

**Electricity Regulatory Commission (State Electricity  
Grid Code) Regulation, Tripura 2010**

# TRIPURA GAZETTE

*Published by Authority*  
**EXTRAORDINARY ISSUE**

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*Agartala, Friday, July 15, 2011 A. D., Asadha 24, 1933 S. E.*

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PART--I-- Orders and Notifications by the Government of Tripura,  
The High Court, Government Treasury etc.

## TRIPURA ELECTRICITY REGULATORY COMMISSION

No. E.25/TERC/2009/

Dated. Agartala, the 29th April, 2010.

### NOTIFICATION OF

### (Tripura Electricity Grid Code) Regulations, 2010.

In exercise of the powers conferred on Commission by sub section (1) and clause (zp) of sub section (2) of section 181 read with clause (h) of sub section (1) of section 86 of the Electricity Act 2003 (36 of 2003) the Tripura Electricity Regulatory Commission (TERC) hereby makes the following Regulations :-

#### Chapter-1

#### General:-

#### 1.1 Short title, commencement and interpretation :

- I. These Regulations may be called the Tripura Electricity Regulatory Commission (State Electricity Grid Code) Regulation, 2010 or in short TEGC.
- II. These Regulations shall come into force on the date of their publication in the official gazette unless otherwise stated in these Regulations and shall be concurrent within the area of jurisdiction of the Tripura Electricity Regulatory Commission.

#### 1.2 Definitions:

1.2.1 In these Regulations unless the context otherwise requires the

- (i) "Act" means the Electricity Act, 2003
  - (ii) "Agency/Entity" means Agency/Entity as specified in Tariff Regulations.
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- (iii) **"ALDC"** means Area Load Despatch Center.
- (iv) **"Automatic Voltage Regulator"** or **"AVR"** means a continuously acting automatic excitation control system to control the voltage at the generator terminals of a generating unit.
- (v) **"ABT"** means Availability Based Tariff as specified in the Tariff Regulations.
- (vi) **"Beneficiary"** means an agency who draws and/or injects power from/to State Grid
- (vii) **"Black Start Procedure"** or **"BSP"** means the procedure necessary to bring back normalcy in the Grid from a black out.
- (viii) **"Bilateral Exchange of Power"** means exchange of power under any agreement between the persons as allowed under the Act.
- (ix) **"CCGT"** means Combined Cycle Gas Turbine.
- (x) **"CEA"** means Central Electricity Authority.
- (xi) **"Commission"** means the Tripura Electricity Regulatory Commission in short called TERC.
- (xii) **"Constituents"** means any Agency/Entity connected to the State Grid System.
- (xiii) **"CPP"** means Captive Power Plant as specified in Tariff Regulations.
- (xiv) **"CTU"** means an Central Transmission Utility.
- (xv) **"Demand"** means the demand of active power in MW, reactive power in MVAR and apparent power in MVA of electricity unless otherwise mentioned.
- (xvi) **"Distribution Licensee"** means a person exempted either under section 13, or under section 8, or a person who has been granted a license by the Commission under section 14 of the Act including a deemed licensee under first third fourth and fifth proviso to the section 14 of the Act to distribute electricity within its area of supply.
- (xvii) **"Distribution Recorder"** or **"DR"** means a device provided to record the behavior of the pre-selected parameters of the system during an event.
- (xviii) **"EHT"** means extra high tension or extra high voltage (EHV) when the voltage exceeds 33000 volts, subject, however, to the percentage variations allowed by Safety Regulations.
- (xix) **"Entity"** means entity as defined in Tariff Regulations.

- (xx) **“Event”** means an unscheduled or unplanned occurrence on a Grid including faults, incidents, break downs and forced outage.
- (xxi) **“Event Logger”** or “EL” means an automatic device provided to record the sequence of operation in time of the relays/equipments at a location during an event.
- (xxii) **“Ex-Power Plant”** means net sent out of a generating station in MW/MWH measured at all outgoing lines/feeders from the generating station.
- (xxiii) **“Fault Locator”** or “FL” means a device installed at the end of a transmission line to measure/indicate the distance at which a line fault may have occurred.
- (xxiv) **“Force Majuro”** means any event which is beyond the control of the parties which they could not foresee or with a reasonable amount of diligence could not have foreseen or which could not be prevented and which substantially affect the performance by either party such as but not limited to :-
  - (a) Natural phenomena, including but not limited to floods, droughts, earthquakes and epidemics.
  - (b) Acts of any Government, domestic or foreign including but not limited to war declared or undeclared, hostilities, priorities, quarantines, embargoes.
  - (c) Riot or Civil commotion.
  - (d) Grid's failure not attributable to parties.
- (xxv) **“Forced Outage”** means an outage of a Generating Unit or a transmission facility due to a fault or other reasons which has not been planned.
- (xxvi) **“Generating Station”** means Generating Stations including CPPs.
- (xxvii) **“Governor Dropp”** means in relation to the operation of the Governor of a Generating Unit, the percentage drop in speed which would cause the Generating Unit under free governor action to change its output from zero to full load.
- (xxviii) **“GT”** means Gas Turbine.



- (xxxix) **"HT"** means High Tension (HT) or High Voltage (HV) where the voltage exceeds 650 Volt but not exceeds 33,000 volts under normal conditions, subject, however, to the percentage variation allowed under the Safety Regulations.
- (xxxx) **"Inter State Generating Station"** or "ISGS" means a generating station owned by any generating company in which two or more then two States have a share and whose scheduling is to be coordinated by the RLDC concerned.
- (xxxi) **"IE Rules"** means Indian Electricity Rules, 1956.
- (xxxii) **"Licensee"** means a person who has been granted license by the Commission under section 14 of the Act for distribution and/or transmission of electricity and also includes a deemed licensee under proviso to section 14 of the Act or persons exempted under section 13 or section 8 of the Act in the State.
- (xxxiii) **"LNG"** means Liquefied Natural Gas.
- (xxxiv) **"LT"** means Low Tension (LT) or low Voltage (LV) where the volage does not exceed 250 Volts, subject, however, to the percentage variations allowed under the Safety Regulations.
- (xxxv) **"MCR"** means Maximum Continuous Rating i.e. the maximum MW output capacity of a generating unit which is sustainable on a continuous basis under specified conditions.
- (xxxvi) **"MT"** means Medium Tension or Medium Voltage (MV) where the voltage exceeds 250 volts but does not exceed 650 volt under normal condition, subject, however, to the percentage variations allowed under Safety Regulations.
- (xxxvii) **"Open Access Customer"** means the Open Access Customer as defined in Open Access Regulations.
- (xxxviii) **"Open Access Regulations"** means the Open Access Regulation as specified in Tariff Regulations.
- (xxxix) **"Open Access Source"** means Open Access source as specified in Open Access Regulations.

- (xl) **"Pool Account"** means an account to be prepared and operated by SLDC for payments regarding Unscheduled interchanges and reactive energy exchanges in the State Grid.
- (xli) **"Power Purchase Agreement"** or **"PPA"** between the entities means the commercial agreement between two agencies for the purchase/sale of power.
- (xlii) **"REF Relays"** means Restricted Earth Fault Relay.
- (xliii) **"Regional Grid"** means the entire synchronously connected "Regional Grid" specified in the Grid Code and connected to the territorial jurisdiction for which RLDC has been established.
- (xliv) **"Regulations"** means the Regulations made under the Act.
- (xlv) **"RLDC"** means Regional Load Dispatch Centre concerned to the territorial jurisdiction under which State is being considered in accordance with sub-section (1) of section 27 of the Act.
- (xlvi) **"RPC"** means Regional Power Committee concerned to the Region under which State is being considered in accordance with the resolutions under clause (55) of section 2 of the Act.
- (xlvii) **"Rules"** means the Rules made under the 'Act' by the State Commission.
- (xlviii) **"ROR"** means the Run of the River.
- (xlix) **"Safety Regulations"** means Regulations framed by Authority under section 53 of the Act or Indian Electricity Rules, 1956.
- (l) **"SLDC"** means SLDC as specified in Tariff Regulations.
- (li) **"Spinning Reserve"** means reserve margin of part loaded generating capacity that is synchronized to the State Grid and is ready to provide increased generation at short notice pursuant to dispatch instruction or instantaneously in response to a frequency drop.

- (lii) **“Standing Committee”** for transmission planning means a committee constituted by the CEA to discuss, review and finalize the ISTS and associated Intra-State Transmission systems.
- (liii) **“STS”** or “State Transmission System” is consisting of Intra-State Transmission System of the State comprising of transmission lines of owners of dedicated transmission lines, STU and Transmission Licensees in State Grid.
- (liv) **“STU”** or “State Transmission Utility” means STU as specified in Tariff Regulations.
- (lv) **“State”** means State of Tripura.
- (lvi) **“State Government”** means Government of Tripura.
- (lvii) **“State Grid”** to be mean the entire synchronously connected grid of power system of the State including the State Transmission System along with the concerned grid of the Distribution Licensee with embedded generating stations, if any.
- (lviii) **“Static VAR Compensator”** or “SVC” means an electronically controlled facility designed for the purpose of generating or absorbing reactive power.
- (lix) **“Tariff Regulations”** means the Regulations framed by the Commission under section 61 of the Act.
- (lx) **“Transmission Licensee”** means Transmission Licensee as specified in Tariff Regulations.
- (lxi) **“Transmission System”** mean the transmission system as specified in the Tariff Regulations.
- (lxii) **“UFR”** means Under Frequency Relay.
- (lxiii) **“User”** means a person/agency using the Intra-State Transmission System
- (lxiv) **“VAR”** means Reactive Power.
- (lxv) **“TSECL”** means Tripura State Electricity Corporation Ltd.

- 1.2.2 Words and expression used and not defined in any of the Regulations shall have the meanings as defined in the Act.

**1.3 Applicability :-**

- 1.3.1 These Regulations are applicable to SLDC and all the entities connected to the State Grid and under the purview of TERC. In case of any inconsistency between the Indian Electricity Grid Code and State Grid Code, the provision of Indian Electricity Grid Code shall prevail.

**1.4 Introduction, Objective, Structure and Functional Responsibilities :**

**1.4.1 Introduction:-**

In Tripura State there is only one licensee namely TSECL who is responsible for entire distribution, transmission and generation of Power within the State. At present OTPC (ONGC -- Tripura Power Company Pvt. Ltd.), Power Grid Corporation of India Ltd., NEEPCO Ltd. are functioning in the State. TREDA (Tripura Renewable Energy Development Agency) is also endeavoring power generation from the Renewable Sources. SLDC (State Load Despatch Centre) is under TSECL, is monitoring Grid operations of the State Grid and RLDC (Regional Load Despatch Centre) Shillong is monitoring the Grid operation of the Regional Grid (NE Grid) in accordance with the Grid Code and as per agreed principles in the RPC in line with the stipulation of sub section (4) of section 29 of E.A. 2003.

**1.4.2 Objective :**

The TERC lays down

- (i) the principles, the guidelines and standards to be followed by various agencies and participants in the system to plan, develop, expand, maintain and operate the State Grid in most efficient, equitable, reliable, safe and economic manner.
- (ii) Suitable measures for connectivity with State Grid for all generating stations, transmission licensees and distribution licensees.
- (iii) The standard of the service for compliance by all participants with regard to quality and reliability.

