

Tamil Nadu Electricity Grid Code, 2005

TAMILNADU

India

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Tamil Nadu Electricity Grid Code, 2005Published vide Notification No. TNERC/GC/13/1, dated 19.10.2005Whereas under clause (h) of subsection 1 of Section 86 of the Electricity Act, 2003 (Central Act 36 of 2003), the State Electricity Regulatory Commission shall among others, specify State Grid Code consistent with the Indian Electricity Grid Code (1EGC) specified by Central Electricity Regulatory Commission under clause (h) of sub-section 1 of Section 79 of the said Act.Now Therefore under the powers conferred by the said section and all other powers enabling in that behalf and after previous publication, the Tamil Nadu Electricity Regulatory Commission hereby specifies the following code.

Chapter 1

1. Short title and commencement.

- (i) This code may be called "Tamil Nadu Electricity Grid Code".(ii)The provisions of this code shall come into effect on the date of its publication in the Tamil Nadu Government Gazette.(iii)The date of commencement for provisions under sections 4 (1) (e) and 4 (2) (f) of this Code is subject to the transitional provisions of section 172 of Electricity Act 2003 where in the State Government may, by notification, authorize the State Electricity Board to continue to function as State Transmission Utility or a licensee for such further period as may be mutually decided by the Central Government and the State Government.

Chapter 2

Preliminary

2. Glossary and Definitions.

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| No. | Item | Definition |
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| 1 | ART | Availability Based Tariff |
| 2 | Act | The Electricity Act 2003 |
| 3 | Agency | A term used in this Code to refer to Licensee /Generating Stations that utilize the Intra State TransmissionSystem. |
| 4 | Apparatus | Electrical equipments and includes all machines,fittings, accessories and appliances in which conductors areused. |
| 5 | Area of Supply | "Area of Supply" means area designatedin the license for carrying out the licensed activity. |
| 6 | Automatic Voltage Regulator (AVR) | A continuously acting automatic excitationcontrol system to control the voltage of a Generating Unitmeasured at the generator terminals |
| 7 | Black Start Procedure | The procedure necessary to bring back normalcyin the Grid from a blackout |
| 8 | BIS | The Bureau of Indian Standards |
| 9 | Captive Power Plant (CPP) | A Power plant set up by any person to generateelectricity primarily for his own use and includes j a powerplant set up by any co-operative society or association ofpersons for generating electricity primarily for use of membersof such co-operative ; societies or associations |
| 10 | CEA | The Central Electricity Authority |
| 11 | CERC | The Central Electricity Regulatory Commission |
| 12 | Central Transmission Utility (CTU) | Central Transmission Utility means anyGovernment company, which the Central Government may notify undersubsection (1) of Section 38 of the Act |
| 13 | Central Generating Station (CCS) | Power Station, which is owned and / orcontrolled by Central Government |
| 14 | Code | 'Code' means the Tamil Nadu Electricity GridCode in as much as this Code is concerned. |
| 15 | Co-generation | "Cogeneration" means a process, whichsimultaneously produces two or more forms of useful energy(including electricity). |
| 16 | Commission | Tamil Nadu Electricity Regulatory Commission. |
| 17 | Connection point | A point at which an agency's Plant and/orApparatus connects to the Infra State Transmission System. |
| 18 | Connection Agreement | An agreement setting out the terms relating tothe Connection to and / or use of the Transmission / DistributionSystem. |
| 19 | Constituent | Any agency who is a member of the StateElectricity System |
| 20 | Consumer | |

Consumer means any person who is supplied with electricity for his own use by a Licensee or the Government or by any other person engaged in the business of supplying electricity to the public under this Act or any other law for the time being in force and includes any person whose premises are for the time being connected for the purpose of receiving electricity with the works of a Licensee, the Government or such other person, as the case may be.

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| 21 | Demand | The demand in MW and MVA of electricity (i.e. both Active and Apparent Power) unless otherwise stated |
| 22 | Disconnection | The act of physically separating User's or customers electrical equipment from the System. |
| 23 | Distribution Licensee | "Distribution licensee" means a licensee authorised to operate and maintain a distribution system for supplying electricity to the consumers in his area of supply. |
| 24 | Distribution System | "Distribution System" means the system of wires and associated facilities between the delivery points on the transmission lines or the generating station connection and the point of connection to the installation of the consumers. |
| 25 | Disturbance Recorder (DR) | A device provided to record the behavior of the pre-selected digital and analog values of the system parameters during an event. |
| 26 | Data Acquisition System (DAS) | A device provided to record the sequence of operation in time, of the relays / equipments / system parameters at a location. |
| 27 | Event | 'Event' when used in conjunction with the terminology 'Event Logger' means an unscheduled or unplanned occurrence on a Grid, including faults, incidents and breakdowns |
| 28 | Event Logger | A device provided to record the sequence of operation in (EL) time, of the relays / equipments ; at a location during an event. |
| 29 | External Interconnection | Electric lines and electrical equipment used for transmission of electricity between the Inter State and Intra State Transmission System. |
| 30 | Forced Outage | An outage of a Generating Unit or a transmission facility due to a fault or other reasons, which has not been planned. |
| 31 | Generating Company | Means any company or body corporate or association or body of individuals, whether incorporated or not, or artificial juridical person, which owns or operates or maintains a generating station. |
| 32 | Generating Unit | The combination of an electrical power generator and its prime mover and all of its associated equipment, which together constitutes a single generating machine. |
| 33 | Good Utility | Any of the practices, methods and acts engaged in or Practices approved by a significant portion of the electricity utility industry during the relevant time period which could have been expected to accomplish the desired results at a reasonable cost consistent with good business practices, reliably, safely and with expedition. |

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| 34 | Governor Droop | In relation to the operation of the governor of a Generating Unit, the percentage drop in system frequency which would cause the Generating Unit under free governor action to change its output from zero to full load. |
| 35 | High voltage DC System (HVDC) | High Voltage Direct Current System |
| 36 | IEC | International Electro Technical Commission, the authority that approves the electricity industry standards used on an international basis. |
| 37 | Independent Private Transmission Company (IPTC) | A licensed transmission agency, not owned / controlled by the Central State Government, involved in the business of transmission of electrical energy |
| 38 | Indian Electricity Grid Code (IEGC) | A document describing the philosophy and the responsibilities for planning and operation of Indian power system specified by the CERC in accordance with sub-section 1 (h) of Section 79 of the Act. |
| 39 | Inter State Transmission System (ISTS) | Inter-State Transmission System includes <ul style="list-style-type: none"> (i) Any system for the conveyance of electricity by means of a main transmission line from the territory of one State to another State (ii) The conveyance of energy across the territory of an intervening State as well as conveyance within the State which is incidental to such inter-state transmission of energy (iii) The transmission of electricity within the territory of State on a system built, owned, operated, maintained or controlled by CTU. |
| 40 | Intra State Transmission System | The transmission system within the State of Tamil Nadu for the transmission of electricity to various parts of the State |
| 41 | Lean Period | That period in a day when electrical demand is at its lowest |
| 42 | Licensee | A person who has been granted a license under section 14 of the Electricity Act, 2003 to supply or transmit or trade electrical energy. |
| 43 | Load | The active, reactive or apparent power, as the context requires, generated, transmitted or distributed or consumed by a utility / installation |
| 44 | Maximum Continuous Rating (MCR) | The normal rated full load MW output capacity of a generating unit, which can be sustained on a continuous basis at specified conditions. |
| 45 | National Grid | The entire inter-connected electric power network of the country, which would evolve after inter-connection of regional Grids. |
| 46 | Operation | A scheduled or planned action relating to the operation of the power system. |
| 47 | Outage | In relation to a generation / transmission system / distribution system or facility, an interruption of power supply whether manually or through |

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| | | protective relaying inconnection with maintenance / breakdown / failure or defects. |
| 48 | Peak Period | That period in a day when electrical demand isat its highest. |
| 49 | Pool Account | A business account for payments regardingunscheduled interchanges (UI account) or and reactive energyexchanges (Reactive Energy account), as the case may be. |
| 50 | Power Station / Power Plant | An installation of one or more Generating Units(even when sited separately) owned and / or operated by the sameGenerating Company and which may reasonably be considered asbeing managed as a single integrated generating complex. |
| 51 | Prudent Utility Practices | Those practices, methods, techniques andstandards, as changed from time to time that are generallyaccepted for use in the international electric utility industry,taking into account conditions in India / Tamil Nadu, andcommonly used in prudent electric utility engineering andoperations to design, engineer, construct, test, operate andmaintain equipment lawfully, safely, efficiently and economicallyas applicable to equipment of a certain size, service and typeand which practices, methods, standards and acts shall beadjusted to the extent necessary, in order: (a) to conform to operation and maintenancguidelines recommended by the equipment manufacturers andsuppliers and according to the guidelines given in the Indian /International Standards code of practice for such equipments. (b) to ensure compliance with the ElectricityAct 2003, rules and other related laws. (c) to take into account the site location,including without limitation, the climatic, hydrological andother environmental or general conditions thereof. (d) to conform to energy conservation and (e) to conform to the general safety standards. |
| 52 | Regional Energy Account (REA) | A regional energy account, for the settlementand billing of "Capacity Charge" and "EnergyCharge". |
| 53 | Regional Grid | The important elements of constituent / usersystems including the ISTS which the RLDC supervises. |
| 54 | The Regional Load Despatch Centre (RLDC) | 'Regional Load Despatch Centre.' means theCentre established under sub-section (1) of Section 27 of theAct. |
| 55 | Single Line Diagram (SLD) | Diagrams which are a schematic representation ofthe HV/EHV apparatus and the connections to all external circuitsat a Connection Point incorporating numbering nomenclature andlabeling. |
| 56 | Site Common Drawing | Drawing prepared for each connection point whichincorporates layout drawings, electrical layout drawings, commonprotection / control |

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| | | drawings and common service drawings. |
| 57 | Southern Region / Region | Region comprising of the States of Tamil Nadu, Andhra Pradesh, Karnataka, Kerala and Pondicherry for the integrated operation of the electricity system. |
| 58 | Spinning Reserve | Part loaded generating capacity with some reserve margin that is synchronized to the system and is ready to provide increased generation at short notice pursuant to despatch instruction or instantaneously in response to a frequency drop. |
| 59 | State Load Despatch Centre (SLDC) | The load despatch centre established under section 31 (1) the Act, operating round the clock for the purpose of managing the operation of the transmission system and co-ordination of generation and drawal on a real time basis. |
| 60 | State Sub Load Centre (SSLDC) | State's Sub Load Centre for local control at various places in Tamil Nadu. |
| 61 | Supervisory Control and Data Acquisition (SCADA) | 'SCADA' means Supervisory Control and Data Acquisition System that acquire data from remote locations over communication links and process it at centralized control location for monitoring, supervision, control as well as decision support. |
| 62 | State Transmission Utility (STU) | "State Transmission Utility" means the Board or the Government company specified as such by the State Government under sub-section (1) of section 39. |
| 63 | Static VAR Compensator (SVC) | An electrical facility designed for the purpose of generating or absorbing reactive power. |
| 64 | STS | State Transmission System |
| 65 | Supply | "Supply" in relation to electricity, means the sale of electricity to a licensee or consumer |
| 66 | TNERC | Tamil Nadu Electricity Regulatory Commission |
| 67 | TNEGC | Tamil Nadu Electricity Grid Code |
| 68 | Transmission System | The system of EHT electric lines and electrical equipment owned and / or operated by the STU and other transmission licensees, for the purpose of the transmission of electricity between power stations, external interconnections and the distribution system. |
| 69 | Transmission License | A license granted by the Commission under section 14 of the Act, to transmit electricity. |
| 70 | User | A person including the STU, Generating Company, Licensee and Power Grid Corporation of India or any such entity that uses the Transmission System and who must comply with the provisions of the Grid Code. |
| 71 | Utility | "Utility" means the electrical lines or electrical plant, and includes all lands, buildings, works and materials attached thereto belonging to any person acting as a generating company or licensee under the provisions of the Act. |

Chapter 3

General

3. Overview.

(1) Generation, Transmission, Distribution and Supply are the main functions in an Electric system. Irrespective of whether there are different wings under the control of the same management or independent companies and Licensees for these functions, as envisaged in Electricity Act 2003, the quality of service rendered to the end user depends upon the function of each wing. This Code defines the main functions connected with the Intra State Transmission System and also lays down the rules, the guidelines and standards to be followed by the various players (agencies and participants) in the system to plan, develop, expand, maintain and operate the power system in the most efficient, reliable, safer and economic manner. This Code is consistent with the Indian Electricity Grid Code (IEGC) and Grid Standards formulated under various regulations by CEA.

