GRID CODE

Part-II

LOAD DESPATCH & SYSTEM OPERATION CODE

Registered office: Vidyut Bhavan, Jyoti Nagar, Jaipur –302 005
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# GRID CODE REVISIONS

## (Part II: Load Despatch & System Operation Code)

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<tr>
<td>ABT</td>
<td>Availability Based Tariff</td>
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<tr>
<td>AVR</td>
<td>Automatic Voltage Regulators</td>
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<td>Bhakra Beas Management Board</td>
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<td>CERC</td>
<td>Central Electricity Regulatory Commission</td>
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</tr>
<tr>
<td>CMD</td>
<td>Chairman &amp; Managing Director</td>
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</tr>
<tr>
<td>CTU</td>
<td>Central Transmission Utility</td>
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<tr>
<td>DISCOM</td>
<td>Jaipur, Jodhpur or Ajmer Vidhyut Vitaran Nigam Limited</td>
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<td>DOT</td>
<td>Department of Telecommunication</td>
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<tr>
<td>GSS</td>
<td>Grid Sub-station</td>
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<td>IEGC</td>
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<td>Inter State Generating Stations</td>
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<td>Inter State Transmission System</td>
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<td>J&amp;K</td>
<td>Jammu &amp; Kashmir State</td>
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<tr>
<td>JS</td>
<td>Jawahar Sagar</td>
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</tr>
<tr>
<td>KTPS</td>
<td>Kota Thermal Power Station</td>
<td></td>
</tr>
<tr>
<td>kV</td>
<td>Kilo Volt</td>
<td></td>
</tr>
<tr>
<td>LD</td>
<td>Load Despatch</td>
<td></td>
</tr>
<tr>
<td>LDC</td>
<td>Load Despatch Centre</td>
<td></td>
</tr>
<tr>
<td>LU</td>
<td>Lakhs Units</td>
<td></td>
</tr>
<tr>
<td>MU</td>
<td>Million Units</td>
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</tr>
<tr>
<td>MVar</td>
<td>Mega Volt Ampere</td>
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</tr>
<tr>
<td>MW</td>
<td>Mega Watt</td>
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<tr>
<td>MWh</td>
<td>Mega Watt Hours</td>
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<td>Northern Regional Electricity Board</td>
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<tr>
<td>NRLDC</td>
<td>Northern Regional Load Despatch Centre</td>
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</tr>
<tr>
<td>OCC</td>
<td>Operation Coordination Committee</td>
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<td>OLTC</td>
<td>On Load Tap Changers</td>
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<td>PGCIL</td>
<td>Power Grid Corporation of India Limited</td>
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<td>PLCC</td>
<td>Power line carrier communication</td>
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<td>PTW</td>
<td>Permission to work</td>
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<tr>
<td>RAPP</td>
<td>Rajasthan Atomic Power Project</td>
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<td>RERC/Commission</td>
<td>Rajasthan Electricity Regulatory Commission</td>
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<td>RLDC</td>
<td>Regional Load Despatch Centre</td>
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<td>RPS</td>
<td>Rana Pratap Sagar</td>
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<tr>
<td>RTU</td>
<td>Remote Terminal Unit</td>
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<tr>
<td>RVPN /RRVPNL</td>
<td>Rajasthan Rajya Vidyut Prasaran Nigam Limited</td>
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<td>RVUN</td>
<td>Rajasthan Rajya Vidyut Utpadan Nigam Limited</td>
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<tr>
<td>SCADA</td>
<td>Supervisory Control And Data Acquisition System</td>
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<td>SLDC</td>
<td>State Load Despatch Centre</td>
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<td>STPS</td>
<td>Suratgarh Thermal Power Station</td>
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<td>STU</td>
<td>State Transmission Utility</td>
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<td>UF</td>
<td>Under Frequency</td>
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<tr>
<td>UFR</td>
<td>Under Frequency Relay</td>
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<tr>
<td>UI</td>
<td>Unscheduled Interchange</td>
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<tr>
<td>ULDC</td>
<td>Unified Load Despatch &amp; Communication</td>
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<tr>
<td>UP</td>
<td>Uttar Pradesh</td>
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<tr>
<td>UT</td>
<td>Union Territory</td>
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<tr>
<td>UTILITY</td>
<td>RVPN, RVUN OR DISCOM or any other distribution or Transmission Licensee or Generating Company, referred Individually</td>
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</tr>
<tr>
<td>VAR</td>
<td>Volt Ampere Reactive</td>
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<tr>
<td>VDU</td>
<td>Visual Display Unit</td>
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</table>
1. Existing Facilities, Procedures and Schemes
Chapter-1