- (iv) The ways and means of planning of the State Transmission System and its development.
- (v) The methods of operation of the State Grid under normal, abnormal and emergency conditions.
- (vi) Documentation of the principles and procedures, which define the relationship between various users of the STS and SLDC.
- (vii) Facilitates beneficial open access of electricity by providing a common basis of operation of STS applicable to all users of the system.
- (viii) Ensure economy and efficiency in the operation of the State Grid in the State and to achieve compliance with the grid standard on direction of SLDC by every licensee and others involved in operation of the State Grid.

#### 1.4.3 Functional Responsibilities:

The functions of STU, SLDC, entities and consumers shall be consistent with the provisions of the Act relevant to State Grid Code, their functions shall be as follows "-

##### (i) State Transmission Utility (STU) .

- (a) The STU shall play the main role for evacuation of power generated by generating stations that are connected to the STS, supply of power to entities engaged in distributing electricity, exchange of power among entities and exchange of power through inter-connection with CTU.
- (b) The STU shall also be responsible for coordinating, managing and servicing of the State Grid Code.
- (c) It shall also discharge functions of planning and co-ordination relating to STS with due co-relation with CTU, State Government, Entities, RPC, CEA and any other person notified by the State Government.
- (d) It shall ensure development of an efficient co-ordinated and economical system of Intra-State transmission lines for smooth flow of electricity from a generating station to the load centers.
- (e) The STU shall also be responsible for providing non-discriminatory open access to its transmission system subject to availability of adequate transmission facility for use by any licensee or generating station or any Open Access Customer on

payment of necessary transmission charges, other charges, fees and surcharges as provided in different Regulations specified by the Commission.

**(ii) State Load Despatch Centre (SLDC)**

The SLDC shall be the apex body in the STS operation to ensure integrated operation of the State Grid in the following manner:

- (a) The SLDC shall give such directions and exercise such supervision and control not inconsistent with the provisions of the Acts, Regulations, Codes and Standards made there under, as may be required for ensuring secured and integrated operation of the State Grid as also for achieving maximum economy and efficiency in the operation of the latter.
- (b) The SLDC shall comply with such principles, guidelines and methodologies in respect of transmission and wheeling and operation scheduling and dispatch of electricity as may be specified in the TEGC and other Regulations specified by the Commission.
- © All directions issued by the RLDC to any transmission licensee or owner of dedicated transmission lines in the State Grid or generating station in the State shall be issued through the SLDC.
- (d) The SLDC shall also be responsible for scheduling and dispatch of electricity in accordance with the contracts entered into with the entities operating under the purview of TERC.
- (e) Further, the SLDC shall be responsible for real time monitoring grid operations, keeping accounts of the quantity of electricity transmitted through the State Grid carrying out real time operation for grid control and dispatch of electricity within the region concerned to the RLDC through secured and economic operation of the State Grid in accordance with the Grid Standards and TEGC within the State and exercise supervision and control over the STS.
- (f) All entities and substation (s) in the State Grid shall comply with the direction by the SLDC.

**(iii) Distribution Licensee :**

A distribution Licensee shall inform the STU and the SLDC about the contracts entered into for importing/exporting power from/to different sources and shall assist

and co-ordinate with the SLDC in real time operation, control of the system and drawal/injection of reactive power from/to the STU. Distribution Licensee shall also assist/follow instruction of the SLDC in scheduling its exchange from/to the STU.

**(iv) Transmission Licensee/Owner of dedicated transmission line:**

Every transmission licensee or owner of a dedicated transmission line of the State grid shall comply with such technical standards of operation and maintenance of transmission line as applicable to the Intra-State Transmission System In accordance with this TEGC Grid Standards and Grid Code.

(a) It shall maintain and operate the part of the STS which are licensed to transmission licensee and comply with directions of SLDC.

(b) It shall provide non-discriminatory open access in pursuance to open access in its transmission system subject to availability of adequate transmission facilities for use by any licensee or generating company or open access customer on payment of the charges as determined by the Commission.

**(v) Generating Station :**

The generating stations connected to the STU and evacuating their generation through the STU shall inform the STU and the SLDC about the contracts entered into with different parties for exporting power along with its schedule. They should follow the instruction of the SLDC and assist the SLDC in the real time operation and control of the system and scheduling of generation.

## **CHAPTER 2**

### **STATE TRANSMISSION SYSTEM PLANNING**

#### **2.1 Introduction**

In accordance with clause (b) of sub section (2) of section 39 of the Electricity Act, 2003, the STU shall discharge all functions of planning and co-ordination relating to STS with CTU. State Government, CEA, RPC and other related organizations, who shall utilize the STS for evacuation or injection or drawal of power.

## **2.2 Planning Procedure :**

### **2.2.1 Load Forecasting;**

Power supply planning starts with a forecast of anticipated future load requirements of both demand and energy covering a particular period of time. The primary responsibility of load forecasting rests with the distribution licensees who shall follow the respective prospective plans as per Tariff Regulations. The distribution entities shall furnish the required data to the STU as required by the STU. The STU shall integrate the load forecasts and determine a relatively long term (10 years) load forecast for the State. The resulting overall load forecast including its spatial distribution should be one of the basis for expansion of generation and transmission and distribution system. The planning process shall consider an extended study period of 10years beyond the base period of 10 years. This load forecast along with a note on such forecasting methodology may be submitted to the Commission for approval before any planning on th basis of such forecast.

2.2.2 This load forecast along with demand growth trend of different Districts and Municipal Corporations are to be provided in the Website of the STU.

### **2.2.3 Planning:**

2.2.3.1 The technical component of transmission and distribution losses shall be estimated based on sample studies, measurements, load flow studies etc. The STU shall work out on the basis of projected loads and losses of the system, the net energy requirement and peak load requirement at generation end. The installed capacity, peak availability, surplus or deficit both in demand and in availability of energy at the state level shall also be worked out by the STU. The demand forecasts as per Regulation 2.2.1 shall be used to determine the capacity of generation, transmission and distribution system and energy forecast along with the load duration curve shall be used to determine the type of generation facilities required. The generation criteria based on operational parameter as per Tariff Regulations shall be applied for arriving at the additional generation capacity requirement. While calculating the availability for existing units, the trend of generation shall be considered and for projects under construction 80% availability shall be considered. For any proposed



hydro-generating station, generating capacity shall be considered on a case specific basis after considering the results of requisite detailed investigation studies.

2.2.3.2 The STU shall work out the requirement of additional transmission capacity after taking into account, the existing capacity, future requirement of power evacuation from new power generating projects inclusive of CPPs , power generating projects under construction in State and share allocation of the State from ISGS. Any supply from generating stations of temporary nature shall not be considered , In addition, the power procurement plan of different distribution licensee of the State pursuant to the Tariff Regulations and power to be wheeled by different Open Acces Customers in Long-Term Open Access as per Open Access Regulation shall also be taken into account for the purpose of overall planning. Consumers having open access of 1 MW and above under short-term Open Access shall also be contracted to assess their likely demand from the State Grid and degree of firmness of such demand to met its regular supply as consumer on expiry of such Short-Term Open Access or back-up or stand-by power as specified in Open Access Regulations. Information from such consumer having open access shall be collected in writing by the Distribution Licensee with whose distribution system the premises of consumer is connected when the Distribution Licensee prepares its perspective plan in pursuance of Tariff Regulations of TERC In the case of absence of any response from such a consumer, I shall be treated that such a consumer has no requirement of back up or stand-by power or any power against regular supply in consumer mode on expiry of the terms of open access during the period of perspective plan for which information is sought for. Such future demand for stand-by or back-up power or regular supply for such consumer having open access shall only be taken into consideration for the forecast demand only after execution of agreement between the licensee and such consumer. The STU shall also identify suitable locations near which big substation required to be installed. Regarding transmission corridor availability, the norms as per Tariff Regulations shall be considered and for adequate redundancy for secure and stable grid operation of the STS, 30% extra capacity is to be created than the required capacity.

2.2.3.3 The STU shall carry out planning process from time to time as per the requirement for identification of major Intra-State Transmission system which shall fit in with the perspective plan developed by State Government. While planning, the following shall

be considered in addition to the data of authentic nature collected from and in consultation with various generating stations, Licensees, State Government etc.

- (i) Long Term Perspective Plan developed by CEA.
- (ii) Latest Electric Power Survey report of CEA.
- (iii) Transmission, planning criteria, generation expansion planning criteria and guidelines issued by the CEA.
- (iv) National Electricity Plan issued by Govt. of India which are relevant for development of STS.
- (v) Any other authentic report on demand forecast carried out by agencies like Planning Commission, CERC, TERC, Govt. of Tripura.
- (vi) Capacity addition utilizing renewable energy resources.
- (vii) System strengthening schemes – Need for which may arise to overcome the constraints in power transfer and to improve the overall performance of the State Grid.
- (viii) Plans prepared by CTU in order to plan for evacuation of power as required for STS or the State.

2.2.4 The plan shall indicate and include a chapter on proposed STS scheme open for private investment by the STU., based on which the entrepreneurs can formulate primary investment decisions.

2.2.5 The planning report shall indicate the action taken to fulfill the additional requirements and actual progress made on new schemes. These reports will be available to any interested party for making investment decision/connection to the STS.

2.2.6 As voltage management plays an important role in the STS, special attention shall be accorded to planning of VAR compensation in the network so that voltage instability does not occur and line can transfer designed power with designed operating voltage range.

2.2.7 Based on the local forecast and the additional generation required for 10 years period the STU shall develop a long term plan for STS considering generation capacity addition programme and expansion in distribution system.

- 2.2.8 Medium Term Planning: A 5 year rolling plan shall also be finalized by the STU every year for requirement arising out of expansion of the STS, generation and distribution systems to meet the future demand and to ensure quality supply to consumers. The rolling plan shall take into account the previous years' achievement.

### 2.3 Planning Criteria:

The planning criteria are based on the security philosophy on which the STS is planned. The guidelines in general are detailed for distribution, transmission and generation are to be as follow:

#### 2.3.1 Distribution :

- (i) The distribution system shall be developed to meet the load demand of all existing consumers and intending consumers seeking connection for supply including programme of intensification and virgin area electrification. The distribution system is to be planned based on load forecast and its spatial distribution. Power flow studies shall be carried out wherever necessary. The perspective plan as per Tariff Regulations shall be evolved for achieving target levels in aspects like reduction of losses by proper choice of the length and size of Low Tension (LT) lines, improvement of power factor, voltage control etc.
- (ii) Separate High Tension (HT) overhead feeders are to be planned to cater to discrete load blocks to facilitate load management during emergency operations. Use of auto sectionalisers or other devices to reduce interruption is to be progressively introduced.
- (iii) The distribution system shall have alternative feeding arrangements for high load density areas and for essential services wherever possible.
- (iv) In addition to catering to the active power demand, reactive power components of power requirement should be studied and adequate VAR compensation are to be installed at different voltage levels to improve power factor and cause reduction of losses. The distribution company in their supply conditions shall include installation of reactive compensation at load end depending on the type of load used.

