

lays down both the information requirements and procedures governing the relationship between STU and Users. The principal objectives of the Grid Code are:

- ◆ To provide clarity and certainty to the STU, MPPGCL, IPP/CPP within MP, Discoms and any open access customers connected to the Transmission System by stating their respective roles, responsibilities and obligations with respect to the operation of the State Transmission System.
- ◆ To improve the grid stability and set minimum standards of system performance.
- ◆ To define requirement for new entrants i.e. future new generating companies, licensees and consumers.
- ◆ To document the common knowledge or normal practice in writing for ease of reference and help in compliance.
- ◆ To agree with generators what performance characteristics their plant must provide.
- ◆ To improve co-operation by providing a mechanism for clear and consistent disclosure of all information.
- ◆ To provide a level playing field.
- ◆ To indicate how generation is to be scheduled and dispatched.
- ◆ To actually enforce what is verbally agreed.

1.3 Structure of Grid Code

The Grid Code has been divided into following parts:

I. General Code

The General Code is intended to ensure that all other sections of the Grid Code work together in the management of the Grid Code and establishment of a procedure for review of Grid Code to cater to inadvertent omissions and the modifications needed from time to time.

II. Planning Code

Planning Code includes sections on:

- (a) System Planning specifying the procedures to be applied by STU in the planning and development of the State Transmission System and by other Users connected or seeking Connection to the State Transmission System. This section deals with procedure to be followed by STU in the development of the EHV Transmission System in the long term taking into account the requirements for new connection of generation and demand.
- (b) Connection Issues specifying the technical requirements and standards to be complied with by STU and other Users connected or seeking Connection to the State Transmission System.

III. Load Despatch & System Operation Code

Load Despatch & System Operation Code includes sections on:

- (a) **System Operation:** specifying the conditions under which STU shall operate the State Transmission System, the Generating Companies shall operate their plants and the Distribution Licensees shall operate their Distribution Systems in so far as necessary to protect the security and quality of supply and safe operation of the State Transmission System under both normal and abnormal operating conditions.
- (b) **Schedule and Despatch:** specifying the procedures relating to the scheduling and despatch of Generating Units and drawal by Discoms to meet State demand and Drawal allocation.
- (c) **Outage Planning:** specifying the procedures relating to the co-ordination of outages for scheduled maintenance of the Transmission Network, Generating Units and Distribution System that will use the State Transmission System.

IV. Protection Code

Protection Code specifies the requirement and co-ordination responsibility and minimum standards of protection that are required to be installed by Users of the State Transmission System.

V. Metering Code

Metering Code specifies the minimum operational and commercial metering to be provided for each User. It also sets out the requirement and procedures for metering.

VI. Data Registration

This contains the details of all the data required by STU, which is to be provided by the Users and vice versa.

1.4 Scope

Grid Code is a document that defines the boundary between STU and Users and establishes the procedures for operation of facilities connected to the Transmission System.

The Grid Code shall be complied with by STU in its capacity as holder of the Transmission License and by State Sector Generating Station (SSGS), Distribution Licensee, Open Access customers and non-licensee (like EHV consumers) connected with STU's transmission system, in the course of generation, transmission, supply and utilisation of electricity.

1.5 Interpretation

The meaning of certain terms used in the Grid Code shall be in accordance with the definitions listed in Section 2, "Definitions", of the Grid Code.

Section 2 of this Code has been developed on the premise that accepted engineering terms do not require additional definitions.

The term "Grid Code" means any or all parts of this document.

1.6 Implementation and Operation of the Grid Code

- 1.6.1 The date of commencement of this code shall be date of publication in Madhya Pradesh Gazette and accordingly the concerned Utilities/Users shall commence its implementation.
- 1.6.2 The connectivity criteria and other provisions of the Grid Code shall be applicable to the new Connections and equipments procured/provided for new works/ replacements from the date the Grid Code is made effective.
- 1.6.3 The existing connections and equipment shall continue to operate till such time the OCC considers alterations necessary. However, operational aspects of the Grid Code shall have no such relaxation and shall apply with immediate effect.
- 1.6.4 The Grid Code shall apply to Users, STU and future transmission licensee. The STU has the duty to implement the Grid Code.
- 1.6.5 All Users are required to comply with Grid Code, which shall be enforced by STU. Users must provide STU reasonable rights of access; service and facilities necessary to discharge its responsibilities in the Users premises and to comply with instructions as issued by STU reasonably required to implement and enforce the Grid Code.
- 1.6.6 STU shall not unduly discriminate against or unduly prefer:
 - (d) any one or any group of persons; or
 - (e) STU in the conduct of any business other than the Transmission Business.
- 1.6.7 If any User fails to comply with any provision of the Grid Code, it shall, inform Grid Code Review Committee without delay of the reason for its non-compliance and shall remedy its non-compliance promptly. Consistent failure to comply with the Grid Code provisions may lead to

disconnection of the User's plant and /or facilities. The disconnection on such ground shall not affect the STU's right to recover transmission and/or other charges during agreement period.

- 1.6.8 The operation of the Grid Code will be reviewed regularly by the Grid Code Review Committee in accordance with the provisions of the relevant section of the Grid Code.

1.7 General Requirements

- 1.7.1 The Grid Code contains procedures to permit equitable management of day-to-day technical situations in the Electricity Supply System, taking into account a wide range of operational conditions likely to be encountered under both normal and abnormal circumstances. It is nevertheless necessary to recognise that the Grid Code cannot predict and address all possible operational conditions.
- 1.7.2 Users must therefore understand and accept that STU in such unforeseen circumstances may be required to act decisively to discharge its obligations under its License. SSGS and Discoms shall provide such reasonable co-operation and assistance as STU may request in such circumstances.

1.8 Code Responsibilities

- 1.8.1 In discharging its duties under the Grid Code, STU has to rely on information, which Users supply regarding their requirements and intentions.
- 1.8.2 STU shall not be held responsible for any consequences that arise from its reasonable and prudent actions on the basis of such information.

1.9 Confidentiality

- 1.9.1 Under the terms of the Grid Code, STU will receive information from Users relating to their intentions in respect of their Generation or Supply businesses.
- 1.9.2 STU shall not, other than as required by the Grid Code, disclose such information to any other person without the prior written consent of the provider of the information.

1.10 Dispute Settlement Procedures

- 1.10.1 In the event of any dispute regarding interpretation of any part of the Grid Code provision between any Users and STU, the matter may be referred to the Commission for its decision. The Commission's decision shall be final and binding.

In the event of any conflict between any provision of the Grid Code and any contract or agreement between STU and Users, the provision of the Grid Code will prevail.

1.11 Communication between STU and Users

- 1.11.1 All communications between STU and Users shall be in accordance with the provision of the relevant section of the Grid Code and shall be made to the designated nodal officer appointed by STU.
- 1.11.2 Unless otherwise specifically required by the Grid Code all communications shall be in writing, save that where operation time scales require oral communication, these communications shall be confirmed in writing as soon as practicable.

The voice shall be recorded at SLDC and such record shall be preserved for a reasonable time to be decided.

1.12 Partial Invalidity

If any provision or part of a provision of the Grid Code should become or be declared unlawful for any reason, the validity of all remaining provisions or parts of provisions, of the Grid Code shall not be affected.

1.13 Directive

State Government may issue policy directives in certain matters as per the Electricity Act 2003. STU shall promptly inform the Commission and all Users of the requirement of such directives.

1.14 Compatibility with Indian Electricity Grid Code

This Grid Code is prepared such that it is consistent/ compatible with the IEGC. However, in matters relating to inter-State transmission, if any provisions of the MP Grid Code are inconsistent with the provisions of the IEGC, then the provisions of IEGC as approved by CERC shall prevail.

SECTION 2 DEFINITIONS

Defined Term	Definition
Act	The Electricity Act 2003 (Central Act No. 36 of 2003)
Apparatus	Electrical apparatus and includes all machines, fittings, accessories and appliances in which conductors are used.
Appendix	An Appendix to a section of the Grid Code.
Area of Supply	As defined in the concerned License.
Automatic Voltage Regulator or AVR	A continuously acting automatic excitation system to control the voltage of a Generating Unit as measured at the Generator Terminals.
Backing Down	SLDC instructions or WRLDC instructions conveyed through SLDC for reduction of generation from generating unit under abnormal conditions such as high frequency, low system demand or network constraints.
Black Start Procedure	The process of recovery from a total or partial blackout of the State Transmission System.
Board	The Board refers to Madhya Pradesh State Electricity Board (MPSEB).
Breakdown	An occurrence relating to equipment of supply system which prevents its normal functioning
Captive Power Plant / CPP	For the purpose of Grid Code, a Power Station that is primarily operated to meet a captive demand and is connected to State Transmission System but not supplying power to the Grid under normal circumstances.
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
Central Transmission Utility (CTU)	The utility notified by the Government of India under sub-section (1) of Section 38 of the Act
Commission/ MPERC	Madhya Pradesh Electricity Regulatory Commission.
Connection	The electric lines and electrical equipment used to effect a Connection of a User's (other than STU) system to the State Transmission System.
Connection Agreement	An agreement between STU and a User setting out the terms relating to the Connection to and/or use of the State Transmission System.
Connection Conditions	The technical conditions to be complied with by any User having a Connection to the State Transmission System as laid down in SECTION 5: "Connection Conditions" of the Grid Code.
Consumer	Any person who is supplied with electricity for his own use by a licensee or the Government or by any other person engaged in the business of supplying electricity to the public under the Act or any other law for the time being in force and includes any person whose premises are for the time being connected for the purpose of receiving electricity with the works of a licensee, the Government or such other person, as the case may be; or whose electricity supply has been disconnected.
Demand	The demand of active power MW and reactive power MVAR of electricity unless otherwise stated.
Designated Officer	A person identified as having responsibility for inter user safety under section

Defined Term	Definition
	13 of the Grid Code.
Despatch Instruction	An instruction by SLDC to SSGS (other than CPP) to despatch generation and to Discom to regulate drawal in accordance with the Scheduling & Despatch procedure of Grid Code.
Disconnection	The act of physically separating a User's or EHV Consumer's electrical equipment from the State Transmission System.
Distribution Company/ Discoms	Discoms or Distribution Company shall mean a company engaged primarily in the business of distribution & supply of electricity in its area of supply including Madhya Pradesh Poorva Kshetra Vidyut Vitran Company Limited, Madhya Pradesh Madhya Kshetra Vidyut Vitran Company Limited and Madhya Pradesh Paschim Kshetra Vidyut Vitran Company Limited.
Distribution System	The system of electric lines and electrical equipment at voltage levels of 33kV and lower, including part of a State Transmission System, where used for supply of Electricity to a single consumer or group of consumers.
Drawal	The import from, or export to, Western Region, of electrical energy and power or both active/ reactive power. In respect of a Discom, drawal means import from or export to STU of electrical energy and power or both active/reactive.
Electricity Supply System (GRID)	The combination of the State Transmission System, Distribution System and Power Stations.
External Interconnection	Electric lines and electrical equipment used for the transmission of electricity between the State Transmission System and the Regional Transmission System and other State systems.
Extra High Voltage (EHV)	Nominal voltage levels of higher than 33kV.
EHV Consumer	A person to whom electricity is provided and who has a dedicated supply at 66kV or above.
Forced Outage	An Outage of a SSGS or any of Power Station Equipment, generally due to sudden failure of one or more parts of equipment at a generating station, of which no notice can be given by the Generator to STU and also include outage of transmission line and any substation equipment of which no notice can be given by STU or transmission licensee to Discom or vice versa.
Generator	A person or agency who generates electricity and who is subjected to Grid Code either pursuant to any agreement with STU or otherwise and include SSGS, ISGS or inter-state generation/transmission/trading company.
Generating Unit	The combination of an alternator and a turbine set (whether steam, gas, Liquid fuel, water or wind driven) or a reciprocating engine and all of its associated equipment, which together represents a single electricity generating machine.
Grid Code / Code	The set of principles and guidelines prepared in accordance with the terms of section 86 (1) (h) of the Electricity Act 2003.
Grid Contingencies	Abnormal operating conditions brought out by tripping of generating units, transmission lines, transformers or abrupt load changes or by a combination of the above leading to abnormal voltage and/or frequency excursions and/or overloading of network equipment.
Grid Disturbance	Grid Disturbance is the situation where disintegration and collapse of grid either in part or full take place in an unplanned and abrupt manner, affecting the power supply in a large area of the region.
Grid Code Review Committee/Committee	The Committee set up under SECTION 3: "Management of Grid Code" of the Grid Code.
IE Rules	Indian Electricity Rules 1956.
Independent Power Produce (IPP)	Independent Power Producer being a Power Station within the State, owned by a Generator who is not part of MPPGCL, STU or Central Sector Generation and is not classified as a CPP.

Defined Term	Definition
Indian Electricity Grid Code (IEGC)	A document describing the philosophy and the responsibilities for planning and operation of Indian power system approved by CERC.
Inter Connecting Transformer (ICT)	Transformer connecting EHV lines of different voltage levels.
Inter-State Generating Station (ISGS)	A Central /MPP /other generating station in which two or more than two states have a share and whose scheduling is to be coordinated by the RLDC.
Inter-State Transmission System (ISTS)	Any system for conveyance of energy by means of a main transmission line from territory of one state to another state and includes: The conveyance of energy across the territory of an intervening state as well as conveyance within the state, which is incidental to such inter-state transmission of energy. The transmission of energy within the territory of a state on a system built, owned, operated and maintained by the CTU or by any agency/person under supervision and control of CTU.
Licensee	Licensee means a person who has been granted a license under section 14 of the Act
Load Crash	Sudden or rapid reduction of electrical load connected to a system that could be caused due to tripping of major transmission line(s), feeder(s), power transformer(s) or natural causes like rain etc.
Maximum Continuous Rating (MCR)	The normal rated full load MW output capacity of a Generating Unit, which can be sustained on a continuous basis at specified conditions.
Merit Order Operation	Priority order of various generating units under ISGS/ SSGS, operating in synchronism with Western Grid System, compiled by SLDC pursuant to schedule and despatch requirements, generally in ascending order of cost of energy.
MPPTCL	Madhya Pradesh Power Transmission Company Limited registered under the Companies Act, 1956
MPPGCL	Madhya Pradesh Power Generation Company Limited.
NTPC	National Thermal Power Corporation Limited.
Open Access	The non-discriminatory provision 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 regulations specified by the Commission
Open Access Customer	Open Access Customer means a consumer permitted by the Commission to receive supply of electricity from a person other than distribution licensee of his area of supply, and the expression includes a generating company and a licensee, who has availed of or intends to avail of open access
Outage	In relation to a Generator/ Transmission/ Distribution facility, an interruption of power supply whether manually or by protective relays in connection with the repair or maintenance of the SSGS/Transmission facility or resulting from a breakdown or failure of the Transmission /Distribution facility/SSGS unit or defect in its Auxiliary system.
Peak Period	That period in a day when electrical demand is at its highest.
Planned Outage	An Outage in relation to a SSGS unit for Power Station Equipment or Transmission facility which has been planned and agreed with SLDC, in advance in respect of the year in which it is to be taken.
Power Station	An installation of one or more Generating Units (even when sited separately) owned and/or operated by the same SSGS and which may reasonably be considered as being managed as a single integrated generating complex.
Power Grid/ PGCIL	The Power Grid Corporation of India Limited.
PTW (Permit to Work)	Safety documentation issued to any person to allow work to commence on inter-user boundary after satisfying that all the necessary safety precautions

Defined Term	Definition
	have been established.
Rotational Load Shedding	Planned Disconnection of Customers on a Rotational basis during periods when there is a significant short fall of power required to meet the total Demand.
Reform Act	The Madhya Pradesh Vidyut Sudhar Adhiniyam, 2000 (No. 4 of 2001)
Regional Transmission System	The combination of EHV electric lines and electrical equipment owned or operated by Power Grid / utilities.
section	A section or part of this Grid Code, which is, identified as covering a specific topic.
Shut Down	The condition of a Generating Unit where it is at rest or on barring gear isolated from grid or Transmission facility, which is at rest or isolated from Grid.
Spinning Reserve	Unloaded generating capacity, which is synchronised to the System and is ready to provide increased generation at short notice pursuant to despatch Instruction or instantaneously in response to frequency drop.
State	The State of Madhya Pradesh.
State Load Despatch Centre (SLDC)	The State Load Despatch Centre having its control room at Jabalpur is the apex body to ensure integrated operations of the power system in the state
State Sector Generating Station (SSGS)	Any power station within the State, except the Inter-State Generating Station (ISGS) located within the State.
State Transmission System (STS)	The system of EHV electric lines and electrical equipment operated and/or maintained by STU or any Transmission Licensee for the purpose of the transmission of electricity between Power Stations, External Interconnections, Distribution Systems and other users connected to it.
State Transmission Utility (STU)	The Board or Government Company specification as such by the State Government under sub-section(1) of section 39 of the Act.
Sub-LDC	Sub-LDC shall mean the Load Despatch Centre set up at Bhopal and Indore.
Supervisory Control and Data Acquisition (SCADA)	The combination of transducers, RTU, communication links and data processing systems, which provides information to the SLDC on the operational state of the State Transmission System.
Synchronised	The condition where an incoming Generating Unit or System is connected to another System so that the voltage, frequencies and phase relationships of that Generating Unit or System, as the case may be, and the System to which it is connected are identical and the terms “Synchronise” and “Synchronisation” shall be construed accordingly.
Transmission License / License	The License to be granted to STU by the Commission under Chapter-V of Madhya Pradesh Vidyut Sudhar Adhiniyam 2000 as well as License to be granted under section 14 of Electricity Act 2003.
Unscheduled Generation	Any generation that is in violation of SLDC / WRLDC instructions and parameters described in relevant sections of the Grid Code.
User	A person, including Generating Stations within MP, Transmission Licensees or Distribution Licensees within MP and open access customer who use the State Transmission System and who must comply with the provisions of the Grid Code.
Western Region / Region	Region comprising of the States and Union Territory of Gujarat, Madhya Pradesh, Chhatisgarh, Maharashtra, Goa, Dadra & Nagar Haveli, Daman & Diu.
Western Regional Grid System	Western Regional Grid System means power systems of SEBs/ Utilities/ IPP/ CPPs of the States of the Western Region and of NTPC & PGCIL having integrated operation.
WREB	Western Regional Electricity Board.
WRLDC	Western Regional Load Despatch Centre.

Note: The terms, which are used in this Code and are not defined above, will have the same meaning as defined in **IEGC or Electricity Act 2003**.

SECTION 3 MANAGEMENT OF THE GRID CODE

3.1 Introduction

- 3.1.1 STU is required to implement and comply with the Grid Code and periodically review the same and its implementation. For the above purpose a Grid Code Review Committee, as per section 3.4, shall be established.
- 3.1.2 Subject to the conditions in the next paragraph of this section, all revision in the Grid Code shall be made by consensus in the meeting of Grid Code Review Committee with majority of members voting for the revision. In the event of no consensus being reached, the matter shall be referred to the Commission for decision. All revisions in the Grid Code shall be approved by the Commission.
- 3.1.3 In any unusual situation where normal day-to-day operation is not possible without revision of some section(s) of the Grid Code, a provisional revision may be implemented before approval of Commission is received, but only after discussions at a special meeting of Grid Code Review Committee convened on emergency basis. The Commission shall be intimated at the earliest but not later than 15 days about the provisional revision by recorded means of communication.
- 3.1.4 The changes/revisions proposed by the Grid Code Review Committee shall be consistent/compatible with IEGC.
- 3.1.5 The Commission may issue directives requiring STU to revise, supplement or replace the Grid Code in such manner as may be specified in those directives and STU shall forthwith comply with any such directives.
- 3.1.6 This document defines the procedure to be followed by STU in maintaining the Grid Code and also in pursuing any change.

3.2 Objective

- 3.2.1 The objective of this procedure is to define the method of managing the Grid Code, submitting and pursuing of any proposed change to the Grid Code and the responsibilities of all Users to effect that change.

3.3 Responsibilities

- 3.3.1 STU will be responsible for managing and servicing the Grid Code.

- 3.3.2 STU shall establish and service the requirements of the Grid Code Review Committee in accordance with provisions of section 3.5 of the Grid Code.

3.4 Grid Code Review Committee

- 3.4.1 STU will inform all Users of the names and addresses of the Committee Chairman and Member Secretary within 15 days of the approval of the Grid Code, and shall inform Users in writing of any subsequent changes.
- 3.4.2 WREB, WRLDC, MPERC shall inform the Committee Member Secretary of the name and designation of their Committee Representative within 30 days of the approval of Grid Code by MPERC and shall inform the Committee Member Secretary, in writing, of any subsequent change.
- 3.4.3 The Committee shall be chaired by STU in its capacity as the Transmission Licensee and consist of the following members:
 - (a) Chairman & Managing Director of STU - **Chairman**

- (b) Chief Engineer of STU - **Member Secretary**
- (c) Chairman & Managing Director of MPPGCL - **Member**
- (d) Chairman & Managing Director of Eastern Discom - **Member**
- (e) Chairman & Managing Director of Central Discom-**Member**
- (f) Chairman & Managing Director of Western Discom - **Member**
- (g) In-charge SLDC-**Member**
- (h) One member representing transmission and distribution licensee (other than **STU/Discoms**) - **Member**
- (i) One representative from **MPERC** - **Member**
- (j) One representative of **IPP/CPP** - **Member**
- (k) One representative from **WRLDC** - **Member**
- (l) Further, one representative from **WREB** may participate in the **Committee** as a special invitee.

