of persistent low voltage conditions, some of the line reactors are to be selected on the basis of line length, grid conditions, network topology etc., which can be switched off in order to improve the system voltage profile. The details of such lines with reactors in WR are included in the list of reactors shown at Annex-II of this document. The switching off of such line reactors and reviving them back would be carried out as per the instructions issued by WRLDC.

3.1.3 Contingency Evaluation

In addition to frequency and voltage control measures outlined above, each system operator at WRLDC/ SLDCs would continuously run the Power Network Analysis (PNA) modules' Contingency Analysis (CA) package to identify credible contingencies, evaluate the system under his control against these contingencies and ensure immediate remedial measures for revival. All the constituents of Western region will implement the PNA module of EMS at the earliest to facilitate the contingency evaluation.

3.1.4 Operating Manpower

The Control Centers of WRLDC, CPCC, SLDCs, Power plants, grid substations(above 110kV) as well as any other control centers of regional constituents shall be manned / monitored round the clock by qualified and adequately trained manpower who would remain vigilant and cooperative at all the times so as to maintain safe and secure grid operation.



CHAPTER 4

DEMAND ESTIMATION & CONTROL

4.0 Objective

This chapter describes the procedures / responsibilities of the SLDCs for demand estimation for both active and reactive power and also the provision to be made by SLDCs to effect 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.

4.1 Overview

Demand estimation plays a very important role in grid operation. Long term demand estimation (five years and beyond) is an important input for generation / transmission planning. Medium term demand estimation (one year and below) constitutes an important input for outage planning of generating units and transmission lines. The short term demand estimation (spanning from one week to next time block) facilitates an important input for generation scheduling. Variation in demand in real time operation from the estimated values should be within $\pm 2\%$ limits to ensure that the grid is not affected adversely.

Demand estimation and control is essentially the responsibility of SLDCs 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 on demand control whenever the same has a bearing on the security of the regional grid and such instructions would have to be complied by all SLDCs.

4.2 Demand estimation

4.2.1

The SLDCs would forecast demand on an annual, monthly, weekly and ultimately on daily basis which would be used in the day ahead scheduling.

4.2.2

In line with the clauses 5.3(c) and 5.3(d) of IEGC, each SLDC shall maintain a historical database and develop methodologies / mechanism for demand estimation for both active and reactive power. The data for the estimation shall also include load shedding, power cuts etc.

4.2.3

In line with the clause 5.3(e) of IEGC, while the demand estimation for operational purposes is to be done on a daily/weekly/monthly basis initially, mechanisms and facilities at SLDCs shall be created at the earliest but not later than 1.1.2011 to facilitate on-line demand estimation of demand for daily operational use for each 15 minutes block.

4.2.4 Each State / SLDCs shall utilize the forecasting modules suitable for their system and compatible to ULDC SCADA scheme for transfer of forecasted data in the form required by WRLDC.

4.2.5

The historical database to be maintained by SLDCs shall also include major events vis-à-vis effect of weather forecast on the actual demand, grid disturbances and loss of



major generation. Effect of weekends and other holidays on the demand pattern shall also be evaluated on the basis of historical data.

4.2.6

The annual, quarterly and monthly demand forecast would be finalized in the respective sub-committee meetings of WRPC and used in the outage plan prepared by WRPC Secretariat in consultation with all the constituents.

4.2.7

Attention would also be paid by SLDCs in demand forecasting for special days such as important festival and national holidays having different crest and troughs in the daily load curve as compared to normal days.

4.2.8

The load forecast utility based on Similar Day Forecast (SDF) technique is available at all the SLDCs and RLDC as a part of the ULDC EMS function. SDF can take two approaches for demand forecast i.e., Profile Based Forecast (PBF) and Weather Based Forecast (WBF).

4.2.9

In the PBF technique, historical demand profile contains hourly demand data for 96 profiles consisting of recent past seven days of every calendar month and 12 special days (holidays like 15th August, 26th January etc.). In the WBF technique, a composite weather parameter representing temperature, atmospheric pressure, wind speed, wind direction, rainfall and relative humidity and corresponding demand data are stored on hourly basis in history as profile.

4.3 Demand Control

4.3.1

The need for demand control arises on account of following conditions:

- Variation in demand from the estimated value (by more than 2%) which cannot be absorbed by the grid.
- Unforeseen generation / transmission outages resulting in reduced power availability.
- Heavy reactive power demand, particularly during Rabi load / high industrial activity causing low voltages
- Critical loading on inter-regional corridors/flow gates
- Commercial reasons

4.3.2

In line with section 5.3.(c) of IEGC, the SLDCs would regularly carry out the necessary exercises to estimate short term and long term demand to facilitate planning so as to ensure that they meet their load without overdrawn from the grid. The deviations of drawl from the schedule have to be controlled by the SLDCs in the following cases:

- Over drawal at frequency below 49.7 Hz
- Under drawal at frequency above 50.2 Hz
- Over/under drawl in line with real time advice from WRLDC during critical contingencies in inter-regional corridors / flow gates
- Reactive power drawls / injections causing low voltage / high voltage.

4.3.3.

The constituents shall endeavor to restrict their net drawl from the grid to within their respective drawl schedule whenever the system frequency falls to 49.7 Hz in line with section 5.4.2(a) of IEGC. However, when the frequency falls to or below 49.5 Hz, requisite

load shedding (manual) shall be carried out in the concerned State to curtail the over drawl in order to improve the frequency above 49.5Hz, as per IEGC 5.4.2(b).

4.3.4.

All constituents shall endeavor to maintain the system frequency above 49.7Hz and would cooperate for helping optimum utilization of regional hydro resources so as to ensure maximum availability during peak hours.

4.3.5.

All constituents shall ensure the availability of the defense mechanism in place as at Annex-III.

4.3.6 (a) Demand Response:

Constituents are expected to implement measures for demand response, per IEGC 5.4.2(d). The clause is reproduced below :

“The SLDCs, through respective State Electricity Boards/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. before 01.01.2011, to reduce overdrawl in order to comply para 5.4.2 (a) and (b) . A Report detailing the scheme and periodic reports on progress of implementation of the schemes shall be sent to the Central Commission by the concerned SLDC”

(b) Demand control would have to be exercised under low frequency conditions by taking the following actions by constituents.

- Scheduled load shedding as decided in OCCM/Board meetings.
- Un-scheduled load shedding for the load generation balancing exercise which is planned for the following day
- Distress load shedding due to load generation imbalance in real time leading to frequency going below 49.5 Hz. This will be carried out through already identified radial feeders.

4.3.7

During the demand control by scheduled load shedding as well as unscheduled load shedding by staggering in different groups, the changeover from one group to another shall be carried out in a gradual manner so as to ensure that the change in load at any point of time does not exceed 100 MW so as to avoid excursions in system parameters.

4.3.8

In case of low voltage pockets, each SLDC would identify feeders drawing heavy quantum of reactive power and disconnect the same when voltage goes below 380kV.

4.4 Load Crash

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

- Lifting the load restrictions, if any.
- Exporting the power to neighboring regions by STOA
- Phasing out hydro
- Backing down or closing down of generating units



CHAPTER 5

OPERATIONAL PLANNING

5.0 Objective

This chapter describes the procedures / responsibilities of the SLDCs 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 long term basis (one year) 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 etc

5.1 Overview

The operational planning starts one year ahead in the month of October for the period April to March next year. The demand control measures planned include scheduled load shedding for each of the power utilities in the region and this is prepared by Western Regional Load Dispatch Centre. The States also plan for STOA transactions in a month a head horizon. Actions are also planned for regulating availability from resources like captive power plants.

The day ahead planning includes demand forecasting by the States, scheduling of power from ISGS , MTOA as well as purchasing power through STOA / Power Exchanges. The demand supply mismatch is achieved 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 UI power on the day of operation.

5.2. Operational Planning

5.2.1. Operational Planning on yearly horizon

5.2.1.1.

For the purpose of operational planning on annual basis, the year considered begins in July of the current year and extends till June next year. This is due to the considerable impact of monsoon on hydro availability as well as its significant impact on demand. By the beginning of July, the progress of monsoon is known and accordingly the overflow forecast of hydro reservoirs is done with a better approximation. First, the hydro generation is allocated on monthly basis for the whole year from each hydro power station. The next exercise is forecasting of the demand for each year ahead. If rainfall is significant, the agricultural demand, pump sets will be absent during July to September. One criteria used is projecting the demand from only growth rates based on the previous years.

5.2.1.2.

In the monsoon months, due to reduction of demand, most of the thermal sets would be taken out for annual overhaul. Generating unit outage planning is done month wise and coordinated amongst various States and Central Sector utilities such that generation availability would not lead to significant load curtailment. For optimizing the outage planning, a Loss of Load Probability (LOLP) criterion is used to optimize the load shedding.

5.2.1.3

The transmission outage planning is also coordinated with generator outage planning and a coordinated outage plan for both generation and transmission is developed.

5.2.1.4.

The monthly generation availability from thermal stations is computed based on the planned outages as indicated in the outage plan, assumed forced outage rate (13.5%) or based on past data and assumed partial outage rates (5%) based on auxiliary problem, fuel related problem etc.



5.2.1.5.

The month-wise forecasted demand and availability would indicate the surpluses/deficits in various months utility/state-wise and Load Generation Balance Report (LGBR) is compiled for Western region for the period April to March next year.

5.2.1.6.

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

5.2.2 Operational planning on quarterly horizon

5.2.2.1

The operational planning exercise carried out for one year horizon is modified on a quarterly basis based on the more current information. The first 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.

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.

5.2.2.2

The quarter October-December 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.

5.2.2.3

The quarter January-March will have high demand similar to that of previous quarter due to continuation of agricultural activities. The industrial demand would also be at its peak as this is the last quarter of the financial year and target needs to be achieved before the budget.

5.2.2.4

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. Since it is difficult to carry out load shedding during this hot summer season, all efforts would be made to maximize generation availability.

5.2.3 Operational planning on monthly horizon

5.2.3.1

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 Central utilities to draw up coordinated action plans.

5.2.3.2

WRLDC prepares hourly scheduled load shedding for the next month based on the anticipated availability and demand which is discussed and approved in OCCM.

5.2.4 Operational planning on day ahead basis

5.2.4.1

In line with clause 6.5 of IEGC under the head of 'Scheduling & Despatch Procedure', plant-wise requisitions from the States are compiled to draw up scheduled for each ISGS. 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.

5.2.4.2

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



5.2.5 Day Ahead Balancing

5.2.5.1

The day ahead power balance can not be obtained without planning for load shedding in case of deficient power States in the region. Out of the total deficits for the following day, the scheduled load shedding takes care of a major portion of the deficits and is planned and frozen at least a month in advance and announced to public. The balance part of the deficit is taken care of through planning of unscheduled load shedding.

5.2.5.2

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.

5.2.6 Same Day Operational Planning

5.2.6.1

On the day of operation, due to errors in demand forecast, forced outage of units, some of the States or Central Sector Plants, sellers/buyers of Short Term Open Access transactions (advance reservations and first-cum-first serve basis only) may revise their schedules – one and half hour ahead for planned deviations and one hour ahead for unforeseen problems.

5.2.6.2

The deviations from schedules may require purchase of balancing power from the regional power pool at a rate determined by UI price vector. Current UI price vector is given at Annex-XV.

5.3 Load Curtailment Planning

5.3.1 Scheduled Load Shedding

5.3.1.1

The State-wise scheduled load shedding is computed by WRLDC on hourly basis and issued one month in advance. It is discussed in the monthly OCCM and finalized.

5.3.1.2

The scheduled load shedding takes care of about 80% of the projected shortfall of the States and is given wide publicity.

5.3.1.3

The scheduled load shedding is implemented in the following ways:-

- Statutory cut on the maximum demand of high tension and low tension industries
- Statutory cut on the consumption of high tension and low tension industries
- The rural feeders are arranged into groups and each group is shed for 8-12 hours in a day with number of groups shed at any point of time.
- Load shedding in urban areas for 1 ½ to 3 hours in a day during morning and evening peak hours.
- Single phasing through which the agricultural load and residential / commercial loads in the rural areas are separated and only three phase loads are subjected to shedding.
- Staggering of holidays through which power supply to a particular is totally cut for about 12 hours.
- Recess staggering through which the lunch break and shift timings are staggered.

5.3.2 Unscheduled Load Shedding

5.3.2.1

The unscheduled load shedding is effected through different set of feeders other than those selected for scheduled load shedding.

5.3.2.2

Unscheduled load shedding is done only when the frequency dips below the acceptable level.

5.3.2.3

Since unscheduled load shedding is not announced before hand to the public such load shedding gets maximum public resentment.

5.3.3 Distress Load Shedding

5.3.3.1

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.

5.3.3.2

The distress load shedding is carried out by tripping of identified 66/132/220kV radial feeders which are opened by emergency call from State Load Despatch Centre.

5.3.4 Automatic Under Frequency Load Shedding (AUFLS)

5.3.4.1

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

5.3.4.2

The approved AUFLS scheme in Western region and the recommended df/dt with changed scenario in NEW grid is enclosed at Annex-III.

5.3.4.3

The feeders for discrete and trend automatic under frequency relays need to be widely dispersed as operation of these relays is sensitive to the location of the disturbance.

CHAPTER 6

OUTAGE PLANNING PROCEDURE

6.1 Introduction

6.1.1

This chapter sets out the procedure for preparation of outage schedule for generating units and transmission elements of the region in coordinated and optimal manner keeping in view the regional system operating conditions and maintaining load generation balance in the system.

6.2 Objective

6.2.1

To formulate a coordinated outage programme of transmission lines and generating units for the regional grid considering all the available regional resources and taking into account transmission constraints as well as other requirements.

6.2.2

To minimise surplus or deficit, if any, in the requirement of power and energy and help to operate system within system standards.

6.2.3

To maintain adequate generation and transmission availability after taking into account the outages and to achieve the security standards.

6.3 General

6.3.1

Annual outage plan shall be prepared in advance for the financial year by the WRPC and reviewed during the year on quarterly and monthly basis.

6.3.2

WRPC shall prepare draft coordinated annual outage plan for generation units and transmission elements to optimise the utilisation of available resources.

6.3.3

OCC meeting is the formal inter-face of WRPC with WRLDC, CTU, and ISGS and other constituents for reviewing the annual outage plan on quarterly /monthly basis.

6.3.4

Stipulations in this chapter are applicable to all generating units above 100 MW (Thermal), 50MW (Hydro) and transmission elements as given in Annex-II.

6.4 Outage Planning Process

6.4.1

Annual Outage Planning

The following calendar shall be followed in respect of annual outage planning for the ensuing financial year:-

- 1) The constituents will forward the required data for outage planning for the next financial year to WRPC Secretariat by 30th November
- 2) WRPC Secretariat will issue the draft outage program to all the regional constituents and WRLDC by 31st December.
- 3) The mutually agreed final outage plan shall be intimated by WRPC Secretariat to all regional constituents and WRLDC for implementation by 31st January.

6.4.2

Quarterly and Monthly Reviews:

The annual outage plans formulated as above shall be reviewed on quarterly /monthly basis as per following programme:-



1) The above outage plan would be reviewed on quarterly and monthly basis in joint meetings of all regional constituents and WRLDC to be coordinated by WRPC Secretariat. The quarterly meetings should be held in the months of March, June, September & December. The revisions/changes if any in the outage plan, the same may be incorporated and communicated by WRPC Secretariat within a week of the review meeting.

2) Monthly review of the outage plan for the current month and the consecutive month would be done in the OCC of WRPC meeting. WRPC Secretariat would issue the outage plan, as decided in this meeting, to all the constituents and WRLDC at least one day before the actual outage.

6.4.3

Unforeseen Outages & Rescheduling of Outages after monthly schedules In the event of any requirement to re-schedule the planned shut down or to avail an emergency / unforeseen shutdown, the concerned constituent shall forward request to WRLDC indicating the nature of emergency or the reasons of deferment. WRLDC would approve such unforeseen outages / rescheduling of an already planned outage based on the exigency vis-à-vis system conditions.

6.5 Availing of Shut Downs.

6.5.1

WRLDC would review on daily basis the outage schedule for the next two days and in case of any contingency or any conditions described under IEGC clause 5.7.4(g), defer any planned outage as deemed fit. The revised dates in such case would be finalized in consultation with the concerned constituents / OCC meetings.

6.5.2

In case of an outage affecting more than one constituent, the information about the approval / deferment shall be communicated by WRLDC to all such constituents.

6.5.3

In respect of important elements of the grid as at Annex-II, a code would have to be obtained from WRLDC before taking the said element for maintenance. All preparatory works for maintenance must have to be done well in advance before availing the code so as to keep the outage time to minimum. Similarly, a code would have to be obtained from WRLDC before reviving the element after shut down.

6.5.4

The code issued by WRLDC for opening / revival of the circuit signifies such approval only from the system point of view notwithstanding anything contained in safety measures and other switching operations to be carried out locally. The related line / substation personnel would be responsible for ensuring all safety precautions while opening / closing of any element to avoid any threat to operating personnel and equipment.

6.5.5

During the period of shutdown all efforts should be made for timely return of shutdown and delays if any shall immediately be reported to WRLDC along with the reasons and likely time of return of shutdown.

6.5.6

Where it is foreseen that return of PTW could be delayed due to physical distance involved in case of a transmission line, mobile/satellite phone would be used for communication with the substation to minimize the outage period.

6.5.7

Any maintenance work on opportunity basis proposed to be carried out by related agencies during a 765&400kV line/ICT shutdown would be carried out in consultation with WRLDC.

6.6 Availing outage of Generating Units

6.6.1

Constituents will inform WRLDC before availing planned unit outages in real time and if the outages cannot be availed, the same shall be intimated to WRLDC.



6.6.2

For planned generation unit outages, constituents will intimate WRLDC 3 days in advance regarding their outage programme. WRLDC will give the concurrence 2 days in advance to the concerned constituents and in case confirmation from WRLDC is not forthcoming, it will be deemed that the outage is confirmed.



CHAPTER 7

SHORT TERM OPEN ACCESS PROCEDURES

7.1 Introduction

7.1.1

With the implementation of Hon'ble CERC order on Short Term Open Access (STOA), bilateral exchanges have provided a suitable edge to constituents in planning and minimizing the gaps in demand and availability. The procedure is in accordance with the various provisions of the CERC regulations dated 25.01.2008, and Power Market Regulations and subsequent amendments issued from time to time.

7.2 STOA Procedures

7.2.1

As per the Electricity Act 2003, non discriminatory provisions for the use of transmission lines or distribution system or associated facilities with such lines or system by any licensee or consumer or a person engaged in generation in accordance with the regulation specified by the appropriate Commission shall be provided. Hence, the transmission utilities shall allow access of their system for Open Access customers without any prejudice.

7.2.2

As per the open access regulations, reservation of transmission corridor for bilateral transactions can be made in the following ways:-

- Advance Reservation
- First come first serve basis
- Day ahead basis
- Day ahead / same day in a contingency

7.2.3

Applications for day-ahead transactions shall be processed only after processing of the collective transactions of the Power Exchange.

7.2.4

Procedure for scheduling of bilateral transactions and collective transactions are as per CERC STOA regulations.

7.2.5

The STOA application shall include all necessary information as per the formats and procedures prescribed by the CTU from time to time.

7.2.6

Wherever the proposed bilateral transaction has a State utility or an inter-state entity as a buyer or a seller, concurrence of concerned State Load Despatch Centre shall be obtained in advance and submitted along with the application.

If the SLDC has not communicated any deficiency within 2 days of receipt of the application and refusal of 'no objection' within specified time, 'no objection' shall deem to have been granted.

Provided further that where concurrence is deemed to have been granted by the SLDC, the applicant while making the application, shall submit an affidavit duly notarized, declaring that a) SLDC failed to convey 'no objection' within specified time and b) Necessary infrastructure for time block wise metering and accounting in accordance with IEGC, is in place.