- (v) Voltage in the distribution system shall be controlled and maintained at statutory levels. Voltages at the consumer terminals shall be maintained as specified in the Safety Regulations.
- (vi) The level of harmonics generated by consumer's equipment is to be controlled as per the limits specified in the grid connectivity standards specified by CEA.
- (vii) Voltage flickers caused by consumers' loads shall have to be controlled within the permissible limits as per Grid Standards.

### 2.3.2 **Transmission :**

#### 2.3.2.1 Permissible limits :

- (i) The permissible voltage excursions for transmission and sub transmission system during the steady state operation is + 5% for 220 KV and + 10% for 132 KV and below.
- (ii) The standard fault rating of switchgear at 132 KV is 31.5 KA and 220 KV is 40 KA.
- (iii) The capacity of any single sub station shall not normally exceed 500 MVA for 220 KV and 250 MVA for 132 KV.
- (iv) Size and number of EHT/HT transformers in a substation of a transmission system shall be planned in such a way that in the event of outage of any single unit, the remaining unit (s) would still supply the load for 80 % of the day.
- (v) The line loading limits shall be based on the thermal/ surge impedance loading depending on the line section and VAR support provided.

#### 2.3.2.2 Contingencies (Under steady state conditions):-

a) The general policies are as given below:

- i). As a general rule, the STS shall be capable of withstanding and be secured against the following contingency outages without necessitating load shedding (except for radial line) or rescheduling of generation during steady conditions in operation:-

Outage of a 132 KV D/C line (except for radial lines)

or,

Outage of a 220 KV D/C line (except for radial lines)

- ii). All the generating units of a generating station may operate within their reactive capability curves and the network voltage profile shall also be maintained within voltage limits specified.
- b). The STS shall be capable of withstanding the loss of the most severe single system in-feed transmission or generation.
- c). Any one of these events defined above shall not cause:
  - (i) Prolonged operation of the system frequency below and above specified limits.
  - (ii) Unacceptable high or low voltage.
  - (iii) System instability.
  - (iv) Unacceptable overloading of STS elements.
- d). In all substations (132 KV and above) at least two transformers shall be provided.
- e). The STU shall carry out planning studies for reactive power compensation of generating stations under TERC purview including reactive power compensation required at their switchyard.

#### 2.3.2.3 Transient stability constraints :

The system shall be designed to maintain synchronism and system integrity under the following disturbances:

- i). A permanent three phase fault with duration of 8 cycles in 220 KV and 132 KV systems assuming three poles opening.

### CHAPTER 3

#### CONNECTIVITY CONDITIONS:-

##### 3.1 General:

Connectivity conditions specify the minimum technical and design criteria which shall be compiled with by any agency connected to, or seeking connection to the STS to transmit electrical energy either way from/to the STS. The STU shall ensure compliance by any agency with the above entities as a pre-requisite for the establishment of an agreed connection.

##### 3.2 Procedure for connection :-

3.2.1 Prior to an agency being connected to the STS, all necessary conditions contained in the TEGC and other Regulations specified by CEA in addition to other mutually agreed requirements to be complied with, must be fulfilled by the agency. Any agency seeking to establish new or modified arrangement of connection to STS for use of it shall submit an application on specified format to the STU along with the following details :

- (i) a report stating the purpose of the proposed connection and / or modification, connection point, description of apparatus to be connected or modification of the apparatus already connected and beneficiaries of the proposed connection.
- (ii) All prospective users shall be required to pay to the STU all charges as specified by TERC for the purpose of conducting the initial interconnection studies, additional study as well as for processing the application.
- (iii) Construction schedule and target completion date.
- (iv) A confirmation that the agency shall abide by TEGC and provisions of IE Rules or as may be specified in the Regulations made by CEA under the Act.

3.2.1.2 The STU shall normally make a formal offer to the agency within one month from the date of receipt of all details along with the proposed changes, if any. The offer shall stipulate and take into account any works required for the extension or reinforcement of the transmission system to satisfy the requirements of the connection application and for obtaining statutory clearances, way leaves as necessary. The agency shall give its consent and submit to STU within a fortnight thereafter.

3.2.1.3 Final decisions on applications for connections to STU network shall be provided by the STU within 45 days from the date of submission of consent to it by the agency.

3.2.1.4 If the nature and complexity of the proposal is such that the specified time limit for making the offer is not adequate, the STU shall make a preliminary offer within the specified time limit indicating the extent of further time required with the consent of the TERC for more detailed examination of the issues

- 3.2.1.5 The STU shall make a revised offer, upon request by any User, if necessitated by changes in data earlier furnished by the User.
- 3.2.1.6 All offers (other than preliminary offers) including revised offers shall remain valid for 60 days of issue of the offer. In the event of the offer becoming invalid or not being accepted by any User within the validity period, no further action shall be taken by the STU on the connection applications. In the offer, details of the requirements and procedures for connection to the STS and the resulting Connection Agreement with the agency shall be set out.
- 3.2.1.7 Upon compliance, STU shall notify the agency that it can be connected to the STS. However in case of the existing connections between STS network and entities, the TERC may allow at its discretion relaxation up to one year in respect of connection agreements and the present agreements/present practice as followed may continue in order to avoid the whole process of re-negotiation with the existing entities.
- 3.2.1.8 Prior to providing any connectivity to a consumer with the STS, the licensee shall take approval of the STU and the SLDC after meeting all technical and commercial requirements of the STU and the SLDC.

### **3.3 Connection Agreement:**

A connection agreement shall include (but may not be limited to) as appropriate, within its terms and conditions, the following:

- (i) a condition requiring both parties to comply TEGC and Grid Code.
- (ii) The details of connection, technical requirements and commercial arrangements.
- (iii) The details of any capital expenditure arising from necessary reinforcement or extension of the system and demarcation of the same between the concerned parties.
- (iv) A Site Responsibility Schedule.
- (v) The metering arrangements.
- (vi) The general procedure, guidelines etc. on protection and telemetry.
- (vii) The procedures necessary for site access, site operational activities and maintenance standard for equipment of Licensee at the premises of the User and vice-versa.

(viii) Commitments to provide data requirement as per **Annexure-I**.

### **3.4 Connection Point :**

3.4.1 Different requirement of connection point of the STS with different constituents are as follows :

- (i) For Generating station, the switchyard voltage of connection point may be 220/132 KV or as agreed with the Licensee with whose network the connection is to be effected. Unless specifically agreed with the Licensee with whose network the connection to be effected, the connection point shall be the outgoing feeder gantry of generating station switchyard. All the terminals, communication, protection and metering equipment owned by the generating company within the perimeter of its site shall be maintained by it. From the outgoing feeder gantry onwards, all electrical equipment shall be maintained by the Licensee or the owner of the dedicated transmission lines with whose network the connection is to be effected.
- (ii) For Distribution Licensee, the voltage of connection point may be as agreed with Generating Station or the Licensee with whose network the connection is to be effected but the same cannot be below 6 KV. The connection point shall be the outgoing feeder gantry of Generating Station, Switchyard or the sub-station in case of the Licensee. However, in case of connection with dedicated transmission lines, it may be the point as agreed by the Distribution Licensee and the owner of the dedicated transmission line. All the terminal, communication, protection and metering equipment within the premises of the sub-station shall be maintained by owner of the substation. From the outgoing feeder gantry onwards, all electrical equipment shall be maintained by the respective distribution entity.
- (iii) For the ISTS of the Regional Grid, the connection point, protection scheme, metering scheme, metering point and the voltage shall be in accordance with the mutual agreement between owners of two connecting systems, until and unless they are specified by CEA in its Regulation under the Act.
- (iv) For CPPs and EHT/HT Consumers, voltage may be 220/132/66/33 KV or as agreed with Licensee with whose network the connection is to be effected. Sub-



stations, owned by CPPs and EHT/HT Consumers, shall be maintained by them or as mentioned in the connection agreement. The connection point shall be the feeder gantry on their premises in case of EHT/HT consumers and at Licensee's gantry in case of CPPs.

### **3.5 STS Parameter Variations :**

#### **General:**

Instantaneous values of system frequency of the State grid and voltage are subject to variation from their nominal value as provided in these Regulations. All agencies shall ensure that their plants and apparatuses requiring service from/to the STS are of such design and construction that satisfactory operation shall not be preented by such variation

#### **3.5.1 Frequency Variations :**

Rated frequency of the system shall be 50.0 Hz and shall normally be controlled within the limits as specified in Grid Code.

#### **3.5.2 Voltage Variations:**

The variation of voltage may not be more than the voltage range specified in the IE Rules as may be specified by CEA in its Regulations under the Act. The agency engaged in sub-transmission and distribution shall not depend upon the STS for reactive support when connected. To avoid need of exchange of reactive power to/from the STS, the agency shall estimate and provide the required reactive compensation in its sub-transmission and distribution network for maintaining a cumulative power factor of 0.85 to 0.95 in order to meet its full reactive power requirement unless specifically agreed to with the STU.

### **3.6 Equipment installed by Agency and STU at Connection Points:**

#### **3.6.1 Sub-station Equipments :**

- (i) All EHV outdoor switchyard equipment shall comply with standard of Bureau of Indian Standards (BIS)/ International Electro Technical Commission (IEC)/ prevailing code of practice.

- (ii) All equipment shall be designed, manufactured and tested and certified in accordance with the quality assurance requirements as per IEC/BIS standards.
- (iii) Each connection between an agency and STS shall be controlled by a circuit breaker capable of interrupting at the connection point, the short circuit as advised by the STU in the specific connection agreement.

### 3.6.2 Fault Clearance Times :

- (i) The total fault clearance time, for faults on agency's equipment directly connected to STS and for faults on STS connected to agency's equipment from fault inception to the circuit breaker are extinction, shall not be more than –
  - (a) 100 Milli -seconds (ms) for 400 KV.
  - (b) 160 milli-seconds (ms) for 220 KV & 132 KV.
  - (c) 160/400 milli-seconds ( 1<sup>st</sup> /2<sup>nd</sup> Zone).
- (ii) Back up protection shall be provided for 132 KV systems and above for required isolation/protection in the event of failure of the primary protection systems provided to meet the above fault clearance time requirements. If a Generating Unit is connected to the STS directly, it shall withstand, until clearing of the fault by back up protection on the STS side.

### 3.6.3 Protection :

- (i) Protection system are required to be provided by all entities connected to the STS and as specified by STU. These are required to isolate the faulty equipments and protect the other components against all types of faults, internal/external to them within the specified fault clearance time with reliability, selectivity, and sensitivity. Protective relay settings shall not be altered or protection bypassed and/or disconnected without consultation and agreement of all the affected users. If protection is bypassed and/ or disconnected by agreement, then the cause must be rectified and protection shall be restored to normal condition as quickly as possible. If agreement is not reached, the electrical equipment, in question, shall be removed from service forthwith in a case where it affects the security of the system. Relay setting co-ordination shall

be done by STU. The STU shall arrange periodic meetings of the entities to discuss coordination of protection. The STU shall investigate into any malfunctioning of protection or other unsatisfactory protection issues. The concerned Licensees shall take prompt action to correct any protection malfunction or issue as discussed and agreed to in these periodical meetings.