A member may nominate his alternative for one or more meetings.

NOTE: Notice of the meeting would be served to all the members. However, the minimum quorum to review shall be of seven members including Chairman of the Committee (CMD).

3.5 Grid Code Review Committee Proceedings

- 3.5.1 The Rules to be followed by the Committee in conducting their business shall be formulated by the Committee themselves and shall be approved by the MPERC. The Committee will meet at least once in three months.

The functions of the Grid Code Review Committee are as follows:

- (a) To keep the Grid Code and its workings under scrutiny and review.
 - (b) To propose any revision, if necessary, in the Grid Code consequent of analysis report on major grid disturbance soon after its occurrence. The recommendations of the Committee may be submitted to Commission for approval and issuing directives to the Users for taking necessary remedial measures, as may be deemed fit, to prevent recurrence.
 - (c) To approve guidelines for load shedding through under frequency relays or otherwise prepared by the Technical Committee.
 - (d) To consider all requests for amendment to the Grid Code which any User makes.
 - (e) To issue guidance on the interpretation and implementation of the Grid Code.
 - (f) To examine problems raised by Users.
- 3.5.2 Sub-meetings may be held by STU with a User to discuss individual requirements and with groups of Users to prepare proposals for the Committee meeting. The Committee may set up sub-committees for detail studies of related problems.

3.6 Grid Code Review and Revisions

- 3.6.1 STU shall, in consultation with Users and WREB and such other persons as the Commission may direct, every three years, or earlier if required by the Commission, review the Grid Code and its implementation.
- 3.6.2 Commission shall reserve the right to review the Grid Code as and when required.
- 3.6.3 The Member Secretary shall present all proposals for revisions of the Grid Code to the Committee for its consideration.
- 3.6.4 STU shall send to the Commission following reports at the conclusion of each review meeting of the Committee.
- (a) A report on the outcome of such review;

- (b) Any proposed revisions to the Grid Code from time to time as STU reasonably thinks necessary for the achievement of the objectives of this Code.
- (c) All written representations or objections from Users arising during the review / consultation process.

3.6.5 All revisions to the Grid Code shall require the prior written approval of the Commission.

STU shall convey to all concerned, revisions to the Grid Code after approval by the MPERC and the same shall be incorporated in the subsequent version of the Grid Code.

The revision number and date of issue shall appear on every page of the Grid Code.

Every change from the previous version shall be clearly marked in the margin. In addition, a revision sheet shall be placed at the front of the revision that lists the number of every changed sub-section, together with a brief statement of change.

3.6.6 STU shall present proposals to the MPERC to allow relaxation, where Users have difficulties in meeting the Grid Code requirements.

3.6.7 STU shall make available a copy (other than service copy) of the respective parts of Grid Code in force for sale to any person requesting it.

3.6.8 STU shall keep an up-to-date list of the recipients and locations of all serviced copies of the Grid Code.

3.7 Functional Committees

The STU is responsible for servicing/implementation of Grid Code whereas the Grid Code Review Committee shall be responsible for management of Grid Code for any changes, modifications in the Grid Code. The Grid Code Review Committee shall constitute following committees for implementation of the Grid Code:

- (a) System Operation Code : Operation and Co-ordination Committee (OCC)
- (b) Protection Code : Protection Co-ordination Committee (PCC)
- (c) Transmission Metering Code : Transmission Metering Committee (TMC)

The Grid Code Review Committee shall nominate the members of the functional committees. Chairman and Member Secretary of the functional committee shall be from STU.

However, STU can formulate any other operational committee as it deems fit for the implementation of the Grid Code.

3.7.1 Operation and Co-ordination Committee (OCC)

Operation and Co-ordination Committee shall coordinate the implementation of Load Despatch & System Operation Code to ensure that respective Generators and Distribution Companies using State Transmission System discharge their obligations under the Grid Code.

OCC shall comprise of a Chief Engineer level members to be appointed by the Grid Code Review Committee, which shall meet once every six months and deliberate on all technical and operational aspects of Load Despatch and System Operation and shall give their recommendations to the Grid Code Review Committee. It shall conduct the following functions.

The rules to be followed by the committee in conducting their business shall be formulated by the Committee itself and shall be approved by Grid Code Review Committee. The committee shall meet once in six months.

- (a) Review of existing interconnection and equipment for alteration, if necessary, so as to comply with the Connection Conditions provided for in the Code.
- (b) Deliberation on connectivity criterion for voltage un-balance as specified in clause 6.1 of Performance Standards and taking remedial measure for cases failing to meet such criterion.
- (c) Review the load forecast and the methodology and assumptions made by each of the Discom.

- (d) Review the load shedding through under frequency relays.
- (e) Transmission system planning coordination for the State as a whole.
- (f) Review and finalise the proposals identified on the basis of planning studies.

3.7.2 Protection Co-ordination Committee (PCC)

Protection Co-ordination Committee shall coordinate the implementation of Protection Code to ensure that respective Users using State Transmission System discharge their obligations under the Protection code.

Protection Co-ordination Committee shall consist of following members:

- (i) Chairman who is an officer designated by STU.
- (ii) Member Secretary who is also an officer from STU.
- (iii) One representative from MPPGCL
- (iv) One representative from each Discom.
- (v) One representative from SLDC.

3.7.3 The rules to be followed by the Protection Co-ordination Committee in conducting their business shall be formulated by the committee itself and shall be approved by Grid Code Review Committee. The committee shall meet at least once in three months and conduct the following functions.

- (i) To keep Protection Code and its implementation under scrutiny & review.
- (ii) To consider all requests for amendment to the Protection code which any user makes.
- (iii) To publish recommendations for changes to the Protection code together with the reason for the change and any objection if applicable.
- (iv) To issue guidance on the interpretation & implementation of the Protection code.
- (v) To deliberate and decide various protection settings testing procedure and periodicity.
- (vi) To review and specify the minimum protection requirements for User's system connected to the State Transmission System.
- (vii) To deliberate and prepare the Under Frequency Load Shedding Schemes and the mechanism to be adopted for the same for various sub-stations to ensure that the frequent tripping of same feeder is avoided.
- (viii) Preparation and finalisation of technical requirement of various protections, Disturbance recorders, Event Loggers.

3.7.4 Transmission Metering Committee (TMC)

Metering Committee shall be constituted as per the provisions of metering code.

The rules to be followed by the Metering Committee in conducting their business shall be formulated by the Metering Committee itself and shall be approved by Grid Code Review Committee. The Metering Committee shall meet at least once in six months.

3.8 Non-Compliance & Derogation

- 3.8.1 If any User fails to comply with any of the provision(s) of the Grid Code, it shall inform STU without delay of the reason for its non-compliance and shall remedy its non-compliance promptly.
- 3.8.2 Wrong declaration of capacity, non-compliance of SLDC's load dispatch instructions, non-compliance of SLDC's instructions for backing down without adequate reasons, non-furnishing data etc. shall constitute non-compliance of Grid Code and shall be subject to financial penalty as may be decided by the Commission.
- 3.8.3 Consistent failure to comply with the Grid Code may lead to disconnection of the User's plant and/or facilities.

- 3.8.4 Derogation if any for any particular section or chapter of the Grid Code shall be with the express permission of the Commission for a specified time. Derogation of any requirement of the Grid Code shall be exception and not the norm, and will be allowed only when it is impossible and not just difficult or inconvenient for the user to comply in the required time-scale. Failure to comply with fixed-time derogation by any User shall carry a financial penalty as may be decided by the Commission while allowing derogation.

PART II

PLANNING CODE

SECTION 4 SYSTEM PLANNING

4.1 Introduction

- 4.1.1 This section specifies the method for data submissions by Users to STU for the planning and development of the State Transmission System. This section also specifies the procedure to be applied by STU in the planning and development of the State Transmission System.
- 4.1.2 A requirement for reinforcement or extension of the State Transmission System may arise for a number of reasons, including but not limited to the following:
- (i) Development on a User's system already connected to the State Transmission System.
 - (ii) The introduction of a new Connection point between the User's system and the State Transmission System.
 - (iii) Evacuation system for Generating Stations within or outside the State.
 - (iv) Reactive Compensation.

- (v) A general increase in system capacity (due to addition of generation or system load) to remove operating constraints and maintain standards of security.
 - (vi) Transient or steady state stability considerations.
 - (vii) Cumulative effect of any of the above.
- 4.1.3 Accordingly, the reinforcement or extension of the State Transmission System may involve work at an entry or exit point (Connection point) of a User to the State Transmission System. Since development of all User's systems must be planned well in advance to permit consents and way leaves to be obtained and detailed engineering design/construction work to be completed, STU will require information from Users and vice versa. To this effect, the planning code imposes time scale, for exchange of necessary information between STU, and Users having regard, where appropriate, to the confidentiality of such information.

4.2 Objective

The provisions of this section are intended to enable STU to produce a plan in consultation with Users, to provide an efficient, coordinated, secure and economical State Transmission System to satisfy requirement of future demand. The Planning Code

- ◆ Defines the procedure for the exchange of information between STU and a User in respect of any proposed User development on the User's system, which may have an impact on the performance of the User.
- ◆ Details the information which STU shall make available to Users in order to facilitate the identification and evaluation of opportunities for use of or connection to State Transmission System;
- ◆ Details the information required by STU from Users to enable STU to plan the development of its Transmission System to facilitate proposed User developments;
- ◆ Specifies planning and design standards, which will be applied by STU in planning and development of the power system.

4.3 Planning Policy

- 4.3.1 STU would develop a perspective transmission plan for next 10 years for State Transmission System. These perspective transmission plans would be updated every year to take care of the revisions in load projections and generation capacity additions. The perspective plans shall be submitted to Commission for approval.
- 4.3.2 STU shall carry out annual planning process corresponding to a 5 year forward term for identification of major State Transmission System, which shall fit into national power plan formulated by Central Government long term plan developed by CEA and the 5 year plan prepared by Central Transmission Utility.
- 4.3.3 STU shall follow the following steps in planning:
- (i) Forecast the demand for power within the Area of Supply, based on the forecasts provided by Discoms, and provide to the Commission details of the demand forecasts, data, methodology and assumptions on which the forecasts are based. These forecasts would be annually reviewed and updated.
 - (ii) Prepare a proposal for the requirement of generation for the State to meet the load demand as per the forecast, after examining the economic; technical and environmental aspects of all available alternatives taking into account the existing contracted generation resources and effects of demand side management.
 - (iii) Prepare a transmission plan for the State Transmission System compatible with the above load forecast and generation plan. This will include provision for VAR compensation needed in the State Transmission System.

- (iv) The reactive power planning exercise to be carried out by STU in consultation with WRLDC/WREB, Discoms, Programme for installation of reactive compensation equipment by STU & Discoms.
 - (v) STU's planning department shall use load flow, short circuit, and transient stability study, relay coordination study and other techniques for transmission system planning.
 - (vi) STU's planning department shall simulate the contingency and system constraint conditions for the system for transmission system planning.
 - (vii) STU would maintain a historical database based on operational data supplied by SLDC using the state-of-the-art tools such as Energy Management System (EMS) for demand forecasting.
 - (viii) STU shall be responsible to prepare and submit a long-term (10 years) plan to the Commission for the requirement of generation expansion and transmission system expansion to meet the future demand growth. The proposal for setting up of generating plant after examining the economic, technical & environmental aspects would be prepared & got approved by Generating Company.
- 4.3.4 All the Users shall supply to STU, the desired planning data by 31st March every year to enable STU to formulate and finalise the plan by 30th September each year for the next 5 years.

4.4 Planning Standards and Procedures

The State Transmission System planning and generation expansion planning shall be in accordance with the provisions of the Planning Criterion as per IEGC Clause 3.5. However, some planning parameters of the State Transmission System may vary according to directives of MPERC.

4.5 Planning Responsibility

- 4.5.1 The primary responsibility of load forecasting within Discom's Area of Supply rests with respective Distribution Companies. The Distribution Companies shall determine peak load and energy forecasts of their areas for each category of loads for each of the succeeding 5 years and submit the same annually by 31st March to STU along with details of the demand forecasts, data, methodology and assumptions on which the forecasts are based along with their proposals for transmission system augmentation. The load forecasts shall be made for each of the prevalent as well as proposed interconnection points between STU and Discoms and shall include annual peak load and energy projections. The demand forecasts shall be updated annually or whenever major changes are made in the existing forecasts or planning. While indicating requirements of single consumers with large demands (1 MW or higher) the Distribution Company shall satisfy itself as to the degree of certainty of the demand materialising.
- 4.5.2 MPPGCL shall provide their generation capacity to STU for evacuating power from their power stations for each of the succeeding 5 years along with their proposals for transmission system augmentation and submit the same annually by 31st March to STU.
- 4.5.3 The planning for strengthening the State Transmission System for evacuation of power from outside state stations shall be initiated by STU.
- 4.5.4 Operation and Co-ordination Committee consisting of members from each Discom, STU and MPPGCL shall review and approve the load forecasts and the methodology followed by each of the Discoms.
- 4.5.5 The State Transmission System proposals identified based on planning studies would be discussed, reviewed and finalised by the OCC.

4.6 Planning Data

- 4.6.1 To enable STU to conduct System Studies and prepare perspective plans for electricity demand, generation and transmission, the Users shall furnish data, to STU from time to time as detailed under Data Registration section as under:

- (a) Standard Planning Data (Generation)/ Standard Planning Data (Distribution)
 - (b) Detailed Planning Data (Generation)/ Detailed Planning Data (Distribution)
- 4.6.2 To enable Users to co-ordinate planning design and operation of their plants and systems with the State Transmission System they may seek certain salient data of Transmission System as applicable to them, which STU shall supply from time to time as detailed under Data Registration section and categorized as:
- (a) Standard System Data (Transmission).
 - (b) Detailed System Data (Transmission).
- 4.6.3 STU shall also furnish to all the Users, Annual Transmission Planning Report, Power Map and any other information as the Commission may prescribe.

SECTION 5 CONNECTION CONDITIONS

5.1 Introduction

Connection Conditions specify the technical, design and operational criteria which must be complied with by any User connected to the State Transmission System including.

5.2 Objective

The objective of this section is to ensure the following:

- (i) All Users or prospective Users are treated equitably.
- (ii) Any new Connection shall not impose any adverse effects on existing Users, nor shall a new Connection suffer adversely due to existing Users.
- (iii) By specifying minimum design and operational criteria, to assist Users in their requirement to comply with License obligations and hence ensure that a system of acceptable quality is maintained.
- (iv) The ownership and responsibility for all items of equipment is clearly specified in a schedule (Site Responsibility Schedule) for every site where a Connection is made.

5.3 Procedure for Application

- (i) The User shall submit the application containing all the information as may be reasonable required to STU.
- (ii) STU shall make a formal offer within 60 days of the receipt of the application. The offer shall specify and take into account any works required for the extension or reinforcement of the State Transmission System necessitated by the applicant's proposal and for obtaining any consent necessary for the purpose.
- (iii) If the prescribed time limit for making the offer against any application is not adequate, STU shall make a preliminary offer within the prescribed time indicating the extent of further time required for detailed analysis.
- (iv) Any offer made by STU shall remain valid for a period of 60 days and unless accepted before the expiry of such period shall lapse thereafter.
- (v) In the event of offer becoming invalid or not accepted by the applicant, STU shall not be required to consider any further application from the same applicant within 12 months unless the new application is substantially different from the original application.
- (vi) The applicant shall furnish the detailed planning data as per Appendix B
- (vii) STU shall be entitled to reject any application for connection to/or use of State Transmission System on the following conditions apart from others as considered reasonable:

- (a) If such proposed connection is likely to cause breach of any provision of its license or any provision of the Grid Code or any provision of IEGC or any provision criteria or any covenants, deeds or regulations by which STU is bound.
- (b) If the applicant does not undertake to be bound, in so far as applicable, by the terms of Grid Code.
- (c) If the applicant fails to give confirmation and undertakings according to this section.

5.4 Connection Agreement

A Connection Agreement (or the offer for a Connection Agreement) shall include, as appropriate, within its terms and conditions the following:

- (a) A condition requiring both parties to comply with the Grid Code.
- (b) Details of connection and/or use of system charges.
- (c) Details of any capital related payments arising from necessary reinforcement or extension of the system.
- (d) Diagram of electrical system to be connected.
- (e) General philosophy, guidelines etc on protection.
- (f) A Site Responsibility Schedule (Appendix G).

5.5 Site Responsibility Schedule

For every Connection to the State Transmission System for which Connection Agreement is required, STU shall prepare a schedule of equipment with information supplied by the respective Users. This schedule, called a Site Responsibility Schedule, shall indicate the following for each item of equipment installed at the Connection site.

- (i) The ownership of equipment.
- (ii) The responsibility for control of equipment.
- (iii) The responsibility for maintenance of equipment.
- (iv) The responsibility for operation of equipment.
- (v) The manager of the site.
- (vi) The responsibility for all matters relating to safety of persons at site.

5.6 System Performance

- 5.6.1 All equipment connected to the State Transmission System shall be of such design and construction to enable STU to meet the requirement of Standard of Performance. Discoms shall ensure that their loads do not cause violation of these standards.
- 5.6.2 Any user seeking to establish new or modified arrangement(s) for Grid connection and/or use of transmission system of STU shall submit the application in the form as may be specified by STU.
- 5.6.3 For every new /modified Connection sought, STU shall specify the Connection Point, technical requirements and the voltage to be used, along with the metering and protection requirements as specified in the Metering and Protection sections of the Code.
- 5.6.4 SSGS (except CPPs) shall make available to SLDC the up to date capability curves for all Generating Units, indicating any restrictions, to allow accurate system studies and effective operation of the State Transmission System. CPPs shall similarly furnish the net reactive capability that will be available for Export to / Import from State Transmission System.

The State Transmission System rated frequency shall be 50.00 Hz and shall be regulated by the provisions of IEGC as given below:

Target range	Statutory acceptable limit
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Upper Limit	50.50 Hz	Upper Limit	51.50 Hz
Lower Limit	49.00 Hz	Lower Limit	48.50 Hz

- 5.6.5 The User shall however be subject to the Grid discipline prescribed by SLDC/ WRLDC as per guidelines mutually agreed with WREB / WRLDC.

The variation of voltage at the inter connection point may not be more than the voltage range specified below:

Limits of Voltage Variation			
Nominal (kV)	% Limit of variation	Maximum (kV)	Minimum (kV)
400	+5%/-10%	420	360
220	+/-10%	245	200
132	+/-10%	145	120

- 5.6.6 Discoms and Open access users shall ensure that their loads do not affect STU system in terms of causing any:

1. Unbalance in the phase angle and magnitude of voltage at the interconnection point beyond the limits prescribed by Transmission Performance Standards.
2. Harmonics in the system voltage at the interconnection point beyond the limits prescribed by Transmission Performance Standards.

STU may direct the Discoms to take appropriate measures to remedy the situation.

- 5.6.7 In the event of Grid disturbances / Grid contingencies in the Western Regional grid, STU shall not be liable to maintain the system parameters within the normal range of voltage and frequency.
- 5.6.8 Insulation Co-ordination of the User's equipment shall conform to values as specified by STU from time to time out of those as per applicable Indian Standards / Codes. Rupturing capacity of switchgear shall not be less than that specified by STU from time to time.
- 5.6.9 Protection schemes and metering schemes shall be as detailed in the Protection and Metering sections of the Code.
- 5.6.10 Detailed Performance Standards and its compliance requirements have been stated separately in the document namely "Madhya Pradesh Electricity Regulatory Commission (Transmission Licensee Performance Standards) Regulations, 2004" drafted under the provisions of section 86 (1) (i).

5.7 Connection Point

- 5.7.1 State Sector Generating Station (SSGS)

Voltage may be 400/220/132kV or as agreed with STU.

Unless specifically agreed with STU the Connection point shall be the outgoing feeder gantry of Power Station Switchyard.

All the terminals, communication and protection equipment owned by SSGS within the perimeter of the Generator's site shall be maintained by the SSGS.

The provisions for the metering system shall be as per the Metering Code. The other User's equipment shall be maintained by respective Users. From the out going feeders' gantry onwards, all electrical equipment shall be maintained by STU.

- 5.7.2 Distribution Company

Voltage may be LV side of power transformer i.e. 33 or 11kV or as agreed with STU. For EHV consumer directly connected to transmission system, voltage may be 220kV or 132kV.

The Connection point shall be the outgoing feeder gantry/cable termination on transmission tower/pole at STU's substation. STU shall maintain all the terminals, communication and

protection for the metering system shall be as per the Metering Code. From the outgoing feeder gantry / transmission line cable terminal structure onwards, all electrical equipment shall be maintained by the respective Distribution Company.

