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# JOINT ELECTRICITY REGULATORY COMMISSION FOR MANIPUR AND MIZORAM
# GRID CODE, 2009

## NOTIFICATION

**No. H. 11019/14/09–JERC dated 18.5.09 :** In exercise of powers conferred by Section 181 (2) (Z P) and 86 (1) (h) of Electricity Act, 2003 (36 of 2003) and all other powers enabling it in this behalf, the Joint Electricity Regulatory Commission for Manipur and Mizoram hereby makes the following Regulations namely:-

## CHAPTER -1: GENERAL

### 1.1 Short Title

(1) These Regulations may be called the "Joint Electricity Regulatory Commission for the States of Manipur and Mizoram (Grid Code) Regulations 2009".

(2) These Regulations shall come into force from the date of its publication in the Official Gazette.

(3) It shall extend to the whole States of Manipur and Mizoram.

### 1.2 Definitions

In the Grid Code Regulations the following words and expressions shall, unless the subject matter or context otherwise requires or is inconsistent therewith, bear the following meanings:

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| ABT | Availability Based Tariff |
| Act | The Electricity Act, 2003 (Act No. 36 of 2003) |
| Active Energy | The electrical energy produced, flowing or supplied by an electric circuit during a time interval, being the integral with respect to time of the instantaneous power, measured in units of watt-hours or standard multiples thereof, |

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| Active Power | The product of voltage and the in phase component of alternating current measured in units of watts and standard multiples thereof, |
| Apparatus | All the electrical apparatus like machines, fittings, accessories and appliances in which electrical conductors are used. |
| Apparent Power | The product of voltage and alternating current measured in unit of volt-amperes and standard multiples thereof, |
| Area of Supply | Area within which a Distribution Licensee is authorized by his license to supply electricity. |
| Automatic Voltage Regulator (AVR) | A continuously acting automatic excitation system to control a Generating Unit terminal voltage. |
| Authority | Central Electricity Authority (CEA) |
| Auxiliaries | All the plant and machinery required for the generating unit's functional operation that do not form part of the generating unit. |
| Availability | The Capability of the generating units expressed in MW.In respect of the Transmission System, "Availability " shall mean the time in hours the Transmission System is capable of transmitting electricity at its rated voltage from the supply point to the delivery point and expressed as a percentage of Annual Availability. |
| Backing Down | Reduction of generation on instructions from SLDC / NERLDC by a generating unit under abnormal conditions. |
| Black start procedure | The procedure necessary to recover from a partial or a total blackout. |
| Black start capability | An ability in respect of a Black Start Station, for at least one of its generating units to start up from shut down and to energize a part of the system and be synchronized to the system upon instruction from the State Load Dispatch Centre, within two hours, without any external supply. |
| Black start stations | Generating stations having Black Start Capability. |
| Captive Power Plant (CPP) | A Power Plant set up by any person to generate electricity for his use and includes a power plant set up by any co-operative society or association of persons for generating electricity primarily for use of members of such co-operative society or association. |
| CEA | Central Electricity Authority |

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| Central Transmission Utility (CTU) | Any Government Company which the Central Government may notify under sub section (1) of section 38 of the Electricity Act, 2003. |
| CERC | Central Electricity Regulatory Commission. |
| Commission | Joint Electricity Regulatory Commission for the States of Manipurr and Mizoram |
| Connection | The electric power lines and electrical equipment used to effect a connection of a user's system to the Transmission System. |
| Connection conditions | Those conditions mentioned in Chapter 4 ("connection conditions") which have to be fulfilled before the User's System is connected to the Grid |
| Connection point | An electrical point of connection between the Transmission System and the User's System. |
| 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 public under the Electricity Act 2003 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 case may be and shall include a person whose electricity supply has been disconnected. |
| Demand | The demand of Active Power in MW and Reactive Power in MVAR of electricity unless otherwise stated. |
| Demand control | Any of the following methods of achieving a load reduction:<br>(a) Consumer Load Management initiated by Users.<br>(b) Consumer Load reduction by Disconnection initiated by Users (other than following an instruction from Load Despatch Centre).<br>(c) Consumer Load reduction instructed by the Load Despatch Centre<br>(d) Automatic under Frequency Load Disconnection<br>(e) Emergency manual Load Disconnection |
| Despatch | Operation control of an integrated electricity system involving operations such as:<br>(a) Assignment of levels of output to specific Generating Plant or Load control devices to effect the most reliable and economical supply as the load vary.<br>(b) The control of the operation of Extra High Voltage lines, associated sub stations and equipment.<br>(c) The scheduling of various types of transactions with the electric utilities over the interconnecting Transmission Lines. |

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| De-synchronize | The act of taking a generating unit off a system to which it has been synchronized. |
| Disconnection | The physical separation of Users or Consumers from the system. |
| Discrimination | The quality where a relay or protective system is enabled to pick out and cause to be disconnected only the faulty apparatus. |
| Distribution Licensees | A licensee authorized to operate and maintain a distribution system for supplying electricity to the consumers in his area of supply. |
| Distribution system | The system of wires and associated facilities between the delivery points on the transmission lines or the generating station connection and the point of connection to the installation of the consumers. |
| Drawal | The import / export of electrical energy from / to the grid |
| Earthing | Connecting the conducting parts of an equipment or machinery with the general mass of earth, in such a manner ensuring at all times an immediate discharge of energy without danger, by maintaining the same efficiently at earth's potential. |
| Earthing device | A means of providing connection between a conductor and earth being of adequate strength and capability. |
| EHV | Extra High Voltage equal to and greater than 66 KV |
| Frequency | The number of alternating current cycles per second (expressed in hertz) at which the system is operating. |
| Generating company | 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. |
| Generating station | Any station for generating electricity, including any building and plant with step-up transformer, switchyard, switch gear, cables or other appurtenant equipment, if any used for that purpose and the site thereof, a site intended to be used for a generating station, and any building used for housing the operating staff of a generating station and where electricity is generated by water – power, includes, penstocks, head and tail works, main and regulatory reservoirs, dams and other hydraulic works, but does not in any case include any sub station. |
| Generating unit | The combination of an electric power generator and its prime mover and all of its associated equipment, which together constitutes a single generating machine. |
| Generating schedule | The despatch schedule of a generating station |

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| Grid | High voltage backbone system of inter-connected Transmission Lines, Sub Stations and Generating Stations. |
| Grid Code | "Electricity Grid Code for Manipur and Mizoram", a document describing the procedures and the responsibilities for planning and operation of the Grid of Manipur and Mizoram states. |
| High voltage or HV | Voltage greater than 400 V and lesser than 33 KV. |
| IEGC | Indian Electricity Grid Code, a document describing the philosophy and the responsibilities for planning and operation of Indian Power System specified by the Central Commission in accordance with sub section 1 (h) of section 79 of the Act. |
| Indian Standards ("IS") | Those Standards and specifications approved by the Bureau of Indian Standards. |
| Inter-State Transmission System (ISTS) | Inter-State Transmission System includes :<br>(a) Any system for the conveyance of electricity by means of a main Transmission Line from the territory of one State to another State;<br>(b) the conveyance of electricity across the territory of an intervening State as well as conveyance within a State, which is incidental to such inter-state transmission of electricity.<br>(c) The transmission of electricity within the territory of a State built, owned, operated maintained or controlled by the Central Transmission Utility. |
| Interconnecting Transformer (ICT) | Transformer connecting EHV lines of different voltage systems. |
| Independent Power Producer (IPP) | Power Station within the State owned by a generator who is not a part of Power and Electricity Department. |
| Intertripping | (a) The tripping of circuit – breaker(s) by commands initiated from protection at a remote location independent of the state of local protection; or<br>(b) Operational intertripping. |
| Intra–State Transmission System | Any system or transmission of electricity other than an Inter - State Transmission System. |
| Isolation | The disconnection of EHV / HV Apparatus from the remainder of the System in which that EHV / HV Apparatus is situated. |
| Lean Period | That period in a day when the electrical power demand is lowest |
| License | Any license granted by the State Commission under provisions of the relevant laws inforce |

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| Load | The Active, Reactive or Apparent power as the context requires, generated transmitted or distributed. |
| Load Factor | Load Factor is the ratio of the average power to the maximum demand. The load factor depends on the interval of time of the maximum demand and the period over which the average is taken.<br><br>Load Factor = Units consumed in a given period<br>Maximum demand X No. of hours in the period |
| Low Voltage or LV | Voltage not exceeding 440 volts |
| Main protection | Protection equipment or system expected to have priority in initiating either a fault clearance or an action to terminate an abnormal condition in a power system. |
| Operating Margin | Aggregate available capacity of generating station in the system on real time basis, which is over and above the operating level to the maximum capacity of the generating units limited by technical parameters for short duration. |
| Operation | A scheduled or planned action relating to the operation of a system. |
| Operational procedure | Management instructions and procedures, both for the safety rules and for the local and remote operation of plant and apparatus, issued in connection with the actual operation of plant and/or apparatus at or from a connecting site. |
| 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. |
| Outage | A total or partial regulation in availability due to repair and maintenance of the Transmission or Distribution or Generation facility or defect in Auxiliary System. |
| Part Load | The condition of a generating station which is loaded but is not running at its declared availability. |
| Partial shutdown | A shutdown of a part of the system resulting in failure of power supply, either from external connections or from the healthy part of the system. |
| Peak period | That period in a day when the electrical power demand is highest. |
| Person | Any company or body corporate or association or body of individuals, whether incorporated or not, or artificial juridical person. |

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| PGCIL | Power Grid Corporation of India Limited |
| Planned outage | An outage of generating plant or part of the Transmission system, or part of a User's System co-ordinated by SLDC. |
| Forced Outage | An Outage of SGS 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. |
| Power factor | The ratio of Active Power (KW) to Apparent Power (KVA) |
| Protection | The scheme and apparatus for detecting abnormal conditions on a system and initiating fault clearance or actuating signals or indications. |
| Rated MW | The "rating plate" MW output of a Generating Unit, being that output up to which the generating unit is designed to operate. |
| Reactive Power | 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; |
| Regulating Margin | The system voltage and frequency beyond which the system should not be operated. |
| Re-Synchronization | The bringing of parts of the system which has gone out of synchronism with each other, back into synchronism. |
| Safety Rules | The rules framed by the Users and the transmission licensee to ensure safety to persons working on plant / apparatus. |
| SLDC | State Load Despatch Centres of Manipur and Mizoram states. |
| Standing Instructions | An instruction issued by SLDC to a generating company whereby, in specified circumstances, the generating company should take specified action, as though a valid dispatch instruction has been issued by SLDC. |
| Start – Up | The action of bringing a generating unit from shutdown to synchronous speed. |
| State Transmission Utility (STU) | Power & Electricity Departments of Manipur and Mizoram or the utility notified by the Government of Manipur /Mizoram under sub section (1) of section 39 of the Electricity Act, 2003 and whose functions have been outlined under sub section (2) of section 39 of the Electricity Act 2003. |
| Station Transformer | A transformer supplying electrical power to the auxiliaries of a generating station, which is not directly connected to a generating unit terminal. |

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| Sub station | Station for transforming or converting electricity for the transmission or distribution thereof and includes transformers, converters, switchgears, capacitors, synchronous condensers, structures, cable and other appurtenant equipment and any buildings used for that purpose and the site thereof. |
| Supervisory Control and Data Acquisition or (SCADA) | The communication links and data processing systems, which provide information to enable implementation of requisite supervisory and control actions. |
| Synchronized | Those conditions where an incoming generating unit or system is connected to the bus bars of another system so that the 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 |
| System | Any transmission and distribution system and / or transmission system, as the case may be. |
| Transmission licensee | A licensee authorized to establish and operate transmission lines |
| Transmission lines | All high pressure cables and overhead lines (not being an essential part of the distribution system of a licensee) transmitting electricity from a generating station to another generating station or a sub station, together with any step-up and step-down transformers, switch-gear and other works necessary to and used for the control of such cables or overhead lines. and such buildings or part thereof as may be required to accommodate such transformers, switch-gear and other works. |
| Transmission system | The system consisting of high pressure cables and overhead lines of transmission licensee for transmission of electrical power from the generating station upto connection point / interface point with the distribution system. This shall not include any part of the distribution system. |
| Under Frequency Relay | An electrical measuring relay intended to operate when characteristic quantity reaches the relay setting by decrease frequency |
| User | A term utilized in various Chapter / Paras of Grid Code Regulations to refer to the persons using the Grid, as more particularly indentified in each section of the Grid Code Regulations. In the generalk conditions the term means any person to whom the Grid Code applies. |

Words and expressions used and not defined in this code but defined in the Acts shall have the meanings assigned to them in the said Acts. Expressions used herein but not specifically defined in this Code or in the said Acts but defined under any law passed by a competent legislature and applicable to the electricity industry in the state shall have the meaning assigned to them in such law. Subject to the above, expressions used herein but not specifically defined in this Code

or in the Acts or any law passed by a competent legislature shall have the meaning as is generally assigned in the electricity industry.

**1.3 Introduction**

**(1)** The Electricity Grid Code for Manipur and Mizoram lays down the rules, guidelines and standards to be followed by all Users of the Manipur and Mizoram State Grid to operate and maintain an efficient and coordinated power system in the States in integration with the North Eastern Regional Grid as per the provisions of Indian Electricity Grid Code (IEGC).