1 Overview

1.1 Introduction

1.1.1 Rajasthan State Power System operates in synchronous with Northern Regional Grid. Northern Regional Grid System consists of power systems of constituent States and Union Territory of Haryana, Punjab, Rajasthan, Uttar Pradesh, Uttarakhal, Himachal-Pradesh, Delhi, Jammu and Kashmir and Chandigarh, Inter-State Generating Stations of National Thermal Power Corporation (NTPC), National Hydro Power Corporation (NHPC), Nuclear Power Corporation (NPC), Bhakra Beas Management Board (BBMB), partnership share in Chambal-Satpura Project and Inter-State Transmission System of Power Grid Corporation of India Limited (PGCIL) and transmission system of BBMB.

1.1.2 Rajasthan State Power System have generating stations of Rajasthan Rajya Vidyut Utapdan Nigam Limited (RVUN), Captive Power Stations, partnership projects and ISGS located within state and connected to State Transmission System. The distribution network of three Discoms namely Jaipur Vidyut Vitaran Nigam Ltd. (JVVN), Ajmer Vidyut Vitaran Nigam Ltd. (AVVN) and Jodhpur Vidyut Vitaran Nigam Ltd. (JdVVN) connected to State Transmission System at various inter-connection points.

1.1.3 Power Map of Rajasthan System shown at Annexure 1.1 and 400 kV Grid Diagram of Northern Region shown at Annexure 1.2 respectively.

1.1.4 The highlights of Rajasthan Power System and load despatch facility at State Load Despatch Centre (SLDC) have been described at Chapter 2.

1.2 Northern Regional Grid System

The role of various agencies operating in the Northern Regional Grid and their organisational linkages with RVPN and the SLDC as per Electricity (Supply) Act 1948 and Electricity Act 1910 as amended by the Electricity Laws (Amendment) Act, 1998 are briefly described below:

1.2.1 Northern Regional Load Despatch Centre (NRLDC)

NRLDC is engaged in the activities of integrated operation of power system of the Northern Region. NRLDC is operated by PGCIL, which has been notified as Central Transmission Utility (CTU) by the Central Government under section 27 (A) (i) of Indian Electricity Act, 1910.

(i) NRLDC is the apex body to ensure integrated operation of the power system in the Northern Region, and
(ii) NRLDC may give such directions and exercise such supervision and control as may be required for ensuring integrated grid operations and for achieving the maximum economy and efficiency in the operation of the power system in the Northern Region.

(iii) Every licensee (including Jaipur, Jodhpur & Ajmer Vidyut Vitaran Nigams), transmission licensee (including RVVPN), generating company (including RVUN), generating stations (including RAPS-A), substations and any other person connected with the operation of the power system has to comply with the directions issued by SLDC and NRLDC through SLDC.