(2) Objective: The objective of the Code is to define the services rendered by each wing in the overall electric system and also for identifying the responsibility and performance factor and measurement points for each one of them. Further it facilitates intra state transmission and wheeling of electricity, with a focus on the operation, maintenance, development and planning of the Tamil Nadu State Electricity Grid. This Code brings out a single set of technical requirements encompassing all the Generators, Licensees, and State Transmission Utility connected to or related to or using the Intra State Transmission System and provides the following:

- The documentation of the principles and procedures, which define the relationship between various users of the Intra State Transmission System and State Load Despatch Centre as well.
- Responsibilities and obligation with respect to the operation of the State Transmission System (STS).
- Suitable measures for connectivity with the Grid for all generating plants.
- The standards with reference to quality, continuity and reliability of service for compliance by the Licensees.
- Planning of the State Electricity Grid and making arrangements for its operation, maintenance, development and expansion.
- Operation of Grid under normal, abnormal and emergency conditions.
- Procedures for black start, fast restart, restoration of supply after major disturbances.
- Penalty for the non-compliance of this Grid Code, Grid Standards and the lawful directions of RLDC and SLDC.
- Facilitation for beneficial trading of electricity by defining a common basis of operation of the Intra State Transmission System applicable to all the users of the system.
- To ensure economy and efficiency in the operation of the power system in the State.
- To achieve compliance with the Grid Standards and other relevant Standards, Codes, Regulations and direction of SLDC by every licensee and others involved in the operation of the power system.

(3) Structure of the Tamil Nadu Electricity Grid Code: The Code is structured in distinct chapters as follows:

- (a) Functional responsibilities of entities connected with the State Grid
- (b) System Planning
- (c) Grid Connectivity conditions
- (d) Requirement in Grid Operation
- (e) Scheduling and Despatch
- (f) Commercial issues and Implementation
- (g) Non Compliance

(4) General Requirements: The Grid Code contains procedures to permit equitable management of day to day technical situations in the Electricity Supply System, taking into account a wide range of operational situations and requirements likely to be encountered under both normal and abnormal conditions. It is nevertheless necessary to recognize that the Grid Code cannot predict and address all possible operational situations. Users must therefore understand and accept that, in

such unforeseen circumstances, the State Transmission Utility (STU) who has to play a key role in the implementation of the Grid Code may be required to act decisively for maintaining the Grid regimes for discharging its obligations. Users shall provide such reasonable co-operation and assistance as the STU may request in such circumstances.(5)Application of other Codes etc.,(i)This code shall be read along with the, Tamil Nadu Electricity Supply Code, Tamil Nadu Electricity Distribution Code, and other relevant provisions of the Act, along with amendments thereon, rules and regulations made there under.(ii)Where any of the provisions of this Code is found to be inconsistent with those of the Act, rules or regulations made there under, notwithstanding such inconsistency, the remaining provisions of this Code shall remain operative.(iii)Where any dispute arises as to the application or interpretation of any provisions of this Code, it shall be referred to the Commission whose decision shall be final and binding on the parties concerned.(iv)Wherever extracts of the Electricity Act, 2003, are reproduced, any changes / amendments to the original Act shall automatically be deemed to be effective under this Code also

Chapter 4

4. Functional responsibilities of entities connected with the State Grid.

- Entities and their roles with respect to the Tamil Nadu Electricity Grid Code and their functional responsibilities are outlined in the following clauses:(1)State Transmission Utility:(a)Responsible to undertake transmission of electricity through Intra State Transmission System.(b)STU shall discharge all functions of planning and coordination relating to intra state transmission system with(i)Central transmission utility(ii)State Government(iii)Generating Stations(iv)Regional Power Committee(v)Central Electricity Authority(vi)All Licensees(vii)Any other person notified by the State Government in this behalf(c)Ensure development of an efficient, coordinated and economical system of intra state transmission lines for smooth flow of electricity from a generating station to the load centers. All the planning works, viz., long term as well as short term shall be the responsibility of STU only.(d)Provide non-discriminatory open access to its transmission system for use by -(i)any licensee or generating company on payment of the transmission charges or;(ii)any consumer as and when open access is provided by the commission under subsection(2) of section 42 of the act, on payment of the transmission charges and a surcharge thereon as may be specified by the commission.(iii)be a nodal agency for all long term open access customers.(e)STU shall not engage in the business of trading of electricity.(2)State Load Despatch Center (SLDC): The State Government shall establish a center to be known as the State Load Despatch Center for the purpose of exercising the powers and discharging the functions under sub section (1) of section 31 of the Act. This State Load Despatch Center shall be operated by a Government Company, or any Authority or Corporation established by the State Government, until such company, or Authority, or Corporation is notified by the State Government, the State Transmission Utility shall operate the State Load Despatch Centre. The SLDC shall be the apex body to ensure integrated operation of the power system in a State. The SLDC shall:(a)be responsible for optimum scheduling and despatch of electricity within the State, in accordance with the contracts entered into with the licensees or the generating companies operating in the State.(b)monitor Grid operation;(c)keep accounts of the quantity of electricity transmitted through the State Grid;(d)exercise supervision and control over the intra state transmission system; and(e)be responsible for carrying out real time operations for

Grid control and despatch the electricity within the State through secure and economic operation of the State Grid in accordance with the Grid standards and this Code.(f)not engage in the business of trading in Electricity.The SLDC may levy and collect such fee and charges from the generating companies and licensees engaged in intra state transmission of electricity as may be specified by the commission.SLDC may give such directions and exercise such supervision and control as may be required for ensuring the integrated Grid operation and for achieving the maximum economy and efficiency in the operation of the power system. Every licensee, generating company, generating station, substation and any other person connected with the operation of the power system shall comply with the direction issued by the SLDC.(3)Transmission Licensees: Every Transmission Licensee shall comply with such technical standards of operation and maintenance of transmission lines, in accordance with this Code, Grid Standards, as may be specified by the Authority and the Indian Electricity Grid Code as applicable to the Intra State Transmission System. It shall be the duty of the transmission licensee.(a)to maintain and operate the transmission system which are licensed to him in the intra state transmission system and comply with the directions of RLDC and SLDC as the case may be.(b)provide non discriminatory open access to its transmission system for use by any licensee or generating company or other users on payment of the charges as determined by the Commission.(4)Regional Load Despatch Centre: The RLDC is the apex body to ensure integrated operation of the power system within the concerned regional grid. In respect of wheeling, optimum scheduling and despatch of electricity, the RLDC shall comply with the principles, guidelines and methodology as specified by the CERC. The RLDC may give such directions and exercise such supervision and control as may be required for ensuring integrated grid operations and for achieving the economy and the efficiency in the operation of the power system in the region under its control. Every licensee including transmission licensee, distribution licensee, STU, generating company, and any other person connected with the operation of power system shall comply with the direction issued by RLDC. All directions issued by the RLDC to any STU or any other licensee of the State or generating company or substation in the State shall be issued through SLDC and SLDC shall ensure that such directions are duly complied with by the licensee or generating company or substation.(5)Regional Power Committee (RPC): Regional Power Committee, established by Government of India for the region may, from time to time, issue guidelines on matters concerning the stability and smooth operation of the Grid and economy and efficiency in the operation of the power system in that region. Such directions shall be binding on all the entities covered by this Code and to the extent they are applicable to the intra state transmission system and State Grid.(6)Central Electricity Authority: Central Electricity Authority in accordance with the provisions of section 177 of the Act 2003 may make regulations, which may provide for the following matters. • Grid Standards as stipulated in Section 34 of the Act. • Measures relating to safety of Electric Supply as stipulated in Section 53 of the Act. • Installation and operation of meters as stipulated in Section 55*of the Act. • Technical standards for the construction of electrical plants, electric lines and connectivity to the Grid and other matters as stipulated in Section 73 of the Act. • The form and manner in which and time at which the State Government and the licensee shall furnish statistics and return and other information under section 74 of Act.Irrespective of whether the provisions under the regulations stated above are explicitly provided for or not in this Code, the said regulations and standards shall be binding on all the entities covered by this Code.(7)Central Transmission Utility: Power Grid Corporation of India Limited (PGCIL) is the Central Transmission Utility as notified by Government of India. CTU is responsible for the entire inter state transmission

and in that context, the relevance of this Code shall be limited to the connectivity between the intra state transmission system and the inter state system.(8)State Coordination Forum: As per Section 166 (4) of the Act, Govt, of Tamil Nadu shall constitute a coordination forum consisting of the Chair person of the TNERC and Members there of, representatives of the generating companies, transmission licensees and distribution licensees engaged in generation, transmission and distribution for electricity in the State for smooth and coordinated development of the power system in the State. Any issues related with the planning and operation of the Grid shall be discussed in this forum. It is-for the Commission to consider the recommendations of the Forum and act suitably through directives to STU / SLDC(9)District Committee: District Committees shall be constituted in each district by Government of Tamil Nadu to:(a)coordinate and review the extension of electrification in each district;(b)review the quality of power supply and consumer satisfaction;(c)promote energy efficiency and its conservation.The recommendations, which are applicable in relation to this Code and also not inconsistent with the provisions of the Act and this Code, shall be coordinated and dealt with by STU.(10)Tamil Nadu Electricity Regulatory Commission (TNERC): The functions of TNERC with relevance to TNEGC are:(i)To determine the rate, charges and terms for the use of the transmission facilities of Licensees.(ii)To specify the fees and charges payable to SLDC.(iii)To issue directions on matters of non compliance of TNEGC or to take decisions on any dispute referred to them.(iv)To issue transmission licenses.(v)To issue amendments to the TNEGC as and when required.(11)Government of Tamil Nadu: Government may issue directions to SLDC, to take measures as may be necessary for maintaining smooth and stable transmission and supply of electricity. SLDC shall abide by such directions if they are not inconsistent with the provisions of the Act and this Code.

Chapter 5

System Planning

5. System Planning.

(1)The System Planning specifies the policy and procedures to be applied in planning of Tamil Nadu State Grid. The Users of the State Transmission System shall take the "System Planning" into account for planning and development of their own System. A requirement for reinforcement or extension of the State Transmission System may arise for a number of reasons, including but not limited to the following:(i)Development on a User's system already connected to the State Transmission System.(ii)The introduction of a new Connection point between the User's system and the State Transmission System.(iii)Evacuation system for Generating Stations within or outside the State.(iv)Reactive Power Compensation.(v)A general increase in system capacity (due to addition of generation or system load) to remove operating constraints and maintain standards of security.(vi)Transient or steady state stability considerations.(vii)Cumulative effect of any of the above.Accordingly, the reinforcement or extension of the State Transmission System may involve work at an entry or exit point (Connection Point) of a User to the State Transmission System. Since development of all User's systems must be planned well in advance to permit consents and way leaves to be obtained and detailed engineering design/construction work to be completed, STU will require information from Users and vice versa. To this effect, the system planning imposes time

scale for exchange of necessary information between STU and Users having regard, where appropriate, to the confidentiality of such information.(2)Objective: The provisions of this section are intended to enable STU to evolve a plan in consultation with Users, to provide an efficient, coordinated, secure and economical State Transmission System to satisfy requirement of future demand. The System Planning• Defines the procedure for the exchange of information between STU and a User in respect of any proposed development on the User's system, which may have an impact on the performance of the User.• Details the information which STU shall make available to Users in order to facilitate the identification and evaluation of opportunities for use of or connection to State Transmission System;• Details the information required by STU from Users to enable STU to plan the development of its Transmission System to facilitate proposed User developments;• Specifies planning and design standards, which will be applied by STU in planning and development of the power system.(3)Planning Policy: STU would develop a perspective transmission plan for next 10 years for State Transmission System. These perspective transmission plans would be updated every year to take care of the revisions in load projections and generation capacity additions. The perspective plans shall be submitted to Commission for approval. STU shall carry out annual planning process corresponding to a 5-year forward term for identification of major State Transmission System. Both the long term and short term plans shall fit into National Electricity Plan formulated by Central Government, perspective plan developed by CEA, Electric Power Survey of India published by the CEA, and long term / short term plans prepared by Central Transmission Utility.(4)Planning Procedure: STU shall adopt the following steps in system planning.(i)Forecast the demand for power within the Area of Supply, based on the forecasts provided by distribution licensees, and provide to the Commission details of the demand forecasts, data, methodology and assumptions on which the forecasts are based. For demand forecasting, the methodology and procedure followed by the Electric Power Survey Committee constituted by CEA may be followed. These forecasts would be annually reviewed and updated. The primary responsibility of load forecasting within distribution licensee's Area of Supply rests with respective distribution licensees. The distribution licensees shall determine peak load and energy forecasts of their areas for each category of loads for each of the succeeding 5 years and submit the same annually by 31st March to STU along with details of the demand forecasts, data, methodology and assumptions on which the forecasts are based along with their proposals for transmission system augmentation. The demand forecasts shall be updated annually or whenever major changes are made in the existing forecasts or planning. While indicating requirements of single consumers with large demands (1 MW or higher) the distribution licensee shall satisfy himself as to the degree of certainty of the demand materializing.(ii)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 and deficit both in demand and energy shall also be worked out by the STU.(iii)Workout the additional generating capacity required after taking into account, the existing capacity, assistance from captive power plants, projects under construction, proposed projects under IPPs (Independent Power Producers) in the State sector and share of the State from Central sector Power Projects both within and outside Tamil Nadu.(iv)Prepare a proposal for the requirement of generation for the State to meet the load demand as per the forecast, after examining the economic; technical and environmental aspects of all available alternatives taking into account the existing contracted generation resources and effects of demand side management.(v)The plan shall indicate the areas opened up for private investors / generation expansion so as to facilitate