5.7.3 Western Regional Transmission System

For the Western Regional Transmission System, the Connection, protection scheme, metering scheme and the voltage shall be in accordance with the provisions of IEGC.

5.7.4 IPPs, CPPs, EHV Consumers and Open access users

Voltage may be 220/132kV or as agreed with STU.

When sub-stations are owned by IPPs, CPPs, EHV Consumers or the Open access users, the Connection point shall be the outgoing feeder gantry on their premises.

5.8 Data Requirements

Users shall provide STU with data for this section as specified in the Data Registration section.

Unless otherwise agreed in Connection Agreement, the equipments for data transmission and communication shall be operational and maintained by the user in whose premises it is installed irrespective of ownership.

SECTION 6 SYSTEM SECURITY ASPECTS

6.1 System Security Aspects

6.1.1 All Users shall endeavour to operate their respective power system and generating stations in synchronism with each other at all times, such that the whole State Transmission System operates as synchronised system as integrated part of Western Regional Grid. STU shall endeavour to operate the inter state links so that inter state transfer of power can be achieved smoothly when required. Security of the power system and safety of power equipment shall enjoy priority over economically optimal operations.

6.1.2 All switching operations, whether affected manually or automatic, will be based on policy guide lines of:

- (a) IEGC
- (b) WRLDC's instructions/Guidelines under IE Rules
- (c) Grid Code
- (d) Grid Code Review Committee's decisions
- (e) State Government's directives
- (f) MPERC's directives

In case of any over-lapping or contradiction in the directives from the aforementioned 6 agencies, the decision of the Grid Code Review Committee shall be final.

6.1.3 No part of the State Transmission System shall be deliberately isolated from the integrated Grid, except

- (a) Under an emergency, and conditions in which such isolation would prevent a total Grid collapse and/or enable early restoration of power supply,
- (b) When serious damage to a costly equipment is imminent and such isolation would prevent it
- (c) When such isolation is specifically advised by SLDC and
- (d) On operation of under frequency/islanding scheme as approved by WREB/MPERC.

All such isolations shall be either as per standing guidelines approved by WREB/MPERC or shall be put up in the Grid Code Review Committee for ratification. Complete synchronisation

- of integrated Grid shall be restored, as soon as the conditions again permit it. The restoration process shall be supervised by SLDC as per relevant procedures separately finalised.
- 6.1.4 The 66kV and above transmission lines and ICTs (except radial lines which do not affect the operation of the Grid) shall not be deliberately opened or removed from service at any time except when advised by SLDC or with specific and prior clearance of SLDC. Where prior clearance from SLDC is not possible it should be intimated to SLDC at the earliest possible time after the incident. Any emergency tripping not advised or permitted by SLDC shall be put up to the Grid Code Review Committee for ratification in the next meeting.
 - 6.1.5 Any tripping, whether manual or automatic, of any of the elements mentioned above, shall be precisely reported to SLDC at the earliest. The reason (to the extent determined) and the likely time of restoration shall also be intimated. All reasonable attempts shall be made for the elementary restoration at the earliest. The information/ data including disturbance recorder, sequential event recorder outputs etc. containing the sequence of tripping and restoration shall be sent to SLDC for the purpose of analysis.
 - 6.1.6 All generating units, which are synchronized with the GRID, irrespective of their ownership, type and size, shall have their governors in normal operation at all times. If any generating unit of over fifty (50) MW size is required to be operated without its governor in normal operation, the WRLDC through SLDC shall be immediately advised about the reason and duration of such operation. The exemption from free governor mode operation in respect of run of river hydro stations without any pondage, steam turbine of thermal and gas based power stations not having free governor mode facility shall be sought from CERC under clause 1.6 of IEGC. Such petitions for exemption shall be preceded by a study preferably by CEA.
 - 6.1.7 Facilities available with/in Load Limiters, Automatic Turbine Run-up System (ATRS), Turbine Supervisory Coordinated Control system etc. shall not be used to bypass the normal governor action in any manner. No dead bands and time delays shall be deliberately introduced.
 - 6.1.8 All Generating Units, operating at/up to 100% of their Maximum Continuous Rating (MCR) shall normally be capable of (and shall not in any way be prevented from) instantaneously picking up five per cent (5%) extra load for at least five (5) minutes or within technical limits prescribed by the manufacturer when frequency falls due to a system contingency. The generating units operating at above 100% of their MCR shall be capable of (and shall not be prevented from) going at least up to 105% of their MCR when frequency falls suddenly. Any generating unit of over fifty (50) MW size not complying with the above requirement shall be kept in operation (synchronised with the Regional grid) only after obtaining the permission of WRLDC through SLDC. However, the constituent can make up the corresponding short fall in spinning reserve by maintaining an extra spinning reserve on the other generating units of the constituent. Any generating unit not capable to complying with above provision either due to not having requisite facilities or otherwise shall be sought exemption from CERC under clause 1.6 of IEGC.
 - 6.1.9 In case frequency falls below 49.5 Hz, all partly loaded Generating Units shall pick up additional load at a faster rate, according to their capability. SLDC in consultation with WREB/WRLDC and Discoms shall prepare a plan for automatic load relief during the low frequency conditions. In case frequency rises to 50.5 Hz or higher, neither any generating unit shall be synchronized with the Grid nor shall generation at any generating station (irrespective of type of ownership) be increased without obtaining approval from SLDC.
 - 6.1.10 Except under an emergency, or to prevent an imminent damage to costly equipment, no User shall suddenly decrease/increase its generation without prior intimation to the SLDC. Similarly, no User shall cause a sudden decrease/increase in its load due to imposition/lifting of power cuts etc., without prior intimation to and consent of the SLDC, particularly when frequency is deteriorating.
 - 6.1.11 All Generating Units shall normally have their Automatic Voltage Regulators (AVRs) in operation, with appropriate settings. In particular, if a Generating Unit of over one hundred and twenty five (125) MW capacity is required to be operated without its AVR in service, the SLDC shall be immediately intimated about the reason and duration, and its concurrence obtained.

- 6.1.12 Each Generating Unit must be fitted with a turbine speed governor having an overall droop characteristic within the range of 3% to 6%, which shall always be in service.
- 6.1.13 SSGS shall follow the instructions of SLDC for backing down/boxing up (ramping-up) and shutting down the generating unit(s). SLDC shall provide the certificate for the period of the backing down/boxing up or shutting down for the purpose of computing the deemed generation, if required.
- 6.1.14 Provision of protections and relay settings shall be coordinated in the State Transmission System, as per a plan to be separately finalised by the Protection Co-ordination Committee.
- 6.1.15 Various steps shall be taken for frequency management (refer section 9.3) and voltage management (refer section 9.5) so as to ensure system security from these considerations.
- 6.1.16 All Generating Units with capacity of 200MW and above, sub-stations with operating voltage of 400kV & above and important 220kV sub-stations with 220/132kV transformation capacity above 250MVA shall be provided with the facilities of Disturbance Recorders (DRs) and Event Loggers (ELs). STU shall submit time-bound plan to install DRs wherever it is required as per this Code.

PART III

LOAD DESPATCH & SYSTEM OPERATION CODE

SECTION 7 OPERATIONAL PLANNING

7.1 Introduction

This section describes the process by which the SLDC carries out the operational planning and demand control procedures to permit reduction in Demand for any reason.

7.2 Objective

The detailed provision is required to enable SLDC to achieve a reduction in demand to avoid Operating problems on all or part of the State Transmission System. SLDC will utilise Demand Control in a manner, which does not unduly discriminate against any one or group of customers.

7.3 Demand Estimation

- 7.3.1 The long-term demand estimation/ load forecast (for more than 1 year) shall be done by the planning department of STU in accordance with the provisions of SECTION 4. SLDC shall be provided with a copy of the same as and when it is finalised. Demand Estimation for period up to 1 year ahead shall be done by SLDC.
- 7.3.2 Discoms shall provide to the SLDC their estimates of demand for the year ahead on month-basis at each inter connection point for the next financial year by 15th November each year. Discoms shall also provide daily demand on month ahead at each inter connection point by 25th for the next month.
- 7.3.3 Discoms shall provide to SLDC estimates of load that may be shed when required, in discrete blocks with the details of arrangements of such load shedding.
- 7.3.4 Discoms shall also furnish realistic category-wise demand for their respective companies along with details of essential loads, supply hours to be maintained in rural areas, details of power cuts imposed or to be imposed and specific requirements, if any.
- 7.3.5 The demand estimation shall cover active power as well as reactive power requirements forecasted for each substation.
- 7.3.6 The SLDC would update the demand forecast (in MW as well as MWh) on quarterly, monthly, weekly and ultimately on daily basis, which would be used in the day-ahead scheduling. Attention shall also be paid by SLDC in demand forecasting for special days such as important festivals and National Holidays having different crests and troughs in the daily load-curve as compared to normal weather conditions & days.
- 7.3.7 STU and SLDC would maintain a historical database for the purpose of Demand Estimation and shall be equipped with the state-of-the-art tools such as Energy Management System (EMS) for demand forecasting.
- 7.3.8 SLDC shall furnish data for and participate in deliberations of data for load generation balance or Annual Demand, availability and shunt capacitors requirement studies of WREB. It shall take into consideration their reports for demand estimation.

7.4 Demand Control

- 7.4.1 Primarily the need for demand control would arise on account of the following conditions:
 - Variations in demand from the estimated or forecasted values, which cannot be absorbed by the grid, and
 - Unforeseen generation / transmission outages resulting in reduced power availability, and
 - Heavy reactive power demand causing low voltages, and

- 7.4.2 SLDC shall match the consolidated demands of the Discoms with consolidated generation availability from SSGS, ISGS, IPP/CPP and other sources and exercise the Demand Control to ensure that there is a balance between the energy availability and the Discoms demand plus losses plus the required reserve.
- 7.4.3 SLDC would maintain a historical database for the purpose of Demand Estimation and shall be equipped with the state-of-the-art tools such as Energy Management System (EMS) for short-term demand estimation to plan in advance, as to how the load would be met without overdrawing from the grid.
- 7.4.4 SLDC shall advise STU for planning of Automatic load shedding schemes and rotational load shedding through installation of Under Frequency Relays.
- The guidelines for under frequency load shedding shall be prepared, in accordance with the instructions from WRLDC/WREB, by the Operation and Co-ordination Committee and shall be approved by the Grid Code Review Committee.
- 7.4.5 The particulars of feeders or group of feeders at a STU sub-station which shall be tripped under under-frequency load shedding scheme whether manually or automatic on rotational basis or otherwise shall be placed on Notice board and will also available at the sub-station for information of the consumer(s).
- 7.4.6 Demand control can also be exercised by the SLDC through direct circuit breaker tripping affected from SLDC using RTUs and under frequency detection by SLDC SCADA or through telephonic instructions. No demand shed by operation of under frequency relays shall be restored without specific directions from SLDC.
- 7.4.7 Rotational Load Shedding Schemes using Under Frequency Relay (UFR) shall be prepared time to time by the Utility in accordance with the guidelines/instructions issued by WRLDC/WREB. The STU shall inform such decisions to MPERC with in seven days from the issue of instructions by WRLDC/WREB.

7.5 Load Crash

- 7.5.1 In the event of load crash in the system due to weather disturbance or any other reasons, the situation would be controlled by the SLDC by the following methods.:
- (i) Backing down of hydel stations for short period immediately
 - (ii) Lifting of the load restrictions, if any
 - (iii) Exporting the power to neighbouring regions
 - (iv) Backing down of thermal stations with a time lag of 5-10 minutes for short period
 - (v) Closing down of hydel units (subject to non spilling of water and effect on irrigation)
- The above methodology shall be reviewed from time to time in Operation and Co-ordination Committee.
- 7.5.2 While implementing the above, the system security aspects should not be violated as per provisions in section 6.2 of IEGC and the Grid Code. Further, in case of hydro generation linked with irrigation requirements, the actual backing down or closing down of such hydro units shall be subject to limitations on such account & to avoid spillage of water.

SECTION 8 SCHEDULE AND DESPATCH

8.1 Introduction

This section specifies the procedure to be adopted for the scheduling and despatch of SSGS to meet demand and Drawal allocation requirements of Discoms.

8.2 Objective

The objective of this section is to detail the actions and responsibilities of SLDC in preparing and issuing a daily schedule of generation and the responsibilities of Users to supply the necessary data and to comply with that schedule.

8.3 General

8.3.1 The following specific points would be taken into consideration while preparing and finalising the schedules:

- (a) SLDC will issue despatch instruction required to regulate all generation and imports from IPPs / CPPs according to the hourly day ahead generation schedule, unless rescheduling is required due to unforeseen circumstances.
- (b) In absence of any despatch instruction by SLDC, SSGS shall generate/ export according to the day- ahead generation schedule.
- (c) However the SLDC shall regulate the overall state generation in such a manner that generation from following types of power stations where energy potential, if unutilized, goes as a waste shall not be curtailed:
 - Run of river or canal based hydro stations.
 - Hydro-station where water level is at peak reservoir level or expected to touch peak reservoir level (as per inflows).
 - Wind power stations.
 - Solar power stations (Other than hybrid).
 - Hybrid solar power stations with minimum generation from conventional fuel required to utilize available solar power.
 - Nuclear power stations (to avoid poisoning of fuel).

8.3.2 Despatch instructions shall be in standard format. These instructions will recognize declared availability and other parameters that have been made available by the SSGS to SLDC. These instructions shall include time, Power Station, Generating Units, (Total export in case of CPP), name of operators Sending and receiving the same.

8.3.3 Standard despatch instructions may include:

- ◆ To switch a SSGS into or out of Service.
- ◆ Details of reserve to be carried on a unit.
- ◆ To increase or decrease MVAR generation to assist with voltage profile as per unit capability at that time
- ◆ To begin pre-planned Black Start procedures.
- ◆ To hold spinning reserve.
- ◆ To hold Generating Units of SSGS on standby.
- ◆ To control MW/MVAR Drawl by Distribution Companies.

8.4 Generation Scheduling

8.4.1 All SSGS shall provide the hourly MW/MVAR availability (00.00-24.00 hours) of all Generating Units to SLDC on the day ahead basis by 10.00 hours.

8.4.2 CPPs shall provide the hourly import/ figures also on the day ahead basis by 10.00 hours.

8.4.3 In working out the MW/MVAR availability, Hydro Power Stations shall take into account their respective levels and any other restrictions and shall report the same to SLDC.

- 8.4.4 SLDC shall obtain from WRLDC the hourly MW entitlement of ISGS, on a day ahead basis. SLDC shall produce a day ahead 15-minute Generation schedule after consolidation of data provided by SSGS and WRLDC. In preparation of the schedule, SLDC shall take into account the Discom wise drawal schedules.
- 8.4.5 SLDC shall intimate the generation schedule/import schedule for the following day to all Generators/CPPs (including any Generating Units not required to run) by 18.00 hours.
- 8.4.6 SSGS shall promptly report to SLDC, changes of Generating Units availability or capability, or any unexpected situation, which could affect its operation.
- 8.4.7 SLDC shall prepare the day ahead generation schedule keeping in view the followings:
- (i) Transmission System constraints from time to time.
 - (ii) Hourly load requirements as estimated by SLDC.
 - (iii) The need to provide operating margins and reserves required to be maintained.
 - (iv) The availability of generation from SSG and, Central Sector Generators together with any constraint in each case.

8.5 Revision in drawal schedule on real time basis

During the day of operation, the drawal schedule may be revised by SLDC in case of forced outage of a unit of any ISGS or SSGS.

8.6 Drawal Scheduling

SLDC is responsible for collection, examination and compilation of Drawal Schedule for each Discom in prescribed manner and at the prescribed time. Each Discom shall supply to SLDC Hourly averaged demand estimates in MW & MVAR at each Connection point for the day ahead.

8.7 Generation Despatch

SSGS shall comply promptly with a despatch instruction issued by SLDC unless this action would compromise the safety of plant or personnel. SSGS shall promptly inform SLDC in the event of any unforeseen difficulties in carrying out an instruction.

Dispatch instructions shall be issued by E-Mail /Fax/ telephone, confirmed by exchange of name of operators sending and receiving the same and logging the same at each end. All such oral instructions shall be complied with forthwith and written confirmation shall be issued promptly by FAX, teleprinter or otherwise

8.8 Data Requirements

Users shall provide SLDC with data for this section as specified in the Data Registration section.

SECTION 9 FREQUENCY AND VOLTAGE MANAGEMENT

9.1 Introduction

This section describes the method by which all Users of the State Transmission System shall co-operate with SLDC and STU in contributing towards effective control of the system frequency and managing the EHV voltage of the State Transmission System.

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

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

State Transmission System voltage levels can be affected by Regional operation. The STU/SLDC shall optimize voltage management by adjusting transformer taps (On Line Tap Changers) to the extent available and switching of circuits/ capacitors/ reactors and other operational steps. SLDC will instruct SSGS to regulate MVAR generation within their declared parameters. SLDC shall also instruct Discoms to regulate demand, if necessary.

9.2 Objective

The objectives of this section are as follows:

- ◆ To define the responsibilities of all Users in contributing to frequency and voltage management.
- ◆ To define the actions required to enable SLDC and STU to maintain State Transmission System voltages and frequency within acceptable levels in accordance with IEGC guidelines, and Planning and Security Standards for State Transmission System.

9.3 Frequency Management

- 9.3.1 The rated frequency of the system shall be 50 Hz and shall normally be regulated within the limits prescribed in IEGC Clause 4.6(b) as also specified in Connection Conditions. STU & SLDC as constituent of Western Region shall make all possible efforts to ensure that grid frequency remain within 49.0 – 50.5 Hz band.

Falling frequency:

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

Rising Frequency:

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

9.4 Responsibilities

- 9.4.1 SLDC shall monitor actual Drawal against scheduled Drawal and regulate internal generation/demand to maintain this schedule. SLDC shall also monitor reactive power drawal and availability of capacitor banks.
- 9.4.2 Generating Stations within MP shall follow the despatch instructions issued by SLDC.
- 9.4.3 Discoms and Open access users shall co-operate with SLDC in managing load & reactive power drawal on instruction from SLDC as required.

9.5 Voltage Management

- 9.5.1 Users using the State Transmission System shall make all possible efforts to ensure that the grid voltage always remains within the limits specified in IEGC at clause 6.2(q) and produced below:

Voltage (kV rms)		
Nominal	Maximum	Minimum
400	420	360
220	245	200
132	145	120

9.5.2 STU and/or SLDC shall carry out load flow studies based on operational data from time to time to predict where voltage problems may be encountered and to identify appropriate measures to ensure that voltages remain within the defined limits. On the basis of these studies, SLDC shall instruct SSGS to maintain specified voltage level at interconnecting points. SLDC and STU shall co-ordinate with the Discoms to determine voltage level at the interconnection points.

SLDC shall continuously monitor 400/220/132kV voltage levels at strategic sub-stations.

9.5.3 SLDC shall take appropriate measures to control State Transmission System voltages, which may include but not be limited to transformer tap changing, capacitor / reactor switching including capacitor switching by Discoms at 33kV substations, operation of Hydro unit as synchronous condenser and use of MVAR reserves with SSGS within technical limits agreed to between STU and Generators. Generators shall inform SLDC of their reactive reserve capability promptly on request.

9.5.4 MPPGCL and IPPs shall make available to SLDC the up to date capability curves for all Generating Units, as detailed in SECTION 5, indicating any restrictions, to allow accurate system studies and effective operation of the State Transmission System. CPPs shall similarly furnish the net reactive capability that will be available for Export to / Import from State Transmission System.

9.5.5 Discoms and Open access users shall participate in voltage management by providing Local VAR compensation (as far as possible in low voltage system close to load points) such that they do not depend upon EHV grid for reactive support.

9.6 General

Close co-ordination between Users and SLDC and STU shall exist at all times for the purposes of effective frequency and voltage management.

SECTION 10 MONITORING OF GENERATION AND DRAWAL

10.1 Introduction

The monitoring by SLDC of SSGS output and active and reactive reserve capacity is important to evaluate the performance of generation plants.

The monitoring of scheduled Drawal is important to ensure that STU and Discoms contributes towards improving system performance, and observes Grid discipline.

10.2 Objective

The objective of this section is to define the responsibilities of all SSGS in the monitoring of Generating Unit reliability and performance, and STU's/ Discoms' compliance with the scheduled Drawal to assist SLDC in managing voltage and frequency.

10.3 Monitoring Procedure

10.3.1 For effective operation of the State Transmission System, it is important that a SSGS declared availability is realistic and that any departures are continually invariably fed back to the Generator to help effect improvement.

10.3.2 The SLDC shall continuously monitor Generating Unit outputs and Bus voltages. More stringent monitoring may be performed at any time when there is reason to believe that a SSGS declared availability may not match the actual availability or declared output does not match the actual output.

10.3.3 SLDC can ask for putting a generating station to demonstrate the declared availability by instructing the generating station to come up to the declared availability within time specified by generators.