**(2)** The Electricity Department, Manipur and Power and Electricity Department, Mizoram which are deemed licensees in terms of section 14 of the Electricity Act 2003, shall be the State Transmission Utilities (STUs) for Manipur and Mizoram. As per section 39(2) of the Electricity Act, 2003 following are the functions of State Transmission Utility;

a) to undertake transmission of energy through the intra-State Transmission System

b) to discharge all functions of planning and coordination relating to intra-State Transmission System with
   (i) Central Transmission Utility;
   (ii) State Power Departments;
   (iii) Generating Companies;
   (iv) Regional Power Committee;
   (v) Authority;
   (vi) Licensees;
   (vii) Any other person notified by the State Government in this behalf

c) to ensure development of an efficient, coordinated and economical system of intra-state transmission lines for smooth flow of electricity from a generating station to load centres;

d) to provide non-discriminatory open access to its transmission system for use by –
   (i) any licensee or generating company on payment of the transmission charges;
   (ii) any consumer as and when such open access is provided by the State Commission under sub section (2) of section 42, on payment of the transmission charges and a surcharge thereon, as may be specified by the State Commission.

**(3) (a) Establishing SLDC:**

As per the section 31of Electricity Act, 2003, the State Government shall establish a centre to be known as the **State Load Despatch Centre (SLDC)** and the State Load Despatch Centre shall be operated by a Government company or any authority or corporation established or constituted by or under any State Act, as may be notified by the State Government. Until a Government company or any authority or corporation is notified by the State Government, the State Transmission Utility shall operate the State Load Despatch Centre, which shall:

**(b) Functioning of SLDC:**

i) be responsible for optimum scheduling and despatch of electricity within the State, in accordance with the contracts entered into with the licensees or the generating companies operating in that State;

ii) monitor the grid operations;

iii) keep accounts for the quantity of electricity transmitted through the State grid;

iv) exercise supervision and control over the intra state transmission system;
v) be responsible for carrying out real time operations for grid control and despatch of electricity within the State through secure and economic operation of the State grid in accordance with the Grid Standards and the State Electricity Grid Code.
vi) The SLDC and licensees shall comply with; the directions of Regional Load Despatch Centre in connection with the integrated grid operation of the power system or in regard to matter which may affect the operation of the Inter State Transmission System.

**(c) Manning of SLDC:**

i) SLDC shall be manned by qualified and experienced Engineers who are well acquainted with State Transmission System.
ii) Periodical Training shall be imparted to the SLDC personnel to update skills and well informed of information regarding NERLDC and State Transmission System, State Generating Stations and the equipment.

**(4)** In order to perform the above task as well as the requirements as stipulated in Clause 86 (1) (h) of the Electricity Act, 2003 the Joint Electricity Regulatory Commission for Manipur and Mizoram has formulated this "Electricity Grid Code for Manipur and Mizoram" herein after called Grid Code. For the Inter State Transmission, Indian Electricity Grid Code shall be applicable.

**(5)** The Grid Code shall apply to STU, SLDC and all users connected with and /or utilising the State Transmission system.

**(6)** STU, SLDC and all users shall abide by the Grid Code to the extent it applies to them.

**1.4 Objective of Grid Code**

The Grid Code governs the boundary between STU and Users and establishes guidelines for operation of facilities for those who are connected and will use the State Grid. It lays down both the information requirements and procedures governing the relationship between STU and Users. The principal objectives of the Grid Code are:

(a) To provide clarity and certainty to the STU, State Generation Companies, Distribution Licensees, IPP/CPP and any open access customers connected to the State Grid by specifying their respective roles, responsibilities and obligations with respect to the operation of the State Grid.
(b) To improve the grid stability and achieve minimum standards of system performance.
(c) To define the connection requirement for new entrants i.e., future new generating companies, distribution/trading licensees, open access customers and consumers
(d) To document the common knowledge or normal practice in writing for ease of reference and help in compliance.
(e) To agree with generators what performance characteristics their plant must provide.
(f) To improve the co-operation by providing a mechanism for clear and consistent disclosure of all information.
(g) To provide a level playing field.
(h) To indicate how generation is to be scheduled and dispatched
(i) To actually enforce what is verbally agreed.

## 1.5 Scope of Grid Code

1. Grid Code defines the boundary between STU and Users and establishes the procedures for operation of facilities connected to the State Grid.
2. STU, SLDC and all Users that connect with and/or utilize the State Grid are required to abide by the principles and procedures as laid down in the Grid Code in so far as they apply to them.
3. Grid Code Regulations is applicable for system dealing with voltage of 33 KV and above.

## 1.6 Implementation and Operation of the Grid Code:

1. The State Transmission Utility shall be responsible for implementation of the Grid Code. All the users shall comply with Grid Code and assist the State Transmission Utility in this regard. The Users must provide all the required information and reasonable rights of access, service and facilities necessary for implementation of the Grid Code.

2. If any User has any difficulty in complying with any of the provisions of the Grid Code, he shall immediately, without delay, inform the same to the State Transmission Utility and at the same time shall remedy his non-compliance promptly.

3. Consistent failure in compliance with the Grid Code may lead to disconnection of the User's plant or apparatus. The responsibility for the consequences of disconnection including payment of damages and compensation to consumers rests with the User who consistently violates the Grid Code.

4. The operation of the Grid Code shall be reviewed regularly by the Grid Code Review committee in accordance with the provisions of the relevant section of the Grid Code.

## 1.7 Limitations of the Grid Code:

The Grid code contains procedure for the management of day to day technical situations in the State Power Grid, taking into account of wide range of operational conditions likely to be encountered under both normal and abnormal conditions. The Grid Code cannot foresee all the possible operating conditions. Users must therefore understand and accept that the SLDC/STU, in such unforeseen circumstances, may be required to act decisively to discharge his obligations as well as to maintain the security of the system. Users shall provide such reasonable co-operation and assistance as the STU/ may require in such circumstances. The STU/SLDC shall however refer all such cases for ratification in the next meeting of the review panel.

## 1.8 Non - Compliance

1. If any User fails to comply with any provision of the Grid Code, the User shall inform the Grid Code Review Committee without delay the reason for its non-compliance and shall remedy its non-compliance promptly.
2. Consistent failure to comply with the Grid Code provisions may lead to disconnection of the User's plant and /or facilities.

## 1.9 Code Responsibilities

1. In discharging its duties under the Grid Code, STU has to rely on information which Users shall supply regarding their requirements and intentions.

2. STU shall not be held responsible for any consequences that arise from its reasonable and prudent actions on the basis of such information.

## 1.10 Confidentiality

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.

2. STU shall not, other than as required by the Grid Code, disclose such information to any person other than Central or State Government without the prior written consent of the provider of the information.

## 1.11 Dispute Settlement Procedures

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

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

## 1.12 Directive

State Government may issue policy directives in certain matters as per section 37 of the Electricity Act 2003. STU shall promptly inform the Commission and all Users of the requirement of such directives.

## 1.13 Compatibility with Indian Electricity Grid Code

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

## 1.14 The Power Department functioning as integrated Utility

The functions of STU, SLDC, generating stations, Distribution Licensees shall be performed by the concerned officers authorised by the Power Department as long as it continues to function as an integrated Utility.

## CHAPTER – 2: Management of Grid Code

### 2.1 Introduction

1. The State Transmission Utility (STU) is required to implement and comply with the Grid Code and to carry out periodic review and amendments of the same with the approval of Joint Electricity Regulatory Commission for the States of Manipur & Mizoram (JERC (M&M)). A Grid Code Review Committee shall be constituted by STU, as required in this Chapter, comprising of the representatives of the Users of the Transmission System.

2. No change in this Grid Code, however small or large, shall be made without being deliberated and agreed by the Grid Code Review Committee and thereafter approved by JERC (M&M). However, in an unusual situation where normal day to day operation is not possible without revision of some clauses of Grid Code, a provisional revision may be implemented before approval of JERC (M&M) is received, but only after discussion at a special Review Panel Meeting convened on emergency basis. JERC (M&M) should promptly be intimated about the provisional revision. JERC (M&M) may issue directions requiring STU to revise the Grid Code accordingly as may be specified in those directions and STU shall promptly comply with any such directions.

3. STU will be responsible for managing and implementing the Grid Code for discharging its obligations with the Users. STU will not be, however, required to incur any expenditure on account of travel etc., of any other member of the panel other than its own representative.

### 2.2 Objective

The objective of this Chapter is to define the method of management of Grid Code documents, implementing any changes / modifications required and the responsibilities of the constituents (Users) to effect that change.

### 2.3 Grid Code Review Committee

1. Grid Code Review Committee shall be established separately for each STU of Manipur & Mizoram States.

2. The Chairperson of the Grid Code Review Committee shall be an Engineer of the STU not below the rank of Superintending Engineer. The Member Secretary of the Committee shall also be nominated by STU. The Review Committee shall consist of the following members on the recommendations of the heads of the respective organizations:

   (a) One Superintending Engineer (Generation) of State Power Department.
   (b) One representative at senior executive level from NorthEastern Regional Load Despatch Centre (NERLDC)
   (c) One representative at senior executive level from Distribution System

(d) One representative at senior executive level from each of the generating companies feeding not less than 50 MW to the State Grid.
(e) One representative from small generating stations of less than 50 MW capacity on rotation basis.
(f) One member from the State Government connected with Electricity Affairs of the State.
(g) Any other member co-opted when directed by JERC (M&M)

3. The functioning of the committee shall be co-ordinated by STU. The Member Secretary nominated by STU shall be the convener.

4. STU shall inform all the Users, the names and addresses of the Review Committee Chairperson and the Member Secretary at least 7 days before the first Review Committee meeting. Any subsequent changes shall also be informed to all the Users by STU. Similarly, each user shall inform the names and designations of their representatives to the Member Secretary of the Review Committee, at least three days before the first Review Committee meeting, and shall also inform the Member Secretary in writing regarding any subsequent changes.

## 2.4 Functions of the Grid Code Review Committee

The functions of the Review Committee are as follows:
(a) Maintenance of the Grid Code and its working and continuous scrutiny and review of Grid Code.
(b) Consideration of all requests for review made by any User and publication of their recommendations for changes in the Grid Code together with reasons for such changes.
(c) Provide guidance on interpretation and implementation of the Grid Code.
(d) Examination of the problems raised by any User as well as resolution of the problems.
(e) Ensuring that the changes / modifications proposed in the Grid Code are consistent and compatible with Indian Electricity Grid Code (IEGC).
(f) Analysis of major Grid disturbances soon after their occurrence and constitute the sub committee to investigate the reasons thereof.

The Grid Code Review Committee may hold any number of meetings as required subject to the condition that at least one meeting shall be held in every three months. Sub-meetings may be held by STU with the Users to discuss individual requirements and with groups of Users to prepare proposals for Review Panel's consideration.

## 2.5 Review and Revisions

1. The Users seeking any amendment to the Grid Code shall send written requests to the Member Secretary of the Review Committee. If the request is sent to Commission directly, the same shall be forwarded to STU. STU shall examine the proposed changes / modifications in line with IEGC stipulations and circulate the same along with its comments to all Review Committee members for their written comments within a reasonable time frame. Whenever it is observed that a certain clause of Grid Code is not consistent with the IEGC, then the same will be discussed in the Review Committee meeting and the clause will be revised to make it consistent with IEGC.

2. All the comments received shall be scrutinized and compiled by STU. These along with STU's comments shall be sent to all the members for their response for the proposed change / modification. If necessary, STU shall convene a meeting of the Review Committee for deliberations. The Member Secretary shall present all the proposed revisions of the Grid Code to the Review Committee for its consideration.

3. Based on the response received, STU shall finalise its recommendation regarding the proposed modification / amendment and submit the same along with all the related correspondence to JERC (M&M) for approval.

4. STU shall send the following reports to the JERC (M&M) at the conclusion of each review meeting of the panel:
   (a) Report on the outcome of such review.
   (b) Any proposed revision to the Grid Code.
   (c) All written representations and objections submitted by the Users at the time of review.

5. All revisions to the Grid Code require the approval of JERC (M&M). STU shall publish revisions to the Grid Code, after the approval of JERC (M&M). STU may submit proposals for relaxation in such cases where Users have difficulties in meeting the requirements of the Grid Code.

6. Any 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 revised version noting the number of every changed sub section, together with reasons for such change.

7. STU shall maintain copies of the Grid Code with the latest amendments and shall make it available at a reasonable cost to any person requiring it. This may also be made available on the website as soon as feasible. The STU shall keep an upto date list of recipients of all the copies of the Grid Code, if found necessary to ensure that the latest version of Grid Code is reached to all the relevant recipients.

8. The Commission, may, on the application of the Users or otherwise, call the emergency meeting of the review panel as and when the situation so dictates and make such alterations or amendments in the Grid Code as it thinks fit.

## CHAPTER – 3: System Planning

### 3.1 Introduction

1. This chapter specifies the technical and design criteria and methods for data submission by Users to STU for planning and development of the State Transmission System. This chapter also specifies the procedures to be adopted by STU in the planning and development of the State Transmission System.

