

KERALA STATE ELECTRICITY REGULATORY COMMISSION

NOTIFICATION

No.1/1/KERC-2006/IX

Dated, Thiruvananthapuram, 13th January 2006.

STATEMENT OF OBJECTS AND REASONS

Subsection 1 (h) of Section 86 of the Electricity Act, 2003 states that *State Electricity Regulatory Commission shall specify State Grid Code consistent with the Indian Electricity Grid Code (IEGC). The State Grid Code covers the Rules and guidelines applicable to system planning, development, operation and maintenance of State power grid.*

The Regulations hereunder has been framed in pursuance of the above provisions of the Act.

STATE GRID CODE

In accordance with the provision of Subsection 1 (h) of Section 86 read with Subsection (1) of Section 181 of Electricity Act, 2003 (Central Act 36 of 2003) the Kerala State Electricity Regulatory Commission hereby makes the following Regulations, namely: -

CHAPTER I

GENERAL

1. Short Title and Commencement. - (1) These Regulations shall be called the **“Kerala State Electricity Grid Code, 2005 (KSEGC 2005)”**

(2) They shall come into effect from 1-4-06.

2. Implementation and Operation of the Grid Code.- (1) Any agency or participant engaged in system planning, development, operation and/or maintenance of Kerala State Power System shall follow the Grid Code. And all the users of Kerala Grid shall comply with the Grid Code. The Kerala Grid users must provide all the required information and reasonable rights of access, service and facilities necessary for implementation of the Grid Code.

(2) In case of persistent non-compliance of any of the stipulations of the KSEGC by any user, the matter shall be reported by the affected party to the KSEGC Review Panel. The review panel shall verify and take up the matter with the defaulting agency for expeditious termination of the non-compliance. In case of inadequate response to the efforts made by the Review Panel, the non-compliance shall be reported to KSERC. KSERC, in turn after due process, may direct the defaulting agency for compliance, failing which, KSERC may take appropriate action. The review panel shall maintain appropriate records of such violations.

(3) Consistent failure in complying with the Grid Code may lead to disconnection of the user's plant or apparatus from the grid.

CHAPTER II

GLOSSARY AND DEFINITIONS

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

- (1) "Act" means The Electricity Act, 2003.
- (2) "Agency" means a term used in various sections of the Grid Code to refer to utilities that utilise the intra-State transmission system;
- (3) "Apparatus" means all equipment, in which electrical conductors are used, supported or of which they may form a part. In safety coordination this also means high voltage electrical circuits forming part of a system on which safety precautions may be applied to allow work and/or testing to be carried out on a system;
- (4) "Area of supply" means area designated in the license for carrying out the licensed activity;
- (5) "Availability" means the capability of the generating unit expressed in MW. "Fully available" shall mean that the generating unit is available to its contracted capacity. In respect of the transmission system, "availability" shall mean the time in hours the transmission system is capable of transmitting electricity at its rated voltage from the supply point to the delivery point during a year and expressed as a percentage of the total number of hours during the year;
- (6) "Backing down" means reduction of generation on instructions from SLDC/SRLDC by a generating unit;
- (7) "Back-up protection" means protection equipment or systems which are intended to operate when a system fault is not cleared in the specified time by the primary protection equipment/system;
- (8) "Black start" means the process necessary for a recovery from a total shutdown or partial shutdown without the availability of electricity from external sources;
- (9) "Black start capability" means an ability, in respect of a Black Start Station, for at least one of its generating units to start up from shutdown and to be synchronized to the system so as to energize a part of the system, upon instruction from the State Load Dispatch Centre, within a comparatively short duration without any external supply;
- (10) "Black Start Stations" means Power Stations having black start capability;
- (11) "Caution Notice" means a notice conveying a warning against interference;
- (12) "CPP" means Captive Power Plant
- (13) "CCGT" means Combined Cycle Gas Turbine;
- (14) "CEA" means Central Electricity Authority;

(15) 'Central Transmission Utility (CTU)' means any Government Company notified by the Central Government under Section 38 of the Act;

(16) "CERC" means Central Electricity Regulatory Commission;

(17) "Connection" means the process of connecting the electric power lines and electrical equipment of any system to the transmission system;

(18) "Connection Agreement" means agreement between STU and an agency setting out the terms relating to a connection to and/or use of the Intra State Transmission System.

(19) "Connection Conditions" means those conditions mentioned in Chapter V of this Code ('Connection Conditions') which has to be fulfilled before the user's system is connected to the Grid;

(20) "Connection Point" means a Grid supply point or Grid Entry point, as the case may be;

(21) "Contingency Reserve" means the available standby generation over forecast demand, which is required in the period from 24 hours ahead down to real time to take care of uncertainties in generating plant availability or errors in forecast;

(22) "Cross Boundary" means the boundary between the system of Transmission Licensee and that of any user including Generating Company or Distribution Licensee;

(23) "Demand" means the demand of electricity expressed in MW or MVA (*i.e.* both active and apparent power) unless otherwise stated;

(24) "Demand Control" means any of the following methods of achieving a load reduction:

- a) Customer Load Management initiated by users
- b) Customer load reduction by disconnection as instructed by the Load Despatch Centre
- c) Customer load reduction by disconnection initiated by users (other than following an instruction from Load Despatch Centre)
- d) Automatic load disconnection through operation of under frequency relays
- e) Emergency manual load disconnection;

(25) "Designed Minimum Operating Level" means the output expressed in MW below which a generating unit is generally not allowed to operate according to prudent operating practice;

(26) "Despatch" means operational control of an integrated electricity system involving operations such as:

- a) Assignment of levels of output to specific generating unit or plant to effect the most reliable and economical supply in accordance with the demand for power
- b) Control of operation of extra high voltage lines, associated substations and Equipments

- c) Scheduling of various types of transactions such as power and energy exchanges of electric utilities over the interconnecting transmission lines;
- (27) "Despatch Schedule" means the ex-power plant net MW and MWH output of a generating station, scheduled to be exported to the grid from time to time.
- (28) "Disconnection" means the physical separation of users or consumers from the system;
- (29) "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;
- (30) "Distribution Licensee" means any person holding distribution license under Section 14(b) of Act;
- (31) "Drawal" means the import/export of electrical energy from/to the grid;
- (32) " Drawal Schedule" means the ex-power plant MW that a licensee/user is scheduled to receive from ISGS/state generating station, including bilateral exchanges from time to time.
- (33) "Entitlement share of a user" means share of a user(in MW and MWH) in the installed capacity/output capability of a generating company.
- (34) "Ex power Plant net MW/MWH output" means net MW/MWH output of a generating station after deducting auxiliary consumption and trasnformer losses.
- (35) "Force Majure" means any event which is beyond the control of the agencies involved which they could not foresee or with a reasonable amount of diligence could not have foreseen or which could not be prevented and which substantially affect the performance by either agency such as but not limited to-
- a) Acts of God, natural phenomena including but not limited to floods,droughts,earthquakes and epidemics;
 - b) Acts of any Government domestic or foreign including but not limited to war declared or undeclared,hostilities,priorities,quarantines,embargoes;
 - c) Riot or Civil Commotion
 - d) Grid failure not attributable to agencies involved.
- (36) "Generation/Generating Company" means any company or body corporate or association or body of individuals, whether incorporated or not or artificial judicial person which owns or operates or maintains a generating station.
- (37) "Grid" means the high voltage backbone system of interconnected transmission lines, substation and generating plants;
- (38) "Grid Feeders" means all EHT feeders that form the part of Kerala Grid as notified by SLDC.

(39) "Grid Station" means any EHT station that forms part of Kerala grid as notified by SLDC.

(40) "Grid Transformer" means any EHT transformer that forms part of Kerala Grid as notified by SLDC.

(41) "IE Rules" means Indian Electricity Rules, 1956 or similar Rules to be made under Section 53 of the Act;

(42) "IEGC" means Indian Electricity Grid Code – a formal document describing the philosophy and responsibilities for planning and operation of Indian Power Systems issued by CERC;

(43) "Interconnecting Transformer (ICT)" means Transformer connecting systems of different voltages at EHV levels;

(44) "I PP" means Independent Power Producer in the State/Country.

(45) "ISGS" means Inter State Generating Station.

(46) "ISTS" means Inter State Transmission System.