(iv) Northern Regional Electricity Board (NREB) may mutually agree with the constituents on matters concerning the smooth operation of the integrated grid and economy and efficiency in the operation of the power system in Northern Region and every licensee, transmission licensee and others involved in the operation of the power system shall have to comply with the decision of the NREB. The following are contemplated as exclusive functions of NRLDC:

- System Operation and control including inter-state/inter-regional transfer of power covering contingency analysis and operational planning, on real time basis
- Scheduling/re-scheduling of generation
- System restoration following grid disturbance
- Metering and data collection
- Compiling and furnishing data pertaining to system operation

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

The State Load Despatch Centre (SLDC) is engaged in the activities of real time operation of the power system in the State under the provisions of the Section 55 (4) of the Electricity (Supply) Act, 1948. As per the provisions of section 55 (i) of the Electricity (Supply) Act 1948, State Load Despatch Centre at Heerapura Jaipur is operated and maintained by Rajasthan Rajya Vidhyut Prasaran Nigam Limited (RVVPN), which is notified by the State Government as State Transmission Utility under section 27 (B)(i) of Indian Electricity Act, 1910. The functions and responsibilities of the SLDC shall be as follows:

(i) State Load Despatch Centre in a State subject to the provisions of the sub-section 55(3) of the Act, may give such directions and exercise such supervision and control as may be required for ensuring the integrated grid operations and for achieving the maximum economy and efficiency in the operation of the power system in that State.

(ii) All directions issued by the Regional Load Despatch Centre to any transmission licensee of the State Transmission lines or any other licensee of the State or generating company (other than those connected to inter-state transmission system) or sub-station in the State shall be issued through the State Load Despatch Centre (SLDC) and the State
Load Despatch Centre shall ensure that such directions are duly complied by the transmission licensee or licensee or generating company or sub-station.

(iii) The regional Load Despatch Centre or State Load Despatch Centre, as the case may be shall enforce the decision of the Regional Electricity Board.

1.3.1 SLDC Functions & Responsibility

The following are contemplated as principal functions of the SLDC:

- Liaison with the State Generating Units, Distribution Companies, IPP, CPP and NRLDC and other in matters related with operation of State Transmission System.
- Collection of data related with system operations, interchange and exchange of energy.
- System Analysis, System Studies, Protection Coordination, preparation of Reports for management information.
- Scheduling and dispatching of ISGS and State Sector Generating Units.
- Monitoring generation, O&M schedule, Hydel Reservoirs particulars, Outage of generating plants.
- Tracking the progress of Generation and Transmission projects.
- Monitoring scheduled and un-scheduled interchange of Central Power and advising the Users to maintain schedule drawal.
- Real time monitoring of State Transmission System and operational coordination with Users.
- Monitoring of active and reactive power flows on the lines/ICTs and coordination for frequency control and voltage regulation.
- Co-ordination for generation outage planning and outage of State Transmission System.
- Development and review of operating Procedure and Grid Code
- Arranging periodical meetings of various committees constituted under Grid Code.
- Co-ordination of inter-state energy exchange and emergency inter-change within Region.

1.4 Indian Electricity Grid Code (IEGC)

The Indian Electricity Grid Code (IEGC) lays down the rules, guidelines and standards to be followed by the various agencies that connect with and/or utilise the ISTS. IEGC provide a common basis to plan, develop, maintain and operate the power system in the most efficient, reliable and economic manner, while facilitating healthy competition in the generation and supply of electricity in the Country.

1.4.1 Salient Provisions of IEGC

(i) Under section 1.3 (1) of IEGC, RVPN/SLDC & other utilities connected with interstate transmission system (ISTS), are required to abide by the principles and procedures defined in IEGC so far as they apply to RVPN/SLDC. Role of SLDC is provided at Clause 2.6 of IEGC.
Except where specific provisions made in IEGC, the operation of SLDC is governed by Grid Code (Part-I _General & Planning Code) and this Load Despatch & System Operation Code(Part-II of Grid Code).

As a constituent of the Northern Region the Connection Conditions specified in Chapter-4 of IEGC applies to RVPN and relevant extract of the IEGC Connection Conditions is placed at Annexure-1.3.

All generating units, which are synchronized with the grid, irrespective of their ownership, type and size, shall have their governors in normal operation at all times. If any generating unit of over fifty (50) MW size is required to be operated without its governor in normal operation, the NRLDC shall be immediately advised about the reason and duration of such operation. All governors shall have a droop of between 3% and 6%. The exemption from free governor mode operation in respect of any generating stations shall be sought from CERC under clause 1.6 of IEGC. Such petitions for exemption shall be preceded by study preferably by CEA.