- 10.3.4 SLDC shall inform a SSGS, in writing, if the continual monitoring demonstrates an apparent persistent or material mismatch between the despatch instructions and the Generating Unit output or breach of the Connection Conditions. Continued discrepancies shall be resolved by the Grid Code Review Committee with a view to either improve performance in future, providing more realistic declarations or initiate appropriate actions for any breach of Connectivity Conditions.
- 10.3.5 SSGS (excluding CPPs) shall provide to SLDC hourly generation summation outputs where no automatically transmitted metering or SCADA/RTU equipment exists. CPPs shall provide to SLDC hourly export / import MW and MVar.
- 10.3.6 The SSGS shall provide any other logged readings that SLDC may reasonably require, for monitoring purposes where SCADA data is not available.

10.4 Generating Unit Trippings

- 10.4.1 SSGS (excluding CPPs) shall promptly inform the tripping of a Generating Unit, with reasons, to SLDC in accordance with the operational Event/Accident Reporting section. SLDC shall keep a written log of all such tripping, including the reasons with a view to demonstrating the effect on system performance and identifying the need for remedial measures.
- 10.4.2 SSGS (excluding CPPs) shall submit a more detailed report of Generating Unit tripping to SLDC monthly.

10.5 Monitoring of Drawal

- 10.5.1 SLDC shall continuously monitor actual MW Drawal by Discoms against that scheduled by use of SCADA equipment where available, or otherwise using available metering. STU shall request WRLDC and adjacent States as appropriate to provide any additional data required to enable this monitoring to be carried out.
- 10.5.2 SLDC shall continuously monitor the actual MVar Drawal to the extent possible. This will be used to assist in State Transmission System voltage management.

10.6 Data Requirement

- 10.6.1 SSGS shall submit data to SLDC as listed in Data Registration section, termed as Monitoring of Generation.

SECTION 11 OUTAGE PLANNING

11.1 Introduction

This section describes the process by which STU carries out the planning of State Transmission System Outages, including interface co-ordination with Users.

11.2 Objective

The objective of this section is to define the process, which will allow STU to optimise transmission Outages with SSGS (other than CPP) and Discoms' Outages while maintaining system security to the extent possible.

11.3 Outage Planning Process

Each User shall provide their outage programme for ensuing financial year to the SLDC for preparing an overall outage plan for State Transmission System as a whole. SLDC shall be responsible for analyzing the outage schedules of the SSGS, Discoms and STU schedule for outage of Transmission network and preparing a draft annual outage Plan for State Transmission System in coordination with the Outage Plan prepared for the region by the WREB.

However, SLDC is authorised to defer the planned outage in case of any of the following events:

- (a) Major grid disturbance

- (b) System Isolation
- (c) Black out in the State
- (d) Any other event in the system that may have an adverse impact on system security by the proposed outage

Each User shall obtain approval of SLDC, prior to availing the Outage. SLDC while releasing the any circuit for outage shall issue specific code. Similarly, no inter user boundary circuits shall be connected back to the State Transmission System the code without specific code/approval by SLDC.

This restriction shall however not be applicable to individual Generating Unit(s) of a CPP.

11.4 Annual Outage Planning

- 11.4.1 Scheduled outage of power stations of capacity 25 MW & above as notified by SLDC from time to time, will be subject to annual planning.
- 11.4.2 Provided that scheduled outage of power station of 50 MW and above and EHV lines as notified by WRLDC, will also be subject to annual planning by WRLDC in co-ordination with SLDC.
- 11.4.3 SSGS and CPP connected to State Grid shall furnish their proposed Outage programme for the next financial year in writing by 15th November of each year.
- 11.4.4 SSGS Outage programme shall contain details like identification of unit, reason for outage, generation availability affected due to such outage, outage start date and duration of outage. SLDC will review the outage programme received from SSGS on monthly basis to chalk out the outage of state transmission system.
- 11.4.5 SLDC shall also obtain from STU, the proposed outage programme for Transmission lines, equipments and sub-stations etc. for next financial year by 15th November each year. STU outage programmes shall contain identification of lines/ substations, reason for outage, outage start date and duration of outage.
- 11.4.6 Scheduled outage of power stations and EHV transmission lines shall be affected only with the approval of WRLDC in co-ordination with SLDC.

Scheduled outage of power stations of capacity 5 MW and above, of all EHV lines and HV lines (i.e. 33kV and 11kV lines) forming interconnection between two EHV substations (and these notified as such by SLDC) shall be approved by Sub-LDC/SLDC, 24 hours in advance based on prevalent operating conditions.
- 11.4.7 In respect of scheduled outage referred in subsection a calendar shall be formulated in respect of annual outage planning for the ensuing financial year. The STU, SSGS and the Discoms in the Operation and Co-ordination Committee (OCC) shall mutually decide this. However, power stations & EHV lines specified in sub-clause shall be decided by OCC of WRLDC.

11.5 Availing of shutdowns schedule

- 11.5.1 SLDC would review on daily basis the outage schedule for the next two days and in case of any contingency or conditions described in section 6.7.4(g) of the IEGC, defer any planned outage as deemed fit clearly stating the reasons thereof. The revised dates in such cases would be finalized in consultation with the User.
- 11.5.2 The shutdowns for scheduled outage shall be taken in accordance with the provisions of SECTION 13 of Grid Code to ensure inter-user coordination.

SECTION 12 CONTINGENCY PLANNING

12.1 Introduction

This section describes the steps in the recovery process to be followed by all Users in the event of State Transmission System or Regional System total or partial blackouts.

12.2 Objective

The objective of this section is to define the responsibilities of all Users to achieve the fastest recovery in the event of a State Transmission System or Regional System blackout, taking into account essential loads, Generator capabilities and system constraints.

12.3 Contingency Planning Procedure

SLDC shall be prepared to face and efficiently handle the following two types of contingencies:

- (a) Partial system black out in the state due to multiple tripping of the transmission lines emanating from power stations/sub-station
- (b) Total black out in the state/region

In case of partial black out in the system/state, priority is to be given for early restoration of power station units, which are tripped. Start up power for the power station shall be extended through shortest possible line and within shortest possible time from adjoining sub-station/power station where the supply is available. Synchronising facility at all power stations and 400/220kV sub-station shall be available.

In case of total regional black out, SLDC In-charge shall co-ordinate and follow the instructions of WRLDC for early restoration of the entire grid. After total collapse, for each power station, to avoid damage to the turbine, survival power is required. To meet the survival power, the diesel generating (DG) sets of sufficient capacity shall be available at each power station. Start-up power to the thermal station shall be given by the hydel stations and interstate supply, if available. All possible efforts are made to extend the hydel supply to the thermal power stations through shortest transmission network so as to avoid high voltage problem due to low load condition. For safe and fast restoration of supply, STU shall formulate the proper sequence of operation for major generating units, lines, transformers and load within the state in consultations with WREB. The sequence of operation shall include closing/tripping of circuit breakers, isolators, on-load tap-changers etc. In emergency situations the licensee may approach to a near by captive power plant to get the start up power. The STU shall formulate the proper sequence of operations in this regard.

12.4 Restoration Procedure

The procedure for restoration of State Transmission System shall be prepared by the SLDC for the following contingency and shall be in conformity to the System Restoration Procedure of the Western Region prescribed under IEGC.

- (a) Total system black out
- (b) Partial System Blackout
- (c) Synchronisation of System Islands and System Split

The restoration process shall take into accounts the generator capabilities and the operational constraints of Regional and State Transmission System with the object of achieving normalcy in the shortest possible time. All Users are aware of the steps to be taken during major Grid Disturbance and system restoration process.

12.5 Special Considerations

During restoration process following State Transmission System or Regional system blackout conditions, normal standards of voltage and frequency shall not apply.

Distribution companies with essential loads will separately identify non-essential components of such loads, which may be kept off during system contingencies. Distribution Companies shall draw up an appropriate schedule with corresponding load blocks in each case. The non-essential loads can be put on only when system normally is restored, as advised by SLDC.

All Users shall pay special attention in carrying out the procedures so that secondary collapse due to undue haste or inappropriate loading is avoided.

Despite the urgency of the situation, careful prompt and complete logging of all operations and operational messages shall be ensured by all Users to facilitate subsequent investigation into the incident and the efficiency of the restoration process. Such investigation shall be conducted promptly after the incident.

SECTION 13 INTER USER BOUNDARY SAFETY

13.1 Introduction

This section sets down the requirements for maintaining safe working practices associated with inter user boundary operations. It lays down the procedure to be followed when work is required to be carried out on electrical equipment that is connected to another User's system.

13.2 Objective

The objective of this section is to achieve agreement and consistency on the principles of safety as prescribed in the Indian Electricity Rules when working across a inter user boundary between one User and another User.

13.3 Designated Officers

STU and all Users shall nominate suitably authorized persons to be responsible for the co-ordination of safety across that company boundary. These persons shall be referred to as Designated Officer.

13.4 Procedure

STU shall issue a list of Designated Officer (names, designations and telephone numbers) to all Users who have a direct inter user boundary with STU. This list shall be updated promptly whenever there is change of name, designation or telephone number.

All Users with a direct inter user boundary with STU or other user system shall issue a similar list of their Designated Officer to STU or other user, which shall be updated promptly whenever there is a change to the Designated Officer list.

Whenever work across an inter-user boundary between STU and any other User or between two users is to be carried out, the Designated Officer, of the User (which may be STU), wishing to carry out work shall personally contact the other relevant Designated Officer. If the Permit to Work (PTW) cannot be obtained personally, the designated officers shall contact through telephone and exchange Code words to ensure correct identification of both parties.

Should the work extend over more than one shift the Designated Officer shall ensure that the relief Designated Officer is fully briefed on the nature of the work and the code words in operation.

The Designated Officers shall co-operate to establish and maintain the precautions necessary for the required work to be carried out in a safe manner. Both the established isolation and the established earth shall be locked in position, where such facilities exist, and shall be clearly identified.

Work shall not commence until the Designated Officer, of the User (who may be STU), wishing to carry out the work, is satisfied that all the safety precautions have been established. This Designated Officer shall issue agreed safety documentation (PTW) to the working party to allow work to commence. The PTW in respect of specified EHV lines and other interconnections shall be issued with the consent of SLDC.

When work is completed and safety precautions are no longer required, the Designated Officer who has been responsible for the work being carried out shall make direct contact with the other Designated Officer to return the PTW and removal of those safety precautions. Return of PTW in respect of specified EHV lines and interconnections shall be informed to SLDC.

The equipment shall only be considered as suitable for return to service when all safety precautions are confirmed as removed, by direct communication using code word contact between the two Designated Officers, and return of agreed safety documentation from the working party has taken place.

STU shall develop an agreed written procedure for inter user boundary safety and continually update it.

Any dispute concerning Inter user Boundary Safety shall be resolved at an appropriate higher level of authority.

13.5 Special Consideration

For inter user boundary between STU and other Users circuits, all Users shall comply with the agreed safety rules, which must be in accordance with IE Rules.

All equipment on inter user boundary between STU and other Users circuits which may be used for the purpose of safety co-ordination and establishment of isolation and earthing, shall be permanently and clearly marked with an identification number or name, that number or name being unique in that sub-station. This equipment shall be regularly inspected and maintained in accordance with manufacturer's specification.

Each Designated Officer shall maintain a legibly written safety log, in chronological order, of all operations and messages relating to safety co-ordination sent and received by them. All safety logs shall be retained for a period of not less than 5 years.

SECTION 14 OPERATIONAL EVENT/ACCIDENT REPORTING

14.1 Introduction

This section describes the reporting procedure, in writing of reportable events in the State Transmission System

14.2 Objective

The objective of this section is to define the incidents to be reported, the reporting route to be followed and the information to be supplied to ensure a consistent approach to the reporting of incidents and accidents on the State Transmission System.

14.3 Reportable Incidents

Any of the following events that could affect the State Transmission System requires reporting:

- (a) Exceptionally high / low system voltage or frequency.
- (b) Serious equipment problem i.e. major circuit breaker, transformer or bus bar.
- (c) Loss of major Generating Unit.
- (d) System split, State Transmission System breakaway or Black Start.
- (e) Tripping of Transmission Line, ICT (Inter connecting transformer and capacitor banks)
- (f) Major fire incidents.
- (g) Major failure of protection.
- (h) Equipment and transmission line overload.
- (i) Accidents-Fatal and Non-Fatal.
- (j) Load Crash / Loss of Load
- (k) Excessive Drawal deviations.
- (l) Minor equipment alarms.

The last two reportable incidents are typical examples of those which are of lesser consequence, but which still affect the State Transmission System and can be reasonably classed as minor. They will require corrective action but may not warrant management reporting until these are repeated for sufficient time.

14.4 Reporting Procedure

14.4.1 Reporting Time for events and accidents

- (a) All reportable incidents occurring in lines and equipment of 33kV and above affecting the State Transmission System shall promptly be communicated by the User whose equipment has experienced the incident (The Reporting User) to any other significantly affected Users and to SLDC.
- (b) Within 1 (one) hour of being informed by the Reporting User, SLDC may ask for a written report on any incident.
- (c) If the reporting incident cannot be classed as minor then the Reporting User shall submit an initial written report within two hours of asking for a written report by SLDC. This has to be further followed up by the submission of a comprehensive report within 48 hours of the submission of the initial written report.
- (d) In other cases the Reporting User shall submit a report within 5 (five) working days to SLDC.

14.4.2 SLDC may call for a report from any User on any reportable incident affecting other Users and STU, in case the same is not reported by such User whose equipment might have been source of the reportable incident.

The above shall not relieve any User from the obligation to report events in accordance with IE Rules.

The format of such a report will be as agreed by the Grid Code Review Committee, but will typically contain the following information:

- (a) Location of incident.
- (b) Date and time of incident.
- (c) Plant or equipment involved.
- (d) Details of relay indications with nature of fault implications.
- (e) Supplies interrupted and duration if applicable.
- (f) Amount of generation lost if applicable.
- (g) Brief description of incident.
- (h) Estimate of time to return to service.
- (i) Name of originator.
- (j) Possibility of alternate arrangement of supply

14.5 Reporting Form

The standard reporting form other than for accidents shall be as agreed from time to time by the Grid Code Review Committee. A typical form is attached as an Appendix H.

14.6 Major Failure

Following a major failure, SLDC and other Users shall co-operate to inquire and establish the cause of such failure and produce appropriate recommendations. The SLDC shall report the major failure to Commission immediately for information and shall submit the enquiry report to the Commission within 2(two) months of the incident.

14.7 Accident Reporting

Reporting of accidents shall be in accordance with the Indian Electricity Rules, 1956, section 44-A. In both fatal and non-fatal accidents, the report shall be sent to the Electrical Inspector in the prescribed form.

PART IV
PROTECTION CODE

SECTION 15 PROTECTION

15.1 Introduction

In order to safeguard State Transmission System, Users' system from faults it is essential that certain minimum standards for protection be adopted. This section describes these minimum standards.

15.2 Objective

The objective of this section is to define the minimum protection requirements for any equipment connected to the State Transmission System and thereby minimise disruption due to faults.

15.3 General Principles

Protection standards are treated as interface issues because of the possible severe inter-user boundary repercussions of faults that occur in the system of any entity. Minimum protection requirements are prescribed in this section because inadequate protection or mal-operation of protection system of any entity may result in far reaching consequences, disturbances and even damages in the systems of other entities.

No item of electrical equipment shall be allowed to remain connected to the State Transmission System unless it is covered by minimum specified protection aimed at reliability, selectivity, speed and sensitivity.

All Users shall co-operate to ensure correct and appropriate settings of protection to achieve effective, discriminatory removal of faulty equipment within the time for target clearance specified in this section.

Protection settings shall not be altered, or protection bypassed and/or disconnected without consultation and agreement of all affected Users. In the case where protection is bypassed and/or disconnected, by agreement, then the cause must be rectified and the protection restored to normal condition as quickly as possible. If agreement has not been reached, the electrical equipment will be removed from service forthwith.

15.3.1 WRLDC shall advice STU regarding:

- (i) Planning for upgrading and strengthening protection system based on analysis of grid disturbance and partial/total blackout in State Transmission System.
- (ii) Planning of Islanding and system split schemes and installation of Under Frequency Relays and df/dt relays.
- (iii) Under-Frequency relay for load shedding, Relays provided for islanding scheme, disturbance recorder and fault locator installed at various sub-stations shall be tested and calibrated. The Protection Practices and Protocol Manual shall have provision for the same.

15.4 Protection Co-ordination

A Protection Coordination Committee (PCC) shall be constituted as per section 3.7.2(i) of the Grid Code and shall be responsible for all the protection coordination functions defined under the same section. STU shall be responsible for arranging periodical meetings of the Protection Coordination Committee. STU shall investigate any malfunction of protection or other unsatisfactory protection issues. Users shall take prompt action to correct any protection malfunction or issue as discussed and agreed to in these periodical meetings

15.5 Fault Clearance Times & Short-time Ratings

From a stability consideration, the minimum short circuit current rating and time and the maximum fault clearance times for faults on any User's system directly connected to the State Transmission System, or any faults on the State Transmission System itself, are as follows:

Nominal Voltage	Minimum Short Circuit current rating and duration of Switchgear		Target Fault clearance Time
kV	kA (rms)	Seconds	msec.
400kV	40	1	100
220kV	31/40	1	160
132kV	25/31	3	160

Slower fault clearance times for faults on a Users system may be agreed to but only if, in STU's opinion, system conditions allow this. STU shall specify the required opening time and rupturing capacity of the circuit breakers at various locations for STU and Discoms/ Open access users directly connected to Transmission System. At generating stations, line faults should be cleared at the generation station end, within the critical clearing time, for the generators to remain in synchronism.

15.6 Generator Requirements

The guidelines mentioned in the "Manual on protection of Generators, Generator Transformers, and 220 kV and 400 kV networks" vide publication no 274 of CBIP shall be kept in view.

All Generating Units and all associated electrical equipment of the Generating Units connected to the State Transmission System shall be protected by adequate protection so that the State Transmission System does not suffer due to any disturbances originating from the Generation unit. The generator protection schemes shall cover at least Differential protection, back up protection, Stator Earth fault protection, field ground/field failure protection (not applicable to brush-less excitation system), negative sequence protection, under frequency, over flux protection, back-up impedance protection and pole slipping protection (applicable to units above 200MW), loss of field protection, reverse power protection etc.

15.7 Transmission Line Requirements

15.7.1 General

Every EHV line taking off from a Power Station or a sub-station shall have protection and back up protection as mentioned below. STU shall notify Users of any changes in its policy on protection from time to time.

For short transmission lines, alternative appropriate protection schemes may be adopted.

Relay Panels for the protection of lines of STU taking off from a Power Station, shall be owned and maintained by Generator. Any transmission line related relay settings or any change in relay settings will be carried out by the Generator in close co-ordination and consultation and with STU approval. All such issues shall be put up in the next Protection Coordination Committee for ratification. Carrier cabinets / equipment, Line matching units including wave traps and communication cable shall be owned and maintained by STU. All Generators shall provide space, Connection facility, and access to STU for such purpose.

15.7.2 400kV Transmission Lines

All 400kV transmission lines owned by STU shall have two fast acting protection schemes, the voltage of the two relays shall be fed from two different cores of the line CVT and the currents of the two relays shall be fed from two different cores of the line CTs.

Main 1 protection scheme shall be numerical, three zone, non-switched fast acting distance protection scheme with permissible inter-trip at remote end (in case of zone-2 fault)

Main 2 protection scheme shall be either similar type of numerical, three zone, non-switched fast acting distance protection scheme with permissible inter-trip at remote end (in case of zone-2 fault) OR a unit protection scheme employing transient wave detection, directional comparison or phase comparison carrier relaying scheme.

One pole tripping and single shot auto-reclosing with adjustable dead-time shall be provided.

15.7.3 400kV Bus-bars

All 400kV sub-station shall have bus bus-bar differential protection scheme along with LBB and auto-reclosures for transmission lines.

15.7.4 220kV Transmission Lines

All 220kV transmission lines owned by STU shall have single, numerical, three zone, non-switched fast acting distance protection scheme, preferably with permissible inter-trip feature at remote end (in case of zone-2 fault), single pole tripping and single-shot single pole auto-reclosing with adjustable dead-time shall be provided.

For back-up protection, three directional IDMTL over current relays and one directional earth fault relay shall be provided.

For short transmission lines, appropriate alternative protection schemes may be adopted.

15.7.5 220kV Bus-bars

Identified important 220kV sub-station (e.g. having generation infeed, PGCIL interfacing sub-station etc.) shall have bus bus-bar differential protection scheme along with LBB and auto-reclosures for transmission lines.

15.7.6 132kV Lines

A single three zone, switched/non-switched static distance protection scheme shall be provided as main protection. The backup protection shall be at least two directional IDMTL over current relays and one directional earth fault relay.

For short transmission line, appropriate alternative protection schemes may be adopted.

15.8 Transformer Requirements

15.8.1 The protection of Auto Transformers, Power Transformers and Distribution Transformers shall be as per revised manual on transformers published by Central Board of Irrigation and Power (CBIP) Publication No. 275.

15.8.2 All windings of Auto Transformers and power transformer of EHT class shall be protected by differential relays having percent bias and harmonic restraint features.