(47) "KSERC" means Kerala State Electricity Regulatory Commission

(48) "Lean period" means that period in a day when the electrical power demand is lowest;

(49) "Major Grid Disturbance" means a disturbance in the power system involving oscillation of frequency and/or grid separation.

(50) "Operating Margin" means contingency reserve plus operating reserve;

(51) "Operating Reserve" means the additional output from a generating plant, which must be realizable in real time operation to correct system frequency to an acceptable level, in the event of a loss of generation, or loss of import from an external source, or mismatch between generation and demand;

(52) "Operation" means a scheduled or planned action relating to the operation of a system;

(53) "Operational Data" means data required under the operating codes and/or scheduling and despatch codes or data as required for effective scheduling and despatch;

(54) "Operational Planning" means planning carried out to achieve, as far as possible, in compliance with the standards of security set out in the transmission planning codes, the matching of generation output with forecast demand together with a reserve of generation to provide a margin, taking into account the outages of the following to which the power stations and/or customers are connected with the grid/transmission system;

- a) Generating units
- b) Elements of the transmission system and
- c) Elements of the user systems;

- (55) "Person" shall include any company or body corporate or association or body of individuals, whether incorporated or not, or artificial juridical person;
- (56) "Planned Outage" means an outage of generating unit(s) or components of the transmission system, or components of a user's system coordinated by SLDC;
- (57) "Point of Connection" means an electrical point of connection between the transmission system and the user's system;
- (58) "Protection Committee" means the Committee constituted by SLDC with members from STU/SLDC/Generating Company/Distribution Licensee/Transmission Licensee.
- (59) "Regulating Margin" means the excess generating capacity in operation over demand which is required to maintain frequency;
- (60) "Re-synchronization" means the bringing of parts of the system which has gone out of synchronism with each other, back into synchronism;
- (61) "Safety Rules" means the Rules framed by the State Transmission Utility/Transmission Licensee to ensure safety to persons, equipments, systems and to any third party working on or connected directly or indirectly with the electrical circuits/plant/apparatus, in accordance with the Act and relevant standards and recommendations/instructions of the manufacturer of plants/equipment/system;
- (62) "Single Point Connection" means a single point of connection, with no interconnection through the user's system to another point of connection;
- (63) "SLDC" means State Load Despatch Centre;
- (64) "RPC" means Regional Power Committee established by resolution by the Central Government for a specific region for facilitating the integrated operation of the power systems in that region.
- (65) "SRLDC" means Southern Regional Load Despatch Centre;
- (66) "Standing instruction" means an instruction issued by SLDC to any user, whereby in specified circumstances, the user should take specified action, as though a valid operating instruction has been issued by SLDC;
- (67) "Start-up" means the action of bringing a generating unit from shutdown to synchronous speed;
- (68) "State Transmission Utility (STU)" means the utility notified by the State Government under Section 39 of Indian Electricity Act, 2003;
- (69) "Supply" in relation to electricity, means the sale of electricity to a licensee or consumer.
- (70) "System" means any user system and/or transmission system, as the case may be;

(71) "System Constraint" means a limitation on the use of a system due to lack of transmission capacity or other system limitations;

(72) "System Margin" means the difference of electrical power in any period between declared availability and demand forecasted plus the operating margin, for that period;

(73) "Transmission License" means the license granted for power transmission under Section 14 of the Act, 2003;

(74) "Transmission Services Agreement" means the agreement between the Transmission Licensee and the user for transmission/wheeling of electrical power through transmission licensee's network to the user;

(75) "Transmission System" means all high voltage cables and overhead lines (not being part of the distribution system of a licensee) transmitting electricity from a generating station to another generating station or a sub-station, together with any step-up or step-down transformers, switchgear, Instrument transformers, Capacitors, Reactors, Static Voltage Compensators etc, and other works necessary to and used for the control of such cables or overhead lines, and buildings and part thereof as may be required to accommodate such transformers, switchgear, Instrument transformers, Capacitors, Reactors, Static Voltage Compensators etc, and other works including, but not limited to software and associated hardware for monitoring and control;

(76) "User" means a Generating Company, State Transmission Utility/Transmission Licensee, Distribution licensee and Open Access Customers;

(77) "Utility" means the electric 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 III

ROLE OF VARIOUS ORGANIZATIONS AND THEIR LINKAGES

1. **Role of SLDC**

1.1 According to section 32 of Electricity Act 2003, the State Load Despatch Center (SLDC) shall be the apex body to ensure integrated operation of the power system in the State.

1.2 SLDC shall exercise supervision and control over the inter-state and intra –state transmission system. SLDC will be responsible for carrying out real time operations for grid control and dispatch of electricity within the State through secure and economic operation of the State Grid in accordance with the Grid Standards and the State Grid Code.

1.3 SLDC shall keep accounts of the quantity of electricity transmitted through the State Grid.

1.1 SLDC shall constitute the Protection Committee with members from the following:

- a. STU/Transmission Licensee
- b. Generating Companies with total capacity of 10 MW and above.
- c. Distribution Licensees.

2. Role of STU

According to section 39 of Electricity Act 2003, the functions of the State Transmission Utility (STU) shall be:

- a. To undertake transmission of electricity through intra-state transmission system;
- b. To discharge all functions of planning and coordination relating to intra – state transmission system with
 - i) Central Transmission Utility;
 - ii) State Governments;
 - iii) Generating companies;
 - iv) Regional Power Committees;
 - v) Authority;
 - vi) Licensees;
 - vii) Any other person notified by the State Government in this behalf;
- c. to ensure development of an efficient, coordinated and economical system of intra-state transmission lines for smooth flow of electricity from a generating station to the load centers;
- d. to provide nondiscriminatory 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 such open access is provided by the State Commission under sub-section(2) of section 42 of the Act, on payment of the transmission charges and a surcharge thereon, as may be specified by the State Commission.

CHAPTER IV

SYSTEM PLANNING

3. Reinforcements and Extensions of the System: -(1) Reinforcements and extensions of the system arise due to:

- a) A development on a user's system already connected to the transmission system.
- b) Introduction of new connection point between a user's system and the transmission system.
- c) The need to increase system capacity, removal of operational constraints, and maintenance of security standards and/or meeting general increases in demand.
- d) Steady State and Transient Stability considerations.
- e) Cumulative effects of any or combination of the above four.

(2) Such reinforcement and extension to the transmission system may also involve work at a connecting point (entry or exit) of a generating company/distribution licensee to the transmission system.

(3) The development of the transmission system must be planned well in advance, allowing sufficient lead time for:

- a) Obtaining all the necessary statutory approvals like forest clearance, railway clearance, clearance from aviation authorities, crossing of national highways, state highways, etc., and the right of way permissions, wherever required.
- b) Detailed engineering, design, procurement of equipment and materials, construction, testing and commissioning.

4. Perspective Plan for the State Power Grid. - (1) The Distribution Licensee shall be responsible for the load forecasting within its area of supply. The Distribution Licensees shall determine the peak load and energy forecasts of their area of supply, for each category of loads, for each of the succeeding 10 years and submit the same annually by 31st March to the STU. This shall include the details of demand forecasts, the basis, methodology/forecast model, and assumptions. The load forecasts shall be made for each interconnection point with the Kerala State Power Grid and the user(s) by STU and the same shall include the annual peak load, energy projections and daily load curves. These forecasts shall be updated annually as well as whenever major changes are made in the existing system. The projections shall take into account the assumed normal growth for non-specific loads, specific and identified loads of 1 MW and above, and the effects of Demand Side Management and energy conservation. The aggregate energy and peak load requirements at each connection point shall be estimated taking into account the losses.

(2) The STU shall review and modify the load forecast methodology, model and assumptions used by the Distribution Licensees. The resulting overall forecast will form the basis of planning for expansion of the transmission system.

(3) The STU shall be responsible to prepare and submit a long-term (ten years) plan for generation and the transmission expansion, proposed to meet the future demand. The planning shall be in conformity with the national perspective plan prepared by the Central Electricity Authority (CEA). A copy of the plan shall be submitted to the Commission for approval.

5. Data Requirement for System Planning.- (1) To enable the STU to conduct system studies and to prepare perspective plans for generation and transmission, all the users shall furnish the data to the STU from time to time. STU shall prepare a comprehensive list of data required and specific format for 'Planning Data Requirements' and the users shall follow this list and format for submission of data to STU.