Under Clause 6.1 (e) of IEGC, Control Rooms of NRLDC, all SLDC, power plants & EHV (33 KV & above) substations and any other control centres of regional constituents are to be manned round the clock by qualified and adequately trained personnel.

Following chapters of IEGC set out the demarcation of responsibilities between NRLDC & SLDC and role of SLDC:

<table>
<thead>
<tr>
<th>Chapter 4</th>
<th>Connection conditions</th>
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<tbody>
<tr>
<td>Chapter 6</td>
<td>Operation of regional grid</td>
</tr>
<tr>
<td>Chapter 7</td>
<td>Scheduling &amp; despatching</td>
</tr>
</tbody>
</table>

1.5 **Rajasthan Grid Code**

RVPN being a Transmission and Bulk Supply Licensee and notified, as State Transmission Utility (STU) by the Government of Rajasthan is required ensure that a Grid Code is in-force in the State Transmission System at all times. This Grid Code is a legally enforceable interface document agreed upon and to be complied with by all the SSGS and Discoms (including their HV/EHV consumers directly connected to STS) interconnected to State Transmission System. The Grid Code has been designed to operate and maintain an efficient and coordinated State Transmission System and allow RVPN to comply with its obligations in relation to the inter-state transmission of power and to operate the system in integration with the Northern Grid as per the provisions of Indian Electricity Grid Code approved by the Central Electricity Regulatory Commission. The Grid Code specifies the standards, which the SSGS, RVPN and Discoms using State Transmission System must comply with. It lays down what is technically optimal with respect to operation and defines standards and common terms to reduce misunderstanding and avoid discrimination.

1.6 **Load Despatch & System Operation Code**

1.6.1 This Load Despatch and System Operation Code has been prepared to ensure that SLDC manages the Rajasthan Power System effectively in conformity with IEGC and Rajasthan Grid Code. The System Operation Code is legally enforceable and binding document to be complied with by all Users and the SLDC. This code will provide...
guidelines and instructions to SLDC staff in their day-to-day working. The Load Despatch and System Operation Code defines SLDC Staff responsibilities in operating matters and in interface with external agencies, viz. NRLDC, SSGS, IPP, CPP, RVPN, and Distribution Companies. Observing the system operation procedures given in this code is mandatory for SLDC staff.

1.6.2 With implementation of ABT in the Northern Region with effect from 1st December 2002, the Complementary Commercial Mechanisms in accordance with Clause 7.1(d) of the IEGC came into force. The Complementary Commercial Mechanisms provides the methodology of regional energy account and UI account settlement amongst the constituents of the Northern Region. The relevant extract of IEGC Complementary Commercial Mechanisms is given at Annexure -1.4.

1.6.3 The role of SLDC with reference to RVPN and its constituents (viz. Discoms, RVPN, RVUN, other licensee or generators within the state but excluding ISGS) is analogous to that of NRLDC and other constituents of the Northern grid. This Code brings out salient features of existing facility, principles governing the operation of integrated power system in accordance with the IEGC, Rajasthan Grid Code and the operating procedures issued by Northern Regional Load Dispatch Centre. The Load Despatch and System Operation Code is a document requiring frequent changes based on augmentation of facility, amendment to IEGC and grid code, mutual agreements between utilities, Regulatory Commission’s directives etc.

1.7 Load Despatch & System Operation Code Organisation

The Load Despatch & System Operation Code has been grouped into following three headings:

1. Rajasthan State Power System and prevalent facilities, procedures and schemes
2. Load Despatch and System Operating Procedures

1.8 Definition & interpretation

The terms used in the Load Despatch and System Operation Code shall have the meaning as defined in the Grid Code. The terms, which are used in this LD&SO Code and not defined in the Grid Code, will have the same meaning as defined in IEGC.