2. Requirement for reinforcement or extension of the State Transmission system arise due to many reasons of which a few are mentioned below:

i) Development on a User's system already connected to the State Transmission System.
ii) 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 power compensation.
v) Need to increase system capacity, to remove operational constraints and to maintain standards of security to accommodate a general increase in the demand.
vi) Transient and steady state stability considerations
vii) Cumulative effect of any combination of the above

3. 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.

4. Development State Transmission system must be planned well in advance to ensure consents and way leaves to be obtained and detailed engineering design / construction work to be completed and so STU will require information from Users and vice versa. To this effect, the planning code imposes time lines for exchange of necessary information between STU and Users.

### 3.2 Objective

This Chapter formulates the procedures for the 'System Planning' to enable STU in consultation with the Users, to evolve an efficient, coordinated, secure and economical State Transmission System to satisfy requirements of future demand.

### 3.3 Planning Policy

1. STU would develop a perspective transmission plan for next 5 years for the State Transmission System. These perspective transmission plans shall be updated every year to take care of the revisions in load projections and generation capacity additions. The perspective plans shall be submitted to the Commission for approval.

2. STU shall carryout network studies and review fault levels for planning system strengthening and augmentation.

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 Distribution Licensees. These shall include details of demand forecasts, data methodology and assumptions on which forecasts are based. These forecasts would be annually reviewed and updated, and also whenever major changes are made in the existing system.
ii) Prepare a transmission plan for the State Transmission System compatible with the above load forecast and generation plan. Reactive Power (VAR) compensation needed will also be included.
iii) To prepare and submit a long term (10 years) plan to the Commission for transmission system expansion to fully meet both energy and peak demand.

iv) To extend full support to CTU to finalise the annual planning. corresponding to a 5 year forward term for identification of major inter-state transmission system including inter - regional schemes which shall fit in with the long term plan developed by CEA.

4. All Users shall supply to STU, the planning data prescribed in Appendix A and Appendix B of Data Registration Chapter within 3 months from the date of notification of the Grid Code Regulations and thereafter such data shall be furnished by 31st March every year to enable STU to formulate and finalise the updated plan by 30th September each year for the next 5 years.

### 3.4 Planning Criterion

1. The planning criterion shall be based on the security philosophy on which both Inter State Transmission System (ISTS) and the State Transmission System (STS) have been planned. The security philosophy shall be as per the Transmission Planning criteria and guidelines given by CEA.

2. The State Transmission System 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 directions of the Commission.

### 3.5 Planning responsibility

1. The primary responsibility of load forecasting within distribution licensee's area of supply rests with the respective Distribution Licensees. The Distribution Licensee shall determine peak load and energy forecast 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 demand forecasts, data, methodology and assumptions on which 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 inter connection points between STU and Distribution Licensees and shall include annual peak load and energy projections.

2. Generating stations 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 augmentation of transmission proposals and submit the same annually by 31st March to STU.

3. The planning for strengthening the State Transmission System for evacuation of power from outside state stations shall be initiated by STU.

### 3.6 Planning data

1. State Generating Companies / IPPs / licensees are to supply following two types of data to STU for developing transmission plan:
   (i) Standard Planning Data
   (ii) Detailed Planning Data

**Standard Planning Data:-**

(i) Standard Planning data consists of details which are expected to be normally sufficient for the STU to investigate the impact on the State Transmission System (STS) due to user development.

(ii) Standard Planning data covering, (a) preliminary project planning data (b) committed project data and (c) connected planning data should be furnished by the User, and Generating companies connected to STU.

**Detailed Planning data:-**

Detailed Planning data consists of additional more detailed data not normally expected to be required by STU to asses the impact of User development on the STS. This data shall be furnished by the Users of State Transmission System as and when requested by STU.

**Formats:**

The standard formats for submission of the data are given in the Data Registration Chapter.

2. 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 Chapter as under:

i) Standard Planning Data (Generation) / Standard Planning Data (Distribution) as per Appendix A.

ii) Detailed Planning Data (Generation) / Detailed Planning Data (Distribution) as per Appendix B.

3. To enable the Users to co-ordinate planning design and operation of their plants and systems with the State Transmission System, they may seek certain data of transmission system as applicable to them, which the STU shall supply from time to time as detailed under Data Registration Section categorized as;

(a) Standard Planning Data (Transmission) as per Appendix A.

(b) Detailed System Data (Transmission) as per Appendix B.

4. The one time data shall be submitted by all the Users to STU within six (6) months from the date of notification of this Grid Code Regulations.

5. STU shall also furnish to all the Users, Annual Transmission Planning Report, Grid Map and any other information as the Commission may specify.

**3.7 Implementation**

The actual programme of implementation of State transmission lines, inter – connecting transformers, reactors/capacitors and other transmission elements will be determined by

STU in consideration with the concerned Users. The completion of these works in the required time frame shall be ensured by STU through the concerned users.

## CHAPTER – 4: Connection Conditions

### 4.1 Introduction

This Chapter specifies the technical, design and operational criteria which shall be complied with by every User connected or seeking connection to the State Transmission System.

### 4.2 Objective

The objective of this Chapter is to ensure the following:

1. All Users and prospective Users are treated equitably.

2. Any new or modified connection shall not impose any adverse effect on the existing Users and new connections shall not suffer adversely due to existing Users.

3. A system of acceptable quality is ensured by specifying the required minimum standards for the design and operational criteria to assist the Users in their requirement to comply with the license obligations.

4. The ownership and responsibility for all equipments is clearly specified in a schedule "(Site Responsibility Schedule)" for every site where a Connection is made.

### 4.3 Procedure for application for connection to Transmission System

The procedure for any new connection or modification of an existing connection with the State Transmission System shall consist of following:

1. The User shall submit the application to STU containing all the information as specified in Data Registration Chapter.

2. STU shall make a formal offer within 60 days of the receipt of the application for obtaining any consent necessary for the purpose. The offer shall specify duly taking into account, any works required for the extension or reinforcement of the State Transmission System necessitated by the applicant's proposal.

3. If the specified time limit for making the offer against any application is not adequate, STU shall make a preliminary offer within the specified time indicating the extent of further time required for detailed analysis.

4. 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.

5. In the event of offer becoming invalid or not accepted by the applicant, STU shall not be bound to consider any further application from the same applicant within 12 months unless the new application is substantially different from the original application.

6. The applicant shall furnish the Detailed Planning Data as per Appendix-B.

**4.4 Rejection of application**

(1) STU shall be entitled to reject any application for connection to or use of the State Transmission System due to the following reasons apart from others as considered reasonable:

i) 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 criteria or covenants or deeds or regulations by which STU is bound.
ii) If the applicant does not undertake to be bound, in so far as applicable, by the terms of the Grid Code.
iii) If the applicant fails to give confirmation and undertakings according to this section.

(2) In the event of any dispute with regard to rejection of application by STU, the User may approach the Commission

**4.5 Connection Agreement**

(1) All Users connected to or seeking connections to the STU shall enter into connection agreement with the STU.

A connection agreement, or the offer for a connection agreement shall include within its terms and conditions the following:

i) A condition requiring both parties to comply with the provisions of the Grid Code.
ii) Details of connection charges and/or use of system charges.
iii) Details of any capital related payments arising from necessary reinforcement or extension of the system.
iv) Details of Plants and equipments to be connected.
v) A Site Responsibility Schedule (Appendix-G).

**4.6 Site responsibility schedule**

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

i) Ownership of the equipment
ii) Responsibility for control of equipment
iii) Responsibility for maintenance of equipment
iv) Responsibility for operation of equipment

v) Responsibility for all matters relating to safety of any person at the connection / interface site.
vi) Management of the Connection / Interface site.

2. The format to be used in the preparation of Site Responsibility Schedule is given in Appendix – G.

**4.7 System Performance**

1. The Design and Construction of all the equipment connected to the State Transmission System shall satisfy the relevant Indian Standard Specifications. In case of equipment for which Indian Standard Specifications do not exist, the appropriate IEC, or IEEE or other International Standards shall apply.

2. Installation of all electrical equipment shall comply with IE Rules, 1956 which are in force for time being and will be replaced by new rules made under Electricity Act, 2003.

3. For every new / modified connection sought the STU shall specify the connection point, technical requirements and the voltage to be used, along with metering and protection requirements as specified in the Metering Code and Protection Code.

4. Insulation coordination of the User's equipment shall conform to the applicable values as per Indian Standards. Rupturing capacity of the switchgear shall not be less than that specified as per Indian Standards.

5. Protection schemes and metering schemes shall be as detailed in the Protection Code and Metering Code.

6. The State Transmission System rated frequency shall be 50.00 Hz and shall normally controlled within the limits as per Regulations/Standards issued by the Authority.

7. The Users shall be subject to the Grid discipline prescribed by SLDC and NERLDC.

8. The variation of voltage at the interconnected point should not be more than voltage range specified below:

| Nominal (KV) | Maximum (KV) | Minimum (KV) |
|---|---|---|
| 400 | 420 | 360 |
| 220 | 245 | 200 |
| 132 | 145 | 120 |
| 33 | 36 | 30 |

9. Protection schemes and metering schemes shall be as detailed in the Protection code and Metering code.

10. In the event of Grid disturbances in the North Eastern Regional Grid, STU shall not be liable to maintain system parameters within the normal range of voltage and frequency.

## 4.8 Connection Points / Interface points

1. State Generating Station (SGS) and STU:

   - Voltage may be 400/220/132/33 KV or as agreed with STU.
   - Unless specifically agreed with STU, the Connection point with generating station shall be the terminal isolator provided just before the outgoing gantry of the feeders.
   - SGS shall operate and maintain all terminals, communication and protection equipments provided within the generating station.
   - The provisions for the metering between generating station and STU system shall be as per the Metering Code.
   - Respective Users shall maintain their equipments from the going out feeders' gantry onwards emanating from generating station

2. Distribution Licensee and STU:

   - Voltage may be LV side of power transformer i.e. 33 KV or 11 KV or as agreed with STU. For EHV consumers directly connected to transmission system, voltage may be 400KV /220 KV/ 132 KV.
   - Unless specifically agreed with Distribution Licensee, the Connection point with STU shall be the terminal isolator provided just before the outgoing gantry of the feeder to Distribution Licensee or individual EHV consumer as the case may be. from STU sub-station.
   - STU shall operate and maintain all terminals, communication and protection equipments provided within its sub-station. The provisions for the metering between STU and Distribution Licensee systems shall be as per the Metering Code. Respective Users shall maintain their equipment beyond the out going gantry of feeders emanating from STU sub-station onwards.

3. NorthEastern Regional Transmission System and STU:

   - The Connection, protection scheme, metering scheme and the voltage shall be in accordance with the provisions of IEGC.

4. IPPs, CPPs, EHV Consumers and Open Access Customers and STU:

   - Voltage may be 220/132/33 KV or as agreed with STU.

- When IPPs, CPPs, EHV Consumers or the Open Access Customers own sub-stations, the Connection point shall be the terminal isolator provided just before the gantry of outgoing/incoming feeder in their premises as mutually agreed.

**4.9 Data Requirements**:

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

- 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 its ownership.

## CHAPTER – 5: SYSTEM SECURITY ASPECTS

### 5.1 Introduction

All Users shall endeavor to operate their respective power system and generating stations in synchronism with each other at all times, such that the State Grid operates as synchronised system as integrated part of North-Eastern Regional Grid. The STU shall endeavor to operate the inter state links in such a way that 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.

### 5.2 Scope

The System Security relates to entire inter – connected power system including that of Users. The operation of the State Transmission System will be controlled and maintained by SLDC as per directions and instructions of NERLDC.

### 5.3 System Security

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

   i) IEGC
   ii) NERLDC's instructions/guidelines
   iii) Grid Code
   iv) State Government's directives.

2. No part of the State Transmission System shall be deliberately isolated from the integrated grid except under the following conditions;

   i) Emergency situations that may result in total grid collapse.
   ii) Isolation of the system to prevent serious damage to important /costly equipment.
   iii) When such isolation is specifically instructed by SLDC.

iv) On operation of under frequency / islanding scheme as approved at North Eastern Region level.

3. Complete synchronization shall be restored as soon as conditions permit. The restoration process shall be supervised by SLDC.

4. The 132 KV and above transmission lines ( except radial lines which do not affect the operation of the Grid) and the inter connecting power transformers should not be opened or removed from service without instructions or prior clearance from the SLDC. Under emergencies where prior clearance from SLDC is not possible, it should be intimated to SLDC at the earliest possible time after the incident and get the clearance, while bringing back these lines into service.

5. Any tripping, whether manual or automatic of transmission lines of 132 KV and above or power transformers of 132 KV class shall be promptly reported to the SLDC at the earliest along with the reasons for such tripping and the likely time required for restoration. The information / data including that down loaded from disturbance recorder, sequential event recorder etc. required for the purpose of analysis shall be sent to SLDC. While the restoration of tripped equipment / line, SLDC shall be informed and get the clearance.

6. All thermal and hydro (except those with zero pondage) 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 50 MW size is required to be operated without its governor in normal operation, the NERLDC through SLDC shall be immediately intimated about the reason and duration of such operation. The exemption for free governor mode operation 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.