7.2.7

The constituents / traders shall seek the consent / approval of WRLDC as the case may be well in advance especially whenever a transmission constraint is foreseen to



facilitate advanced booking of the transmission corridor and optimum utilization by all the constituents.

7.2.8

While approving / consenting the STOA application, WRLDC shall check primarily the following points of relevance.

- 1) corridor availability
- 2) valid agreement between buyer/seller/trader shall be produced on demand.
- 3) consent from all the relevant utilities and RLDCs
- 4) Payment status of necessary STOA charges.

7.3 STOA Implementation

The details regarding such STOA agreements and their implementation philosophies are explained below.

7.3.1

WRLDC would require above information in respect of STOA for

- 1) Working out the net drawal schedule of each constituent
- 2) Checking for transmission constraints, if any, arising out of such exchanges

7.3.2

Each of the constituent involved in the STOA would intimate WRLDC on daily basis the quantum of power to be exchanged on 15-minute time block basis for the next day. This would enable WRLDC to include the quantum of such transfer in day ahead schedules which includes the STOA transactions approved under various categories. In case of any agreement with a State in another region, this information can be passed through concerned RLDC.

7.3.3

- 1) The revision in the Advance and FCFS STOA category is allowed with two days advance notice.
- 2) No revision in day-ahead and contingency

7.3.4

In case of rounding off to decimals, the relevant IEGC provisions shall be prevailed upon by WRLDC.

7.3.5

No post-facto revisions of schedule would be carried out on account of bilateral transactions.

7.4 STOA curtailment

During transmission constraints, the STOA transactions will be curtailed first to ease the congestion. Open access bilateral transactions would generally be curtailed first followed by the collective transactions. The curtailment will be done on pro-rata basis.

As per IEGC 2010, real time revisions are permissible in STOA ,where a generator of capacity of 100 MW and above is seller, the generator shall immediately intimate the same along with the requisition for revision of schedule and estimated time of restoration of the unit, to SLDC/RLDC as the case may be . Consent of buyer shall not be the prerequisite for such revision of schedule. The schedule of the generator and the buyer are revised accordingly. The revised schedule shall become effective from the 4th time block, counting in which the forced outage is declared to be the first one. The RLDC shall inform revised schedule to the buyer and seller. The original schedule shall become effective from the estimated time of restoration of the unit. However the transmission charges as per original schedule shall continue to be paid for 2 days.



CHAPTER-8

SCHEDULING AND DESPATCH PROCEDURES

8.1 OVERVIEW

Section 6.4 of the I.E.G.C details the demarcation of responsibilities for the purpose of scheduling and despatch. This chapter describes the procedure for scheduling with the treatment to be accorded for special conditions also.

8.2 GENERAL

8.2.1

For the purpose of scheduling, each day would be divided into 96 blocks of 15-minutes duration each and for each block, WRLDC would intimate each SLDC the drawl schedule and to each ISGS the generation schedule in advance as outlined in section 8.3 below.

8.2.2

The net drawl schedule of any State would be the sum of the ex-PP schedule from different ISGS and the total Open Access (long term, medium term, power exchange and short term) exchanges agreed with other constituent states in Western region or outside the region after discounting the estimated transmission loss. The power system under each SLDC constitutes a notional control area and hence the State would be required to maintain their actual drawl from the grid close to such net drawl schedule by regulating own generation and / or load, particularly when frequency falls to 49.7Hz and going above 50.2 Hz.

8.2.3

The dispatch schedule of each ISGS shall be some of the requisitions made by each of the beneficiaries, restricted to their entitlements and subject to the maximum and minimum value criteria and any other technical constraints as indicated by WRLDC.

8.2.4

Clause 5.2 (m) of IEGC stipulates the grid frequency operation in the band of 49.50-50.20 Hz, however, for the safety and security of the system operation, the normal range of desirable frequency is 49.7-50.2 Hz. The state shall initiate action to restrict the drawal of its control area from the grid whenever the frequency falls to 49.7 Hz and do not under drawal whenever the frequency is above 50.2 Hz provided that when the frequency is higher than 50.2 Hz, the actual net injection shall not exceed the scheduled despatch for that time block. Also, while the frequency is above 50.2 Hz, the ISGS may (at their discretion) back down without waiting for an advice from RLDC to restrict the frequency rise. When the frequency falls below 49.7 Hz, the generation at all ISGS (except those on peaking duty) shall be maximized, at least up to the level to which can be sustained, without waiting for an advice from RLDC subject to the condition that such increase does not lead to unacceptable line loading or system parameters to deteriorate beyond permissible limit. (IEGC clause 6.4.11)

8.2.5

WRPC Secretariat would ensure that any change in the allocations from each ISGS is finalized and intimated to all concerned at least 24 hours in advance to facilitate trading of such capacity if required. This is in line with spirit of clause 5.1.3 of the ABT order of CERC.

8.3 Scheduling and Despatch Procedure

Scheduling timeline is given in Annexure-XVII.



8.3.1. By 8 AM every day, the ISGS shall advise the concerned RLDC, the station-wise ex-power plant MW and MWh capabilities foreseen for the next day, i.e., from 0000 hrs to 2400 hrs of the following day.

8.3.2. The above information of the foreseen capabilities of the ISGS and the corresponding MW and MWh entitlements of each State, shall be compiled by the RLDC every day for the next day, and advised to all beneficiaries by 10 AM. The SLDCs shall review it vis-à-vis their foreseen load pattern and their own generating capability including bilateral exchanges, if any, and advise the RLDC by 3 PM their drawal schedule for each of the ISGS in which they have Shares, long-term and medium-term bilateral interchanges, approved short term bilateral interchanges.

While availability declaration by ISGS may have a resolution of 1 MW and 1 MWh, all entitlements, requisitions and schedules shall be rounded off to the nearest decimal to have a resolution of 0.1 MW.

8.3.3 The SLDCs may also give standing instructions to the RLDC such that the RLDC itself may decide the best drawal schedules for the States.

8.3.4

8.3.4.1 Scheduling MTOA Transactions:

Following is the extract in the procedure approved by CERC regarding scheduling of MTOA transactions:

“

17. SCHEDULING OF MEDIUM TERM OPEN ACCESS TRANSACTION

The scheduling jurisdiction and procedure, curtailment and revision of schedule of MTOA transactions, metering, energy accounting and accounting of (Unscheduled Interchange) UI charges shall be as per the Regulations and the Indian Electricity Grid Code, as amended from time to time. While scheduling on day-ahead basis, long-term access customers would have the highest priority, followed by medium term customers and then followed by short-term customers.

a. Underutilization of transmission capacity

In case it is observed by RLDCs that the MTOA customer request for scheduling is consistently (for more than 5 days) lower than the capacity granted by the Nodal Agency (i.e.; CTU), RLDC may issue a notice to such MTOA customer asking the reasons for such under-utilization. The MTOA customer shall furnish the reasons for such under-utilization and will provide such details like the reduced requirement, likely period, etc. by the following day. The un-utilized transfer capability will then be released for scheduling of Short-term open access transaction. “

8.3.4.2 Scheduling of collective transactions:

a)

NLDC shall indicate to Power Exchange(s), the list of interfaces/control areas/regional transmission systems on which unconstrained flows are required to be advised by the Power Exchange(s) to the NLDC.

Power Exchange(s) shall furnish the interchange on various interfaces/control areas/regional transmission systems as intimated by NLDC. Power Exchange(s) shall also furnish the information of total drawal and injection in each of the regions. Based on the information furnished by the Power Exchanges, NLDC shall check for congestion. In case of congestion, NLDC shall inform the Exchanges about the period of congestion and the available limit for scheduling of collective transaction on respective interface/control area/transmission systems during the period of congestion for Scheduling of Collective Transaction through the respective Power Exchange. The limit for scheduling of collective



transaction for respective Power Exchange shall be worked out in accordance with CERC directives.

Based on the application for scheduling of Collective Transaction submitted by the Power Exchange(s),

NLDC shall send the details (Scheduling Request of Collective Transaction) to different RLDCs for final checking and incorporating them in their schedules. After getting confirmation from RLDCs, NLDC shall convey the acceptance of scheduling of collective transaction to Power Exchange(s). RLDCs shall schedule the Collective Transaction at the respective periphery of the Regional Entities.

b)

The individual transactions for State Utilities/intra-State Entities shall be scheduled by the respective SLDCs. Power Exchange(s) shall send the detailed break up of each point of injection and each point of drawal within the State to respective SLDCs after receipt of acceptance from NLDC. Power Exchange(s) shall ensure necessary coordination with SLDCs for scheduling of the transactions.

c)

Timeline for above activities will be as per detailed procedure for Scheduling of Collective Transaction issued in accordance with CERC(Open Access in inter-state transmission) Regulations,2008 and as amended from time to time.

8.3.5 By 6 PM each day, the RLDC shall convey:

(i) The ex-power plant “despatch schedule” to each of the ISGS, in MW for different time block, for the next day. The summation of the ex-power plant drawal schedules advised by all beneficiaries shall constitute the ex-power plant station-wise despatch schedule.

(ii) The “net drawal schedule” to each regional entity, in MW for different time block, for the next day. The summation of the station-wise ex-power plant drawal schedules from all ISGS and drawal from /injection to regional grid consequent to other long term access, medium term and short-term open access transactions, after deducting the transmission losses (estimated), shall constitute the regional entity-wise drawal schedule.

8.3.6 The SLDCs/ISGS shall inform any modifications/changes to be made in drawal schedule/foreseen capabilities, if any, to RLDC by 10 PM or preferably earlier.

8.3.7 The hydro electric generation stations are expected to respond to grid frequency changes and inflow fluctuations. They would, therefore, be free to deviate from the given schedule as long as they do not cause a grid constraint. As a result, the actual net energy supply by a hydro generating station over a day may differ from schedule energy (ex-bus) for that day. Compensation shall then be made by the concerned load despatch centre in the day ahead schedule for the 4th day (day plus 3).

8.3.8 The declaration of the generating capability by hydro ISGS 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 concerned Load Despatch Centre shall periodically check that the generating station is declaring the capacity and energy sincerely, and is not manipulating the declaration with the intent of making undue money through UI.

8.3.9 Since variation of generation in run-of-river power stations shall lead to spillage, these shall be treated as must run stations. All renewable energy power plants, except for biomass power plants, , and non-fossil fuel based cogeneration plants whose tariff is determined by the CERC shall be treated as ‘MUST RUN’ power plants and shall not be subjected to ‘merit order despatch’ principles.



8.3.10. Run-of-river power station with pondage and storage type power stations are designed to operate during peak hours to meet system peak demand. Maximum capacity of the station declared for the day shall be equal to the installed capacity including overload capability, if any, minus auxiliary consumption, corrected for the reservoir level. The Regional Load Despatch Centers shall ensure that generation schedules of such type of stations are prepared and the stations despatched for optimum utilization of available hydro energy except in the event of specific system requirements/constraints.

8.3.11. The schedule finalized by the concerned load despatch centre for hydro generating station, shall normally be such that the scheduled energy for a day equals the total energy (ex-bus) expected to be available on that day, as declared by the generating station, based on foreseen/planned water availability/release. It is also expected that the total net energy actually supplied by the generating station on that day would equal the declared total energy, in order that the water release requirement is met. While the 15-minute wise, deviations from schedule would be accounted for as Unscheduled interchange (UI), the net energy deviation for the whole day, if any, shall be additionally accounted for as shown in the illustration.

8.3.12

WRLDC will ensure following points while preparing the schedule.

8.3.12.1

The final drawl / dispatch schedule shall not give rise to any transmission constraints. In case of such constraints, WRLDC shall moderate the schedule to the required extent as per IEGC clause 6.4.12

8.3.12.2

The final drawl / dispatch schedules shall be operationally reasonable particularly in terms of ramping up / ramping down rates and ratio between minimum and maximum generation levels. In case of such problem, WRLDC shall moderate the schedule to the required extent as per IEGC clause 6.5.15

8.3.12.3

The procedure to be followed for STOA bilateral curtailment has already been indicated in Chapter-7

8.4 Revision of Schedules

8.4.1

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

8.4.2

In the event of a situation arising out of bottle neck in evacuation of power due to transmission constraints, WRLDC shall revise the schedule which shall become effective from the 4th time block counting the time block in which the transmission constraints has been brought to the notice of WRLDC as a first one. During the first three time blocks, the schedules shall deem to have been revised to be equal to the actual generation of ISGS and drawl by the States.

8.4.3

Revision of declared capability by generator and requisition by the beneficiaries for the remaining period of the day shall be permitted with advance notice. Revised schedules / declared capability in such cases shall become effective from the 6th time block counting the time block in which the request for revision has been received by RLDC to be the first one.

8.4.4

In case of transmission constraints, curtailment shall be done by WRLDC as per IEGC clause 6.5.28

8.4.5

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

8.4.6

On completion of the operating day, the final schedule as implemented shall be issued by WRLDC after incorporating all before the fact changes during the day of operation.

The final schedule implemented by WRLDC shall be open to all constituents for checking / verification for a period of five days and mistakes/omissions, if any, would be rectified

8.4.7 Revision of STOA Transactions:

In case of forced outage of a unit for a Short Term bilateral transaction, where a generator of capacity of 100 MW and above is seller, the generator shall immediately intimate the same along with the requisition for revision of schedule and estimated time of restoration of the unit, to SLDC/RLDC as the case may be.

The schedule of the generator and the buyer shall be revised, accordingly. The revised schedules shall become effective from the 4th time block, counting the time block in which the forced outage is declared to be the first one. The original schedule shall become effective from the estimated time of restoration of the unit.

8.5 Allocation of Un-requisitioned surplus

As per CERC order dated 11.1.2010 in petition No. 134/2009, all the generating stations, governed by the Tariff Regulations of the Commission be allowed to change schedule for the un requisitioned quantum of power from one beneficiary(s) to another beneficiary(s) of the same power station on the requisition by these beneficiaries through the provision provided in the IEGC, i.e. within six time blocks or as per the provisions of the IEGC as amended from time to time.

In case original beneficiary requests back for its share of power then its schedule and schedule of beneficiary who had availed URS power may be revised within six time blocks as per the IEGC provisions and as amended from time to time.

The schedule revisions would be treated as reallocation of power on temporary basis and would not be taken as open access transactions. The tariff would be governed by terms & conditions of tariff regulation as applicable to the generating station. If more than one beneficiary surrenders and more than one beneficiary requisition the beneficiary(s) requiring shall furnish station wise requirement to WRLDC (as per the decision taken in 411th OCC).

8.6 SSP Scheduling

SSP is a joint power project shared by Maharashtra, Gujarat, M.P. the scheduling of SSP is done in following manner as mandated by IEGC clause 1.3 iii) and 6.3.

NCA will submit daily declared machine hours & MUs for SSP along with 96 block schedule as per agreed guidelines decided in 44th PSC to WRLDC. If availability of water on any day is more than meeting generation requirement of all machines of RBPH, then machines can be proposed to run continuously for 24 hours. This will meet the requirement of MP as well as save water flowing through GODBOLE GATE for environmental releases.



In the event of any objection communicated to NCA or WRLDC, by any of the beneficiary states, NCA will take up the matter with WRLDC for the modifications in the machine hour's blocks issued by WRLDC.

8.7 Scheduling of Wind and Solar generation

Scheduling of Wind and Solar generation shall be done as per IEGC clause 6.5.23 (effective from 01 January, 2011).

The effect of UI due to wind/solar actual generation will be treated as per Annex-XVIII

8.8 Exchange of Information

In order to avoid any adverse commercial effect on the ISGS/SLDCs, the need for a reliable and fast communication arrangements for exchange of information in respect of scheduling need not be over emphasized.

8.8.1

The revision of schedule would be required under the following conditions as detailed at 8.4.above

- i) Forced outage of an ISGS unit
- ii) Transmission constraints resulting in output reduction in any ISGS
- iii) Revision of DC by any ISGC
- iv) Revision of requisition by any beneficiary
- v) Suo Moto revision by WRLDC in the interest of better system operation.

As the time available for schedule revision is limited (half an hour to one hour only), some of the steps mentioned in section 8.3 above would be skipped for e.g., in cases i), ii) & iii) above, there need not be any fresh requisition from the beneficiaries and WRLDC would assume as follows:

a) On occasions of downward revision:

The constituents requisition will be deemed as earlier MW requirement or maximum revised entitlement whichever is less.

b) On occasion of upward revision:

The constituents requisition will be deemed as earlier MW requirement if there were under-requisition by the constituents prior to the revision otherwise the constituents requirement will be deemed as full revised entitlement.

8.8.2

In view of large volume of information needed to be exchanged in a time bound manner, the transfer of information between WRLDC and other constituents i.e., constituent States and ISGS will be carried out on internet only. The data available on WRPC website is to be checked by the regional entities. Any discrepancies observed should be brought to the notice of WRDC Control Room executives immediately for necessary verification and corrections if any

However, in case of contingencies like internet failure etc., the transfer of information could be effected through alternate mode i.e., fax / telephone on request of concerned SLDC/ISGS.

8.9 The ISGS and all beneficiaries shall get the information at the WRLDC website www.wrldc.com / www.wrldc.in with regard to scheduling, by continuous access to WRLDC website and download the injection / drawl / STOA schedules.

8.10 At the end of the day, the final schedule as implemented after incorporating all before the fact changes during the day of operation shall be made available by WRLDC on the website.



CHAPTER 9

GRID DISTURBANCES AND REVIVAL PROCEDURES

9.0 Objective

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

9.1 Overview

9.1.1

As per CEA regulations on Grid standards 2010,

(a) "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.

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

9.1.2

In the event of a grid disturbance, highest priority is to be accorded to early restoration / revival of the system. During restoration, it is possible that system may have to be operated with reduced security standards and under suspension of all commercial incentives / penalties. This chapter forms the guidelines for classifications of disturbances into different categories for the purpose of analysis and reporting.

9.2 Grid incidents and disturbances

9.2.1 Classification of Grid incidents and disturbances

As per CEA regulations on Grid standards 2010, the categorisation of grid incidents and grid disturbances shall be as follows:-

(a) Categorisation of grid incidents in increasing order of severity,-

Category GI-1 - Tripping of one or more power system elements of the Grid like a generator, transmission line, transformer, shunt reactor, series capacitor and Static VAR Compensator, which requires re-scheduling of generation or load, without total loss of supply at a sub-station or loss of integrity of the grid at 220 kV

Category GI-2 - Tripping of one or more power system elements of the grid like a generator, transmission line, transformer, shunt reactor, series capacitor and Static VAR Compensator, which requires re-scheduling of generation or load, without total loss of supply at a sub-station or loss of integrity of the grid at 400 kV

(b) Categorisation of grid disturbance in increasing order of severity,-

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

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

Category GD-3 - When twenty per cent to less than thirty per cent of the antecedent generation or load in a regional grid is lost;

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

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

Explanation: For the purpose of categorisation of grid disturbances, percentage loss of generation or load, which ever is higher shall be considered.



c) The information may please be furnished in every OCC in the following format:

**DETAILS OF ENERGY NOT SERVED DUE TO
GRID DISTURBANCE**

State /Utility/Control Area: _____

Date	Time of occurrence	Category GD-1 to GD-5	Black out at Bus	Restoration Time	Essential Loads/Traction affected Area	MW affected	Energy not supplied(MUs)

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

9.2.3 In any case, if only one state system or one ISGS is affected, the schedules would not be suspended but only revised.