The Load Despatch and System Operation Code is prepared such that it is consistent/compatible with the Grid Code and IEGC. If any provisions of the Load Despatch and System Operation Code are inconsistent with the provisions of the Grid Code, then the provisions of Grid Code shall prevail.
However, in matters relating to inter-State transmission, if any provisions of the Rajasthan Grid Code is inconsistent with the provisions of the IEGC, then the provisions of IEGC shall prevail.
Chapter-2

2 Existing Power System and Load Despatch Facility

2.1 Generation Capacity within State:

2.1.1 Major generating Stations operating in the State are given below.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of Generating Station</th>
<th>Unit Ratings &amp; Nos</th>
<th>Total capacity MW</th>
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<tbody>
<tr>
<td>(A)</td>
<td>RVUN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Kota Thermal Power Station (KTPS)</td>
<td>2 X 110 MW</td>
<td>850 MW</td>
</tr>
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<td></td>
<td></td>
<td>3 X 210 MW</td>
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</tr>
<tr>
<td>2</td>
<td>Suratgarh Thermal Power Station (STPS)</td>
<td>4 X 250 MW</td>
<td>1000 MW</td>
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<tr>
<td>3</td>
<td>Ramgarh Gas Thermal Power Station (RGTPS)</td>
<td>1 X 35.5 MW</td>
<td>73 MW</td>
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<td></td>
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<td>1 X 37.5 MW</td>
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<td>4</td>
<td>Mahi Hydro Power Station-I (Mahi-PH-I)</td>
<td>2 X 25 MW</td>
<td>50 MW</td>
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<tr>
<td>5</td>
<td>Mahi Hydro Power Station-II (Mahi-PH-II)</td>
<td>2 X 45 MW</td>
<td>90 MW</td>
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<td>(B)</td>
<td>RVPN -Partnership Projects in State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Ranapratap Sagar Hydro Power Station (RPS)</td>
<td>4 X 43 MW</td>
<td>172 MW</td>
</tr>
<tr>
<td>2</td>
<td>Jawahar Sagar Hydro Power Station (JS)</td>
<td>3 X 33 MW</td>
<td>99 MW</td>
</tr>
<tr>
<td>(C)</td>
<td>NTPC Projects in State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Anta Gas Thermal Power Station (Anta GTPS)</td>
<td>3 X 88.71 MW</td>
<td>419.3 MW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 X 153.2 MW</td>
<td></td>
</tr>
<tr>
<td>(D)</td>
<td>NPC Projects in State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Rajasthan Atomic Power Station-A (RAPS-A)</td>
<td>1 X 100 MW +</td>
<td>300 MW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 X 200 MW</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rajasthan Atomic Power Station-B (RAPS-B)</td>
<td>2 X 220 MW</td>
<td>440 MW</td>
</tr>
</tbody>
</table>

Note :-
1. RPS and JS power stations are part of Chambal-Satpura Project in partnership between Rajasthan & M.P. Rajasthan’s share is 50% in hydro projects and 40% in Satpura thermal PS-stage-I. RPS and JS power stations are owned by RVPN but operated and maintained by RVUN and two other power stations of partnership viz. Gandhisagar Hydro power station 5x23 MW and Satpura thermal PS-stage-I 5x62.5 MW are operated and maintained by MP.

2. Sr. No. (C) and (D) above are Central Sector Generating Stations located in the State. These are interstate generating stations except RAPS-A, which will be operated and maintained by NPC in which Rajasthan has 100% allocation.
3. The above generating capacity do not include the capacity of generating units below 5 MW which are not subject to SLDC Scheduling & Despatch such as mini-micro hydel generating stations, Wind Farm and other non-conventional generating units though integrated with State Transmission System.

2.1.2 Rajasthan have partnership in Bhakra & Beas Projects also and gets its partnership share of 15.22% in Bhakra, Gangwal and Kotla Hydro Power Stations, 20% in Dehar Hydro Power Station and 58.5% in Pong Hydro Power Station through common transmission system of Bhakra and Beas Project. These Power Stations and transmission system are operated and maintained by Bhakra & Beas Management Board (BBMB).

