RAJASTHAN ELECTRICITY REGULATORY COMMISSION, JAIPUR
NOTIFICATION
JAIPUR 24.05. 2008

No. RERC / Secy / Reg - 74 In exercise of the powers conferred under Section 181 read with section 86(1)(h) of the Electricity Act, 2003 (Act 36 of 2003) the Rajasthan Electricity Regulatory Commission after previous publication makes the following regulations namely:

1.0 Short title and applicability

(i) These regulations shall be called as the "Rajasthan Electricity Regulatory Commission (Rajasthan Electricity Grid Code) Regulations 2008". In short **REGC**.

(ii) These regulations shall apply to the **Users** of 33kV and above, which includes Transmission licensee, Generating Station located in the State including Independent Power Producers, Renewable Energy Power Plants, Generating or/and Transmission Companies connected to State Transmission System, Distribution Companies having HV/EHV consumers directly connected to State Transmission System, Open access customers interconnected to State Transmission System, and Traders.

(iii) These Regulations supersede Part-1 of the Grid Code; earlier approved by Rajasthan Electricity Regulatory Commission **(RERC)** and published by Rajasthan Rajya Vidyut Prasaran Nigam Ltd **(RVPN).** The REGC shall be effective from the date of its publication in the official gazette.

(iv) These Regulations shall also be applicable to the new **Connections** and equipments procured/provided for new works/replacements from the date the **REGC** is made effective. The existing Connections and equipments shall continue to operate till such time it is considered necessary. The operational aspects of the **REGC** shall have no such relaxation and shall be applicable with immediate effect.

(v) The Regulations relating to Grid connectivity, Grid standards & safety standard as specified by the CEA under section 73 of the Act shall generally be complied with in addition to **REGC**.

(vi) These Regulations are covered in 16 Chapters:

Chapter I	SHORT TITLE AND APPLICABILITY
Chapter II	GENERAL REQUIREMENT & BACKGROUND.
Chapter III	DEFINITIONS.
Chapter IV	MANAGEMENT OF THE GRID CODE.
Chapter V	SYSTEM PLANNING.
Chapter VI	CONNECTION CONDITIONS.
Chapter VII	SYSTEM SECURITY ASPECTS.
Chapter VIII	OUTAGE PLANNING.
Chapter IX	OPERATIONAL PLANNING.
Chapter X	SCHEDULEING, DESPATCH AND ACCOUNTING.
Chapter XI	FREQUENCY, VOLTAGE AND NETWORK LOADING MANAGEMENT.
Chapter XII	CONTINGENCY PLANNING.
Chapter XIII	INTER USER BOUNDARY SAFETY.
Chapter XIV	OPERATIONAL EVENT/INCIDENT AND ACCIDENT REPORTING
Chapter XV	PROTECTION.
Chapter XVI	DATA REGISTRATION.

2.0 Chapter-II General Requirement & Background

The Central Electricity Regulatory Commission (**CERC**) under the Electricity Act 2003, Section 79(1)(h) has specified the Indian Electricity Grid Code (**IEGC**). The Electricity Act 2003, Section 86(1)(h) also mandates that the State Electricity Regulatory Commissions shall specify State Grid Code consistent with **IEGC**. Accordingly **REGC** is introduced.

REGC lays down the rules, guidelines and the standards to be followed by the **Users** to operate and maintain an efficient and coordinated State Transmission

System and to allow State Transmission Utility (**STU**) and State Load Despatch Centre (**SLDC**) to comply with the obligations in relation to the inter-state transmission of power and to operate the system in integration with the Northern Grid as per provisions of Indian Electricity Grid Code.

2.1 The principal objectives of REGC are:

(i) To provide certainity to **STU**, **SLDC** and other **Users** by enabling them to understand their obligations in operating the State Transmission System.

(ii) To improve the grid stability and performance, and to set up minimum standards of system parameters.

(iii) To define requirements for new entrants i.e. future new generating companies, licensee(s) and consumers.

(iv) To document the common knowledge or normal practice.

(v) To direct the generating companies as to what performance characteristics their plant shall provide.

(vi) To have better coordination by providing a clear and consistent disclosure mechanism for all information.

(vii) To facilitate operation, maintenance, development and planning of economic and reliable State Transmission System.

(viii) To avoid allegations of discrimination or favouritism by providing a level playing field.

(ix) To indicate how generation is to be scheduled and despatched.

(x) Legal enforcement.

2.1.1 The **SLDC** shall frame a Load Despatch and System Operation Manual, consistent with **REGC** and submit to **RERC** for approval after obtaining views of the **Users,** till then part II of earlier Grid Code shall continue to be applicable wherever it is not inconsistent with **IEGC**

2.2 Scope

The **REGC** details the procedure for equitable management of day-to-day technical situations in the **Electricity Supply System**, considering a wide range of operational exigencies likely to be encountered under normal and abnormal circumstances. However, it is understood that **REGC** cannot predict and address all possible operational exigencies.

Under such circumstances the **Users** must, therefore, understand and accept that **SLDC/STU** may be required to act decisively to discharge its obligations and provide such cooperation and assistance as **SLDC / STU** may seek.

2.3 Partial Invalidity:

If any provision or part provision of the **REGC** becomes redundant or declared unlawful for any reason, the applicability of the remaining provisions, of the **REGC** shall not be affected.

2.4 Compatibility with Indian Electricity Grid Code

The **REGC** has been prepared so as to be consistent/ compatible with the **IEGC**. However, in the matters relating to inter-state transmission, if any provision of the **REGC** is inconsistent with the provisions of the **IEGC,** the provision of **IEGC** shall prevail.

3.0 Chapter -III DEFINITIONS

(1) **Act** means the Electricity Act, 2003 (36 of 2003), including amendments thereto.

(2) **Agency** means a term referred to a person licensed including deemed licensee under Section 14 or is exempted under Section 13 of the Act, generating company, generating station, captive power plant and consumer.

(3) **Apparatus** means apparatus used for operating & maintaining the Power system and includes all machines, fittings, accessories and appliances.

(4) **Appendix** means an Appendix to a **CHAPTER** of the **Grid Code**

(5) **Applicant** means a person who has made an application for open access to an intra-state transmission system.

(6) **Area of Supply** means area as defined in the concerned **Licence** or as demarcated for the deemed licensee.

(7) **Automatic Voltage Regulator or 'AVR'** means a continuously acting automatic excitation control system for voltage control at the Generator terminals of a

generating unit.

(8) **Backing Down** means **SLDC** instructions or **NRLDC** instructions conveyed through **SLDC** for reduction in generation from **generating unit** under abnormal conditions such as high frequency, low system demand or network constraints.

(9) **'BBMB'** means Bhakra Beas Management Board

(10) **Black Start Procedure** means the procedure necessary to recover the grid from a total or partial blackout.

(11) **Bulk Power Transmission Agreement (BPTA)** means an executed agreement under which a Transmission System User is entitled to the access to an intra-State transmission system of a Transmission Licensee.

(12) **Captive Power Plant (CPP)** means a Power Plant set up by any person or co-operative society or association of persons to generate electricity primarily for his / their own use.

(13) **'CEA'** means Central Electricity Authority.

(14) **'CERC'** means Central Electricity Regulatory Commission.

(15) **Central Transmission Utility (CTU)** means any Government company notified by the Central Government under sub-section (1) of Section 38 of the Electricity Act 2003.

(16) **Connection** means the electric lines and electrical equipments used for connecting the **User's** system to the **State Transmission System**.

(17) **Connection Agreement** means an agreement setting out the terms relating to the **Connection** to and/or use of the intra-State Transmission System.

(18) **Connection Conditions** means the technical conditions to be complied by a **User** having a **Connection** to the **State Transmission System** as laid down in **Chapter-V**: "**Connection Conditions**" of the **Grid Code**.

(19) **Connection Point** means a point at which a User's or Transmission Licensee's Plant and / or Apparatus connects to the intra-State transmission system.

(20) **Designated Officer** means a person identified as having responsibility for inter User boundary safety under **Chapter-XII** of the **REGC**.

(21) **Despatch Instruction** means an instruction given by **SLDC** to **SGS** (other than **CPP**) to despatch generation and to **Discom** to regulate drawal in accordance with the Scheduling and Despatch procedures of **Grid Code**.

(22) **Disconnection** means the act of physically separating a **User's** or **EHV Consumer's** electrical equipment from the **State Transmission System**.

(23) **Distribution Company / Discom** means a company primarily engaged in the business of distribution & supply of electricity to the consumers in its area of supply and includes **Jaipur Vidyut Vitran Nigam Ltd. (JVVN), Ajmer Vidyut Vitran Nigam Ltd. (AVVN), Jodhpur Vidyut Vitran Nigam Ltd. (JdVVN)** and deemed distribution licensee.

(24) **Drawal** by **STS** means an import by **STS** from **Northern Region**, of electrical energy and power or both active / reactive power. In respect of a **Discom**, drawal means import from **STS** of electrical energy and active/reactive power or both. In respect of a **Consumer,** drawal means import from **Distribution Company / STS** of electrical energy and active / reactive power or both.

(25) **Electricity Supply System** means the Power system of the State i.e. the combination of the **State Transmission System, Distribution System** and **Power Stations**.

(26) **External Interconnection** means electric lines and electrical equipment used for the transmission of electricity between the **State Transmission System** and the **Regional Transmission System** and other **State transmission systems**.

(27) **Extra High Voltage (EHV**) means where the voltage exceeding 33,000 volts under normal conditions, subject, to the percentage variation allowed by the Authority.

(28) **EHV Consumer** means a person to whom electricity is provided and who has a dedicated power supply at 132kV or above.

(29) **Forced Outage** means an Outage of a Generating Unit or a transmission facility or apparatus due to a fault or other reasons, which has not been planned.

(30) **Generator** means a person or agency generating electricity either pursuant to any agreement with purchaser or otherwise and includes **SGS, ISGS** or inter-

state generation / transmission / trading company.

(31) **Generating Unit** means the combination of an alternator and a turbine set (whether steam, gas, Liquid fuel, water or wind driven) or a reciprocating engine and all of its associated equipment, which together represents a single electricity-generating machine.

(32) **Grid Code** means the set of principles and guidelines prepared in accordance with the terms of Section 86(1)(h) of the Electricity Act, 2003.

(33) **Grid Contingencies** means abnormal operating conditions brought about by tripping of generating units, transmission lines, transformers or abrupt load changes or by a combination of it leading to abnormal voltage and/or frequency excursions and/or overloading of network equipment.

(34) **Grid Disturbance** means a situation where disintegration and grid collapse either in part or full occurs in an unplanned and abrupt manner, affecting the power supply in a large area.

(35) **IE Rules** means Indian Electricity Rules 1956.

(36) **Independent Power Producer (IPP**) means a **Power Station** within the **State**, owned by a **Generator** not being part of **RVUN**, **STU**, **BBMB** or Central Sector Generation and not classified as a **CPP**.

(37) **Indian Electricity Grid Code (IEGC**) means a document describing the philosophy and the responsibilities for planning and operation of Indian power system published by **CERC**.

(38) **Inter Connecting Transformer (ICT) / Inter linking Transformer** means Transformer connecting EHV lines of different voltage levels.

(39) **Inter-State Generating Station (ISGS**) means a Central/Merchant Power Plant/other generating station where two or more than two states have a share and their scheduling is coordinated by the **RLDC**.

(40) **Inter-State Transmission System (ISTS**) means a system for energy conveyance by main transmission line from one state territory to another state and includes:

(i) The energy conveyance across the intervening state territory and energy conveyance within the state which is incidental to such inter-state energy transmission.

(ii) The energy transmission within the territory of a state on a system built, owned, operated and maintained by the **CTU** or by any agency/person under supervision and control of **CTU**.

(41) **Load Crash** means a sudden or rapid reduction of electrical load connected to a system caused by tripping of major transmission line(s), feeder(s), power transformer(s) or natural causes like rain etc.