decision on private investment.(vi)Prepare a transmission plan for the State Transmission System compatible with the above load forecast and generation plan. This will include provision for VAR compensation needed in the State Transmission System. The reactive power planning exercise is to be carried out by STU in consultation with RLDC/SREB and distribution licensees.(vii)STU's planning department shall use load flow, short circuit, transient stability study, relay coordination study and other techniques for transmission system planning.(viii)STU's planning department shall simulate the contingency and system constraint conditions for the system in transmission system planning.(ix)STU would maintain a historical database based on operational data supplied by SLDC using the state-of-the-art tools such as Energy Management System (EMS) for demand forecasting.(x)STU shall be responsible to prepare and submit a long-term (10 years) plan to the Commission for the requirement of generation expansion and transmission system expansion to meet the future demand growth. The proposal for setting up of generating plant would be prepared after examining the economic, technical & environmental aspects.(xi)All the Users shall supply to STU, the desired planning data by 31st March every year to enable STU to formulate and finalize the plan by 30th September each year for the next 5 years.(xii)The plan reports shall contain a Chapter on additional transmission requirement, which may include not only intra-State transmission lines but also additional equipment such as transformer, capacitors, reactors etc.(xiii)The plan report shall also indicate the action taken to fulfill the additional requirement and actual progress made on new schemes. The planning report and power map will be available to any interested party for making investment decision/connection decisions to the STS.(xiv)To provide long-term open access as per the terms and conditions formulated by TNERC.(xv)Based on Plans prepared by the STU, other Transmission / distribution licensees shall have to plan, their systems to further evacuate power from the STS. In case of Long Term Open Access Applications requiring any strengthening in the intra-State transmission system to absorb/evacuate power beyond STS, the applicant shall co-ordinate with CTU.(xvi)The Inter-State Transmission System and associated intra-State transmission system are complementary and inter-dependent and planning of one affects the other's planning and performance. Therefore, the development of associated intra-State transmission system shall also be in line with the development of Inter-State Transmission System.(5)Planning Standards: The State Transmission System planning and generation expansion planning shall be in accordance with the provisions of the Planning Criterion as per IEGC. However, some planning parameters of the State Transmission System may vary according to directives of TNERC and State specific requirements.(6)Generation Planning: (a) The generation planning mainly concerns with the expansion of the generating network and the special focus are:• Capacity addition by the distribution licensee, IPPs, Co-Generators and Captive Generators. • Flows from central sector power stations. • Expected power flow through Trading of Power. • Adoption and effectiveness of Demand Side Management and Energy Conservation Measures. • Optimization of existing capacity through renovation and modernization. • Utilizing the off peak surplus from base load station for the pumped storage plants during pump mode operation. • Environmental and financial constraints. • Fuel prices and availability.(b)The important key issues with respect to the generation planning are. • Predicting the establishment of new generation capacity, including where, when and how much. • Predicting generation despatch. • Provision towards generation reserve for reliability of supply. • Predicting decommissioning of old generation capacity. • Environmental regulation leading to an increasing amount of renewable energy sources generation with prioritized Grid access. • The impact of wind energy generators, Co-Generators and Captive generation units on

the dynamic performance of the power system considering its special nature. • Impact of large generating plant on the Grid. • Increasing amount of non-despatchable generation. • Marginal costs for generators. • Price elasticity of consumers. • Market player's estimates of future power prices. • Rules for access to the capacity on the interconnection. (c) The STU shall analyze the planning problem by making use of software models, simulation programs etc., of power system engineering. Possible applications are: • Predicting the generation capacity and despatch by including system reliability, marginal generation costs, future electricity price and future environmental policy, through dedicated models. • Simulation of different scenarios in capacity development and generation despatch for the development of a flexible transmission grid structure. • Integrated resource or least cost planning methods to evaluate the potential capacity addition resources and uncertainties and to determine the best mix of sources. • Probability methods for generation planning by representing generating unit failure and repair processes, load variability due to weather and other uncertainties. Note: Many hydro stations in Tamil Nadu are tied up with irrigation schedules and these stations have to be closed down during certain period of the year. Also in case of monsoon failure, many hydro stations cannot be operated at full capacity. For estimating peak availability and energy availability for generation planning, these peculiarities shall be taken into account. (7) Transmission System Planning: (a) The planning criterion are based on the security philosophy on which the STS has been planned. The security philosophy may be as per the Transmission Planning Criteria and other guidelines as given by CEA. The general criteria shall be as detailed 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 or rescheduling of generation during Steady State Operation: - Outage of a 110 kV D/C line or, - Outage of a 230 kV D/C line or, - Outage of a 400 kV S/C line or, - Outage of single Interconnecting Transformer. (ii) The above contingencies shall be considered assuming a pre contingency system depletion (Planned outage) of another 230 kV D/C line or 400 kV S/C line in another corridor and not emanating from the same substation. All the Generating Units may operate within their reactive capability curves and the network voltage profile shall also be maintained within voltage limits specified. (b) The STS shall be capable of withstanding the loss of most severe single system infeed without loss of stability. (c) Any one of these events defined above shall not cause: (i) Loss of supply. (ii) Prolonged operation of the system frequency below and above specified limits. (iii) Unacceptable high or low voltage. (iv) System instability. (v) Unacceptable overloading of STS elements. (8) Sub-Station Planning: Planning and design of sub stations shall be based on the following: (i) Security of supply, extendibility, maintainability and operational flexibility. (ii) Statutory Safety Requirements. (iii) Protection from direct lightning stroke. (iv) Switching Scheme: - (a) 400 kV sub-station: One and a half breaker scheme or double main and transfer bus bar scheme. (b) 230 kV sub-station: Double Main and Transfer Scheme or Double-Main with breaker by-pass scheme. (c) 110 kV sub-station: Main and Transfer Scheme. (d) Below 110 kV: as decided by the licensee with the consent of STU. (v) All new EHT Circuit Breakers shall be of SF6 type. (Any alternative type of circuit breaker developed in due course with same or better performance may be employed after taking clearance from the STU / Commission). Pre insertion Resistors shall be used for 400 kV (and above) circuit breakers to control switching surges. (vi) Isolators shall be pneumatic or motor operated. (vii) Surge diverters shall be of metal oxide type as per IEC 60099. (viii) Inter-Connecting Transformers shall be provided with On Load Tap Changers (OLTC). (ix) The Control Room shall be extensible. Operation of Circuit breakers, OLTCs, Isolators (230KV and above), shall be possible

from the Local Panels as well as Panels in the Control Room. Necessary interlocks shall be provided to meet these requirements.(x)All sub-station structures shall be of lattice steel, protected against corrosion by hot dip galvanization. Lightning masts shall be designed for diagonal wind condition. The structures shall conform to IEC - 865, IS - 875, IS - 806, IS-802 and IS-800.(xi)Electrical, mechanical and civil designs shall be standardized to the extent possible. Where standards developed by CTU/STU are available, the same may be adopted at the option of the transmission licensee.(xii)Power Supply to Sub-Station Auxiliaries:(a)AC supply: Two HT supplies shall be arranged from independent sources. One of the two HT supplies shall be standby to the other. In addition, a Diesel Generating set of suitable capacity shall also be provided.(b)DC Supply: (Applicable to new sub-stations) There shall be two sets of 220V batteries, each equipped with its own charger for substations of 230 kV and above. Each battery shall be of adequate capacity to meet the sub-station requirements. The batteries shall operate in parallel and one being standby to the other. Facility for changing the duty of the batteries from main to standby and vice versa shall be made. There shall be two sets of 50V batteries (one being standby to the other) for PLCC System. For sub-stations of 110 KV and below, one set of battery each may be provided.(xiii)For high current, XLPE cables shall be employed., However for LV / MV systems PVC Cables corresponding to IS -1554 could be employed at the discretion of the Licensees. The cables shall normally be laid in trenches. For buried cables, suitable protection shall be provided.(xiv)Reliable (PLCC or higher quality) communication link shall be provided on all EHT lines for voice, fax, protection, telemetry and SCADA. High accuracy standard coupling shall be provided for this purpose.(xv)Sub-Station Grounding shall be done in accordance with IEEE-80.(xvi)The size and number of Interconnecting transformers shall be selected such that outage of one ICT would not overload the remaining ICTs or the underlying system.(xvii)The stuck breaker condition in the sub-station shall cause disruption of not more than four feeders in 110 kV or 230kV system, more than two feeders in 400kV.(xviii)In the sub-stations of 230 kV and higher voltage, the Control Room, PLCC Room, Relay Testing Room and Electronic Laboratory shall be air-conditioned.(9)EHV/HV Underground Cables: (i) The cable proposed to be connected to the system shall comply with the following(a)Shall be of XLPE (Cross linked Poly Ethylene) type corresponding to IS -7098(Any alternative type of cable developed in due course with same or better performance may be employed after taking clearance from the STU / Commission).(b)The cable conductor shall be of adequate size considering continuous current, short circuit current voltage drop etc and shall correspond to IS s 130(c)Cables shall be provided suitable sheathing, armouring and screening such that these have the requisite mechanical strength and flexibility to withstand the stresses during handling and laying into ducts/ trenches.(d)Prior permission shall be obtained from the appropriate authority for digging trenches and precautions shall be taken to prevent accidents and to preclude accidental cutting of communication cables, other power cables, water, gas and sewage lines in accordance with the provisions of "Part-VIII of the Act".(e)The route maps shall be kept at the substation and markers shall be fixed to trace the cables.(f)Road crossing shall be carried out by providing culverts, huge pipes or GI pipes.(g)Jointing anti termination shall be carried out in accordance with the relevant standards.(ii)Clearance from Power Telecom Coordination Committee shall be obtained.(10)Planning for VAR Compensation in the Network.: (a) Over and above the demand estimation and planning to cater the active power, reactive power despatch is also important for overall efficient and trouble free Grid operation. A close relation exists between voltage instability and reactive power compensation. Hence the planning for reactive power compensation is also a system-planning problem and needs careful

study. STU shall carry out planning studies for Reactive Power Compensation of STS including reactive power compensation requirement at the Generating Station's Switchyard. Normally, while planning the system, the degree of reactive power compensation is considered at load points by keeping an eye on target power factor assigned, the load power factor and the supply/absorption of reactive power from the various elements in the system. It is considered a good practice of not drawing any reactive power from the remote ends but meeting all the requirements locally. Flattening the nominal voltage across the system shall be achieved by the optimal use of reactive power compensation in the network so as to improve the voltage profile across the system and is a measure of balance between the reactive power generated and absorbed in the system.(b)The operative power factor of the generators in the network shall be between 0.85 lagging and 0.95 leading for good reactive power supply capability for local loads and should not generally be used for remote despatching of reactive power.(c)The quantum of compensation required to be provided in the Grid shall be suitably distributed in the transmission system, sub stations and distribution system of network. The norms for percentages and quantum of MVar to be provided by the Licensees / Generators for different period must be specified by STU through well-documented guidelines for use by all concerned.(11)Planning Data: For System Planning ISGS/State Generating Companies/ IPPs/licensees are to supply two types of data. They are:(i)Standard planning data Standard planning data consists of details, which are expected to be normally sufficient for the STU to investigate the impact on the STS due to User development. For generation planning the required standard data shall be furnished as per Annexure A-1. For transmission planning the required standard data shall be furnished as per Annexure A-2.(ii)Detailed planning data Detailed planning data consist of additional, more detailed data not normally expected to be required by STU to assess the impact of User development on the STS. This data shall be furnished by the Users of STS as and when requested by STU.(12)Implementation of Transmission Plan: The actual program of implementation of transmission lines, Interconnecting Transformers, reactors/capacitors and other transmission elements will be determined by STU in consultation with the concerned agencies. The completion of these works, in the required time frame, shall be ensured by STU through the concerned agency.