7. Facilities available with Load limiter, 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.

8. All generating units operating at or upto 100% of their maximum continuous rating shall normally be capable of (and shall not be prevented from) picking up 5% extra load, more than the declared maximum continuous rating, for atleast five minutes or within the technical limits specified by the manufacturers, when the frequency falls due to a system contingency. In case any generating unit of 50 MW and above size does not meet this requirement for any period, the generating company should intimate the same to SLDC along with reasons thereof. Any generating unit not capable of complying with above provisions either due to not having requisite facilities or otherwise shall seek exemption from CERC under clause 1.8 of IEGC.

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 NERLDC and Distribution Licensees 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 or ownership) be increased without obtaining approval from SLDC.

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 SLDC, particularly when frequency is deteriorating.

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 50 MW capacity is required to be operated without its AVR in service, the same should be operated only after prior concurrence of SLDC.

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.

13. State Generating Stations and other generating stations connected to the Grid shall follow the instructions of SLDC for backing down/boxing up (ramping-down) and shutting down the generating unit(s). SLDC shall provide the certificate for the period of the backing down/ backing up or shutting down for the purpose of computing the deemed generation, if required.

14. All positive efforts shall be taken for frequency management and voltage management as indicated in Chapter 13 so as to ensure system security from these considerations.

15. Each User and Transmission Licensee shall provide adequate and reliable communication facility internally and with State Load Despatch Centre, other Users and other Transmission Licensees to ensure exchange of data/information necessary to maintain reliability and security of the grid. Wherever possible, redundancy and alternate path shall be maintained for communication along important routes, e.g., SLDC to Users.

16. User and Transmission Licensee shall send the requested information/data including disturbance recorder/sequential event recorder output etc to State Load Despatch Centre for purpose of analysis of any grid disturbance/event. No User or Transmission Licensee shall block any data/information required by the State Load Despatch Centre for maintaining reliability and security of the State or Regional Grid and for analysis of an event.

## Chapter – 6 : Operation Planning

### 6.1 Introduction

This Chapter describes the process by which the SLDC carries out the operational planning and demand control procedures.

### 6.2 Objective

The detailed procedure is required to enable SLDC to achieve a reduction in demand to avoid operating problems on all parts of the State Transmission System. SLDC will utilize demand control in a manner, which does not unduly indiscriminate against any one or group of consumers.

## 6.3 Demand Estimation

1. The Distribution Licensee shall formulate a short–term demand forecast considering the previous financial year as base and projecting the demand for the succeeding 5 years.

2. It shall be the responsibility of all Distribution Licensees to fully cooperate with STU in preparation of demand forecast for the entire state.

3. The long term demand estimation / load forecast (for more than 1 year) shall be done by STU and SLDC shall be provided with a copy of the same as and when it is finalized.

4. The Distribution Licensees shall provide to the STU and SLDC their estimates of demand for each inter connection point for the next financial year by 31st January of each year. Distribution Licensees shall also provide daily demand for the month ahead at each inter connection point by 25th of the month.

5. Based on the data furnished by the Distribution Licensees, STU shall make monthly peak and lean period demand estimates for year ahead and daily peak and lean period demand estimates for the month ahead and furnish the same to SLDC.

6. The Distribution Licensee shall provide to SLDC on day ahead basis, at 9.00 hrs, each day their estimated demand for each 15 minute block for the ensuing day. The Distribution Licensee shall also provide to SLDC estimates of loads that may be shed, when required, in discreet blocks with details of arrangement of such load shedding.

7. The SLDC would upto date demand forecast (in MW as well as KWh) on quarterly, monthly, weekly and ultimately on daily basis which would be used in the day – ahead scheduling.

## 6.4 Demand Control

1. Automatic load shedding shall be resorted to by means of installation of the Under Frequency Relays at the sub stations of the STU as per the directions of the SLDC to preserve the overall integrity of the power system. The number and size of the discrete blocks using Automatic Under Frequency Relays for Load Shedding shall be determined on rotational basis in consultation with every Distribution Licensee. The frequency settings of these relays shall be coordinated in consultation with the RLDC.

2. Whenever restoration of large portions of the total demand disconnection effected by the automatic load shedding is not possible within a reasonable time, the SLDC shall implement additional disconnection manually, to restore an equivalent amount of demand disconnected.

   Each Distribution Licensee shall help the SLDC in identifying such load blocks. Load shed by the operation of automatic load shedding devices shall not be restored without specific directions from the SLDC.

3. Planned manual load shedding shall be implemented by the SLDC when there is a shortfall in generation, or constraints in Transmission System, or reduction of imports through external connection etc., requiring demand control to control the over-drawl of power from ISGS. In

such cases a rotational load shedding scheme shall be adopted to ensure equitable treatment for all consumers as far as practicable.

4. Emergency manual load shedding to deal with unacceptable voltage and frequency levels etc. shall be implemented by the SLDC when loss of generation, mismatch of generation with the demand, constraints in the transmission system, over-drawal from the grid in excess of respective schedule affecting the frequency of the regional grid below 49 Hz, requiring load shedding at short notice or no notice, to maintain a regulating margin.

5. These control measures shall not be withdrawn till the system frequency improves and when the SLDC issues such instructions after review of the situation.

### 6.5 Load Crash

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

i. Lifting of the load restrictions, if any
ii. Exporting the power to neighbouring regions/ states
iii. Backing down of thermal stations with a time lag of 5-10 minutes for short period in merit order.
iv. Closing down of hydel units (subject to non spilling of water and effect on irrigation) keeping in view the inflow of water into canals and safety of canals/hydel channels.

The above methodology shall be reviewed from time to time.

(2) While implementing the above, the system security aspects should not be violated as per provisions in Section 5.3 of the Grid Code Regulations.

## Chapter –7 : Outage Planning

### 7.1 Introduction

This Chapter describes the procedure by which STU shall carry out the planning of outage in the State Transmission System, including interface co-ordination with Users.

### 7.2 Objective

The objective of this Chapter is to define the process which will allow STU to optimise planned transmission Outages with SGS's (other than CPP) and Distribution Licensee's, outages in co-ordination with outage planning of regional system while maintaining system security to the extent possible.

### 7.3 Outage Planning Process

(1) Each User shall provide their outage programme for ensuing financial year to SLDC for preparing an overall outage plan for the State Transmission System as a whole.

SLDC shall be responsible for analyzing the outage schedules of all Users including SGS, Distribution Licensees, STU and Transmission Licensee(s) schedules for outage of Transmission network and preparing a draft annual Outage Plan for the State Transmission System in coordination with the Outage Plan prepared for the region by NERLDC. The Users shall furnish the information to SLDC as per Appendix-C.

(2) However, SLDC is authorised to defer the outage in case of any of the following events.

- Major grid disturbance
- System Isolation
- Black out in the State
- Any other event in the system that may have an adverse impact on system security by the proposed outage

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

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

**7.4 Annual Outage Planning**

1. Scheduled outage of power stations of capacity 10 MW & above and EHV lines as notified by SLDC from time to time, will be subject to annual planning.

2. SGS (except CPPs) connected to the State Grid shall furnish their proposed Outage programme for the next financial year in writing by 15th November each year.

3. SGS 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 shall review the outage programme received from SGS on monthly basis to chalk out the outage of the State Transmission System.

4. 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 programme shall contain identification of lines/ substations, reasons for outage, outage start date and duration of outage.

5. Scheduled outage of power stations and EHV transmission lines affecting regional power system shall be affected only with the approval of NERLDC in co-ordination with SLDC.

6. Scheduled outage of power stations of capacity 10 MW and above, of all EHV lines and HV lines forming interconnection between two EHV substations (and these notified as such by SLDC) shall be approved by SLDC, 24 hours in advance based on prevalent operating conditions.

7. In respect of scheduled outage referred in this section a calendar shall be formulated in respect of annual outage planning for the ensuing financial year.

### 7.5 Availing of shutdowns schedule

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 5.7.4(g) of the IEGC, it may 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.

## Chapter – 8 : Contingency Planning

### 8.1 Introduction

This Chapter describes the steps in the recovery process to be followed by all Users in the event of failure of the State Grid or North Eastern Grid resulting in total or partial collapse of the System causing blackouts.

### 8.2 Objective

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

### 8.3 Contingency Planning Procedure

1. SLDC shall be prepared to face and efficiently handle the following types of contingencies and restoration of system back to normal:

   - Partial system blackout in the state due to multiple tripping of the Transmission lines emanating from power stations/sub-stations
   - Total black out in the state/region
   - Synchronisation of system islands and system split

2. In case of partial blackout in the system/state, priority is to be given for early restoration of power station units, which have tripped. Start-up power for the power station shall be extended through shortest possible route and within shortest possible time from adjoining sub-station/ power station where the supply is available. Synchronising facility shall be available at all power stations and 220 Kv, 132 Kv sub-stations having inter-connection with Inter State Transmission System.

3. In case of total regional blackout, SLDC In-charge shall co-ordinate and follow the instructions of NERLDC for early restoration of the entire grid. Start-up power to the thermal stations shall be given by the hydel stations or through interstate supply, if available. All possible efforts shall be 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 conditions.

For safe and fast restoration of supply, SLDC shall formulate the proper sequence of operations for major generating units, lines, transformers and load within the state in consultation with NERLDC. The sequence of operations shall include opening, closing/tripping of circuit breakers, isolators, on-load tap-changers etc.

**8.4 Restoration Procedure**

(1) Detailed procedure for restoration of the State Transmission System shall be prepared by SLDC for the following contingencies and shall be in conformity with the System Restoration Procedure of the North Eastern Region prescribed under IEGC.
- Total System Black out
- Partial System Blackout
- Synchronisation of System Islands and System Split

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

**8.5 Special Considerations**

(1) During process of restoration of the State Transmission System or Regional System blackout conditions, normal standards of voltage and frequency need not be applied and left to the discretion of the SLDC.

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

(3) All Users shall pay special attention to carry out the procedures so that secondary collapse due to undue haste or inappropriate loading is avoided.

(4) 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 and placed before the Grid Code Review Panel in its next meeting.

**8.6 Post Disturbance Analysis.**

SLDC as per guidelines and instructions from NERLDC shall carry out the post analysis of disturbance occurrence of all major grid disturbances resulting into total or partial system blackout and out of synchronization of any part of the state grid. All users shall enable SLDC analyse the system disturbance and furnish report to NERLDC.

## Chapter – 9 : Inter User Boundary Safety

### 9.1 Introduction

This Chapter specifies the requirements for safe working practices for maintenance of equipment associated with inter-user boundary operations and 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.

### 9.2 Objective

The objective of this section is to achieve an agreement and consistency on the principles of safety as prescribed in the Indian Electricity Rules 1956 which are in force for time being and will be replaced by the rules made under Electricity Act, 2003 when working across the inter user boundary between one User and another User.

### 9.3 Designated Officers

STU and all Users shall nominate suitable authorized persons to be responsible for the co-ordination of safety across their boundary. These persons shall be referred to as Designated Officer(s) (or control person(s).

### 9.4 Procedure

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

(2) All Users with a direct inter user boundary with STU or other User system shall issue a similar list of their Designated Officers to STU or other User(s), which shall be updated promptly whenever there is a change in the list.

(3) Whenever work across a cross boundary / an inter-user boundary is to be carried out, the Designated Officer of the User including STU itself, 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 agencies.

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

(5) The Designated Officer(s) 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.

(6) Work shall not commence until the Designated Officer of the User including STU itself, 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.

(7) 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.

(8) The equipment shall only be considered as suitable for connecting back to service when all safety measures are confirmed as removed, by direct communication using code word contact between the two Designated Officers, and after ensuring that the return of agreed safety documentation (PTW) from the working party has taken place.

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

(10) Any dispute concerning inter user boundary safety shall be resolved at the level of STU if STU is not a party. In case STU is a party, the dispute shall be referred to JERC (M&M) for resolution of the dispute.

### 9.5 Special Consideration

(1) For inter-user boundary between STU and other User's circuits, all Users shall comply with the agreed safety rules, which must be in accordance with IE Rules or Rules framed under the Act.

(2) 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 him. All safety logs shall be retained for a period of not less than 10 years.

## Chapter -10: Operational Event Information Reporting

### 10.1 Introduction

This Chapter describes the reporting procedure of reportable events in the State Transmission System

### 10.2 Objective

The objective of this Chapter 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.

### 10.3 Reportable Events

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 relating to major circuit breaker, transformer or bus bar.
c. Loss of major Generating Unit. System split, State Transmission System breakaway or Black Start.

d. Tripping of transmission Line, ICT (Inter connecting transformer) and capacitor banks.
e. Major fire incidents.
f. Force-Majeure condition like flooding or lightening etc.
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.

**10.4 Reporting Procedure**

1) Reporting time for events and accidents

All reportable incidents occurring on lines and equipment of 33 KV and above and all the lines on which there is the inter user flow affecting the State Transmission System shall promptly be reported orally by the User whose equipment has experienced the incident (the reporting User) to any other significantly affected Users and to SLDC. The reporting user should submit a written confirmation to SLDC within one hour of such oral report.