15.8.3 Over-fluxing relays shall be provided for EHT transformers.

15.8.4 All 400kV class transformers shall have Restricted Earth Fault (REF) protection for winding.

15.8.5 In addition, there shall be back up IDMTL over current and earth fault protection.

15.8.6 For parallel operation, such back up protection shall have directional feature. For protection against heavy short circuits, the over current relays should incorporate a high set instantaneous element, wherever overall co-ordination permits the same. However, it should not rip due to inrush of the magnetising current and should not be set to such a high value, which is not beneficial to transformer.

15.8.7 In addition to electrical protection, gas operated relays, winding temperature protection and oil temperature protection shall be provided.

15.8.8 It is recommended that the following minimum protections should be provided for transformers:

- (a) All 400kV class power transformers shall be provided with differential, REF, open delta (Neutral Displacement Relay) and over-fluxing relays. In addition, there shall be back up IDMTL over current and earth fault protection. For parallel operation, such back up protection shall have inter-tripping of both HT and LT breakers. For protection against

heavy short circuits, the over current relays should incorporate a high set instantaneous element. In addition to electrical protection, transformer own protection viz. buchholz, OLTC oil surge, gas operated relays, winding temperature protection, oil temperature protection, PRV relay shall be provided for alarm and trip functions. It is recommended to have Double PRV protection scheme for transformer tank.

- (b) All 220kV class power transformers shall have same protections as mentioned in Sections 15.8.8 (a) except REF protection.
- (c) For 132kV and 33kV class transformers of capacity 5 MVA and above, the protections shall be same as mentioned in Sections 15.8.8 (a) above except over-fluxing relays, REF and PRV.
- (d) For 33kV class power transformers less than or equal to 5 MVA provided on either Transmission or Distribution System, over-current with high set instantaneous element along with auxiliary relays for transformer trip and alarm functions as per transformer requirements, shall be provided.

15.9 Sub-Station Fire Protection

Adequate precautions shall be taken and protection shall be provided against fire hazards to all Apparatus of the Users conforming to relevant Indian Standard Specification and /or provisions in I.E. Rules.

15.10 Calibration & Testing

The protection scheme shall be tested at each 400kV, 220kV, 132kV, 66kV sub-station by STU once in a year or immediately after any major fault, which ever is earlier. Setting, co-ordination, testing and calibration of all protection schemes pertaining to generating units/stations shall be responsibility of MPPGCL. The overall co-ordination between MPPGCL and STU shall be decided in meeting of Protection Co-ordination Committee. The Protection Co-ordination Committee shall review the testing and calibration as and when needed.

15.11 Data Requirements

Users shall provide STU with data for this section as specified in the Data Registration section.

PART V

TRANSMISSION METERING CODE

SECTION 16: TRANSMISSION METERING

16.1 Introduction

- 16.1.1 The code prescribes a uniform policy in respect of electricity metering for State Transmission Utility (STU), Generating Companies, inter-utility metering and any metering for all Users of Transmission System including open access customers as per the Electricity Act 2003 using transmission system of State Transmission Utility and any new system interfacing with State Transmission Utility system in the state of Madhya Pradesh.
- 16.1.2 This code shall form a part of the Madhya Pradesh Electricity Grid Code (MPEGC) prepared under section 86 (1) (h) of Electricity Act 2003.

16.2 Objective

- 16.2.1 The objective of the code is to define minimum acceptable metering standards which will affect proper metering of the system parameters for the purpose of accounting, commercial billing and settlement of electrical energy and will also provide information which will help to optimize the system planning.

16.3 Scope

- 16.3.1 The scope of the code covers the practices that shall be employed and the facilities that shall be provided for the measurement and recording of various parameters like active/reactive/apparent power/energy, power factor, voltage, frequency etc.
- 16.3.2 The code sets out or refers to the requirements of metering at generating stations, sub-stations and interfaces for Tariff and Operational metering.
- 16.3.3 The code also specifies the requirement for calibration, testing and commissioning of metering equipments viz. energy meters with associated accessories, current transformers and voltage transformers. The code broadly indicates the technical features of various elements of the metering, data communication, testing and calibration system, the procedure for assessment of consumption in case of defective and stuck-up meters and also lays down guidelines for resolution of disputes between different agencies.
- 16.3.4 The date of commencement of this code shall be date of publication in Madhya Pradesh Gazette and accordingly the concerned licensees shall commence its implementation.

16.4 Reference Standards

- 16.4.1 The following Indian Standards (amended up to date) shall be applicable as relevant to meters and associated equipment

Sr.	Standard Number	Standard Title
	IS 13779	AC Static Watt-hour Meters for Class 1 & 2

i	IS 14697	AC Static Transformer Operated Watt-hour and VAr-hour Meters, Class 0.2S and 0.5S
	IS 2705	Indian Standard for Current Transformers
	IS 3156	Indian Standard for Voltage Transformers
	IS 9348	Indian Standard for Coupling Capacitors and Capacitor Divider
	IS 5547	Indian Standard for Capacitor Voltage Transformer
i.	CBIP Technical Report - 88	Specification for AC Static Electrical Energy Meters
ii.	CBIP Technical Report - 111	Specification for Common Meter Reading Instrument
iii.	IS 9000	Basic Environmental Testing Procedures for Electronic & Electrical items
iv.	IS 12063	Indian Standard for classification of degrees of protection.

16.4.2 The following International Standards (amended up to date) can be applicable as relevant to meters and associated equipment not complying to Indian Standards or not manufactured in India:

Sr.	Standard Number	Standard Title
i.	IEC 687	Specification for AC Static Watt-hour Meters for Active Energy (Classes 0.2S and 0.5S)
ii	IEC 1036	Alternating Current Static Watt-hour Meters for Active Energy (Classes 1 & 2)
ii	IEC 1268	Alternating Current Static Watt-hour Meters for Reactive Energy (Classes 2 & 3)

16.5 Definitions

All terms not defined herein but are referred in this Code shall be deemed to be as defined in the Madhya Pradesh Electricity Grid Code (MPEGC) or Indian Electricity Grid Code (IEGC).

16.5.1 Active Energy

Active Energy means the electrical energy produced, flowing or supplied by an electrical circuit during a time interval, and being the integral of the instantaneous power with respect to time, measured in units of watt hours or standard multiples thereof, which is:

$$1,000 \text{ Wh} = 1 \text{ kWh} = 1 \text{ Unit}$$

$$1,000 \text{ kWh} = 1 \text{ MWh}$$

$$1,000 \text{ MWh} = 1 \text{ GWh} = 1 \text{ MU (Million Units)}$$

16.5.2 Active Power

Active Power means the product of voltage and the in-phase component of alternating current measured in units of watts and standard multiples thereof, which is:

$$1,000 \text{ W} = 1 \text{ kW}$$

$$1,000 \text{ kW} = 1 \text{ MW}$$

$$1,000 \text{ MW} = 1 \text{ GW}$$

16.5.3 Apparent Energy

Apparent Energy means the integral of the Apparent Power with respect to time. It is measured in Volt Ampere hour and standard multiple thereof, which is:

$$1,000 \text{ VAh} = 1 \text{ kVAh}$$

$$1,000 \text{ kVAh} = 1 \text{ MVAh}$$

$$1,000 \text{ MVAh} = 1 \text{ GVAh}$$

16.5.4 Apparent Power

Apparent Power means the product of voltage and current measured in units of volt amperes and standard multiples thereof, which is:

$$1,000 \text{ VA} = 1 \text{ kVA}$$

$$1,000 \text{ kVA} = 1 \text{ MVA}$$

$$1,000 \text{ MVA} = 1 \text{ GVA}$$

16.5.5 Data Processing System (DPS)

Data Processing System means a Computer System meant for receiving data manually or downloaded through CMRI or retrieved through remote communication network, converts downloaded raw data into standard output format (e.g. ASCII, csv) and processes data for various calculations, analysis and display.

16.5.6 Centralized Data Collection Centre (CDCC)

The centre which is responsible to collect, collate and process the energy meter data for various applications like energy accounting and auditing, energy billing, transmission system loss calculations and power purchase bill reconciliation.

16.5.7 Common Meter Reading Instrument (CMRI or MRI)

CMRI means a common meter reading instrument with necessary accessories capable of downloading data/information from various makes of AC static energy meters when loaded with the corresponding meter specific downloading software(s) called meter reading instrument program(s).

The CMRI can extract information about energy data, load survey data, billing parameters, meter status, meter anomaly and tamper data from the memory of the meter and store for retrieval at a later stage.

16.5.8 Demand Integration Period

Demand Integration Period means the period over which active power, reactive power or apparent power are integrated to produce energy value for averaging. For settlement purpose, each Demand Integration Period shall be of 15 minutes duration, which shall commence from 00.00 hours. Demand computation shall be on sliding window principle with three updates.

16.5.9 Demand Values

(a) Demand value in terms of energy: Energy demand means active energy, reactive energy or apparent energy drawn during any demand period, one of which shall commence from 00.00 hours.

(b) Demand value in terms of power: Power demand means active power, reactive power or apparent power drawn during any demand period, one of which shall commence from 00.00 hours.

16.5.10 Distribution Licensee

Distribution Licensee means a Licensee authorised to operate and maintain a distribution system for supplying electricity to the consumers in his area of supply.

16.5.11 Generating Company

Generating Company means any company or body corporate or association or body of individuals, whether incorporated or not, or artificial juridical person, which owns or operates or maintains a generating station.

16.5.12 Instrument Transformers

Current Transformer (CT) or Voltage Transformer (VT). The term VT is used to cover either Electromagnetic Voltage Transformer (EVT) or Capacitive Voltage Transformer (CVT). EVT is also known as Potential Transformer (PT).

16.5.13 Load Survey Data

Load survey data is a database of load values defined in terms of Watt, VAr or VA (or multiples of thereof) during each predefined interval of time.

16.5.14 Meter

Meter means a device for measurement of bidirectional active energy, reactive energy, apparent energy, active power, reactive power, apparent power, currents, voltages, power factor, frequency and any other electrical parameter derived out of these measurements.

16.5.15 Main Meter and Check Meter

The primary meter used for billing purpose is named as Main Meter. The check meter is used as back-up to main meter for billing purpose, in case main meter fails or operates erroneously or shows error beyond permissible limits.

16.5.16 Metering Equipment

Metering equipment means set of energy meters, associated instrument transformers and cabling, local networking equipment for meters and associated wiring.

16.5.17 Metering Point

Actual metering point means the physical location of current and voltage sensing devices (i.e. CTs, VTs) and meters at which electricity is metered.

16.5.18 Operational Metering

Metering equipment and associated accessories (excluding any tariff metering) installed in the sub-station or generating station primarily for:

- (a) Operational and System Control purposes
- (b) Monitoring and Manual Recording purposes
- (c) Auditing and accounting of energy

16.5.19 Overall Accuracy

The combined accuracy of meter, associated instrument transformers and cabling for a given metering system.

16.5.20 Protocol

Protocol is the software implemented to exchange the information with external device or equipment through interfacing communication port.

16.5.21 Reactive Power

Reactive Power means the product of voltage and current and the sine of the phase angle between them measured in units of volt amperes reactive and standard multiples thereof, that is:

$$1,000 \text{ VAr} = 1 \text{ kVAr}$$

$$1,000 \text{ kVAr} = 1 \text{ MVar}$$

$$1,000 \text{ MVar} = 1 \text{ GVar}$$

16.5.22 Reactive Energy

Reactive Energy means the integral of the Reactive Power with respect to time. It is measured in volt amperes reactive hours and standard multiple thereof, that is:

$$1,000 \text{ VArh} = 1 \text{ kVArh}$$

$$1,000 \text{ kVArh} = 1 \text{ MVarh}$$

1,000 MVARh = 1 GVARh

16.5.23 (a) Simultaneous Maximum Demand (SMD): For a given demand period, sum of individual demand across all interface points in a Distribution System gives simultaneous demand of a Distribution Licensee for a given period. SMD means the maximum demand value out of all such simultaneous demands for a month (i.e. maximum demand value out of $4 \times 24 \times 30 = 2880$ periods in a month for demand interval of 15 minutes).

(b) Maximum demand means the 4 times maximum value of Average KVA delivered to consumers at the point of supply during any consecutive period of 15 minutes during the month computed on sliding window principal of measurement.

16.5.24 Tariff Metering or Commercial Metering

The energy measurement system comprising of metering equipments and associated data collection devices, based on which the energy supplying entity raises bills payable by the energy receiving entity or consumer.

16.5.25 TOD Tariff or TOU Tariff

TOD stands for Time Of Day and TOU stands for Time Of Use, which means different tariff during different usage time in a day.

16.6 Ownership

16.6.1 The ownership of the metering system shall belong to the agency in whose premises the metering equipment is physically located.

16.7 Right to Install Energy Meters

16.7.1 The Owner of the metering system (as defined in Clause 0) shall provide necessary metering equipment. As and when required by the user, the owner shall enable the representatives of the user with advance notice, to access, inspect, test etc. any of the metering equipment installed in the Owner's premises.

16.8 Facility to be Provided on Metering Locations

16.8.1 The Owner shall make available the required space and the required outputs of the specified current and voltage transformers to facilitate installation of Meters and associated equipment in their premises and shall carry out operation and maintenance of these equipments. Necessary auxiliary supply shall be extended up to the metering system, if meter can be powered by only external supply.

16.9 Minimum Technical Requirements for Energy Meter

16.9.1 Measuring Elements:

The meter shall be 3 phase 4 wire, full four quadrant type static Tri-vector Meter (TVM), which can be used for 3 phase 3 wire system or 2 phase 2 wire system (traction application) without affecting the metering accuracy and other essential parameters. Meter shall basically measure fundamental rms value of electricity and harmonics.

16.9.2 Operating System Parameters (for balanced and unbalanced load):

- (a) Operating Voltage Range: The meter shall work satisfactorily on 110 Volts AC (Line-Line) or 415 Volts AC (Line-Line) with variation range of -30% to +15%.
- (b) Operating Frequency Range: The meter shall work satisfactorily on 50 Hertz with variation range of -5% to +5%.
- (c) Operating Power Factor Range: The meter shall work satisfactorily over a power factor range of zero lag to unity to zero lead.

16.9.3 Rated Nominal Current and Rated Maximum Current:

Meter shall operate on 1 Ampere or 5 Ampere from CT secondary circuit. Rated maximum secondary current shall not exceed 120% of nominal current.

16.9.4 Rated Short time Current:

Meter shall be capable of withstanding 20 times the rated nominal current for 0.5 second.

16.9.5 Minimum Starting Current:

The meter shall start operating and recording energy with minimum starting current equal to 0.1% of nominal current at unity power factor.

16.9.6 Burden and Power Consumption:

The burden imposed by the metering system shall not exceed 1 W, 8 VA for voltage circuit and 1 VA for current circuit so that there is no significant voltage drop in the VT and CT leads.

16.9.7 Accuracy Class (Better than the mentioned accuracy class shall be acceptable):

	<i>Particular</i>	Main Meter	Check Meter	Sub-station Auxiliary Meter	Metering between Two Licensees
	2	3	4	6	7
i.	Tariff Meter	0.2S (for active energy) 0.5S (for reactive energy)	0.2S (for active energy) 0.5S (for reactive energy)	1.0 (for active energy) 2.0 (for reactive energy)	0.2S (for active energy) 0.5S (for reactive energy)
ii.	Operational Meter	0.5/1.0 (for active energy) 1.0/2.0 (for reactive energy)	0.5/1.0 (for active energy) 1.0/2.0 (for reactive energy)	--	0.5/1.0 (for active energy) 1.0/2.0 (for reactive energy)

16.9.8 Earthing System:

The metering system shall be suitable for solidly earthed power system.

16.9.9 Meter Box:

The meter box shall conform to the degree of protection not less than IP-51 as stipulated in IS 12063, and shall be capable of satisfactory operation in an indoor, non-air conditioned installation.

16.9.10 Installation and Mounting:

The meter shall be suitable for install indoor or outdoor application. The meter can be mounted in dust proof, lockable and tamper proof panel or rack or metal box, as per requirement and site condition, conforming to minimum IP-31.

The metering system shall have facility of CT shorting when the meter module is withdrawn or dismantled.

16.9.11 Data Display Capabilities - Instantaneous Values:

The meter shall be capable to record and display (on demand) at least following instantaneous parameters/information:

- (a) Three rms line voltages
- (b) Three rms line currents
- (c) System frequency (Hz)
- (d) Power factor with sign of lag/lead.
- (e) Watt - Import
- (f) Watt - Export
- (g) VAr - Lead
- (h) VAr - Lag
- (i) VA - Import
- (j) VA - Export
- (k) Maximum Demand (Import) during the month in Watt and VA with date and time
- (l) Maximum Demand (Export) during the month in Watt and VA with date and time
- (m) Meter Serial Number

16.9.12 Data Storage Capabilities - Cumulative Values:

The meter shall be capable to record, store and display (on demand) at least following cumulative parameters. At least five (5) registers shall be provided for each parameter, out of which one (1) register shall record energy for 24 hours in a day whereas other four (4) registers shall record Time of Day (TOD) energy during morning peak, morning off-peak, evening peak and evening off-peak durations:

- (a) Watt hour - Import
- (b) Watt hour - Export
- (c) VAr hour - Lead while Watt hour - Import
- (d) VAr hour - Lag while Watt hour - Import
- (e) VAr hour - Lead while Watt hour - Export
- (f) VAr hour - Lag while Watt hour - Export
- (g) VA hour - Import
- (h) VA hour - Export
- (i) VAr hour during low voltage ($V < 97\%$)*
- (j) VAr hour during high voltage ($V > 103\%$)*

**These parameters are for Availability Based Tariff (ABT) purpose only hence TOD registers are not required*

16.9.13 Data Logging Capabilities¹ - Integrated Values:

The meter shall have sufficient memory to store any combination of at least ten (10) parameters listed in Clause 0 and Clause 0 over minimum forty (40) days at a logging interval of fifteen (15) minutes. The State Transmission Utility shall be able to select these parameters locally through optical port using CMRI and/or remotely through communication port. At least, following essential parameters shall be logged at an interval of 15 minutes:

- (a) Watt - Import
- (b) Watt - Export
- (c) VAr - Lead while Watt - Import
- (d) VAr - Lag while Watt - Import
- (e) VAr - Lead while Watt - Export
- (f) VAr - Lag while Watt - Export
- (g) VAr hour during low voltage ($V < 97\%$)
- (h) VAr hour during high voltage ($V > 103\%$)
- (i) Average frequency (Hz)
- (j) Average three phase voltage

¹ In case of operational metering, the number of parameters and their logging intervals shall be decided by the Licensee as per their operational requirements.

16.9.14 Other Parameters²:

Each meter shall also store the values of active energy (Import), active energy (Export), reactive energy (lag) and reactive energy (lead) separately during active energy (import) & active energy (export) conditions recorded at 24.00 hours on last day of the month for a period of at least twelve (12) months. User shall be able to program time and day at which value of energy to be stored in the memory.

16.9.15 Events and Abnormalities Logging Capabilities³:

The meter shall be able to log date and time stamped events captured with a resolution of at least one (1) second. Sufficient memory shall be provided to store at least last 100 events in the meter on First-In-First-Out (FIFO) basis as following, but not limited to:

- (a) Missing potential (VT supply missing)
- (b) CT/VT Polarity reversal
- (c) Current unbalances (magnitude as well as phase unbalance) in any one of the phases or more than one phase
- (d) Voltage unbalances (magnitude as well as phase unbalance) in any one of the phases or more than one phase
- (e) Supply interruptions along with the duration of each interruption
- (f) Tamper information/anomaly occurrence/anomaly restoration.
- (g) Meter internal set-up/program change information

16.9.16 Real Time Clock (RTC) and Calendar:

The meter shall have in-built Quartz crystal based accurate Real Time Clock. The meter shall display real time in 24 hours format (hh : mm : ss).

Meter shall also display the date as per Indian calendar in dd-mm-yyyy format. Thirty (30) years calendar with automatic leap year adjustment shall be provided in the meter.

The accuracy of the clock and calendar shall be better than one minute per year.

16.9.17 Time Synchronization:

All meters shall have facility for time synchronisation locally and/or remotely through a Global Positioning System (GPS) or through the central computer (at CDCC) using the same port used for remote data communication.

16.9.18 Data Retention:

The logged data shall be stored in a non-volatile memory of meter with a minimum retention period of ten (10) years without any battery back-up.

² This clause may not be applicable for operational metering

³ In case of advanced metering, the meter need to store time stamped events with at least 1ms resolution for meeting operational needs.

16.9.19 Data Concentration and Network Integration:

The local network of all meters installed in a sub-station shall be formed using modem/multiplexer/data concentrator/LAN hub switch. This local network shall be integrated with communication network using appropriate standard protocol. Communication network may be based on Radio frequency, Microwave, Public Switched Telephone Network (PSTN), Power Line Carrier Communication (PLCC), Vary Small Aperture Terminal (VSAT) network, Optical Fibre Cable (OFC), GSM, Radio or any other means of telemetry.

16.9.20 Pulse Output:

High intensity Light Emitting Diodes (LED) shall be provided on front of the meter for test calibration and accuracy check of Wh and VARh measurements.