Chapter 6

Grid Connectivity Conditions

6. Objectives.

(1)The objectives of the grid connectivity conditions are to ensure that (a) the basic rules for connections are complied with to treat all agencies in a non-discriminatory manner (b) any new or modified connections, when established, shall neither suffer unacceptable effects due to its connection to the transmission system nor impose unacceptable effects on the system of any other connected agency (c) the ownership and responsibility for all the equipments, shall be clearly specified in a schedule (Site Responsibility Schedule) and (d) a prospective user is well informed, in advance, of the standards and conditions his system has to meet, for being integrated into the existing power system, the standards and parameters of the existing system with which his system has to be interfaced and the electrical environment in which his system has to operate.(2)Scope: The

connectivity conditions apply to all State / Central Government sponsored generating companies, captive power generators, IPPs, STU, transmission / distribution Licensees, Bulk Consumers and all the users seeking new connection with the intra state transmission system including the existing transmission licensees and the users who may be required to modify / upgrade their systems.

(3) Procedure for connection: (i) STU shall identify opportunities for new connections and optimal locations after conducting the system studies in co-ordination with the organizations listed under the respective sections of the Act, namely Section 39(2)(b) for the STU and in conformity with the National Electricity Plan drawn by the Authority under Section 3(4) of the Act. (ii) STU shall furnish details of the prospective connection points in respect of their system on their web-site inviting initial application from the users. (iii) Connection may also be sought for locations other than those described in (i) and (ii). (iv) In all the cases covered by the points (i), (ii) and (iii) above, the users and transmission licensee shall forward their request for grid connectivity to the STU, as the case may be, in the proforma prescribed by the STU. Proforma for different categories of users shall be made available on STU's web-sites and shall inter-alia, include technical data pertaining to generating unit(s)/ transmission system / distribution system / load, single line diagram and topographical map showing the location of the proposed user's apparatus and equipment. (v) The prospective users shall be required to pay to the STU/transmission licensee the charges as (proposed by STU/transmission licensee) approved by the Commission, for the purposes of conducting initial interconnection studies, any additional studies as well as processing the application. (vi) On receipt of the request from the user & transmission licensee along with the prescribed charges, the STU / transmission licensee shall, within one month of receipt of the proposal, accept the proposal or suggest modifications thereto. In the event of user / transmission licensee requesting for any specific information / study / data from the STU / transmission licensee for the purpose of grid connectivity, the STU /transmission licensee shall make the same available to the user /transmission licensee. (vii) STU shall be entitled to reject any application for connection to/or use of State Transmission System if such proposed connection is likely to cause breach of any provision of its license or any provision of the Grid Code or any provision of TEGC. In the event of any dispute with regard to modifications, not being acceptable to the user, the user may approach the Commission for dispute resolution. (viii) The STU/ transmission licensee and the user/ transmission licensee shall enter into a Connection Agreement within two months of acceptance of the proposal. The Connection Agreement shall contain time schedule for completion of the facilities of User and STU/ transmission licensee, both indemnifying the delays on the part of the other. Both the parties shall inform the progress of major milestones to each other. The time limit for entering into the connection agreement may be extended, if both parties agree. (ix) Copies of the Connection Agreement shall be sent to the transmission licensee, load dispatch centre, Regional Power Committee, Commission and the Authority. (x) Upon fulfillment of all the conditions, STU shall notify the agency that it can be connected to the STS. (xi) In respect of existing connections, the Commission may allow relaxation up to 2 years in respect of connection agreements. The process of renegotiation of the connection conditions of the STS should be completed within the above period. Due to any reason if this process gets delayed further, Commission may consider relaxation for a further period for which a petition will have to be filed by the concerned constituent along with STU's recommendations / comments. The present agreements may continue till such renegotiation and revised agreements are over. (xii) The cost of modification, if any, shall be borne by the concerned constituent. The STU shall normally make a formal offer to the agency within two

months. The offer shall specify 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.

(4) General Connectivity Conditions: A prospective user and transmission licensee proposing a new connection shall comply with the following conditions:

- (i) The user shall meet the requirements in accordance with the provisions of Standards on Grid Connectivity and Grid Standards specified by the Authority and IEGC specified by CERC.
- (ii) Requisite protections shall be provided in the user's system to protect the Grid from the faults originating in the user's systems.
- (iii) Notwithstanding the protection systems provided in the Grid, the user/transmission licensee shall provide requisite protections for safeguarding his system from the faults originating in the transmission system / Grid.
- (iv) No user of the Grid shall exceed the Harmonic Distortion Level specified in the CEA (Grid Connectivity) Regulations.
- (v) The user shall furnish requisite data to the STU / transmission licensee for enabling it to conduct interconnection studies.
- (vi) The user is obliged to cooperate with the STU, transmission licensee and load dispatch centre in respect of the operational matters listed below, but not limited to:
 - (a) Carry out the modifications in his equipment considered necessary, whenever the power system is upgraded or modified.
 - (b) Protection coordination (relay settings).
 - (c) Provide on line data to the appropriate load dispatch centre.
 - (d) Participate in contingency operations such as load shedding, islanding, black start, providing start-up power and restoration.
 - (e) Furnish data to the STU / transmission licensee, SLDC and any committee constituted by appropriate Government or Authority for disturbance analysis and other studies.
 - (f) Coordinated outage plan of the State/Region.
 - (g) Prompt implementation of instructions of load dispatch centre.
- (vii) The user's equipment at the site owned by the transmission licensee shall be maintained promptly and properly by the user and vice versa so that the equipment and personnel of the site owner are not jeopardized by the neglect of the other entity.

(5) Connection Agreement: Every connection of a user's system to the transmission system shall be covered by a Connection Agreement between the user and the transmission licensee. The Connection Agreement shall contain general, specific, technical and financial conditions, applicable to that connection. A connection agreement shall include (but not limited) as appropriate, within its terms and conditions, the following:

- (i) A condition requiring both parties to comply with Indian Electricity Grid Code and Tamil Nadu Electricity Grid code, provisions under the Act, other Codes and regulations issued by the Commission / CEA.
- (ii) Details of connections, technical requirements and commercial arrangements.
- (iii) Details of capital expenditure if any required to be met before extending open access to the open access consumer.
- (iv) Site responsibility schedule.
- (v) Details of the protection arrangements made and its coordination with the Grid. This includes short circuit protection and insulation coordination.
- (vi) Procedure necessary for site access, site operational activities and maintenance standards for STU equipment at the premises of the users and vice versa.
- (vii) Specific clause to the effect that necessary guidelines for insulation coordination in live working shall be followed by the STU / Agency.
- (viii) Commitment to provide the data requirements as per Annexure B-1.

(6) Metering and Communication

- (i) The user shall provide meters for accounting and audit purposes as per the standards specified by Authority under Section 73(e) of the Act. The agency who has to provide, operate and maintain the metering arrangements at various locations will be stipulated by the STU in the connection agreement. STU shall be responsible to formulate the metering procedure and implement it with other Users.
- (ii) The user shall be required to provide the voice and data communication facilities as decided by SLDC.
- (iii) The user shall make arrangements for integration of the controls and telemetering features of his system into the

Automatic Generation Control, Special Protection System, Energy Management Systems and SCADA system of the STU / SLDC.

(7) Connection Points (i) Generating Stations including IPPs: Generating stations Switchyard Voltage may be at the level of 400, 230 and 110 kV or as agreed to by the STU. Unless specifically agreed with the STU, the connection point shall be the outgoing feeder gantry of the Power Station switchyard. All the terminal, communication, protection and metering equipments owned by the generating agency, within the perimeter of their site shall be maintained by them. From the outgoing feeder gantry onwards, all electrical equipments shall be maintained by the STU. (ii) Distribution Licensee: The Voltage may be at the level of 110, 33, 22 and 11 kV. The connection point shall be the outgoing feeder gantry of the STU's sub-station, if the sub station is owned by STU, else, the connection point shall be the terminal structure feeder gantry at the entry into the sub station. (iii) Inter-State transmission System: For the Southern Regional Transmission System, the inter state transmission link to the intra state system, the connection point, protection scheme, metering scheme, metering point and the voltage shall be in accordance with the mutual agreement between CTU and the STU.

(8) Captive Generators, Co-generators and HV consumers: The voltage level may be at 230, 110, 66, 33, 22, 11 kV or as agreed to by STU. Sub-stations shall be owned by Co-Generators, CPPs and the HV consumers. The connection point shall be the feeder gantry on their premises.

(9) Site Responsibility Schedule: A Site Responsibility Schedule (SRS) shall be prepared for every connection. At the connection site where equipment of both entities, i.e., the Transmission Licensee and the user are installed, the user shall furnish required data to the Transmission Licensee and the Transmission Licensee shall prepare SRS. At a generating station, the transmission licensee shall furnish the necessary data to the generating company who shall prepare SRS. A SRS format is given in Annexure - B1.

(10) Access at Connection Site: The user owning the Connection Site shall provide reasonable access and other required facilities to another User / Licensee whose equipment is proposed to be installed / installed at the Connection Site for installation, operation, maintenance, etc. Written procedures and agreements shall be developed between entities to ensure that mandatory access is available to the entity concerned, at the same time safeguarding the interests of both entities at the connection site.

(11) Site Common Drawings: Site Common Drawings shall be prepared by the owner company (transmission licensee or User) using the information furnished by the other company (user or transmission licensee) containing the following information: (a) Connection Site Equipment Layout (b) Electrical Layout (c) Common Protection and Controls (d) Common Services (water, compressed air, telephone, LT electricity for lighting and other appliance, etc.,) The site common drawings shall clearly show the gas insulated parts and gas/air boundary in the case of gas insulated sub-stations. If any change in the drawing is found necessary, either by agency or STU, the details will be exchanged between agency and STU as soon as possible.

(12) Site Operational and Safety Procedures: (i) The transmission licensee and the user shall ensure that staff is available to take necessary safety precautions and carry out operational duties at the site. Written operating and safety procedures as approved by competent authority shall be made available at each site. The telephone numbers and addresses of the officers of each entity responsible for operation at the connection site shall be furnished to the other entity. (ii) The CEA (Safety) Regulations and CEA (Safety) Standards shall be complied with by all the Users and Transmission Licensees. (iii) Fire Protection Systems shall be provided at the generating stations and sub-stations as per prudent utility practices.

(13) Boundaries between Systems of Entities: (i) Boundary between a Generating station and the Transmission System: The boundary shall be the line isolator of the feeder, which injects power into the transmission system. The isolator shall be in

the jurisdiction of the generating company.(ii)Boundary between the Transmission System and the Distribution System: The boundary shall be the line isolator of the outgoing feeder injecting power into the distribution system. The line isolator shall be in the jurisdiction of the transmission licensee. Alternatively the boundary may be the isolator between the LV side circuit breaker of the Extra High Tension (EHT) Transformer and the 33kV bus-bars at the EHT Sub--Station. The actual boundary shall be decided jointly by the transmission licensee and the distribution licensee.(iii)In respect of case (i) and (ii) above, at particular inter-connections both parties may jointly agree on a different boundary. In such an event the written agreement shall be submitted to the RPC /STU.(iv)Boundaries between Transmission / Distribution Licensee and Captive Generators, Co-generators and HV consumers: The boundary between the transmission / Distribution licensee and Captive Generators, Co-generators and HV consumers is the isolator in the consumer's or Captive Generators or Co-generators system, which is also the point of commencement or injection of supply.(v)Boundaries between Inter-State Transmission System and Intra State Transmission System For the Southern Regional Transmission System, the inter state transmission link to the intra state system shall be in accordance with the mutual agreement between CTU and the STU. In such an event the written agreement shall be submitted to the RPC.(14)Standards and Codes of Practices: (i) The equipment to be installed by the users and transmission licensees shall conform to the relevant construction standards specified by the Authority, the relevant Indian Standards (IS), the relevant British Standard, IEC Standard, Standard of American National Standards Institute (ANSI) or any other equivalent International Standard(ii)Where neither an Indian nor an International Standard or Code of Practice exists, an entity shall develop its own Interim Standard or Code of Practice acceptable to Prudent Utility Practices. The Standards and Codes of Practice shall be similar to the existing standards for similar equipment. The aim of each Standard or Code of Practice shall be to achieve quality and reliability in performance and safety and compatibility with other equipment in the same system. The Interim Standard developed by an entity shall be replaced by an Indian or an International Standard when it is published.(iii)Wherever an International Standard or IEC Standard is followed, necessary corrections shall be made for different system frequency, nominal system voltage, ambient temperature, humidity and other conditions prevailing in India before actual adoption of the Standard.(15)Basic Insulation Level and Insulation Coordination: (i) For Basic Insulation Level and Insulation Coordination, the Grid Connectivity Standards formulated by CEA shall be followed.(ii)The following criteria shall be applied in the same order of priority in determining Basic Insulation Level (BIL) of various items of equipment and ratings of surge diverters at generating stations, lines and substations:(a)Ensure safety to public and operating personnel.(b)Avoid permanent damage to plant..(c)Prevent failure of costly equipment.(d)Minimize circuit interruptions.(e)Minimize interruptions of supplies to consumers.(iii)For determining BIL, the following factors shall be taken into account:(a)Over voltages due to switching and transients occurring under the highest permissible steady state system voltage conditions.(b)Lightning surges.(c)Type of earthing of the system - solidly earthed or earthed through resistor/reactor or isolated neutral.(d)Weather conditions prevailing at site.(e)Effects of pollution.(iv)Computer-based optimisation studies may be carried out to finalise the BIL. The recommendations of IEC - 71 may be taken into consideration while carrying out the above studies.(v)Each user/transmission licensee shall calculate optimum BIL for various items of equipment and lines in his system and ensure that the equipment used / proposed to be used is manufactured to the required BIL. It shall be the responsibility of the user / transmission licensee to