If the reporting incident is of major nature then the Reporting User shall submit an initial written report within two hours to 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.

In other cases the Reporting User shall submit a report within 5 (five) days to SLDC.

2) SLDC shall 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 shall be as agreed by the State Grid Code Review Committee, but will typically contain the following information:

i. Location of incident.
ii. Date and time of incident.
iii. Plant or equipment involved.
iv. Details of relay indications with nature of fault implications.
v. Supplies and quantum interrupted and duration if applicable.
vi. Amount of generation lost if applicable.
vii. Brief description of incident.

viii. Estimate of time to return to service.
ix. Name of Organisation
x. Possibility of alternate arrangement of supply

### 10.5 Reporting Form

The standard reporting form other than accidents shall be as agreed from time to time by the Grid Code Review Committee. A typical form is attached (APPENDIX-H).

### 10.6 Major Failure

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

### 10.7 Accident Reporting

Reporting of accidents shall be in accordance with the section 161 of the Electricity Act, 2003 and the rules framed thereunder. Notice of accident and failure of supply or transmission of electricity shall be in the specified form to the Commission and the Electrical Inspector

## Chapter – 11 : Scheduling and Load Despatch

### 11.1 Introduction

This Chapter specifies the procedure to be adopted for scheduling and load despatch of SGS and ISGS to meet system demand and drawal allocation requirements of Distribution Licensees.

### 11.2 Objective

The objective of this Chapter 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 the schedules.

### 11.3 General

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

1. SLDC will issue despatch instructions required to regulate all generation and imports from IPPs / CPPs according to the 15-minute day ahead generation schedule. In the absence of any despatch instruction by SLDC, SGS shall generate/ export according to the day- ahead generation schedule.
2. The SLDC shall regulate the overall state generation in such a manner that generation from following types of power stations shall not be curtailed:

1) Run of river or canal based hydro stations.
2) Storage type hydro-stations when water level is at peak reservoir level or expected to touch peak reservoir level as per inflows.
3) Despatch instructions to SGS shall be in standard format to be communicated by SLDC.

**11.4 Generation Scheduling**

**1. <u>Steps in Scheduling</u>**

Step by step procedure for scheduling of ISGS and SGS/IPP/CPP shall be as described below:

i. By 9.00 hours every day each SGS shall intimate to SLDC the station wise ex- power plant MW and MWh capabilities foreseen for the next day i.e. between 00.00 to 24.00 hrs of the following day, at 15 minutes interval.
ii. By 9.00 hours every day each Distribution Licensees shall intimate SLDC the overall requirement in MW and MWh for the next day at 15 minutes interval.
iii. After receipt of the information in regard to the availability from different sources, the SLDC shall review aggregate generating capability of SGS and the bilateral interchanges, if any, vis-à-vis Distribution Licensees requirements.
iv. By 15.00 hrs, SLDC shall finalise (a) generation schedule of SGS and (b) drawal schedule of each Distribution Licensees. It shall accordingly advise each Distribution Licensees of their drawal schedule and will workout and convey to NERLDC for net drawal schedule in each of the ISGS along with the bilateral exchanges agreed or intended to be had with the other state / states and the estimates of demand / availability in the state and additional power it would like to draw subject to availability.
v. By 1700 hrs, NERLDC shall convey to SLDC the drawal schedule for the State from each of the ISGS and SLDC shall convey to SGS the generation schedule and drawal schedule to Distribution Licensees by 1900 hrs.
vi. SGS and each Distribution Licensees may inform the modifications / changes to be made, if any, in the above schedule to SLDC by 21.30 hours.
vii. SLDC after considering the same shall convey revised schedule to NERLDC by 22.00 hrs.
viii. On receipt of information and after due consultations, the NERLDC shall issue the final generation and drawal schedule by 23.00 hrs, and SLDC shall inform the same to all concerned.

2. SLDC shall prepare the day ahead generation schedule keeping in view the followings:
(i) Transmission System constraints from time to time.
(ii) 15 minute 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 SGS, Central Sector Generators and others together with any constraint in each case.

3. During the day of operation, the generation schedule may be revised under following conditions:
i. In case of forced outage of a unit of any SGS, SLDC may revise the generation schedule on the basis of revised declared capability by the affected SGS.

ii. NERLDC may revise the schedule of drawal from North - Eastern Region and consequently SLDC shall enforce the revisions within State.

### 11.5 Drawal Scheduling

SLDC is responsible for collection, examination and compilation of drawal Schedule for each Distribution Licensees in prescribed manner and at the prescribed time. Each Distribution Licensee shall supply to SLDC 15-minute average demand estimates in MW for the day ahead.

### 11.6 Generation Despatch

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

2. Despatch 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, tele-printer or otherwise

### 11.7 Responsibilities

1. SLDC shall monitor actual power drawal against scheduled power drawal and regulate internal generation and demand to maintain this schedule. SLDC shall also monitor reactive power drawal and availability of capacitor banks.

2. Generating Stations within state shall follow the despatch instructions issued by SLDC.

3. Distribution Licensees and Open Access Customers shall comply with the instructions of SLDC for managing load & reactive power drawal as per system requirement.

## Chapter –12 : Monitoring of Generation and Drawal

### 12.1 Introduction

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

The monitoring of actual drawal against schedule is important to ensure that STU and Distribution Licensees contribute towards improving system performance and observe Grid discipline.

### 12.2 Objective

The objective of this section is to define the responsibilities of all SGS 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.

**12.3 Monitoring Procedure**

(1) For effective operation of the State Transmission System, it is important that a SGS's declared availability is realistic and that any departures from the availability are invariably reported to the SLDC.

(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 SGS's declared availability may not match the actual availability or declared output does not match the actual output.

(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.

(4) SLDC shall inform a SGS, 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 State 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. Continued default by the generating stations entails penalty as may be determined by the Commission.

(5) SGS (excluding CPPs) shall provide to SLDC 15-minute block-wise generation summation outputs where no automatically transmitted metering or SCADA/RTU equipment exists. CPPs shall provide to SLDC 15-minute block-wise export / import MW and MVAr.

(6) The SGS shall provide any other logged readings that SLDC may reasonably require, for monitoring purposes where SCADA data is not available.

**12.4 Generating Unit Trippings**

(1) SGS shall promptly inform SLDC of the tripping of a Generating Unit, with reasons in accordance with Chapter - 12 'Operational Event/Accident Reporting'. SLDC shall intimate NERLDC about the trippings and their revival. SLDC shall keep a written log of all such trippings, including the reasons with a view to demonstrating the effect on system performance and identifying the need for remedial measures.

(2) SGS shall submit a more detailed report of Generating Unit trippings to SLDC on monthly basis.

**12.5 Monitoring of Drawal**

(1) SLDC shall continuously monitor actual MW Drawal by Distribution Licensees and other users against their schedules through use of SCADA equipment wherever available, or

otherwise using available metering. SLDC shall request NERLDC and adjacent States as appropriate to provide any additional data required to enable this monitoring to be carried out.

(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.

### 12.6 Data Requirement

SGS shall submit data to SLDC as listed in Data Registration Chapter (Appendix C-5)

## Chapter -13: Frequency and Voltage Management

### 13.1 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 voltage of the State Transmission System.

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

SLDC shall accordingly instruct Generating Stations to regulate Generation 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.

The State Transmission System voltage levels can be affected by Regional operation. The STU 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 SGS to regulate MVAr generation within their declared parameters. SLDC shall also instruct Distribution Licensees to regulate demand, if necessary.

### 13.2 Objective

The objectives of this section are as follows:

(1) To define the responsibilities of all Users in contributing to frequency and voltage management.

(2) To define the actions required to enable SLDC and STU to maintain the State Transmission System voltages and frequency within acceptable levels in accordance with IEGC guidelines as well as Planning and Security Standards for the Inter State Transmission System specified by the Central Commission, if any.

### 13.3 Frequency Management

1) The rated frequency of the system shall be 50 Hz and shall normally be regulated

within the limits specified in Connection Conditions. STU and SLDC shall make all possible efforts to ensure that grid frequency remains within 49.2 – 50.3 Hz band.

2) Falling frequency

Under falling frequency conditions, SLDC shall take appropriate action to issue instructions, in co-ordination with NERLDC to arrest the falling frequency and restore frequency within permissible range. Such instructions may include despatch instruction to SGS to increase generation and/or instruction to Distribution Licensees and Open Access Customers to reduce load demand by appropriate manual and/or automatic load shedding.

3) Rising Frequency

Under rising frequency conditions, SLDC shall take appropriate action to issue instructions to SGS in co-ordination with NERLDC to arrest the rising frequency and restore frequency within permissible range. SLDC shall also issue instructions to Distribution Licensees and Open Access Customers in coordination with NERLDC to lift Load shedding (if exists) in order to take additional load. In case of Load Crash, SLDC shall take steps as per Para 6.5 of the Grid Code Regulations.

**13.4 Voltage Management**

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 5.2 (r) and IE Rules 1956 as re-produced below:

Voltage (KV rms)

| Nominal | Maximum | Minimum |
|---|---|---|
| 400 | 420 | 360 |
| 220 | 245 | 200 |
| 132 | 145 | 120 |
| 33 | 36 | 30 |

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 SGS to maintain specified voltage level at interconnecting points.

SLDC shall continuously monitor 220 KV and 132 KV voltage levels at strategic sub-stations.

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 Distribution Licensees at 33 KV substations, operation of Hydro unit as synchronous condenser and use of MVAr reserves with SGS within technical limits agreed to between STU and Generators. Generators shall inform SLDC of their reactive reserve capability promptly on request.

4) Distribution Licensees and Open Access Customers 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.

## Chapter –14: Protection

### 14.1 Introduction

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

### 14.2 Objective

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

2. Minimum protection requirements are prescribed because inadequate protection or mal operation of protection system of any entity may result in far reaching consequences, disturbances and even damages to the system of other entities.

### 14.3 General Principles

1. 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, stability and sensitivity.

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

3. Protective Relay settings shall not be altered, or protection relays bypassed and/or disconnected without consultation and agreement between all affected Users. In a case where protection is bypassed and/or disconnected by an 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 shall be removed from service forthwith.

### 14.4 Protection Coordination

The settings of protective relays starting from the generating unit upto the remote end of 132 KV / 33 KV lines shall be such that only the faulty section is isolated under all circumstances.

The STU / Transmission Licensee shall notify the initial settings and any subsequent changes to the Users from time to time. Routine checks on the performance of the protective relays shall be conducted and any malfunction shall be noted and corrected as soon as possible. The STU / Transmission Licensee shall conduct the required studies for deciding the relay settings, with the data collected from the Users. If necessary, Protection Coordination Committee (PCC) with representatives from the generating companies, STU and Distribution Licensees shall be constituted to meet periodically to discuss any malfunctions, changes in the system configuration, if any, and possible revised settings of relays.

### 14.5 Fault Clearance Times

1. From stability consideration, 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, shall be as follows:

| Nominal Voltage | Target Fault clearance | |
|---|---|---|
| (KV) | Time (m.sec) | |
| 400 | 100 | |
| 220 | 120 | |
| 132 | 160 | |
| 33 | 300 | |

2. Lower 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 Distribution Licensees / Open Access Customers directly connected to Transmission System. At generating stations, line faults should be cleared at the generation station end within the critical clearing time so that the generators remain in synchronism.

### 14.6 Generator Requirements

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

**14.7 Transmission Line Requirements**

(1) General

Every EHV line taking off from a Generating Station or a sub-station or a switching station shall have protection and back up protection as mentioned below. STU shall notify Users of any changes in protection system.

Switchgear equipment and Relay Panels for the protection of lines of STU taking off from a Generating Station shall be owned and maintained by the 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 with STU. 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.

(2) 220 KV Transmission Lines

All 220 KV transmission lines owned by STU shall have two fast acting protection schemes.

Main 1 protection scheme shall be numeric, three zone, non-switched fast acting distance protection scheme with permissible inter-trip at remote end (in case of zone-2 fault). The scheme shall have power swing blocking, location of fault recording, disturbance recording, event logger, communication port, single and three shot auto reclosing as well as Local Breaker Backup (LBB).

Main 2 protection scheme shall be static/ numeric, three zone, switched/ non-switched fast acting distance protection scheme having all features as main- 1 except auto reclosing and Local Breaker Backup (LBB).

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

(3) 132 KV Lines

A single scheme three zone, non-switched numeric distance protection with standard built in features like single and three phase tripping, carrier inter-tripping, IDMT over current and earth fault, power swing blocking and LBB protection 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 radial lines, appropriate alternative protection schemes may be adopted.

(4) 33 KV Lines

All 33 KV lines at connection points / Interface points shall be provided with a minimum of over current and earth fault relays as follows:

(i) Radial Feeders:
Directional over current and Earth Fault Relays with suitable settings to obtain discrimination between adjacent relay settings.

(ii) Parallel / Ring Feeders: .
Directional Time Delay over current and Earth Fault Relays.

**14.8 Transformer Requirements**

(1) The protection of EHV 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.

The following minimum protections should be provided for transformers:

i. All 220 KV class power transformers shall be provided with numeric fast acting 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 HV and LV 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.

ii. For 132 KV and 33 KV class transformers of capacity 5 MVA and above, the protection shall be same as mentioned in 14.8 (1) (i) except over-fluxing, REF and PRV relays.

iii. For 132 KV and 33 KV 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.