9.2.4 In case of transmission constraints, curtailment shall be done by WRLDC as per IEGC clause 6.5.28

9.3 System Revival

9.3.1 The recovery of the system shall be carried out in line with the document ‘Recovery Procedure for Western Region’

9.3.2 The general guidelines and precautions to be followed during system revival are indicated below:

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



- ii) Security of the network being built up would be strengthened at the earliest by closing the parallel lines available in the restoration path.
- iii) Priority would be accorded for extending supply to Railway tractions and installations where safety is of paramount important such as Nuclear power stations
- iv) All switching instructions for a particular system have to emanate from a single agency i.e. SLDC/CPCC as the case may be. For synchronization of two systems, WRLDC would be the coordinating agency.
- v) During revival, only authorized personnel would be present in Control room of substation / power station / SLDC / WRLDC so as to expedite restoration.
- vi) In line with section 5.8(e) of IEGC, all communication channels for restoration process shall be used for operational communication only until the grid normalcy is restored.
- vii) Restricted Governor Mode of Operation and generators with excitation control would help in proper frequency/voltage control.
- viii) Synchronizing facility available at major grid substations will be used so as to have flexibility in choosing the point of synchronization.
- ix) All SLDCs / ISTS / RLDC shall make available a copy of the latest 'Recovery Procedures for Western Region' for ready reference to their operating staff in Control room.

9.4 Declaration of System Normalization

9.4.1

System normalization will be declared by WRLDC as follows:

- i) All major sub-systems have been synchronized and
- ii) A minimum of around 50% of the total loss of generation at ISGS stations during the incident have been revived.

9.5 Post Disturbance Analysis

9.5.1 In case of any grid disturbance, WRLDC shall issue a flash report to be followed by a detailed report in the following manner:

- a) Grid Disturbance Category-GD-5 – Flash Report within a period of six hours followed by a detailed report within a period 15 working days.
- b) For GD-1 to GD-4 – Flash Report within a period of five hours followed by a detailed report within a period of 7 working days.
- c) Grid Incident – Flash Report within a period of four hours followed by a detailed report within a period of 4 working days.

9.5.2

To enable WRLDC to issue the above reports, all the SLDCs/constituents shall submit clear soft/hard copies of disturbance recorder (DR), sequential event recorder (SER), data acquisition system output (DAS), relay flag indications and restoration sequence within preferably two working days of the incident.



CHAPTER 10

EVENT INFORMATION AND REPORTING PROCEDURE

10.0 Objective

To define the timeline, procedure and structure for incidents required to be reported, information to be furnished.

10.1 Overview

Timely and accurate reporting and exchange of information plays an important role in grid operation. This assumes more importance during a disturbance or crisis. Timely and accurate information flow under such conditions would help people in making an informed decision and reduces uncertainty. This chapter documents the sequence of information to be exchanged between the constituents and WRLDC and its periodicity.

10.2 Event Information

(As per IEGC 5.9.5)

10.2.1 Responsibility

a) The RLDC/SLDC shall be responsible for reporting events to the Users, SLDC/STU, and CTU/NLDC/RLDC/RPC Secretariat as the case may be.

b) All Users, STU, CTU and the SLDC shall be responsible for collection and reporting of all necessary data to NLDC, WRLDC and WRPC Secretariat for monitoring, reporting and event analysis as the case may be.

10.2.2 Reportable Events

Any of the following events require reporting by WRLDC to Users, SLDC, STU, and CTU:

- i) Violation of security standards.
- ii) Grid indiscipline.
- iii) Non-compliance of RLDC's instructions.
- iv) System islanding/system split
- v) Regional black out/partial system black out
- vi) Protection failure on any element of ISTS, and on any item on the "agreed list" of the intra-State systems.
- vii) Power system instability
- viii) Tripping of any element of the Regional grid.
- ix) Sudden load rejection by any User

10.2.3 Reporting Procedure

(a) Written reporting of Events by Users, STU, CTU and SLDC to WRLDC:

In the case of an event which was initially reported by a User, STU, CTU or a SLDC to RLDC orally, the User, STU, CTU, SLDC will give a written report to RLDC in accordance with this section. RLDC in turn give a report to NLDC.

(b) Written Reporting of Events by RLDC to Users, STU, CTU and SLDC:

In the case of an event which was initially reported by RLDC to Users, STU, CTU, SLDC, NLDC orally, the RLDC will give a written report to the Users, STU, CTU, SLDC, and NLDC in accordance with this section.

(c) Form of Written Reports:

A written report shall be sent to NLDC, RLDC, STU, CTU and SLDC, as the case may be, in the reporting formats as devised by the appropriate load despatch Centre and will confirm the oral notification together with the following details of the event:

- i) Time and date of event
- ii) Location
- iii) Plant and/or Equipment directly involved
- iv) Description and cause of event

v) Antecedent conditions of load and generation, including frequency, voltage and the flows in the affected area at the time of tripping including Weather Condition prior to the event

vi) Duration of interruption and Demand and/or Generation (in MW and MWH) interrupted

vii) All Relevant system data including copies of records of all recording instruments including Disturbance Recorder, Event Logger, DAS etc

viii) Sequence of trippings with time.

ix) Details of Relay Flags.

x) Remedial measures

10.2.4

Any tripping of an element under the list of important elements of regional grid, whether manual or automatic, shall be intimated by the control centre of the constituent to WRLDC in a reasonable time say within 10 minutes of the incident. Along with the tripping intimation, the reasons for tripping (to the extent known) and the likely time of restoration shall also be intimated. Such information can be on telephone, fax or e-mail.

10.2.5

Any operation planned to be carried by a constituent which may have an impact on the regional grid or on any of the important element, shall be reported by the constituent to WRLDC in advance.

10.2.6

Any operation planned to be carried out on the instructions of WRLDC which may have an impact on the system of a constituent/s shall be reported by WRLDC to such constituent/s in advance.

10.2.7

The intimation and the exact time of revival of any element under the category of important events will be furnished to WRLDC as early as possible.

10.2.8

Under Frequency Relay Operation (Constituents to WRLDC)

In line with clause 5.2 (n) of IEGC, all state constituents have to provide AUFLS in their respective systems as per plans approved by WRPC to arrest frequency decline that could result in collapse / dis-integration of the grid. In order to check and ascertain their operation as per approved plans, the details of all such tripping in their areas shall be intimated by each SLDCs to WRLDC whenever required by the later.

10.2.9

Weekly Report (WRLDC to constituents)

WRLDC shall issue a weekly report to all the constituents of the region covering the performance of the regional grid during the previous week.

10.2.10 Quarterly Reports (WRLDC to constituents)

A quarterly report shall be issued by WRLDC to all the constituents detailing the power supply position during the last quarter, quality of supply, the system constraints and other relevant information.

10.2.11

Exceptional Reporting (constituents to WRLDC)

In case of any contingency such as industrial unrest, natural calamity etc., there could be additional reporting requirements not covered in the above schedule. WRLDC shall inform all constituents of any such exceptional requirements and the constituents would extend all necessary cooperation in this regard.



CHAPTER 11

SETTLEMENT SYSTEM PROCEDURES

11 OVERVIEW

The settlement system is an important part in implementation of Availability Based Tariff (ABT). The system involves scheduling, metering, data collection and processing, energy accounting and UI bills. This chapter indicates the roles and responsibilities of the different constituents in making the settlement system operative in most efficient manner.

11.1 Metering and Data Collection

11.1.1 As per Chapter-6 clause 6.4.21 of IEGC-2010, the CTU shall install Special Energy Meters on all inter connections between the regional entities and other identified points for recording of actual net MWh interchanges and MVARh draws.

11.1.2 The installation, operation and maintenance of special energy meters shall be in accordance with Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 and Central Electricity Authority (Installation of Operation of meters) Amendment Regulation 2010.

11.1.3 The type of meters to be installed, metering scheme, metering capability, testing and calibration requirements and scheme for collection and dissemination of meter data shall be as per Annexure-2 of IEGC, also enclosed at Annex-XIX with this procedure.

11.1.4 All concerned entities having SEMs installed in their premises shall fully cooperate and extend necessary assistance by taking weekly meter reading and transmitting them to WRLDC in time.

11.1.5 All concerned entities having SEMs shall also carry out necessary time adjustments in the meter as per the procedure already in vogue/advice of WRLDC.

11.1.6 If there exists a problem in any SEMs installed in their premises, the matter shall be informed by the entity to WRLDC initially and later taken up with POWERGRID transmission group for necessary action.

11.1.7 Any new line/ generation station / ICTS forming part of ISTS network, the concerned regional entity must confirm the installation of Special Energy Meters (SEMs) at interface points at least 15days before charging of the element.

11.2 Data Processing

11.2.1 All the energy meter data would reach WRLDC by every Monday for the previous week from Monday to Sunday. WRLDC would carry out data validation and in case of any problem, request any entity to send the data again. Each entity would therefore have necessary backup of data at their local PC level.

11.2.2 The computation of the net injection of each ISGS and actual net drawl of each beneficiary shall be carried out in line with clause 6.4.22 of IEGC based on the above meter readings received at WRLDC. The preparation of UI accounts and monthly REA to the constituents shall be done by WRPC Secretariat on the basis of meter data and implemented schedule forwarded by WRLDC.

11.2.3 Data related to the reactive energy between two regional entities and between regional entity and ISTS points would also be forwarded by WRLDC for preparation of reactive energy accounts by WRPC Secretariat.



11.3 Energy Accounting

WRPC Secretariat would process the information provided by WRLDC to determine the following:

- a) As per clause 2.4.5 of IEGC-2010, WRPC will prepare monthly Regional Energy Accounts.
- b) On a weekly basis
 1. WRPC shall prepare weekly UI bills as per Central Electricity Regulatory Commissions' Regulation on "Unscheduled Interchange charges and related matters (Amendment) Regulation 2010".
 2. WRPC shall prepare weekly reactive energy account clause 6.6 and Annexure-2 of IEGC 2010

11.4 Pool Account Operation

In line with clause 8 &9 of "Unscheduled Interchange charges and related matters (Amendment) Regulation 2010", from the date of issue of weekly UI Account by WRPC Secretariat, within 10-days, the concerned constituent shall pay on priority the indicated amount into "Regional Unscheduled Interchange Pool Account Fund" operated by WRLDC. The agencies that have to receive the money from pool accounts would then be paid within 2-working days of the receipt of the payment. These pool accounts are to be reconciled once in six months. The following accounts are operated by WRLDC. All the transactions with these accounts are done through RTGS.

Sr. No.	Account	Account Name
1	UI	POSCO WRPC UI A/C
2	Reactive Energy charge	POSCO WRPC REACTIVE A/C
3	IRE	POSCO WRPC IRE A/C
4	Congestion charge	POSCO WR CONGESTION CHARGE A/C
5	UI Capping	POSCO WRPC DIFFERENTIAL UI A/C

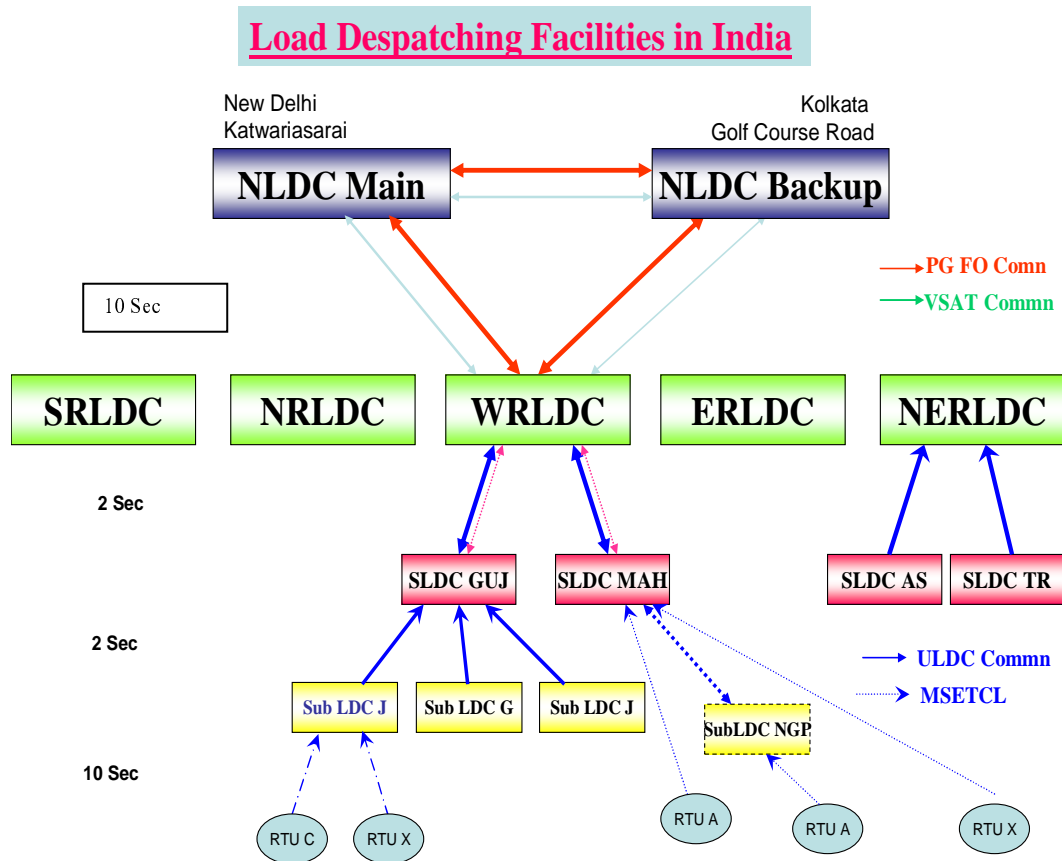
CHAPTER 12

ULDC SCHEME IN WESTERN REGION

12.1 Introduction

Unified Load Dispatch Scheme (ULDC) in WR has been commissioned in July 2006 to facilitate overall development of load dispatch and communication facilities on control centers. The scheme envisaged installation and commissioning of Remote Terminal Units, integration of existing RTUs in Chhattisgarh, Gujarat, Madhya Pradesh, Goa and Union Territory of Daman & Diu and Dadra & Nagar Haveli, installation and commissioning of dedicated communication system comprising of fiber optic and PLCC system, installation and commissioning of auxiliary power system such as UPS, DG set, 48V DC supply system and installation of EPABX system. Under the scheme, the Regional System Coordination Centre (RSCC) and Central Project Coordination Centre (CPCC) were established at Mumbai and Jabalpur respectively whereas State Load Dispatch Centers (SLDCs) were established at Bhilai (Chhattisgarh), Gotri (Gujarat), Jabalpur (M.P) and Panjim (Goa). Under each SLDC, sub-LDCs were also established. ULDC scheme operates in a hierarchical structure consisting of state-of-art equipment and advanced SCADA-EMS functions.

The SCADA real time values acquired at WRLDC Mumbai is further transmitted to National Load Dispatch centre at New Delhi (Main) and Kolkata (Backup) for operation, monitoring and optimization of national resources. The real time data is also made available to MOP, CEA and other senior officers at New Delhi. Data flow from sub station / Generating station to NLDC is shown in fig below.



12.2 SCADA features

The SCADA system has been designed for continuous real time data availability for grid operation and control with high level reliability. In order to achieve this, redundancy has been provided at communications and at each SCADA functions level. Real time data from over 16,000 number of analog measurands (MW, MVAR, AMP, KV, Frequency, OLTC tap position) and 22,000 number of status indication points (Isolator, Circuit breaker, Sequence of events – protection operation) have been wired up covering more than 300 (400 including MSETCL) nodes across the Western region. Data from these nodes are updated every 10-12 seconds for analog measurands and every (2) 4 seconds for status indication points (by exception). The real time data are archived to historical data base in ORACLE RDBMS and various reports, analysis, graphs, charts etc are prepared for reporting day-to-day functioning to various departments including CEA and MOP. After commissioning of NLDC during August 2008, all India important generations, power flows and other parameters are also made available to WRLDC load dispatchers for monitoring and control of power flows, generations and other grid parameters.

12.3 Energy Management System (EMS)

12.3.1

The Energy Management System (EMS) software supports following modules:-

- a) Power Network Application (PNA)
- b) Generation Despatch and Control (GDC)
- c) Similar Day Forecast (SDF)
- d) Inter-change Scheduling (IS)
- e) Water inflow forecast (WIF)
- f) Unit commitment / transaction evaluation (UC)
- g) Comprehensive Operational Planning System (COPS)

12.3.2

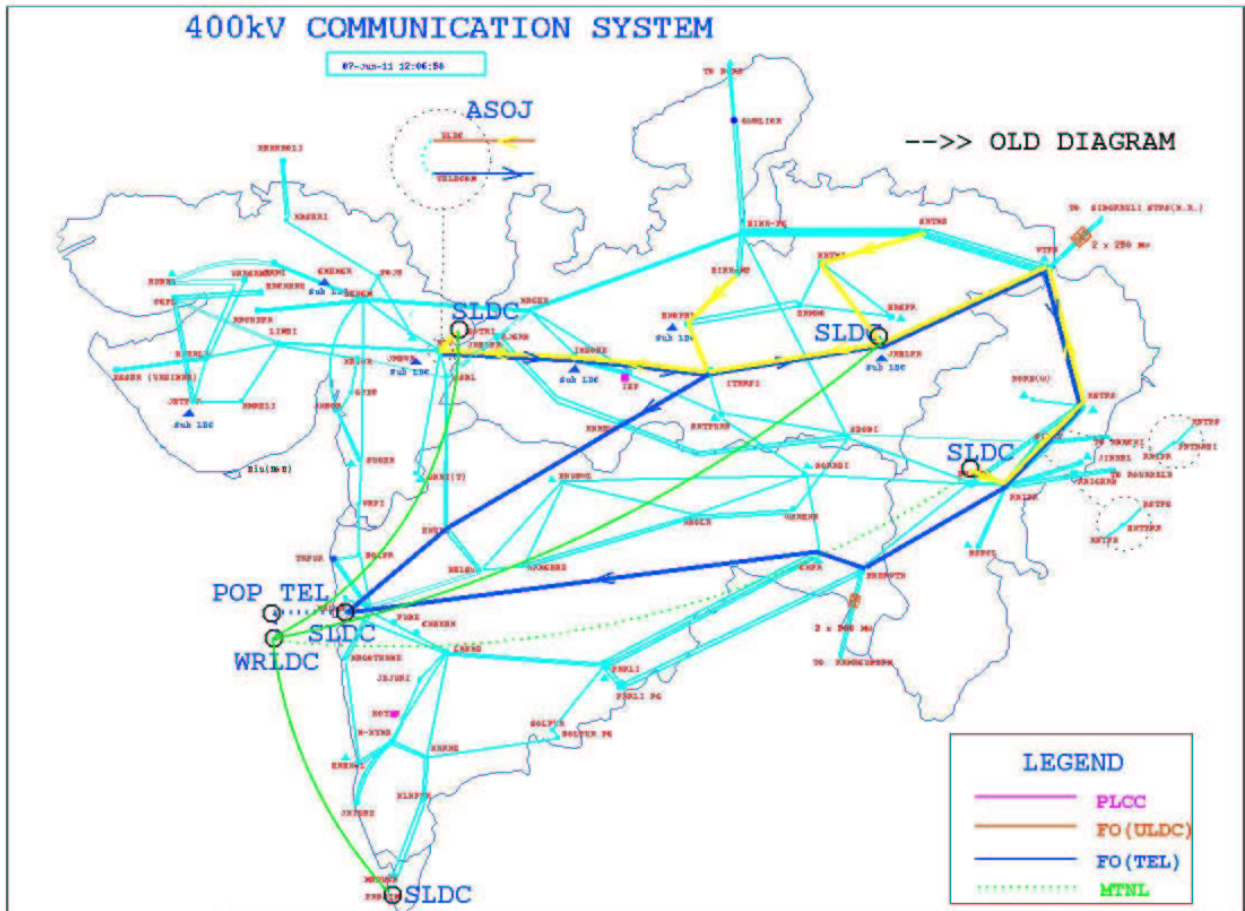
Consequent upon the Electricity Act 2003 and Availability Based Tariff, some of the standard EMS functions available under the ULDC contract need major customization and modeling. Action has been initiated during 7th ULDC O&M meeting held at Mumbai for carrying out network modeling. Based on the present operational exigency, PNA and SDF modules are implemented in WR. The PNA provides network analysis, both real time as well as study mode, contingency analysis which play increasingly important role in grid operation. It has equipped the control centre operators with means of identifying and analyzing potential operating problems as well as formulating various remedial strategies in an online system environment. A detailed procedure to run Real Time Network Analysis (RTNA) and Study Mode Network Analysis (STNA) is enclosed at Annex-XVII for reference.