(2) To enable the users to co-ordinate planning, design and operation of their plants and systems with the transmission system of STU/Transmission Licensee, the users may seek salient data of the transmission system as applicable. The STU shall supply these data from time to time as per a comprehensive list and format for 'Transmission System Data' that shall be prepared by STU, on the basis of user data requirements/requests.

(3) Notwithstanding the above provisions, the planning Code of IEGC shall also apply to generating companies, IPPs, CPPs, STUs and licensees, as far as data submissions and data exchanges are concerned.

(4) The first submission of this data to STU shall be within 6 months from the date of implementation of this Grid Code. Thereafter data shall be made available on first of April every year and/or as required by STU.

CHAPTER V
CONNECTION CONDITIONS

6. Connectivity. -The Connectivity shall ensure the following:

- a) All Users or prospective Users are treated equitably.
- b) No new connections shall impose any adverse effect on the existing users. Also new connections shall not suffer adversely due to existing users.
- c) Acceptable quality of supply is maintained as specified in the Electricity Supply Code.

7. Site Responsibility Schedule. - (1) For every connection to the transmission system for which a Connection Agreement is required, the STU shall prepare a Schedule of Equipment, pursuant to the relevant Connection Agreement, with the information supplied by the Users. This Schedule, called a "Site Responsibility Schedule" shall state the following for each item of equipment/system installed at the Connection Site: -

- a) Ownership of the Plant/Apparatus.
- b) Responsibility for control of Plant/Apparatus.
- c) Responsibility for operation of Plant/Apparatus.
- d) Responsibility for maintenance of Plant/Apparatus.
- e) Responsibility for all matters relating to safety of any person at the connected Site.
- f) Management of the Site.
- g) Approved detailed schematic diagram with ratings and specification of EHV/HV apparatus and all power system components and power, control, metering, communication and protection circuits.

(2) The user owning the Connection Site shall provide reasonable access and other required facilities for other Users whose equipments are installed/ to be installed at the Connection Site for operation, maintenance, etc.

8. Compliance of Connection with Standards. - (1) The design and construction of all the equipments connected to the transmission system shall satisfy the relevant Indian Standard. In case of equipments/system for which the Indian Standard/Code do not exist, the appropriate IEC, or other International Standards shall apply.

(2) Installation of all electrical equipment shall comply with IE Rules or Rules made under Section 53 of the Act.

(3) For every new connection sought, the Transmission Licensee shall specify the connection point and the supply voltage, along with the metering and protection requirements.

(4) The User shall adhere to the grid discipline prescribed by the SLDC and SRLDC.

(5) The Insulation co-ordination of the users' equipment shall conform to the applicable Indian Standards/Code of practices. The rupturing capacity of the switchgear and all other technical requirements shall meet the requirement of the system as specified by the STU based on appropriate technical studies.

(6) The equipment for data transmission and communication for all the Power Stations existing at the time when the Grid Code comes into effect shall be owned and maintained by the STU unless alternative arrangements are mutually agreed to. For new Power Stations the same shall be owned and maintained by the STU, unless alternative arrangements are agreed mutually to.

9. Connection Points with Generating Company.- The voltage at the point of connection with the transmission system may be 400/220/110/66 kV or as agreed to by the STU. The connection point shall be the outgoing feeder gantry point of the Power Station switchyard. The Metering Point shall be the outgoing feeder. All the protection and metering equipment within the perimeter of the Power Station shall be owned and maintained by the Generating Company.

10. Connection Points with Distribution Licensee.- The voltage at the point of connection to the transmission system may be as required by the Distribution Licensee. The connection point shall be the outgoing feeder gantry of the STU's/Transmission Licensee's substation. The metering point shall be at the outgoing feeder. All the terminal, communication, protection and metering equipment within the premises of the Transmission Licensee shall be owned and maintained by the STU/Transmission Licensee. The respective Distribution Licensee shall maintain all the equipment from the outgoing feeder gantry onwards.

11. Connections with other Transmission Systems.- The connection, metering and protection scheme, metering point and the voltage for the Southern Regional Transmission System shall be in accordance with the mutual agreement between the CTU and the STU. The connection for other neighbouring State Transmission systems shall also be in accordance with the mutual agreement between the concerned State licensees.

12. Applications for Connections.- (1) Any user seeking to establish new or modified arrangements for connection to and/or use of the transmission system shall submit the following report, data and undertaking along with an application, duly observing the procedural requirements, to the STU/Transmission Licensee:

- a) Report with drawings/schematic, stating the purpose of the proposed connection and/or modification, connecting site, technical description of apparatus to be connected or modification to the apparatus already connected.
- b) Detailed project construction schedule and target completion date.
- c) An undertaking to the effect that the user shall abide by the Grid Code and the provisions of IE Rules, for installation and operation of the apparatus.
- d) For special loads like Arc Furnaces, Rolling Mills, etc., Real and Reactive Power values of the load with time and harmonic Level.
- e) Any other pertinent technical details/schemes and drawings required by STU/Transmission Licensee.

(2)The STU/Transmission Licensee shall make a formal offer, with cost and time estimation, to the user not later than one month from the date of receipt of application containing all the above information along with any such information as may be reasonably required. The break-up cost of the works to be undertaken shall be furnished duly classified under the sub-heads like materials, labour and supervision.

(3)A user whose development requires the STU/Transmission Licensee to obtain any of the consents, approvals, permissions, and right of ways or to comply with any other requirements mentioned in this Grid Code shall,

- a) Provide necessary assistance, supporting information or evidence to the STU/Transmission Licensee; and
- b) Ensure attendance by such witnesses as the STU/Transmission Licensee may reasonably request.

(4) In respect of offers for modifications to the existing connections, the terms shall also take into account, the existing Connection Agreement.

(5) If the nature of complexity of the proposed development is such that the prescribed time limit for making the offer is not considered adequate, the STU/Transmission Licensee shall make a preliminary offer within the prescribed time limit indicating the extent of additional time required for more detailed analysis of the issues.

(6) All final offers (other than the preliminary offers) including revised offers shall remain valid for a minimum period of 60 (sixty) days from the date of issue of the offer. The STU/Transmission Licensee shall make a revised offer, upon request by a user, if necessitated by changes in data furnished earlier by the user.

(7) The user shall furnish the relevant detailed planning data to the STU/Transmission Licensee within thirty days of acceptance of an offer or such longer period as the STU/Transmission Licensee may agree in a particular case.

(8) Wherever the State Power Grid is connected with the Inter State Transmission System, the provisions of connection conditions of IEGC will prevail.

13. Right to Reject an Application.- The STU/Transmission Licensee may reject any application for connection to and/or use of the Transmission system only under the following conditions:

- a) If the proposed connections violate any provisions under the Transmission License
- b) If the proposed works stated in the application do not lie within the purview of the license or do not conform to the provisions of the Grid Code
- c) If the applicant fails to give the undertakings in accordance with clause 16(1)(c) of this Chapter

14. Connection Agreements.- (1) A connection Agreement, or the offer for a Connection Agreement, shall include, as appropriate within its terms and conditions, the following:

- a) A clause requiring both the parties to comply with the Grid Code.
- b) Details of connection and/or use of the system with complete approved set of drawings and technical documentation.
- c) Details of any capital related payments and any other payments and deposits, etc., arising from necessary reinforcement or extension of the System.
- d) A "Site Responsibility Schedule" detailing the division of responsibility at the connection sites in relation to ownership, control, safety, operation and maintenance of plant and apparatus.

15. Generating Units and power Station

- a) Generating Units shall be capable of continuously supplying its normal rated active/reactive output within the system frequency and voltage variation

- range specified in IEGC, subject to the design limitations specified by the manufacturer.
- b) Generating Units shall be fitted with turbine speed governor having overall droop characteristic within the range of 3% to 6%, which shall always be in service.
 - c) Generating units shall be capable of instantaneously increasing its output by 5% when frequency falls. Ramping back to the previous MW level (in case the increased output level can not be sustained) shall not be faster than 1% per minute.

16. Reactive Power Compensation

- a) Reactive power compensation should be provided by STUs/Transmission Licensees and Distribution licensees as far as possible in the low voltage system close to the load points thereby avoiding the need for exchange of reactive power to/from ISTS and to maintain grid voltage.
- b) Line reactors may be provided to control temporary over voltage within the limits as set out in Connection Agreements.
- c) The additional reactive compensation to be provided by the user shall be indicated by the STU in the Interconnection Agreement.