(42) **Maximum Continuous Rating (MCR**) means the normal rated full load MW output capacity of a Generating Unit, which can be sustained on continuous basis at specified conditions.

(43) **'NPC'** means Nuclear Power Corporation.

(44) **'NRPC'** means Northern Regional Power Committee

(45) **'NRLDC'** means Northern Regional Load Despatch Center

(46) **Northern Region** means **Region** comprising of the States of **Haryana, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand, Himachal Pradesh, Delhi, Jammu and Kashmir** and **Union Territory of Chandigarh.**

(47) **Northern Regional Grid System** means Power systems of SEBs / Utilities / IPP / CPPs of the Northern Region and of **NTPC**, **NHPC**, **NPC**, **BBMB** & **PGCIL** having integrated operation within the periphery of **Northern Region**.

(48) **Open Access (OA)** means the non-discriminatory provision for the use of transmission lines or distribution system or associated facilities with such lines or system by any licensee or consumer or a person engaged in generation in accordance with the regulations specified by the Commission.

(49) **Open Access (OA) Consumer** means a person permitted by the Commission to receive electricity supply from a person other than the distribution licensee of his area of supply, the expression includes a generating company and a licensee, having availed or intending to avail open access.

(50) **Operating Coordination Committee / OCC** means the Committee constituted by **NRPC**, which coordinates the operation of the **Regional Transmission System** and

Central Sector Generation.

(51) **Planned Outage** means Outage of a Generating Unit or a transmission facility or **Users** apparatus**,** planned and agreed by **SLDC**.

(52) **Power Purchase Agreement (PPA)** means an agreement between a Generator and the distribution licensee where, subject to certain conditions, distribution licensee agrees to purchase the electrical output of the **Generator's Generating Unit** and the **Generator** agrees to provide services from the Unit.

(53) **Power Station** means an installation of one or more **Generating Units** (even when sited separately) owned and/or operated by the same **SGS** and which may reasonably be considered as being managed as a single integrated generating complex.

(54) **Power Grid/ PGCIL** means the Power Grid Corporation of India Limited.

(55) **Project Operator** means person responsible for operating an electrical plant during planned outage.

(56) **Permit to Work (PTW)** means safety documentation issued to any person to allow work to commence on inter-user boundary after satisfying that the necessary safety precautions have been established.

(57) **'RERC' / Commission** means Rajasthan Electricity Regulatory Commission.

(58) **Rotational Load Shedding** means planned Disconnection of Customers on a Rotational basis during periods having significant short fall of power required in meeting the total Demand.

(59) **'REGC'** means Rajasthan Electricity Grid Code or Grid Code.

(60) **'RVPN'** means Rajasthan Rajya Vidyut Prasaran Nigam Ltd, registered under the Companies Act 1956.

(61) **'RVUN'** means Rajasthan Rajya Vidyut Utpadan Nigam Ltd, registered under the Companies Act 1956.

(62) **Regional Transmission System** means the combination of **EHV** electric lines and electrical equipment owned or operated by **Power Grid / BBMB** / utilities.

(63) **Spinning Reserve** means unloaded generating capacity synchronized to the System and ready to provide increased generation at short notice pursuant to **Despatch Instruction** or instantaneously in response to Frequency drop.

(64) **State** means the **State** of Rajasthan.

(65) **State Load Despatch Center (SLDC**) means the centre under Section 31(1) of the Act, having its control room at Heerapura (Jaipur), to ensure integrated operation of the power system in the State.

(66) **'State Power Committee' (SPC)** means the Committee set up under **Chapter-IV**: "Management of Grid Code" of **REGC**.

(67) **State Generating Station (SGS)** means a power station within the **State**, except **Inter-State Generating Station (ISGS)** located within the **State.** This includes **IPP.**

(68) **State Transmission System (STS**) means the **EHV** electric lines system and electrical equipments operated and/or maintained by **Transmission Licensee** for the transmission of electricity between **Power Stations**, **External Interconnections**, the **Distribution System** and the connected **Users** within the State.

(69) **State Transmission Utility (STU)** means the utility notified by the State Government under sub-section (1) of Section 39 of the **Act**.

(70) **Supervisory Control and Data Acquisition (SCADA**) means a computer system acquiring data from remote locations over communication links and process it at centralized control location for monitoring, supervision, control and decision support.

(71) **Synchronised** means the condition where an incoming Generating Unit or Power System is connected to another Power System so that the voltage, frequencies and phase relationships of the Generating Unit or System, and the Power System to which it is connected are identical.

(72) **Transmission Licensee** means the License granted by the Commission under Section 14 of the **Act** to transmit electricity.

(73) **Transmission Capacity Rights** means right of a Transmission System User to transfer Power in MW, under normal circumstances, between the point of injection and drawal as may be set out in the **Bulk Power Transmission**

agreement.

(74) **User** means person including Transmission licensee, Generating Station located in the State including Independent Power Producer, Renewable Energy Power Plant, Generating or/and Transmission Company connected to State Transmission System, Distribution Company including their HV/EHV consumer directly connected to State Transmission System, OA customer interconnected to State Transmission System, and Trader.

(75) **Year** means financial year.

Note: The terms, which are used in this Code and are not defined above, shall have the same meaning in that order as defined in;

(i) RERC (Terms &Conditions for Open Access) Regulations- 2004,
(ii) RERC (Intra State ABT) Regulations-2006 ,
(iii) Indian Electricity Grid Code and
(iv) The Electricity Act 2003.

The meaning of the terms printed in bold letters used in the **REGC** shall be in accordance with the definitions given above.

This Chapter has been developed on the premise that accepted engineering terms do not require additional definitions.

4.0 Chapter-IV MANAGEMENT OF THE GRID CODE

4.1 **General:** A **State Power Committee** shall be constituted by the STU within 30 days from the date of notification of **REGC** for its effective implementation. The existing **State Power Committee** shall continue until the **new State Power Committee** is formed.

Any amendment in **REGC** shall be effected by **RERC**, either suo-moto or based on the SPC recommendations after following the prescribed procedure.

4.2 **SLDC responsibility**

The **SLDC** shall discharge the functions assigned to it under the provisions of the **Act** (Sec. 31, 32) and **REGC** in an independent and unbiased manner.

SLDC shall be the apex body to ensure the integrated operations of the power system in the State**.**

SLDC shall exercise supervision and control imparting directions not inconsistent with the provisions of the **Act**, in ensuring secured integrated grid operations in achieving the maximum economy and efficiency in operating the power system in the State.

The **Regional Power Committee** from time to time shall meet on the matters concerning stability and smooth operations of the integrated grid and economy in operating efficient power system in the region.

The **NRLDC** shall issue directions through **SLDC,** and **SLDC** shall ensure that such directions are complied by the **Users**.

SLDC shall comply with the directions of **NRLDC.**

The **RLDC** or **SLDC**, as the case may be shall abide by the decision of the **Regional Power Committee**.

SLDC shall -

(i) Be responsible for optimum scheduling and despatch of electricity within the State in accordance with the contracts signed with the licensee(s) or the generating companies operating in the State.
(ii) Monitor the grid operations in accordance with the Load Despatch and System Operations manual.
(iii) Keep account of the electricity transmitted through the State grid to the **Users**.
(iv) Exercise supervision and control over the intra-state transmission system.
(v) Be responsible for carrying out real time operations for grid control and electricity despatch within the state through secure and economic operation of the State grid in accordance with the grid standards and **REGC**.

SLDC may levy and collect such fee and charges as may be specified by the Commission from the generating companies, licensee(s) and OA consumers utilizing intra-state transmission of electricity system.

Every **User**, licensee, generating company, generating station, sub-station and the

persons operating the power system shall comply with the directions issued by **SLDC.**

Any dispute relating to the quality of electricity or safe secure and integrated operation of the State Grid or about the directions given by **SLDC,** shall be referred to **RERC** for decision.

However, until the **RERC** decides, the **SLDC** directions are to be complied with by the licensee and by the generating company.

If a licensee, generating company or a person fails to comply with the directions issued by **SLDC**, he shall be liable to penalty under the provisions of the Act.

4.3 STU responsibility

The **STU** shall discharge the functions assigned to it under the provisions of the **Act** (Section39).

The **STU** shall ensure the power evacuation of the generating stations, for supply to the entities engaged in distributing electricity and to OA consumers, exchange of power among entities, exchange of power through inter-connection with **CTU** including:

(i) Coordination of **REGC** through **SPC**.

(ii) Planning and co-ordination relating to intrastate transmission system with **CTU**, State Government, **NRPC**, **CEA, licensee, Generating company** and any other person notified by the State Government.

(iii) Non-discriminatory OA to the transmission system subject to availability of adequate transmission facility for use by a licensee or a generating company or a consumer on payment of transmission charges, and other levies as may be specified by **RERC**.

The **STU** shall not unduly discriminate against or prefer some one or a group of persons in implementing and complying with the REGC (including the scheduling of maintenance of the **STS)**.

The **STU** shall also hold sub meeting with the **User** to discuss individual requirements and with the group of **Users** for preparing proposals for **SPC** meeting.

4.4 State Power committee (SPC) responsibilities:

(i) Facilitating the implementation of the rules and procedures developed under the provisions of **REGC**.

(ii) Assessing and recommending the remedial measures for issues that might arise during the course of implementation of provisions of these regulations, and the rules and procedures developed under the provisions of **REGC**.

(iii) To undertake regular review of **REGC** and to make suitable recommendations.

(iv) Any other function as may be directed by the commission from time to time.

4.5 State Power Committee (SPC) shall have the following members:

(1) Chief Executive / Managing Director of **STU –** as Chairperson.

(2) Chief Engineer of **STU -** as **Member Secretary**

(3) Chief Executive / Managing Director of **RVUN –** as Member

(4) Chief Executive / Managing Director of **Ajmer Discom –** as Member

(5) Chief Executive / Managing Director of **Jaipur Discom –** as Member

(6) Chief Executive / Managing Director of **Jodhpur Discom –** as Member

(7) Incharge **SLDC –** as Member

(8) One member representing transmission and distribution licensee, if any (other than **RVPN, Jaipur/Jodhpur/Ajmer Discoms)** to be nominated by Chairperson**.**

(9) **IPP/CPP** representative to be nominated by Chairperson **–** as Member

(10) Chief Executive of Rajasthan Renewable Energy Corporation (**RREC**) – as Member

(11) One representative from **NRPC** may participate in the Committee as a special invitee.

(12) One representative of NRLDC – as special invitee.

(13) One representative from **RERC –** as Observer

The meeting notice would be issued to the members. The quorum to review shall be of seven members including Chairperson of the Committee.

The **STU** shall inform the **Users** names and addresses of the Committee members constituted within 30 days of the publication of the **REGC,** and shall also inform of

the subsequent changes from time to time.

4.6 SPC proceedings

The Rules of business shall be formulated by the Committee. The Committee shall meet at least once in three months.

The **SPC,** besides having inherent powers and functions of the functional committee, shall undertake the following functions:

(i) To review and approve (wherever required) the reports of the functional committee for implementation.

(ii) To analyze major **Grid Disturbances,** soon after the occurrence, and to suggest remedial measures and issue suitable directives to the **Users**.

(iii) To approve load shedding guidelines through under frequency relays or as formulated by the Technical Committee.

(iv) To consider the **Users** suggestions for amendment in **REGC** and to make recommendations to the **Commission**.

(v) To issue guidance on the implementation of the **REGC.**

(vi) To look into the problems raised by the **Users** and to resolve the disputes.

(vii) In case of OA, where **SLDC** is unable to resolve a grievance, **SPC** shall resolve the grievance within 30 days.

4.7 Grid Code Review and Revisions

The Member Secretary **SPC** shall put up the proposals for revision in **REGC** to be decided in the **SPC** meeting with majority voting.

The **SPC** shall submit a report to the **Commission on**:

(a) Outcome of the review.