12.3.3 The Similar Day Forecast (SDF) module of EMS facilitates the demand estimation of WR characterized by 96-specific demand profiles which incorporate the load pattern of 7-days of week, for 12-months of a year coupled with 12-holidays. It calls for each SLDC to upload the demand forecast data for the next day by 1500 hrs on daily basis.

12.4 Communication System

A dedicated communication backbone system has been established under ULDC scheme consisting of fiber optic and PLCC communication. An alternate physical route between WRLDC and SLDCs has been established (MTNL/BSNL) to provide reliability and redundancy in data communication channel. The wide band communication data flow

diagram is shown in picture below.



12.5 Operational Requirements

12.5.1 Validation / Correctness of Data

The entire gamut of real time monitoring of the regional grid and EMS functions depends upon the availability, reliability and authenticity of telemetered data. It is therefore essential that various control centers i.e., RSCC / SLDCs / Sub LDCs / substations take responsibility towards authenticity / validation of the data on a regular basis so that the facilities created in the scheme is optimally utilized to benefit the grid operation. It is therefore considered essential that each control centre i.e., RSCC/SLDCs/Sub LDCs/substation takes up the exercise of data validation / authenticity periodically preferably once in three month or whenever any discrepancy is noticed to ensure that the data flow to the control centers from various nodes are error free.

12.5.2 Availability of Speech and Data Communication System

In the event of commissioning of new generating station / substation / transmission elements etc., it is essential that reliable and efficient speech and data communication system are provided by the concerned agency to facilitate data up to WRLDC / SLDC as the case may be. In this connection, clause 4.6.2 of IEGC is relevant and hence reproduced below:

Reliable and efficient speech and data communication system shall be provided to facilitate necessary communication and data exchange, and supervision / control of the grid by the RLDC, under normal and abnormal conditions. All agencies shall provide systems to



telemeter power system parameter such as flow, voltage and status of switches / transformer taps etc in line with interface requirements and other guidelines made available to RLDC / SLDC as the case may be, shall also be established by the concerned agency as specified by CTU in connection agreement. All agencies in coordination with CTU shall provide the required facilities at their respective ends and RLDC / SLDC as specified in the connection agreement.

12.5.3 Availability of Ruts

Remote Terminal Units (Ruts) constitute an important element of the SCADA system for transfer of analog misbrands and status indications continuously from various nodes to the control centre. Hence, it is essential that Ruts installed in the system and reporting to the different control centers are monitored and maintained in a proper way to ensure continuity of data. Failure of any RTU may cause stoppage of data and thereby may lead to operational problem. Hence, it is important that any problem encountered in RTU causing failure of data to the control centre is attended at the earliest preferably within 24 hours so that information flow is restored at the earliest.

12.5.4 Availability of Dedicated Communication System

In order to transfer the real time data from Ruts to sub-Laces / SLDCs / WRLDC, communication backbone network consisting of fiber optic and PLCC end links are provided and the same need to be maintained properly. In case of any failure of the link i.e., fiber cut between two locations causing complete failure of upstream data, failure of supply to the repeater station etc., and immediate action needs to be initiated by the concerned authority to restore the system data as quick as possible preferably within 24 hours to avoid any operational problem.

12.5.5 Upkeep / Maintenance of Control Centers All out efforts should be made by WRLDC / SLDC / sub-SLDCs to ensure that proper environmental conditions are maintained in all the control centers for proper functioning of the equipments and in the event of failure of any auxiliary system such as Air conditioning, UPS etc., immediate action is initiated by the concerned to restore the system at the earliest.

12.6 STOA System

The STOA software module developed by CDAC was customized to meet World's special needs and was implemented on Dual Server/Shared Storage platform of IBM make with Red hat Linux OS and JBOSS/Myself. The STOA application of CDAC is now fully functional and entire process is fully automated with specific operational training imparted to users from Control Room as well as from Open Access Group of WRLDC. The system is in operation from May 2010.

12.7 ISMS implementation and certification

The Information Security Management Systems as per ISO 27001:2005 were implemented in all departments of WRLDC. The same standard was implemented at all Rids/NLDC with WRLDC as lead RLDC. The implementation of the ISMS has brought in several new concepts with added awareness for security of the information being handled and stored by all departments. In addition, the Risk Management also has undergone change with this new outlook. All Rids/NLDC were certified by BSI for ISMS as compliant to ISO 27001:2005 w.e.f.1.4.2011.



12.8 Web-Based Scheduling

A Web-browser based Interface is provided on WRLDC website for entering scheduling request. The user can login in the scheduling module and he can enter his request for DC and requisition from the ISGS plant. WRLDC control room engineer can acknowledge the request and do the further processing from his terminal in the control room. The final schedule issued by control room engineer is displayed on the WRLDC website.

Time	Action
By 10.00 hrs.	ISGSs shall advise WRLDC the Station-wise MW and MWh capabilities
By 1100 hrs.	WRLDC shall advise the States / Beneficiaries the Station wise MW & MWh entitlements
By 1500 hrs.	SLDCs/ Beneficiaries shall communicate the Station-wise requirements and details of bilateral exchanges to WRLDC
By 1700 hrs.	WRLDC shall convey the ex-power plant dispatch schedule to each ISGS and net drawal schedule to each State / Beneficiary. The details of unrequited surpluses shall also be intimated.

Sr No	From TimeBlock	To TimeBlock	DC in MW	Close Resv. in MW
1				0

12.9 SCADA data on WRLDC intranet

Western region important grid parameters such as generation, line flows, 400kV bus voltage, constituent's actual drawl from grid etc are archived from SCADA real time values and stored in ORACLE data base. A Web-browser based Interface is provided on WRLDC intranet for access of all historical data for analysis and other user requirement. The data can be accessed from WRLDC intranet SCADA→Reports→Generations/Line Flows/Voltages and SCADA→Reports→ABT



Flow-gates of Western Region

Arno.	Axis of cross section	Remarks
Gate 1.	400kV Bina-Nagda D/C 400kV Itarsi-Indore D/C 400kV Satpura-Indirasagar 400kV Khandwa-Dhule D/C 400kV Koradi-Bhusawal 400kV Koradi-Akola 400kV Wardha-Akola D/C HVDC bi-pole Chandrapur-Padghe 400kV Chandrapur-Parli T/C	If the loading on any AC line across this section exceeds 500 MW, please carry out the following steps: i) Increase power order on HVDC Chandrapur-Padghe ii) Take into service any of the AC lines on this section, if kept out. iii) Load shedding in Western part of MP/Maharashtra and Gujarat 400 kV Bhadrawati-Parli (PG) D/C and 400 kV Wardha-Parli (PG) are the additional 400 kV lines being added to this corridor
Gate 2.	400kV Satna-Bina (2xD/C) 400kV Jabalpur-Itarsi (2xD/C) 765kV Sipat-Seoni D/C 400kV Bhilai - Seoni 400kV Bhilai-Koradi 400kV Bhilai-Bhadrawati 400kV Raipur-Bhadrawati T/C	In case the loading on any line on this section exceeds 500 MW, please ensure that if any of the lines in this section is kept off, it might be taken into service immediately. In case frequency is high, reduce generation in Eastern Region and Korba/Vindhyachal/Sipat complex. In case frequency is low, load shedding might be required in the western part. 400 kV Raipur-Wardha D/C is an augmentation planned on this corridor.
Gate 3	400kV Korba NTPC-Bhilai D/C 400 kV Korba West-Bhilai 400kV Korba NTPC-Bhatapara 400kV Pathadi-Raipur 220kV Raigarh-Raigarh(PG) D/C 220kV Kotmikala-Amarkantak D/C	If the flow on any line on this section exceeds 550 MW, injection of Chhattisgarh and Lanco to be reduced. If any line on this section is not in service, please try to take this into service. 400 kV Korba NTPC-Birsingpur D/C and 400 kV Korba NTPC-Raipur D/C are the additional lines being planned in this corridor along with 400 kV Korba West-Bhilai line.
Gate 4	400kV Indore-Asoj D/C 400kV SSP-Asoj S/C 400kV SSP-Kasor S/C 400kV Nagda-Dehgam D/C	If the loading on any line exceeds 500 MW, please take into service any of the lines in this section in case it is off. Check whether the load is on account of wheeling of power to Northern region or heavy drawal by Gujarat. In case it is on account of wheeling, change power order on HVDC Vindhyachal HVDC back to back to the extent possible (West to North) and follow up with NLDC/NRLDC. In case of overdrawal by Gujarat, take up with Gujarat SLDC.

Note: The above is intended only as a broad guideline. In real time operation there could be several other reasons for overload and the WRLDC operator is empowered to take any other decision in real time.



IMPORTANT REGIONAL GRID ELEMENTS (AS ON 30.05.2011)					
A. Generating Units					
STATE	AGENCY	TYPE	STATION	UNIT DETAILS	EFFECTIVE CAPACITY (MW)
a) Grid elements under supervision and monitoring of WRLDC (Prior approval of WRLDC required for outage of such elements)					
CHATTISGARH	NTPC	THERMAL	KSTPS	3X200+3X500+1X500	2600
MP	NTPC	THERMAL	VSTPS	2X210+2X500+2X500	3260
CHATTISGARH	NTPC	THERMAL	SIPAT	2X500+1X660	1660
GUJRAT	NTPC	GAS/RLNG/NAPHTA	KAWAS	4X106+2X116.1	656
GUJRAT	NTPC	GAS/RLNG	GHANDAR	3X144.3+224.49	657
GUJRAT	NCA	HYDRO	SSP	6X200+5X50	1450
MAHARASHTRA	NPCIL	NUCLEAR	TARAPUR	2X160+2X540	1400
GUJRAT	NPCIL	NUCLEAR	KAKRAPAR	2X220	440
CHATTISGARH	JINDAL POWER LTD	THERMAL	TAMNAR	4X250	1000
CHATTISGARH	NSPCL	THERMAL	BHILAI	2X250	500
CHATTISGARH	LANCO	THERMAL	PATHADI	2X300	600
b) Grid elements under monitoring of WRLDC (Prior intimation to WRLDC required for outage of such elements)					
GUJRAT	G.S.E.G.C.L	HYDRO	UKAI	4X75	300
GUJRAT	G.S.E.G.C.L	HYERO	KADANA	4X60	240
GUJRAT	G.S.E.G.C.L	THERMAL	GANDHINAGAR	2X120+3X210	870
GUJRAT	G.S.E.G.C.L	THERMAL	WANAKBORI	7X210	1470
GUJRAT	G.S.E.G.C.L	THERMAL	UKAI	2X120+2X200+1X210	850
GUJRAT	TORRENT POWER	THERMAL	A.E.Co.C.D.E.F	1X60+1X120+2X110	400
GUJRAT	G.S.E.G.C.L	THERMAL	SIKKA	2X120	240
GUJRAT	G.S.E.G.C.L	LIGNITE	KUTCH(Panandthro)	2X70+2X75	290
GUJRAT	ESSAR POWER	GAS	ESSAR	3X110+1X185	515
GUJRAT	GPEC	GAS	GPEC	3X138+1X241	655
GUJRAT	GIPCL-BARODA	GAS	GIPCL-II	1X54+1X111	165
GUJRAT	GIPCL-MAGNROL	LIGNITE	SURAT	4X125	500
GUJRAT	G.S.E.G.C.L	LIGNITE	AKRIMOTA	2X125	250
GUJRAT	G.S.E.G.C.L	THERMAL	DHURAN	2X110	220
GUJRAT	G.S.E.G.C.L	GAS	DHURAN	(68+39)+72+40)	219
GUJRAT	G.S.E.G.C.L	GAS	UTRAN-II	1X229+1X146	375
GUJRAT	GSEG,HAZIRA	GAS	GSEG	3X52	156
GUJRAT	TORRENT POWER	GAS	SUGEN	3X382.5	1148
GUJRAT	ADANI POWER LTD	THERMAL	APL MUNDRA	4x330+2x660	2640
MP	MPPGCL	HYDRO	BANASGR TONES	3X105	315
MP	MPPGCL	HYDRO	PENCH	2X80	60
MP	NHDC	HYDRO	INDIRA SAGAR	8X125	1000
MP	NHDC	HYDRO	OMKARESHWAR	8X65	520
MP	MPPGCL	HYDRO	AMARKANTAK CHACHAI	2X120+1X210	450
MP	MPPGCL	THERMAL	SATPURA-I	5X62.5	312.5
MP	MPPGCL	THERMAL	SATPURA-II	1X200+1X210	410
MP	MPPGCL	THERMAL	SATPURA-III	2X210	420
MP	MPPGCL	THERMAL	S GANDHI TPS	4X210	840
MP	MPPGCL	THERMAL	S GANDHI TPS	1X500	500
MAHRASHTRA	MAHA GENCO	HYDRO	KOYNA I & II	4X(65+5)+4X(75+5)	600
MAHRASHTRA	MAHA GENCO	HYDRO	KOYNA III	4X80	320
MAHRASHTRA	MAHA GENCO	HYDRO	KAOYNA IV	4X250	1000
MAHRASHTRA	MAHA GENCO	HYDRO	VAITARNA	1X60	60
MAHRASHTRA	MAHA GENCO	HYDRO	TILLARI	1X60	60
MAHRASHTRA	MAHA GENCO	HYDRO	GHATGHAR	2X125	250
MAHRASHTRA	TAATA POWER CO	HYDRO	BHIRA PSS	1X150	150
MAHRASHTRA	M.S.E.G.C.L.	GAS	URAN	4X108+2X120	672
MAHRASHTRA	M.S.E.G.C.L.	THERMAL	NASIK	2X125+3X210	880
MAHRASHTRA	TAATA POWER CO	GAS	TROMBAY	120+60	180
MAHRASHTRA	TAATA POWER CO	THERMAL	TROMBAY	150+2X500+1X250	1400
MAHRASHTRA	M.S.E.G.C.L.	THERMAL	KORADI	1X200+2X210	620
MAHRASHTRA	M.S.E.G.C.L.	THERMAL	BHUSAWAL	2X210	420
MAHRASHTRA	M.S.E.G.C.L.	THERMAL	PARLI	3X210	630
MAHRASHTRA	M.S.E.G.C.L.	THERMAL	NEW PARLI	2X250	500
MAHRASHTRA	M.S.E.G.C.L.	THERMAL	CHANDRAPUR	4X210+3X500	2340
MAHRASHTRA	M.S.E.G.C.L.	THERMAL	KHAPARKHEDA	4X210	840
MAHRASHTRA	RELIANCE ENERGY	THERMAL	DAHANU	2X250	500
MAHRASHTRA	M.S.E.G.C.L.	THERMAL	PARAS EXT	2X250	500
MAHRASHTRA	KSK EVL	THERMAL	WARORA	4X135	540
MAHRASHTRA	JSW ENERGY	THERMAL	JSW, JAIGAD	4X300	1200
MAHRASHTRA	RGPCL	GAS	RATNAGIRI	3X(2X240+260)	2220
CHATTISGARH	CSPGCL	THERMAL	KORBA (E)	2X120	240
CHATTISGARH	CSPGCL	THERMAL	KORBA (E) Ext	2X250	500
CHATTISGARH	CSPGCL	THERMAL	KORBA (W)	4X210	840



B. TRANSMISSION LINES

LIST OF 765 KV LINES						
Sr. No.	LINE	NO OF CKTS	MAINTENED BY	AGENCY AT END-1	AGENCY AT END-2	OTHER AGENCY AFFECTED
1	SIPAT-SEONI	2	POWERGRID	NTPC	POWERGRID	GRID
2	BINA-GWALIOR	2	POWERGRID	POWERGRID	POWERGRID	GRID
3	SEONI-BINA	1	POWERGRID	POWERGRID	POWERGRID	GRID
4	SEONI-WARDHA	1	POWERGRID	POWERGRID	POWERGRID	GRID
5	AGRA-GWALIOR	2	POWERGRID	POWERGRID	POWERGRID	GRID
Sr No 2-5 CHARGED AT 400 KV						

LIST OF HVDC LINES

Sr. No.	LINE	NO OF CKTS	MAINTENED BY	AGENCY AT END-1	AGENCY AT END-2	AFFECTED AGENCIES
1	+/- 500 kV CHANDRAPUR-PADGHE HVDC	2	MSETCL	MSETCL	MSETCL	GRID

LIST OF HVDC BTB ELEMENTS

Sr. No.	LINE	NO OF CKTS	MAINTENED BY	AGENCY AT END-1	AGENCY AT END-2	AFFECTED AGENCIES
1	BHADRAWATI(2X500 MW)	2	POWERGRID	POWERGRID	POWERGRID	GRID
2	VINDHYACHAL(2X250MW)	2	POWERGRID	POWERGRID	POWERGRID	GRID

LIST OF 400 KV LINES

Sr. No.	LINE	NO OF CKTS	MAINTENED BY	AGENCY AT END-1	AGENCY AT END-2	AFFECTED AGENCIES
1	KORBA(NTPC)-KORBA(W)	1	POWERGRID	NTPC	CSPTCL	GRID
2	KORBA(NTPC)-BHILAI	2	POWERGRID	NTPC	CSPTCL	GRID
3	KORBA (NTPC)-PATHADI	1	POWERGRID	NTPC	LANCO	GRID
4	PATHADI-RAIPUR	1	POWERGRID	LANCO	POWERGRID	GRID
5	KORBA(NTPC)-BHATAPARA	1	POWERGRID	NTPC	POWERGRID	GRID,CS TCL
6	BHATAPARA-RAIPUR	1	POWERGRID	POWERGRID	POWERGRID	GRID
7	VINDHYACHAL-KORBA(NTPC)	2	POWERGRID	NTPC	NTPC	GRID
8	BHILAI-KORADI	1	POWERGRID	CSPTCL	MSETCL	GRID
9	BHILAI-BHADRAVATI	1	POWERGRID	CSPTCL	POWERGRID	GRID
10	RAIPUR-BHADRAVATI	3	POWERGRID	POWERGRID	POWERGRID	GRID
11	KORADI-SATPURA	1	POWERGRID	MSETCL	MPPTCL	GRID
12	SATPUR-ITARSI	1	POWERGRID	MPPTCL	POWERGRID	GRID
13	ITARSI-INDORE	2	POWERGRID	POWERGRID	MPPTCL	GRID
14	ITARSI-KHANDWA	2	POWERGRID	POWERGRID	POWERGRID	GRID
15	KHANDWA-DHULE	2	POWERGRID	POWERGRID	MSETCL	MPPTCL,GRID
16	INDORE-ASOJ	2	POWERGRID	MPPTCL	GETCO	GRID
17	BHADRAWATI-CHANDRAPUR	4	POWERGRID	POWERGRID	MSETCL	GRID
18	VINDYCHAL-JABALPUR	4	POWERGRID	NTPC	POWERGRID	NTPC,MPPTCL
19	JABALPUR-ITARSI	4	POWERGRID	POWERGRID	POWERGRID	NTPC,MPPTCL
20	JHANOR-DEHGAM	1	POWERGRID	NTPC	GETCO	GRID
21	JHANOR-SUGEN	2	POWERGRID	NTPC	SUGEN	GRID
22	DEHGAM-SUGEN	1	POWERGRID	POWERGRID	SUGEN	GRID
23	JHANOR-GPEC	1	POWERGRID	NTPC	GPEC	NTPC,GETCO
24	VINDYACHAL-SATNA	4	POWERGRID	NTPC	POWERGRID	GRID
25	SATNA-BINA(PGCIL)	4	POWERGRID	POWERGRID	POWERGRID	MPPTCL,GRID
26	BHILAI-RAIPUR	2	POWERGRID	CSPTCL	POWERGRID	CSTPCL,GRID
27	KOLAHAPUR-MAPUSA	2	POWERGRID	MSETCL	POWERGRID	GOA
28	RAIPUR-RAIGARH	4	POWERGRID	POWERGRID	POWERGRID	GRID,CS TC;
29	TARAPUR-BOISAR	2	POWERGRID	NPCIL	MSETCL	GRID
30	TARAPUR-PADGHE	2	POWERGRID	NPCIL	POWERGRID	GRID
31	SUGEN-VAPI	1	POWERGRID	SUGEN	POWERGRID	GRID
32	VAPI-BOISAR	1	POWERGRID	POWERGRID	POWERGRID	GRID
33	BOISAR-PADGHE	1	POWERGRID	POWERGRID	MSETCL	GRID
34	BINA(PGCIL)-BINA(MPPTCL)	2	POWERGRID	POWERGRID	MPPTCL	MPPTCL
35	BINA(PGCIL)-SUJALPUR	2	POWERGRID	POWERGRID	POWERGRID	GRID
36	SUJALPUR-NAGDA	2	POWERGRID	POWERGRID	MPPTCL	GRID
37	NAGDA-DEHGAM	2	POWERGRID	MPPTCL	POWERGRID	GRID
38	SEONI-KHANDWA	2	POWERGRID	POWERGRID	POWERGRID	MPPTCL,GRID
39	KHANDWA-RAJGARH	2	POWERGRID	POWERGRID	POWERGRID	MPPTCL,GRID
40	SIPAT-RAIPUR	2	POWERGRID	NTPC	POWERGRID	GRID