16.9.21 Display:

Meter shall have a minimum of 7 digits Alpha-numeric Liquid Crystal Display (LCD) or Light Emitting Diode (LED) type display with bright back-light and automatic back-light time out feature. A touch key pad or push buttons shall be provided on the meter front for switching ON the display and for changing from one indication to next. Two separate push buttons shall be provided one for scrolling and other for MD resetting.

16.9.22 Data Security:

- (a) Data encryption (coding) capability
- (b) Mechanical seals and locks i.e. sealing provision for terminal block, meter cover, MD reset button and all communication ports.
- (c) Message authentication algorithm capability/Multi-level password protection
- (d) Independent security across communication channels

16.9.23 Self Diagnostics Feature:

The meter shall have self diagnostics feature to scan the healthiness of internal components and circuitry. On detection of any exception or fault, meter shall display the message immediately.

16.9.24 Communication Ports:

The meter shall have at least following communication ports:

- (a) One optically isolated infra-red communication port (optical port) for local communication as per IEC 1107
- (b) One galvanically isolated Ethernet (LAN) port or RS485 serial port or RS232 serial port for remote communication

16.9.25 Communication Protocol:

For communication by meter with external devices, meter supplier shall implement industry standard open protocol(s) like MODBUS RTU, MODBUS, TCP/IP, IEC 870-5-

102, IEEE 1377, DNP 3.0, Device Language Message Specification (DLMS) or any other industry standard protocol.

In case of proprietary protocol, the meter supplier shall furnish the protocol software and details of protocol followed by him. Any variation in the standard protocol for optimizing communication resources shall be detailed.

16.9.26 Reprogramming of the meter:

Utility shall be able to select the display parameters, logging parameters, timings of TOD registers, billing dates, logging interval or any other parameter locally using CMRI through optical and/or remotely using meter reprogramming software installed at CDCC through communication port(s).

16.9.27 Data Downloading:

Utility shall be able to download the logged data locally using CMRI through optical port and/or remotely using meter interrogation software installed at CDCC through communication port(s). Any interrogation/read operation shall not delete or alter any stored meter data.

16.9.28 Ratio and Phase Angle Correction Feature:

The meter shall have facility to correct the ratio error and phase angle error of external CTs and VTs connected to it.

16.9.29 External Auxiliary Supply:

- (a) The meters shall be capable of powered up with 240V AC auxiliary supply and 110V or 220V DC supply of sub-station so that metering cores of VT is never loaded. The meter will normally be powered up by AC auxiliary supply and will be switched over automatically to DC supply only when AC auxiliary supply fails.
- (b) If any external supply is not available, self-powered type meter can be provided which derives internal power consumption from VT signal itself. In case of failure of main power supply or VT supply, meters shall be capable of being read locally using CMRI and/or remotely through communication network. Suitable maintenance-free dry battery shall be provided internally for this purpose.

16.10 Minimum Technical Requirement for Current Transformer (CT)

16.10.1 Single-phase type current transformers shall be used for 3 phase 4 wire and 3 phase 3 wire and 2 phase 2 wire measurement system. The secondary current rating of the CTs shall be 1 ampere or 5 ampere depending upon the total circuit burden. 5A secondary can be used for low burden circuits.

16.10.2 Either dedicated set of current transformers or dedicated core of current transformers shall be provided for metering and wherever feasible, CTs (or their cores) feeding to main meters and check meters shall be separate. The errors of the current transformers shall be checked in the laboratory or at site. However, if such facilities are not available, CT test certificates issued by Government test house or Government recognized test agency shall be referred to.

16.10.3 The total burden connected to each current transformer shall not exceed the rated burden of CT. Total circuit burden shall be kept close to rated burden of CT for minimum error.

16.10.4 Refer ANNEXURE-A and ANNEXURE-E for minimum acceptable detailed specification for current transformer.

16.11 Minimum Technical Requirement for Voltage Transformers (VT)

16.11.1 Either Electromagnetic Voltage Transformers (EVT) or Capacitive Voltage transformer (CVT) may be used for metering purpose. Generally, term VT is used to cover either EVT or CVT. The secondary voltage per phase shall be $110/\sqrt{3}$ volts or $415/\sqrt{3}$ volts. The VTs shall be connected to main and check meters and shall preferably be dedicated to the metering. Fuses of proper rating shall be provided at appropriate locations in the VT circuit.

16.11.2 The errors of the VTs shall be checked in the lab or at site. However if such facilities are not available, VT test certificates issued by Government test house or Government recognized test agency shall be referred to.

16.11.3 The total burden connected to each VT shall not exceed the rated burden of VT. % voltage drop in VT leads shall be within the permissible limits.

16.11.4 Refer ANNEXURE-B, ANNEXURE-C, ANNEXURE-D and ANNEXURE-E for minimum acceptable detailed specification for voltage transformer.

16.12 Application of Metering System

16.12.1 Generating Stations:

Main and check meters shall be installed on each Generator terminal, HV side of Generator Step-up Transformer (GST), LV side of Unit Auxiliary Transformer (UAT), HV side of Station Transformers (ST) and all outgoing feeders at Generating Stations to work out energy generated and net energy delivered by the power station in the grid. Commercial settlement shall be based on the energy meters installed at interface points as defined in the electricity grid code or applicable agreement.

16.12.2 Non-conventional Energy Sources:

For the energy supplied by non-conventional energy sources (mini hydel projects, wind farms, biomass and bagasse based generation projects etc.) to the State Transmission Utility or Distribution Licensee, as the case may be, CT and VT units of 11kV or 33kV or 132kV voltage rating having two identical metering cores along with main and check meters shall be provided at interface points as defined in the electricity grid code or distribution code. Wherever feasible, two identical cores in the same CT/VT or from separate CT, VT may be utilized.

16.12.3 Metering between State Transmission Utility -Distribution Licensee:

- (a) For measurement of power delivered by State Transmission Utility to Distribution Licensee, metering shall be provided on the LV side of EHV Power

Transformer i.e. 33kV side of 132/33kV and 11kV side of 132/11kV transformers installed in EHV sub-stations.

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

- (b) In case of EHV industrial and railway traction consumers of Distribution Licensee directly fed from 220kV or 132kV sub-station of State Transmission Utility, tariff metering shall be provided on outgoing feeder emanating from EHV sub-station of State Transmission Utility.

16.12.4 Metering between two Distribution Licensee:

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

If installation of metering at such point is not feasible, it shall be provided at nearest sub-station feeding other Distribution System. In such case, energy accounting may be in proportion to installed capacity of Distribution Transformers on the line or as agreed mutually.

16.12.5 Sub-station Auxiliary Consumption Metering:

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

Except unidirectional kWh, other data logging/billing capabilities/energy registers/other features may not be required for this application.

16.12.6 Open Access Customer:

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

In case of EHV/HV Consumer availing/seeking open access, metering equipment shall be installed in Transmission Licensee's premises at a single point supply.

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

16.12.7 Operational Metering:

Operational metering shall be sited wherever reasonably required by State Transmission Utility /Generating Companies for applications other than tariff metering. The parameters and other requirements shall be finalized by State Transmission Utility based on the operational requirements.

16.13 **Data Collection Systems and Data Downloading**

- 16.13.1 Data downloading and collection system shall be either manual or CMRI Based or remote downloading through communication network as per the operational requirements.

16.14 Testing Arrangements

- 16.14.1 The test terminal blocks shall be provided on all meters to facilitate testing of meters. Portable test set with high accuracy static source and 5 times more accurate (or better) electronic reference standard meter shall be used for testing. This means at least class 0.05s reference standard meter for testing of class 0.2s meter, class 0.1s reference standard meter for testing of class 0.5s meter and class 0.2s reference meters for testing of class 1.0s meter. These benches shall also be used for checking and calibration of portable testing equipments. The above shall be applicable for laboratory testing of meters, however, for site testing meter testing equipments with one class higher accuracy than meter under test may be used as per provision of IS-12346-1999.
- 16.14.2 Separate test terminal blocks for testing of main and check meters shall be provided so that when one meter is under testing, the other meter continues to record actual energy during testing period. Where only one/main meter exists, an additional meter shall be put in circuit during the testing period of the main meter so that while the main meter is under testing, the other meter can record energy during the period of meter under testing.

16.15 System for Joint Inspection, Testing, Calibration

- 16.15.1 The metering system located at metering points between Generating Companies, State Transmission Utility and Distribution Licensees shall be regularly inspected, tested and calibrated at least once in a year (or at an interval lesser than one year as mutually agreed) jointly by both the agencies involved for dispatch and receipt of energy. Since the static trivector meters are calibrated through software at the manufacturers' works, only accuracy of the meters and functioning shall be verified during joint inspection and certified jointly by both the agencies. In case of any doubt or defect, the meter shall be replaced then and there or calibrated. In later case, error correction as determined will be applied to the meter reading for the purpose of billing contingency referred as in Clause 19 and comprising their readings. To cover for loss of time, spare meters shall always be kept available with the agency to whom the meter/metering point belongs. After testing, the meter shall be properly sealed and a joint report shall be prepared giving details of testing work carried out, details of old seals removed and new seals affixed, test results, further action to be taken (if any) etc. The agency in whose premises the meter is located shall be responsible for proper security, protection of the metering equipment and sealing arrangement.
- 16.15.2 Joint inspection shall also be carried out as and when difference in meter readings (so corrected) exceeds the sum of maximum error as per accuracy class of main and check meter. The meters shall be jointly tested/calibrated on all loads and power factors as per relevant standards through static phantom load.

16.16 Meter Sealing Provision

- 16.16.1 Tariff metering systems shall be jointly sealed by the authorized representatives of the concerned parties as per the procedure agreed upon.

16.16.2 No seal, applied pursuant to this metering code, shall be broken or removed except in the presence of or with the prior consent of the agency affixing the seal or on whose behalf the seal has been affixed unless it is necessary to do so in circumstances where (i) both main and check meters are malfunctioning or there occurs a fire or similar hazard and such removal is essential and such consent can not be obtained immediately (ii) such action is required for the purpose of attending to the meter failure. In such circumstances, verbal consent shall be given immediately and it must be confirmed in writing forthwith.

16.16.3 Each party shall control the issue of its own seals and sealing pliers, and shall keep proper register/record of all such pliers and the authorized persons to whom these are issued.

16.16.4 Sealing of the metering system shall be carried out in such a manner so as not to hamper downloading of the data from the meter using CMRI or a remote meter reading system.

16.17 Access to Equipment and Data

16.17.1 Each constituent of the agency (Utility) on request with advance notice, shall grant full right to install metering equipments for other agency's employees, agents/duly authorized representative for inspecting, testing, calibrating, sealing, replacing the damaged equipment, collecting the data, joint reading recording, and other functions necessary and as mutually agreed.

16.18 Operation and Maintenance of the Metering System

16.18.1 The maintenance of the meters shall be the exclusive responsibility of the owner of the meters. The ownership of meters has been defined in Clause 6.

16.18.2 The operation and maintenance of the metering system includes proper installation, regular maintenance of the metering system, checking of errors of the CTs, VTs and meters, proper laying of cables and protection thereof, cleaning of connections/joints, checking of voltage drop in the CT/VT leads, condition of meter box and enclosure, condition of seals, regular/daily reading meters and regular data retrieved through CMRI and DPS, attending any breakdown/fault on the metering system etc.

16.19 Procedure for Assessment of Consumption in case of Defective and/or stuck-up Meter

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

16.19.2 If main as well as check metering systems become defective, the assessment of energy consumption for the outage period shall be done by the concerned parties as mutually agreed or at the level of Transmission Metering Committee (vide Clause 0).

16.20 Replacement of Defective or Stuck-up Meter

16.20.1 Defective or stuck-up meter shall be replaced as soon as possible. The owner of the meter shall maintain spare inventory of meters in sufficient quantity, so that down time is minimized.

16.21 Transmission Metering Committee (TMC)

16.21.1 State Transmission Utility shall be responsible for managing and serving the Transmission Metering Code among the constituents for discharging its obligation under the License.

16.21.2 The Grid Code Review Committee shall establish a Transmission Metering Committee (TMC) in accordance with Grid Code and such Committee shall consist of the following:

- (a) A Chairman, who is an Officer designated by State Transmission Utility
- (b) A Member (Secretary), who is also an Officer from State Transmission Utility
- (c) One representative from the State Generating Company
- (d) One representative from each of the Distribution Licensees
- (e) One member from Power Grid Corporation of India (PGCIL) representing WRLDC
- (f) One Member from IPPs (functioning) and major CPPs (with installed capacity exceeding 50 MW) connected to the State Transmission Utility's transmission system

16.21.3 The rules to be followed by the Committee in conducting their business shall be formulated by the Committee themselves and shall be approved by Grid Code Review Committee. The Committee shall meet at least once in six (6) months and conduct the following functions:

- (a) To keep Metering Code and its working under scrutiny and review.
- (b) To consider all requests for amendment to the Metering Code which any user makes.
- (c) To publish recommendations for changes to the Metering Code together with the reason for the change and any objection if applicable.
- (d) To issue guidance on the interpretation and implementation of the Metering Code.

16.22 Mechanism for Dispute Resolution

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

16.23 Implementation of Transmission Metering Code

16.23.1 For existing metering system not complying with this Code, State Transmission Utility shall submit a time-bound action plan to MPERC for replacement of the metering

equipment in phased manner keeping in view the immerging and future requirements like development of open power market, Electricity Act 2003 Requirements, ABT implementation in state, other tariff structures (two-part tariff etc.), Quality of Supply monitoring, remote monitoring/control etc.

16.23.2 For any new procurement of metering system, this code shall be applicable immediately.

16.24 Dynamic Code

16.24.1 To have a dynamic code is very valuable aspect because there is continuous and very fast upgradation in the technology of metering and communication, therefore the code needs to be reviewed periodically as decided by the Commission.

ANNEXURE-A

**MINIMUM ACCEPTABLE SPECIFICATIONS OF DEDICATED
SINGLE-PHASE EHV & HV CURRENT TRANSFORMERS (CT) FOR METERING**

Sr. No.	Particulars	11kV	33kV	132kV	220kV
1.	Nominal System Voltage (kV rms)	11	33	132	220
2.	Highest System Voltage (kV rms)	12	36	145	245
3.	Reference Standard	IS 2705 with latest amendments			
4.	Standard CT Ratio	2000-1000/1-1	800-400/1-1	800-400/1-1-1	1200-600/1-1-1-1
		1600-800/1-1	600-300/1-1	400-200/1-1-1	800-400/1-1-1-1
		1200-600/1-1	400-200/1-1	200-100/1-1-1	
		800-400/1-1	300-150/1-1	100-50/1-1-1	
		600-300/1-1	100-50/1-1		
		400-200/1-1			
		300-150/1-1			
		150-75/1-1			
5.	No. of Metering cores	Two			
6.	Rated Continuous Thermal Current	120% of Rated Primary Current			
7.	Rated Short time thermal primary current	13.1 KA for 1 sec	26.2 KA for 2 sec	40 KA for 1 sec	40 KA for 1 sec
8.	CT characteristics:				
(a)	Rated Primary Current (Amps)	2000-1000	800-400	400	800
		1600-800	600-300	200	
		1200-600	400-200	100	
		800-400	300-150	50	
		600-300	100-50		
		400-200			
		300-150			
		150-75			
(b)	Rated Secondary Current (Amps)	1 or 5	1 or 5	1 or 5	1 or 5
(c)	Accuracy Class	0.2	0.2	0.2	0.2
(d)	Maximum Instrument Security Factor (ISF)	5	5	5	5
(e)	Rated Secondary Burden (VA)	30	30	30	40
9.	Reference Standard for insulating oil	IS 335 with latest amendments			

ANNEXURE-B

**MINIMUM ACCEPTABLE SPECIFICATIONS OF DEDICATED
SINGLE-PHASE EHV CAPACITOR VOLTAGE TRANSFORMERS (CVT) FOR METERING**

Sr. No.	Particulars	132kV	220kV
1.	Nominal System Voltage (kV rms)	132	220
2.	Highest System Voltage (kV rms)	145	245
3.	Reference Standard	IS 3156 with latest amendments	
4.	Rated Capacitance (pF)	4400 pF with tolerance +10% and -5%	
5.	For low voltage terminal over entire carrier frequency		
	(a) Stray Capacitance	Shall not exceed 200 pF	
	(b) Stray Conductance	Shall not exceed 20 micro siemens	
6.	(a) High frequency capacitance for entire carrier frequency range	Within 80% to 150% of rated capacitance	
	(b) Equivalent Series Resistance over the entire frequency range	Less than 40 ohms	
7.	No. of Secondary Windings for potential measurement devices	Two	Two
8.	Standard Voltage Ratio		
	(a) Winding-I	$132kV/\sqrt{3} / 110V/\sqrt{3}$	$220kV/\sqrt{3} / 110V/\sqrt{3}$
	(b) Winding-II	$132kV/\sqrt{3} / 110V/\sqrt{3}$	$220kV/\sqrt{3} / 110V/\sqrt{3}$
9.	Rated Secondary Burden (VA)		
	(a) Winding-I	50	50
	(b) Winding-II	50	50
10.	Accuracy Class		
	(a) Winding-I	0.2	
	(b) Winding-II	0.2	
11.	Rated Voltage Factor and Duration		
	(a) Winding-I	1.2 continuous and 1.5 for 30 seconds	
	(b) Winding-II	1.2 continuous and 1.5 for 30 seconds	
12.	Reference Standard for insulating oil	IS 335 with latest amendments	

NOTE: Electromagnetic VTs may be used upto 220KV class.

ANNEXURE-C

**MINIMUM ACCEPTABLE SPECIFICATIONS OF DEDICATED
SINGLE-PHASE EHV POTENTIAL TRANSFORMERS (PT) FOR METERING**

Sr. No.	Particulars	132kV	220kV
1.	Nominal System Voltage (kV rms)	132	220
2.	Highest System Voltage (kV rms)	145	245
3.	Reference Standard	IS 3156 with latest amendments	
4.	No. of Secondary Windings for potential measurement devices	Two	Two
5.	Standard Voltage Ratio		
	(a) Winding-I	$132\text{kV}/\sqrt{3} / 110\text{V}/\sqrt{3}$	$220\text{kV}/\sqrt{3} / 110\text{V}/\sqrt{3}$
	(b) Winding-II	$132\text{kV}/\sqrt{3} / 110\text{V}/\sqrt{3}$	$220\text{kV}/\sqrt{3} / 110\text{V}/\sqrt{3}$
6.	Rated Secondary Burden (VA)		
	(a) Winding-I	200	200
	(b) Winding-II	50	50
	(c) Winding-III	50	50
7.	Accuracy Class		
	(a) Winding-I	3 P	
	(b) Winding-II	0.2	
	(c) Winding-III	0.2	
8.	Rated Voltage Factor and Duration		
	(a) Winding-I	1.2 continuous and 1.5 for 30 seconds	
	(b) Winding-II	1.2 continuous and 1.5 for 30 seconds	
9.	Reference Standard for insulating oil	IS 335 with latest amendments	

ANNEXURE-D

**MINIMUM ACCEPTABLE SPECIFICATIONS OF DEDICATED
SINGLE-PHASE HV POTENTIAL TRANSFORMERS (PT) FOR METERING**

Sr. No.	Particulars	33kV	11kV
1.	Nominal System Voltage (kV rms)	33	11
2.	Highest System Voltage (kV rms)	36	12
3.	Reference Standard	IS 3156 with latest amendments	
4.	No. of Secondary Windings for potential measurement devices	Two	Two
5.	Standard Voltage Ratio (for both windings)	$33\text{kV}/\sqrt{3} / 110\text{V}/\sqrt{3}$	$11\text{kV}/\sqrt{3} / 110\text{V}/\sqrt{3}$
6.	Rated Secondary Burden (VA) per winding	100	100
	(a) Winding-I	100	100
	(b) Winding-II	50	50
	(c) Winding-III	50	50
7.	Accuracy Class (At 10% to 100% of rated VA burden)	0.2	0.2
	(a) Winding-I	3 P	
	(b) Winding-II	0.2	
	(c) Winding-III	0.2	
8.	Rated Voltage Factor and Duration	1.2 continuous and 1.5 for 30 seconds	

**MINIMUM ACCEPTABLE SPECIFICATIONS OF DEDICATED
THREE-PHASE HV CT-PT SET FOR METERING**

Sr. No.	Particulars	33kV
	Specification of CT (for CT-PT Set)	
1.	Nominal System Voltage (kV rms)	33
2.	Highest System Voltage (kV rms)	36
3.	Reference Standard	IS 2705 with latest amendments
4.	Standard CT Ratio (Amps/Amps)	200-100/1-1 100-50/1-1
5.	Rated continuous thermal current	120% of rated primary current
6.	Rated short time thermal primary current for 1 second (in kA)	25
7.	CT Characteristic:	
(a)	Rated Primary Current (Amps)	200-100 100-50
(b)	Rated Secondary Current (Amps)	1
(c)	Accuracy Class	0.2
(d)	Maximum Instrument Security Factor (ISF)	<10
(e)	Rated Secondary Burden (VA)	30
8.	Reference Standard for insulating oil	IS 335 with latest amendments
	Specification of PT (for CT-PT Set)	
1.	Nominal System Voltage (kV rms)	33
2.	Highest System Voltage (kV rms)	36
3.	Reference Standard	IS 3156 with latest amendments
4.	No. of Secondary Windings for potential measurement devices	Two
5.	Standard Voltage Ratio	$33\text{kV}/\sqrt{3} / 110\text{V}/\sqrt{3}$
6.	Rated Secondary Burden (VA) per winding	50
7.	Accuracy Class (At 10% to 100% of rated VA burden)	0.2
8.	Rated Voltage Factor and Duration	1.2 continuous and 1.5 for 30 seconds

DATA REGISTRATION CODE

SECTION 17 DATA REGISTRATION

17.1 Introduction:

This section contains a list of all data required by STU and SLDC, which is to be provided by Users, and data required by Users to be provided by STU at times specified in the Grid Code. Other section of the Grid Code contains the obligation to submit the data and defines the times when data is to be supplied by Users.