ensure through appropriate tests that the equipment procured has the required BIL.(vi)Insulation coordination of equipment and lines on both sides of a connection point belonging to different entities shall be accomplished and the co-ordination shall be done by the transmission licensee.(vii)To protect the costly equipment like Generator and Transformer against lightning, switching and other surges, surge diverters shall be provided as near the equipment terminal as possible.(16)Disturbance Recorders and Event Loggers: Every generating station connected to the Grid at 230 kV or above, 230 kV sub-stations with transformation capacity more than 200 MVA, all substations of voltage 400 kV and above shall be provided with disturbance recorders and event loggers and shall be synchronized with a common time reference of Global Position Satellite (GPS) System.(17)Schematic Diagram: (i) The user and transmission licensees shall prepare single line schematic diagrams in respect of their system / facility and make the same available to the transmission licensees and the users in order to enable both of them to have requisite information about the system with which they are to get connected.(ii)The following details shall be included in the single line diagrams:(a)HT and EHT equipment, bus bars, incoming and outgoing feeders, control, protection, metering arrangement, length of feeder, size of the conductor and name of the station at the other end of the feeder.(b)AC and DC auxiliary power supply systems. Standby supplies and sources.(c)Connection of distribution systems at El IT sub-stations, showing the areas served by each outgoing feeder.(iii)State Grid Maps showing the complete network of transmission lines shall be prepared, updated and maintained by STU and supplied to the entities requiring the same.(18)Protection System and Coordination: (a) Protection in general(i)Every element of the power system shall be protected by a standard protection system having the required reliability, selectivity, speed, discrimination and sensitivity. Where failure of a protective relay in the system of one entity has substantial impact on the system from which power is drawn by it, it shall connect an additional protection as standby. The entity supplying power to another entity shall provide back-up protection to the system which receives power.(ii)Protection coordination shall be done at State level by STU in consultation with RPC. Each entity shall develop protection manuals conforming to various standards for the reference and use of its personnel in consultation with STU. The System Fault Dependability Index shall be as stipulated in CEA (Grid Standards) for the systems of all entities.(iii)Over current, short circuit, earth fault over voltage and other types of protection systems are generally required to be provided by all Licensees and other agencies connected to the Grid. These protective systems are essentially required for the quick isolation of faulty equipments, lines and UG Cables and protection of the network and its healthy equipments and lines and UG cables from the severe impact of the fault, with the appropriate reliability, sensitivity and selectivity.(b)Fault clearance Time(i)The fault clearance time, for a three phase fault (close to the bus-bars) on agencies equipment directly connected to STS and for a three phase fault (close to the bus-bars) on STS connected to agencies equipment, shall not be more than:(a)100 milli seconds (ms) for 400 kV and above(b)160 milli seconds (ms) for 220 kV & 110 kV(ii)Back-up protection shall be provided 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.(iii)All agencies connected to the STS shall provide protection systems as specified in the connection agreement.(c)Generating Unit Requirements The guidelines mentioned in the "Manual on protection of Generators, Generator Transformers, and 220 kV and 400 kV networks" vide publication No: 274 of CBIP shall be kept in view. All Generating Units and associated electrical

equipments connected to the Transmission System shall be protected by adequate protection so that the Transmission System does not suffer due to any disturbance originating from the Generating Unit. The generator protection schemes shall cover at least differential protection, back up protection, stator earth fault protection, field ground/field failure protection (not applicable to brush-less excitation system), negative sequence protection, under frequency, over flux protection, back-up impedance protection and pole slipping protection (applicable to units above 200MW), loss of field protection, reverse power protection etc.

(d) Transmission System Requirements: All HV lines taking off from a power station or a sub-station shall have appropriate over voltage protection and distance protection and back up protection schemes. The STU shall notify the users of any change in its policy on protection from time to time.

(i) 400 kV Lines / UG Cables: Two independent protection systems (Main I & II Protection) with separate DC Battery supply shall be arranged. Main-I Protection shall be preferably with three-zone static non-switched numerical distance protection with appropriate carrier protection and back up protection. Main-II Protection shall be a fast protection scheme using direction comparison or phase comparison carrier relaying scheme. In addition, single pole tripping and single shot, single pole auto-reclosing after an adjustable dead time shall be provided.

(ii) 230 kV Lines/UG Cables: The main protection shall be through three-zone static, non-switched numerical distance protection with suitable carrier protection. The back up will be micro processor based switched distance protection scheme. One pole tripping and single shot single pole auto-reclosing with adjustable dead time shall be provided for both schemes.

(iii) 110 kV and 66 kV lines/UG Cables: Static/micro processor based distance protection with suitable backup protection shall be provided as the main protection scheme. The back up will be directional three phase over current and earth fault protection scheme.

(iv) General: For short transmission lines and sub transmission system at or below 33 kV, appropriate protection schemes may be adopted. Relay Panels for the protection of lines of STU taking off from a Generating Station shall be owned and maintained by the STU. Generating Companies shall provide space, connection facility and access to the STU for such purpose.

(v) Generator, Auto and Power Transformers: All windings of Auto Transformers and Power transformers of 400, 230 and 110 kV class shall be protected by differential relays and REF (Restricted Earth Fault) 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 smaller transformers of FIV 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 of 1.6 MVA and above but less than 10 MVA shall be protected by time lag over current, earth fault and instantaneous REF relays. In addition, all transformers of 1.6 MV A and above shall be provided with gas-operated relays, winding temperature protection and oil temperature protection.

(vi) Bus bar protection: Suitable (high impedance) bus bar protection shall be provided for the speedy clearance of bus faults at all the generating stations and 400 kV and 230 kV Transmission substations.

(vii) Over voltage protection: There shall be proper "Insulation Coordination" studies before implementing the over voltage protection scheme. All the operating equipments, lines and UG cables shall be protected against direct lightning strokes by the use of masts / ground wires. In respect of protection against system generated surges (switching surges) and indirect lightning strokes/ back flash-overs, co-coordinated protective gaps and Metal Oxide

Arresters (Gapless Arresters) shall be provided. These protective gapless arresters shall be placed at the entry point of OH lines/Under Ground Cable, at the power/ substation (Line Entrance Arrestors) and at a location very close to Auto/Power Transformers and other protected equipments including shunt capacitor banks. Gapless surge diverters shall be provided at the interface of OH line - UG cable in a composite circuit and also its entry at the power station / substation. To the extent possible, the mixing up of gapped and gapless arresters shall be avoided. Gapless arresters should not be placed on the LV side of a Auto/Power Transformer, when a gapped surge diverter already exists on its HV side. When IIV lines (110 kV or 66 kV) are used for feeding lower voltage substations (33,22 and 11 kV) after its degradation, its insulation level should be brought down to the level required by the substations fed i.e derated HV lines should not be employed directly for feeding lower voltage substations. All power system equipments should withstand twice its rated power frequency voltage for one minute so as to withstand the rigors of temporary over voltages generated in the systems, as a consequence of faults. (19) Protection against environmental contamination: STU and other agencies connected to the Grid shall take appropriate protective measures against the outage /tripping of lines and equipments triggered by environmental pollution especially at locations exposed to Saline Pollution, Industrial Pollution, Coal-fired Thermal Power Station, Chemical and Cement Dust Pollution or a combination of these contaminations.

Chapter 7

Requirements In Grid Operation

7. Introduction.

(1) In order to ensure the integrated operation of the State Electricity Grid and to enhance the overall operational economy and reliability of the electric power network spread over the entire State, the following operation guidelines have been specified. It covers the real time operation of the State Electricity Grid with all its interconnections to the neighboring State Grids. It applies to all the constituents of the State Electricity System, STU, SLDC, CTU, RLDC, Generators, IPPs and other agencies who are connected to the Grid. It also applies to the agencies who intent / plan to generate, transmit and distribute the electrical energy and become a constituent of the State Electricity Grid. (2) Basic Policy: The primary objective of integrated operation of the State Grid is to enhance the overall operational economy and reliability of the entire electric power network spread over the geographical area of the State. The real time operation of the State Grid shall be supervised from the State Load Despatch Centre (SLDC). The roles of SLDC and STU shall be in accordance with the provisions of Act 2003. All State entities shall comply with these operation guidelines and coordinate with each other, for deriving maximum benefits from the integrated operation and for equitable sharing of obligations. A set of detailed internal operating procedures for the State Grid shall be developed and maintained by the SLDC in consultation with the STU and other State entities and shall be consistent with TNEGC and IEGC. The control rooms of the SLDC, all SSLDCs, Power Plants, EHV and HV sub-stations and any other control centers of all State entities shall be controlled round the clock and manned by trained and qualified personnel wherever necessary. The SLDC shall develop methodologies / mechanisms for daily / weekly / monthly / yearly demand estimation (MW, MVar and MWh) for operational purposes. The data for the estimation shall also

include load shedding, power cuts etc., SLDCs shall also maintain historical database for demand estimation. The demand estimates are to enable the SLDC to conduct system studies for operational planning purposes.

(3) System Security Aspects: (i) The Tamil Nadu Electricity Grid shall be operated as a synchronized system. All State entities shall operate their respective power systems and power stations in synchronism with the Grid. Appropriate security standard will be adopted in the operation of the system. Reliability criteria will also be adopted. (ii) No element/part of the Grid shall be deliberately isolated from the rest of the State Grid or islanded except: • under an emergency, and conditions in which such isolation would prevent a total Grid collapse and / or enable early restoration of power supply, • when serious damage to a costly equipment is imminent and such isolation would prevent it, • when such isolation is specifically directed by SLDC or with specific prior approval from SLDC. Complete re-synchronization of the Grid shall be restored as soon as the normal conditions are restored. The restoration process shall be supervised by SLDC, as per the approved operating procedures separately formulated. (iii) The list of such important Grid link/elements on which the above stipulations apply shall be prepared and be available at SLDC / SSLDCs. In case of opening / removal of any important element of the Grid under an emergency situation, the same shall be communicated to SLDC at the earliest possible time after the event. (iv) Any tripping, whether manual or automatic, of any of the above elements of State Grid shall be precisely intimated by the concerned entities to SLDC as soon as possible, say 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. (v) All generating units, which are synchronized with the Grid, irrespective of their ownership, type and size, shall have their governors in normal, preferably at free-governor mode 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 a droop between 3 % and 6 % for thermal and 0 to 10 % for hydro generators. (vi) 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 in any manner. No dead bands and / or time delays shall be deliberately introduced. (vii) All generating units, operating at / up to 100% of their Maximum Continuous Rating (MCR) shall normally be capable of (and shall not in any way be prevented from) instantaneously picking up 5% of extra load and sustain the increase for a minimum of 5 minutes when frequency falls due to a system contingency. The generating units operating at above 100% of their MCR shall be capable of (and shall not be prevented from) going at least up to 105% of their MCR when frequency falls suddenly. After an increase in generation as above, a generating unit may ramp back to the original level at a rate of about one percent (1%) per minute, in case continued operation at the increased level is not sustainable. Any generating unit of over fifty (50) MW size, not complying with the above requirement, shall be kept in operation (synchronized with the State Grid) only after obtaining the permission of 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. (viii) The recommended rate for changing the governor setting, i.e. supplementary control for increasing or decreasing the output (generation level) for all generating units, irrespective of their type and size, would be one (1.0) per cent per minute or as per manufacturer's 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 capability. (ix) Except under an emergency, or to prevent an imminent

damage to personnel and equipment, no entity shall suddenly reduce his generating unit output by more than one hundred (100) MW without prior intimation to and consent of the SLDC, particularly when frequency is falling or is below 49.0. Similarly, no entity shall cause sudden increase in its load by more than one hundred (100) MW without prior intimation to and consent of the SLDC.(x)All generating units shall normally have their Automatic Voltage Regulators (AVR) in operation, with appropriate settings. *In particular, if a generating unit of over fifty (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 Stabilizers (PSS) in AVRs. of generating units (wherever provided), shall be got properly tuned by the respective generating unit owner as per a plan prepared for the purpose by the STU from time to time. STU will be allowed to carry out checking of PSS and suggests further tuning, wherever considered necessary.(xi)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.(xii)All entities shall put in all possible efforts to ensure that the Grid is operated within the frequency limits prescribed by the implementation of Availability Based Tariff (ABT) i.e. frequency always remains within the 49.0 - 50.5 Hz band.(xiii)All State entities shall provide automatic under-frequency load shedding, based on the operation of df/dt or constant frequency setting relay in their respective systems, to arrest frequency decline that could result in a collapse / disintegration of the Grid, as per the plan separately finalised by SLDC in consultation with STU, 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 SLDC.(xiv)Procedures shall be developed by SLDC in consultation with STU, to recover from partial / total collapse of the Grid and periodically updated in accordance with the requirements given under Code 7 (5) (f). These procedures shall be followed by all the entities to ensure consistent, reliable and quick restoration.(xv)Each entity shall provide adequate and reliable communication facility internally and with other entities/ SLDC 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 to SSLDCs and generating stations.(xvi)The entities shall send information / data including disturbance recorder / sequential event recorder output etc., to 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.(xvii)Only authorized persons as certified by STU can give/take line clear on Grid equipment and lines for maintenance/fault rectification works. For carrying out erection/ repair in the circuit above 230 kV the competent person should have a minimum operating experience of one year.(xviii)Before undertaking hot line working/hot line washing of the insulators connected with Grid equipment, advance information should be given to SLDC and other operating personnel concerned.(xix)All entities shall put in all possible efforts to ensure that the Grid voltage always remains within the following operating range.