In case of installation of any device, which necessitates modification/replacement of existing protection relays/scheme in the network, such modification/replacement shall be carried out by owner of respective part of the network. All agencies concerned to STS shall provide protection systems as specified in the connection agreement. Relay setting coordination shall be done at State level by STU.

(ii) Generating Units and generating stations requirement

- (a): A generating unit shall be capable of continuously supplying its normal rated active/reactive output within the system frequency and voltage variation range indicated at regulation 3.5.3 above, subject to the design limitations specified by the manufacturer.
- (b) A generating unit shall be provided with an AVR, protective and safety devices, as set out in connection agreements.
- © All generating Units and associated electrical equipment connected to the State Grid shall be provided with adequate protection so that the State Grid does not suffer due to any disturbance originating from the generating unit.
- (d) Each generating unit shall 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.
- (e) Each generating unit shall be capable of instantaneously increasing output by 5% limited to 105% MCR when the frequency falls. Sliding back to the previous MW level (in case the increased output level can not be sustained) shall not be faster than 1% per minute.

(iii) Transmission Line Requirements :

Every EHT line taking off from a generating station or a sub-station shall have distance protection and back up protection as mentioned below. The STU shall notify users of any changes in its policy on protection from time to time.

(a) 400 KV Lines:

Three-zone non-switched Main-1 and Main-2 distance protection with different technical philosophy shall be provided. In addition to the above, single pole tripping and single shot single pole auto-reclosing after an adjustable dead time shall be provided. There need be no other back up protection.

(c) 220 KV Line:

Three-zone non-switched distance protection with permissive inter trip and a suitable back up protection is to be provided. Single pole tripping with single shot auto re-closing with adjustable dead time shall be provided.

© 132 KV Lines:

Three-zone non-switched distance protection with suitable back-up protection is to be used.

For cable feeders – cable differential/suitable fast protection to be used.

(d) General :

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

(iv) Distribution Line Requirements:

All 33 KV and 11/6 KV lines at connection points shall be provided with a minimum of over current and earth fault protection with or without directional features as given below :

(a) Single Radial Feeders:

Non-directional time lag over current and earth fault relay with suitable settings to obtain discrimination between adjacent relay stations.

(b) Parallel Feeders/ Ring Feeders:

Directional time lag over current and earth fault relays.

© Long Feeders/ Transformer Feeders :

For long feeders or transformer feeders, the relays should incorporate a high set instantaneous element

(iv) Transformer Requirements Generator Step Up, Auto and Power Transformers:

All windings of auto transformers and power transformers of EHV class shall be protected by differential relays and REF relays. In addition there shall be back up time lag over current and earth fault protection. For parallel operation such back up protection shall have directional feature. For protection against heavy short circuits, the over current relays should incorporate a high set instantaneous element. In addition to electrical protection, gas operated relays, winding temperature protection and oil temperature protection shall be provided. For transformers of HV class, differential protection shall be provided for 10 MVA and above along with back up time lag over current and earth fault protection (with directional feature for parallel operations).

Transformers 2.5 MVA and above and less than 10 MVA shall be protected by time lag over current, earth fault and instantaneous REF relays. In addition, all transformers 2.5 MVA and above shall be provided with gas-operated relays, winding temperature and oil temperature protection.

(v) Sub-Station Bus Bar Protection and Fire Protection:

All users shall provide suitable bus bar protection for substation bus bars in all 220 KV and 132 KV class substations or generating stations. Adequate precautions shall be taken and protection shall be provided against lightning and fire hazards to all apparatus of the users conforming to relevant Indian Standard Specification and/ or provisions as specified in Safety Regulations.

**3.6.4 Metering:**

- (i) The agency who has to provide, operate and maintain the metering arrangements at various locations shall be specified by the STU in the connection agreement.

(ii) Commercial Metering :

The commercial metering is designed to ensure the following:

- (a) to compute the actual net drawal by the STU for the time blocks to be specified by the STU through reading of special energy metering installed at all locations of interconnections.
- (b) To measure energy supplied by the various generators.
- (c) To measure total energy supplied to high tension consumers at various voltages and to measure energy at substation end to distribution feeders of the distribution licensees.
- (d) To measure the import and export of energy into and from EHV level of State Grid system so as to arrive at the losses at various voltage levels.
- (e) To measure the VAR flow at various nodes of the grid.
- (f) To strike an energy balance in each financial year.

( i i i ) Commercial metering details:

- (a) MW, MWH and MVARH flow are to be measured at interconnection points, power transformer locations, distribution substation end and consumption by HT/EHT consumers.
- (b) Wherever a meter becomes defective, consumption recorded by the check meter shall be referred for a mutually agreed period. The details of malfunctioning along with date, time and other data including load survey data shall be retrieved from the main meter. The exact nature of malfunctioning shall be brought out after analyzing the data so retrieved and the consumption/losses recorded by the main meter shall be assessed accordingly.

- (c) If the main as well as the check metering systems become defective, the assessment of energy consumption for the outage period shall be done by the concerned parties on mutually agreed basis.
- (d) A procedure shall be drawn up between the STU and the entities covering summation, collection, processing tariff meter readings at various connection sites. This may be revised from time to time as needed.
- (e) The ownership and responsibility of maintaining and testing of meters shall be mutually agreed between the entities and the STU.
- (f) Any disputes relating to inter-entity metering between the STU/ Transmission Licensee and Generating Company/ Distributing Licensee/ Open Access Users/ Transmission Licensee shall be settled in accordance with the procedures stipulated under relevant Power Purchase Agreement/ Connection Agreement as the case may be. In case of unresolved dispute, the matter may be referred to TERC for adjudication and reference for arbitrations.

(iv) Operational Metering:

- (a) The Generating Company shall install operational metering to STUs specification so as to provide operational information for both real time and recording purposes in relation to each generating unit at each power station in respect of bus voltage frequency, MW, MVAR and any other additional data as required by STU.
- (b) All current transformers and voltage transformers used in conjunction with operational metering shall conform to the relevant standards and shall have accuracy better than accuracy class 0.5 and of suitable ratings to cater to the meter and lead wire burden.
- © Meters shall be calibrated so as to achieve overall accuracy of operational metering in the limits as specified by the STU.
- (d) Records of calibration shall be maintained for reference and shall be made available to the STU on request.

- (e) Generating companies shall furnish recorded data to all electric measurements and events recorded by the operational metering to the SLDC as requested by them.
- (g) The STU shall be responsible to formulate the metering procedure and implement it with other users.

#### **3.6.5 Data Requirements:**

Users shall provide the STU with data for this section as specified in the formats under **Annexure-II.**

#### **3.6.6 Communication Facilities:**

The following communication facilities as relevant and applicable to the user shall be decided and finalized at the initial stage and incorporated in the Connectivity Agreement.

##### **(a) Audio Communication :**

Reliable and efficient audio communication system shall be provided to the SLDC to facilitate supervision/ control/ direction of the State Grid under both normal and abnormal operating conditions.

##### **(b) Data Communication**

Real time telemeter data through Supervisory Control And Data Acquisition System (SCADA) or Data Acquisition System (DAS) and off-line data for State Grid such as flow, voltage, States of switches, transformer taps, etc. through suitable and reliable data communication facilities so as to facilitate efficient and uninterrupted data exchange with SLDC/ALDC under both normal and abnormal operating conditions.

##### **© Data Entry Terminals:**

Data entry facilities as advised by SLDC for exchange of information between SLDC and entities.

#### **3.6.7 System Recording Instruments:**



Recording instruments such as DAS/ Disturbance Recorder/ Event Logger/ Fault locator (including time synchronization equipment) shall be provided in the STS for recording of dynamic performance of the STS. Agencies shall provide all the requisite recording instruments as specified in the connection agreement according to the agreed time schedule.

**3.7 Reactive Power Compensation:**

- 3.7.1 Reactive power compensation and/ or other facilities, should be provided by the STU or Transmission Licensees etc. For agencies engaged in distributing electricity reactive power compensation shall be provided as far as possible in the low voltage systems close to the load points, thereby avoiding the need for exchange of reactive power to/from STS and to maintain STS voltage within the specified range.
- 3.7.2 Fixed line reactors may be provided to control temporary over voltage within the limits as set out in connection agreements.
- 3.7.3 The addition of reactive compensation to be provided by the agency (including generating station) shall be indicated by the STU in the Connection Agreement for implementation on the basis of planning studies.

**3.8 Responsibilities for Operational Safety:**

The STU, the users, and the entities shall be responsible for safety as indicated in Site Responsibility Schedules for each connection point.

**3.8.1 Site Responsibility Schedules :**

- (i) A site Responsibility Schedule shall be produced by the parties as agreed in the connection agreement detailing the ownership, control, maintenance and operational responsibilities of each, before execution of the project or connection including safety responsibilities. For connection to the STS, a schedule shall be prepared by the agency pursuant to the relevant connection agreement which shall mention, for each item of plant and apparatus at the connection point, the following:

- Ownership of the plant/ apparatus.
  - Responsibility for control of the plant/ apparatus.
  - Responsibility for operation of the plant/ apparatus.
  - Responsibility for maintenance of the plant/apparatus and
  - Responsibility for all matters relating to the safety of any person.
  - The in charge of the site.
- (ii) The format, principles, and basic procedures to be used in the preparation of Site Responsibility Schedules shall be formulated by the STU in line with the Regulation specified by the CEA for technical standards for connection to grid and shall be provided to each agency/entities for compliance.
- (iii) All agencies concerned to or planning to connect to the STS shall ensure providing of Remote Transmission Unit (RTU) and other communication equipments, as specified by the SLDC, for sending real-time data to the SLDC at least before date of commercial operation of the generating stations or sub-station/line being connected to the STS.

### **3.8.2 Single Line Diagrams "**

- (i) Single line Diagram shall be furnished to the SLDC for each connection point with transmission licensee by the connected agencies in concurrence with Transmission Licensee. These diagram shall include all HV connected equipment and the connections to all external circuits and incorporate numbering, nomenclature and labeling etc. The diagram shall provide an accurate record of the layout and circuit connections, rating, numbering and nomenclature of HV apparatus and related plant.
- (ii) Whenever any equipment is proposed to be changed, the concerned agency shall intimate the desired changes to the Licensee with whom he is connected and to the SLDC. When the changes are implemented, changed Single Line Diagram shall be circulated by the agency to the SLDC and the STU.

### **3.8.3 Site Common Drawings:**

- (i) Site Common Drawing shall be prepared for each connection point and shall include the layout, electrical layout details of protection and common services drawings. The detailed drawings for the portion each of the agencies concerned at each connection point shall be prepared individually and exchanged between agencies and STU.
- ii) The detailed drawings for the portion of the agencies and the STU at each connection point shall be prepared individually and copies shall be handed over to other party and the STU.
- (iii) If any change in the drawing is found necessary, either by agencies or the STU, the details shall be exchanged between agency and the STU as soon as possible.

**3.9 Procedure for Site Access, Site Operational Activities and Maintenance Standards:**

The connection agreement shall also indicate the procedures necessary for site access, site operational activities and maintenance standards for the STU equipment at the premises of the users and vice versa.