LIST OF 400 KV LINES

Sr. No.	LINE	NO OF CKTS	MAINTENED BY	AGENCY AT END-1	AGENCY AT END-2	AFFECTED AGENCIES
41	SIPAT-RANCHI	2	POWERGRID	NTPC	POWERGRID	GRID
42	WARDHA-AKOLA	2	POWERGRID	POWERGRID	MSETCL	MSETCL
43	ZERDA-KANKROLI	1	POWERGRID	POWERGRID	POWERGRID	GRID
44	ZERDA-BHINMAI	1	POWERGRID	POWERGRID	POWERGRID/NR	GRID
45	DAMOH-BIRSINGPUR	2	POWERGRID	POWERGRID	MPPTCL	MPPTCL
46	RAIGARH-RAURKELA	1	POWERGRID	POWERGRID	POWERGRID	GRID
47	RAIGARH-STERLITE	1	POWERGRID	POWERGRID	STERLITE	GRID
48	DEHGAM-PIRANA(PG)	2	POWERGRID	POWERGRID	POWERGRID	GRID
49	BHADRAWATI-PARLI(PG)	2	POWERGRID	POWERGRID	POWERGRID	MSETCL_GRID
50	PARLI(PG)-PARLI	2	POWERGRID	POWERGRID	MSETCL	MSETCL_GRID
51	SUGEN-PIRNA(T)	2	TPGL	SUGEN	TPGL	GRID
52	PIRNA(T)-PIRANA(PG)	2	TPGL	TPGL	POWERGRID	GRID
53	MUNDRA-SAMI	2	APL	APL	APL	APL
54	SAMI-DEHGAM	2	APL	APL	POWERGRID	APL
55	TAMNAR-RAIPUR	2	JPL	JPL	POWERGRID	JPL
56	NSPCL-RAIPUR	2	NSPCL	NSPCL	POWERGRID	GRID
57	BHOPAL-BINA	2	MPPTCL	MPPTCL	MPPTCL	GRID
58	INDIRASAGAR-NAGDA	1	MPPTCL	MPPTCL	MPPTCL	GRID
59	INDIRASAGAR-SATPURA	1	MPPTCL	MPPTCL	MPPTCL	GRID
60	INDIRASAGAR-INDORE	2	MPPTCL	MPPTCL	POWERGRID	GRID
61	INDORE-NAGDA	1	MPPTCL	MPPTCL	POWERGRID	GRID
62	ITARSI-BHOPAL	2	MPPTCL	POWERGRID	MPPTCL	GRID
63	SATPURA-SEONI	1	MPPTCL	SSP	POWERGRID	GRID
64	SEONI-BHILAI	1	MPPTCL	MPPTCL	CSPTCL	GRID
65	SSP-RAJGARH	2	MPPTCL	NCA	MPPTCL	GRID
66	RAJGARH-NAGDA	2	MPPTCL	MPPTCL	MPPTCL	GRID
67	BIRSINGPUR-DAMOH	1	MPPTCL	MPPTCL	POWERGRID	GRID
68	DAMOH-KATNI	1	MPPTCL	POWERGRID	MPPTCL	GRID
69	KATNI-BIRSINGPUR	1	MPPTCL	MPPTCL	MPPTCL	GRID
70	ASOJ-UKAI	1	GETCO	GETCO	GETCO	GRID
71	ASOJ-WANKBORI	1	GETCO	GETCO	GETCO	GRID
72	CHORNIA-AMRELI	1	GETCO	GETCO	GETCO	GRID
73	ASOJ-CHORNIA	2	GETCO	GETCO	GETCO	GRID
74	ASOJ-SSP	1	GETCO	GETCO	SSP	GRID
75	KASOR-SSP	1	GETCO	GETCO	SSP	GRID
76	KASOR-GPEC	1	GETCO	GETCO	GPEC	GRID
77	KASOR-CHORNIA	1	GETCO	GETCO	GETCO	GRID
78	AMRELI-JETPUR	1	GETCO	GETCO	GETCO	GRID
79	CHORNIA-HADALA	1	GETCO	GETCO	GETCO	GRID
80	HADALA-VADINAR	2	GETCO	GETCO	ESSAR	GRID
81	HADALA-JETPUR	1	GETCO	GETCO	GETCO	GRID
82	HADALA-MUNDRA	1	GETCO	GETCO	APL	GRID
83	HADALA-VARSANA	1	GETCO	GETCO	GETCO	GRID
84	MUNDRA-VARSANA	1	GETCO	GETCO	GETCO	GRID
85	SOJA-KANSARI	1	GETCO	GETCO	GETCO	GRID
86	VADAVI(R.PURAJ)-DEHGAM	2	GETCO	GETCO	POWERGRID	GRID
87	SOJA-WANAKBORI	1	GETCO	GETCO	GETCO	GRID
88	SOJA-DEHGAM	1	GETCO	GETCO	POWERGRID	GRID
89	DEHGAM-WANAKBORI	1	GETCO	POWERGRID	GETCO	GRID
90	BHILAI-KORBA(W)	1	CSPTCL	CSPTCL	CSPTCL	GRID
91	BABHLESHWAR-AURANGABAD	1	MSETCL	MSETCL	MSETCL	MSETCL
92	AURANGABAD-BHUSAWAL	1	MSETCL	MSETCL	MSETCL	MSETCL
93	BABHLESHWAR-PADGHE	2	MSETCL	MSETCL	MSETCL	MSETCL
94	BHUSAWAL-BABHLESHWAR	1	MSETCL	MSETCL	MSETCL	MSETCL
95	CHANDRAPUR-KHAPERKHEDA	1	MSETCL	MSETCL	MSETCL	GRID
96	KHAPERKHEDA-KORADI	1	MSETCL	MSETCL	MSETCL	GRID
97	CHANDRAPUR-PARLI	3	MSETCL	MSETCL	MSETCL	GRID
98	DABHOL-NEW KOYNA(Q/C)	2	MSETCL	RGPL	MSETCL	MSETCL
99	DHULE-BABHLESHWAR	2	MSETCL	MSETCL	MSETCL	GRID
100	DHULE-SARDAR SAROVAR	2	MSETCL	MSETCL	SSP	GRID



LIST OF 400 KV LINES

Sr. No.	LINE	NO OF CKTS	MAINTENED BY	AGENCY AT END-1	AGENCY AT END-2	AFFECTED AGENCIES
101	KALWA-KHARGHAR	1	MSETCL	MSETCL	MSETCL	GRID
102	KHARGHAR-PADGHE	1	MSETCL	MSETCL	MSETCL	GRID
103	KALWA-LONIKAND	1	MSETCL	MSETCL	MSETCL	GRID
104	KALWA-PADGHE	2	MSETCL	MSETCL	MSETCL	GRID
105	PADGHE-PUNE(PG)	1	MSETCL	MSETCL	POWERGRID	GRID
106	PUNE(PG)-CHAKAN	1	MSETCL	POWERGRID	MSETCL	GRID
107	CHAKAN-LONIKAND	1	MSETCL	MSETCL	MSETCL	GRID
108	KARAD-NEW KOYNA	2	MSETCL	MSETCL	MSETCL	GRID
109	KARAD-KOLHAPUR	2	MSETCL	MSETCL	MSETCL	GRID
110	KORADI-BHUSWAL	1	MSETCL	MSETCL	MSETCL	GRID
111	KORADI-AKOLA	1	MSETCL	MSETCL	MSETCL	GRID
112	AKOLA-BHUSAWAL	1	MSETCL	MSETCL	MSETCL	GRID
113	PARLI-SOLAPUR	1	MSETCL	MSETCL	MSETCL	GRID
114	SOLAPUR-SOLAPUR(PG)	1	POWERGRID	MSETCL	POWERGRID	GRID
115	SOLAPUR(PG)-KARAD	1	MSETCL	POWERGRID	MSETCL	GRID
116	LONIKHAND-JEJURI	1	MSETCL	MSETCL	MSETCL	GRID
117	JEJURI-KOYNA-IV	1	MSETCL	MSETCL	MSETCL	GRID
118	LONIKHAND-KARAD	1	MSETCL	MSETCL	MSETCL	GRID
119	NEW KOYNA-KOYNA-IV	2	MSETCL	MSETCL	MSETCL	GRID
120	LONIKAND-KOYNA-IV	1	MSETCL	MSETCL	MSETCL	GRID
121	PADGHE-NAGOTHANE	2	MSETCL	RGPPL	MSETCL	GRID
122	PARLI-LONIKAND	2	MSETCL	MSETCL	MSETCL	GRID
123	JAIGAD-NEW KOYNA	2	JSW	JSW	MSETCL	JSW

LIST OF 220 KV LINES

Sr. No.	LINE	NO OF CKTS	MAINTENED BY	AGENCY AT END-1	AGENCY AT END-2	AFFECTED AGENCIES
1	KAWAS-NAVSARI	2	POWERGRID	NTPC	GETCO	GETCO
2	KAWAS-HALDARWA	2	POWERGRID	NTPC	GETCO	GETCO
3	KAWAS-VAV	1	POWERGRID	NTPC	GETCO	GETCO
4	KAWAS-ICHHAPUR	1	POWERGRID	NTPC	GETCO	GETCO
5	ICHHAPUR-VAV	1	POWERGRID	GETCO	GETCO	GRID
6	KAKRAPAR-VAV	2	POWERGRID	NPCL	GETCO	GETCO
7	KAKRAPAR-VAPI	2	POWERGRID	NPCL	GETCO	GETCO
8	KAKRAPAR-HALDARWA	2	POWERGRID	NPCL	GETCO	GETCO
9	JHANOR-HALDARWA	2	POWERGRID	NTPC	GETCO	GETCO
10	KORBA EAST-BUDHIPADAR	1	POWERGRID	CSPTCL	GRIDCO,ORISSA	GRID,CSPTCL
11	VAPI(PG)-MAGARWADA	2	POWERGRID	POWERGRID	DD	DD
12	VAPI(PG)-KARADPADA	2	POWERGRID	POWERGRID	DNH	DNH
13	VAPI(PG)-KHADOLI	2	POWERGRID	POWERGRID	DNH	DNH
14	ITARSI(PG)-ITARSI(MPPTCL)	1	POWERGRID	POWERGRID	MPPTCL	MPPTCL
15	TAPS-1,2-VAPI	1	GETCO	NPCL	GETCO	MSETCL
16	TAPS-1,2-BHILAD	1	GETCO	NPCL	GETCO	MSETCL
17	TAPS-1,2-BOISAR	1	MSETCL	NPCL	MSETCL	GETCO
18	TAPS-1,2-BORIVALI	1	MSETCL	NPCL	MSETCL	GETCO
19	KOLHAPUR-PONDA	1	MSETCL/GOA	MSETCL	GOA	GOA
20	HALKARNI-AMONA	1	MSETCL/GOA	MSETCL	GOA	GOA
21	MEHGAON-AURAIYA	1	MPPTCL/UPPTCL	MPPTCL	UPPTCL	GRID/MPPTCL
22	MALANPUR-AURAIYA	1	MPPTCL/UPPTCL	MPPTCL	UPPTCL	GRID/MPPTCL
23	BADOD-MODAK	1	MPPTCL/RRV/PNL	MPPTCL	RRV/PNL	GRID/MPPTCL
24	BADOD-KOTA	1	MPPTCL/RRV/PNL	MPPTCL	RRV/PNL	GRID/MPPTCL
25	KORBA EAST-BUDHIPADAR	1	CSPTCL/GRIDCO	CSPTCL	GRIDCO,ORISSA	GRID,CSPTCL
26	RAIGARH-BUDHIPADAR	1	CSPTCL/GRIDCO	CSPTCL	GRIDCO,ORISSA	GRID,CSPTCL
27	KOLHAPUR-CHIKODI	2	MSETCL/KPTCL	MSETCL	KPTCL	



C. ICTs

LIST OF ICTs				
SR NO.	NAME OF SUBSTATION	NO. OF X-MRES X CAPACITY(MVA)	VOLTAGE RATIO	TRANSFORMATION CAPACITY (MVA)
GUJARAT				
1	UKAI(T)	1X315	400/220	315
2	ASOJ	2X500	400/220	1000
3	WANAKBORI	1X315	400/220	315
4	SOJA	2X500	400/220	1000
5	JETPUR	3X315	400/220	945
6	CHORANIA	2X500	400/220	1000
7	HADALA	2X315	400/220	630
8	GPEC	1X500	400/220	500
9	KASOR	2X315	400/220	630
10	AMRELI	2X315	400/220	630
11	KANSARI	3X315	400/220	945
12	VADAVI	2X315	400/200	630
CHATTISGARH				
1	KORBA(W)	1X500	400/220	500
2	BHILAI	3X315	400/220	945
MADHYAP RADESH				
1	SATPURA	1X500	400/220	500
2	INDORE	4X315	400/220	1260
3	BHOPAL	3X315	400/220	945
4	NAGDA	3X315	400/220	945
5	BIRSINGPUR	1X500	400/220	500
6	KATNI	1X315	400/220	315
7	BINA	3X315	400/220	945
MAHARASHTRA				
1	KALWA	1X600+2X500	400/220	1600
2	BHUSAWAL	2X200	400/132	400
3	BHUSAWAL	1X315	400/220	315
4	SOLAPUR	2X500	400/220	1000
5	KORADI	1X300+1X315	400/220	615
6	NAGOTHANE	2X315	400/220	630
7	JEJURI	2X500	400/220	1000
8	CHANDRAPUR	2X315	400/220	630
9	PARLI	2X315	400/220	630
10	KARAD	3X315	400/220	945
11	LONIKAND	3X315	400/220	945
12	AURANGABAD	2X315+1X500	400/220	1130
13	PADGHE	3X315	400/220	945
14	NEW KOYNA	2X315	400/220	630
15	DHULE	2X315	400/220	630
16	BABLESHWAR	2X315	400/220	630
17	KOLHAPUR	2X315	400/220	630
18	AKOLA	1X315	400/220	315
19	KHARGHAR	2X315	400/220	630
20	CHAKAN	2X315	400/220	630

LIST OF ICTs				
SR NO.	NAME OF SUBSTATION	NO. OF X-MRES X CAPACITY(MVA)	VOLTAGE RATIO	TRANSFORMATION CAPACITY (MVA)
POWERGRID				
1	RAIGARH	2X315	400/220	630
2	JABALPUR	2X315	400/220	630
3	SATNA	2X315	400/220	630
4	RAIPUR	2X315	400/220	630
5	MHAUSA	2X315	400/220	630
6	VAPI	2X315	400/220	630
7	BOISAR	2X315	400/220	630
8	KHANDWA	2X315	400/220	630
9	SEONI	3X1500	765/440	4500
10	SEONI	2X315	400/220	630
11	BHATAPARA	2X315	400/220	630
12	RAJGARH	2X315	400/220	630
13	GWALIOR	2X315	400/220	630
14	DAMOH	2X315	400/220	630
15	ITARASI	1X315	400/220	315
16	DEHGAM	2X315	400/220	630
17	WARDHA	2X315	400/220	630
18	BINA	1X315	400/220	315
19	PUNE	1X315	400/220	315
20	SOLAPUR	2X315	400/220	630
21	PIRANA	1X315	400/220	315
NTPC/NCA/IPP				
1	SIPAT	2X1000	765/400	2000
2	VINDHYACHAL	3X200	400/132	600
3	GANDHAR	2X500	400/220	1000
4	SSP	2X315	400/220	630
5	APL,MUNDRA	2X315	400/220	630
6	JINDAL,TAMAR	2X315	400/220	630
7	NSPCL	2X315	400/220	630
DNH				
1	KHADOLI	2X160	220/66	320
2	KARADPADA	1X50+3X100	220/66	350
DD				
1	MAGARWADA	2X50+1X100	220/66	200

D. BUS / TERTIARY REACTORS

List of Bus /Tertiary Reactors				
Sr. No.	Name of S/ S	No. of ReactorsXcapacity(MVAR)	Rated Voltage	Total MVAR
POWERGRID				
1	Seoni	1x240	765	240
2	Dehgam	1x63+1x125	420	188
3	HVDC Vindhyachal	1x90	420	90
4	Itarasi	3x50	420	150
5	Jabalpur	1x63	420	63
6	Jabalpur	2x25	33	50
7	Damoh	1x63	420	63
8	Raipur	1x80	420	80
9	Mhapusa	1x50	420	50
10	Satna	1x50	420	50
11	Dhule	1x80	420	80
12	Kolhapur	1x80	420	80
13	Bina	1x63	420	63
14	Raigarh	1x63	420	63
15	Wardha	1x50	420	50
16	Bhadravati	1x50	420	50
17	Khandwa	1x125	420	125
18	PARLI	1X63	420	63
19	GWALIOR	1X50	420	50
20	SOLAPUR	1X63	420	63
Gujarat				
1	Asoj	1x50	420	50
2	Chorania	1x50	420	50
3	Jetpur	1x50	420	50
4	Amreli	1x50	420	50
5	Kasor	1x50	420	50
6	Kansari	1x50	420	50
7	Soja	1x50	420	50
8	APL Mundra	1x80+1X81	420	161
9	Sami	1x50	420	50
Madhya Pradesh				
1	Bina	1x50	420	50
2	Bina	2x25	33	50
3	Nagda	2x25	33	50
4	Indore	2x25	33	50
5	Bhopal	2x25	33	50
6	Satpura	2x25	33	50
7	Satpura	1x63	420	63

List of Bus /Tertiary Reactors				
Sr. No.	Name of S/ S	No. of ReactorsXcapacity(MVAR)	Rated Voltage	Total MVAR
Maharashtra				
1	Padghe	1x80	420	80
2	Nagothane	1x80	420	80
3	Kharghar	1x80	420	80
4	Bableshwar	2x80	420	160
5	Koradi	1x50	420	50
6	Karad	1x80	420	80
7	Dhule	2x50	420	100
NTPC				
1	Vindhyachal	1x63	420	63
2	Jhanor	1x50	420	50
3	Sipat	1x240	420	240

E. FSC

400 kV LINES WITH FIXED SERIES COMPENSATION				
Sr. NO.	NAME OF THE LINE	LENTH(CKT KMS)	40% FSC at	AGENCY
1	SEONI-KHANDWA-I	350	KHANDWA	POWERGRID
2	SEONI-KHANDWA-II	350	KHANDWA	POWERGRID

F. TCSC

400 kV LINES WITH TCSC						
Sr. NO.	NAME OF THE LINE	LENTH(CKT KMS)	FIXED PORTION	VARIABLE	LOCATION	AGENCY
1	RAIPUR-RAIGARH-I	217	40%	5- 15%	RAIPUR	POWERGRID
2	RAIPUR-RAIGARH-II	217	40%	5- 15%	RAIPUR	POWERGRID

APPROVED UNDER FREQUENCY LOAD SHEDDING SCHEME IN WESTERN REGIONA. Discrete Under Frequency Relays (UFR)

Setting Freq(Hz)	Time Delay (sec.)	Recommended Load relief (MW)	Load Relief (MW) Recommended			
			GETCO	MPPTCL	MSETCL	CSPTCL
48.8	Inst.	960	220	152	550	38
48.6	Inst.	960	220	152	550	38
48.2	Inst.	1280	295	205	730	50
	Total	3200	735	509	1830	126

Excludes load relief of Mumbai system under AUFLS (which is around 20%) of MSETCL system)

B. Frequency Trend Relays (df/dt)

Settings Hz./sec.	Recommended Load relief (MW)	Load Relief (MW) Recommended				
		GETCO	MPPTCL	MSETCL	Mumbai	CSPTCL
49.2/0.4	2472	1001	392	686	273	120
49.0/0.2	2212	1001	393	687	91	40
48.8/0.1	3023	1521	546	825	91	40
TOTAL	7707	3523	1331	218	455	200

C. Recommended Frequency Trend Relays (df/dt) with changed scenario

In view of changed power scenario with the integrated operation of New grid, following df/dt relay settings have been agreed for implementation as given at Table-I

Table-I:

Setting of df/dt relay	NR	WR	ER
Stage-I	2000 MW at 0.1 Hs/sec at 49.9 Hz	2000 MW at 0.1 Hz/sec at 49.9 Hz	800 MW (600 MW ER + 200 MW SR) at 0.125 Hz/sec at 49.9 Hz
Stage-II	2000 MW at 0.2 Hz/sec at 49.9 Hz	2000 MW at 0.2 Hz/sec at 49.9 Hz	Nil

Stage-I of df/dt is designed to protect the New grid, from the loss of generation of a large power station whereas Stage-II of df/dt is designed to protect the split grid from loss of generation of a large power station. Stage-III of df/dt which is presently set at 49.2 Hz, 0.4 Hz/sec has to be upgraded to 49.9 Hz in line with above revision.