| Nominal | Maximum | Minimum |
|---------|---------------------|---------|
| | Voltage in (kV rms) | |
| 400 | 420 | 360 |

| | | |
|-----|-----|-----|
| 230 | 255 | 210 |
| 110 | 120 | 100 |

(xx)The steady state and transient stability limits of the Grid should be communicated periodically.(xxi)There should be adequate spinning reserve in the system.(xxii)The STU should provide power for maintenance, short term and emergency to the IPPs and other non utility generators in accordance with the connection agreement entered into.(4)Demand Control: Demand control is concerned with the provisions to be made by SLDC to ensure the reduction of demand in the event of insufficient generating capacity, and transfers from external interconnections being not available to meet demand, or in the event of breakdown or operating problems (such as frequency, voltage levels or thermal overloads) on any part of the Grid.Towards this end the following requirements shall be complied with:(i)Power drawing 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 shall be pre-planned for each level of under frequency.(ii)Further, in case of certain contingencies and / or threat to system security, the SLDC may direct the SSLDCs and other sub stations to decrease its drawal by a certain quantum. Such directions shall immediately be acted upon.(iii)Each distribution licensee shall make arrangements that will enable manual demand disconnection to take place, as instructed by the SLDC /SSLDC, under normal and / or contingent conditions. The measures taken to reduce the entities' drawal from the Grid shall not be withdrawn as long as the frequency / voltage remains at a low level, unless specifically permitted by the SLDC / SSLDC.(5)Operational Liaison (a) Operations and events on the State Grid: Before any operation is carried out on the State Grid, the SLDC will inform each participating 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 will inform each State 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.(b)Operations and events on an entity's system: Before any operation is carried out on an entity system, the entity will 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 will 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.(c)Periodic Reporting: A weekly report shall be issued by SLDC to all entities of the State and STU and shall cover the performance of the State Grid for the previous week. The weekly report shall contain the following:(i)Frequency profile showing the maximum and minimum frequency recorded daily and daily frequency variation index (FVI)(ii)Voltage profile of selected substations.(iii)Major Generation and Transmission outages and constraints.(iv)Instances of persistent/significant non-compliance of TNEGC The SLDC shall also prepare a quarterly report, which shall bring out the system constraints, reasons 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.(d)Outage Planning: It is assumed that the list of elements of the Grid as per Annexure C-1 and Annexure C-2 covered under these requirements shall be prepared and be available with SLDC for the proper implementation of the outage planning exercises. The objective of outage planning are:• To produce 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. • To minimize surplus or deficits, if any, in the system requirement of power and energy and help operate the system within Security Standards. • To optimize the transmission outages of the elements of the State Grid without adversely affecting the Grid operation but taking into account the generation outage schedule, outages of constituent systems and maintaining system security standards. Outage planning is prepared in advance for the current year and reviewed during the year on quarterly and monthly basis. (e) Outage Planning Process: (i) SLDC shall be responsible for analyzing the outage schedule given by all State constituents, preparing a draft annual outage schedule and finalization of the annual outage plan for the following financial year by 31st January of each year. (ii) The STU, the IPPs, Generating Companies and Independent Private Transmission Companies (IPTCs) shall provide SLDC their proposed, outage programs in writing for the next financial year by 30th November of each year. These shall contain identification of each generating unit / line / ICT, the preferred date for each outage and its duration and where there is flexibility, the earliest start date and latest finishing date. (iii) SLDC shall then come out with a draft outage programme for next financial year by 31st December of each year for the State Grid taking into account the available resources in an optimal manner and 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 to be ensured while finalizing outage programmes. (iv) The final outage plan shall be intimated to all entities for implementation latest by 31st January of each year or by such earlier date as may be mutually decided by STU/SLDC. (v) The above outage plan shall be reviewed by SLDC / STU on quarterly and monthly basis in coordination with all parties concerned. (vi) In case of emergency in the system viz., loss of generation, break down of transmission line affecting the system, Grid disturbance, system isolation, SLDC, may conduct studies again before clearance of the planned outage. (vii) 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 may have an adverse impact on the system security by the proposed outage. (viii) Each State entity shall obtain the final approval from SLDC prior to availing an outage. (ix) The detailed generation and transmission outage programmes shall be based on the latest annual outage plan (with all adjustments made to date). (x) In cases involving non-reconciliation of the planned outages, TNERC shall be consulted for orders. (f) Recovery Procedures (i) Restoration system presents unique challenges to the system operators since the transmission system topologies will be quite different from the well integrated system during the normal condition (ii) Detailed plans and procedures for restoration after partial / total black out of each constituent's system within the State, will be finalised by the concerned entity in coordination with the SLDC. The procedure will 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, should 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. (g) Event information (i) This requirement of reporting procedures in writing of reportable events in the system to all State entities and SLDC needs to be specified. The objective is to define the incidents to be reported, the reporting route to be followed and information to be supplied to ensure consistent approach to the reporting of incidents / events. The incident reporting shall be as per format specified in Annexure C-3. (ii) Reportable Events: Any

of the following events require reporting by SLDC / State Entities. • Violation of security standards • Grid Indiscipline • Non-compliance of SLDC's instructions • System islanding / system black out • State black out / partial system black out • Protection failure in any element of STS or ISTS • System instability • Tripping of any element of the State Grid. (iii) Reporting Procedure: In the case of an event, which was initially reported by a State entity to SLDC orally, the entity will give a written report to SLDC. In the case of an event, which was initially reported by SLDC to an entity orally, the SLDC will give a written weekly report to the entity in accordance with this section. (iv) A written report shall be sent to SLDC or a State entity, as the case may be, and will confirm the oral notification together with the following details of the event: • Time and date of event • Location • Plant and / or equipment directly involved • Narration of event • Demand and / or Generation (MW) interrupted & duration • All relevant system data including copies of records of all recording instruments including Disturbance Recorder, Event Logger, DAS etc., • Sequence of trippings with time • Details of relay flags • Remedial measures (h) Accident Reporting: Reporting of accidents shall be in accordance with the Section 161 of Act 2003 in both fatal and non-fatal accidents.

Chapter 8

Scheduling and Despatch

8. Scheduling and Despatch.

(1) This chapter sets out the demarcation of responsibilities between various entities and SLDC in scheduling and despatch of load in the Grid and procedure for reactive power and voltage control mechanisms. (2) Certain procedures are to be adopted while scheduling of generation by State Sector Generating Stations (SSGS), open access customers, share from central sector generation and other licensees for scheduling the drawal by the beneficiaries of the State on a daily basis. The procedure for submission of capability by each generating company and submission of drawal schedule by each beneficiary / distribution licensee of the State is intended to enable SLDC to prepare the generation and drawal schedule connected with system operation. It also provides methodology for issuing real time despatch / drawal instructions and rescheduling, if required, along with the commercial arrangement for the deviations from schedules. (3) The following specific points would be taken into consideration while preparing and finalizing the schedules: (a) [SLDC will issue despatch instruction required to regulate all generation and imports from SSGS, IPPs, CPPs and Generators based on renewable sources of energy according to the hourly day ahead generation schedule, unless rescheduling is required due to unforeseen circumstances. Generation from wind mills shall be scheduled as per the Commission's Intra State Availability Based Tariff (ABT) order or regulation in force.] [Substituted In/ Notification No. V1(2)/207/2013, dated 12.09.2013.] (b) SLDC shall regulate the overall State generation in such a manner that generation from following types of power stations where energy potential, if unutilized, goes, as a waste shall not be curtailed. • Run of river or canal based hydro stations. • Hydro-station where water level is at peak reservoir level or expected to touch peak reservoir level (as per inflows). • Wind Power Stations and Renewable Energy Sources. • Nuclear Power Stations. (c) Despatch instructions shall be in Annexure format D1. These instructions will recognize declared availability and other parameters that have been made available by the generators to SLDC. These instructions shall include time, power station, generating units, (total

export in case of CPP) and name of operators sending and receiving the same. (d) Standard despatch instructions may include:

- To switch a generator into or out of service.
- Details of reserve to be carried on a unit.
- To increase or decrease MVAR generation to assist with voltage profile as per unit capability at that time.
- To begin pre-planned Black Start procedures.
- To hold spinning reserve.
- To hold generating units on standby.
- To control MW/MVAR drawal by beneficiaries / distribution licensees.

(4) Demarcation of responsibilities: (i) The SLDC shall have the total responsibility for:

- [Scheduling or despatching the generation of all agencies including the Utilities, IPPs, Generators based on renewable sources of energy, Co-Generators, etc. connected to the Grid.] [Substituted by Noti. No. V1(21/207/2013. dated 12.09.2013.]
- Regulating the demand of the beneficiaries / Distribution licensee in the State.
- Regulating the drawal from the central generating stations and regulating the bilateral interchanges, if there is any.
- Adopting merit order despatch, ABT procedures and free governor operation at power stations wherever possible.

(ii) SLDC shall always endeavor to restrict its net drawal from central generating stations and other generating stations within their respective drawal schedules and the guidelines of ABT. (iii) The generating stations shall be responsible for power generation generally according to the daily schedule provided to them by the SLDC on the basis of the drawal schedules received from the beneficiaries / distribution licensee and also in accordance with Merit Order Despatch and Connectivity Agreements. However, the generating stations may deviate from the given schedules depending on the plant and system conditions with the prior approval from SLDC. Provided that when, the frequency is higher than 50.5 Hz, the actual net injection shall not exceed the scheduled despatch for that hour. Also while the frequency is above 50.5 Hz, the generating stations may (at their discretion) back down without waiting for the advice from SLDC. When the frequency falls below 49.5 Hz, the generation at all stations (except those on peaking duty) shall be maximized, at least up to the level, which can be sustained, without waiting for the advice from SLDC. Notwithstanding the above, the SLDC may direct the generating stations / beneficiaries to increase / decrease their generation/ drawal in case of contingencies e.g. overloading of lines / transformers, abnormal voltages, threat to system security. Such directions shall immediately be acted upon. (iv) For all outages of generation and transmission system, which may have an effect on the State Grid, all entities shall co-operate with each other and co-ordinate their actions as per the approved procedures separately. In particular, outages requiring restriction of generation which a beneficiary / distribution licensee can receive (and which may have a commercial implication) shall be planned carefully to achieve the best optimization. The entities shall furnish to the SLDC all requisite information for billing purposes. (v) All entities shall abide by the concept of frequency linked load despatch and pricing of deviations from schedule i.e. unscheduled interchanges. All generating units of the entities and the licensees shall normally be operated according to the standing frequency linked load despatch guidelines issued by the SLDC to the extent possible, unless otherwise advised by the SLDC. (vi) The STU shall opt to install special energy meters on all inter connections between the State entities and other identified points for recording of actual net MWh interchanges and MVARh drawals. The SLDC shall be responsible for computation of actual net MWh injection of each generating stations and actual net drawal of each beneficiary, 15 minute-wise, based on the above meter readings. The SLDC shall be responsible for Intra-State Energy Accounting as per the scheme approved by STU, and all entities shall extend the necessary assistance to the STU personnel in timely collection of metered data. The generators shall furnish the data as per Annexure D-2. (vii) The STU will undertake necessary Energy Audits in the Grid. (5) Scheduling and Despatch procedure: (i) The