## **CHAPTER 4**

### **OPERATION OF THE STATE GRID**

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**4.1 Operation Policy:**

- 4.1.1 An integrated operation of the State grid is aimed at achievement of overall operational economy and reliability of the State Grid.
- 4.1.2 Overall real time operation of the State grid shall be supervised by the SLDC. The roles of the SLDC and the STU shall be in accordance with TEGC.
- 4.1.3 Such Distribution Licensee shall establish at least one ALDC to monitor grid operation of its distribution system and to make coordination with the SLDC.
- 4.1.4 All State entities shall comply with the operation guidelines specified hereinafter and co-ordinate with each other, for deriving maximum benefits from the integrated operation and for equitable sharing of obligations.

4.1.5 A set of detailed internal operating procedures for the State Grid shall be developed and maintained by the SLDC in consultation with the entities and the same shall be consistent with TEGC.

4.1.6 The control rooms of the SLDC, ALDC, generating stations, and EHV sub-stations and any other control centers of all the entities shall be manned round the clock by qualified personnel with adequate training.

**4.2 System Security Aspects :**

4.2.1 All entities in the State grid shall endeavor to operate their respective State Grids and generating stations in synchronism with each other at all times, such that the entire State grid operates as one synchronized system.

4.2.2 (i) No part of the State Grid shall be deliberately isolated from the rest of the State Grid, except –

- (a) under an emergency and conditions in which such isolation would prevent a total grid collapse and/or enable early restoration of power supply.
- (b) When serious damage to a costly equipment is imminent and such isolation would prevent it , and
- (c) When such isolation is specifically instructed by SLDC.

(iii) Such isolation due to any of the above mentioned causes under (i) shall be followed by complete restoration of synchronized grid as soon as the conditions again permit. The restoration process shall be supervised by the SLDC, as per operating procedures separately formulated.

4.2.3 No important element of the State grid shall be deliberately opened or removed from service at any time, except when specifically instructed by the SLDC or with specific and prior clearance of the SLDC. The list of such important grid elements on which the above stipulations apply shall be prepared and be available at the SLDC. If any opening/removal of any important element of the grid under an emergency situation as mentioned 4.2.2 (i) & (ii) takes place, the same shall be communicated to the SLDC at the earliest possible time after the event.

- 4.2.4 .Any tripping whether manual or automatic, of any of the above elements of State grid shall be precisely intimated by the concerned entities to the SLDC as soon as possible. preferably within ten minutes of the event. The reason (to the extent determined) and the likely time of restoration shall also be intimated. All reasonable attempts shall be made for the elements' restoration as soon as possible. Similarly any incident of outage significantly affecting the system of any agency will be intimated to the agency by SLDC within the above time.
- 4.2.5 All generating units, which are synchronized with the grid irrespective of their ownership, type and size shall have their governors in normal operation at all times. If any generator of over 50 MW rating is required to be operated without its governor in normal operation, the SLDC shall be immediately advised about the reason and duration of such operation. All governors shall have droop between 3% to 6%.
- 4.2.6 Facilities available with load limiters, Automatic Turbine Run up System (ATRS), turbine supervisory control, coordinated control system etc. shall not be used to suppress the normal governor action. No dead bands and/ or time delays shall be deliberately introduced.
- 4.2.7 All generating units, operating at or up to 100% at their MCR shall normally be capable of (and shall not in any way be prevented from) instantaneously picking up five percent (5%) extra load as soon as possible but preferably within five (5) minutes when frequency falls due to a system contingency. However, for existing generating units (generating units of COD up to 31.12.2005), these should be within the technical limits stipulated by the manufacturer. The generating units operating at above 100% of their effective MCR shall not be prevented from going at least up to 105% of their effective MCR when frequency falls suddenly. After an increase in generation as above, a generating unit may slide back to the original level at a rate of about 1% per minute., in case continued operation at the increased level is not sustainable. Any generating unit (synchronized with the State grid ) of over fifty (50) MW size not complying with the above requirement, shall be kept in operation only after obtaining the permission of the SLDC. However, the entity can make up the corresponding shortfall in spinning reserve by maintaining an extra spinning reserve on the other generating units of the entity.

- 4.2.8 The recommended rate for changing the governor settings, i.e. supplementary control for increasing or decreasing the generation sent out for all generating units, irrespective of their types and sizes, would be 1% per minute or as per manufacturers' limits. However, if frequency falls below 49.5 Hz, all partly loaded generating units shall pick up additional load at a faster rate, according to their respective capability.
- 4.2.9 Except under an emergency or when there is need to prevent an imminent damage to personnel and equipment, no entity shall suddenly reduce its generating unit output by more than 100 MW without prior intimation to and consent of the SLDC, particularly when frequency is falling or is below 49.0 HZ. Similarly, no entity shall cause sudden increase in its load by more than 100 MW without prior intimation to and consent of the SLDC.
- 4.2.10 All generating units shall normally have their AVR's in operation, with appropriate settings. In particular, if a generating unit above 50 MW size is required to be operated without its AVR in service, the SLDC shall be immediately intimated about the reason and duration, and its permission obtained. Power System Stabilizer (PSS) in AVR's of generating units (wherever provided) shall be got properly tuned by the respective generating unit owner as per plan prepared for the purpose by the SLDC from time to time. The STU will be allowed to carry out checking of PSS and further tuning it, wherever considered necessary.
- 4.2.11 Provision of protections and relay settings shall be coordinated periodically throughout the State grid, as per a plan to be separately finalized by the STU in coordination with all entities and RPC.
- 4.2.12 All entities shall ensure that the grid frequency always remains within the 49.0 – 50.5 Hz band.
- 4.2.13 All entities shall provide automatic under frequency load shedding in their respective systems, to arrest frequency decline that could result in a collapse/ disintegration of the grid, as per the plan separately finalized by the SLDC and shall ensure its effective application to prevent cascaded tripping of generating units in case of any contingency. All entities shall ensure that the under-frequency load shedding/ islanding schemes are functional and no under-frequency relay is by-passed or removed without prior consent of the SLDC.

- 4.2.14 All entities shall also facilitate identification, installation and commission of system protection schemes (including inter-tripping and run-back) in the State's State Grid to protect against situations such as voltage collapse and cascading. Such schemes would be finalized by the concerned SLDC forum, and shall be kept in service. The SLDC shall be promptly informed in case of any of these is taken out of service.
- 4.2.15 Procedures shall be developed to recover from partial/total collapse of the grid and periodically updated in accordance with the regulation 4.8. These procedures shall be followed by all the entities to ensure consistent, reliable and quick restoration for which the SLDC shall co-ordinate with all entities.
- 4.2.16 Each entity shall provide adequate and reliable communication facility internally and with the SLDC and with other entities, if required 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. SLDCs generating stations.
- 4.2.17 The entities shall furnish on request information/data including disturbance recorder/sequential even recorder output etc.. to the SLDC for purpose of analysis of any grid disturbance/event. No State entity shall block any data/information required by the SLDC for maintaining reliability and security of the grid and for analysis of an event.
- 4.2.18 All entities shall make all possible efforts to ensure that the grid voltage always remains within the following operating range as specified for different equipment.

Nominal	Maximum	Minimum
Voltage in (KV runs)		
220	231	209
132	145	119
66	72	60

#### **4.3 Demand Estimation for Operational Purposes:**

The SLDC shall develop methodologies/ mechanisms for daily/ weekly/ monthly/ yearly demand estimation (MW, MVAR and MWh) mainly based on the data furnished by the Distribution Licensees for operational purposes. The data for the estimation shall also include load shedding, power cuts etc. The SLDC shall also maintain historical database for demand estimation, which shall also take into account weather forecast appropriately. The demand estimates are to enable the SLDC to conduct system studies for operational planning purposes. While the demand estimates for operational purposes is to be done on a daily, weekly. Monthly basis initially, as deemed fit by the SLDC and within one year, appropriate mechanism and facilities at the SLDC shall be created at the earliest to facilitate on-line estimation for daily operational use.

#### **4.4 Demand Control:**

##### **4.4.1 Manual Demand Disconnection:**

- 4.4.1.1 The entities shall endeavor to restrict their net drawal from the grid to within their respective drawal schedules whenever the system frequency is below 49.5 Hz. When the frequency falls below 49.0 Hz. Requisite load shedding (manual) shall be carried out to curtail the over drawal. Such load shedding and also automatic UFR operation shall be pre-planned for each level of under frequency as per the guidelines as specified in Regulations of the Commission or stipulated in any of the Commission's order, if any and where applicable.
- 4.4.1.2 Further, in the case of certain contingencies and/or threat to system security, the SLDC may direct the sub stations/ distribution licensee to decrease its drawal by a certain quantum. Such directions shall immediately be acted upon.
- 4.4.1.3 Each entity shall make such arrangements that will enable manual demand disconnection to take place, as instructed by the SLDC under normal and / or contingent conditions.
- 4.4.1.4 The measures taken to reduce the entities drawal from the State grid shall not be withdrawn as long as the frequency/ voltage remains at a low level, unless specifically permitted by the SLDC. If required, necessary rescheduling of drawal for the entities shall be done by SLDC.



**4.4.2 Load Shedding Policy:**

In the case of shortage of power availability with respect to demand, the SLDC shall resort to shedding the load of different feeders on economic principle till the Commission specifies any policy in this matter through notification.

**4.4.3 Regulating Supply, Distribution, Consumption or Use :**

- (i) The SLDC will monitor, regulate and submit report to the Commission as per order under section 23 of the Act.
- (ii) In the case of shortage of supply, the Commission in consultation with the SLDC, may impose restriction on any consumer or class of consumers or any feeder in drawal of power, including zero drawal, for any time/ duration of the day for a period as may be decided by the Commission.

**4.5 Periodic Reports :**

4.5.1 A weekly report shall be submitted by the SLDC to the Commission. The licensee of the State shall cover the performance of the State grid for the previous week. The weekly report shall contain the following:

- (i) Frequency profile: Maximum and Minimum frequency recorded daily on 15 minutes time block basis and also average frequency during peak, off-peak and normal period.
- (ii) Voltage profile: The voltage profile of 132 KV and above substations.
- (iii) Major Generation and Transmission outages.
- (iv) Transmission constraints.
- (v) Daily demand profile consisting of :
  - (a) Daily maximum demand (MW) with corresponding frequency (HZ) and energy (MU) with corresponding average frequency.
  - (b) Daily load shedding at peak hours (MW).
  - (c) Daily load shedding in MU.
  - (d) Daily technical interruption losses in MW at peak hours.
  - (e) Daily technical interruption in MU.
- (vi) Daily Generation Performance Status:

Generating station wise daily schedule for availability declared, actual generation, non-drawal by the system (if any), reason for non-drawal, reason for less generation.

- (vii) Instances of persistent/significant non-compliance of TEGC.
- (viii) Monthly load duration curve with date.
- (ix) Demand and load for the days of month of maximum demand and minimum demand.

#### **4.5.2 Other Reports:**

The SLDC shall also prepare a quarterly report, which shall bring out the system constraints, reason for not meeting the requirements, if any, of security standards and quality of service, along with details of various actions taken by different agencies and the agencies responsible for causing the constraints.