CHAPTER VI

OPERATION PLANNING AND SECURITY MANAGEMENT

17. Objectives of Operation Planning.- The Operation Planning shall enable the STU/Transmission Licensee to minimize transmission outages by coordination with the generating companies and other users while maintaining system security.

18. Demand Estimation.- (1) The Distribution Licensees shall provide the estimates of demand at each connection points on annual, monthly and daily basis ahead of each year, month and day as the case may be, to the SLDC.

(2) The SLDC shall use 15 minutes time block generation summation figures and shall provide to Distribution Licensees import/export figures to meet the demand estimation.

(3) The Distribution Licensees shall provide to the SLDC, the estimates of non-essential loads that may be shed, in case of extreme exigencies to keep the security of the Grid, in discrete blocks with details of arrangements of such load shedding.

(4) The SLDC shall maintain a database of the total demand for the State on an hourly basis.

19. Data Requirements for Operation Planning.-(1) The users and the STU/Transmission Licensee shall provide to SLDC all the data such as demand estimates, scheduled outage program, essential and non-essential loads, Protection Data, Metering Data, etc.

(2) Each Generating Company shall submit to the SLDC monthly generation and the performance chart of the each of their generators for the entire year. This information shall also match with that furnished in the Power Purchase Agreement (PPA) or the parameters agreed to by the parties involved in the PPA.. The generator performance chart shall include the details of the Generator Transformers and demonstrate the

limitation of reactive capability of the generating unit at the transmission system voltage, as and when required by the SLDC.

20. Disconnection of Generating Units.- Notwithstanding the provision in any approved outage plan, no cross boundary circuits or generating units of a generating company shall be removed from service without specific approval from the SLDC. This restriction shall not apply to individual generating units of a CPP with plant capacity less than 10 MW. Once an outage has commenced, and if any delay in restoration is apprehended, the SLDC or the user concerned shall inform the other parties promptly, together with the revised estimation of restoration time.

21. Transmission Outage Planning.- (1) The SLDC shall prepare an annual schedule of transmission outage. All the Generating Companies and Distribution Licensees shall furnish, their proposed scheduled outage programs containing the identification of the unit, substation, etc., with details of date of start of outage and duration of outage, in writing to the SLDC, one year ahead. The SLDC shall inform the annual schedule of transmission outage to the SRLDC.

(2) The SLDC shall interact with all the above agencies and prepare an optimum outage preliminary/draft plan with a view to minimizing interruptions to consumers. The final transmission outage plan shall be prepared by the SLDC and furnished to all the users by the first of April every year, that is one year ahead.

(3) The users' requests for additional outages, if any, shall be considered by the SLDC and accommodated to the extent possible. Such changes shall be informed by the SLDC promptly to all the concerned. Distribution Licensee shall inform any scheduled interruptions of power supply well in advance to the consumers through the media.

22. Operating Margin.- (1) Operating Margin comprises of contingency reserve and operating reserve required for the satisfactory operation of the power system to cover uncertainties in plant availability, variations in demand forecasts, loss of external connections, loss of generation, constraints in the transmission System and any other unforeseen factors.

(2) The required contingency reserve shall be decided by the SLDC on the basis of historical trends such as:

- a) Reduction in availability of each generating plant,
- b) Reduction in availability of imports through inter-State tie lines and
- c) Increases in demand forecast during real time operation.

(3) Whenever the contingency reserve is to be maintained by a Thermal Power Station, the SLDC shall include the same in the operational instructions/notifications and in the despatch instructions to the generating company so that the generating unit shall be operated in the contingency reserve mode.

23. Demand Control.- (1) Whenever restoration of large portions of the total demand disconnections effected by the automatic load shedding is not possible within a reasonable time, the SLDC shall direct to implement additional disconnections manually, so as to restore an equivalent amount of demand disconnected through automatic load shedding. The Distribution Licensees shall help the SLDC in identifying such load blocks. No load shed by the operation of automatic load shedding devices shall be restored without specific directions from the SLDC.

(2) Planned Manual Disconnection shall be implemented by the SLDC when there is a shortfall in generation, or constraints in transmission, or reduction of imports through external connection, *etc.*, requiring demand control over prolonged period. In such cases, a rotational load shedding scheme shall be adopted to ensure equitable treatment for all customers as far as practicable.

(3) Emergency Manual Disconnection to deal with unacceptable voltage and frequency levels, thermal overloads, *etc.* shall be implemented by the SLDC only when loss of generation, mismatch of generation with the demand or constraints in the transmission system, result in an emergent situation, requiring load shedding at short notice or no notice.

24. System Security Management- (1) All users shall co-operate with the STU so that the respective sections of the power system operate in synchronism with Kerala State Power Grid.

(2) The Transmission System shall not be isolated from the Southern Grid except under the following conditions:

- a) Emergency situations that may result in the total grid collapse.
- b) Situations that could result in any damage to costly equipments.
- c) Instructions of the SLDC or the SRLDC under operating conditions.
- d) Operation of under frequency islanding scheme

(3) Complete synchronism shall be restored as soon as the conditions permit. The restoration process shall be supervised by the SLDC.

(4) The Transmission Lines of 66 kV and above, and the Inter-connecting Power Transformers, except radial lines which do not affect the grid operation, should not be opened without instructions or prior clearance from the SLDC unless under emergencies. The SLDC shall also refer the matter to the Review Panel if it considers that the reasons for not taking prior permission are not justified.

(5) Any tripping of the transmission lines or power transformers, whether actuated by protective relays or manually, shall be promptly reported to the SLDC by the Engineer in Charge of the substation/generating station at the earliest, along with the reasons for such tripping and the time required for restoration. The report shall accompany all the relevant information/data including the outputs of the disturbance recorder, sequential event recorder, *etc.*, required for the purpose of analysis.

(6) The governors of all the generating units, except run of the river hydroelectric power stations, and steam turbines of combined cycle gas turbines, shall be in free mode operation at all times. If for any reason, the governors are locked, the same should be intimated to the SLDC along with the reasons and duration of such operation, which has to be ratified by the Review Panel subsequently. The Load Limiter, Automatic Turbine Run-up System (ATRS), Turbine Supervisory Coordinated Control System, *etc.*, shall not be used to suppress the normal governor action in any manner. No dead bands and time delays shall be used.

(7) Generating units shall be capable of and shall not be prevented from picking up 5% extra load, more than the declared maximum continuous rating, for at least five minutes or within the technical limits specified by the manufacturers, when the frequency falls due to a system contingency. In case any generating unit does not

meet this requirement for any period, the generating company should intimate the same to the SLDC.

(8) In case the frequency falls below 49.5 Hz, all the partly loaded generating units shall pick up additional load at a faster rate, according to their capability. The SLDC in consultation with the SRLDC and the Distribution Licensees shall prepare a plan for automatic load relief during the low frequency conditions. In case the frequency rises to 50.5 Hz or higher, neither any generating unit which is in standby mode shall be synchronized with the Grid nor active power generation at any generating station be increased, irrespective of the type and ownership.

(9) Except under an emergency, or to prevent an imminent damage to a costly equipment, no user shall suddenly reduce his generating unit output by more than Ten (10) MW without prior intimation to and consent of SLDC, particularly when frequency is falling or is below 49.0 Hz. Similarly no user shall cause a sudden increase in its load by more than Ten (10) MW without prior intimation to and consent of SLDC.

(10) All generating units shall have automatic voltage regulators in operation, with appropriate settings. All power factor corrections at substations of STU's/Licensees' shall have automatic and/or proper PF correction controls. If for any reason it has to be operated without the same, the SLDC shall be intimated immediately with reasons and duration of such operation and its concurrence obtained.

(a) All generators are to be loaded to the rated MVar to keep the bus voltage at the rated voltage or the MVar has to be suitably regulated to maintain the rated Bus Voltage. Power system Stabilisers (PSS) in the AVR of the generating units (wherever provided), shall be got properly tuned by the respective generating unit owner, as per plan prepared for the purpose by the STU, from time to time. STU will be allowed to carry out checking of PSS and further tuning it, wherever considered necessary.

(b) Reactive power compensation should ideally be provided locally by generating reactive power, as close to the reactive power compensation as possible. The beneficiaries are therefore expected to provide local Var compensation/generation such that they do not draw Var from the grid, particularly under low voltage condition. To discourage Var drawl by beneficiaries, Var exchanges with the grid shall be priced at a nominal rate, as may be specified by KSERC from time to time.