The above df/dt settings may be further classified constituent-wise in Western Region in the present ratio as in Table-II

Table-II:

Settings	Recommended Load relief (MW)	Load Relief (MW) Recommended				
Hz/ (Hz/sec)	Region	GETCO	MPPTCL	MSETCL	CSEB	TPC
49.9/(0.1 Hz/sec)	2000	1006	361	546	27	60
49.9/(0.2 Hz/sec)	2000	905	355	621	37	82
49.9/(0.4 Hz/sec)	2472	1001	392	686	120	273
	6472	2912	1108	1853	184	415

DETAILS OF UNDER VOLTAGE LOAD SHEDDING RELAYS IN WESTERN REGIONA) Madhya Pradesh

Sr.No.	Name of S/S	Name of feeders	Setting	Load relief(MW)
1.	400 kV Indore	132 KV Jetpur 132 KV Dhar	360 KV , 5 Sec delay	100 MW
2.	400 kV Nagda	132 KV Alot 132 KV Mahitpur A few 33 KV feeders	360 KV , 5 Sec delay	100 MW

B) No Under Voltage Load shedding Relays provided in Maharashtra, Gujarat, Chhattisgarh, Goa, DD and DNH systems.

ISLANDING SCHEMES IN WESTERN REGION

1. MUMBAI (TPC & REL) POWER SYSTEM

1.1

Islanding scheme for the Mumbai Metropolis, Island can meet the load of 1800 MW with generation at Trombay(1330MW), Bhira(150 MW), Bhivpuri (72MW), Khopoli (72 MW), Bhira PSG (150 MW) of TPC and Dahanu (2x250 MW) of REL.

1.2

The first level of separation of TPC+REL system from MSETCL system at 47.9 Hz with the tripping of:

- 110kV Kalyan(TPC)-Kalwa(MSETCL) at Kalyan(TPC)
- 110kV Borivali(TPC)-Borivali(MSETCL) D/C at Borivali(TPC)
- 220kV Borivali(TPC)=Borivali(MSETCL)-I
- 110kV Salsette(TPC)-Kalyan(TPC)-Kalwa(MSETCL) at Salsette and Kalyan substations of TPC
- 220kV Trombay(TPC)-Trombay(MSETCL) D/C at Trombay(TPC)

1.3

The second level of separation of TPC system from MSETCL system at 47.9Hz under reverse power condition (with flow from TPC to MSETCL) with the tripping of:

- 110kV Trombay(TPC)-Trombay(MSETCL) D/C at Trombay TPC
- 110kV Kalwa-Kalyan S/C
- 220kV Kalwa(MSETCL)-Salsette(TPC) D/C at Salsette (TPC)

1.4

The separation of REL system from MSETCL system shall also take place at 47.9 Hz with reverse power condition of power flowing from REL to MSETCL with the tripping of:

- 220kV Boisar-Versova
- 220kV Boisar-Dahanu.

1.5

In the event of failure of primary protection for islanding, backup RPUF relay set at 47.9 Hz with 0.5 seconds time delay is set to trip the same breaker. LBB protection is provided to take care of stuck breaker condition.

1.6

TPC system separates from REL system when 220kV Borivali (TPC)-Aarey(REL) D/C interconnections open at 47.7 Hz under reverse power condition (with power flow from TPC to REL).In addition to this REL separates from TPC at 47.6 Hz

1.7

In REL system, UF load shedding is done to ensure that the system remains connected with TPC system and survives after separation from TPC.

1.8

AUFLS (discrete) of about 800 MW set at 47.9 Hz is provided at TPC to ensure load generation balance in TPC subsequent to islanding. In addition, there is frequency trend relays set at 49.0 Hz at 0.5 Hz/sec in TPC system to ensure successful islanding.

2. DHUVARAN ISLANDING SCHEME IN GUJARAT

One 62.5 MW unit out of the 4x62.5 MW units islands at 47.6 Hz with house load of Dhuvaran thermal power station.

Remaks: At present 4x62.5 units at Dhuvaran are marked for scrapping.

3. GIPCL ISLANDING SCHEME IN GUJARAT

The islanding scheme to save about 145 MW generation at GIPCL Stage-I

- 132kV Vatwa-Ranasan D/C
- The 100MW gas based station islands with radial load of Vatwa (Ahmedabad)

The islanding takes place at 47.6 Hz.

4 Kakrapara Islanding Scheme OF N.P.C

4.1

Islanding scheme to save the units (2x220MW) at Kakrapara Atomic Power station along with the loads of Vapi. Islanding caters to 300-350 MW load of Vapi in Gujarat and UTs of DD & DNH.

4.2

Separation points

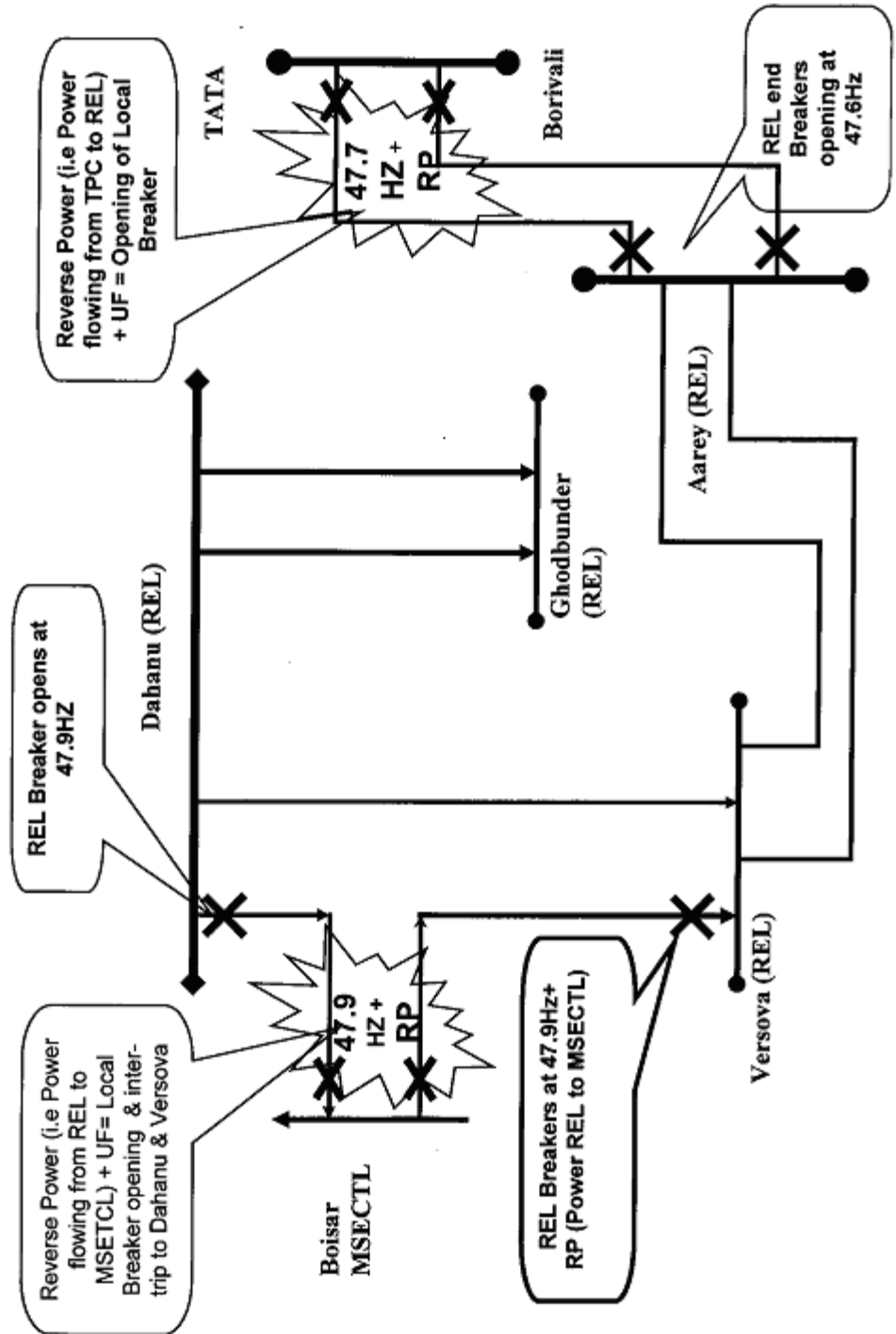
- 220kV Kakrapar - Haldarwa
- 220kV Tarapur - Vapi
- 220kV Navsari - Vapi
- 220kV Kakrapar - Vav

4.3

Frequency setting at Kakrapara & Vapi 47.8 Hz with 0.6 seconds delay or 48 Hz with 0.8 Hz/sec rate.

Remarks: Presently the scheme is not kept in operation

Mumbai Islanding Scheme for REL Interconnections



**OPERATING PROCEDURE FOR SPECIAL PROTECTION SCHEME (SPS) AT
LANCO (PATAHDI)**

1) **INTRODUCTION:**

The SPS in LANCO PATHADI (2x300 MW) comprising of a Power Relay which is having CT input from CT-62 (Core-4, CT Ratio 1000/1 A) and PT input from Line CVT-62 (400kV/110 V) extended from LINE-1 (Pathadi-Sipat-Raipur) for Power measurement & Breaker contact of CB-61 of Pathadi-Sipat- Raipur line at Lanco Pathadi end . Scheme is facilitated with Arming and Disarming selector for UNIT # 1 & UNIT # 2 . Trip signal of SPS will operate Master Trip relay of Generator Protection Panel which in turn will trip GCB and Turbine of selected unit. Facia indicators indicating SPS OFF, SPS ON FOR UNIT#1, SPS ON FOR UNIT#2 are also provided in the scheme.

2) **TRIGGERING SIGNAL FOR SPS ACTION:**

SPS scheme will be triggered through Power Relay as the Power Flow in Pathadi-Sipat-Raipur Line is < 50 MW OR 400KV Pathadi-Sipat-Raipur Line Breaker (CB-61) at Pathadi end is opened.

3) **SPS ACTION ON RECEIPT OF TRIGGER SIGNAL:**

As the trigger signal is received tripping command will be issued to the Unit which is selected for tripping through SPS Selector Switch.

4) **ARMING AND DISARMING OF SPS :**

The SPS will be armed viz. kept in service through SPS selector switch whenever both the units at Lanco Pathadi are in operation. viz. normal operating conditions.

In case of planned shutdown of 400 kV Lanco Pathadi-Raipur line with both units operating at Lanco Pathadi, the generation will be backed down to technical minimum after which the SPS will be disarmed first before opening the line manually. SPS will be armed immediately after the 400 kV Pathadi-Sipat-Raipur line is restored. The generation at Lanco Pathadi will be ramped up only after the SPS is armed.

5) **FACIA INDICATIONS FOR THE PLANT OPERATOR AND OTHER OPERATING INSTRUCTIONS:**

Indicating lamps are provided in Control room panel to indicate the SPS status to operator. Indicating lamps are designated as SPS OFF (if SPS is disarmed), SPS ON U#1 (if SPS is armed for UNIT#1), SPS ON U#2 (if SPS is armed for UNIT#2). Provision of alarm in case of SPS operated is also made in Control room panel for selected unit.

Look-up Table

Name of the Line	Contingency leads to	Action required to be taken
400kV Sugan-Vapi	1. 220kV Gandhar-Haldarwa D/C overloading 2. 220kV Kawas-Navsari D/C gets critically loaded	1. Taking into service the 400 kV SSP-Dhule D/C lines 2. Increasing the power order on Chandrapur-Padghe HVDC bipole 3. Increasing generation at Koyna in Maharashtra. 4. Reduce drawal by Maharashtra. 5. Reduce generation in Gujarat system. 400 kV Gandhar-Navsari (PG)-Boisar D/C and 400 kV Kawas-Vapi-Navi Mumbai D/C lines are planned on this section.

WR RGMO MONITORING: Number of Eligible UNITS and Capacity (MW)														
TYPE	C'SECTOR		GUJARAT		M.P		C'GARH		MAH		IPP		W.R.	
	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)
HYDRO	11	1450	8	540	39	2110	3	120	45	2941			106	7161
THERMAL	18	6360	7	1470	10	2380	6	1340	31	8230	10	2760	82	22540
TOTAL	29	7810	15	2010	49	4490	9	1460	76	11171	10	2760	188	29701

WR RGMO MONITORING: Number of UNITS and Capacity (MW): Confirmation of participation

TYPE	C'SECTOR		GUJARAT		M.P		C'GARH		MAH		IPP		W.R.	
	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)
HYDRO					18	1340			11	246			29	1586
THERMAL	11	4050	7	1470	1	500	2	500	4	1410	9	2510	34	10440
TOTAL	11	4050	7	1470	19	1840	2	500	15	1656	9	2510	63	12026

WR RGMO MONITORING: Number of UNITS and Capacity (MW): Where exemption applied to CERC

TYPE	C'SECTOR		GUJARAT		M.P		C'GARH		MAH		IPP		W.R.	
	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)
HYDRO	11	1450	8	540									19	1990
THERMAL													0	0
TOTAL	11	1450	8	540									19	1990

WR RGMO MONITORING: Number of UNITS and Capacity (MW): Where problems are indicated

TYPE	C'SECTOR		GUJARAT		M.P		C'GARH		MAH		IPP		W.R.	
	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)	No. of UNITS	CAPACITY (MW)
HYDRO					21	770	3	120	32	2445			56	3335
THERMAL	7	2310			9	1880	4	840	27	6820	1	250	48	12100
TOTAL	7	2310			30	2650	7	960	59	9265	1	250	104	15435

PHILOSOPHY OF ISSUING MESSAGES A/B/C TO WR CONSTITUENTS

Category 'A' message is issued to the overdrawing constituents, if

- 1) The frequency is less than 49.7 Hz and the over drawl by a constituent is more than 150 MW or above 10% of the schedule, whichever is less and
- 2) There is a downward trend in frequency

Category 'B' message is issued under the following conditions:

- 1) The frequency is less than 49.50 Hz and over drawl by a constituent is more than 150 MW or above 10% of the schedule whichever is less for the last 15 minutes
- 2) Remarks:

Generally category 'B' messages are issued after issuing of category 'A' messages. However, in case of sudden increase in over drawl by a constituent or sharp dip in frequency or repeated instances of over drawl at frequency below 49.50 Hz, category 'B' messages may be issued independent of category 'A' messages and without waiting for the given time period.

Category 'C' message is issued under the following conditions:

- 1) Frequency is less than 49.50 Hz and UI is more than 150 MW or above 10% of the schedule, whichever is less for more than the last 20 minutes

OR

- 2) Frequency is less than 49.20 Hz and a constituent is overdrawing more than 150 MW OR above 10% of the schedule, whichever is less.

OR

- 3) Repeated instances of over drawl by a constituent when frequency is less than 49.50 Hz.

- 4) Remarks:

Generally category 'C' messages are issued after issuing of category 'B' messages. However, in case of sudden increase in over drawl by a constituent or sharp dip in the frequency or repeated instances of over drawl at frequency below 49.50 Hz, category 'C' messages may be issued independent of category 'B' messages and without waiting for the given time period.

ANNEX-IX
TYPE-A MESSAGE

WESTERN REGIONAL LOAD DESPATCH CENTRE
POWER SYSTEM OPERATION CORPORATION LTD.

F-3, MIDC Area, Marol, Andheri (E), Mumbai 400 093
Tel: 28203885 / 28397634, FAX: 022-28202630 / 28202693, WEB: www.wrldc.com

FAX MESSAGE

Reference No: WRLDC/ OD /A/_____ Date:_____ Time:_____

FROM: SHIFT CHARGE MANAGER, TO: SHIFT INCHARGE
WRLDC, MUMBAI. LD CONTROL CENTRE
CSPTCL / GETCO / MPPTCL /
MSETCL / GOA / DD / DNH

CC: S.E. (LD), CSPTCL / GETCO / MPPTCL
/ MSETCL / GOA / DD / DNH.

Sub: Request to restrict drawl at low frequency

System frequency is below 49.70 Hz. Over drawl by constituents is as follows:-

Constituent	Quantum of over drawl (MW)	Frequency (Hz)

Your specific reference is invited to Clause 5.4.2(a) & (b) and 6.4.7 of IEGC amended regulation dated 28.04.2010. The clause 6.4.7 is reproduced below for ready reference.
“The SLDC, SEB/distribution licensee shall always endeavour to restrict the net drawal of the state from the grid to within the drawal schedules, whenever the system frequency is below 49.7 Hz. The concerned SEB/distribution licensee User, SLDC shall ensure that their automatic demand management scheme mentioned in clause 5.4.2 acts to ensure that there is no over drawl when frequency is 49.5 Hz or below. If the automatic demand management scheme has not yet been commissioned, then action has to be taken as per manual demand management scheme to ensure zero over rowel when frequency is 49.5 Hz. or below.”