generation scheduling and despatch data shall be as per format in Annexure D-1. The procedure has been devised taking into account the ABT (Available Based Tariff) regime.(ii)Each day starting from 00.00 hours will be divided into 96 time blocks of 15 minutes intervals.(iii)By 10.00 a.m. every day all the generating stations in the States shall furnish to the SLDC, the station wise ex-power plant MW and MWh capability foreseen for each time block of the next day i.e. from 00.00 hours to 24.00 hours of the following day.(iv)The SSLDC shall inform the SLDC the MW and MWh requirements for different hours for the next day by 11.00 AM. The SLDC shall receive information from RLDC regarding the MW and MWh entitlements from Central Generating stations for different hours and blocks for the next day by 11.00 AM.(v)The above information of the foreseen capabilities of the State generating stations received from SSLDC and entitlements from CGS given by RLDC shall be compiled by the SLDC everyday for the next day, and advised to all SSLDC by 12 AM.(vi)The SSLDCs shall review it vis-a-vis their foreseen load pattern based on the drawal schedule of all the beneficiaries/ distribution licensees and shall advise the SLDC by 1.00 PM, the sub station wise MW and MWh requirements foreseen for different hours for the next day i.e., from 00.00 hours to 2400 hours of following day to the SLDC.(vii)The SLDC shall review the foreseen load pattern and the generation capacity available including bilateral exchanges if any, and advise the RLDC by 3.00 PM. their drawal schedule for the next day for each of the generating stations in which they have shares and the other generating companies in the State, their despatch schedule.(viii)By 5 PM each day, the RLDC shall convey the ex-power plant "despatch schedule" to each of the Inter State Generating Stations, and "net drawal schedule" to each SLDC / beneficiary in MW for different hours, for the next day.(ix)By 6 PM each day, the SLDC shall convey the ex-power plant "despatch schedule" to each of the State generating stations and "net drawal schedule" to each of the State beneficiary / distribution licensee through SSLDC in MW for different hours, for the next day.(x)The summation of the station-wise ex-power plant generation schedules for all generating stations after deducting the apportioned transmission losses (estimated), shall constitute the State beneficiaries / distribution licensees drawal schedule(xi)While finalizing the above daily generation schedules for the generating stations, the SLDC shall ensure that the same is operationally reasonable, particularly in terms of ramping-up /ramping-down rates and the ratio between minimum and maximum generation levels. Additional charges payable to the generating companies on account of such plant operations requiring oil support and / or unit shut-down / start-up shall also be considered by SLDC.(xii)The generating companies in the State may inform through SSLDC any modification / changes to be made in station wise drawal, schedule / foreseen capabilities, if any, to SLDC by 9.00 PM.(xiii)Based on the surplus, if any, the SLDC may arrange for bi-lateral exchanges. Such arrangement shall be intimated to RLDC by the SLDC by 10.00 PM.(xiv)The SLDC shall receive the final 'drawal schedule' against Central allocation along with bilateral exchange of power, if any by 11.00 PM.(xv)The SLDC shall inform the final drawal schedule for the next day to SSLDC by 11.15 PM(xvi)The SSLDC shall, in turn, inform the beneficiaries / distribution licensees the drawal schedule for the next day by 11.30 PM and it is frozen.(xvii)In the event of any contingency, SLDC will revise the schedules on the basis of revised declared capability by the generators. The revised schedules will become effective from the 4th time block, counting the time block in which the revision is advised by the generator to be the first one. The revised declared capability will also become effective from the 4th time block.(xviii)In the event of bottleneck in evacuation of power due to any constraint, outage, failure or limitation in the transmission system, associated switchyard and substations owned by STU (as certified by SLDC) necessitating reduction in generation, SLDC will

revise the schedules which will become effective from the 4th 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 generation of the station will be deemed to have been revised to be equal, to actual generation and also the scheduled drawals of the beneficiaries / distribution licensees will be deemed to have been revised to be equal to their actual drawals.(xix)In case of any grid disturbance, scheduled generation of all the generating stations and scheduled drawal of all the beneficiaries / distribution licensees shall be deemed to have been revised to be equal to their actual generation/drawal for all the time blocks affected by the Grid Disturbance. Certification of Grid Disturbance and its duration shall be done by SLDC.(xx)Revision of declared capability by generator(s) and requisition by beneficiaries / distribution licensees for the remaining period of the day will also be permitted with advance notice. Revised schedules/declared capability in such cases shall become effective from the 6th time block, counting the time block in which the request for revision has been received in SLDC to be the first one.(xxi)If, at any point of time, 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 4th time block, counting the time block in which the revised schedule is issued by SLDC to be the first one. To discourage frivolous revisions, SLDC may, at its sole discretion, refuse to accept schedule/capability changes of less than 50 MW(xxii)Generation schedules and drawal schedules issued/revised by SLDC shall become effective from designated time block irrespective of communication success.(xxiii)For any revision of scheduled generation, including post facto deemed revision, there shall be a corresponding revision of scheduled drawals of the beneficiaries.(xxiv)While finalizing the drawal and despatch schedules as above, the SLDC and SSLDCs shall also check that the resulting power flows do not give rise to any transmission constraint. In case any impermissible constraints are foreseen, the SLDC shall moderate the schedules to the required extent, under intimation to the concerned Users. Any changes in the scheduled quantum of power which are too fast or involve unacceptably large steps, may be converted into suitable ramps by the SLDC.(xxv)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 despatch schedule of generating stations and drawal schedule of the Users shall be issued by SLDC. This schedule shall be the datum for commercial accounting. The average ex-bus capability for each of the generating stations shall also be worked out based on all before-the-fact advice to SLDC.(xxvi)The SLDC and the SSLDCs shall properly document all the above information i.e. station-wise foreseen ex-power plant capabilities advised by the generating stations, the drawal schedule indented by the beneficiaries / distribution licensees, all schedules issued by the SLDC / SSLDCs, and all revisions / updating of the above.(xxvii)The procedure for scheduling carried out by SLDC/ SSLDCs, shall be open to all entities for any checking / verification. In case any mistake / omission is detected, the SLDC and SSLDCs shall forthwith make a complete check and rectify the same.(xxviii)A procedure for recording the communication regarding changes to schedules duly taking into account the time factor shall be evolved by STU.(6)Reactive Power and Voltage Control(i)Regarding VAR drawal / absorption from Inter State Grid, the SLDC has to follow IEGC.(ii)All the end users, distribution licensees, transmission licensees and STU are expected to provide local VAR compensation such that they do not draw VARs from the ITV Grid. VAR compensation has to commence in the following order. • Consumer end • Distribution transformer end • At the substations end of 11 / 22 KV distribution feeders • Substations • Generating

stations(iii)While tap changing on all 400 / 230 KV ICTs of CTU shall be done as per the instruction of RLDC, tap changing of other ICTs shall be done as per the instructions of SLDC and SSLDCs.(iv)The generating stations shall generate / absorb reactive power as per instructions of SLDC, within the capability limits of the respective generating units(v)Notwithstanding the above, SLDC may direct a beneficiary to curtail its VAR drawal/injection in case the security of Grid or safety of any equipment is endangered.(vi)In general, the beneficiaries shall endeavor to minimize the VAR drawal at an interchange point when the voltage at that point is below 95% of rated, and shall not return VARs when the voltage is above 105%.

Chapter 9

Commercial Issues and Implementation

9. Commercial Issues.

(1)In regard to central sector allocation of power, the CERC has full jurisdiction to determine the tariff and other commercial issues.(2)Subject to any scheme of tariff, as may be approved by the TNERC, the bulk power supply agreements between the constituents shall duly specify the relationship between capacity charges to be paid and plant availability, and energy charge rates (in rupees per MWh) for each station, in ex-power plants. Regarding the other commercial issues, the following are applicable:(i)The transmission charges and other open access charges shall be paid to the respective constituents as per the TNERC regulations issued time to time.(ii)The summation of the station-wise ex-power plant drawal schedules for all generating stations after deducting the apportioned transmission losses (estimated), shall constitute the State beneficiaries / distribution licensees drawal schedule which in turn shall be used for billing.(iii)In case of a deviation from the generation schedule, the frequency-linked Unscheduled Interchanges Charges (UI charges) shall be applicable for such deviations as may be approved by the CERC/TNERC from time to time and dependent on average frequency for the concerned 15-minute block.(iv)Energy Accounts shall be prepared by the SLDC on a monthly basis. The beneficiaries / distribution licensees as per provision in the respective PPAs shall pay these bills.(v)The SLDC shall in parallel issue the weekly bills for UI charges and Reactive Energy Charges to all constituents by Tuesday for the seven-day period ending on the penultimate Sunday mid night. These bills shall have a higher priority, and the generating stations and beneficiaries / distribution licensees shall pay the billed amounts within 10 days of billing date.(vi)If payments against the above bills are delayed beyond 10 days, the defaulting entities shall have to pay a simple interest rate of 0.04 percent for each day of delay. The interest so collected shall be paid to the entities who have to receive the payment which got delayed.(vii)SLDC shall periodically review the actual deviation from the-generation and net drawal schedules to check whether any of the entities is indulging in unfair gaming. In case any such practice is detected the matter shall be reported to the STU for further investigation / action.(viii)All energy accounting calculation carried out by SLDC shall be open to all users for any checking / verification. In case any mistake is detected, the SLDC shall forthwith make a complete check and rectify the mistake.(ix)Energy accounting (including billing of UI charges and reactive energy charges) is one of the most important and critical function of SLDC. Any flaw in the energy accounting will lead to serious financial consequences. Hence, a committee to be designated by the Commission will

conduct annual audit on the accounting and technical performance of SLDC and present a report to the Commission before the end of May every year for the previous financial year.(x)Regarding VAR drawal / absorption from Inter State Grid, the SLDC has to follow IEGC. The charge/payment for VARs, shall be at a nominal paise / kVARh rate as may be approved by CERC / TNERC from time to time, and will be between the beneficiary and the Pool Account and between two beneficiaries. The generating stations shall generate / absorb reactive power as per instructions of SLDC, within the capability limits of the respective generating units. No payments shall be made to the generating companies for such VAR generation / absorption.(xi)The basic rules for absorption / generation are:• The Beneficiary pays for VAR drawal when voltage at the metering point is below 97%.• The Beneficiary gets paid for VAR return when voltage is below 97%.• The Beneficiary gets paid for VAR drawal when voltage is above 103%.• The Beneficiary pays for VAR return when voltage is above 103%.

Chapter 10

Non-Compliance

10. Non Compliance and Disputes.

(1)As stipulated under Section 33 (2), (4) and (5) of the Act, every licensee, generating company, generating station, substation and any other person connected with the operation of the power system shall comply with the directions issued by SLDC. If any dispute arises with reference to the quality of electricity or safe, secure and integrated operation of the State Grid or in relation to any direction given by SLDC, it shall be referred to the Commission for decision. Pending decision of the Commission the licensee or the generating company shall comply with the directions of the SLDC. TNERC, in turn, after due process, may order the defaulting entity for compliance, failing which it may take penal action and other regulatory measures, which includes termination of connectivity agreement/ de-linking from the Grid etc., through STU/SLDC.(2)Non-payment of dues: In case of non-payment of capacity and energy charges, unscheduled interchange charges, transmission/SLDC charges, etc. by any beneficiary, the affected generating company shall report the matter to the STU. The latter shall verify and take up the defaulting entity for paying up the dues. In case of inadequate response, the STU shall report the same to TNERC. TNERC in turn, after due process, may order the defaulting entity to pay the dues within a certain period, failing which the TNERC may initiate necessary regulatory measures.

Chapter 11

11. Management Of Tamil Nadu Electricity Grid Code.

- 11.1 The Tamil Nadu Electricity Grid Code (TNEGC) has been specified by the Tamil Nadu Electricity Regulatory Commission (TNERC) as per section 86 (1) (h) of the Electricity Act, 2003. Any amendments to TNEGC shall also be specified by TNERC only.11.2The TNEGC and its amendments shall be finalized and notified adopting the prescribed procedure followed for

regulations issued by TNERC.11.3The requests for amendments to / modifications in the TNEGC and for removal of difficulties shall be addressed to Secretary, TNERC, for periodic consideration, consultation and disposal.11.4Any dispute or query regarding interpretation of TNEGC may be addressed to Secretary, TNERC and clarification issued by the TNERC shall be taken as final and binding on all concerned.Annexure A-1Planning Data (Generation)[Refer clause 5 (11) (i)]The following data are to be made available to the planning wing of STU by all the Agencies and various Users.

1. Name of Power Station:

2. Station Capacity

(i)Total Capacity.(ii)Number of units and unit size.

3. Site:

Give location map to scale showing roads, railway lines, transmission lines, rivers, reservoirs.