(c) Notwithstanding the above, the SLDC may direct a beneficiary to curtail its Var drawl/injection in case the security or safety of any equipment is endangered.

(11) Adequate metering and protection systems shall be provided by the respective users.. The settings of protective relays shall be coordinated as per the plan separately finalized by the "Protection Committee" wherever required.

(12) The users shall make all possible efforts to ensure that the grid frequency and voltage always remains within the ranges specified in IEGC.

25. System Integrity and Operation.- It is essential that all the users of the Transmission System shall fully co-operate with the STU/Transmission Licensee to

maintain the system integrity and healthy operation. Various agencies involved in the management of the power system shall be coordinated by the SLDC.

- a. All users except generating companies shall provide automatic under-frequency and rate of change of frequency (df/dt) load shedding in their system, to arrest frequency decline that could result in a collapse/disintegration of the grid, as per the plan separately finalized by the Protection Committee/SLDC and shall ensure its effective operation to prevent cascade tripping of generating units in case of any contingency. All constituents shall ensure that the above under-frequency and df/dt load shedding/islanding schemes are always functional. However, in case of extreme contingencies, these relays may be temporarily kept out of service with the prior consent of SLDC. SLDC shall inform Protection Committee about instances when the desired load relief is not obtained through these schemes in real time operation. Protection Committee shall carryout periodic review of the under frequency relays and maintain proper records.
- b. Manual disconnection: the users shall endeavor to restrict their net drawl from the grid to scheduled drawals whenever the system frequency is between 49.5 and 50.5 Hz. When the frequency falls below 49.0 Hz, requisite load shedding (manual) shall be carried done in the concerned STU/Transmission Licensee/Distribution Licensee consumers to curtail over-drawl. In the case of extreme emergencies SLDC may direct users to restrict drawal to specified limits. The users shall act upon such directions immediately. The users shall make arrangements that will enable disconnection to take place as instructed by SLDC. The measures taken to restrict drawal from the grid shall not be withdrawn as long as the frequency/voltage remains at a low level unless specifically permitted by SLDC.
- c. Periodic reports: A weekly report shall be issued by SLDC to all members of the Protection Committee and shall cover the performance of the State grid for the previous week. Such weekly reports shall also be available on the website of the SLDC for at least 12 weeks. The report shall contain the following:
 - i. Frequency profile
 - ii. Voltage profile of selected grid stations.
 - iii. Major Generation and Transmission outages.
 - iv. Transmission constraints.
 - v. Instances of persistent/significant non-compliance of KSEGC.
- d. Other reports: SLDC shall 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. SLDC shall also provide information/report which is be called for by the Protection Committee in the interest of smooth operation of Grid.

CHAPTER VII DESPATCH, METERING AND PROTECTION

26. System Operation and Despatch.- (1) The SLDC shall be fully equipped for optimum and reliable operation of the Power System. Detailed operating procedure shall be developed and maintained by SLDC in consultation with the users and the same shall be consistent with the provisions of KSEGC to enable compliance requirement of KSEGC. The control rooms of SLDC, generating stations and substations of 66 KV and

above and important control centers of users shall be manned round the clock by qualified and trained personnel.

(2) The Despatch instructions shall be issued by the SLDC by the telephone message/fax message/e-mail and contain the following:

- a) Specific generating company to which the instruction applies
- b) The output to which the instruction applies
- c) The start time, wherever the same is different from the time the instruction is issued
- d) Issue time of instruction
- e) Spinning Reserve (MW)
- f) Name and contact details of the sender of despatch instruction
- g) During exigencies SLDC may issue oral instructions, which shall be complied by the users. Voice Recording facility may be provided at SLDC and major stations.

(3) SLDC and all the other users shall follow standards and procedures regarding the following aspects for the satisfactory operation of the Grid:

- a) Quality of Power Supply
- b) Outage Planning
- c) Generation scheduling and despatch
- d) Voltage and Reactive Power management
- e) Black- start operations
- f) Generation Reserve
- g) Monitoring of generation

(4) The SLDC shall follow the instructions of SRLDC for ensuring the GRID Discipline by giving direction for backing down/shutting down generation, regulating the load flow, *etc.* The SLDC shall accordingly instruct the generating companies to regulate their generation and hold reserves of active and reactive power within their respective declared parameters.

(5) The SLDC shall also regulate the load as may be necessary to meet this objective. The STU/Transmission Licensee shall optimize voltage management by adjusting the transformer taps to the extent available and switching the capacitors/reactors and take such other operational steps as directed by SLDC. The SLDC shall also instruct the generating companies to regulate the MVA_r generation within their declared parameters. The SLDC shall also instruct the Distribution Licensees to regulate their demand if necessary. The Distribution Licensees shall also participate in the voltage management by regulating their reactive power drawal and by installing compensatory equipment as may be required.

(6) The STU/ Transmission Licensees shall evolve a regular procedure with all the generating companies in coordination with SLDC for a pattern of generation reduction at different power stations when the system load comes down after the peak load period. Schedule and despatch procedure shall be suitably modified from time to time keeping in view of the tariff agreements for achieving optimum cost of power as soon as such arrangements are reached with the generating companies.

(7) The Distribution Licensee shall maintain high Power Factor and furnish all the data required by the SLDC to ascertain the Reactive Power flow to their distribution system. The SLDC may also instruct the Distribution Licensees to maintain appropriate Power Factor and take all measures to minimize Reactive Power drawal.

27. Metering and Protection.- (1) The metering and protection to be provided at the Power Stations, Substations and the distribution systems shall meet all the general as well as any specific requirements specified by Protection Committee. All users shall cooperate with the Protection Committee to ensure correct and appropriate settings of protection scheme/system to achieve an effective, discriminatory removal of faulty equipment within the target clearance time specified. Protective relay settings shall not be altered, or protection bypassed and/or disconnected, without consultation and agreement of the Protection Committee. In the case where protection is bypassed and/or disconnected by agreement, then the cause must be rectified and protection restored to normal condition as quickly as possible. If agreement has not been reached, the faulty equipment shall be removed from service forthwith.

28. Fire Protection. - All adequate precaution and prevention shall be taken and protection shall be provided against fire hazards to all plants and apparatus in the system conforming to the relevant Indian Standards, provisions of IE Rules, Indian Electricity Grid Code (IEGC), etc.

CHAPTER VIII

MONITORING OF GENERATION AND DRAWAL

29. Monitoring of Generation.- (1). The SLDC shall continuously monitor the generating unit outputs and bus voltages. More stringent monitoring shall be performed at any time when there are reasons to believe that the generating company's declared availability may not match with the actual availability, or declared output does not match with the actual output.

(2) SLDC shall stringently monitor the performance of generating units and observe any mismatch between dispatch instructions and actual generation. Discrepancies shall be resolved at appropriate levels for improving the performance, providing more realistic declarations and/or correcting any breach of "Connection Conditions".

(3) The generating companies shall provide to the SLDC generation summation outputs wherever no automatic transmission of metered data or SCADA equipment exists. At present, 15 minutes interval norm is followed due to Availability Based Tariff (ABT) regime, which needs to be followed. All the CPPs (capacity above 5 MW) shall provide data to the SLDC for SCADA. The generating company shall provide other logged readings, which the SLDC may reasonably require, for monitoring purposes wherever SCADA data is not available.

30. Monitoring of Drawal by the Grid.- (1) The SLDC shall continuously monitor actual drawal (Import/Export) against the scheduled drawal from the generating companies, central grid, distribution companies and open access consumers, by the use of SCADA equipment wherever available, or otherwise using available metering. The SLDC shall request the SRLDC and adjacent States as appropriate to provide any additional data required to enable this monitoring.

(2) The SLDC shall also monitor the actual MVar Import/Export to assist in the voltage management in the transmission system.

31. *Generating Unit Tripping.*- The generating companies shall promptly inform the tripping of a generating unit, with reasons, to the SLDC. The SLDC shall keep a log of all such tripping, including the reasons for the purpose of demonstrating the effect on system performance and identifying the need for remedial measures. The generating companies shall submit to the SLDC detailed monthly report of tripping of their generating units.

CHAPTER IX

CONTINGENCY PLANNING

32. *Recovery Procedure.*- (1) All the users are responsible for achieving the fastest possible recovery of the Grid in the event of a failure in the Transmission System, or any sudden loss of Generation or a blackout caused due to the failure of the Southern Grid.