You are therefore requested to take necessary measures so that your drawal is reduced at frequency below 49.70 Hz.

Regards,

SHIFT CHARGE MANAGER WRLDC



WESTERN REGIONAL LOAD DESPATCH CENTRE
POWER SYSTEM OPERATION CORPORATION LTD.
F-3, MIDC Area, Marol, Andheri (E), Mumbai 400 093
Tel: 28203885 / 28397634, FAX: 022-28202630 / 28202693, WEB: www.wrldc.com
FAX MESSAGE

Reference No: WRLDC/ OD / B / _____ Date: _____ Time: _____

FROM: SHIFT CHARGE MANAGER, TO: SHIFT IN CHARGE
WRLDC, MUMBAI. LD CONTROL CENTRE
CSPTCL / GETCO / MPPTCL /
MSETCL / GOA / DD / DNH
CC: S.E. (LD), CSPTCL / GETCO / MPPTCL
/ MSETCL / GOA / DD / DNH /SE(O),
WRPC

Sub: Intimation of violation of Clause 6.4.12 of IEGC regarding notice for immediate action to restrict over drawl in order to avert threat to system security under clause 6.4.12 of IEGC and section 29(1) of Indian Electricity Act, 2003.

This has reference to our earlier messages on the above subject. In spite of our requests, over drawl continues. At present, the over drawl is as follows:

Constituent	Quantum of over drawl (MW)	Frequency (Hz)

In this regard, it is to bring to your notice the clause 6.4.7 read in conjunction with Clause 5.4.2(a) & (b) of IEGC, which states that when the frequency is 49.5 Hz or below, requisite load shedding would be carried out by the concerned SLDC/SEB/Distribution license & bulk consumer in its control area to curtail the over drawl. We would therefore point out that by continuing to overdraw at frequency below 49.5 Hz; you have violated the clause 6.4.7 of IEGC.

Further it is a matter of serious concern that despite the low frequency condition in the grid, the over drawl by your state is continuing. You would agree that operation of grid at present level of frequency is a threat to system security and in order to ensure stability of grid, WRLDC directs you to act immediately to increase the generation and/or carry out manual load shedding in your system including by tripping the desired number of radial feeders in order to restrict your drawl within schedule and inform the details of action taken. Please note that these directions are being issued in line with Clause 6.4.12 of IEGC and Section 29(1) of Indian Electricity Act, 2003 and non-compliance of the same would be construed as violation of IEGC and IE Act 2003.

Please treat this message as MOST URGENT and act immediately.

SHIFT CHARGE MANAGER WRLDC



WESTERN REGIONAL LOAD DESPATCH CENTRE
POWER SYSTEM OPERATION CORPORATION LTD.
F-3, MIDC Area, Marol, Andheri (E), Mumbai 400 093
Tel: 28203885 / 28397634, FAX: 022-28202630 / 28202693, WEB: www.wrldc.com
FAX MESSAGE

Reference No: WRLDC/OD /C/ _____ Date: _____ Time: _____

FROM: SHIFT CHARGE MANAGER,
WRLDC, MUMBAI.

TO: SHIFT INCHARGE
LD CONTROL CENTRE
CSPTCL / GETCO / MPPTCL /
MSETCL / GOA / DD / DNH

CC: CE (LD), GETCO / MPPTCL / CSPTCL
/MSETCL / EE GOA / DD / DNH/ SCE,
NLDC/

DIRECTOR / MEMBER
CSPTCL /GETCO/MPPTCL/
MSETCL/GOA/DD/DNH

MEMBER SECRETARY, WRPC

Sub: Intimation of violation of Clause 5.4.2(b),6.4.12 of IEGC and 29(2)/29(3) of Indian Electricity Act, 2003 and request for immediate action for curtailing the Over drawl in the interest of grid safety and security.

Please refer WRLDC notice issued vide reference No.WRLDC/OD/B/_____ dated_____ directing to increase the generation and / or carry out manual load shedding in your system including tripping the desired number of identified radial feeders in order to restrict over drawl by in the interest of grid security and in line with Clause 6.4.12 of IEGC and Section 29(1) of Indian Electricity Act 2003.

However, the over drawl at low frequency is continuing resulting in threat to system security and you have violated the Clause 6.4.12 of IEGC and Section 29(2)/29(3) of IE Act 2003 by not complying with WRLDC's instructions.

At present, the over drawl is as follows:

Constituent	Quantum of over drawl (MW)	Frequency (Hz)

We once again request you to curtail the over drawl by your State in the interest of grid stability and security. We would also point out that for any disturbance in the grid due to persistent low frequency condition, the responsibility would rest on you and penalties may be imposed for violation of IEGC provisions and section 29 of EA, 2003.

SHIFT CHARGE MANAGER WRLDC



ANNEX-XII (1/7)

Format-I

National/_____ Regional Load Despatch Centre

TOTAL TRANSFER CAPABILITY FOR _____(month) _____(year)

Issue date: _____
No. _____

Issue time: _____

Revision

Corridor/ Control Area	Date	Time period	Total transfer capability (TTC) (MW)	Reliability Margin (RM) (MW)	Available Transfer Capability (ATC) (MW)

Assumptions:

A. Load (MW)

Region/Entity name	Peak load	Off peak load
Total		

B. Generation (MW)

	Thermal		Hydro	
	Peak	Off peak	Peak	Off peak
ISGS				
State				



C. Major Transmission line outages

	Element	Voltage (kV)	Remarks
Central sector			
State sector			

D. Generation outages

	Generating unit	MW	Remarks
Central sector			
State sector			

E. HVDC Settings

Name	Setting (MW)

F. Constraints:

F. Miscellaneous:

Note: Format may be changed as per requirement with prior approval of the Commission.



National/_____Regional Load Despatch Centre

CONGESTION MONITORING DISPLAY

dd/mm/yyyy, hh:mm

Corridor/Control area	TTC (MW)	ATC (MW)	Actual (MW)

Note: Format may be changed as per requirement with prior approval of the Commission.



National/_____Regional Load Despatch Centre

Notice Number: INLDC/RLDC)/yyyy/mm/.....Date: dd/mm/yy

Time of issue: hh:mm

To

WARNING NOTICE

The actual transfer of electricity on following corridors has crossed the ATC:

Corridor/Control area	ATC (MW)	Actual flow (MW)

The following regional entities, which are downstream of the congested corridor, are advised To reduce their drawl/increase their generation to decongest the system:

- 1.
- ...
- m.

The following regional entities, which are upstream of the congested corridor are advised to /increase their drawl/reduce their generation to decongest the system.

- 1.
- ..
- n.

Shift Charge Manager

This is a warning notice before levying of congestion charges and issued in accordance with the Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009.

NLDC would send this notice to RLDC & RLDC would send this notice to regional entities.

Note: Format may be changed as per requirement with prior approval of the Commission.



National/_____Regional Load Despatch Centre

Notice Number: (NLDC/RLDC)/yyyy/mm/.....

Date: dd/mm/yy

Time of issue: hh:mm

To

NOTICE FOR APPLICATION OF CONGESTION CHARGE

Congestion charge for Unscheduled Interchange (UI) energy as per CERC (Measures for relieving congestion) Regulations 2009 dated 22nd December 2009 would be applicable.

Time block no. (hh:mm) of **dd/mm/yyyy**.

Corridor/Control area	TTC (MW)	Actual flow (MW)

Congestion charge would be applicable on the following regional entities, which are down stream of the congested corridor:

- 1.
- ...
- m.

Congestion charge would be applicable on the following regional entities, which are upstream of the congested corridor:

- 1.
- ...
- N.

Shift Charge Manager

Issued in accordance with the Central Electricity Regulatory Commission (Measures to Relieve congestion in real time operation) Regulations, 2009.

NLDC would send this notice to RLDC and RLDC would send this notice to regional entities.

Note: Format may be changed as per requirement with prior approval of the Commission.



National/_____Regional Load Despatch Centre

Notice Number: (NLDC/RLDC)/yyyy/mm/.....

Date: dd/mm/yy

Time of issue: hh:mm

To

NOTICE FOR WITHDRAWAL OF CONGESTION CHARGE

Congestion charge on Unscheduled Interchange (UI) energy that was applicable i.e. **hh:mm of dd/mm/yyyy vide Notice Number.....** issued at hh:mm of dd/mm/yyyy would be lifted w.e.f **time block No. (hh:mm) of dd/mm/yyyy.**

Shift Charge Manager

Issued in accordance with the Central Electricity Regulatory Commission (Measures to Relieve congestion in real time operation) Regulations, 2009.

NLDC would send this notice to RLDC and RLDC would send this notice to regional entities.

Note: Format may be changed as per requirement with prior approval of the Commission.



National/_____Regional Load Despatch Centre

STATEMENT ON NOTICE OF APPLICATION & WITDRAWAL OF CONGESTION
CHARGE FOR

Date:

Issued on:

Application		Withdrawal		Downstream Regional Entities	Upstream Regional Entities
Time block	Time	Time block	Time		
1	0000-0015				
2	0015-0030				
3	0030-0045				
96	2345-0000				

Note: Format may be changed as per requirement with prior approval of the Commission.

ANNEX-XIII

MESSAGE FOR INTER-REGIONAL O/D

WESTERN REGIONAL LOAD DESPATCH CENTRE
POWER SYSTEM OPERATION CORPORATION LTD.
F-3, MIDC Area, Marol, Andheri (E), Mumbai 400 093
Tel: 28203885 / 28397634, FAX: 022-28202630 / 28202693, WEB: www.wrldc.com

FAX MESSAGE

Reference No: WRLDC/OD/IRE/_____ Date:_____ Time:_____

FROM: SHIFT CHARGE MANAGER, WRLDC, MUMBAI

TO: SHIFT IN CHARGE
NLDC

CC: SHIFT IN CHARGE,
ERLDC/NRLDC

Sub: **Over drawal at low frequency.**

The schedule vs. drawl over the IR links is as follows.

Sr. No.	IR	LINK NAME	Schedule	Drawl	Freq.(Hz)
1.		WR-ER			
2.		WR-NR			

NLDC is requested to take necessary action to control the drawl and improve the frequency in view of grid security.

SHIFT CHARGE MANAGER, WRLDC



MESSAGE FOR TTC VIOLATION

WESTERN REGIONAL LOAD DESPATCH CENTRE
POWER SYSTEM OPERATION CORPORATION LTD.

F-3, MIDC Area, Marol, Andheri (E), Mumbai 400 093
Tel: 28203885 / 28397634, FAX: 022-28202630 / 28202693, WEB: www.wrldc.com

FAX MESSAGE

Reference No: WRLDC/ TTC_____ Date:_____ Time:_____

FROM: SHIFT CHARGE MANAGER,
WRLDC, MUMBAI.

TO: SHIFT IN CHARGE, NLDC,
LD CONTROL CENTRE
CSPTCL / GETCO / MPPTCL /
MSETCL / GOA / DD /
DNH/NRLDC/ERLDC

CC: CE (LD),
CSPTCL / GETCO / MPPTCL /
MSETCL / GOA / DD / DNH/ NRLDC/
ERLDC/ NLDC
MEMBER SECRETARY, WRPC

Sub: Total Transfer Capability Violation.

At the moment, the following is observed at WRLDC:

*New Grid Frequency: _____ Hz

FLOW GATE	TTC (MW)	SCHEDULING LIMIT (MW)	PRESENT LEVEL (MW)
WR->NR			
WR->ER			

UTILITY/ AGENCY	SCHEDULE (MW)	ACTUAL (MW)

You would agree that secure operation of grid can be ensured by keeping the flow-gate within the limits of Total Transfer Capability of respective corridors.

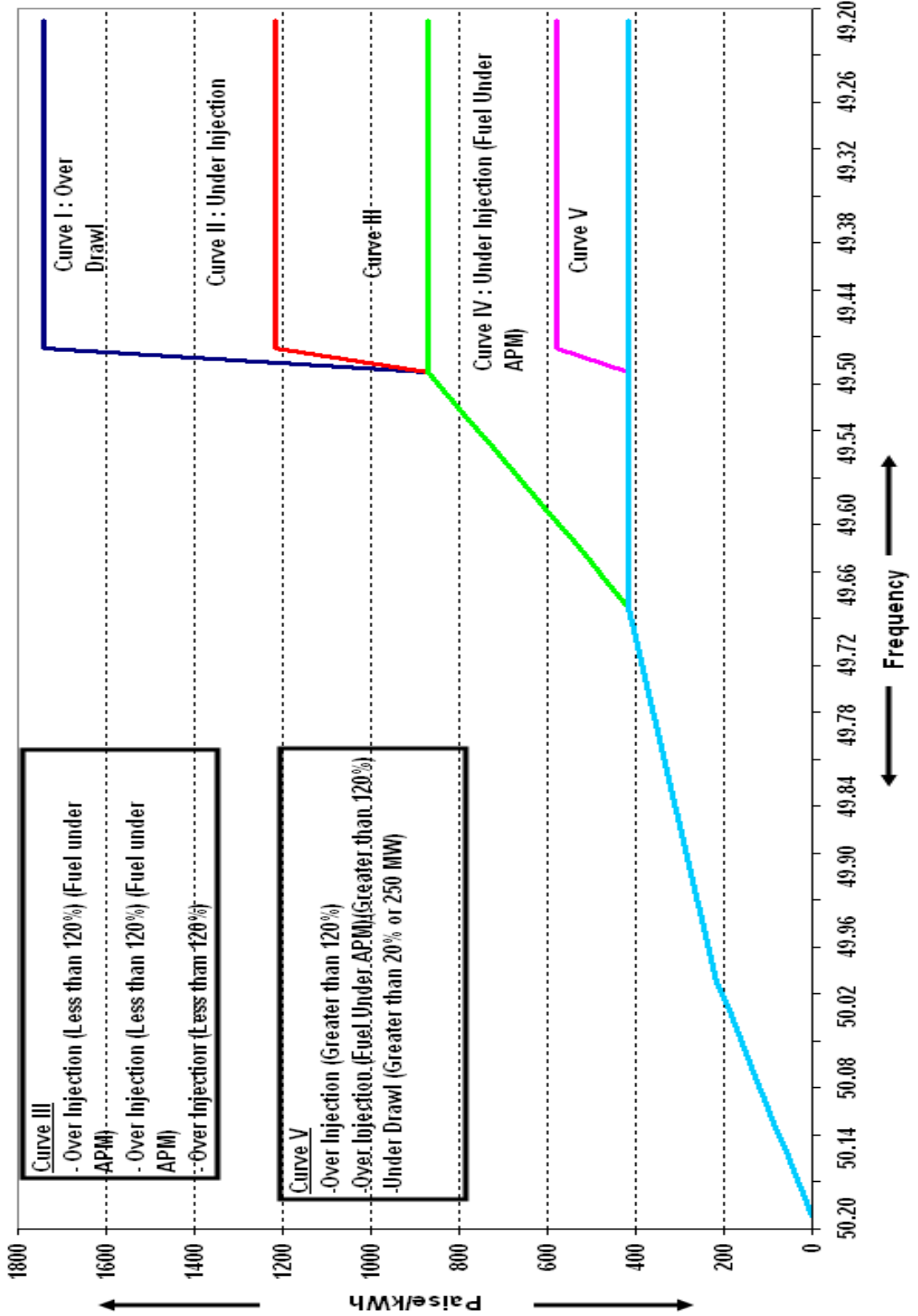
Please take necessary steps to avoid excessive flows.

Please treat this message as MOST URGENT.

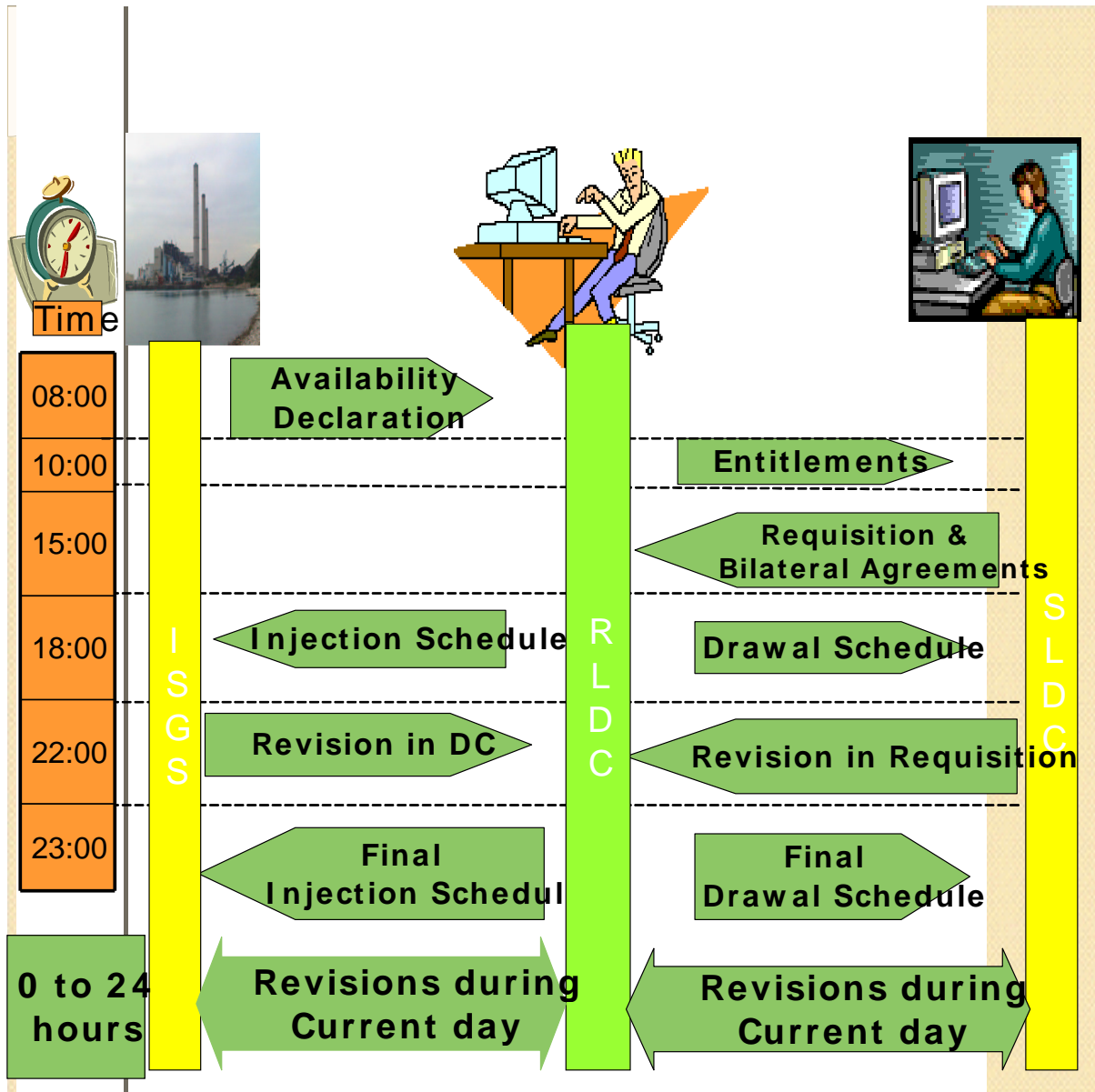
SHIFT CHARGE MANAGER WRLDC



UI Vector (With Caps and Addl.UI)



S C H E D U L I N G T I M E L I N E



Procedure to run Real Time Network Analysis (RTNA) and Study Mode Network Analysis (STNA)

1.1 Real Time Network Analysis

RTNA module is used to estimate and eliminate the bad data in real time. Once the bad data is eliminated, the case can be used for doing various studies like transmission line outage, generator outage etc.