(b) Proposed revisions in **REGC**

(c) Representations or objections received from the Users during the review / consultation process.

The amendments in **REGC** shall be effective on notification by the **Commission.** However, in an unusual situation where the day-to-day operation is not possible without revision a provisional revision may be considered pending approval of the Commission, but only after discussions in **SPC** on emergency basis. The **Commission** shall be apprised of it within 15 days by recorded means of Communication.

The changes/revisions proposed by **SPC** shall not be inconsistent / incompatible with **IEGC.**

4.8 The SPC shall constitute the following functional Committees for implementing **REGC:**

(1) Technical Committee

(2) Commercial Committee

(3) Protection Coordination Committee

The rules to be followed by the Functional Committees, in conducting the business shall be formulated by the Committees and shall be approved by the **SPC.**

4.8.1. The Technical Committee, shall consist of the following members:

(1) A Chairperson designated by **STU.**

(2) A Member Secretary from **STU.**

(3) One representative from RVUN

(4) One representative from each Discom.

(5) One representative from **SLDC**

(6) One representative from privately owned Utility to be nominated by the **SPC** Chairperson.

The Technical Committee shall meet once in three months or even earlier as may be required to discharge the following functions.

(a) General Matters

The Technical Committee shall coordinate the implementation of Load Despatch & System Operation Manual to ensure that the respective SGS and Distribution Companies/Others using **STS,** and discharge following obligations under the **REGC** .

(i) To formulate the guidelines for under frequency load shedding scheme - manually or automatic on rotational basis or otherwise.

(ii) To look into the existing interconnections and equipments for alteration, if so required, so as to comply with the **Connection Conditions** of **REGC.**

(iii) To hold deliberations on connectivity criterion for voltage imbalance and other parameters as specified under System Performance in chapter VI by taking required remedial measure.

(b) Load Forecast

To review the methodology and the assumptions drawn by the Discoms

(c) Transmission System Planning and Co-ordination

To review and finalise the proposals identified based on the planning studies, coordination of system planning, execution of works, maintenance schedule and contingency plan to have adequate transmission and distribution system and its availability for wind farm and other non-conventional power stations.

4.8.2 The Commercial Committee shall comprise of the following members –

(1) Chief Engineer, **SLDC – RVPN** - Chairperson.
(2) **RVUN** representative **–** Member.
(3) One representative from each **Discom –** Member.
(4) One representative from privately owned Utility (to be nominated by Chairperson) **–** as Member.
(5) Superintending Engineer, Energy Accounts, **SLDC** – **RVPN –**Member Secretary.

The **Commercial Committee** shall meet once a month or more frequently as may be required to discharge the following functions.

(a) To deliberate and decide the monthly energy accounts of **SLDC.**
(b) To finalize provisional energy accounts of **SLDC.**
(c) Finalize energy accounts.
(d) Finalize OA accounts.

4.8.3 The Protection Coordination Committee shall comprise of the following members:

(1) Chairperson to be designated by **STU.**
(2) Member Secretary an officer from **STU.**
(3) One representative from RVUN
(4) One representative from each Discom.
(5) One representative from **SLDC**
(6) One representative from privately owned Utility to be nominated by Chairperson of **SPC**.

The Protection Coordination Committee shall meet once in three months or more frequently as required for discharging the following functions.

(i) To implement and review the provisions of Chapter-XV "Protection"..
(ii) To analyze system disturbances and to monitor the performance of protection system and propose remedial measures.
(iii) To Prepare and finalize technical requirements of automation, protection, Disturbance recorders, Event Loggers.

4.9 Non-Compliance & Derogation:

If a **User** fails to comply with the **REGC** provision(s), the affected party shall inform the **SLDC** for taking immediate remedial measures as per **REGC** provisions.

Wrong declaration of capacity, non-compliance of **SLDC's** instructions on load despatch, backing down without adequate reasons, non-furnishing of data etc. shall constitute non-compliance of **REGC** and shall be subject to financial penalty as per section 33 of the Act, presently not exceeding Rs. 5.0 lac**.**

Constant failure to comply with the **REGC** may lead to **disconnection** of **User's** plant and/or facilities.

Derogation of any particular section or **REGC** chapter shall be with the express permission of the **Regulatory Commission** only for a specified time period. Derogation of the **REGC** requirements shall be an exception, and may be allowed only when it is not possible for the User to comply within the given time-frame. Failure to comply with a fixed-time derogation by any **User** may attract a financial penalty as may be decided by the **Commission**.

5.0 Chapter-V SYSTEM PLANNING

5.1 System planning identifies the method for data submissions by **Users** to **STU** and

the procedure to be applied by **STU** in the planning and development of the **STS** so as to evolve an efficient, coordinated, secure and economical **STS** to satisfy future demand and generation requirements.

A requirement for reinforcement or **STS** extension may arise for a number of reasons, such as:

(i) Development on a **User's** system already connected to the **STS.**

(ii) Introduction of a new **Connection** point between the **User's** system and the **STS.**

(iii) Evacuation system for **SGS** / **IPP/ CPP** and Generating Stations within or outside the State.

(iv) Reactive Compensation.

(v) An increase in the system capacity (Augmentation of generation or system load) to remove operating constraints and to maintain security standards.

(vi) Stability considerations.

(vii) Cumulative effect of any of the above.

Such reinforcement and extension to the transmission System may involve work at a Connection Point / Interface Point of a Generating Company / Distribution Licensee to the Transmission System.

The Transmission System development shall be planned in advance with sufficient lead time, for detailed engineering, design and construction work and the time required for obtaining statutory approvals from various agencies for implementation of the scheme(s).

5.2 Planning Policy

5.2.1 **SLDC** shall be responsible for assessing the availability and its requirement in kW, kWH & kVAr for one year on monthly basis and **STU** for next five and ten years on an annual basis.

5.2.2 The assessment shall be based on the historical data, load requirement projected by the distribution licensee(s), maintenance schedule of generating companies selling electricity to distribution licensee(s), maintenance schedules of transmission licensee(s), transmission constraints, generation and transmission capacity additions in consultation with the concerned generating companies, distribution licensee(s), trading licensee(s) and transmission licensee(s), **NRPC**, national / Regional Load Despatch Center(s), **CEA** and **CTU.**

5.2.3. The **STU** shall follow the following steps in planning:

(i) Forecast the power demand within the **Area of Supply,** based on **Discoms** forecasts**,** and to provide details of the demand forecasts to **SLDC** and **SPC** along with data, methodology and forecast assumptions. The forecasts shall be reviewed and updated every year.

(ii) To prepare a generation plan for the state, in consultation with **SLDC**, in meeting the load demand as per forecast, after examining the economic, technical and environmental aspects of the alternatives by considering contracted generation resources and demand side management effects.

(iii) Prepare a transmission plan for the **STS** compatible with the load forecast and generation plan including provision for reactive volt ampere (VAR) compensation needed in the **STS.**

(iv) The reactive power planning exercise to be carried out by **STU** in consultation with **NRPC, Discoms,** as per **RERC's** directives and Programme for installation of reactive compensation equipment by **User.**

(v) **STU** shall use the load flow, short circuit, and the transient stability study, relay coordination study and other techniques for the transmission system planning.

(vi) **STU** shall simulate the contingency and system constraint conditions for the system for the transmission system planning.

(vii)**STU** shall maintain the historical database, based on the operational data supplied by **SLDC** using the state-of-the-art tools such as Energy Management System (EMS) for demand forecasting

5.2.4 All the **Users** shall furnish the desired, planning data to **STU** by 31st March every year to enable **STU** to formulate and finalise the plan by 30th September each year for the next 5 years. **STU** may extrapolate the demand forecast of

Discoms for the purpose of long term projections.

5.3 The **Planning Criterion** is based on the security philosophy as per Transmission Planning Criteria and **CEA** guidelines on which **ISTS** and **STS** have been planned. The general policy shall be as follows:

(i) The **ISTS/STS** shall be secured against the following contingency outages without necessitating load shedding or rescheduling of generation during Steady State Operations

- Outage of a 132 kV D/C line or,
- Outage of a 220 kV D/C line or,
- Outage of a 400 kV S/C line or,
- Outage of a single Interconnecting Transformer,
- Outage of Single circuit 132kV and 220kV line (where all outgoing lines of a particular voltage are single circuit).
- Outage of one circuit of 400kV D/C line.

(ii) The above contingencies be considered assuming a pre-contingency system depletion (Planned Outage) of another 220 kV D/C line or 400 kV S/C line in another corridor and not emanating from the same sub-station. The Generating Units may operate within their reactive capability curves and the network voltage profile shall also be maintained within the specified voltage limits.

(a) **STS** shall be capable of withstanding the loss of most severe single system infeed i.e outage of a generating station or interregional interconnection or all line connections between two stations without loss of stability.

(b) In all substations (132kV and above), at least two transformers shall be provided. However, on 132kV substations where it is possible to arrange alternative supply at 33kV within 5 (five) minutes of outage of 132kV transformer, then the provision of one transformer may be considered acceptable in the first phase. In existing substations where only one transformer exists, second transformer shall be installed as per investment plan in a phased manner. A provision of two transformers shall be kept while designing a new 132kV substation.

(d) The aforesaid contingencies shall not cause:

(i) Loss of supply
(ii) Prolonged operation of the system frequency below and above specified limits
(iii) Unacceptable high or low voltage
(iv) System instability
(v) Unacceptable overloading of ISTS/STS elements.

5.4 Planning Responsibility

5.4.1 The distribution licensee(s) shall submit its power requirement to **SLDC** for the ensuing year by 31st October on monthly basis as per their entitlement and share in generating stations and contract signed with the generating companies and the traders, and the projected demand for the next 5 and 10 years on annual basis to **SLDC & STU**. In case information is not received timely, the **SLDC** & **STU** shall assess the requirement and convey to the distribution licensee(s). If no observations are received from the distribution licensee(s) within seven days, it shall shall be considered as final. The load forecasts shall be made for each of the interconnection points between **STU** and the distribution licensee(s) and shall include annual peak load and energy projections. The demand forecasts shall be updated annually or whenever major changes are made in the existing planning. While indicating requirements of an individual consumer with large demands (1 MW or higher) the distribution licensee(s) shall satisfy itself about the certainty of the demand materializing.

5.4.2 **SGS** shall provide its generation capacity to **STU / SLDC** for power evacuation from its power stations for each of the succeeding 5 years along with transmission system augmentation proposals to **STU,** annually by 31st March**.**

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

5.4.4 The Technical Committee shall review and approve the load forecasts and the

methodology followed by each of the distribution licensee(s) as per **RERC** (Power Purchase and Procurement Process of Distribution Licensee) Regulation, 2004.

5.4.5 The State Transmission System proposals identified on the basis of planning studies shall be discussed, reviewed and finalized and approved by the Technical Committee and apprised the **SPC**.

5.5 Planning Data:

5.5.1 To enable **STU / SLDC** to conduct System Studies and prepare perspective plans for electricity demand, generation and transmission, the Users and / or Rajasthan Renewable Energy Corporation (RREC)shall furnish timely data, to STU as detailed under Chapter-XVI and Appendix–A; Planning / Connectivity Data and other data as required.

The data pertaining to the Generating Station including CPPs and Generating Units owned by Distribution Licensee working in parallel with grid and Distribution Licensee(s), shall be updated on addition of Generating Units/modification of the Distribution Systems.

5.5.2 To enable Users to co-ordinate the planning design and operation of its plants and systems with the State Transmission System the **User** may ask for Transmission System data from the **STU** as applicable to them.

5.5.3 The **User /STU** shall exchange data as provided in **IEGC** relating to generation and energy transmission from **ISTS**.

5.5.4 One time data shall be submitted within 6 months from the date **REGC** comes into effect, by all concerned to the **STU**. The data other than the one time data shall be made available to **STU** on 1st of April and 1st of October every year. 'Data already furnished' as per earlier Grid Code shall be considered to have been submitted under **REGC.**

6.0 Chapter-VI CONNECTION CONDITIONS

6.1 Connection Conditions specify the technical, design and operational criteria to be complied with by the **User** connected to the **STS** in ensuring the following:

(i) All **Users** or prospective **Users** are treated equitably.