(2) The procedure to be adopted for a fast recovery shall take into account the following:

- a) The immediate restoration of essential loads
- b) Restoration and/or making use the capabilities of the Power Stations
- c) The possible transfer of power from the neighbouring Systems through Inter State Transmission Lines
- d) The extent of immediate availability of power from the Central Sector Power Stations.

33. *Strategy for Recovery.*- The SRLDC and the SLDC shall coordinate in determining the extent of blackout. The SLDC shall inform all the users of the situation and advise them to follow the strategy as outlined in this Section for restoration. The personnel authorized by the users shall be readily available at the users' end for communication and acceptance of all operational communications throughout the period of contingency. The use of communication channels shall be restricted to the operational communications only, till normalcy is restored. In case there is failure of communication also, the generating stations shall follow the Standing Instructions maintained. The STU/Transmission Licensee shall prepare the Standing Instructions to be followed by all generating stations and major grid stators during black out.

34. *Total Regional Blackout.*- (1) The SLDC shall instruct all the generating companies having Power Stations with Black-Start capabilities, to commence their pre-planned Black- Start procedure.

(2) The SLDC shall prepare the transmission system for restoration by creating discrete power islands with no interconnection.

(3) SLDC shall maintain close coordination with Distribution Licensees during the restoration process to form and make available discrete load blocks to maintain the stability of the generating units, immediately after they become available in individual islands.

(4) Power Stations, to which the start up power supply is made available, shall sequence their start up activities to match their auxiliary power demand with the supply available.

(5) The Engineer-in-charge of the Power Station shall inform the SLDC as and when the generating units become available to take load, so that the SLDC may assess the load demand which the generating unit is likely to pickup.

(6) The SLDC, in close coordination with the generating companies and Distribution Licensees shall take the following steps:

- a) Formation of discrete power islands with one generating unit feeding some of the local loads
- b) Extend such islands by adding more generating units and more loads in a coordinated manner maintaining load-generation balance
- c) Synchronize these islands to form a larger, more stable island
- d) Wherever facilities for synchronization are available, the same shall be made use of to bring the complete system into synchronism
- e) Regional or Inter-State assistance, wherever appropriate, shall be utilized in the above process.

35. Total State Transmission Outage.- The strategy shall be the same as in the case of "Total Regional Blackout". The SLDC shall carryout simultaneous action to draw power from Southern Region in radial mode.

36. Partial Transmission Outage.-(1) The SLDC shall ensure with the users that the security of the healthy part of the Transmission System is not disturbed.

(2) The SLDC shall gradually extend the healthy system to provide start-up power to the appropriate generating units.

(3) With the close coordination of the generating companies and the users, the SLDC shall gradually restore the load to match with the generation immediately after the availability of the generating units.

(4) All the users shall take care to ensure that the load-generation balance is maintained at all times under the directions of the SLDC.

37. Responsibilities of SLDC, STU, Distribution Licensee and Users.-
(1)The SLDC shall maintain a record of Power Station Black Start capabilities and associated Power Station Black Start operation plans.

(2) The SLDC in co-ordination with the STU/Transmission Licensee shall prepare, distribute, and maintain up-to-date Black-Start procedures covering the restoration of the transmission system following total or partial blackouts. The users shall agree to these Black Start procedures and promptly inform the SLDC in advance whenever they have difficulty in following the same.

(3) The SLDC shall be responsible for directing the overall transmission system restoration process in coordination with all the users and the SRLDC.

(4) The Distribution Licensees shall be responsible for sectionalizing the Distribution System into discrete, unconnected blocks of load. They shall advise the SLDC about the quantum of load likely to be picked up by the generator being synchronized.

(5) The Generating Companies shall be responsible for commencing their planned Black Start procedure on the instruction of the SLDC and steadily increasing

their generation according to the demand intimated by the SLDC and closely monitoring the grid frequency.

38. Special Considerations applicable to Contingency Planning.- (1) During the process of restoration of the transmission system, or Regional System blackout conditions, the normal standards of voltage and frequency need not be insisted and SLDC may at its discretion direct as appropriate depending on the prevailing situation.

(2) The Distribution Licensees shall separately identify non-essential loads, which may be kept off during system contingent conditions and SLDC may examine the technical feasibility of the same periodically. Distribution Licensee shall also draw up an appropriate schedule with corresponding load blocks in each case. The non-essential loads can be put on only when the system normalcy is restored, or as advised by the SLDC.

(3) All users shall pay special attention in carrying out the procedures to prevent secondary collapse of the system due to haste or inappropriate loading/operating conditions.

(4) Prompt and complete logging of all operations and operational messages shall be ensured by all the users to facilitate subsequent investigation into the incident and reviewing of the efficiency of the restoration process. Such investigation shall be conducted after the incident, and placed before the Grid Code Review Panel for appraisal in its immediate next meeting.

CHAPTER X CROSS BOUNDARY SAFETY

39. Control Persons. - The STU/Transmission Licensee and all the users shall nominate and notify authorized persons to be responsible for the coordination of safety across their boundary. These persons shall be referred to as "Control Persons". Control Persons shall be trained periodically in formal procedures to carryout operations and maintenance conforming to safety and quality standards, specifically applicable to the concerned cross boundary circuits.

40. Procedure to Work on Cross Boundary Circuits.- (1)The STU/Transmission Licensee shall issue a list of Control Persons with their names, designations, addresses and telephone numbers, to all the users having direct cross boundary with him. This list shall be updated promptly, whenever there is any change of name, designation or telephone number of any Control Person named in the list.

(2) All the users having a direct cross boundary with the STU/Transmission Licensee shall issue a similar list of their Control Persons to the STU/Transmission Licensee. This list shall be updated promptly whenever there is any change of name, designation or telephone number of any Control Person named in the list.

(3) Whenever any work across a cross boundary is to be carried out by the user or the STU/Transmission Licensee, the Control Person of the user or the STU/Transmission Licensee as the case may be, shall directly contact his counterpart." Code word/secret code" shall be agreed to at the time of work to ensure correct identification of both the parties.

(4) If the work extends beyond one shift, the Control Person shall hand over charge to the relief Control Person and explain clearly the nature of work and the code words in the operation.

(5) The Control Persons shall cooperate to establish and maintain the precautions necessary to be taken for carrying out the required work in a safe manner. Both the established isolation and the established earth shall be kept in the locked positions with “men working” tag wherever such facilities exist, and these shall be clearly notified to all concerned well in advance with locations sketch marked, identified and very visibly displayed. Entry of any unauthorized persons shall not be allowed to such premises.

(6) The Control Person in charge of the work shall satisfy himself that all the safety precautions to be taken are established before commencing the work. He should issue the safety documentation and work permit to the working party to allow the work to commence. STU/ Transmission Licensee shall prepare detailed, comprehensive “work permit form”, which shall contain particulars of work and necessary precautions, requirements of qualifications/certifications of personnel to perform the work, time limits to perform the work, *etc.*

(7) After the completion of the work, the Control Person in charge of the work being carried out should satisfy himself that the safety precautions taken are no longer required, and shall make a direct contact with his counterpart Control Person and request removal of the safety precautions. The equipment shall be declared as suitable for return to service only after confirmation of removal of all the safety precautions, by direct communication, using the code word contact between the two Control Persons, and the return of agreed safety documentation from the working party.

(8) The Transmission Licensee shall develop an agreed written procedure for cross boundary safety and continuously update the same. There shall be a designated competent person(s) authorizing the same.

(9) All the users shall strictly comply with the Safety Manual mentioned in Section 44 of this Code for carrying out any operations and/or maintenance in the cross boundary circuits.

(10) All the equipment on cross boundary circuits, which may be used for the purpose of safety coordination and establishment of isolation and earthing, shall be permanently and clearly marked with an identification number or name being unique to the particular line or sub-station. These equipments shall be regularly inspected and maintained in accordance with the manufacturers’ specifications.

41. Safety Log and System Map.- (1) Each Control Person shall maintain a legibly written safety log, in chronological order, of all operations and messages relating to the safety coordination sent and received. The safety log information shall be computerized and periodically analyzed and inferences drawn to facilitate future decision support in cross boundary safety aspects.

(2) All the Distribution Licensees connected to the Transmission System shall maintain an updated grid map of the system specifically highlighting the area fed by each substation, and exhibit the same in the concerned area offices of the Distribution Licensee.