#### **4.6 Operational Liaison:**

- 4.6.1 Exchange of information, in relation to operations and/or events on the total State Grid which have had or will have an effect on the State Grid or Inter-State links or the system of an entity is extremely important for the purpose of maintaining stability of the State Grid.

The operational liaison generally relates to notifying of what is expected to happen or what has happened and does not relate to the reasons of the same. The operational liaison function is a mandatory built-in hierarchical function of the SLDC and entities to facilitate quick transfer of information to operational staff. It will correlate the required inputs for optimization of decision making and actions.

#### **4.6.2 Procedure for Operational Liaison :**

- (i) **Operations and events on the State Grid.**

Before any operation is carried out on the State Grid the SLDC shall inform each entity whose system may or will experience an operational effect, and give details of the operation to be carried out. Immediately following an event in the State Grid, the SLDC shall inform each entity, whose system may or will experience an operational effect following the event and give details of what has happened in the event but not the reasons why.

(ii) **Operations and events on an entity's system :**

Before any Operation is carried out on an entity system, the entity shall inform the SLDC in case the State Grid may, or will experience an operational effect, and give details of the operation to be carried out . Immediately following an event on an entity system, the entity shall inform the SLDC, in case the State Grid may or will experience an operational effect following the event and give details of what has happened in the event but not the reasons why.

**4.7 Outage Planning:**

**4.7.1 General :**

The procedure for preparation of outage schedules for the elements of the State Grid in a coordinated and optimal manner keeping in view the State Grid operating conditions and the balance of generation and demand in optimal level requires following activities:

- (i) A list of elements of State grid covered under these Regulations shall be prepared and be available with the SLDC within 30<sup>th</sup> June,2010.
- (ii) Preparation of a coordinated generation outage programme for the State grid considering all the available resources and taking into account transmission constraints as well as irrigational requirements. The generation output and transmission system should be adequate after taking into account the outages to achieve the State Grid security standards.
- (iii) Preparation of annual outage planning in advance for the current year and reviewed during the year on quarterly and monthly basis after due discussion in the SLDC.
- (iv) Optimization of the transmission outages of the elements of the State grid without adversely affecting the grid operation taking into account the generation outage schedule., outages of constituent systems and expected level of maintenance of system security standards on such transmission outages.

**4.7.2 Outage Planning Process :**

- (i) The licensees with generation shall provide the SLDC with their respective proposed outage programs in writing for the next financial year by 1<sup>st</sup> August each year. These shall contain identification of each generating unit/line/inter

connecting transformer, the preferred date for each outage and its duration and where there is flexibility, the earliest start date and latest finishing date.

- (ii) The SLDC shall then come out with a draft outage programme for the next financial year by 15<sup>th</sup> November each year for the State grid taking into account the available resources in an optimal manner and the need to maintain security standards. This will be done after carrying out necessary system studies and if necessary, the outage programmes shall be rescheduled. Adequate balance between generation and load shall be ensured while finalizing outage programme.
- (iii) The SLDC shall inform the Regional Power Committee (RPC) Secretariat of its proposed outages in writing by 30<sup>th</sup> November for each financial year.
- (iv) The RPC Secretariat shall then come out with an outage programme for the next financial year for the Regional Grid as per Grid Code.
- (v) The SLDC shall interact with all users as may be necessary to review and optimize the outage plan, agree to any changes and produce an acceptable co-ordinated generation and transmission outage plan.
- (vi) The SLDC shall release the finally agreed outage plan which takes into account of regional and user requirements to all users by 1<sup>st</sup> March each year.
- (vii) The SLDC shall review the final outage plan quarterly in consultation with the RLDC and the users who shall be informed by the SLDC of any proposed changes. Users request for additional outages will be considered by the SLDC and accommodated to the extent possible. The SLDC shall inform users promptly of any changes that affect them.
- (viii) In case of emergency in the system viz. loss of generation, break down of transmission line affecting the system, grid disturbance, system isolation, the SLDC, may conduct studies again before clearance of the planned outage.
- (ix) The SLDC is authorized to defer the planned outage in case of any of the following:
  - (a) major grid disturbance.
  - (b) System isolation.
  - (c) Black out in a constituent system.
  - (d) Any other event in the system that has an adverse impact on the system security by the proposed outage.

- (x) Each entity shall obtain the approval from the SLDC prior to availing an outage.

**4.8 Recovery Procedures :**

**4.8.1 Introduction:**

The RLDC and the SLDC shall co-ordinate with each other to determine the extent of the problem in case there is any contingency crisis arising out of a total or a partial blackout of the State Grid or the Regional Grid. The SLDC shall advise all users of the situation and follow the strategy as outlined below for restoration.

Users' employees' persons authorized for operation and control shall be available at Users' end for communication and acceptance of all operational communications throughout the contingency. Communication channels shall be restricted as far as possible, to operational communications only till normalcy is restored.

**4.8.2 Total Regional Blackout :**

The SLDC shall instruct all relevant generating stations with black start capability to commence their pre-planned Black Start Procedure. The SLDC may require the Captive Power Plants to extend start-up power supply to generating stations as may be feasible. The SLDC shall prepare the STS for restoration by creating discrete power islands with no interconnection. Close co-ordination with concerned entities shall be maintained during such restoration process. Generating stations to whom start up power supply is made available shall sequence their start up to match their auxiliary power demand with supply available.

Generating stations shall inform the SLDC as generating units become available to take load in order that the licensee may assess the MW demand, which the generating unit is likely to pick up on circuit breaker closure.

The SLDC shall co-ordinate with generating stations and distribution licensees to:

- (i) form discrete power islands with one generating unit feeding some local demand.
- (ii) Extend islands by adding more generating units and more demand in a coordinated manner maintaining load generators balance.
- (iii) Synchronize islands to form a larger, more stable island.

The SLDC shall taking into account sites where system synchronizers are available; gradually extend the synchronization until all demand is restored.

The SLDC shall utilize any regional or Inter-State assistance available; if appropriate at any time to assist in the above process.

During recovery, priority of withdrawal of restriction on power drawal shall be as per policy of 4.4.3.

#### **4.8.3 Responsibilities:**

- (i) Detailed plans and procedures for restoration of the State grid under partial/ total black out shall be developed by the SLDC in consultation with all entities and the RLDC/ the RPC and shall be received/ updated annually and be communicated to all transmission and distribution licensee and generating companies.
- (ii) Detailed plans and procedures for restoration after partial/ total black out of each constituent's system within the State, shall be finalized by the constituent concerned in coordination with the SLDC. The procedure shall be reviewed, confirmed and / or revised once every year.
- (iii) List of generating stations with black start facility, inter-State synchronizing points and essential loads to be restored on priority, shall be prepared and be available with SLDC.
- (iv) The SLDC is authorized during the restoration process following a black out to operate with reduced security standards for voltage and frequency as necessary in order to achieve the fastest possible recovery of the grid.
- (v) The SLDC shall always Endeavour to restrict its net drawal from the Inter-State/ regional grid within the respective drawal schedules of entities by directing appropriate instruction to the entities, whenever the system frequency is below 49.5 MHz. When the frequency falls below 49.0 MHz, requisite load shedding shall be carried out in the concerned licensed area to curtail the over drawal.
- (vi) The SLDC is required to advise the entities about their respective entitlement from allocation/ share of generation stations, collection of their requisition, compiling them into State's total requisition from central sector allocation etc. in accordance with the principle laid down by the policy of the State Government or Government of India.

#### **4.8.4 Special Considerations :**

During the restoration process following regional blackout conditions, normal standards of voltage and frequency shall not apply.

A list of essential loads and priority of restoration shall be prepared by each entity in line with regulation 4.4.3.

Distribution Licenses with essential loads shall separately identify non-essential components of such loads, which may be kept off during system contingencies. Distribution Licensees shall draw up and 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 the SLDC.

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

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

#### **4.9 Operational Event/ Accident Reporting:**

##### **4.9.1 Repeatable Incidents :**

Typical examples of repeatable incidents that could affect the grid are the following:

- (i) Exceptionally high/low system voltage or frequency.
- (ii) Serious equipment problem i.e. major circuit, transformer or bus bar fault.
- (iii) Loss of major generating unit.
- (iv) System split, transmission system breakaway or black start.
- (v) Major fire incidents.
- (vi) Major failure of protection.
- (vii) Equipment and transmission line overload.
- (viii) Excessive Drawal deviations.

##### **4.9.2 Reporting Procedure:**

- (i) All reportable incidents occurring in lines and equipment of 33 KV and above at grid sub-stations and generating stations shall promptly be reported orally/ message by the user whose equipment has experienced the incident to any other significantly affected Users and to SLDC.
- (ii) Depending on the nature of incidence, the SLDC may ask for a preliminary as well as detailed written report, which shall be submitted within 48 hours in case of

preliminary report and in case of detailed report it shall be submitted within 7 days.

- (iii) In the case of an event occurring in EHV system and generating equipment which was initially reported by a constituent, the constituent shall give a written report within a week.
- (iv) The SLDC may call for a report from any user on any reportable incident affecting other users and the entity in case the same is not reported by such user whose equipment might have been the source of the reportable incident.
- (v) The above shall not relieve any user from the obligation to report events in accordance with Safety Regulations.
- (vi) The format of such a report shall be approved by the Commission, but will typically contain the following information:

Location of incident.

Date and time of incident.

Plant or equipment involved.

Supplies interrupted and duration if applicable

Amount of generation lost if applicable.

Brief description of incident.

Estimate of time to return to service.

Name of originator.

4.9.3 The standard reporting form would be as follows:



## INCIDENT REPORTING

Date.....

Time.....

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. System parameters after the incident.
6. Network configuration before the incident.
7. Relay indications received and performance of protection.
8. Damage to equipment.
9. Supplies interrupted and duration, if applicable.
10. Amount . of Generation lost, if applicable.
11. Estimate of time to return service.
12. Cause of incident.
13. Any other relevant information and remedial action taken.
14. Recommendations for future improvement/ repeat incident.
15. Name of the Organization.

### **4.9.4 Major Failure :**

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

### **4.9.5 Accident Reporting :**

Reporting of accidents shall be in accordance with the Section 161 of Electricity Act, 2003. In both fatal and non-fatal accidents, the report shall be sent to the Electrical Inspector in the prescribed form and to such other authorities as the State Government may by general or special order direct.

## **CHAPTER 5**

### **SCHEDULING AND DESPATCHING**

#### **5.1 Objective :**

Procedures to be adopted after introduction of intra-State ABT for scheduling of injection by beneficiaries including all generating agencies connected with the STS, injected share of ISGS and scheduling of drawal by all licensees connected to the STS of the State on a daily basis are dealt with herein.