(ii) New **Connections** shall not cause any adverse effect on the existing **Users,** nor shall a new **Connection** shall suffer because of existing **Users.**

(iii) The ownership and responsibility of the equipments is clearly specified in the Appendix-B (Site Responsibility Schedule) for the sites where ever a **Connection** is made.

6.2 General Principles for Grid Connectivity

General principles for grid connectivity shall be governed by Technical Standards on Connectivity to the Grid as specified by CEA under section 73 of the Act. However where a request is made for grid interconnection, it is understood that the requester takes full care of the following points:

(i) Not to force changes in maintenance schedules of utilities, due to constraints arising in the requesters system during the grid operation.

(ii) To take care of modifications in equipment rating, if any, for the system and grid connection point equipments on account connectivity modifications.

(iii) To satisfy protection standards and relay coordination aspects at the connection point as per grid norms as may be evolved in the Technical Committee of **SPC**

(iv) To provide telemetering, SCADA and the relevant data at the interconnection points if felt necessary by **RLDC/SLDC** to facilitate the grid operation.

(v) To take care of his system in the event of grid initiated disturbances and not to rely on grid defense mechanisms alone.

(vi) To ensure sensitive and reliable protection for discriminate opening and isolation of requesters system from grid interconnection on account of disturbances initiated from his System.

(vii) To participate islanding and other grid scheme(s) by contributing generation/load wherever available, as decided by **STU / SLDC** and to follow load restoration guidelines during islanded operation.

(viii) To help grid by supplying start up power from if he has generating sources in

his area as per **RLDC/SLDC** instructions for which the tariff shall be as decided by **RERC.**

(ix) To provide protection-tripping data for grid disturbances to SLDC and to Protection Coordination Committee for analysis in ensuring safe and reliable grid operation.

(x) Grid to help requester in the event of system failures, by assisting in start up power and restoration by **RLDC/SLDC** for which the tariff shall be as decided by **RERC.**

(xi) To comply with the safety standards and operating procedure during maintenance of common portion by the other end utility personnel, line permits and allowing locking of isolator in open position to prevent accidental charging.

(xii) To ensure proper tele-metering, accessibility by express communication, so that grid inter-connectivity data is made available to the concerned.

(xiii) To ensure proper metering system as per specified standards.

(xiv) To perform testing/calibration of equipments and meters at inter connection points in the presence of interested parties and the utilities and to make available the test reports to the parties and to concerned utilities/organizations including **SPC**.

(xv) To plan maintenance schedule of lines/ICTs or bay at connection point in consultation with the **STU / SPC**.

The **STU / NRLDC / SLDC** reserves the right to reschedule the maintenance schedule of the Requester's system if adverse conditions exist. **This shall however be an exception and not the rule**.

(xvi) To satisfy the equipment and personnel safety norms, equipment protection and grid operation codes, environment safety Laws and the national policies.

(xvii) To share the information whenever of his system adopts and follows other than the prescribed norms/standards in respect of equipment protection, grounding and other operation/protection standards and human safety in **SPC** and **CEA** forums for the benefit of the Grid.

(xviii) Training of sub-station/line staff at the interconnection of requester and existing utility of tie points with regard to safety and operation procedures to be conducted annually and mutually.

(xix) The requester shall not energize a dead Utility connection unless permitted by **RLDC/SLDC**.

All the above provisions are inclusive and not exhaustive. The provisions of the Act, IEGC, Grid Standard, direction of the Commissions and other statutory bodies as applicable from time to time shall be followed by the requester.

6.3 Safety Standards

At the point of Grid Interconnection an isolating device, which is typically an isolator/disconnect switch, shall be provided to physically and visibly isolate the Grid from the Electrical Plant. Safety and operating procedures for the isolating device shall be in compliance with the safety requirements as specified by the Authority under Section 73(c) of the Act until then Safety Code as approved by **RERC** shall be applicable. The **Project Operator** shall visibly mark the switchgears that could leave the equipment energized, so that the maintenance crew is aware of the potential hazards. The isolating device may be placed at a location other than the point of Interconnection, with the consent of **STU** and affected parties. The device shall:

(i) be accessible by **STU** and under jurisdiction of RLDC/SLDC.

(ii) be suitable for safe operation under the conditions of use.

(iii) simultaneously open all phases (gang-operated) of the **Electricity Supply System**.

(iv) not be operated without advance notice to either party, unless an emergency condition requires the device to be opened to isolate the Electrical Plant.

(v) be lockable in the open position by **STU**.

(vi) be locked by **STU** personnel in the open position and install safety grounds if: (a) it is necessary for the protection of maintenance personnel when working

on de-energized circuits.

(b) the Electrical Plant presents a hazardous condition.

(c) the Electrical Plant interferes with the Grid operation.

(d) the Grid interferes with the operation of the Electrical Plant.

6.4 Site Responsibility Schedule

6.4.1 **STU** and the **Users** shall be responsible for safety as indicated in the Site Responsibility Schedule (Appendix-B) for each connection point.

6.4.2 For every Connection to the State Transmission System where a Connection Agreement is required, **Transmission Licensee** shall prepare a schedule of equipments, pursuant to relevant connection agreement with the information furnished by the Users. The Site Responsibility Schedule, shall categorically indicate the following.

(i) The ownership of equipment/plant

(ii) The responsibility for control of equipment/plant

(iii) The responsibility for maintenance of equipment/plant

(iv) The responsibility for operation of equipment/plant

(v) The manager of the site

(vi) The responsibility relating to safety of persons at site.

6.4.3 The format, principles and the basic procedure be used in preparation of Site Responsibility Schedule shall be formulated by **STU** and given to **Users** for compliance.

6.4.4 An illustrative Site Responsibility Schedule is provided at Appendix-B.

6.4.5 Responsibility for providing & maintaining metering system shall be as specified in RERC (Metering) Regulation, 2007.

6.5 Point of Interconnection Considerations General Configurations and Constraints:

Integration of generation projects into power system usually falls into one of the three categories:

(a) Interconnection into a 132 kV to 400 kV AC substation, with (depending on the bus configuration) the transmission and generator feeder lines each terminated into bays containing one or more breakers.

(b) Interconnection on the low-voltage side of an existing customer service transformer (typically 11kV to 33kV) that was originally designed to serve loads and that taps an existing transmission line.

(c) Interconnection at 11kV to 400V by directly tapping a transmission line. Wherever the generator becomes an additional current source at the line terminals, the interconnections (b) and (c) as above create a condition of multi-terminal line. A line with three or more terminals affects the **STU's** ability to protect, operate, despatch and maintain the transmission line, the increased complexity of the control and protection schemes affects the system stability and reliability. The **STU** shall determine the feasibility of multi-terminal line interconnections on case-to-case basis.

6.5.1 Other Considerations

Before providing interconnection of a new generating source, **STU** shall study the impact of interconnection towards suitability of existing equipment rating, system stability and reliability, insulation coordination, modification of protection schemes and protective relays, control schemes and reliability of service relating to despatch and maintenance. Requester shall comply with the requirements as intimated by **STU** based on such study.

6.6 System Performance

6.6.1 A **User** seeking to establish new or modified arrangement(s) for **Grid connection** and/or use of transmission system of **Transmission Licensee** shall submit the application in the form as may be specified by **STU.**

6.6.2 The **STU** shall specify the **Connection** Point, technical requirements and the voltage to be used, along with the protection requirements as specified in Chapter-XVI for the new/ modified **connection**.

6.6.3 The **SGS** (except **CPPs)** shall make available the up-to-date capability curves for all **Generating Units,** indicating restrictions to **SLDC**, to allow accurate system studies and effective operation of the **State Transmission System.** Similarly **CPPs** shall furnish the net reactive capability that shall be available for Export to /

Import from **STS.**

6.6.4 The transmission system operation shall be in accordance with the operating standards as given here after.

6.6.4.1 **The STS** rated frequency shall be 50.0 Hz. The **SLDC** in coordination with **RLDC** and the **Users** shall make all possible efforts to maintain grid frequency within the 49.0 – 50.5 Hz band in accordance with **IEGC** 5.2 (l).

6.6.4.2 The **SLDC,** and the **Users** shall ensure that the grid voltage remains within the operating limits as specified in **IEGC** 5.2 (r):

Nominal System Voltage	Grid Voltage		
	Variation Limits	Maximum	Minimum
400kV	+5%/-10%	420 kV	360 kV
220 kV	+/-10%	245 kV	200 kV
132 kV	+/-10%	145 kV	120 kV
33 kV	+/-10%	36 kV	30 kV

All efforts shall be made for progressive reduction of operating voltage variation limit to be ±3% latest by 21.2. 2012.

6.6.4.3 Voltage and Current Harmonics:

(a) Voltage Harmonics: The maximum limit of total harmonic distortion for voltage shall be:-

Nominal System Voltage	Total Harmonic Distortion (THD)	Individual harmonic of any particular frequency
400 kV	2.0%	1.5%
220 kV	2.5%	2.0%
132 kV	3.0%	2.0%

(b) Current Harmonics: The total harmonic current drawn from the transmission system at any point shall not exceed 8% of the fundamental frequency current.

6.6.4.4 The maximum limit of voltage imbalance shall be as given below:

Nominal System Voltage	Permissible Voltage Imbalance
220 kV & above	2.0%
Below 220 kV	3.0%

6.6.4.5 However, the parameters as may be notified by CEA, under Section-73 of the Act, shall be applicable for 6.6.4.1 to 6.6.4.4.

6.6.5 **Discoms** shall ensure that their loads do not affect **STS** in terms of causing any:

(i) Imbalance in voltage at the interconnection point beyond the permissible limits.

(ii) The harmonics in system voltage at the interconnection point beyond the prescribed limits. **STU** may direct the **Discoms** to take appropriate measures to suppress the harmonics.

6.6.6 In the event of **Grid disturbances / Grid contingencies** in the Northern Regional grid, **the Transmission Licensee** shall not be liable to maintain the system parameters within the normal range of voltage and the frequency.

6.7 Connection Point

6.7.1 State Generating Station (SGS)

Voltage shall be either 400 kV, 220 kV, 132 kV or as agreed by **STU.**

Unless specifically agreed by **STU** the **Connection Point** shall be the outgoing feeder gantry of **Power Station** Switchyard.

All the terminals, communication and protection equipment owned by **SGS** within the perimeter of the **Generator's** site shall be maintained by the **SGS. Transmission Licensee** shall maintain the electrical equipment from the out going feeders' gantry onwards**.**

6.7.2 Distribution Company

Voltage may be either 33kV, 11 kV or as agreed with **STU.**

The **Connection Point** shall be the outgoing feeder gantry/ cable termination on transmission tower/pole at **Transmission Licensee's** substation. From the outgoing feeder gantry or transmission line cable terminal structure onwards, all

the electrical equipment shall be maintained by the respective **Distribution Company.**

6.7.3 **Northern Regional Transmission System** shall have the **Connection Point,** protection scheme, metering scheme and the voltage in accordance with the **IEGC** provisions**.**

6.7.4 **IPPs, CPPs & EHV Consumers**

Voltage may be 220kV, 132 kV or as agreed with **STU.** When Sub-stations are owned by **IPPs, CPPs** or **EHV Consumers,** the **Connection Point** shall be the outgoing feeder gantry on its premises.

6.8 **Data Requirements**

Users shall provide **STU / SLDC** the data as specified in Chapter-XVI to facilitate the scheduling and accounting with duly demarcated boundaries of the **Users**. Unless otherwise agreed in the **Connection Agreement,** the equipments for data transmission and communication shall be operated and maintained by the **User** in whose premises they are installed irrespective of its ownership.