CHAPTER XI

SAFETY AND LINE CLEAR PERMITS

42. Safety Manual.- (1) All users shall have an approved Safety Manual detailing Safety Policy and safety and Loss Prevention program. The safety rules and procedures shall be drawn up in accordance with relevant rules and provisions of Electricity Act, Rules, IS, IEC, Indian Electricity Grid Code (IEGC), etc, as applicable. The Safety Manual shall cover all the systems and equipments, including cross boundary circuits. Copy of the Safety Manual shall be made available to all concerned.

(2) There shall be trained and experienced safety engineers and safety officers, responsible and authorized to implement this safety program. The program shall cover all health, safety and environment (HSE) as well as system/equipment hazard identification plan, safety procedure, safe working conditions, first aids, periodical training and drills, use of protective equipments and recovery programs. List of safety officers and their emergency contact information/telephone/mobile phone numbers shall be visibly displayed at the offices of the Licensee.

(3) There shall be proper accident and damage reporting with detailed quantitative technical documentation. These data shall be analyzed to arrive at changes/modifications in the safety programs

(4) For the guidance of the Shift Operators, "Operation and Maintenance Manuals" for each Substation shall be prepared by the licensee. These manuals shall contain all the maintenance and operation schedules based on the recommendations of the manufacturers of the various equipments installed in the Substation. These manuals shall be periodically reviewed and updated.

(5) The operation manual shall clearly contain the details of isolation and earthing to be provided for allowing work on the equipments. The single line diagram of the station indicating the positions of various isolating devices shall be prominently displayed in the station. Charts showing the clearances from live parts for working on the isolated equipments where workmen are allowed to work shall be displayed prominently at each Substation.

(6) Safety instructions, displays and warnings, caution/danger boards, emergency contact names, telephone/fax/mobile phone numbers, etc., as required shall be visibly displayed at places approachable by the persons and general public.

(7) Regular maintenance shall be carried out on all the transmission lines in accordance with IS/IEC/Manufacturer Standards and records of all these shall be maintained. Wherever possible, hot line checking and replacement of failed insulators shall be made before and after monsoon.

(8) All the equipments in the receiving stations and substations shall be maintained in good condition as per the manufacturers' manuals and relevant Indian and/or International standards as applicable. The relays and circuit breakers shall be checked and tested and calibrated for their proper operation, at specified intervals as well as whenever these are taken out for maintenance purposes. Valid testing/calibration certificates shall be on files; and sticker indicating validity and/or expiry of calibration/test date shall be visibly marked on the equipments and meters. The station batteries shall be maintained in good working condition by carrying out routine checks and

maintenance. The DC system provided in all the stations shall be properly maintained with no appreciable leakage current. An on-line monitoring system for monitoring of leakage and detection of ground faults shall be provided.

(9) The Licensee shall always possess all safety equipments, testing and calibration sets, meters and instruments and sufficient number of qualified and trained personnel.

43. Line Clear Permit (LCP).- Licensees shall have a form titled "Requisition for Line Clear Permit". The requesting Safety Officer/Coordinator, who is an authorized person, shall use this form. There shall be a section in that for "Line Clear Return" which shall be used for the return of the Line Clear Permit on completion of the work contained in the LCP. There shall be a comprehensive "Check List for Line Clear Permit". This list may be printed in the "Requisition for Line Clear Permit" form and this list shall be checked at the time of issue of Line Clear Permit.

CHAPTER XII

COMMUNICATION AND DATA ACQUISITION

44. Supervisory Control and Data Acquisition (SCADA).- (1) The Transmission Licensee shall install and maintain an "operational metering and data collection system" using SCADA for storage, display and analysis/processing of operational data. All the users shall provide data outputs of their respective operational equipment/meters to the SCADA interface equipment.

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

45. Communication.- (1) Independent dedicated communication links for voice communication and written communication and data acquisition shall be installed by the SLDC/STU/Transmission Licensee between all the Power Stations, Receiving Stations, Substations and SLDC. In addition to this, similar links between adjacent Transmission System Substations shall also be established.

(2) Communication shall be available by direct dialing of discrete numbers and also through hot line. The Transmission Licensee shall also establish hot-Line links between all the major Power Stations, important Substations and SLDC

46. Data Acquisition.- (1) The SLDC shall maintain following real time data:

- a) MW and MVAR Generated in each Power Station
- b) MW and MVAR Drawal from the External Interconnection
- c) MVAR and MVAR Hours Generated or absorbed in each Power Station
- d) MVAR Imported or Exported from the External Interconnections
- e) MW & MVAR flow in each Transmission Line
- f) Voltages in all the System Busbars
- g) Frequency in the System

(2) The generating companies shall provide the necessary transducers for the transmission of the above data from their Power Stations to SLDC/SRLDC.

(3) The Transmission Licensee shall similarly provide the necessary transducers for the transmission of the above data from their receiving stations and Substations to SLDC/SRLDC.

(4) The Transmission Licensee shall establish a suitable data transfer link between SLDC and SRLDC for exchange of operational data transmission

(5) Mutually agreed procedures shall be drawn up between the STU/Transmission Licensee and other users outlining inter-responsibility, accountability and recording of day-to-day communication and data transmission on operational matters.

(6) All the additional data such as breaker/switch position shall be transmitted on "if change" basis. Geographical Positioning Systems (GPS) shall be used for time stamping of the trip information at the respective stations.

(7) At all the 400 kV Lines and important 220 kV Lines and 110 kV lines, disturbance recorders shall be installed and the recorder data shall be made available at SLDC/SRLDC for post event analysis of the disturbances.

CHAPTER XIII

OPERATIONAL EVENTS AND INCIDENTS

47. Reportable Incidents.- (1) All events in the Transmission System having an operational effect on the users' System shall be notified by the STU/Transmission Licensee to SLDC and to the users, whose systems are affected.

(2) All events on the users' System having an operational effect on the transmission system shall be notified by the user to the STU/Transmission Licensee and SLDC who in turn shall notify the other users on whose system the event may have an operational effect.

(3) Typical examples of reportable incidents that could affect the transmission system are given below. The examples are only illustrative and in no way limit the general requirements to be reported:

- a) Exceptionally high/low voltage or frequency
- b) Serious equipment problem *i.e.* major circuit breaker, transformer, busbar fault
- c) Major problem in the Generating Unit
- d) Tripping of ICT, Transmission Line or Capacitor Bank
- c) Major Fire incident
- d) Major protection failure
- e) Overloading of Equipment or Transmission Line
- f) Activation of any alarm or indication of abnormal operating condition
- g) Adverse climatic conditions being experienced or forecast
- h) Breakdown, or faults, or temporary changes in the capabilities of Plant and/or apparatus
- i) Impending risks of protection operation
- j) Loss of load
- k) Accidents
- l) Excessive drawal deviations

48. Reporting Procedure for Operational Incidents.- (1) All reportable incidents occurring in lines and equipments of 11 kV and above at the Grid Substations shall promptly be reported orally by the user whose equipment has experienced the incident, to all other significantly affected users and to SLDC. The reporting user should submit a written confirmation to SLDC within one hour of such oral report. If the reporting incident is of major nature, the written report may be submitted within two hours, duly followed by a comprehensive report within 48 hours of the submission of the initial written report. In other cases, the reporting user shall submit a report within five working days to SLDC.

(2) The SLDC shall call for a report from any user on any reportable incident affecting other users in case such user, whose equipment might have been a source of the reportable incident, does not report the same. However, this shall not relieve any user from the obligation to report events in accordance with provisions of this Code. The format for such a report shall be as prepared by the Grid Code Review Panel and shall typically contain the following:

- a) Location of the incident
- b) Date and time of the incident
- c) Plant or Equipment involved
- d) Supplies interrupted and the duration wherever applicable
- e) Quantum of Generation lost, wherever applicable
- f) System Parameters before and after the incident
(Voltage, Frequency, Flows, Generation, etc.)
- g) Network configuration before the incident
- h) Relay indications and performance of protection
- i) Brief description of the incident
- j) Estimated time of return to service
- k) Any other relevant information
- l) Recommendations for future improvement
- m) Name and contact details of the originator of the report.