#### **5.2 Demarcation of responsibilities:**

- (i). In pursuance to Intra-State Availability Based Tariff (ABT) specified in Tariff Regulations, the SLDC, shall have the total responsibility for scheduling/ dispatching by generating stations of generating companies, the Captive Power Plants and Open Access Customers concerned as per Tariff Regulations connected to the State grid, the drawal/injection by the entities, the drawal from the ISGS and the inter-State interchanges of traded power or under sub-section (5) of section 64 of the Act, if there is any
- (ii) The SLDC, if required, through STU, shall always Endeavour to restrict net drawal from generating stations and others within their respective drawal schedules.
- (iii) The Generating stations and inter-state injectors under Intra-State ABT connected to the STS shall be responsible for power injection generally according to the daily schedule advised to them by the SLDC.
- (iv) However, such generating stations may deviate from the given injection schedules depending on the plant and system conditions. In particular, they would be allowed/ encouraged to generate beyond the given injection schedule under deficit conditions as per guideline of the SLDC.

- (v) Provided that when, the frequency is higher than 50.5 Hz, the actual net injection shall not exceed the scheduled injection for that hour. Also while the frequency is above 50.5 Hz, the generating stations may back down their generation in concurrence with the SLDC to restrict the frequency rise. When the frequency falls below 49.5 Hz, the lifting of backing down should be as per guidance of SLDC.
- (vi) However, notwithstanding the above, the SLDC may direct the beneficiaries to increase/ decrease their injection/ drawal in case of contingencies e.g. overloading of items/ transformers, abnormal voltages, threat to system security. Such directions shall immediately be acted upon.
- (vii) For all outages of generation and transmission system, which may have an affect on the State grid, all entities shall co-operate with each other and co-ordinate their actions as per the procedures finalized separately. In particular, outages requiring restriction of generation, which a beneficiary can receive (and which may have a commercial implication) shall be planned carefully to achieve the best optimization.
- (viii) The entities shall furnish to the SLDC all requisite information for billing purposes.
- (ix) All entities shall abide by the concept of frequency linked load dispatch and pricing of deviations from schedule i.e. unscheduled interchanges. All generating units of the entities shall normally be separated according to the standing frequency linked load dispatch guidelines issued by the SLDC to the extent possible, unless otherwise advised by the SLDC.
- (x) The SLDC shall be responsible for intra-State energy accounting as per the Balance and Settlement Code as specified in Tariff Regulations, and all entities shall extend the necessary assistance to the STU personnel in timely collection of metered data.

### **5.3 Scheduling and Despatch Procedure:**

The general methodology for scheduling and calculating availability and capacity index shall be as under:

- (i) By 11.00 a.m. every day, all the generating stations connected to the STU shall furnish their expected generation (in terms of Ex-bus MW, for all the 15 minutes time blocks and also in terms of MU or MWH for the whole day) for the next day to the SLDC as per format in **Annexure-III**. The declaration shall be for that capacity which can be actually made available. For Hydro generating station, the declaration shall be made for a period of time not less than 3 hours within a 24 hours period for pondage and storage type of stations and for the entire day for purely run-of-river type stations.
- (ii) The declaration shall be for the capacity of the generating station to deliver ex-bus MW for the next day either as one figure for the whole day or as different figures for different periods of the day along with maximum available capacity (MW) and total energy (MWh) ex-bus to the SLDC. The capacity as declared by the generating stations also referred to as the declared capacity shall form the basis of injection scheduling.
- (iii) For hydro-generating stations, the declaration should also include limitation on generation during specific time periods, if any, on account of restriction on water use due to irrigation, drinking water, industrial, environment al considerations etc.
- (iv) For hydro-generating stations transformation losses means the losses due to transformation of firm generation voltage to transmission voltage and is about 0.5% of energy generated..
- (v) The SLDC shall receive ISGS schedule of the next day from RLDC within 10.00 a.m. and in turn after exploring all availabilities and exchanges (both bilateral and through traders and with licensees) prepare their expected drawal schedule and send their requisition for the next day within 3.00 p.m. to RLDC.
- (vi) Based on the requisitions given by the beneficiaries and different entities and taking into account technical limitations on varying the generation and transmission system constraints, if any, the availability of central sector allocation/ share, the relevant issues like open access and trading of power, etc. in the regional schedule, the SLDC shall prepare the economically optimal injection schedules for generating stations of generating company, distribution licensees and other entities and also drawal schedules for distribution licensees

and other entities. The SLDC shall communicate the same to the generating stations and the beneficiaries.

- (vii) While finalizing the above daily generation schedules for the generating stations, the SLDC shall ensure that the same are on merit order basis as far as possible, operationally reasonable, particularly in terms of ramping/ sliding rates and the ratio between minimum and maximum generation levels.

The SLDC shall also formulate the procedure for meeting contingencies both in the long run and in the short run, and detailed scheduling procedure in a surplus and shortage system in its monthly meeting with the licensees.

- (viii) The generating agencies connected to STS or agencies injecting power in State Grid shall inform any modification/changes to be made in station wise foreseen capabilities, if any, to the SLDC by 09.00 p.m. Beneficiaries may also inform any modification/ change of their drawal/ export, if any, to the SLDC by 09.00 PM.
- (ix) Based on the surplus, if any, the concerned beneficiaries may arrange for supply such surplus power through day ahead transaction under Open Access Regulations or any Inter-State supply. Such arrangement on the modification, if any, shall be intimated to the RLDC by the SLDC by 10.00 p.m. The SLDC shall receive the final 'drawal schedule' from the RLDC against ISGS share along with any Bilateral Exchange of Power, if any by 11.00 p.m.
- (x) The SLDC shall inform the final injection/ drawal schedule for the next day to all concerned by 11.30 p.m.
- (xi) In the event of any contingency during the course of the day of operation, the SLDC or any generating station of any generating company connected to the STS or any entity may revise its injection and drawal schedule and its foreseen capability, drawal/export for the balance period of the day. The SLDC shall then revise the concerned 'drawal schedule' and 'dispatch schedule' in consultation with the concerned beneficiaries and issue the same. All such revisions shall be effective one hour after the first advice is received by the SLDC.
- (xii) While finalizing the drawal and injection schedules as above, the SLDC shall also check that the resulting power follows do not give rise to any transmission

constraint. In case any impermissible constraint is foreseen, the SLDC shall moderate the schedules to the required extent, under intimation to the beneficiaries concerned. The revised schedule shall be made effective from the fourth time blocks counting the issuing time as the first time block. In case of any grid disturbance, the scheduled injection and scheduled drawal of all beneficiaries shall be deemed to have been revised to be equal to their actual injection/drawal for all the time blocks affected by grid disturbances.

- (xiii) In the case of a forced outage of a unit, the SLDC shall revise the schedules on the basis of revised declared capacity. The revised declared capacity and the revised schedules shall become effective from the 4<sup>th</sup> time block counting the time block in which the revision is advised by the generator to be the first one.
- (xiv) In the event of a bottleneck in evacuation of power due to any constraint, outage, failure or limitation in the STS, associated switchyard and sub-station owned by the Licensees necessitating reduction in injection by any beneficiary, the SLDC shall revise the schedules which shall become effective from the 4<sup>th</sup> time block, counting the time block in which the bottleneck in evacuation of power has taken place to be the first one. Also during the first, second and third time blocks of such an event, the scheduled injection shall be deemed to have been revised to be equal to actual injection and the scheduled drawals/ injection of the beneficiaries and all other entities on whom these Regulations is applicable shall be deemed to have been revised to be equal to their actual drawals.
- (xv) In the case of any grid disturbance, scheduled injection and scheduled drawal of the beneficiaries and all other entities on whom these Regulations are applicable shall be deemed to have been revised to be equal to their actual injection/ drawal for all the time blocks affected by the grid disturbance. Certification of grid disturbance and its duration shall be done by the SLDC within 24 hours of the grid disturbance. The SLDC shall notify all the entities in the grid about the period of such grid disturbance and the effected portion of the grid system in detail.
- (xvi) Revision of declared capacity by the generation station(s) and requisition by beneficiary (ies) for the remaining period of the day or part of the day or injection / drawal of the entities as per agreement shall also be permitted with advance notice. Revised schedules/ declared capacity or injection/ drawal schedule in

such cases shall become effective from the 6<sup>th</sup> time block, counting the time block in which the request for revision has been received in the SLDC to be the first one.

- (xvii) If, at any point of time, the SLDC observes that there is need for revision of the schedules in the interest of better system operation, it may do so on its own and in such cases, the revised schedules shall become effective from the 4<sup>th</sup> time block, counting the time block in which the revised schedule is issued by the SLDC to be the first one.
- (xviii) For any revision of a scheduled injection including post facto deemed revision there shall be a corresponding revision of scheduled drawals of the beneficiaries. The SLDC shall issue final schedule of the day by 06.00 a.m. on next day for the purpose of UI calculation.
- (xix) On completion of the operating day, by 24.00 hours, the schedule finally implemented during the day (taking into account all before the fact changes in dispatch schedule of generating stations and drawal schedule of the users) shall be issued by the SLDC. This schedule shall be the datum for commercial accounting. The average ex-bus capability for each of the generating stations connected with the STS shall also be worked out based on all before the fact advice to the SLDC.
- (xx) While making or revising its declaration of capacity, the generator shall ensure that the declared capacity during peak hours is not less than that during other hours. However, exception to this may be allowed in case of tripping/ re-synchronization of units as a result of forced outage of units. The peak hours shall be as applicable for generating station as per Tariff Regulations.
- (xxi) The scheduled injection and actual injection for generation station shall be ex-bus generation at the generating station. For beneficiaries and all other entities on whom these Regulations are applicable, the scheduled and actual net drawals shall be at their respective receiving points as mentioned in the PPA.
- (xxii) For calculating the net drawal schedules of beneficiaries and all other entities on whom these Regulations are applicable, the applicable intra-State transmission losses shall be apportioned to their drawal schedules for the time being.

Provided that a refinement may be specified by the Commission in future depending on the preparedness of the SLDC.

- (xxiii) Drawal/injection schedules issued/ revised by the SLDC shall become effective from designated time block. Every endeavor shall be made by the SLDC to communicate the revision to the concerned entities unless there are extraordinary circumstances for only upon such communication the time block shall be reckoned to commence.
- (xxiv) A procedure for recording the communication regarding changes to schedules duly taking into account the time factor shall be evolved by the STU.
- (xxv) The SLDC shall properly document all above information i.e. station-wise foreseen ex-power plant capabilities advised by the generating stations, the drawal schedule indented by the beneficiaries, all schedules issued by the SLDC and all revision/ updating of the above.
- (xxvi) The procedure for scheduling carried out by SLDC shall be open to all entities for any checking/ verification. In case any mistake/ omission is detected, the SLDC shall forthwith make a complete check and rectify the same.
- (xxvii) While availability declaration by the generating stations may be a resolution of one MW and one MWhr all entitlement requisitions and schedules shall be rounded off to the nearest decimal to have a restriction of 0.1 MW.

#### **5.4 Reactive Power and Voltage Control :-**

- (i) Regarding VAR drawal/ absorption from intra-State Grid, the SLDC has to follow the Grid Code.
- (ii) All the distribution licensees, transmission licensees and the STU are expected to provide local VAR compensation such that they do not draw VARs from the grid. VAR compensation has to commence in the following order :
  - (a) Consumer end.
  - (b) Distribution transformer end.
  - (c) At the substations end of 6/11/33 KV distribution feeders.
  - (d) Substations of STU.