6.9 **The Connection Agreement** shall appropriately incorporate the following:

(i) A condition requiring both the parties to comply with the **REGC.**
(ii) **Connection** details and/or use of system charges.
(iii) Details of capital works related payments of reinforcement and system extension.
(iv) Electrical system with connectivity diagram.
(v) General philosophy and protection guidelines.
(vi) A Site Responsibility Schedule.

7.0 Chapter-VII SYSTEM SECURITY ASPECTS

7.1 **The User** shall operate its respective power system and generating stations duly synchronized with each other so that the entire **STS** operates in synchronism as integral part of Northern Regional Grid. The **STU** shall endeavour to operate the interstate links so that interstate power transfer can be achieved smoothly when required. The security of power system and safety of equipments shall have the priority over the economically optimal operations and comply with the Safety Regulations, and Grid Standard Regulations as specified by CEA under section 73 of the Act.

7.2 The **switching operations**, whether manual or automatic, shall be based on the guidelines issued by

(a) IEGC.
(b) NRLDC's instructions/guidelines under Electricity Act, 2003.
(c) REGC.
(d) RERC's directives.
(e) State Government's directives.
(f) SPC's decisions.
(g) **SLDC's** instruction and guidelines.

7.3 No part of the **STS** shall be deliberately isolated from the integrated **GRID,** except

(i) under an emergency, and under the conditions where the isolation would prevent the total **Grid** collapse and/or enables early restoration of power supply,
(ii) where serious damage to a costly equipment or personnel safety is imminent, prevented by such isolation.
(iii) where such isolation is specifically advised by **SLDC** and
(iv) Operating an under frequency/islanding scheme dully approved by Technical Committee of **SPC** and as per directives of **NRPC.**

All isolations shall be as per standing guidelines or be ratified by the **SPC**. Complete synchronization of integrated **Grid** shall be restored at the earliest. The restoration process shall be supervised by **SLDC** as per procedure separately finalized.

7.4 The 132kV and above transmission lines and ICT shall not be deliberately opened or removed from service without prior clearance of **SLDC.** However**, SLDC** may provide relaxation, for particular line or substation. Where prior clearance from **SLDC** is not possible it shall be intimated to **SLDC** immediately after the incident.

Any emergency tripping not advised or permitted by **SLDC** shall be reported to the **SPC** for needful in the next meeting.

7.5 All trippings, whether manual or automatic, shall be reported to **SLDC** as per Load Despatch & System Operation Manual. The reasons (to the extent determined) and the likely restoration time shall be intimated. Attempts shall be made for the elementary restoration at the earliest. The information/data including disturbance recorder, sequential event recorder outputs etc. having tripping sequence and restoration shall be sent to **SLDC** for analysis.

7.6 All generating units, synchronized with the **Grid**, irrespective of ownership, type and size, shall constantly have governors in normal operation. If any generating unit of over fifty (50) MW is required to be operated without its governor in normal operation, the NRLDC through SLDC shall be informed of the reasons and duration of such operations. All governors shall have an overall droop characteristic within the range of 3% to 6%.

Run of river hydro stations without pondage shall be exempted from free governor mode operation.

The exemption from free governor mode operation in respect of steam turbine of thermal and gas based power stations not having free governor mode facility shall be sought from **CERC** under clause 1.6 of **IEGC.**

7.7 Facilities available within Load Limiters, Automatic Turbine Run-up System (ATRS), Turbine Supervisory Coordinated Control system etc. shall not be used to bypass the normal governor action in any manner. No dead bands and no time delays shall be introduced deliberately.

7.8 All Generating Units, operating up to 100% of Maximum Continuous Rating (MCR) shall normally be capable of (and shall not in any way be prevented from) instantaneously picking up five per cent (5%) extra load for at least five (5) minutes or within technical limits prescribed by the manufacturer when frequency falls due to system contingency. The generating units operating at above 100% of its MCR shall be capable of (and shall not be prevented from) going at least up to 105% of its MCR when frequency falls suddenly. Any generating unit of over fifty (50) MW size not complying with the above requirements shall be kept in operation (synchronised with the Regional grid) only after obtaining the permission from NRLDC through SLDC. However, the constituent can makeup the corresponding short fall in spinning reserve by maintaining an extra spinning reserve on the other generating units of the constituent.

Any generating unit not capable of complying with the above provision shall seek exemption from **CERC** under clause 1.6 of **IEGC.**

7.9 The recommended rate for changing the governor setting i.e. supplementary control for increasing or decreasing the output (generation level), irrespective of type and size, would be one (1.0) percent per minute or as per manufacturers' specified limits. In case frequency falls below 49.5 Hz, partly loaded Generating Units shall pick up additional load at a faster rate according to its capability.

SLDC in consultation with NRPC / NRLDC and Discoms shall prepare an automatic load relief plan during the low frequency conditions.

In case frequency rises to 50.5 Hz or higher, a generating unit shall not be synchronized with the Grid. The MW generation at a generating station (irrespective of type or ownership) shall also not be increased without approval from **SLDC.**

7.10 Except under an emergency, in preventing possible damage to equipments, no **User** shall suddenly decrease its generation by more than 100MW without prior intimation/consent of **SLDC** particularly when frequency is going below 49.0 Hz**.** Similarly, User shall not cause a sudden increase in its load by more than 100MW without prior intimation / consent of **SLDC,** particularly when the frequency is going below 49.0 Hz.

7.11 The Generating Units shall have its Automatic Voltage Regulators (AVRs) in operation, with appropriate settings. If any Generating Unit of over fifty (50) MW capacity is required to be operated without the AVR in service, the **SLDC** shall be informed of the reasons and the duration, and concurrence obtained.

7.12 Power system stabilizers (PSS) in AVR, wherever provided, shall be tuned by the owner of respective generating units as per plan prepared by **STU** from time to time. **STU** shall be entitled to carry out checking of PSS, wherever considered necessary

7.13 **SGS** shall follow the **SLDC** instructions for backing down/ boxing up and shutting down the generating unit(s). **SLDC** shall certify the period of backing down/ boxing up or shutting down for computing the deemed generation, if so required in the **PPA.**

7.14 To ensure system security, proper steps shall be taken for voltage, frequency management and protection coordination as provided under **REGC**.

7.15 Generating Units having capacity of 200 MW and above, sub-stations with operating voltage of 400 kV & above and 220 kV sub-stations with 220/132 kV transformation capacity above 250 MVA shall have the Disturbance Recorders (DRs) and Event Loggers (ELs) fully functional. The DRs/ ELs shall have the time stamping feature of events upto the accuracy of 1 millisecond, independent of scan rate and accuracy of DRs Clock, and shall be capable of time synchronization using GPS time reference.

7.16 The **STU / Discoms** shall provide Under Frequency Relays (UFR) as per UFR plan for load shedding finalized by **NRPC**. **STU / Discoms** shall ensure that the feeders connected on UFRs are exempted from manual load shedding ensuring that the relief through UFRs is available at all times. **STU / Discoms** shall submit the list of the feeders connected on UFRs which are to be exempted from manual load shedding to **SLDC**.

8.0 Chapter-VIII OUTAGE PLANNING

The outage schedule shall be prepared considering the State system operating conditions and the balance of generation and demand with the objective:

(i) to produce a coordinated generation outage programme for the State grid considering the available resources, the transmission constraints and irrigational requirements.

(ii) to minimize the surplus or deficits if any in the system requirement of power and energy and help in operating the system within the Security Standards.

(iii) to optimizes the transmission outages of the State grid without affecting the grid operation by taking into consideration the Generation Outage Schedule, outages of constituents systems and by maintaining the system security standards.

8.1 Outage Planning Process

8.1.1 The outage planning for the next year shall be prepared in the current year and reviewed during the year on quarterly and monthly basis. For this the year-0 means the current year and year - 1 means the next year.

8.1.2 Each **User** and the **STU** shall furnish their proposed outage programme to **SLDC** for the year - 1 by the 31st October of year - 0 with identification of generation 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.

8.1.3 The **SLDC** shall come out with the outage programme for year -1 by 31st December of year - 0 for the State grid considering the available resources in an optimal manner maintaining the security standards, after carrying out the system studies. If need be, the outage programme can be rescheduled. Adequate balance between generation and load shall be ensured while finalizing the outage programme.

8.1.4 The year - 1 plan shall be intimated to the entities for implementation, as may be decided by the **STU** prior to the end of year - 0.

8.1.5 The year-1 plan shall be reviewed by **SLDC/STU** on quarterly and monthly basis in a coordinated manner.

8.1.6 In case of emergency in the system viz. loss of generation, break down of transmission line affecting the system, grid disturbance, system isolation, **SLDC** shall conduct studies again before clearance of the planned outage.

8.1.7 **SLDC** is authorized to defer the planned outage in any of the following cases:

(i) Major grid disturbance,

(ii) System Isolation,
(iii) Blackout in the State / Northern region,
(iv) Any other event in the system that may have an adverse impact on system security by the proposed outage.

8.1.8 Each User shall obtain the **SLDC** approval prior to availing the outage. **SLDC** while allowing outage of a circuit shall issue specific code. Similarly no intra-state circuit shall be connected back to the State Transmission System without specific code and approval by **SLDC.** This restriction shall not be applicable to Generating units of **CPP**.

9.0 Chapter-IX OPERATIONAL PLANNING

This Chapter describes the provisions required to enable **SLDC** to achieve reduction in demand and follow the procedure to avoid operating problems on the **STS**. The **SLDC** shall utilize demand control without undue discrimination against any one or group of consumers.

9.1 Demand Estimation: Each **Discom** shall provide its demand estimates to **SLDC** on monthly basis for the year ahead and on daily basis for the month ahead at each interconnection point.

9.2 Generation Availability: Each **SGS** shall provide its estimated generation availability to **STU** and **SLDC** on monthly basis for the year ahead and on daily basis for the month ahead. SGS shall also provide the generator capacity to **SLDC** on monthly basis by 31st October for the next year.

9.3 Demand Control

SLDC shall match the consolidated demand with the consolidated generation availability from **SGS, ISGS, IPP/CPP** and other sources and shall exercise the Demand Control such that there is a balance between the energy availability and the **Discoms** demand plus losses plus the required reserve.

SLDC shall maintain the historical database for the purpose of demand estimation and be equipped with the state-of-the-art tools such as Energy Management System (EMS) for demand forecasting

If the demand estimation and generation availability figures published by the **SLDC** indicate a significant shortfall or demand gap, in any Discom then that **Discom** shall work out a plan to meet the shortfall. If the shortfall is not met out, a manual load shedding program shall be announced by the **Discom** well in advance.

SLDC shall advice the **STU** to plan Automatic Load Shedding Schemes and rotational load shedding by installing Under Frequency Relays.

The guidelines for under frequency load shedding shall be prepared by the Technical Committee, and approved by the **SPC**. A copy of the approved guidelines can be made available on demand and on payment as may be decided by the **SPC**.

The details of feeders or group of feeders at a EHV sub-station scheduled to be tripped through under-frequency load shedding scheme whether manually or automatic on rotational basis or otherwise shall be displayed on the Notice Board and at the sub-station for the information of consumer(s).

9.4 Operational Liaison

The exchange of information is required in relation to Operations and / or events on the total grid systems, having effect on **STS**, **ISTS** in Northern region, and the system of a regional constituent. The operational liaison function is a built-in hierarchical and mandatory function of the **SLDC**, to facilitate quick transfer of information to the operational staff and to correlate the required inputs for optimization of decision-making and actions.

9.5. Procedure for Operational (operations and events) Liaison

9.5.1 On the Grid :- Before any operation is carried out on the **State Grid**, the **SLDC** shall inform the **Users** whose system may or will experience an operational effect, give operational details to be carried out. The **SLDC** shall immediately following the event on the **State Grid** inform the **Users**, the operational effect giving details of what happened in the event but need not give reason thereof.