(3) The report shall contain sufficient detail to describe the event to enable the recipient to assess the implications and risks arising out of the same. The cause need not be included in the report but the recipient may ask for clarifications wherever necessary and it is obligatory that the reporting user shall put his best efforts and provide all the necessary and reasonable information.

(4) In case of a request by either party, the oral report shall be written down by the sender and dictated by way of a telephone message or sent by Fax/e-mail to the recipient. In case of an emergency, the report can be given only orally followed by written confirmation.

(5) The maximum time limit allowed for oral report of the event is fifteen minutes from the time of the occurrence of the event.

49. Significant Events.- (1) Significant events include such events having an operational effect e.g.

- a) Tripping of Plant and/or Apparatus manually or automatically
- b) Voltage variations beyond statutory limits
- c) System frequency variations beyond statutory limits
- d) System instability
- e) System overloads

(2) Wherever a user reports an event that the SLDC or the Transmission Licensee considers to have caused a significant effect on the Transmission System, the Transmission Licensee may require the user to report that event in writing within one day.

(3) Wherever the STU/Transmission Licensee notifies SLDC and a user of any event which the user or SLDC considers to have caused a significant effect on the users' System, the user may require the STU/Transmission Licensee to report that event in writing within one day.

50. Warnings to be issued by SLDC. -(1) An oral warning shall be issued by SLDC and confirmed in writing as well, to the STU/Transmission Licensee and the users, who may be affected when SLDC anticipates that there is a risk of widespread and serious disturbance to the whole, or part, of the total System.

(2) Provided that sufficient time is available, the warning shall contain such information, as the SLDC considers reasonable, to explain the nature and extent of the anticipated disturbance, provided that such information is available to SLDC.

(3) Each user and the STU/Transmission Licensee, on receipt of such a warning, shall take necessary steps to warn its operational staff and maintain its Plant and Apparatus in the condition in which it is best able to withstand the anticipated disturbance for the duration of the warning.

(4) Scheduling and Despatch may be affected during the period covered by such a warning.

51. Loss of Communication with the SLDC.- In the event of loss of communication with SLDC, under the above conditions, each Power Station shall continue to operate in accordance with the last Despatch instruction issued by SLDC, but shall use all reasonable endeavors to maintain the System frequency at the target of 50 Hz, plus or minus 0.5 Hz by monitoring frequency until such time the new Despatch instructions are received from SLDC.

52. Enquiry and Reporting of Major Failure.- Whenever a major failure takes place, the Transmission Licensee and other Users shall cooperate and inquire and establish the cause of such failure and produce appropriate recommendations. The SLDC/STU/Transmission Licensee shall submit the inquiry report to the Grid Code Review Panel and submit the report with the recommendations of the Panel to the Commission within two months of the incident.

53. Accident Reporting.- Any accident occurred shall be reported appropriately in accordance with the provisions of Section 53 of Electricity Act, 2003.

CHAPTER XIV DATA REGISTRATION

54. Responsibility for Data Submission.- (1) All Generating Companies, CPPs, Distribution Licensees and Users of Kerala State Electricity Grid are responsible for submitting the up-to-date data in accordance with the provisions of this Grid Code. All the Users shall provide the SLDC, the names, designation, addresses and the telephone numbers of the persons responsible for sending the data. The SLDC shall inform all the users the names, designation, addresses and telephone numbers of the persons responsible for receiving the data.

(2) The SLDC shall provide up-to-date data to all the Generating Companies, CPPs, Distribution & Retail Companies, and users as mentioned in the relevant Sections of the Grid Code.

(3) Responsibility for the accuracy and authenticity of these data rests with the concerned Users providing the data.

55. Methods of Submission of Data.- (1) SLDC/STU/Licensees shall prepare the data schedules structured to serve as standard formats for data submission and these formats shall be used for written data submission.

(2) Wherever computer data link exists between the user and SLDC /STU/Transmission Licensee, data may be submitted electronically on-line. The data shall be in the same format as specified for paper transmission. The user shall specify the method to be used in consultation with SLDC/STU/Transmission Licensee and resolve issues such as protocols, transmission speeds, etc., at the time of transmission.

(3) The SLDC or any user may at any time make reasonable request for additional data as and when necessary.

56. Changes in User's Data. - Whenever the user becomes aware of any changes to any items of the data registered, the User must promptly notify the same to SLDC. The SLDC on receipt of the changes shall promptly correct the database accordingly. This shall also apply to any data compiled by the STU/Transmission Licensee regarding his own System.

57. Data Storage and Management. - There shall be all endeavors to prepare and store the data in proven data base software for easy retrieval, analysis, query-address and information processing and decision-making. For this purpose, the State-of-Art IT Support shall be made use of.

CHAPTER XV

MANAGEMENT OF GRID CODE

58. Amendments of the Grid Code.- The State Transmission Utility (STU) shall carry out periodic review and suggest amendments to the Grid Code, to the Commission through a Grid Code Review Panel, which shall be constituted as per provisions of Section 4 hereunder. The authority for amending the Grid Code shall vest with the Commission.

59. Grid Code Review Panel.- (1) STU shall constitute a Grid Code Review Panel. The Chairperson of the Grid Code Review Panel shall be an Engineer of STU not below the rank of a Chief Engineer. Till the State Transmission Utility is formed, Chief Engineer nominated by the Kerala State Electricity Board (KSEB) will be the Chairperson of the Panel. The panel shall consist of the following members as recommended by the heads of the respective organizations;

- a) One Member at Chief Engineer level from each Transmission Licensee
- b) One representative at senior executive level from National Thermal Power Corporation Limited (NTPC)
- c) One representative at senior executive level from Power Grid Corporation of India Limited (POWERGRID)
- d) One representative at senior executive level from State Load Dispatch Center (SLDC)
- e) One representative at senior executive level from each Distribution Licensee

- f) One representative at senior executive level from each of the generating companies connected to the STU/Transmission Licensee operating in the State of Kerala
- g) One representative from the CPPs/small power plants of capacity 10 MW and above on rotation basis
- h) One nominee of the Commission

(2) Any other member can be co-opted as a member of the Panel as directed by the Commission.

(3) One Member shall be nominated by the Commission as the Convener and the Convener shall coordinate the functioning of the Panel.

(4) The STU/Kerala State Electricity Board (KSEB) shall inform all the Users, the names and addresses of the Panel Chairperson and Panel Members at least seven days before the first Panel meeting. They shall also inform any subsequent changes to all the users. Similarly, each User shall inform the names, designations and addresses of their representatives to the Panel Chairperson, at least three days before the first Panel meeting and shall also inform any subsequent changes to the Panel Chairperson. Minutes of the meeting shall be forwarded to the Commission.

60. Functions of the Grid Code Review Panel.- (1) The functions of the Grid Code Review Panel are:-

- a) Maintenance of the Grid Code and continuous scrutiny and review of the implementation of Grid Code
- b) Consideration of requests for review made by any user and publication of the recommendations for changes to the Grid Code together with reasons for such changes
- c) Issue of guidance on interpretations and implementation of the Grid Code
- d) Examination of the problems raised by any user
- e) Ensuring that the changes/modifications proposed in the Grid Code are consistent and compatible with Indian Electricity Grid Code (IEGC)
- f) Analysis of major grid disturbances soon after their occurrence
- g) Constitute a Committee of experts in power transmission system in the areas of protection, control, and other important power system technology domains. The Committee may monitor performance indices of the State Grid and conduct relevant studies and evolve implementation strategies.

(2) The Review Panel may hold meeting at least once in every three months.

61. Review and Revisions of Grid Code.- (1) The users seeking any amendment to the Grid Code shall send written requests to the Convener of the Grid Code Review Panel with a copy to the Commission. The Grid Review Panel shall examine the proposed changes/modifications and circulate the same along with its comments to all the users for their written comments within a reasonable time frame.

(2) Based on the comments received and after discussion in the Grid Code Review Panel meeting, the Grid Code Review Panel shall finalize its recommendation regarding the proposed amendment(s) and submit the same along with all the related correspondence to the Commission for approval.

(3) The Commission shall publish revisions to the Grid Code after due approval and forward copies to all users.

(4) The STU/Kerala State Electricity Board (KSEB) shall keep copies of the Grid Code with the latest amendments and make it available to all concerned at a reasonable cost. The up-to-date list of recipients of the copies of the Grid Code shall be maintained by the STU/ Kerala State Electricity Board (KSEB).

By Order of the Commission

Sd/-
Ajitha.S
Secretary