1.1.1 Procedure to run RTNA

1. Open display 5.1 (PNA case index)
 - i) If case 0 is green, click on control page
 - ii) If case 0 is white, click on case 0 and “assign the case”, then click on control page
 - iii) On clicking “control page”, the display 5.1 will appear
 - a) If “control console” is “yes”, proceed to step 2.
 - b) If “Control console” is “No”, click on “No”, a menu will appear asking for “Assume Control” or “Override” option. Click on the button which is highlighted and execute. Now you have the control over the RTNA case.
2. In order to run RTNA
 - i) Click on “PROGRAM EXECUTION”. The RUN menu would appear.
 - ii) Click on RTNA
3. RTNA will run through three phases “INIT→NC→SE”
4. If State Estimator (SE) converges, the color of SE will turn pink with a convergence message. If SE does not converge, it will turn yellow with a non-convergence message.
5. If the case 0 has a converged solution, it can be used for Study Mode Network Analysis (STNA) after transferring the case 0 to one of the cases in case 1-6.

1.1.2 Saving and backing up cases.

The user can have only 6 cases for off line study (STNA). However, the user can save back up up to 130 cases. To copy the back up cases, use the following steps.

- 1) Open display 5.2
 - 2) Click on “Store case control”
 - 3) Copy function is used to copy between CASE (Study Case 1-6) and STCs (saved case up to 130)
- Case copy options are:
- CASE → STCS (Study case to save case)
 - STCS→CASE (Save case to study case)
 - CASE→CASE (Study case to study case)
 - STCS→STCS (Save case to save case)

If you want to copy a real time case (case 0) to STCS 2 for back up, select CASE →STCS. Then click on “Data”. These boxes will be ready for data entry. Enter “0” on the left hand side and “2” on the right hand side. Click the enter key. Now click on “Perform copy” and execute. Case 0 will be copied to STC2. STC2 will be updated with the latest date and time. The transfer will take 1-2 minutes and after successful transfer, message “execution completed” will appear.

1.2 Study Mode Network Analysis

As already stated, up to six cases can be run in respect of already saved real time cases. Following steps are to be taken for studying a case:

1. Open display 5.1 (PNA case index)
2. Select the desired case in the study mode. Say case 2.
 - a) If case 2 is green in colour, click on control page.
 - b) If case 2 is white in colour, click on case 2 and “Assign the case”, then click on control page.



3. If control console is 'yes', proceed to step 4. If control console is "No", click on "No", a menu will appear asking for "Assume control" or "over ride" option. Click on the button which is highlighted and 'execute'. Now you have the control over the case.
 4. Click on "PROGRAM EXECUTION" and then click on "RUN STNADPF"
 5. STNA will run through three phases "INIT→NC→DPF".
 6. In the menu bar, click on "Special" and then click on DISPLAY INDEX. This page will list out the system
 7. To go to any other page click on summary and then click corresponding sub-menu.
- 1.3 Viewing results
Open display 5.2 under the base case displays all pages that can be viewed are listed.
- 1.4 Study on effect of transmission element outage in STNA mode.
- 1) Open display 5.2
 - 2) Click on "Line summary"
 - 3) Scroll down to the line you would like to open
 - 4) In the status column, click on "on line" and make it "off line".
 - 5) Click on "special" on the menu bar, click on control page. Click on "PROGRAM EXECUTION" and then click on "RUN STNA-DPF".
 - 6) The new results can be viewed by navigating through display 5.2 → base case display as at 1.3
- 1.5 PNA Element Restoration.
- 1) Click on "Special" on the menu bar. Click on "Station". Click on station name (under column "Name") on one end of the line which was opened.
 - 2) Another display with station bus details will appear. Click on "breaker details"
 - 3) Click on the opened line elements such as breaker, isolator, line reactor whose status is showing open under "status" column. Click on "Open". A status menu will appear. Click on closed.
 - 4) Repeat the above steps at Sl.No.1 to 3 for the station at the other end of the line.
 - 5) Go to control page
 - 6) Click on "PROGRAM EXECUTION" and then click on "RUN STNADPF".
 - 7) View closing of line under "status" column by navigating through "special" on the menu bar.

(A)

Illustrative examples for commercial settlement for Wind Generation (WG)

The commercial settlement procedure is explained below:

Case 1: Actual as per generation schedule

Schedule (MW)	Actual generation (MW)	Implication on purchaser	Unscheduled Interchange (UI)	
			Implication on host state	Implication on wind generator
100	100	Purchaser to pay Wind Generator for 100 MW at Contracted rate.	No implication on host state.	No implication on wind generator.

Case 2: Under Injection by the Wind Generator within 30 % variation

Schedule (MW)	Actual generation (MW)	Implication on purchaser	Unscheduled Interchange (UI)	
			Implication on host state	Implication on wind generator
100	70	Payment to be made by Purchaser for 70 MW (as per actual) at contracted rate and for 30 MW To Renewable Regulatory Fund (RRF) at UI rate of his region.	For 30 MW UI liability on the host state, as a result of under generation by the Wind Generator embedded in the State system, the same shall be received by the host state from RRF	No implication on wind generator.

Case 3: Under Injection by the Wind Generator beyond 30 % variation

Schedule (MW)	Actual generation (MW)	Implication on purchaser	Unscheduled Interchange (UI)	
			Implication on host state	Implication on wind generator
100	60	To pay for 70 MW to wind Generator (since, in this range, the wind Generator comes under UI mechanism) at Contracted rate. 30 MW by purchaser at UI rate in his Region, to RRF.	Out of 40 MW liability of UI on Host State on account of under generation by Wind generator, UI for 30 MW shall be received by the host state from RRF and UI of 10 MW would be received from the UI pool.	UI rate for 10 MW payable by Wind Generator to UI Pool

Case 4: Over Injection by the wind generator within 30% variation

Schedule (MW)	Actual generation (MW)	Implication on purchaser	Unscheduled Interchange (UI)	
			Implication on host state	Implication on wind generator
100	130	To pay for 130 MW to wind Generator at Contracted rate. Purchaser shall Receive payment for 30 MW from RRF at UI rate of his region.	For 30 MW, UI benefit for the host State on account of over generation by wind generator to be passed on to the RRF.	No implication on wind generator.

Case 5: Over Injection by the wind generator from 130% to 150 % generation
(as compared to schedule)

Schedule (MW)	Actual generation (MW)	Implication on purchaser	Unscheduled Interchange (UI)	
			Implication on host state	Implication on wind generator
100	140	To pay for 130 MW at contracted rate. Purchaser shall Receive payment for 30 MW from RRF at UI rate of his region.	For 40 MW UI benefit for the Host State on account of over generation by wind generator, UI for 30 MW to be passed on to the RRF and UI for 10 MW to be passed to UI pool.	UI for 10 MW to be received from UI pool.

Case 6: Over Injection by the wind generator beyond 150 % (as compared to schedule)

Schedule (MW)	Actual generation (MW)	Implication on purchaser	Unscheduled Interchange (UI)	
			Implication on host state	Implication on wind generator
100	160	To pay for 130 MW at contracted rate. Purchaser shall Receive payment for 30 MW from RRF at UI rate of his region.	For 60 MW benefit for the Host State from UI Pool on account of Higher generation by wind, UI for 30 MW to be passed on to RRF and UI for 30 MW to be passed on to UI pool	UI for 20 MW to be received by Wind Generator from UI Pool at the UI rate applicable at that particular time and for 10 MW UI to be received by Wind Generator from UI Pool at the UI rate applicable for frequency interval below 50.02 and not below 50.00Hz.

Note:

(1) For all of the above scenarios, the UI rate shall be the normal UI rate applicable at that particular time block except in case 6 i.e. for over injection beyond 50 %. In this case the wind generator shall get UI for injection beyond 50% of the schedule at the UI rate applicable for frequency interval below 50.02 and not below 50.00 Hz, in accordance with the CERC (Unscheduled Interchange Charges and related matters Regulations, 2009, as amended from time to time.

(2) The balance in the Renewable Regulatory Fund (RRF) on account of UI by the wind generators in all states, whether surplus or deficit, shall be shared by all the states of India in the ratio of their peak demands in the previous month. The RRF shall be operated by the NLDC on a national basis.

(3) For all cases above it is assumed that Purchasers drawal is as per schedule.

(B)

Illustrative examples for commercial settlement for Solar Generation Solar generator to give schedule to the concerned SLDC and RLDC. Purchasing state to pay to solar generator at contracted rate for whatever power is generated by the solar generation. Remaining under drawal / over-drawal to be settled in UI mechanism and RRF.

Case 1: Actual as per generation schedule

Schedule (MW)	Actual generation (MW)	Implication on purchaser	Unscheduled Interchange (UI)	
			Implication on host state	Implication on wind generator
5	5	Purchaser to pay Solar Generator for 5 MW at contracted rate.	No implication on host state.	No implication on wind generator

Case 2: Under Injection by the Solar Generator

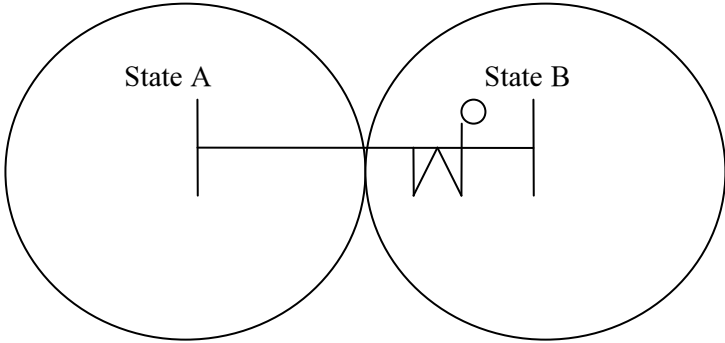
Schedule (MW)	Actual generation (MW)	Implication on purchaser	Unscheduled Interchange (UI)	
			Implication on host state	Implication on wind generator
5	4	Payment to be made by purchaser for 4 MW (as per actual) at contracted rate and for 1 MW to RRF at UI rate.	For 1 MW UI liability on the host state, as a result of under generation by the Solar Generator embedded in the State system, the same shall be received by the host state from RRF at UI rate.	No implication on Solar Generator.

Case 3: Over Injection by the Solar Generator

Schedule (MW)	Actual generation (MW)	Implication on purchaser	Unscheduled Interchange (UI)	
			Implication on host state	Implication on wind generator
5	6	To pay for 6 MW to Solar Generator at Contracted rate Purchaser shall Receive payment for 1 MW from RRF at Contracted rate.	For 1 MW, UI benefit for the host State on account of over generation by solar generator to be passed on to the RRF at UI rate	No implication on Solar Generator

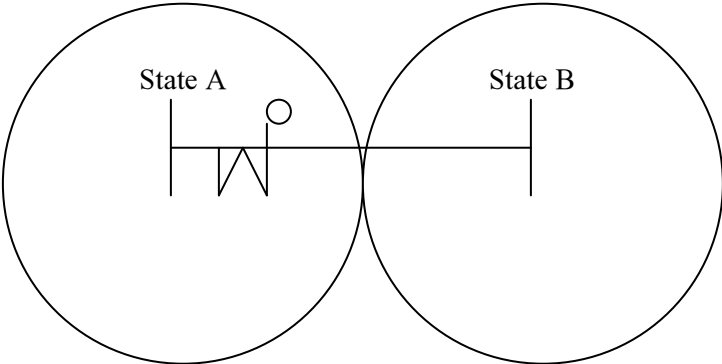
PAYMENT FOR REACTIVE ENERGY EXCHANGES ON STATE OWNED LINES

Case – 1:
Interconnecting line owned by State-A, Metering Point: Substation of State-B



State-A pays to State-B for
(i) Net VARh received from State-B while voltage is below 97%, and
(ii) Net VARh supplied to State-B while voltage is above 103%
Note: Net VARh and net payment may be positive or negative

Case - 2:
Interconnecting line owned by State-B, Metering point: Substation of State-A

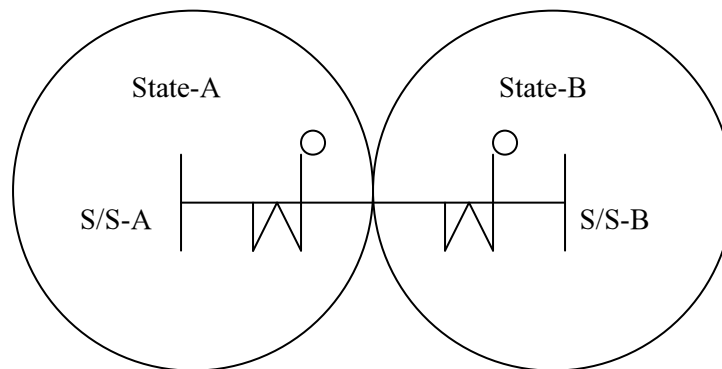


State-B pays to State-A for
(i) Net VARh received from State-A while voltage is below 97%, and
(ii) Net VARh supplied to State-A while voltage is above 103%
Note: Net VARh and net payment may be positive or negative

Case – 3:

Interconnecting line is jointly owned by States-A and –B.

Metering points: Substations of State-A and State-B



Net VARh exported from S/S-A, while voltage < 97% = X1 Net VARh exported from S/S-A, while voltage > 103% = X2 Net VARh imported at S/S-B, while voltage < 97% = X3 Net VARh imported at S/S-B, while voltage > 103% = X4

(i) State-B pays to State-A for X1 or X3, whichever is smaller in magnitude, and
(ii) State-A pays to State-B for X2 or X4, whichever is smaller in magnitude. Note:

1. Net VARh and net payment may be positive or negative.
2. In case X1 is positive and X3 is negative, or vice-versa, there would be no payment under (i) above.
3. In case X2 is positive and X4 is negative, or vice-versa, there would be no payment under (ii) above.

IMPORTANT TELE PHONE NUMBERS OF PARTICIPANTS IN WR GRID

Sl.No	NAME OF CONSTITUENTS/MODAL AGENCIES/SLDC/IPP/ISGS		PLACE	OFFICE NO	FAX No	Name of Web Site
1	Central Electricity Authority	CEA	NEWDELHI	011-26106181	011-26170385 / 26107416	http://www.cea.nic.in/
2	Western Regional Power Committee	WRPC	MUMBAI	022-2820 0194, 95, 96	022-28370193	http://www.wrpc.gov.in/
3	Power Grid Corporation of India (POWERGRID)	POWERGRID	GURGAON	0124-2571700 //2571719	0-124-2571760, 2571761,2571848	www.powergridindia.com
4	National Load Despatch Centre	NLDC	C/Room NEWDELHI	011-26524522, 011-26536832	011-26524522, 011-69414584	http://www.nldc.in/
5	Northern Regional Load Despatch Centre	NRLDC	C/Room NEWDELHI	011-26519406, 011-26513869,011-46560411	011-26852747	http://www.nrldc.org/ www.nrlc.org/
6	Eastern Regional Load Despatch Centre	ERLDC	C/Room KOLKATTA	033-24235265,24235875	033-24235704,033-24235809,033-24235029	http://www.erlhc.org/
7	North Eastern Regional Load Despatch Centre		C/Room SHILLONG	0364-2231482,2231479/426/486,09206040103,09206040098	0364-2231426/482/479,2537470	http://www.nerlhc.org/
8	Southern Regional Load Despatch Centre	SRLDC	C/Room BANGALORE	080-22254525,22351146,22252612,22204525	080-22259219, 080-22204325, 080-22351146	http://www.srlhc.org/
9	Western Regional Load Despatch Centre	WRLDC	C/Room MUMBAI	022-28203885,022-28397634	022-28202630,022-28202693	http://www.wrlhc.com/
10	CPCC/POWERGRID/WRTS-I	CPCC/BADRAWATI	C/Room BADRAWATI	07175-265503,09423681895	07175-265076,267754	
11	CPCC/POWERGRID/WRTS-II	CPCC/JABALPUR	C/Room JABALPUR	0761-2643282,2641822	0761-2640484	
12	Gujarat State Load Despatch Centre	GETCO	C/Room GOTRI	0265-2352103,6531132	0265-2352019	http://www.sldcguj.com/
13	Maharashtra State Load Despatch Centre	MSETCL	C/Room KALWA	022-27601765,27601766	022-27601769	http://mahasldc.in/ http://www.msetcl.com/
14	Madhya Pradesh State Load Despatch Centre	MPPTCL	C/Room JABALPUR	0761-2668586,2660015	0761-2664343	http://www.sldcmpindia.com/
15	Chhattisgarh State Load Despatch Centre	CSEB	C/Room Bhilai	0788-2282635/33	0788-2282632	http://www.cseb.gov.in
16	Goa State electricity Board	GOA	C/Room Ponda	0832-2312130,09422444028	0832-313780,2312180,2317810	
17	Dadar Nagar Haveli	DNH	C/Room Kharadpada,Silvasa	0260-9824114899,0260-2651203	0260-2642338	dnh@bsepl.com
18	Daman and Diu	DD	C/Room Magarwada, Daman	0260-2230535,09925679149,09328788833	0260-2250889	
19	M.P. AUDYOGIK KENDRA VIKAS NIGAM (INDORE)LIMITED (MPAKVNL)	MPAKVNL		INDORE	0731-4070976, 2572623, 2574311, 2557363	0731-2572629
20	National Thermal Power Corporation (NTPC)	NTPC	C/Room MUMBAI	022-28306069,28310217	022-27601769	www.ntpc.co.in
21	KORBA STPS	KSTPS	C/Room KORBA	237529,09424141909,2307805-	07759-232440	
22	Vindhyachal STPS	VSTPS	C/Room Vindhyachal	241405,244916,09429177328	07805-247917	
23	SIPAT STPS	SSTPS	C/Room Sipat	07752-246545,09424140682	07752-246730	
24	KAWAS	KGPP	C/Room Kawas	02612-860375	02612-861428	
25	GANDHAR	GGPP	C/Room Gandhar	02642-287450	02642-287069	
26	HVDC B'WATI		C/Room BADRAWATI	07175-265503,09423681895		
27	HVDC V'CHAL		C/Room Vindhyachal	07805-247124,243074	07805-247458,09425823143	
28	NPC , TARAPUR STG -I	TAPS1&2	C/Room Tarapur	02525-244120,244126	02525-244125/244128	
29	NPC , TARAPUR STG -II	TAPS3&4	C/Room Tarapur	02525-244100,244005,244511	02525-244609	
30	NPC , KAPS	KAPS	C/Room Kakarapar	Switch Yard 02525-244024 02626-231231		
31	Narmada control authority	NCA	C/Room INDORE	0731-2552703,2573126,4225058,2574633	0731-2574633	http://www.nca.gov.in/
32	Dy. Director (Power)			731-2553783		
33	Jindal Power	JPL	C/Room TAMNAR	07767-281701-08, 281994,09302173022	07767-281994	
34	Adani Power Limited, Mundra,Kutch - Gujarat.	APL	C/Room MUNDRA	02838-266177,9687660422	02838-266364	http://www.adanipower.com
			Sub-Stn	02838-266000,266300		
				02838-266095		
35	Lanco Amarkantak Power Limited	LAPPL	C/Room PATHADI	07759-279908,07759-279919,09826210888,909784411	07759-279918	
				9425282505		
36	NSPCL	NSPCL	C/Room BHILAI	0788-2445990,2284011	0788-2221386	
				0788-6454408		
37	Sugen Power	SGPP	C/Room Sugen	0-9228002880	0265-2652019	
				9227410250		
39	RGPPL	RGPPL	C/Room DHABOL	02359-266047		
				02359-266048		
40	Indira Sagar HEP	ISP	C/Room	07323-284542,284719		
41	Koyna HEP	Koyna HEP	C/Room	02355-230690/230667		
42	Reliance Energy Ltd	REL	C/Room Dahanu	09525-28222497,09325119426		
			Arey C/R	30094743		
43	TATA Power Company Ltd.	TATA POWER	C/Room MUMBAI	022-66687091/92/93	022-25541908	http://www.tatapower.com/
				022-25543331		