9.5.2 On User System: - Before any operation is carried out on the **User** system, the concerned

User shall inform the **SLDC** if the State grid may or will experience the operational effect and shall give operational details. The **User,** immediately following that event shall inform the **SLDC,** if the State grid is to experience the operational effect and give details of what happened in the event and given the reasons for the same if asked for by **SLDC**.

10.0 Chapter -X SCHEDULEING, DESPATCH AND ACCOUNTING

This Chapter describes the procedure for scheduling, despatch and accounting to be adopted by the **Users** to meet the demand and **Drawal** allocation, requirements of **Discoms** and **O A consumers.**

10.1.1 Generation Scheduling: Each **SGS** and OA supplier shall declare the 15 minute time block averaged capability estimate in MW & MVAr at each connection point for the day ahead to **SLDC**.

The **SLDC** shall prepare a day ahead generation ex-power plant schedule keeping in view the:

1. **STS** constraints.
2. Load requirements estimated by **SLDC** for specified intervals.
3. The operating margins and reserves required to be maintained.
4. Generation availability from **SGS, IPPs, CPPs,** and **ISGS** and constraints if any.
5. Overall economy to **Transmission Licensee** and each **Discom.**

The **SLDC** shall instruct the **SGS** to hold capacity reserves (spinning and/or standby) as per **NRPC** guidelines or as may be determined by **SLDC** or as agreed for local conditions.

SLDC may instruct the **SGS** to generate MVAr within the capability limits of its respective generating units to hold station bus-bar voltages at specified levels.

The **SLDC** shall also prepare the injection schedule for grid operation by OA consumers.

10.2 Drawal Scheduling: Each **Discom** and the **OA Consumer** shall provide hourly averaged drawal schedule in MW & MVAr at each connection point for the day ahead to **SLDC**.

The **SLDC** shall scrutinize and compile the Drawal Schedule as received from each **Discom** and OA consumers for grid operation in specified manner at a prescribed time.

10.3 Generation Despatch

SGS shall be responsible for power generation generally as per daily schedules advised to them by **SLDC**.

Actual generation of each **SGS** shall be regulated by **SLDC.**

SGS shall comply with the **despatch instructions** issued by **SLDC** unless the action would compromise the safety of the apparatus and personnel. **SGS** shall also inform the **SLDC** of the unforeseen difficulties in carrying out the instructions.

Under the deficit conditions the **SLDC** shall allow / encourage the **SGS** to generate beyond the given schedule. Deviation from ex-power plant generation schedule shall, however, be appropriately priced through the Unscheduled Interchanges (UI) mechanism.

10.4 Actual Drawal

Distribution companies shall be primarily responsible for managing their load and reactive power drawal and endeavor to restrict their load within its drawal schedule whenever, the system frequency is below 49.5 Hz. When the frequency falls below 49.0 Hz, requisite load scheduling (manual) shall be carried out by the distribution company to curtail the over-drawal as per directions of **SLDC**.

Actual **drawal** by **Discoms** shall be regulated by **SLDC.**

10.5 Despatch instructions shall be given on telephone, confirmed by exchange of names of operators sending and receiving the instructions and logging them at each end. All such telephonic instructions shall be complied with and a confirmation be sent promptly thereafter by Fax, e-mail, Teleprinter or otherwise. Scheduling and despatch function may be implemented by data logging system, where, such facilities exist.

10.6 **Enhancement of Schedule and Despatch** can be suitably done by **SLDC** to cater to tariff agreements reached with **SGS. STU** shall keep the **SLDC** informed of the changes in the Agreements or of additional Agreements.

10.7 Monitoring

10.7.1 The **SLDC** shall continuously monitor the **Generating Unit** outputs, **Drawal** by **Discoms** and **OA consumers** in actual MW and actual MVAr and Bus voltages by using suitable **SCADA** equipments.

10.7.2 Where **SCADA** equipments are not available or are defective or there is delay in installation, **SGS** (excluding CPPs) shall provide the **SLDC** hourly generation summation outputs and other required logged readings. **CPPs** shall provide the hourly export / import MW and MVAr to **SLDC**.

10.7.3 **SLDC** shall inform **SGS,** if, constant monitoring reveals the persistent material mismatch between the **despatch instructions** and the **Generating Unit** output or breach of the **Connection Conditions,** for taking urgent corrective steps**.** Continued discrepancies shall be considered as non-compliance of **SLDC's** directions**.**

10.7.4 The **STU / SLDC** shall request the **NRLDC** and adjacent States to provide additional data required for monitoring.

10.8 **SLDC** shall obtain the metering data for **energy accounting** from

(i) **NRLDC / NRPC**
(ii) **IPP**
(iii) **CPP**
(iv) **SGS**
(v) **OA consumers**
(vi) **Distribution licensee** and
(vii) **STS** including **STU**.

Based on clear demarcation of boundaries, **SLDC** shall keep an account of the electricity transmitted within the state for each **User** as per requirements of the settlement mechanism and as per "Load Despatch Manual and System Operation" Manual.

10.9 Commercial mechanism

10.9.1 Unscheduled Interchange (UI) and Reactive energy account.

SLDC shall prepare the energy account and settlement of UI and Reactive energy drawal / injection as per "**RERC** (Intra state ABT) Regulation 2006" and "**RERC** (Terms &Conditions for Open Access) Regulations 2004" for each **Discom** and OA consumer. Other provisions shall be as here-under:-

(i) Any generation up to 105% of the declared capacity in time block of 15 minutes and averaging up to 101% of the average declared capacity over a day shall not be construed as gaming. The generator shall be entitled to UI charges for such excess generation over and above the scheduled generation.

(ii) For any generation beyond the prescribed limits, the **SLDC** shall ensure that there is no gaming and if gaming is found by the **SLDC**, the corresponding UI charges to the generating station on account of such extra generation can be reduced to zero and the amount shall be adjusted in UI account of beneficiaries in the ratio of their capacity share in the generating station.

10.9.2 The **Discom** and the OA consumers shall settle its commercial transaction directly with the OA customer, Generating companies and the Traders.

10.10 **Data Requirements:** The **Users** shall provide the data for this chapter to **SLDC** in the manner as specified in Chapter-XVI.

11.0 Chapter-XI FREQUENCY, VOLTAGE AND NETWORK LOADING MANAGEMENT

11.1 To maintain **STS** voltages and frequency within acceptable limits, the Regional constituents are required to follow the instructions of **NRLDC** for backing down the generation, regulating loads, MVAr drawal etc. to meet the objective.

The **Transmission Licensee / SLDC** shall optimize the voltage management by adjusting transformer taps to the extent available and switching of circuits/ capacitors/ reactors etc and other operational steps.

11.2 Responsibilities

Close co-ordination amongst the **Users, SLDC** and the **Transmission Licensee** shall exist at all times for the purposes of effective frequency and voltage management.

The **SLDC** shall monitor the actual **Drawal** against the scheduled **Drawal** and shall regulate the internal generation/demand and maintain the schedule. **SLDC** shall also monitor the reactive power drawal and availability of capacitor bank(s).

The **SGS** shall follow the **despatch instructions** issued by **SLDC.**

The **Discoms** shall primilarly be responsible for managing its load and reactive power **drawal** as per instructions of **SLDC.**

11.3 **Frequency Management:** The nominal system frequency is 50Hz. All possible efforts shall be made to ensure that system frequency shall remain in the band of 49.0Hz to 50.5Hz.

11.4 **Voltage Management: STU** and/or **SLDC** shall carry out the load flow studies based on operational data from time to time to predict where the voltage problems may be encountered and to identify appropriate measures to ensure that the voltage remain within the prescribed limits. Based an such studies the **SLDC** shall instruct the **SGS** to maintain the specified voltage level at interconnecting points. **SLDC** and **STU** shall co-ordinate with the **Discoms** to determine voltage level at the interconnection points.

SLDC shall continuously monitor 400kV, 220kV, 132kV voltage levels at strategic sub-stations and take appropriate measures to control **STS** voltages which may include but not be limited to transformer tap changing, capacitor / reactor switching including capacitor switching by **Discoms** at 33 kV substations, operation of Hydro unit as synchronous condenser and use of MVAr reserves with **SGS** within technical limits as agreed to between **STU** and **SGS.**

RVUN and **IPPs** shall make available the up-to-date capability curves for all **Generating Units** to **SLDC**, as detailed in Chapter-VI, indicating restrictions if any, to allow more accurate system studies and effective operation of the **STS.** The **CPPs** shall furnish the net reactive capability available for Export to/Import from **STS.**

The **Discoms** shall participate in voltage management by providing Local VAR compensation as far as possible, in low voltage system close to load points not depending on **EHV Grid** for reactive support.

11.5 **Network Loading Management:** The **SLDC** shall carry out the periodic studies of the intra-state network loading at least once a year to assess the transfer capability of the state as a whole as well as **Discom** wise and post such information on its website. This shall form the basis for approving Short Term OA transaction at the inter state level.

12.0 Chapter -XII CONTINGENCY PLANNING

12.1 **General:** The recovery process is to be followed by all the **Users** in the event of contingency i.e. total or partial blackouts of **STS** or Regional Transmission System to achieve the fastest recovery taking into account the essential load, Generator capabilities and system constraints.

12.2 **Contingency Planning Procedure:** The contingency planning and blackstart procedure for the **State Transmission System** shall be as per Load Despatch & System Operation Manual.

12.3 **Restoration Procedure:** The restoration procedure for **STS** shall be prepared by **SLDC** for the following contingency:

(i) Total system black out
(ii) Partial System Blackout
(iii) Synchronisation of System Islands and System Split (separation)

The procedure shall be in conformity to the Recovery Procedure of the **Northern Region** prescribed under **IEGC** to be updated with new network parameters.

The restoration process shall take into account the generator capabilities and the operational constraints of Region and **STS** in achieving normalcy in the shortest possible time. The Users should be aware of the steps to be taken during the **Grid Disturbance** and system restoration process.

12.4 During the restoration period as certified by **SLDC** the provision of ABT shall remain

suspended.

12.5 During the restoration period the users are expected to promptly comply with the directions of **SLDC** with regard to dispatch and use of electricity to assist the grid for faster recovery towards normalcy.

12.6 During the period of restoration the energy account for the difference between the open access injection and open access drawal shall be settled by **SLDC** by considering the entire difference of energy as banked with the grid or open access supplier, as the case may be and allowed for use latest by next billing cycle.

12.7 Special Considerations

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

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

All **Users** shall pay special attention in observing the procedures, with a view to avoid the secondary collapse due to undue haste or inappropriate loading.

Even in emergency situation, prompt and complete logging of all operations and operational messages shall be ensured by the **Users** to facilitate subsequent investigation of the incident and the efficiency of the restoration process. Such investigation shall be conducted promptly after the incident.

13.0 Chapter -XIII INTER USER BOUNDARY SAFETY

13.1 General: The chapter deals with the procedure ensuring safe working practices associated with the inter-user boundary operations, to be followed when work is required to be carried out on electrical equipments that is connected to another **User's** system and to have agreement and consistency with the safety principles.

13.2 **The Transmission Licensee / STU** and the **Users** shall nominate authorized persons as **Designated Officers** to be responsible for the co-ordination of safety across that company boundary.

13.3 Procedure

The **Transmission Licensee** / **STU,** shall issue list of **Designated Officers** (names, designation and telephone numbers) of all the **Users** at connection point having a direct inter-user boundary with the **Transmission Licensee / STU** and shall promptly update whenever there is any change.

All **Users** with a direct inter-user boundary with **Transmission Licensee / STU** or other **User** system shall send list of their **Designated Officers** to **Transmission Licensee / STU** or other **Users** and shall promptly update whenever these is any change.

When a work across an inter-user boundary between **Transmission Licensee / STU** and the other **User** or between two **Users** is to be carried out, the **Designated Officer** of the **User,** wishing to carry out work shall personally contact the other end **Designated Officer** to obtain permission to work (PTW) through telephone, and exchange code words to ensure correct identification of the parties.