17.2 Objective

The objective of the section is to list all the data required to be provided by Users to STU and vice versa, in accordance with the provisions of the Grid Code.

17.3 Responsibility

All Users are responsible for submitting up-to-date data to STU/ SLDC in accordance with the provisions of the Grid Code.

All Users shall provide STU and SLDC with the name, address and telephone number of the person responsible for sending the data.

STU shall inform all Users and SLDC of the name, address and telephone number of the person responsible for receiving data.

STU shall provide up-to-date data to Users as provided in the relevant schedule of the Grid Code.

Responsibility for the correctness of data rests with the concerned User providing the data.

17.4 Data Categories and Stages in Registration

Data required to be exchanged has been listed in the appendices of this section under various categories with cross-reference to the concerned sections.

17.5 Changes to Users Data

Whenever any User becomes aware of a change to any items of data that is registered with STU, the User must promptly notify STU of the changes. STU on receipt of intimation of the changes shall promptly correct the database accordingly. This shall also apply to any data compiled by STU regarding to its own system.

17.6 Methods of Submitting Data

The data shall be furnished in the standard formats for data submission and such format must be used for the written submission of data to SLDC/STU.

Where standard format are not enclosed these would be developed by SLDC / STU in consultation with Users.

All data to be submitted under the Schedule(s) must be submitted to SLDC / STU or to such other department and/or address as STU may from time to time notify to Users. The name of the Person who is submitting each schedule of data must be indicated.

Where a computer data link exists between a User and SLDC/ STU, data may be submitted via this link. The data shall be in the same format as specified for paper transmission except for electronic encoding for which some other format may be more suited. The User shall specify the method to be used in consultation with the SLDC/ STU and resolve issues such as Protocols, transmission speeds etc. at the time of transmission.

Other modes of data transfer, such as magnetic tape may be utilised if SLDC/ STU gives its prior written consent.

17.7 Data not supplied

Users are obliged to supply data as referred to in the individual section of the Grid Code and listed out in the Data Registration section Appendices. In case any data is missing and not supplied by any User, STU or SLDC may, acting reasonably, if and when necessary, estimates such data depending upon the urgency of the situation. Similarly, in case any data is missing and not supplied by STU, the concerned User may, acting reasonably, if and when necessary, estimates such data depending upon urgency of the situation. Such estimates will in each case, be based upon corresponding data for similar plant or Apparatus or upon such other information, the User or STU or SLDC, as the case may be, deemed appropriate.

17.8 Special Considerations

STU and SLDC and any other User may at any time make reasonable request for extra data as necessary.

STU shall supply data, required/requested by SLDC for system operation, from data bank to SLDC.

By Order of the Commission
ASHOK SHARMA, Dy. Secy.,

APPENDIX

Appendix A: STANDARD PLANNING DATA

Standard Planning Data consist of details, which are expected to be normally sufficient for STU to investigate the impact on the State Transmission System due to User development.

Standard planning data covering (a) preliminary project planning

REFERENCE TO:

SECTION - 4 SYSTEM PLANNING

SECTION - 5 CONNECTION CONDITION

A-1 STANDARD PLANNING DATA (GENERATION)

For SSGS – Thermal

A.1.1 THERMAL (COAL / GAS/FUEL LINKED)

A.1.1.1 GENERAL

- | | | |
|-----|---|---|
| i | Site | Give location map to scale showing roads, railway lines, Transmission lines, canals, pondage and reservoirs if any. |
| ii | Coal linkage/ Fuel (Like Liquefied Natural Gas, Naphtha etc.) linkage | Give information on means of coal transport / carriage. In case of other fuels, give details of source of fuel and their transport. |
| iii | Water Sources | Give information on availability of water for operation of the Power Station . |
| iv | Environmental | States whether forest or other land areas are affected. |
| v | Site Map (To Scale) | Showing area required for Power Station coal linkage, coal yard, water pipe lines, ash disposal area, colony etc. |
| vi | Approximate period of construction | |

A.1.1.2 CONNECTION

- | | | |
|----|--|---|
| i | Point of Connection | Give single line diagram of the proposed Connection with the system. |
| ii | Step up voltage for Connection (kV) | |

A.1.1.3 STATION CAPACITY

- | | | |
|----|--|--|
| i | Total Power Station capacity (MW) | State whether development will be carried out in phases and if so, furnish details. |
| ii | No. of units & unit size (MW) | |

A.1.1.4 GENERATING UNIT DATA

- | | | |
|-----|------------------------------|---|
| I | Steam Generating Unit | State type, capacity, steam pressure, stream temperature etc. |
| Ii | Steam turbine | State type, capacity. |
| Iii | Generator | Type
Rating (MVA)
Speed (RPM)
Terminal voltage (kV)
Rated Power Factor
Reactive Power Capability
(MVA _r) in the range 0.95 of leading and 0.85 lagging
Short Circuit Ratio
Direct axis (saturated) transient reactance (% on MVA rating) |

Iv	Generator Transformer	Direct axis (saturated) sub-transient reactance (% on MVA rating) Auxiliary Power Requirement MW and MVAr Capability curve Type Rated capacity (MVA) Voltage Ratio (HV/LV) Tap change Range (+ % to - %) Percentage Impedance (Positive Sequence at Full load)
----	-----------------------	--

A.1.2 HYDRO ELECTRIC

For SSGS – Hydro

A.1.2.1 GENERAL

Site	Give location map to scale showing roads, railway lines, and transmission lines.
Site map (To scale)	Showing proposed canal, reservoir area, water conductor system, fore-bay, power house etc.
Submerged Area	Give information on area submerged, villages submerged, submerged forest land, agricultural land etc
Whether storage type or run of river type	
Whether catchment receiving discharges from other reservoir or power plant.	
Full reservoir level	
Minimum draw down level.	
Tail race level	
Design Head	
Reservoir level v/s energy potential curve	
Restraint, if any, in water discharges	
Approximate period of construction.	

A.1.2.2 CONNECTION

i	Point of Connection	Give single line diagram proposed Connection with the Transmission System.
ii	Step up voltage for Connection (kV)	

A.1.2.3 STATION CAPACITY

i	Total Power Station capacity (MW)	State whether development is carried out in phases and if so furnish details.
ii	No. of units & unit size (MW)	

A.1.2.4 GENERATING UNIT DATA

i	Operating Head (in Metres)	a. Maximum b. Minimum c. Average
	Hydro Unit	Capability to operate as synchronous condenser Water head versus discharges curve (at full and part load) Power requirement or water discharge while operating as synchronous condenser
i	Turbine	State Type and capacity
iii	Generator	Type

- Rating (MVA)
- Speed (RPM)
- Terminal voltage (kV)
- Rated Power Factor
- Reactive Power Capability (MVA_r) in the range 0.95 of leading and 0.85 of lagging
- MW & MVA_r capability curve of generating unit
- Short Circuit Ratio
- Direct axis transient (saturated) reactance (% on rated MVA)
- Direct axis sub-transient (saturated) reactance (% on rated MVA)
- Auxiliary Power Requirement (MW)
- iv Generator - Transformer
 - a. Type
 - b. Rated Capacity (MVA)
 - c. Voltage Ratio HV/LV
 - d. Tap change Range (+% to -%)
 - e. Percentage Impedance (Positive Sequence at Full Load).

A.2 STANDARD PLANNING DATA (TRANSMISSION)

For STU and Transmission Licensees

Note: The compilation of the data is the internal matter of STU, and as such STU shall make arrangements for getting the required data from different Departments of STU/other transmission licensees (if any) to update its Standard Planning Data in the format given below:

- i. Name of line (Indicating Power Stations and substations to be connected).
- ii. Voltage of line (kV).
- iii. No. of circuits.
- iv. Route length (km).
- v. Conductor sizes.
- vi. Line parameters (PU values).
 - a. Resistance/km
 - b. Inductance/km
 - c. Susceptance/ km (B/2)
- vii. Approximate power flow expected- MW & MVA_r.
- viii. Terrain of the route- Give information regarding nature of terrain i.e. forest land, fallow land, agricultural and river basin, hill slope etc.
- ix. Route map (to scale) - Furnish topographical map showing the proposed route showing existing power lines and telecommunication lines.
- x. Purpose of Connection- Reference to Scheme, wheeling to other States etc.
- xi. Approximate period of Construction.

A.3. STANDARD PLANNING DATA (DISTRIBUTION)

For Discoms and distribution licensees

A.3.1 GENERAL

- i Area Map (to scale) Marking the area in the map of Madhya Pradesh for which Distribution **License** is applied. .
- ii Consumer Data Furnish categories of consumers, their numbers and connected loads.
- iii Reference to Electrical Divisions presently in charge of the Distribution.

A.3.2 CONNECTION

- i Points of **Connection** Furnish single line diagram showing points of **Connection**
- ii Voltage of supply at points of **Connection**
- iii Names of Grid Sub-Station feeding the points of **Connection**

A.3.3 LINES AND SUBSTATIONS

- i Line Data Furnish lengths of line and voltages within the Area.
- ii Sub-station Data Furnish details of 33/11kV sub-station, 11/0.4kV sub-stations, capacitor installations

A.3.4 LOADS

- i Loads drawn at points of **Connection**.
- ii Details of loads fed at **EHV**, if any. Give name of consumer, voltage of supply, contract demand and name of Grid Sub-station from which line is drawn, length of **EHV** line from Grid Sub-station to consumer's premises.
- iii Reactive Power compensation installed

A.3.5 DEMAND DATA (FOR ALL LOADS 1 MW AND ABOVE)

- i Type of load State whether furnace loads, rolling mills, traction loads, other industrial loads, pumping loads etc.
- ii Rated voltage and phase
- iii Electrical loading of equipment State number and size of motors, types of drive and control arrangements.
- iv Power Factor
- iv Sensitivity of load to voltage and frequency of supply.
- v Maximum Harmonic content of load.
- vi Average and maximum phase unbalance of load.
- vii Nearest sub-station from which load is to be fed.
- viii Location map to scale Showing location of load with reference to lines and sub-stations in the vicinity.

A.3.6 LOAD FORECAST DATA

Peak load and energy forecast for each category of loads for each of the succeeding 5 years. Details of methodology and assumptions on which forecasts are based. If supply is received from more than one substation, the sub-station wise break up of peak load and energy projections for each category of loads for each of the succeeding 5 years along with

estimated Daily load curve.
Details of loads 1 MW and above.
Name of prospective consumer.
Location and nature of load/complex.
Sub-Station from which to be fed.
Voltage of supply.
Phasing of load.

Appendix B: DETAILED PLANNING DATA

REFER TO:

SECTION – 4	<u>SYSTEM PLANNING</u>
SECTION -- 5	<u>CONNECTION CONDITIONS</u>

B.1 DETAILED PLANNING DATA (GENERATION)

PART-I FOR ROUTINE SUBMISSION

B.1.1 THERMAL POWER STATIONS

For SSGS – Thermal

B.1.1.1 GENERAL

1. Name of **Power Station**.
2. Number and capacity of **Generating Units** (MVA).
3. Ratings of all major equipments (Boilers and major accessories, Turbines, Alternators, Generator Unit Transformers etc).
4. Single line Diagram of **Power Station** and switchyard.
5. Relaying and metering diagram.
6. Neutral Grounding of **Generating Units**.
7. Excitation control- (What type is used? e.g. Thyristor, Fast Brushless Excitors)
8. Earthing arrangements with earth resistance values.

B.1.1.2 PROTECTION AND METERING

- i. Full description including settings for all relays and protection systems installed on the **Generating Unit**, Generator unit Transformer, Auxiliary Transformer and electrical motor of major equipments listed, but not limited to, under Sec. 3 (General).
- ii. Full description including settings for all relays installed on all outgoing feeders from **Power Station** switchyard, Tie circuit breakers, and incoming circuit breakers.
- iii. Full description of inter-tripping of circuit breakers at the point or points of **Connection** with the **Transmission System**.
- iv. Most probable fault clearance time for electrical faults on the **User's System**.
- v. Full description of operational and commercial metering schemes.

B.1.1.3 SWITCHYARD

In relation to interconnecting transformers:

- i. Rated MVA.
- ii. Voltage Ratio.

- iii. Vector Group.
- iv. Positive sequence reactance for maximum, minimum, normal Tap. (% on MVA).
- v. Positive sequence resistance for maximum, minimum, normal Tap. (% on MVA).
- vi. Zero sequence reactance (% on MVA).
- vii. Tap changer Range (+% to -%) and steps.
- viii. Type of Tap changer. (off/on load).

In relation to switchgear including circuit breakers, isolators on all circuits connected to the points of **Connection**:

- i. Rated voltage (kV).
- ii. Type of circuit breaker (MOCB/ABCB/SF6).
- iii. Rated short circuit breaking current (kA) 3 phase.
- iv. Rated short circuit breaking current (kA) 1 phase.
- v. Rated short circuit making current (kA) 3 phase.
- vi. Rated short circuit making current (kA) 1-phase.
- vii. Provisions of auto reclosing with details.

Lightning Arresters -

Technical data

Communication -

Details of communication equipment installed at points of connections.

Basic Insulation Level (kV) -

- i. Bus bar.
- ii. Switchgear.
- iii. Transformer bushings.
- iv. Transformer windings.

B.1.1.4 GENERATING UNITS

(a) Parameters of Generating Units:

- i. Rated terminal voltage (kV).
- ii. Rated MVA.
- iii. Rated MW.
- iv. Speed (rpm) or number of poles.
- v. Inertia constant H (MW Sec./MVA).
- vi. Short circuit ratio.
- vii. Direct axis synchronous reactance (% on MVA) X_d .
- viii. Direct axis (saturated) transient reactance (% on MVA) X_d' .
- ix. Direct axis (saturated) sub-transient reactance (% on MVA) X_d'' .
- x. Quadrature axis synchronous reactance (% on MVA) X_q .
- xi. Quadrature axis (saturated) transient reactance (% on MVA) X_q' .
- xii. Quadrature axis (saturated) sub-transient reactance (% on MVA) X_q'' .
- xiii. Direct axis transient open circuit time constant (Sec) $T'd_o$.

- xiv. Direct axis sub-transient open circuit time constant (See) $T''d_o$.
- xv. Quadrature axis transient open circuit time constant (Sec) $T'q_o$.
- xvi. Quadrature axis sub-transient open circuit time constant (Sec) $T''q_o$.
- xvii. Stator Resistance (Ohm) R_a .
- xviii. Neutral grounding details.
- xix. Stator leakage reactance (Ohm) X_1 .
- xx. Stator time constant (Sec).
- xxi. Rated Field current (A).
- xxii. Open Circuit saturation characteristic for various terminal Voltages giving the compounding current to achieve the same.
- xxiii. MW and MVA_r Capability curve

B.1.1.5 Parameters of excitation control system:

- i. Type of Excitation.
- ii. Maximum Field Voltage.
- iii. Minimum Field Voltage.
- iv. Rated Field Voltage.
- v. Details of excitation loop in block diagrams showing transfer functions of individual elements using I.E.E.E. symbols.
- vi. Dynamic characteristics of over - excitation limiter.
- vii. Dynamic characteristics of under-excitation limiter.

B.1.1.6 Parameters of governor:

- i. Governor average gain (MW/Hz).
- ii. Speeder motor setting range.
- iii. Time constant of steam or fuel Governor valve.
- iv. Governor valve opening limits.
- v. Governor valve rate limits.
- vi. Time constant of Turbine.
- vii. Governor block diagram showing transfer functions of individual elements using I.E.E.E. symbols.

B.1.1.7 Operational parameters:

- i. Minimum notice required to synchronise a **Generating Unit** from de-synchronization.
- ii. Minimum time between synchronizing different **Generating Units** in a **Power Station**.
- iii. The minimum block load requirements on synchronizing.
- iv. Time required for synchronizing a **Generating Unit** for the following conditions:
 - a. Hot
 - b. Warm
 - c. Cold
- v. Maximum Generating Unit loading rates for the following conditions:
 - a. Hot
 - b. Warm

- c. Cold
- vi. Minimum load without oil support (MW).

B.1.1.8 GENERAL STATUS

- i. Detailed Project report.
- ii. Status Report
 - (a) Land
 - (b) Coal
 - (c) Water
 - (d) Environmental clearance
 - (e) Rehabilitation of displaced persons
- iii. Techno-economic approval by **Central Electricity Authority (CEA)**.
- iv. Approval of **State** Government/Government of India.
- v. Financial Tie-up.

B.1.1.9 CONNECTION

- i. Reports of Studies for parallel operation with the **State Transmission System**.
 - (a) Short Circuit studies
 - (b) Stability Studies.
 - (c) Load Flow Studies.
- ii. Proposed **Connection** with the **State Transmission System**.
 - (a) Voltage
 - (b) No. of circuits
 - (c) Point of **Connection**.

B.1.2 HYDRO - ELECTRIC STATIONS

For SSGS – Hydro

B.1.2.1 GENERAL

- i. Name of **Power Station**.
- ii. No and capacity of units. (MVA)
- iii. Ratings of all major equipment.
 - a) Turbines (HP)
 - b) Generators (MVA)
 - c) Generator Transformers (MVA)
 - d) Auxiliary Transformers (MVA)
- iv. Single line diagram of **Power Station** and switchyard.
- v. Relaying and metering diagram.
- vi. Neutral grounding of Generator.
- vii. Excitation control.
- viii. Earthing arrangements with earth resistance values.
- ix. Reservoir Data.

- a) Salient features
- b) Type of Reservoir
 - i. Multipurpose
 - ii. For Power
- c) Operating Table with
 - i. Area capacity curves and
 - ii. Unit capability at different net heads

B.1.2.2 PROTECTION

- i. Full description including settings for all relays and protection systems installed on the **Generating Unit**, Generator transformer, auxiliary transformer and electrical motor of major equipment included, but not limited to those listed, under Sec. 3 (General).
- ii. Full description including settings for all relays installed on all outgoing feeders from **Power Station** switchyard, tiebreakers, and incoming breakers.
- iii. Full description of inter-tripping of breakers at the point or points of **Connection** with the **Transmission System**.
- iv. Most Probable fault clearance time for electrical faults on the **User's** System.

B.1.2.3 SWITCHYARD

- (a) Interconnecting transformers:
 - i. Rated MVA
 - ii. Voltage Ratio
 - iii. Vector Group
 - iv. Positive sequence reactance for maximum, minimum and normal Tap.(% on MVA).
 - v. Positive sequence resistance for maximum, minimum and normal Tap.(% on MVA).
 - vi. Zero sequence reactance (% on MVA)
 - vii. Tap changer range (+% to -%) and steps.
 - viii. Type of Tap changer (off/on load).
 - ix. Neutral grounding details.
- (b) Switchgear (including circuit breakers, Isolators on all circuits connected to the points of **Connection**).
 - i. Rated voltage (kV).
 - ii. Type of Breaker (MOCB/ABCB/SF6).
 - iii. Rated short circuit breaking current (kA) 3 phase.
 - iv. Rated short circuit breaking current (kA) 1 phase.
 - v. Rated short circuit making current (kA) 3 phase.
 - vi. Rated short circuit making current (kA) 1 phase.
 - vii. Provisions of auto reclosing with details.
- (c) Lightning Arresters
 - Technical data

- (d) Communications
 - Details of Communications equipment installed at points of connections.
- (e) Basic Insulation Level (kV)
 - i. Bus bar.
 - ii. Switchgear.
 - iii. Transformer Bushings
 - iv. Transformer windings.