- (e) Generating stations.
- (iii) While tap changing on all 400/ 220 KV ICTs of CTU shall be done as per the instruction of the RLDC while tap changing of other ICTs shall be done as per the instructions of the SLDC.
- (iv) The generating stations shall generate/ absorb reactive power as per instruction of the SLDC, within the capability limits of the respective generating units. No payments shall be made to the generating companies for such VAR generation/ absorption.
- (v) The SLDC may direct a beneficiary to curtail its VAR drawal/ injection in case security of the grid or safety of any equipment is endangered.
- (vi) At interchange point the VAR drawal/ injection shall be minimum when voltage at their point is below 97% or above 103 %.

## CHAPTER 6

### NON-COMPLIANCE:-

- 6.1 In pursuance to sub-sections (2) (4) and (5) of section 33 of the Act , every licensee, generating company, generating station, EHT S/S and any other entity connected with the operation of the State Grid shall comply with directions issued by the SLDC. If any dispute arises with reference to the safe, secure and integrated operation of the State Grid or interpretation of clauses of State Grid Code or in relation to any direction given by the SLDC, it shall be referred to TERC for decision. Pending decision of the Commission, the concerned party raising the dispute shall comply with direction of the SLDC. The TERC, in turn, after due process may order the defaulting entity for compliance or otherwise. The non-compliance of the same may lead to penal action which includes termination of connectivity agreement and de-linking from the State Grid.
- 6.2 In the case of non-payment of dues i.e. bills by any beneficiary the affected entity shall report the matter to the SLDC. The SLDC shall verify the facts and take up the matter with the defaulting entity for paying up of the dues. In case of non-compliance by the defaulting entity, the TERC shall be informed by the SLDC whereupon the TERC shall initiate necessary action.

- 6.3 Any entity that has been accused of non-compliance of any direction of any Appropriate Commission and has its connection disconnected with any grid by virtue of any order of the Appropriate Commission shall not be allowed any connectivity with State Grid unless the original dispute is settled.

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## CHAPTER 7

### COMMERCIAL ISSUES

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- 7.1 The summation of input meter readings at the connection points of the STS with generating stations, entities/ licensee engaged in distribution of electricity and inter-connection points with the CTU and other entities gives the total flow into the STS. Similarly, the summation of export at the connection points of the STS with generating stations, entities engaged in distribution of electricity and inter connection points with the CTU and other entities gives the total outflow from the STS. The difference between the inflow and outflow is the transmission loss of the STS. As the connection points with distribution entity may be large in number, initially it may not be possible to apply the above principle to determine transmission loss. In such an event several load flow studies representing different load conditions covering at least three seasons and three hours of the day may be carried out to determine the transmission loss. The transmission losses determined either way shall be apportioned to the distribution entity consuming power and energy from the STS network and added to their metered drawal to arrive at the billing figure.
- 7.2 Any variation between an actual injection or an actual drawal and the scheduled injection or the scheduled drawal shall be accounted for by SLDC as per Tariff Regulations. Weekly bills of variations shall be prepared and issued by the SLDC. These bills shall have high payment priority and the concerned entities shall make payment of the billed amount within 10 days of billing date. If the payments against the above bills are delayed, the defaulting entities shall have to pay simple interest @ 0.04% for each day of delay. The interest so collected shall be paid to the entities who were to receive the payment.

In case of continued payment default, the matter should be brought to the notice of the TERC by the SLDC.

- 7.3 Energy accounts shall be prepared by the SLDC on monthly basis and shall be issued to all concerned entities within 3 clear working days of the succeeding month.
- 7.4 All energy accounting calculations carried out by the SLDC shall be open to all users for any checking/ verification. In case any mistake is detected the SLDC shall make a complete check and rectify the mistake.
- 7.5 In matters concerning VAR drawal/ absorption (its rate and payment) from inter-State grid the SLDC has to follow Grid Code. VAR drawal/ absorption and payment for the same shall be settled between a beneficiary and the pool account or between the beneficiaries as applicable. The generating stations shall generate/ absorb reactive power as per the instruction of the SLDC within the capability limits of the generating units. No payments shall be made to generating companies for the same.

#### **CHAPTER 8**

### **POWER OF THE COMMISSION TO AMEND, TO REMOVE DIFFICULTIES, DISPENSE WITH REGULATIONS..**

#### **8.1 Powers to remove difficulties.**

- 8.1.1 If any difficulty arises in giving effect to any of the provisions of these Regulations, the Commission may , with reasons to be recorded in writing, direct the licensees, the consumers or the applicants for Open Access, by general or special order, for taking suitable action not inconsistent with the provisions of the Act, as may appear to be necessary for removing the difficulty.

#### **8.2 Powers to Amend :-**

- 8.2.1 The Commission may, at any point of time, at its sole discretion,, vary, alter, modify, add or amend any provisions of these Regulations.

#### **8.3 Power to dispense with Regulations :-**

- 8.3.1 Nothing in these Regulations shall be deemed to limit or otherwise affect the inherent powers of the Commission to make such orders as may be necessary for meeting ends of justice or to prevent the abuse of the process of the Commission.

*BY Order of the Commission*

*DW?*  
*Secretary* *29/7*  
*2011*  
TERC

**SITE RESPONSIBILITY**

[See Regulation 3.3]

Name of Power Station/Sub-Station owner:

Tel. Number:

Fax Number:

Permanent Address

Item of Plant/Apparatus	Plant Owner	Responsibility for				Remarks
		Safety	Control	Operation	Maintenance	
....KV Switchyard						
All equipments including Bus bars						
Feeders						
Generating Units						

**PLANING /CONNECTIVITY DATA**  
**[See Regulation 3.6.5]**

**Generation**

1. Name of Power Station
2. Station type – Thermal (coal, gas, oil), Hydro (Reservoir type), ROP (with hours of Storage/Pump Storage), GT/CCGT.
3. Station capacity-
  - (i). Total capacity
  - (ii) Number of units & size

**4.1 Thermal Station –**

- (i) Rating of Boiler, Turbine & major auxiliaries
- (ii) Peaking availability and peaking capability

**4.2 GT/CCGT –**

- (i) Natural Gas/LNG/Oil
- (ii) Salient details of GT/CCGT
- (ii) Peaking availability and peaking capability

**4.3 Hydro –**

- (i) Schematic layout showing dam reservoir area, water conductor system, fore bay, powerhouse
- (ii) Rating of Turbine and other major equipment

(iii) Reservoir data and operating table

(iv) Operating head  $\text{Max}^m$  &  $\text{Min}^m$

#### 4.4 Captive power plant

(i) Salient details including plant capacity & exchange of Power.

#### 5.1 Generators –

(i) Type

(ii) Rating/MVA

(iii) Voltage

(iv) Speed

(v) Inertia constant  $H(\text{MW Sec/MVA})$

(vi) Rated P.F

(vii) Reactive Power capability

(viii) S.C. Ratio

(ix)  $X_d', X_d^{11}$  (Saturated & Unsaturated )

(x)  $X_q', X_q^{11}$  (Saturated & Unsaturated )

(xi)  $T_{do}^1, T_{do}^{11}$

(xii)  $T_{qo}^1, T_{qo}^{11}$

(xiii) Stator resistant & leakage reactance or Potier Reactance

(xiv) Stator time constant

(xv) Rated field current

(xvi) Neutral grounding

(xvii) Generator Capability Curve

**6. Generator Transformer**

- (i) Type
- (ii) Rated capacity /MVA
- (iii) Voltage ratio & Vector group
- (iv) Tape changer range
- (v) On load/Off load tap changer
- (vi) Percentage impedance-Positive & Zero Sequence
- (vii) Grounding of Generator Transformer
- (viii) X/R Ratio

**7.1 Excitation –**

- (i) Type of excitation
- (ii) Rated field voltage, maximum & minimum field voltage
- (iii) Details of excitation loop block diagram showing transfer function

**8. Governor System-**

- (i) Governor droop
- (ii) Speeder motor setting range
- (iii) Governor block diagram showing transfer functions & different time constant
- (iv) Dead band if any.

**9. Protecting & Metering –**

- (i) Description of all relays & protection system installed in generating unit.
- (ii) Description of all relays & protection system installed on all outgoing feeders
- (iii) Full description of operational & commercial metering schemes.

**10. Operational parameters –**



- (i) Minimum time required to synchronize a generating unit from de-synchronization (hot start)
- (ii) Maximum time to synchronize a unit from rest (cold start)
- (iii) The Maximum load
- (iv) Maximum loading & unloading rates.

**Transmission Data**

**1.1 Single line diagram of transmission system down to 132/33 KV S/S.**

- (i) Name of S/S
- (ii) Power Station connection
- (iii) Number & length of circuits
- (iv) S/S bus layout (Main & transfer, 2 Main & transfer, 2 Main, Breaker & half)
- (v) Power transformers
- (vi) Reactive compensation equipment
- (vii) Grounding arrangement

**1.2 Transformer parameters – Rated MVA, Voltage rating & vector group, Positive & zero sequence Impedance, Tap Changer (on/off load) and range, Transformer Grounding and X/R Ratio**

**1.3 Component details –**

- (i) Circuit breaker, isolating switches, current & potential transformers.

**1.4 Relay & Meters-**

- (i) Relay protection for all transformers and feeders
- (ii) Metering detail

**1.5 Line parameters – Line designation, Year of commissioning, Length of line (Km), Line capacity (Thermal & surge impedance), No. of circuits, Per unit circuit impedance on 100 MVA & admittance values (positive & zero sequence).**

**Distribution data**

1. Name of S/S of STU from where connection shall be made.
- 1.2 Quantum of Power (MW)/MVA to be drawn/injected from / to of STU S/S and voltage and no. of circuits required.
- 1.3 The length and size of the feeder and no. of distribution S/S connects to the feeder for supply of load to distribution area.
- 1.4 Reactive compensation used to control reactive drawal from STU, feeder – wise.
- 1.5 Details of protection & metering for the feeders.
- 1.6 Type of Load characteristic (whether constant power or Voltage impedance, etc.)

**Load forecast Data**

1. Consumer data – Furnish categories of consumers, their nos. connected load.
2. Peak load and energy forecast for each connection point / in the face point for each category of load for each of the succeeding 10 years.
3. Methodology and assumptions on which forecast made.
4. If supply is received from more than one STU S/S , the S/S- wise break-up of peak load & energy projections for each of succeeding 10 years with estimated daily load curve.
5. Details of bulk load 5 Mw & above, Voltage of supply, S/S from which is to be fed.

**INJECTION SCHEDULE**

[See Regulation 5.3(i),]

Block No.	Time in	Proposed Injection by Entity in MW from own Generating Station	Proposed Injection by the Entity from Own availability for other entities*	Injection of Power on behalf of other entities as per 5.3 (ix)	Total Injections (Outside own area of Supply)
(1)	(2)	(3)	(4)	(5)	[6=(4+5)]
1	00.00 hrs. to 00.15 hrs.				
2	00.30 hrs. to 00.45 hrs.				
3	00.30 hrs. to 00.45 hrs.				
4	00.45 hrs. to 01.00 hrs.				
5					
6	23.45 hrs. to 24.00 hrs				

\* Note: Destination wise injection is to be shown separately in separate column.