If the work extends to another shift the, **Designated Officer** shall ensure that the relieving **Designated Officer** is fully briefed about the nature of work and the operating code words.

The **Designated Officers** shall cooperate to establish and maintain the precautions necessary for the work to be carried out in the safe given manner. Both, the established isolation and the established earthing shall be in locked position, where such facilities exists, and shall be clearly identified.

Work shall not commence until the **Designated Officer** of the **User** wishing to carry out the work, is satisfied that all the safety precautions have been established. The other end **Designated Officer** shall issue the safety documentation i.e **Permit To Work (PTW)** to the working party to allow work to commence. The **PTW** in respect of EHV lines and other interconnections shall be

issued with the consent of **SLDC.**

On completion of work and when safety precautions are no longer required, the **Designated Officer,** responsible for the work being carried out, shall make direct contact with the other end **Designated Officer** to return the **PTW** and for removal of safety precautions. Return of **PTW** in respect of specified EHV lines and interconnections shall be informed to **SLDC.**

The equipment shall be considered suitable for service when all safety precautions are confirmed as removed; using code word contact between the two **Designated Officers** at both ends**,** and return of **PTW** from the working party has taken place.

The **STU** shall adopt an agreed written procedure for inter-user boundary safety and shall continually update it.

Disputes relating to Inter-user Boundary Safety shall be resolved at appropriate level of authority.

13.4 Special Considerations: For inter - user boundary between **Transmission Licensee** and other **User** circuits, all **Users** shall comply with the safety rules, in accordance with **IE Rules 1956 till** the safety standards are specified by the CEA.

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

Each **Designated Officer** shall maintain a legible safety log, in chronological order, of operations and messages relating to safety coordination sent and received by him. The safety logs shall be retained for a period of not less than 10 years.

14.0 Chapter -XIV OPERATIONAL EVENT/INCIDENT AND ACCIDENT REPORTING

14.1 General: The incidents to be reported, the reporting route/procedure to be followed and the information to be supplied ensuring a consistent reporting approach for incidents and accidents on the **STS** is given below. However, this shall not relieve the **User** from the event reporting obligation in accordance with **IE Rules** 1956 till the safety standards are specified by CEA.

14.2 Reportable Incidents: The incidents /event that could affect the **STS** require reporting are:

(i) Exceptionally high / low system voltage or frequency.
(ii) Serious equipment problem i.e. major circuit breaker, transformer or bus bar.
(iii) Loss of major **Generating Unit.**
(iv) System split, **STS** breakaway or **Black Start.**
(v) Tripping of Transmission Line, ICT (Inter connecting transformer) and capacitor banks.
(vi) Major fire incidents,
(vii) Major failure of protection,
(viii) Equipment and transmission line overload,
(ix) Fatal and Non-Fatal - Accidents,
(x) Load Crash / Loss of Load
(xi) Excessive Drawal deviations,
(xii) Minor equipment alarms.

The events at (xi) & (xii) above are typical examples of lesser consequence, but still affect the **STS** and can be classified as minor and may require corrective action but may not warrant management reporting until the problems repeated and persist for sufficient time.

14.3 Reporting Procedure

i All reportable incidents occurring in lines and equipments of 33 kV and above affecting the **STS** shall be promptly communicated by the User having experienced the incident (The Reporting **User)** to the affected **Users** and to **SLDC.**

ii Within an hour of being informed by the Reporting **User,** the **SLDC** shall ask for a written report of the incident.

iii If the reporting incident cannot be classified as minor then the Reporting **User** shall submit initial written report within two hours of asking for a written report by **SLDC.** This shall be followed by a comprehensive report within 48 hours of sending of the first report.

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

14.3.1 **SLDC** may call for a report from any **User** on any reportable incident affecting other **Users** and **Transmission Licensee** where the **Users** equipment might have been the source of the reportable incident.

The format of such report shall be as agreed at the **SPC** but would typically containing the following information:

i Location of the incident.
ii Date and time of the incident.
iii Plant or equipments involved.
iv Details of relay indications with fault implications.
v Supplies interrupted and duration if applicable.
vi Amount of generation lost, if applicable.
vii Brief description of incident.
viii Estimated time to return to service.
ix Name of incident originator.
x Possibility of alternate arrangement of power supply.
Xi Printout of Disturbance Recorder and Event Loggers, if installed.

14.4 **Reporting Form:** The standard reporting form other than for accidents, shall be as agreed by **SPC.** A typical form is attached as at Appendix-C**.**

14.5 **Major Failure:** Following a major failure, **STU** / **Transmission Licensee / SLDC** and other **Users** shall co-operate to inquire and establish the cause of such failure and evolve appropriate recommendations. The **STU** shall furnish the enquiry report to the **SPC.** The enquiry report with it's recommendations of **SPC** shall be submitted to the **Commission** within 2(two) months of the incident.

14.6 **Accident Reporting** shall be in accordance with the I. E. Rules, 1956 presently in force and shall be governed by the provisions made by the appropriate Government under Section 161 of Electricity Act, 2003 and safety regulations specified by **CEA**. The report of both fatal and non-fatal accidents shall be sent to the Electrical Inspector in the prescribed form.

15.0 Chapter-XV PROTECTION

15.1 **General:** In order to safeguard **Users** power system, the minimum protection requirements for the equipments connected to the **STS** and to minimize disruption due to faults, following standards of protection shall be adopted.

15.2 **Protection Principles**

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

For **EHV** system, numerical relay or relays with latest technology and proven practice shall be provided even if the requirement listed hereunder might reflect a specific type of relay. For other system voltages, numerical relay is preferable.

The **SGS & Discoms** shall co-operate with the **Transmission Licensee** ensuring correct and appropriate setting of protection ensuring effective, and discriminatory removal of faulty equipments within time for target clearance specified for the purpose.

Protection settings shall not be altered, or protection bypassed and/or disconnected without consultation and agreement of the affected **Users.** Wherever protection is bypassed and/or disconnected, by agreement, the cause shall be rectified and protection restored to normal as quickly as possible. If an agreement is not reached the electrical equipment shall be removed from service forthwith.

SLDC shall advise the **Transmission Licensee** regarding

a) Planning for upgrading and strengthening the protection system based on

grid disturbance analysis and partial/total blackout in the State Transmission System.

b) Planning of Islanding and system split schemes and installation of Under Frequency Relays and df/dt relays.

c) Under-Frequency relay for load shedding, Relays provided for islanding scheme, disturbance recorder and fault locator installed at the sub-stations and for its testing and calibration.

15.3 Protection Coordination: The Protection Coordination Committee shall be responsible for protection coordination functions as mentioned in **REGC.** The **Transmission Licensee** shall investigate into any malfunction or other unsatisfactory protection issues and shall report to Protection Coordination Committee. The decision of the protection coordination committee shall be promptly implemented by **Transmission Licensee and Users.**

15.4 Fault Clearance Times & Short Circuit Current Ratings:

From stability consideration the minimum short circuit current rating and the maximum fault clearance time(s) for faults on **User's** system directly connected to the **STS**, or any faults on the **STS** itself, are as follows:

Nominal Voltage	Minimum Short Circuit current rating of Switch-gear	Target Fault clearance Time
kV	kA (rms)	Milli sec.
400	40	100
220	40	160
132	31.5	160
33	26.3	
11	26.3	

Slower fault clearance time for faults on any **User** system may be agreed to, if in **STU** opinion system condition allows this. At Generating stations the line faults should be cleared at the generating station end, within the critical clearing time, for the generators to remain in synchronism.

15.5 Generator Protection Requirements: The guidelines given in the Manual on Protection of Generators, Generator Transformers, 220 kV and 400 kV networks" vide publication no.274 of CBIP shall be kept in view.

All **Generating Units** and all the associated electrical equipments of the **SGS** connected to **STS** shall be provided with adequate protection so that the **STS** does not suffer due to any disturbance originating from the Generating unit. As per **CBIP** publication no.274, the generator protection schemes shall cover at least the back up voltage controlled over current, 95% Stator Earth fault, field ground protection, negative sequence protection, under frequency, reverse power protection, Generators having 10 MVA rating, additional protection like Differential protection, over flux protection, back-up impedance, loss of field protection, low forward power protection (for steam turbine – generator only) are to be provided. Pole slipping and 100% Stator Earth fault protection are to be provided only for the Generating units above 100MVA rating.

15.6 Transmission Line Requirements: Every **EHV** line taking off from a **Power Station** or a sub-station shall have the protection and back up protection as mentioned below. **STU** shall notify the policy changes on protection from time to time to the **Users**.

15.6.1 400 kV Transmission Lines: All 400 kV transmission lines shall have two fast acting protection schemes, the voltages to the two relays shall be fed from two different cores of the line CVT (Current Voltage Transformer) and the currents to the two relays shall be fed from two different cores of the line CTs (Current Transformers).

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

Main-2 protection scheme shall be three zone, non-switched fast acting

distance protection scheme preferably having different technical philosophy than Main-1 but may be of same make with permissible inter-trip / blocking at remote end (in case of zone-2 fault) .

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

Over voltage relay for steady state and transient over voltage rise shall also be installed.

400kV system shall be provided with breaker failure protections (BFP)/ local breaker back up (LBB) with remote end breaker tripping facility.

Directional overcurrent and earth fault backup protection (Stand alone mode) shall be provided.

400 kV line protection shall have the inter trip / block arrangement through carrier so that tripping at one end of line is transmitted to other end also.

15.6.2 400kV Bus-bars & Breaker Failure Protection: All 400 kV sub-station shall have the bus bar differential protection scheme with built in BFP/LBB protection. Separate breaker failure protection (BFP/LBB) shall be provided which may be part of any protection scheme/ panel as per **Users'** option and design.

15.6.3 220 kV Transmission Lines: All 220 kV transmission lines shall have single, three zone non-switched distance protection with permissive inter-trip for accelerating tripping at remote end in case of zone-2 fault as Main-I protection. Three-pole auto-reclosing with adjustable dead time shall be provided. The back up Main-II protection shall have three zone switched distance protection with carrier accelerating tripping or blocking at remote end. As back-up protection, three directional IDMTL over current relays and one directional earth fault relay shall be provided. 220 kV Transmission lines shall have the breaker failure protection with facilities of remote end breaker tripping.

15.6.4 220kV Bus-bars & Breaker Failure Protection: All 220kV sub-station shall have bus bar differential protection scheme with built in LBB protection. Separate BFB/LBB shall be provided which may be part of any protection scheme/ panel as per Users option and design.

15.6.5 132kV Lines: All 132kV lines shall have three zone switched/ non-switched distance protection as main protection. Permissive inter trip for accelerating tripping at remote end in case of a zone-2 fault shall be provided for important 132kV grid connected lines or emanating from a generating station. The backup protection shall be directional three phase over current and earth fault protection.

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

Relay Panels for the protection of lines of **Transmission Licensee** taking off from a **Power Station,** shall be owned and maintained by **SGS.** Any transmission line related relay settings or any change in relay settings shall be carried out by **SGS** in close co-ordination and consultation with **Technical Committee's** approval. All such issues shall be put up in the next Technical Committee meeting for ratification. Carrier cabinets / equipment, Line matching units including wave traps and communication cable shall be owned by the Generators and may be maintained by **Transmission Licensee** at the request of **Generators.** The **Generators** shall provide space, **Connection** facility, access to the **Transmission Licensee** for such purposes.

15.7 Distribution Line Requirements:

All 33 kV and 11 kV lines at **Connection** points shall be provided with a minimum of over current and earth fault protection with or without directional features with high-set element. Co-ordination with the originating EHV sub-station should be ensured by Discoms so as to avoid tripping of major sub-station equipment / EHV transmission lines on through-faults due to delayed fault clearance in the distribution feeders. Protection system of **Discoms** on 33 kV & 11 kV transformers and lines or its sectionalizing points shall be coordinated with the protection system provided on 33 kV & 11 kV connection points at EHV sub-stations. **Discoms** shall give phased programme of providing protection on its HV & LV system (if not already installed) within 3 months.