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

**14.9 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 provisions in I.E. Rules or rules framed under Electricity Act 2003.

**14.10 Calibration and Testing**

The protection scheme shall be tested at each 220 KV, 132 KV and 33 KV sub-station by STU once in six months 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 respective SGS.

## Chapter -15: Metering Code

### 15.1 Introduction

This Chapter prescribes a uniform policy in respect of electricity metering in the State Transmission System amongst the utilities i.e. STU, Generating Companies, Distribution Licensees and for the Open Access Customers in the State Transmission system, EHV and HV Consumers of Distribution Licensees directly connected to the State Transmission System.

### 15.2 Objective

The objective of this Chapter is to define minimum acceptable standards of metering equipment which shall provide proper metering of the various operating system parameters for the purpose of accounting, commercial billing and settlement of electrical energy and to provide information which shall enable to operate the system in economic manner.

### 15.3 Scope

(1) The scope of this Metering 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.

(2) This Metering code sets out or refers to the requirements of metering at generating stations, sub-stations and interfaces for tariff and operational metering.

(3) This Metering 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 Metering code broadly indicates the technical features of various elements of the metering, data communication and testing system.

### 15.4 Applicability

This Metering Code shall apply to:

i) STU/Transmission Licensees
(ii) Generating Stations connected to State Transmission System
(iii) Distribution Licensees connected with State Transmission System
(iv) EHV Consumers of Distribution Licensee(s) directly connected to State Transmission System
(v) Open Access Customers availing Open Access on State Transmission system
(vi) Captive Generators connected to State Transmission System

### 15.5 Reference Standards

All the equipment installed under this Code shall necessarily conform to the relevant standards as specified in the Central Electricity Authority's Standards/Regulations on Installation and Operation of Meters.

## 15.6 Meter Installation

1. Ownership

The ownership of the metering system shall be as provided in relevant agreement governing exchange of power and if no agreement exists then the ownership of the metering system shall belong to the User in whose premises the metering equipment is installed.

2. Safety of Meters:

The User (Supplier or Buyer) in whose premises the interface meters are installed shall be responsible for their safety.

3. Right to Install Energy Meters

Each User shall extend necessary assistance and make available the required space to the other User for installation of the metering equipment and provide required outputs of the specified current and voltage transformers to facilitate installation of Meters, RTUs and associated equipment in their premises.

4. Access to Equipment and Data

Each User on request, shall grant full right to install metering equipments and RTUs to other User's employees, agents/duly authorized representative. The other Users shall also have access to metering locations for inspecting, testing, calibrating, sealing, replacing the damaged equipment, collecting the data, joint readings of meters and metering equipments, and other functions necessary jointly or otherwise as mutually agreed.

5. Operation and Maintenance of the Metering System

The operation and maintenance of the metering system includes proper installation, regular maintenance of the metering system and RTUs, 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 MRI, attending any breakdown/ fault on the metering system etc.

6. Type of Meters and Metering Capability

The meters shall be all electronic (static) poly phase tri-vector type having facility to measure active, reactive and apparent energy/power in all four quadrants i.e. a true import export meter. All inter-user meters shall be bi-directional while capacitor bank meters and sub-station aux. meters may be unidirectional.

Meters shall have downloading facilities of Metered data through Meter Reading Instrument (MRI)

**ABT compliant energy meters shall be provided at such interface points, wherever the energy exchange is based on Availability Based Tariff (ABT).**

## 15.7 Various Standards for Metering Equipment

(1) The minimum specifications for the metering equipment are given below.

**Table 1**

| S. No. | Particulars | METER TYPE | | | | | |
|---|---|---|---|---|---|---|---|
| | | Main & Check | Back up | Capacitor Bank | Sub-Stn Auxiliary | Inter Distributi-on Licensees | Secondary Back up |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **(1)** | **Accuracy class** | | | | | | |
| (a) | Meter | 0.2 | 0.2 | 0.5 | 1.0 | 0.2 | 0.2 |
| (b) | CTs | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| (c) | PTs / CVTs | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| (d) | CT-PT sets for 33 KV feeders | 0.2 | Existing | Existing | Existing | Existing | Existing |
| **(2)** | **Salient aspect of meters** | | | | | | |
| (a) | Phase angle and ratio error compensation of CTs & PTs | No | No | No | No | No | No |
| **(b)** | **Communication port** | | | | | | |
| (i) | Optical port | Yes | Yes | No | No | Yes | Yes |
| (ii) | For remote reading | Yes | Yes | No | No | Yes | Yes |
| (c) | Whether both Import & Export features required | Yes | Yes | No | No | Yes | Yes |
| (d) | Meter memory for 45 days | Yes | Yes | No | No | Yes | Yes |

(2) Minimum Technical Requirements for Energy Meter

(i) 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 -40% to +20%.

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.

(ii) Measuring Elements:

a. The meter shall be 3 phase 4 wire type, capable to record and display import and export KWh, KVArh, KVAh and maximum demand in kW and KVA for 3 phase 4 wire AC balanced/ unbalanced load for a power factor having range of zero lagging to unity to zero leading in all 4 quadrants. In addition, meter shall also be capable of displaying, on demand, the present status of supply/load, missing potential, CT polarity, current unbalance, anomaly occurrence and logging of occurrences as well as load survey data etc. which shall be down loaded to a user friendly Base Computer System (BCS) through portable data collection devices or MRI which shall be connected to optical communication port of the meter. Meter shall be equipped with self-diagnostic features also and be capable of recording average values based on their integration on time base for KWh, KVArh, KVAh for at least 45 days. Meter shall be capable of measuring fundamental as well as total energy including harmonics separately.

b. Energy measurement during demand period shall be such that sampling in the meter is synchronized with the end of the time block otherwise energy measured in a demand period but not stored in that period shall be carried forward. An LED glow or pulse output coincident with end of each demand period need be provided in the meter so as to ensure that demand integration coincided the preset time block.

(iii) Display

Present meter status, real time and date, cumulative energy registers, voltage, currents, power factor, present demand, frequency and meter serial number shall be available on demand through push button. Any interrogation/read operation shall not delete or alter any stored meter data.

(iv) Memory

a. Numerical values of voltage/current, power factor and cumulative energy registers as well as anomalies/tampered details along with date and time of logging of and restoration of anomalies (subject to the meter memory space) shall be logged in the meter memory and shall be available for retrieving with the help of the data collection devices (MRI) through meter optical port and down loading to PCS.

b. Memory in a static tri-vector meter shall not get 'erased' after reading or retrieving of data through MRI. Data shall be retained for a minimum of 45 days or shall not get erased from meter until replaced by fresh data. However, desired data can be erased from MRI, when

memory of a MRI becomes full after downloading of readings of a number of meters, as there is fixed space made available in CMRI for;

(i) Energy registers.

(ii) Load survey data.

(iii)Anamoly data etc.

When a fresh data is logged in the memory, the oldest data shall disappear automatically

(v) Test terminal blocks

The test terminal blocks shall be provided on all meters to facilitate testing of meters in service. Main & back up meters of inter state / major generating stations shall be having the feature of draw out type modular units and shall have automatic CT short circuiting so that meter can be taken out for testing without shut down requirements.

(vi) Meter Power Supply

Meters of inter state / major generating stations shall be capable of powered with 230 volt alternating current auxiliary supply and 110 volt or 220 volt DC supply of the substation so that metering core of PT/CVT is never loaded and in case of shut down on feeder/breaker, meter can be interrogated locally or remotely. It shall normally be powered by AC auxiliary supply and shall be switched over to DC supply only when AC auxiliary supply fails.

(vii) Battery back-up

The meter shall have battery back up (2 years), for its Real Time Clock (RTC).

(viii) Meter Programmability

The meters shall be equipped with necessary hardware/software to suit tariff requirements such as ABT, TOD, two-part tariff based on SMD as may be called for from time to time.

(ix) Immunity to External Factors:-

The meters shall be immune to external influences like Magnetic induction, Vibration, Electro static discharges, switching transients, Surge voltages, oblique suspension and harmonics.

(3) Minimum Technical Requirement for Current Transformer (CT)

a. Three single-phase type current transformers shall be used for 3 phase 4 wire and 3 phase 3 wire measurement system. The secondary current rating of the CTs shall be 1 ampere particularly for 220 KV, 132 KV, 66 KV measurements. However existing CTs with 5-ampere secondary current shall also be acceptable provided the connected meters and instrument have base 5 ampere current rating. For other voltages, 1 ampere or 5 ampere shall be employed.

b. The current transformers shall have dedicated core for metering and wherever feasible, the 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 a Government test house or Government recognized test agency shall be referred to.

c. 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.

(4) Minimum Technical Requirement for Voltage Transformers (VT)

a. Either Electromagnetic Voltage Transformers (EVT) or Capacitive Voltage transformer (CVT) should be used for metering purpose. Generally, term VT is used to cover either EVT or CVT. The secondary voltage per phase shall be 110/ 3 volts or 415/ 3 volts. Either dedicated VTs or dedicated core of VTs shall be provided for metering and that wherever feasible, VTs (or their cores) feeding to main meters and backup/check meters shall be separate. Fuses of proper rating shall be provided at appropriate locations in the VT circuit.

b. 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 should be referred to.

c. 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.

d. The current transformers and voltage transformers shall meet the requirements as per the relevant standards. Where a combined CT/PT unit is provided, the accuracy shall be as specified under relevant IS.

**15.8 Testing Arrangement**

1) Two types of test facilities shall be available:

   a. Meter test bench with high accuracy, static source and 0.02S class electronic reference standard meter (RS Meter) shall be used for testing and calibration of meters. Meter Testing Laboratories duly equipped with testing benches and other equipment's shall be established at suitable locations for testing and calibration of meters by STU. The Meter Testing benches with 0.02S-class reference standard meter shall also be used for checking and calibration of portable testing equipment's. Testing, calibration and maintenance of Energy Meters shall conform to the requirement of IS: 9792 and Testing equipments shall conform to Indian Standards Specification IS: 12346.

   b. Portable test set with static source and electronic reference meter of 0.1 class shall be used for verification and joint testing of accuracy of static tri-vector meters at site on regular/routine basis.

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 to record energy during the testing period of the main meter so that while the main meter is under testing, the other meter continues to record energy during the period of meter remaining under testing.

3) Testing at site shall be carried out for all meters once in a year.

4) The Licensee shall allow the testing of Open Access Customers' meters at third party (National Accreditation Board for Testing and Calibration Laboratories (NABL) approved) Testing Labs in case the Customers so request for the same. In case of testing by third party (NABL approved) Testing Labs, the Open Access Customers shall apply with prescribed fee to the Licensee.

**15.9 Meter Reading**

The STU and concerned Generating Companies, CPP /Distribution Licensees, Open Access Customers as the case may be shall jointly read the meters through their authorized representatives preferably on 1st of every month at about 12.00 Hrs. / retrieve meter reading data using MRI/Tele metering.

**15.10 Joint Inspection, Testing, Calibrations**

1) The metering system located at metering points between Generating Companies, STU and Distribution Licensees shall be regularly inspected at least once in a year or at an interval lesser than 1 year as mutually agreed by both the agencies involved for dispatch and receipt of energy. Since the static tri-vector 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. 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.

2) Joint inspection shall also be carried out as and when difference in meter readings exceeds the sum of maximum error as per accuracy class of main and check meter. The meters provided at the sending end as well as at the receiving end shall be jointly tested/ calibrated on all loads and power factors as per relevant standards through static phantom load.

**15.11 Sealing**

(1) Tariff metering systems shall be jointly sealed by the authorized representatives of the concerned agencies as per the procedure agreed upon.

(2) Any seal, applied, shall not 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

(a) both main and check meters are malfunctioning or there occurs a fire or similar hazard and such removal is essential and such consent cannot be obtained immediately

(b) 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.

(3) Each agency 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.

(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 MRI or a remote meter reading system.

**15.12 Interface Metering Arrangement**

The metering system shall comprise of main and checkmeters. In the event of main meter becoming defective, billing shall be based on check meter reading.

**1) Generating Stations:**

a. Meters shall be installed on each Generator terminal, at each Unit Auxiliary Transformer (UAT), and all outgoing feeders at Generating Stations to work out energy generated and net energy delivered by the Power Station in the Grid.

b. For measurement of energy supplied by major generating stations within the state, meters shall be provided on each outgoing feeder at the power station designated as main meter for billing purpose as per commercial agreement and/or Grid Code Connectivity Conditions.

c. A Check Meter shall also be provided along with the Main Meter. Meters on each generator and each auxiliary transformer shall work as backup meters.

**2) Interstate Transmission and Inter-Regional Transmission System:**

Metering arrangement for Inter-State Transmission Lines and for Inter-Regional Transmission System shall be governed by IEGC. Special Energy Meters (SEM) capable of time-differentiated measurement (15 minutes) of active energy and voltage differentiated measurement of reactive energy as specified by CTU/NERLDC shall be provided on interstate and inter-regional transmission lines. STU shall comply with requirement for installation, meter reading & downloading and communication of readings of Special Energy Meters (SEM) to NERLDC as per operating procedure of NERLDC. STU may install its own Check Meters at inter-state/inter-regional transmission lines at the periphery of State Transmission System.