B.1.2.4 GENERATING UNITS

- (a) Parameters of Generator
 - i. Rated terminal voltage (kV).
 - ii. Rated MVA.
 - iii. Rated MW.
 - iv. Speed (rpm) or number of poles.
 - v. Inertia constant H (MW sec./MVA).
 - vi. Short circuit ratio.
 - vii. Direct axis synchronous reactance X_d (% on MVA).
 - viii. Direct axis (saturated) transient reactance (% on MVA) X'_d .
 - ix. Direct axis (saturated) sub-transient reactance (% on MVA) X''_d .
 - x. Quadrature axis synchronous reactance (% on MVA) X_q .
 - xi. Quadrature axis (saturated) transient reactance (% on MVA) X'_q .
 - xii. Quadrature axis (saturated) sub-transient reactance (% on MVA) X''_q .
 - xiii. Direct axis transient open circuit time constant (sec) T'_{d_0} .
 - xiv. Direct axis sub-transient open circuit time constant (sec) T''_{d_0} .
 - xv. Quadrature axis transient open circuit time content (sec) T'_{q_0} .
 - xvi. Quadrature axis transient open circuit time constant (sec) T''_{q_0} .
 - xvii. Stator Resistance (Ohm) R_a .
 - xviii. Stator leakage reactance (Ohm) X_l .
 - xix. Stator time constant (Sec).
 - xx. Rated Field current (A).
 - xxi. Neutral grounding details.
 - xxii. Open Circuit saturation characteristics of the Generator for various terminal voltages giving the compounding current to achieve this.
 - xxiii. Type of Turbine.
 - xxiv. Operating Head (Metres)
 - xxv. Discharge with full gate opening (cumecs)
 - xxvi. Speed Rise on total Load throw off(%).
 - xxvii. MW and MVA_r Capability curve
- (b) Parameters of excitation control system:
 - As applicable to thermal **Power Stations**

- (c) Parameters of governor:
As applicable to thermal **Power Station**
- (d) Operational parameter:
 - i. Minimum notice required to Synchronise a **Generating Unit** from de-synchronisation.
 - ii. Minimum time between Synchronising different **Generating Units** in a **Power Station**.
 - iii. Minimum block load requirements on Synchronising.

B.1.2.5 GENERAL STATUS

- i. Detailed Project Report.
- ii. Status Report.
 - (a) Topographical survey
 - (b) Geological survey
 - (c) Land
 - (d) Environmental Clearance
 - (e) Rehabilitation of displaced persons.
- iii. Techno-economic approval by Central Electricity Authority.
- iv. Approval of State Government/Government of India.
- v. Financial Tie-up.

B.1.2.6 CONNECTION

- i. Reports of Studies for parallel operation with the **State Transmission System**.
 - (a) Short Circuit studies
 - (b) Stability Studies.
 - (c) Load Flow Studies.
- ii. Proposed **Connection** with the **State Transmission System**.
 - (a) Voltage
 - (b) No. of circuits
 - (c) Point of **Connection**.

B.1.2.7 RESERVOIR DATA

- (a) Dead Capacity
- (b) Live Capacity

B.1.3 GAS POWER STATIONS

For SSGS – Gas

B.1.3.1 GENERAL

- i. Name of **Power Station**.
- ii. Number and capacity of **Generating Units** (MVA).
- iii. Ratings of all major equipments (Turbines, Alternators, Heat Recovery Boiler, Generator Unit Transformers etc)
- iv. Single line Diagram of **Power Station** and switchyard.

- v. Relaying and metering diagram.
- vi. Neutral Grounding of **Generating Units**.
- vii. Excitation control- (What type is used? e.g. Thyristor, Fast Brushless Exciters)
- viii. Earthing arrangements with earth resistance values.
- ix. Start up Engine
- x. Turbine Details

B.1.3.2 PROTECTION AND METERING

- i. Full description including settings for all relays and protection systems installed on the Generating Unit, Generator unit Transformer, Auxiliary Transformer and electrical motor of major equipments listed, but not limited to, under Sec. 3 (General).
- ii. Full description including settings for all relays installed on all outgoing feeders from Power Station switchyard, Tie circuit breakers, and incoming circuit breakers.
- iii. Full description of inter-tripping of circuit breakers at the point or points of Connection with the Transmission System.
- iv. Most probable fault clearance time for electrical faults on the User's System.
- v. Full description of operational and commercial metering schemes.

B.1.3.3 SWITCHYARD

In relation to interconnecting transformers:

- i. Rated MVA.
- ii. Voltage Ratio.
- iii. Vector Group.
- iv. Positive sequence reactance for maximum, minimum, normal Tap.(% on MVA).
- v. Positive sequence resistance for maximum, minimum, normal Tap.(% on MVA).
- vi. Zero sequence reactance (% on MVA).
- vii. Tap changer Range (+% to -%) and steps.
- viii. Type of Tap changer. (off/on load).

In relation to switchgear including circuit breakers, isolators on all circuits connected to the points of Connection:

- i. Rated voltage (kV).
- ii. Type of circuit breaker (MOCB/ABCB/SF6).
- iii. Rated short circuit breaking current (kA) 3 phase.
- iv. Rated short circuit breaking current (kA) 1 phase.
- v. Rated short circuit making current (kA) 3 phase.
- vi. Rated short circuit making current (kA) 1-phase.
- vii. Provisions of auto reclosing with details.

Lightning Arresters -

Technical data

Communication -

Details of communication equipment installed at points of connections.

Basic Insulation Level (kV) -

- i. Bus bar.
- ii. Switchgear.
- iii. Transformer bushings.
- iv. Transformer windings.

B.1.3.4 GENERATING UNITS

(a) Parameters of Generating Units:

- i. Rated terminal voltage (kV).
- ii. Rated MVA.
- iii. Rated MW.
- iv. Speed (rpm) or number of poles.
- v. Inertia constant H (MW Sec./MVA).
- vi. Short circuit ratio.
- vii. Direct axis synchronous reactance (% on MVA) X_d .
- viii. Direct axis (saturated) transient reactance (% on MVA) X_d' .
- ix. Direct axis (saturated) sub-transient reactance (% on MVA) X_d'' .
- x. Quadrature axis synchronous reactance (% on MVA) X_q .
- xi. Quadrature axis (saturated) transient reactance (% on MVA) X_q' .
- xii. Quadrature axis (saturated) sub-transient reactance (% on MVA) X_q'' .
- xiii. Direct axis transient open circuit time constant (Sec) $T'd_o$.
- xiv. Direct axis sub-transient open circuit time constant (Sec) $T''d_o$.
- xv. Quadrature axis transient open circuit time constant (Sec) $T'q_o$.
- xvi. Quadrature axis sub-transient open circuit time constant (Sec) $T''q_o$.
- xvii. Stator Resistance (Ohm) R_a .
- xviii. Neutral grounding details.
- xix. Stator leakage reactance (Ohm) X_l .
- xx. Stator time constant (Sec).
- xxi. Rated Field current (A).
- xxii. Open Circuit saturation characteristic for various terminal Voltages giving the compounding current to achieve the same.
- xxiii. MW and MVA_r Capability curve

B.1.3.5 Parameters of excitation control system:

- i. Type of Excitation.
- ii. Maximum Field Voltage.
- iii. Minimum Field Voltage.
- iv. Rated Field Voltage.
- v. Details of excitation loop in block diagrams showing transfer functions of individual elements using I.E.E.E. symbols.
- vi. Dynamic characteristics of over - excitation limiter.
- vii. Dynamic characteristics of under-excitation limiter.

B.1.3.6 Parameters of governor:

- i. Governor average gain (MW/Hz).
- ii. Speeder motor setting range.
- iii. Time constant of steam or fuel Governor valve.
- iv. Governor valve opening limits.
- v. Governor valve rate limits.
- vi. Time constant of Turbine.
- vii. Governor block diagram showing transfer functions of individual elements using I.E.E.E. symbols.

B.1.3.7 Operational parameters:

- i. Minimum notice required synchronising a Generating Unit from de-synchronization.
- ii. Minimum time between synchronizing different Generating Units in a Power Station.
- iii. The minimum block load requirements on synchronizing.
- iv. Time required for synchronizing a Generating Unit for the following conditions:
 - a. Hot
 - b. Warm
 - c. Cold
- v. Maximum Generating Unit loading rates for the following conditions:
 - a. Hot
 - b. Warm
 - c. Cold
- vi. Minimum load without oil support (MW).

B.1.3.8 GENERAL STATUS

- i. Detailed Project report.
- ii. Status Report
 - (a) Land
 - (b) Gas/Liquid Fuel
 - (c) Water
 - (d) Environmental clearance
 - (e) Rehabilitation of displaced persons
- iii. Approval of **State** Government/Government of India.
- iv. Financial Tie-up.

B.1.3.9 CONNECTION

- i. Reports of Studies for parallel operation with the State Transmission System.
 - (a) Short Circuit studies
 - (b) Stability Studies.
 - (c) Load Flow Studies.
- ii. Proposed Connection with the State Transmission System.
 - (a) Voltage

- (b) No. of circuits
- (c) Point of Connection.

B.2 DETAILED SYSTEM DATA - TRANSMISSION

For STU and Transmission Licensees

B.2.1 GENERAL

- i. Single line diagram of the Transmission System down to 33kV bus at Grid Sub-station detailing:
 - (a) Name of Sub-station.
 - (b) Power Station connected.
 - (c) Number and length of circuits.
 - (d) Interconnecting transformers.
 - (e) Sub-station bus layouts.
 - (f) Power transformers.
 - (g) Reactive compensation equipment.
- ii. Sub-station layout diagrams showing:
 - (a) Bus bar layouts.
 - (b) Electrical circuitry, lines, cables, transformers, switchgear etc.
 - (c) Phasing arrangements.
 - (d) Earthing arrangements.
 - (e) Switching facilities and interlocking arrangements.
 - (f) Operating voltages.
 - (g) Numbering and nomenclature:
 - i. Transformers.
 - ii. Circuits.
 - iii. Circuit breakers.
 - iv. Isolating switches.

B.2.2 LINE PARAMETERS (for all circuits)

- i. Designation of Line.
- ii. Length of line (km).
- iii. Number of circuits.
- iv. Per Circuit values.
 - (a) Operating voltage (kV).
 - (b) Positive Phase sequence reactance (pu on 100 MVA) X_1
 - (c) Positive Phase sequence resistance (pu on 100 MVA) R_1
 - (d) Positive Phase sequence susceptance (pu on 100 MVA) B_1
 - (e) Zero Phase sequence reactance (pu on 100 MVA) X_0
 - (f) Zero Phase sequence resistance (pu on 100 MVA) R_0
 - (g) Zero Phase sequence susceptance (pu on 100 MVA) B_0

B.2.3 TRANSFORMER PARAMETERS (For all transformers)

- i. Rated MVA
- ii. Voltage Ratio
- iii. Vector Group
- iv. Positive sequence reactance, maximum, minimum and normal (pu on 100 MVA) X_1
- v. Positive sequence resistance, maximum, minimum and normal (pu on 100 MVA) R_1
- vi. Zero sequence reactance (pu on 100 MVA).
- vii. Tap change range (+% to -%) and steps.
- viii. Details of Tap changer. (Off/On load).

B.2.4 EQUIPMENT DETAILS (For all substations)

- i. Circuit Breakers
- ii. Isolating switches
- iii. Current Transformers
- iv. Potential Transformers

B.2.5 RELAYING AND METERING

- i. Relay protection installed for all transformers and feeders along with their settings and level of co-ordination with other Users.
- ii. Metering Details.

B.2.6 SYSTEM STUDIES

- i. Load Flow studies (Peak and lean load for maximum hydro and maximum thermal generation).
- ii. Transient stability studies for three-phase fault in critical lines.
- iii. Dynamic Stability Studies
- iv. Short circuit studies (three-phase and single phase to earth)
- v. Transmission and Distribution Losses in the Transmission System.

B.2.7 DEMAND DATA (For all substations)

- i. Demand Profile (Peak and lean load).

B.2.8 REACTIVE COMPENSATION EQUIPMENT

- i. Type of equipment (fixed or variable).
- ii. Capacities and/or Inductive rating or its operating range in MVar.
- iii. Details of control.
- iv. Point of Connection to the System.

B.3. DETAILED PLANNING DATA (DISTRIBUTION)

For Discoms /Distribution Licensees

B.3.1 GENERAL

- i. Distribution map (To scale). Showing all lines up to 11kV and sub-stations belonging to the Supplier.

- ii. Single line diagram of Distribution System (showing distribution lines from points of Connection with the Transmission System, 33/11kV substations, 11/0.4kV substation, consumer bus if fed directly from the Transmission System).
- iii. Numbering and nomenclature of lines and sub-stations (Identified with feeding Grid sub-stations of the Transmission and concerned 33/11kV substation of Supplier).

B.3.2 CONNECTION

- i. Points of Connection (Furnish details of existing arrangement of Connection).
- ii. Details of metering at points of Connection.

B.3.3 LOADS

- i. Connected load - Active and Reactive Load. Furnish consumer details, Number of Consumers category wise, details of loads 1 MW and above, power factor.
- ii. Information on diversity of load and coincidence factor.
- iii. Daily demand profile (current and forecast) on each 33/11kV sub-station.
- iv. Cumulative demand profile of Distribution System (current & forecast).

Appendix C: OPERATIONAL PLANNING DATA

C.1 OUTAGE PLANNING DATA

REFER TO:

SECTION 7 OUTAGE PLANNING

C.1.1 DEMAND ESTIMATES

For Discoms /Distribution Licensees

Item	Due date/ Time
Estimated aggregate annual sales of Energy in Million Units and peak and lean demand in MW & MVAR at each Connection point for the next financial year.	15th November of current year
Estimated aggregate monthly sales of Energy in million Units and peak and lean demand in MW & MVAR at each Connection point for the next month.	25th of current month
Hourly demand estimates for the day ahead.	10.00 Hours every day.

C.1.2 ESTIMATES OF LOAD SHEDDING

For Discoms/Distribution Licensee

Item	Due date/ Time
Details of discrete load blocks that may be shed to comply with instructions issued by SLDC when required, from each Connection point.	Soon after Connection is made.

C.1.3 YEAR AHEAD OUTAGE PROGRAMME (For the financial year)

C.1.3.1 GENERATOR OUTAGE PROGRAMME

For SSGS

Item	Due date/ Time
Identification of Generating Unit.	15 th November each year
MW, which will not be available as a result of Outage.	15 th November each year
Preferred start date and start-time or range of start dates and start times and period of Outage.	15 th November each year

If outages are required to meet statutory requirements, then the latest- date 15th November each year by which Outage must be taken.

C.1.3.2 YEAR AHEAD WREB OUTAGE PROGRAMME
(Affecting Transmission System)

Item	Due date/ Time
MW, which will not be available as a result of Outage from Imports through external Connections.	1st November each year
Start-date and start-time and period of Outage.	1st November each year

C.1.3.3 YEAR AHEAD CPP's OUTAGE PROGRAMME

Item	Due date/ Time
MW, which will not be available as a result of Outage.	30th November each year
Start-date and start time and period of Outage.	30th November each year

C.1.3.4 YEAR AHEAD DISCOM's OUTAGE PROGRAMME

Item	Due date/ Time
Loads in MW not available from any Connection point.	15 th November each year
Identification of Connection point.	15 th November each year
Period of suspension of Drawal with start-date and start-time.	15 th November each year

C.1.3.5 STU's OVERALL OUTAGE PROGRAMME

Item	Due date/ Time
Report on proposed Outage programme to <u>WREB</u> .	15 th February each year
Release of finally agreed Outage plan.	15th February each year

C-2. GENERATION SCHEDULING DATA

REFER TO:

SECTION 9: SCHEDULE AND DESPATCH

For SSGS

Item	Due date/ Time
Day ahead hourly MW/MVAr availability (00.00 - 24.00 Hours) of SSGS.	10.00 hrs
Day ahead hourly MW import/export from CPP's.	10.00 hr
Status of Generating Unit Excitation AVR in service (Yes/No).	10.00 hr
Status of Generating Unit Speed Control System. Governor in service (Yes/No).	10.00 hr
Spinning reserve capability (MW).	10.00 hr
Backing down capability with/without oil support (MW).	10.00 hr
Hydro reservoir levels and restrictions.	10.00 hr
Generating Units hourly summation outputs (MW).	10.00 hr
Day ahead hourly MW entitlements from Central Sector Generation Power Stations from WRLDC.	11.00 hr

C-3 CAPABILITY DATA

REFER TO:

SECTION 10: FREQUENCY AND VOLTAGE MANAGEMENT

For SSGS

Item	
Generators and IPPs shall submit to STU up-to-date capability curves for all Generating Units.	On receipt of request from STU/ SLDC.
CPPs shall submit to STU net return capability that shall be available for Export/Import from Transmission System.	On receipt of request from STU/ SLDC.

C-4 RESPONSE TO FREQUENCY CHANGE

REFER TO:

SECTION 10 - FREQUENCY AND VOLTAGE MANAGEMENT

For SSGS

Item	
Primary Response in MW at different levels of loads ranging from minimum Generation to registered capacity for frequency changes resulting in fully opening of governor valve.	On receipt of request from STU/ SLDC.
Secondary response in MW to frequency changes	On receipt of request from STU/ SLDC.

C-5 MONITORING OF GENERATION

REFER TO:

SECTION 11 MONITORING OF GENERATION AND DRAWAL

For SSGS

Item	
SSGS shall provide hourly generation summation to SLDC.	Real time basis
CPPs shall provide hourly export/ import MW to SLDC.	Real time basis
Logged readings of Generators to SLDC.	As required
Detailed report of Generating Unit tripping on monthly basis.	In the first week of the succeeding month

C-6 ESSENTIAL AND NON-ESSENTIAL LOAD DATA

REFER TO:

SECTION 12 CONTINGENCY PLANNING

For Discoms /Distribution Licensee

Item	Due Date/ Time
i. Schedule of essential and non-essential loads on each discrete load block for purposes of load shedding.	As soon as possible after Connection

Appendix D: PROTECTION DATA

REFER TO:

SECTION 15 - PROTECTION

Item	Due date/ Time
For SSGS Generators / CPPs / IPPs shall submit details of protection requirement and schemes installed by them as referred to in B-1. Detailed Planning Data under sub-section "Protection And Metering".	As applicable to Detailed Planning Data
For STU /Transmission Licensee The STU shall submit details of protection equipment and schemes installed by them as referred to in B-2. Detailed system Data, Transmission under sub-section "Relaying and Metering" in relation to Connection with any User.	As applicable to Detailed Planning Data

Appendix E: METERING DATA

REFER TO:

SECTION – 16 METERING

Item	Due date/ Time
For SSGS SSGS shall submit details of metering equipment and scheme installed by them as referred in B-1. Detailed Planning Data under sub-section "Protection and Metering".	As applicable to Detailed Planning Data
For STU /Transmission Licensee STU shall submit details of metering equipment and schemes installed by them as referred in B-2. Detailed System Data, Transmission under sub-section "Relaying and Metering" in relation to Connection with any User.	As applicable to Detailed Planning Data

Appendix F: PLANNING STANDARDS

REFER TO:

SECTION – 4 SYSTEM PLANNING

General Policy

The State Transmission System planning and generation expansion planning shall be in accordance with the provisions of the Planning Criterion as per IEGC Clause 3.5 as detailed below. However, some planning parameters of the State Transmission System may vary according to directives of MPERC.

Planning Criterion

- (a) The planning criterion is based on the security philosophy on which ISTS and State Transmission System has been planned. The security philosophy shall be as per the Transmission Planning Criteria and other CEA guidelines. The general policy shall be as detailed below:
 - i. As a general rule, the ISTS shall be capable of withstanding and secured against the following contingency outages without necessitating load shedding or rescheduling of generation during Steady State Operations:

- Outage of a 132kV D/C line or,
 - Outage of a 220kV D/C line or,
 - Outage of a 400kV S/C line or,
 - Outage of a single Interconnecting Transformer, or,
 - Outage of one pole of HVDC Bipole line, or,
 - Outage of a 765kV S/C line.
- ii. The above contingencies shall be considered assuming a pre-contingency system depletion (Planned Outage) of another 220kV D/C line or 400kV S/C line in another corridor and not emanating from same sub-station. All the generating Units may operate within their reactive capability curves and the network voltage profile shall also be maintained within voltage limits specified.
- (b) The ISTS/STS shall be capable of withstanding the loss of most severe single system in feed without loss of stability.
- (c) Any one of these events defined above shall not cause:
- i. Loss of supply
 - ii. Prolonged operation of the system frequency below and above specified limits
 - iii. Unacceptable high or low voltage
 - iv. System instability
 - v. Unacceptable overloading of ISTS/STS elements

Appendix G: SITE RESPONSIBILITY SCHEDULE

REFER TO:

SECTION – 5 CONNECTION CONDITIONS

Name of Power Station/Sub-Station

Site Owner:

Tel. Number:

Fax Number:

Item of Plant/ Apparatus	Plant Owner	Safety Responsibility	Control Responsibility	Operation Responsibility	Maintenance Responsibility	Remarks
.....kV Switchyard						
All equipment including bus bars						
Feeders						
Generating Units						

Appendix H: INCIDENT REPORTING

REFER TO:

SECTION – 14: OPERATIONAL EVENT /ACCIDENT REPORTING

FIRST REPORT.....

Date:

Time:

- Date and time of incident
- Location of incident
- Type of incident
- System parameters before the incident (Voltage, Frequency, Flows, Generation, etc.)
- Relay indications received and performance of protection
- Damage to equipment
- Supplies interrupted and duration, if applicable
- Amount of Generation lost, if applicable
- Possibility of alternate supply arrangement
- Estimate of time to return service
- Cause of incident
- Any other relevant information and remedial action taken
- Recommendations for future improvement/repeat incident
- Name of the Organisation