15.7.1 **Non-Parallel Radial Feeders:** Non-directional Inverse Definite Minimum Time Lag (IDMTL) over current and earth fault relay with suitable settings shall discriminate between the adjacent relay stations. Instantaneous highset element shall also be provided on non-parallel feeders.

15.7.2 **Parallel Feeders/ Ring Feeders:** Directional IDMTL over current and earth fault relays with high set instantaneous element shall be provided on parallel/ ring feeders.

15.7.3 **Long Feeders / Transformer Feeders:** For long feeders or transformer feeders, the relays shall have directional IDMTL over current and earth fault relays with high set instantaneous element.

15.8 **Transformer Protection Requirements:** The protection of Auto transformers, Power transformers and Distribution transformers shall be as per revised manual on transformers published by Central Board of Irrigation and Power (CBIP) Publication No.275.

15.8.1 **Generating station/ STS:** All windings of Auto (inter connecting) Transformers and Power Transformers of EHV class shall be protected by differential relays having percentage bias and harmonic restraint features, Restricted Earth Fault (REF) and over-fluxing relays, besides back up IDMTL over current and earth fault protection. For protection against heavy short circuits, the over current relays shall incorporate a high set instantaneous element. In addition to electrical protection, gas operated relays (Buchholz and PRV), winding temperature protection and oil temperature protection shall provided.

15.8.1.1 All EHV class power transformers shall be provided with protections as mentioned in 15.8.1. In addition the Neutral Displacement Relay shall be provided for earth fault protection of delta-connected tertiary winding and connected in 'Alarm' mode. 400 kV & 220 kV class Power Transformers shall have double Pressure Relief Valve (PRV) Protection Scheme.

15.8.1.2 For 132 kV class transformers having 5MVA or more capacity but less than 10 MVA, the protections shall be same as per 15.8.1, except that REF relays need not be provided in existing installations.

15.9 **Distribution System:** For smaller transformers of HV class on the Distribution System differential protection shall be provided for 10 MVA capacity and above with back up non-directional IDMTL over current and earth fault protection inter-tripping of HV and LV side breakers. Transformers of 1.6 MVA and above and less than 10 MVA capacity shall be protected by IDMTL over current and earth fault. All transformers above 1.6 MVA and above shall be provided with gas-operated relays, winding temperature protection and oil temperature protection. For the existing transformers, where the aforesaid protections are not provided, it shall be deliberated in **Technical Committee** for providing the said protections in a phased manner within 3 years.

15.10 **Sub-Station Bus Bar Protection:** The **Users** shall provide adequate Bus zone protection for substation Bus Bars in 220 kV class and above grid substations with built in LBB protection as per Users option and design.

15.11 **Sub-Station Fire Protection:** Adequate precautions shall be taken and protection shall be provided against fire hazards to the **Users' Apparatus** conforming to relevant Indian Standard Specification and /or provisions in I.E. Rules or the safety standards as specified by the Authority under Section 53 of the **Act** whichever is applicable.

15.12 **Calibration & Testing:** Calibration and Testing shall be carried out periodically as may be decided by Technical Committee or immediately after any major fault or suspected mal-operation.

15.13 **SGS, STU, Discoms** and other **Users** shall extend full co-operation in commissioning of System Protection Schemes finalized by the **NRPC** and Protection Coordination Committee of **SPC**. Installation and commissioning of the System Protection Schemes and its operation shall be closely monitored by the Protection Coordination Committee.

15.14 **Data Requirements: Users** shall provide data for this chapter to **STU** in the manner as specified in the Chapter-XVI.

16.0 Chapter -XVI DATA REGISTRATION

16.1 General: The responsibility and categorisation of the data required to be provided by **Users** to **STU/SLDC** and vice versa shall be as under:

16.2 Responsibility:

The **Users** shall be responsible for submitting updated data to **STU/ SLDC** and **STU** shall provide updated data to the **Users** (whenever asked for) in accordance with the provisions of the **Grid Code.**

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

The responsibility for the correctness of the data rests with the data provider

16.3 Data Categories and Stages in Registration: Data, as required to be exchanged, have been listed in the Appendices under various categories with cross-reference to the concerned Chapters.

16.4 Changes to Users Data: When any **User** becomes aware of a change in any item of data registered with **STU,** the **User** must promptly inform the **STU** of the changes. The **STU** shall promptly correct the database accordingly. This shall also apply to any data compiled by **STU** regarding **STS**.

16.5 Methods of Submitting Data: The data shall be furnished in the standard formats being used for the written submission of data to **SLDC/STU.**

Where standard formats are not available, the formats shall be developed by **SLDC / STU** in consultation with **Users.**

Where a computer data link exists between a **User** and **SLDC/ STU,** data may be provided in the same format as specified for paper transmission but for electronic encoding. The **User** shall evolve and agree on the method to be used in consultation with **SLDC/ STU** and resolve the issues such as Protocols, transmission speeds etc. for data transmission.

Any other mode of data transfer can be utilised if **SLDC/ STU** gives a written consent.

16.6 Data not supplied: Users are obliged to supply data as referred to in the individual chapter of the **Grid Code**. If any data is missing and not supplied by any **User,** then the **STU** or **SLDC** may have reasonable estimation of such data depending upon the urgency of the situation when necessary. Similarly where any data is missing and not supplied by **STU,** the concerned **User,** depending upon urgency of the situation, may estimate the data based on corresponding data for similar plant or **Apparatus** as the case may be or as deemed appropriate by the **User** or **STU** or **SLDC**. Non-supply of data shall be considered as violation of **REGC**.

16.7 Special Considerations: The STU and **SLDC** or any other **User** may make a reasonable request for additional data as may be required.

APPENDIX- A
(Refer Chapter – V)

PLANNING / CONNECTIVITY DATA

1.0 Generation Data

1.1 Name of Power Station

1.2 Station type – Thermal (coal, gas, oil), Hydro (Reservoir type), ROR (with hours of Storage/ Pump Storage), GT/CCGT.

1.3 Station capacity -

i) Total Capacity

ii) Number of units and size

1.4.1 Thermal Station

i) Rating of Boiler, Turbine and major auxilliaries

ii) Peaking availability and peaking capability

1.4.2 GT/CCGT

i) Natural gas / LNG / Oil

ii) Salient features of GT/CCGT

iii) Peaking availability and peaking capacity

1.4.3 Hydro

i) Schematic layout showing dam reservoir area, water conductor system, fore bay, powerhouse etc.
ii) Rating of turbine and other major equipments
iii) Reservoir data and operating table
iv) Operating head maximum and minimum

1.4.4 Captive power plant – Salient features including plant capacity and power exchange.

1.5. Generators

i) Type
ii) Rating / MVA
iii) Voltage
iv) Speed
v) Inertia constant H (MW Sec/MVA)
vi) Rated P F
vii) Reactive power capability
viii) S.C. ratio
ix) X_d , X'_d , X''_d (Saturated & Unsaturated)
x) X_q , X'_q , X''_q (Saturated & Unsaturated)
xi) T'_{do}, T''_{do}
xii) T'_{qo}, T''_{qo}
xiii) Stator resistance, leakage reactance or Potier Reactance
xiv) Stator time constant
xv) Rated field current xvi)
Neutral grounding
xvii) Generator Capability Curve

1.6. Generators Transformers

i) Type
ii) Rated capacity / MVA

iii) Voltage ratio and vector group
iv) Tap changer range
v) On load / Off load tap changer
vi) Percentage impedance – Positive and Zero Sequence
vii) Grounding of Generator Transformer
viii) X / R Ratio

1.7. Excitation

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

1.8. Governor System

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

1.9. Protection and Metering

(I) Generator protection

(II) Generator Transformer protection

(III) Motor protraction

(IV) Bus bar protection

(V) Metering details

1.10. Operational parameters

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

2.0 <u>Transmission Data</u>

2.1 Single line diagram of transmission system down to 132/33 kV S/S.

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

2.2 Transformer parameters – Rated MVA, Voltage rating and vector group, Positive and Zero Sequence Impedance, Tap Changer (on / off load) and range, Transformer Grounding and X/R Ratio.

2.3 Component details – Circuit breaker, Isolating switches, Current and Potential transformers.

2.4 Relays and Meters

i) Protection details for all transformers and feeders
ii) Metering details.

2.5 Line parameters – Line designation, Year of commissioning, line Length (Kms), Line capacity (Thermal & surge impedance), No. of circuits, per unit circuit impedance on 100 MVA and admittance values (positive & zero sequence).

3.0 Distribution Data

3.1 Name of substation of STU from where the connection is made.

3.2 Quantum of power (MW) / MVA to be drawn / injected from / to of STU S/S and voltage and no. of circuits required.

3.3 The length and size of the feeder and no. of distribution S/S connects to the feeder for supply of load to distribution area.

3.4 Reactive compensation used to control reactive drawal from STU, feeder-wise.

3.5 Details of protection and metering for the feeders.

3.6 Type of Load or Load characteristic (whether constant power or Voltage impedence, etc.)

4.0 Load Forecast Data

4.1 Consumer data – Furnish consumers categories, their nos., connected load.

4.2 Peak load and energy forecast for each connection point / in the face point for each category of load for succeeding 10 years.

4.3 Forecast Methodology and assumptions.

4.4 If supply is received from more than one STU S/S, the S/S-wise break-up of peak load and energy projections for succeeding 10 years with estimated daily load curve.

4.5 Details of bulk load 5 MW and above, supply Voltage, S/S from where it is to be fed.

5.0 Protection Data

5.1 Full description including settings for all relays and protection systems installed on

(a) Generating Unit**,** Generator unit Transformer, Auxiliary Transformer and electrical motor of major equipments.

(b) All outgoing feeders from Power Station switchyard, Tie circuit breakers, incoming circuit breakers.

(c) Inter-tripping of circuit breakers at Connection point/ points with the **Transmission System.**

5.2 Fault clearance time for electrical faults on the User's System.

5.3 Full description of operational and commercial metering schemes.

6.0 System Studies

6.1 Load Flow studies (Peak and lean load for maximum hydro and maximum thermal generation).

6.2 Transient stability studies for three-phase fault in critical lines and Single pole reclosing for 400kV lines and critical 220kV lines.

6.3 Dynamic Stability Studies.

6.4 Short circuit studies (three-phase and single phase to earth)

6.5 Transmission and Distribution Losses in the system.

7.0 Demand Data (For all substations)

7.1 Demand Profile (Peak and off Peak load).

8.0 Reactive Compensation Equipment

8.1 Type of equipment (fixed or variable).

8.2 Capacitive and/or Inductive rating or its operating range in Voltage and MVAr.

8.3 Details of control.

8.4 Connection point to the System.

APPENDIX-B
(Refer Chapter – VI)

SITE RESPONSIBILITY SCHEDULE

CONNECTION CONDITIONS

Name of Power Station/Sub-Station Site:

Owner: **Tel. Number:** **Fax.Number:**

E-mail ID:

Items of Plant/ Apparatus	Plant Owner	Safety Responsibility	Control Responsibility	Operational Responsibility	Maintenance Responsibility	Remarks
kV Switchyard Equipments including busbars						
Feeders						
Generating Units						

APPENDIX-C
(Refer Chapter – XIV)

INCIDENT REPORTING

OPERATIONAL EVENT /INCIDENT REPORTING

FIRST REPORT Date:
Time:

1. Date and time of incident
2. Location
3. Type of incident
4. System parameters before the incident (Voltage, Frequency, Flows, Generation, etc.)
5. Relay indications received and performance of protection
6. Damage to equipment
7. Power Supply interrupted and duration
8. Quantum of Generation lost
9. Alternate supply arrangement
10. Estimate of time to return service
11. Cause of incident
12. Other relevant information and remedial action taken
13. Recommendations for future improvement/repeat incident
14. Name of the Originator.
15. Printout of Disturbance Recorders and Event Loggers, if installed