**3) Metering between STU and Distribution Licensee**

a. For measurement of power delivered by STU to Distribution Licensee, both main and check meters shall be provided on the LV side of EHV Power Transformer i.e. 33 KV

side of 220/33 KV and 33 KV side of 132/33 KV and 11 KV side of 132/33/11 KV and 11 KV side of 132/11 KV transformers installed in EHV sub-stations.

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

c. In case of EHV and HV industrial and other consumers directly fed from 220 KV, 132 KV or 33 KV sub-stations, tariff metering shall also be provided on outgoing feeder emanating from EHV and HV sub-station.

**4) Sub-station Auxiliary Consumption Metering**:

The STU 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, streetlights etc.) apart from sub-station auxiliary load, separate metering shall be provided on individual feeders.

**5) Open Access Customers**

The Inter-State Open Access Customers and the embedded Open Access Customers within the State Transmission System shall provide Special Energy Meters capable of time-differentiated measurement (15 minutes) of active energy and voltage differentiated measurement of reactive energy as specified by CTU/ RLDC. The Distribution licensee may provide Check Meters of the same specification as Main Meters.

**6) Operational Metering:**

Operational metering shall be provided wherever reasonably required by STU/ Generating Companies for applications other than tariff metering.

**15.13 Supervisory Control And Data Acquisition (SCADA)**

1) The STU shall install and make operative an operational Metering Data Collection System under SCADA for storage, display and processing of Operational Metering Data. All Users shall make available outputs of their respective Operational meters to the SCADA interface equipment.

2) The data collection, storage and display centre shall be the State Load Despatch Centre (SLDC).

3) Until SCADA is established, STU shall make suitable arrangements to collect the metering data.

### 15.14 Two part and TOD Tariff Capability

The metering arrangement for recording Distribution Licensee consumption/Power input in his area of supply shall consist of following:

Static tri-vector meters to be provided on LV secondary side of all EHV transformers. The function/duty of this meter will be as under:

a) Measurement of KWh/KVAh/KVARh supplied to Distribution Licensee for billing purpose.

b) KW/ KVA demand and power factor in 15 minute block-wise and as well as monthly drawn by Distribution Licensee on each EHV transformer.

## CHAPTER -16: Data Registration

### 16.1 Introduction:

This Chapter specifies a list of all the data required by STU and SLDC, which is to be provided by the Users, and the data required by Users to be provided by STU at the required time.

### 16.2 Objective

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

### 16.3 Responsibility

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

2. All Users shall provide STU and SLDC, the names, addresses and telephone numbers of the persons responsible for sending the data.

3. STU shall inform all Users and SLDC, the names, addresses, and telephone numbers of the persons responsible for receiving data.

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

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

### 16.4 Data to be registered

Data required to be exchanged has been listed in the Appendices to this section under various categories.

### 16.5 Changes in User's 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 its own system.

### 16.6 Methods of Submitting Data

(1) The data shall be furnished in the standard formats for data submission and such formats must be used for the written submission of data to SLDC and STU. Where standard formats are not enclosed they would be developed by SLDC or STU in consultation with Users.

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

(3) 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. 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.

### 16.7 Data not supplied

All Users are obliged to supply data as referred to in the individual Chapters of the Grid Code Regulations and listed out in the Data Registration Chapter Appendices. In case any data is not supplied by any User or is not available, STU or SLDC may, acting reasonably, if and when necessary, estimate such data depending upon the urgency of the situation. Similarly, in case any data is not supplied by STU, the concerned User may, acting reasonably, if and when necessary, estimate 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, deems appropriate.

### 16.8 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.

# APPENDIX A: STANDARD PLANNING DATA

(Reference to: Chapter 3 para 3.3 (4), para 3.6 (1,2,3) and Chapter 4 para 4.3 (6), para 4.9)

## A-1 STANDARD PLANNING DATA (GENERATION)

**For SGS – Thermal**

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

**(1) GENERAL**

| | | |
|---|---|---|
| i | Site | Furnish 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 | State 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 | |

**(2) CONNECTION**

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

**(3) STATION CAPACITY**

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

**(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<br>Rating (MW)<br>Speed (RPM)<br>Terminal voltage (KV)<br>Rated Power Factor<br>Reactive Power Capability<br>(MVAr) in the range 0.95 of leading and 0.85 lagging<br>Short Circuit Ratio<br>Direct axis (saturated) transient reactance (% on MVA rating)<br>Direct axis (saturated) sub-transient reactance ( % on MVA rating)<br>Auxiliary Power Requirement<br>MW and MVAr Capability curve<br>Ramp-up and ramp-down rate<br>Generator Characteristic curve |

| | | |
|---|---|---|
| iv | Generator Transformer | Make<br>Phases<br>Type<br>Rated capacity (MVA)<br>Voltage Ratio (HV/LV)<br>Tap change Range (+ % to - %)<br>Percentage Impedance (Positive Sequence at Full load) |

## A.1.2 HYDRO ELECTRIC (For SGS)

### (1) GENERAL

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

### (2) CONNECTION

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

## (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) | |

## (4) GENERATING UNIT DATA

| | | |
|---|---|---|
| I | Operating Head (in Metres) | a. Maximum<br>b. Minimum<br>c. Average |
| | Hydro Unit | Capability to operate as synchronous condenser.<br>Water head versus discharges curve (at full and part load)<br>Power requirement or water discharge while operating as synchronous condenser |
| i | Turbine | State Type and capacity |
| iii | Generator | Type<br>Rating (MVA)<br>Speed (RPM)<br>Terminal voltage (KV)<br>Rated Power Factor<br>Reactive Power Capability (MVAr) in the range 0.95 of leading and 0.85 of lagging<br>MW & MVAr capability curve of generating unit<br>Short Circuit Ratio<br>Direct axis transient (saturated) reactance (% on rated MVA)<br>Direct axis sub-transient (saturated) reactance (% on rated MVA)<br>Auxiliary Power Requirement (MW) |
| iv | Generator-Transformer | a. Type<br>b. Make<br>c. Phase<br>d. Rated Capacity (MVA)<br>e. Voltage Ratio HV/LV<br>f. Tap change Range (+% to -%)<br>g. Percentage Impedance (Positive Sequence at Full Load). |

## A.2 STANDARD PLANNING DATA (TRANSMISSION)

**For STU and Transmission Licensees**

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 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 |
| vii. | Approximate power flow expected- MW & MVAr. |
| 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 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 Distribution licensees**

### (1) GENERAL

| | | |
|---|---|---|
| i | Area Map (to scale) | Furnish map of Manipur/Mizoram duly marked with the area of supply relevant for the Distribution License . |
| ii | Consumer Data | Furnish categories of consumers, their numbers and connected loads. |
| iii | Reference to Electrical Divisions presently in charge of the Distribution. | |

**(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 | |

**(3) LINES AND SUBSTATIONS**

| | | |
|---|---|---|
| i | Line Data | Furnish lengths of line and voltages within the Area. |
| ii | Sub-station Data | Furnish details of 132/33 KV sub-stations, 33/11 KV sub-station, capacitor installations |

**(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/load 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 |

**(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 | 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. |

## (6) LOAD FORECAST DATA

| | |
|---|---|
| i | Peak load and energy forecast for each category of loads for each of the succeeding 5 years. |
| ii | Details of methodology and assumptions on which forecasts are based. |
| iii | Details of loads 1 MW and above.<br>a. Name of prospective consumer.<br>b. Location and nature of load.<br>c. Sub-Station from which to be fed.<br>d. Voltage of supply.<br>e. Phasing of load. |

## APPENDIX B: DETAILED PLANNING DATA

(Reference to: Chapter 3 para 3.3 (4), para 3.6 (1,2,3)and Chapter 4 para 4.6 (6), para 4.9)

### B.1 DETAILED PLANNING DATA (GENERATION)

### B.1. THERMAL POWER STATIONS (For SGS)

#### (1) GENERAL

i. Name of Power Station.

ii. Number and capacity of Generating Units (MW).

iii. Ratings of all major equipments (Boilers and major accessories, Turbines, Alternators, 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 Excitors)

viii. Earthing arrangements with earth resistance values.

#### (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.

#### (3) SWITCHYARD

i. In relation to interconnecting transformers:

1. Rated MVA.

2. Voltage Ratio.

3. Vector Group.

4. Positive sequence reactance for maximum, minimum, normal Tap. (% on MVA).
5. Positive sequence resistance for maximum, minimum, normal Tap. (% on MVA).
6. Zero sequence reactance (% on MVA).
7. Tap changer Range (+% to -%) and steps.
8. Type of Tap changer. (off/on load).

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

1. Rated voltage (KV).
2. Type of circuit breaker (MOCB/ABCB/SF6).
3. Rated short circuit breaking current (KA) 3 phase.
4. Rated short circuit breaking current (KA) 1 phase.
5. Rated short circuit making current (KA) 3 phase.
6. Rated short circuit making current (KA) 1-phase.
7. Provisions of auto reclosing with details.

iii. In relation to the Lightning Arresters Technical data

iv. In relation to the Communication Details of communication equipment installed at points of connections.

v. In relation to the Basic Insulation Level (KV) -

1. Bus bar.
2. Switchgear.
3. Transformer bushings.
4. Transformer windings.

**(4) 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) Xd.

viii. Direct axis (saturated) transient reactance (% on MVA) Xd'.

ix. Direct axis (saturated) sub-transient reactance (% on MVA) Xd".

x. Quadrature axis synchronous reactance (% on MVA) Xq .

xi. Quadrature axis (saturated) transient reactance (% on MVA) Xq'.

xii. Quadrature axis (saturated) sub-transient reactance (% on MVA) Xq".

xiii. Direct axis transient open circuit time constant (Sec) T'do.

xiv. Direct axis sub-transient open circuit time constant (See) T"do.

xv. Quadrature axis transient open circuit time constant (Sec) T'qo.

xvi. Quadrature axis sub-transient open circuit time constant (Sec) T"qo.

xvii. Stator Resistance (ohm)Ra.

xviii. Neutral grounding details.

xix. Stator leakage reactance (ohm) X1.

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 MVAr Capability curve

**(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.

**(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.

**(7) OPERATIONAL PARAMETERS:**

Minimum notice required to synchronize a Generating Unit from de- synchronization.

i. Minimum time between synchronizing different Generating Units in a Power Station.

ii. The minimum block load requirements on synchronizing.

iii. Time required for synchronizing a Generating Unit for the following conditions:

1. Hot
2. Warm
3. Cold

iv. Maximum Generating Unit loading rates for the following conditions:

1. Hot
2. Warm
3. Cold

v. (v) Minimum load without oil support (MW).

**(8) GENERAL STATUS**

i. Detailed Project report.

ii. Status Report

1. Land
2. Coal
3. Water

4. Environmental clearance

5. 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.

**(9) CONNECTION**

i. Reports of Studies for parallel operation with the State Transmission System.

ii. Short Circuit studies

iii. Stability Studies.

iv. Load Flow Studies.

v. Proposed Connection with the State Transmission System.

a. Voltage

b. No. of circuits

c. Point of Connection.

**B.1.2 HYDRO - ELECTRIC STATIONS (For SGS)**

**(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

c. Multipurpose

d. For Power

e. Operating Table with

1. Area capacity curves and

2. Unit capability at different net heads

**(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.

**(3) SWITCHYARD**

i. Interconnecting transformers:

1. Rated MVA

2. Voltage Ratio

3. Vector Group

4. Positive sequence reactance for maximum, minimum and normal Tap.(% on MVA).

5. Positive sequence resistance for maximum, minimum and normal Tap.(% on MVA).

6. Zero sequence reactance (% on MVA)

7. Tap changer range (+% to -%) and steps.

8. Type of Tap changer (off/on load).

9. Neutral grounding details.

ii. Switchgear (including circuit breakers, Isolators on all circuits connected to the points of Connection).

1. Rated voltage (KV).
2. Type of Breaker (MOCB/ABCB/SF6).
3. Rated short circuit breaking current (KA) 3 phase.
4. Rated short circuit breaking current (KA) 1 phase.
5. Rated short circuit making current (KA) 3 phase.
6. Rated short circuit making current (KA) 1 phase.
7. Provisions of auto reclosing with details.

iii. Lightning Arresters

Technical data

iv. Communications

Details of Communications equipment installed at points of connections.

v. Basic Insulation Level (KV)

1. Bus bar.
2. Switchgear.
3. Transformer Bushings
4. Transformer windings.

**(4) GENERATING UNITS**

i. Parameters of Generator

1. Rated terminal voltage (KV).
2. Rated MVA.
3. Rated MW
4. Speed (rpm) or number of poles.
5. Inertia constant H (MW sec./MVA).
6. Short circuit ratio.
7. Direct axis synchronous reactance Xd (% on MVA).
8. Direct axis (saturated) transient reactance (% on MVA) X'd.