4. Station type:

Thermal(Coal) / Hydro/ Pumped Hydro/ Nuclear/ GT/CCGT/Diesel4.1Thermal (Coal):(a)Coal linkage details.(b)Ratings of Boilers, turbines and major auxiliaries.(c)Water sources for station operation.(d)Environmental constraints and clearances.(e)Peaking availability and peaking capability.4.2Hydro:(a)Site map showing the dam, reservoir area, water conductor system, fore bay, power house etc.,(b)Information on area submerged, villages submerged, forest and agricultural areas submerged etc.,(c)Ratings of turbine and other major equipments.(d)Reservoir data and operating table with area capacity curves and unit capability at different heads.(e)Irrigation discharge linkage details.(f)Operating head: max. and min.4.3Nuclear:(a)Salient and disclosable details of the plant.(b)Ratings of turbine and other major auxiliaries.(c)Water sources for station operation.(d)Environmental constraints and clearances.(e)Peaking availability and peaking capability.4.4Gas Turbine / CCGT(a)Natural Gas / LNG.(b)Salient details of the GT / CCGT.(c)Ratings of major auxiliaries.(d)Water sources for station operation.(e)Environmental constraints and clearances.(f)Peaking availability and peaking capability.4.5Diesel Engine:(a)Type of DG engine and other salient particulars.(b)Details of cooling system and water sources for operation.(c)Environmental constraints and clearances.(d)Peaking availability and peaking capability.4.6Captive Power Plants:(a)Salient details including the plant capacity.5.oGenerators:(a)Type(b)Rating (MVA)(c)Terminal voltage (KV)(d)Speed (RPM)(e)Inertia constant H (MW Sec./MVA)(f)Rated Power Factor.(g)Reactive Power Capability (MVA_r) in the range 0.95 of leading and 0.85 of lagging.(h)Short Circuit Ratio(i)Direct axis synchronous reactance (% on MVA) X_d(j)Direct axis transient reactance (% on MVA) X_{d'}(k)Direct axis sub-transient reactance (% on MVA) X_{d''}(l)Quadrature axis synchronous reactance (% on MVA)X_q(m)Quadrature axis transient reactance (% on MVA) X_{q'}(n)Quadrature axis sub-transient reactance (% on MVA) X_{q''}(o)Direct axis transient open circuit time constant (Sec) T'_{do}(p)Direct axis sub-transient open

circuit time constant (Sec) T''_{do} (q) Quadrature axis transient open circuit time constant (Sec) T'_{qo} (r) Quadrature axis sub-transient open circuit time constant (Sec) T'_{qo} (s) Stator Resistance R_a (Ohm) (t) Stator leakage reactance X_l (Ohm) (u) Stator time constant (Sec) (v) Rated Field current (A) (w) Neutral grounding details (x) Open Circuit saturation characteristic for various terminal

6.0 Generator Transformers: (a) Type (b) Rated capacity (MVA) (c) Voltage ratio (FIV/LV) and vector group (d) Tap change range (+ % to - %), (e) On load / off load tap changer (f) Percentage impedance (Positive sequence at full load).

7.0 Connection to Grid: (a) Point of Connection: Give single line diagram for the point of connection. (b) In relation to switchgear including circuit breakers, isolators on all circuits connected to the point of connection: (i) Rated voltage (kV) (ii) Type of Breaker (MOCB/ABCB/SF6) (iii) Rated short circuit breaking current (kA) 3 phase (iv) Rated short circuit breaking current (kA) 1 phase (v) Rated short circuit making current (kA) 3 phase (vi) Rated short circuit making current (kA) 1-phase (vii) Provisions of auto reclosing with details

8.0 Other Details: 8.1 Excitation Control System (i) Type of Excitation (ii) Maximum Field Voltage (iii) Minimum Field Voltage (iv) Rated Field Voltage (v) Details of excitation loop in Block Diagrams showing transfer functions of individual elements using I.E.E.E. symbols. (vi) Dynamic characteristics of over - excitation limiter (vii) Dynamic characteristics of under-excitation limiter

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

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

8.4 Basic Insulation Levels: (i) Bus bar (ii) Switchgear (iii) Transformer Bushings (iv) Transformer windings.

8.5 Surge diverters: Technical data. (gapless and gapped arresters separately)

8.6 Communication: Details of equipment installed at points of Connections.

8.7 Operational parameters: (i) Minimum notice required to synchronize a Generating Unit from De-synchronization. (ii) Minimum time between synchronizing different Generating Units in a Power Station. (iii) The minimum block load requirements on synchronizing. (iv) Time required for synchronizing a Generating Unit. (v) Maximum Generating Unit loading rates. (vi) Minimum load.

Annexure A-2 Planning Data (Transmission) [Refer clause 5 (11)(i)] The following data are to be made available to the planning wing of STU by all the Agencies and various Users.

1.0 General

1.1 Single line diagram of the Transmission System down to 33 kV bus detailing: (a) Name of Sub-station. (b) Power Station, connected. (c) Number and length of circuits. (d) Interconnecting transformers. (e) Sub-station bus layouts. (f) Power transformers. (g) Reactive compensation equipment.

1.2 Route map of the transmission lines and locations of the sub stations up to 33 kV. The consolidation of the geographical map shall be the responsibility of the respective planning wing of STU.

1.3 Sub-station layout diagrams showing: (a) Bus bar layouts. (b) Electrical circuitry, lines, cables, transformers, switchgear etc. (c) Phasing arrangements. (d) Earthing arrangements. (e) Switching facilities and interlocking arrangements. (f) Operating voltages. (g) Numbering and nomenclature: • Transformers. • Circuits •

Circuit breakers• Isolating switches

2.0 Transformer Parameters (For all transformers)

(i) Rated MVA

(ii) Voltage Ratio

(iii) Vector Group

(iv) Positive sequence reactance (pu on 100 MVA) (max, min. & normal) X_1

(v) Positive sequence, resistance (pu on 100 MVA) (max, min. & normal) R_1

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

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

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

(ix) Impedance between HV-MV, MV-LV and EIV-LV for three winding trs.

(x) Loading capability of tertiary (if any)

(xi) Grounding impedance in pu (if the neutral of the star is grounded)

3.0 Equipment Details (For all substations)

(i) Circuit Breakers.

(ii) Isolating switches.

(iii) Current Transformers.

(iv) Potential Transformers.

4.0 Relaying and metering

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

(ii) Metering Details.

5.0 Reactive Compensation Equipment

(i) Type of equipment (fixed or variable)

(ii) Capacities and/or Inductive rating or its operating range in MVar

(iii) Details of control

(iv) Point of Connection to the System.

6.0 Line Parameters (For all circuits)

(i) Designation of Line.

(ii) Year of commissioning

(iii) Length of line (km)

(iv) Line capacity (thermal and surge impedance limits)

(v) No. of circuits.

(vi) Per Circuit values

• Operating voltage (kV)

• Positive sequence reactance/ km (pu on 100 MVA) X_1

• Positive sequence resistance/ km (pu on 100 MVA) R_1

• Positive sequence half line susceptance/ km (pu on 100 MVA) B_1

• Zero sequence reactance (pu on 100 MVA) X_0

• Zero sequence resistance (pu on 100 MVA) R_0

• Zero sequence half line susceptance (pu on 100 MVA) B_0

Annexure B-1 Site Responsibility Schedule (Refer clause 6 (8))

Name of Power Station: Tel. Number: Fax Number: Permanent Address: Site Manager:

| Item of Plant/Apparatus | Plant Owner Responsibility for | | | Remarks |
|-------------------------|--------------------------------|-----------|-------------|---------|
| | Control | Operation | Maintenance | |
| Safety | | | | |
|kV | | | | |

Switchyard

All equipments Including Bus burs

Feeders

Generating Units

Annexure C-1 Outage Planning - Sub-Station Level Data (Refer clause 7 (5) (d)) To be furnished to the SLDC for each sub station and updated annually or when there is a major change or when specifically required by STU/ SLDC.

| Item | Description | Submitted by |
|------|--|----------------------------|
| 1 | Estimated aggregate annual sales of energy in million units and peak and lean demand in MW & MVar at each sub station for the period from July of current year to June of next year. | 31st March of current year |
| 2 | Estimated aggregate monthly sales of energy in million units and peak and lean demand in MW & MVar at each sub station for the next month. | 15th of current month |

B. Estimates of Load Shedding and Details of Essential Loads and Priority of Restoration

1. Details of discrete load blocks that may be shed to comply with emergency requirements.

2. Details of essential loads and the priority as below.

| No. | Priority | Type of Load | Approximate MW | Name of Sub-Station |
|-----|----------|--------------|----------------|---------------------|
|-----|----------|--------------|----------------|---------------------|

Annexure C-2 Outage Planning - Generation Data (Refer clause 7 (5) (d)) To be furnished to the SLDC for each generating station including IPP for every year by the generation wing of TNEB or its successors and the IPPs, CPPs. Year Ahead Outage Programme (For the period July to June) Generator Outage Programme.

| Item | Description | Submitted by |
|------|---|----------------------|
| 1 | Identification of Generating Unit. | 1st August each year |
| 2 | MW which will not be available as a result of Outage | 1st August each year |
| 3 | Preferred start date and start-time or range of start dates and start times and period of outage. | 1st August each year |
| 4 | If outages are required to meet statutory requirements then the latest- date by which Outage must be taken. | 1st August each year |

Year Ahead RLDC'S Outage Programme (affecting Transmission System)

| Item | Description | Submitted by |
|------|---|------------------------|
| 1 | MW which will not be available as a result of Outage from Imports through External Connections. | 1st November each year |
| 2 | Start-Date and Start-Time and period of Outage. | 1st November each year |

The STU'S Overall Outage Programme

| Item | Description | Submitted by |
|------|---|------------------------|
| 1 | Report on proposed Outage programme to RLDC | 1st November each year |
| 2 | Release of finally agreed Outage plan | 1st March each year |

Annexure C-3 Incident Reporting (Refer Clause 7 (5) (g) (i))

| First Report | Date..... | Time: |
|---|-----------|-------|
| 1. Date and time of incident | | : |
| 2. Location of incident | | : |
| 3. Type of incident | | : |
| 4. System parameters before the incident (Voltage, Frequency, 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 Organisation :

Annexure D-1 Generation Scheduling Data (Refer clause 8(5)) To be furnished to the SLDC / SSLDC:

| Schedule and Despatch | Submitted by |
|---|------------------------|
| 1 Day ahead hourly MW/MVAr availability (0.00 -24.00 Hrs) of all Generator Units | 10.00 Hrs. every day |
| 2 Day ahead hourly MW import/export from CPP's | -do- |
| 3 Status of Generating unit Excitation AVR inservice (Yes/No) | -do- |
| 4 Status of Generating Unit Speed Control System Governor | -do- |
| 5 Spinning Reserve Capability (MW) | -do- |
| 6 Backing down Capability with / without Oil Support (MW) | -do- |
| 7 Hydro Reservoir Levels and restrictions | -do- |
| 8 Generating Units hourly Summation outputs (MW) | -do- |
| 9 Sub station wise MW and MWh requirements from 00.00 hrs to 24.00 hours of following day to SSLDC | 10.00 hrs. |
| 10 MW and MWh requirements from 00.00 to 24.00 for Sub-Stations covered by each SSLDC to SLDC | 11.00 hrs. |
| 11 MW and MWh entitlements from CCS and Neyveli Stage 1 for different hours for the next day | 11.00 hrs. every day * |
| 12 Tentative Drawal schedule for the next day by SLDC to RLDC and despatch schedules for all generating stations in the State | 15.00 hrs. |
| 13 Net Drawal schedules communicated to all beneficiaries, stations and distribution in charges and ex powerplant despatch schedule to each 1SGS by RLDC. | 17.00 hrs |
| 14 State generating companies request for modification if any to SLDC | 21.00 hrs. |
| 15 SLDC to inform RLDC for any revisions/ bilateralexchanges | 22.00 hrs |
| 16 Final drawal schedule against CGS allocation to be informed to SLDC by RLDC | 23.00 hrs. |
| 17 SLDC to inform the SSLDCs the final drawal schedule | 23.15 hrs. |
| 18 SSLDCs to inform the drawal schedule to the respective beneficiaries | 23.30 hrs |

Annexure D-2 Monitoring of Generation (Refer clause 8 (4) (vi))

| Item Description | Submitted by |
|--|--------------|
| 1. Generating stations shall provide generation Real Summation to SLDC in 15 minutes block | time basic |
| 2. CPP's shall provide hourly export/ import MW to SLDC in 15 minutes block | Real time |

- | | | |
|----|--|---------------------------------------|
| 3. | Logged readings of Generators to SLDC | As required |
| 4. | Detailed report of Generating Unit trippings onMonthly basis | First week of the succeeding month |