9. Direct axis (saturated) sub-transient reactance (% on MVA) X"d.
10. Quadrature axis synchronous reactance (% on MVA) Xq.
11. Quadrature axis (saturated) transient reactance (% on MVA) X'q.
12. Quadrature axis (saturated) sub-transient reactance (% on MVA) X"q.
13. Direct axis transient open circuit time constant (sec) T'do.
14. Direct axis sub-transient open circuit time constant (sec) T"do.
15. Quadrature axis transient open circuit time content (sec) T'qo.
16. Quadrature axis transient open circuit time constant (sec) T"qo.
17. Stator Resistance (ohm) Ra.
18. Stator leakage reactance (ohm) X1.
19. Stator time constant (sec).
20. Rated Field current (A).
21. Neutral grounding details.
22. Open Circuit saturation characteristics of the Generator for various terminal voltages giving the compounding current to achieve this.
23. Type of Turbine.
24. Operating Head (metres)
25. Discharge with full gate opening (cumecs)
26. Speed Rise on total Load throw off(%).
27. MW and MVAr Capability curve

ii. Parameters of excitation control system:

iii. Parameters of governor:

iv. Operational parameter:

1. Minimum notice required to Synchronise a Generating Unit from de-synchronisation.
2. Minimum time between Synchronising different Generating Units in a Power Station.
3. Minimum block load requirements on Synchronising.

**(5) GENERAL STATUS**

i. Detailed Project Report.

ii. Status Report.

1. Topographical survey
2. Geological survey
3. Land
4. Environmental Clearance
5. Rehabilitation of displaced persons.

iii. Techno-economic approval by Central Electricity Authority.

iv. Approval of State Government/Government of India.

v. Financial Tie-up.

**(6) CONNECTION**

i. Reports of Studies for parallel operation with the State Transmission System.

1. Short Circuit studies
2. Stability Studies.
3. Load Flow Studies.

ii. Proposed Connection with the State Transmission System.

1. Voltage
2. No. of circuits
3. Point of Connection.

**(7) RESERVOIR DATA**

i. Dead Capacity

ii. Live Capacity

**B.1.3 GAS POWER STATIONS (For SGS Gas)**

**(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 Transformer 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 Excitors)

(viii) Earthing arrangements with earth resistance values.

(ix) Start up Engine

(x) Turbine Details

**(2) PROTECTION AND METERING**

(i) Full description including settings for all relays and protection systems installed on the Generating Units, Generator unit Transformer, Auxiliary Transformer and Electrical motor of major equipments.

(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 schems.

**(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

**(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) Xd.

(viii) Direct axis (saturated) transient reactance (% on MVA) Xd'.

(ix) Direct axis (saturated) sub-transient reactance (% on MVA) Xd".

(x) Quadrature axis synchronous reactance (% on MVA) Xq

(xi) Quadrature axis (saturated) transient reactance (% on MVA) Xq'

(xii) Quadrature axis (saturated) sub-transient reactance (% on MVA) Xq"

(xiii) Direct axis transient open circuit time constant (Sec) T'do.

(xiv) Direct axis sub-transient open circuit time constant (Sec) T"do.

(xv) Quadrature axis transient open circuit time constant (Sec) T'qo.

(xvi) Quadrature axis sub-transient open circuit time constant (Sec) T"qo.

(xvii) Stator Resistance (ohm) Ra.

(xviii) Neutral grounding details.

(xix) Stator leakage reactance (ohm) X1.

(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 MVAr Capability curve.

**(b) 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.

**(c) Parameter 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.

**(d) Operational parameters:**

(i) Minimum notice required synchronising a Generating unit from desynchronization.

(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).

**(5) 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.

**(6) CONNECTION**

(i) Reports of Studies for parallel operation with State Grid.

(a) Short Circuit Studies

(b) Stability Studies

(c) Load Flow Studies

(ii) Proposed Connection with the State Grid.

(a) Voltage

(b) No. of circuits

(c) Point of Connection.

**B.2 DETAILED SYSTEM DATA – TRANSMISSION**

**For STU and Transmission Licensees**

**(1) GENERAL**

i. Single line diagram of the Transmission System down to 66KV,33KV bus at Grid Sub-station detailing:

1. Name of Sub-station.
2. Power Station connected.
3. Number and length of circuits.
4. Interconnecting transformers.
5. Sub-station bus layouts.
6. Power transformers.
7. Reactive compensation equipment.

ii. Sub-station layout diagrams showing:

1. Bus bar layouts.
2. Electrical circuitry, lines, cables, transformers, switchgear etc.
3. Phasing arrangements.
4. Earthing arrangements.
5. Switching facilities and interlocking arrangements.
6. Operating voltages.
7. Numbering and nomenclature:
8. Transformers.
9. Circuits.
10. Circuit breakers.
11. Isolating switches.

**(2) LINE PARAMETERS (for all circuits)**

i. Designation of Line.

1. Length of line (Km).
2. Number of circuits Per Circuit values.
3. Operating voltage (KV).
4. Positive Phase sequence reactance (pu on 100 MVA) X1
5. Positive Phase sequence resistance (pu on 100 MVA) R1
6. Positive Phase sequence susceptance (pu on 100 MVA) B1
7. Zero Phase sequence reactance (pu on 100 MVA) X0
8. Zero Phase sequence resistance (pu on 100 MVA) R0
9. Zero Phase sequence susceptance (pu on 100 MVA) B0

**(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) X1

v. Positive sequence resistance, maximum, minimum and normal (pu on 100 MVA) R1

vi. Zero sequence reactance (pu on 100 MVA).

vii. Tap change range (+% to -%) and steps.

viii. Details of Tap changer. (Off/On load).

**(4) EQUIPMENT DETAILS (For all substations)**

i. Circuit Breakers

ii. Isolating switches

iii. Current Transformers

iv. Potential Transformers /CVTs

**(5) RELAYING AND METERING**

i. Protection relays installed for all transformers and feeders along with their settings and level of co-ordination with other Users.

ii. Metering Details.

**(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.

**(7) DEMAND DATA (For all substations)**

Demand Profile (Peak and lean load) for next 5 years.

**(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 Distribution Licensees**

### (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, 132/33 KV sub stations, 33/11KV substations, and consumer bus in case of consumers 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 220/123/33/11KV, 132/33/11KV, and 33/11KV sub-station of Licensee).

### (2) CONNECTION

i. Points of Connection (Furnish details of existing arrangement of Connection).

ii. Details of metering at points of Connection.

### (3) LOADS

i. Details of major loads of 1 MW and above to be contracted for next 5 years.

ii. Demand profile of Distribution System (Current & forecast)

## APPENDIX C: OPERATIONAL PLANNING DATA

**(Reference to: chapter 7 para 7.3 (1))**

### C.1 OUTAGE PLANNING DATA

#### 1 Demand Estimates

(For Distribution Licensees)

| Item | Due date/ Time |
|---|---|
| a) Estimated aggregate month-wise 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 |
| b) Estimated aggregate day-wise 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 |
| c) Hourly block-wise demand estimates for the day ahead. | 09.00 Hours every day. |

#### (2) Estimates of Load Shedding for Distribution Licensee

| Item | Due date / Time |
|---|---|
| a) Details of discrete load blocks that may be shed to compiy with instructions issued by SLDC when required, from each connection point. | Soon after connection is made |

#### (3) Year ahead outage progamme (For the financial year)

**(i) Generator outage programme for (SGS)**

| Item | Due date / Time |
|---|---|
| a) Identification of Generating Unit. | 15th November each year |
| b) MW, Which will not be available as a result of Outage. | |
| c) Preferred start date and start-time or ranges of start dates and start times and period of outage. | |
| d) If outages are required to meet statutory requirement, then the latest – date by which outage must be taken. | |

**(ii) Affecting Intra – State Transmission System**

| Item | Due date / Time |
|---|---|
| a) MW, which will not be available as a result of Outage from Imports through external connections. | 15th November each year |
| b) Start date and start time and period of Outage. | |

**(iii) Year ahead CPP's outage progamme (Affecting Intra – State Transmission System)**

| Item | Due date / Time |
|---|---|
| a) MW, which will not be available as a result of Outage from Imports through external connections. | 15th November each year |
| b) Start date and start time and period of Outage. | |

**(iv) Year ahead Distribution Licensees outage progamme**

| Item | Due date / Time |
|---|---|
| a) Loads in MW not available from any connection point. Identification of connection point. | 15th November each year |
| b) Period of suspension of drawal with start date and start time. | |

**(v) STU's Overall outage progamme**

| Item | Due date / Time |
|---|---|
| a) Report on proposed outage programme to NERB | 15th February each year |
| b) Release of finally agreed outage plan | 15th February each year |

## C-2. GENERATION SCHEDULING DATA

(Reference to: Chapter 11)

**SCHEDULE AND DISPATCH (For SGS, IPPs and CPPs)**

| Item | Due date/ Time |
|---|---|
| **Day ahead Hourly block-wise MW/MVAr availability (00.00 - 24.00 Hours).** | **09.00 hrs** |
| a) Status of Generating Unit Excitation AVR in service (Yes/No). | 09.00 hrs |
| b) Status of Generating Unit Speed Control System. Governor in service (Yes/No). | 09.00 hrs |
| c) Spinning reserve capability (MW). | 09.00 hrs |
| d) Backing down capability with/without oil support (MW). | 09.00 hrs |
| **Hydro reservoir levels and restrictions.** | **09.00 hrs** |
| a)Generating Units Hourly block-wise summation outputs (MW). | 09.00 hrs |
| b) Day ahead Hourly block-wise MW entitlements from Central Sector Generation Power Stations from NERLDC. | 09.00 hrs |

## C-3 CAPABILITY DATA

(Reference to: Chapter 13)

**For SGS**

| Item | |
|---|---|
| a) Generators and IPPs shall submit to STU up-to-date capability curves for all Generating Unit. | On receipt of request from STU / SLDC. |
| b) 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

(Reference to: Chapter 13)

**For SGS**

FREQUENCY AND VOLTAGE MANAGEMENT(For SGS)

| Item | |
|---|---|
| a) 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. |
| b) Secondary response in MW to frequency changes | On receipt of request from STU / SLDC. |

## C-5 MONITORING OF GENERATION

(Reference to: Chapter 12)

**For (SLDC)**

**MONITIRING OF GENERATION AND DRAWAL (For SGS)**

| Item | |
|---|---|
| a) SGS shall provide 15-minute block-wise generation summation to SLDC. | Real time basis |
| b) CPPs shall provide 15-minute block-wise export / import MW to SLDC. | Real time basis |
| c) Logged readings of Generators to SLDC. | As required |
| d) 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

(Reference to: Chapter 8)

**For SGS**

**CONTINGENCY PLANNING (For SLDC)**

| Item | Due date/ Time |
|---|---|
| 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

(Reference to: Chapter 14)

**PROTECTION:**

| Item | Due date/Time |
|---|---|
| a) 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 |
| b) 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

(Reference to: Chapter 15)

**E.1 METERING**

| Item | Due date/ Time |
|---|---|
| a) SGS shall submit details of metering equipment and schemes installed by them as referred in B-1. Detailed Planning Data under sub-section "Protection and Metering" | As applicable to Detailed Planning Data |
| b) STU s 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

### F.1 SYSTEM PLANNING

**(a)** The State Grid 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 Intra State Transmission system may vary according to directives of JERC for Manipur & Mizoram.

**Planning Criterion:**

The planning criterion is based on the security philosophy on which ISTS and Intra State Transmission system has been planned. The security philosophy shall be as per the Transmission Planning Criteria of the Regulation and other CEA guidelines.

(i) As a general rule, the ISTS shall be capable of withstanding and secured against the following contingency outages without necessitating load shedding or generation during Steady State Operations:

- Outage of 132 KV D/C line or,
- Outage of a 220KV D/C line or,
- Outage of a 400 KV S/C line or,
- Outage of a single Interconnecting Transformer, or,

(ii) The above contingencies shall be considered assuming a pre – contingency system depletion (Planned outage) of another 220 KV line or 400 KV 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

**(d)** In all Sub – stations (132 Kv and above), at least two transformers shall be provided.

## APPENDIX G: SITE RESPONSIBILITY SCHEDULE

(Reference to: Chapter 4 para 4.6 (2))

Name of Power Station / Sub – Station:

Site Owner:

Site Manager:

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 | | | | | | |
| Fee lers | | | | | | |
| | | | | | | |
| | | | | | | |
| Gene ating units | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## APPENDIX H: INCIDENT REPORTING (OTHER THAN ACCIDENTS)

(Reference to: Chapter 10 para 10.5)

First report

Date:_____

Time:_____

| S.N | Item | Details |
|---|---|---|
| 1 | Date and time of incident | |
| 2 | Location of incident | |
| 3 | Type of incident | |
| 4 | System parameters before the incident (voltage, frequency, flows, generation etc.) | |
| 5 | Relay indications received and performance of protection | |
| 6 | Damage to equipment | |
| 7 | Supplies interrupted and duration, if applicable | |
| 8 | Amount of generation lost, if applicable | |
| 9 | Possibility of alternate supply arrangement | |
| 10 | Estimate of time to return to service | |
| 11 | Cause of incident | |
| 12 | Any other relevant information and remedial action taken | |
| 13 | Recommendations for future improvement / repeat incident | |
| 14 | Name of the organization | |

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