2.1.3 Rajasthan have firm allocations in various central sector power stations. Besides this, temporary allocations from unallocated capacity are also made from time to time by Government of India/CEA. The list of ISGS generating stations in which Rajasthan has shares/allocations is given at Annexure-2.1

2.1.4 The RVPN’s EHV transmission system as on 31st March 2003 consists of 2 Nos. 400 KV Sub-stations, 46 Nos. 220 kV Sub-stations & 215 Nos. 132 kV Sub-stations vide Annexure-2.2.

2.2 Inter-State Transmission System

2.2.1 Rajasthan Power System is inter-connected with Inter-State Transmission System though tie lines. The details of the inter-state transmission lines connecting Rajasthan Power System with Northern Region and other States and the point of metering are given at Annexure-2.3.

2.2.2 Rajasthan Power System operates in integrated mode with Northern Region System which work on the concept of loose power pool. Load Despatch and System operation of interstate generating stations (ISGS) (viz. power stations of NTPC, NHPC & NPC) and interstate transmission system (ISTS) (viz. PGCIL’s EHV transmission system) is effected by NRLDC, New Delhi, that of BBMB’s power station and transmission lines by BBMB’s load despatch Centre at Chandigarh and that of State’s power system by State Load Despatch Centre at Heerapura (Jaipur).

The above is for the scheduling & despatch point of view and is without prejudice to Clause 55 of the amended Electricity Supply Act, 1948 and provisions of IEGC

2.3 Load Despatch Facility

2.3.1 The State Load Despatch Centre (SLDC) of Rajasthan is functioning at Heerapura (Jaipur). The SLDC has communication links and with NRLDC and all major generating stations and important sub-stations for system operation and load despatch function. Basic data necessary for System Operation is available in the LD Control Room, through the existing ULDC system. The communication map showing the links between SLDC and sub-LDCs and between Sub-LDC and RTU Stations are shown at Annexure 2.4. PLCC is main communication channel between sub-LDC and RTU Stations. Microwave has been used as data
communication link between Sub-LDCs and SLDC at Heerapura. At few locations OFC links have been also provided for data transfer. The on-line flow of MW, MVAR of the inter-state tie lines, generating stations, 220 KV/132 kV Grid Sub-stations etc. is being monitored at the SLDC, Heerapura round the clock. On line data is displayed on screen of operators consoles in the LD Control Room. ULDC has facility for displaying the MW, MVAR flows on single-line diagram of respective stations along with digital status of breakers and isolators etc. These online screens displaying data and single line diagrams can be modified/reprogrammed if required.

2.3.2 In the present set-up, line flows on various 220 kV tie lines with the Northern Grid, generation data from major power stations in the State as well as mimic diagrams of 400 kV Heerapura and several 220 kV Sub-Stations are available on the monitors which also display the scheduled drawl from NR Grid vis-a-vis actual load flows on 220 kV lines. In addition, express links are available through PLCC / DOT links from Heerapura. This enables monitoring of over drawl/under drawl of energy from the central stations, which is essential to enable the SLDC to regulate the load of various SSGS in the State.

2.3.3 Under ULDC scheme, Sub Load Dispatch Centres at Kota, Bhilwara and Ratangarh and Heerapura have been also established which transfer data to SLDC through microwave links. ULDC has facilities of transfer of such data to NRLDC, New Delhi. The communication scheme comprises microwave stations / Repeater stations (18 Nos.) at 220 kV, 132 kV and 33 kV Sub-stations, Fibre Optic links for Heerapura-Alwar and Debari - Chittorgarh & Chittorgarh - Bhilwara. Sub-load despatch centres will also facilitate the Discoms to effect load control on their substations.

2.3.4 In addition to this, important on-line data of Central sector generating stations & BBMB stations, relevant to RVPN, are being received from NRLDC. The ULDC Scheme has provision of remote control operation of circuit breakers etc. from SLDC/NRLDC Control Room but the operation thereof has not been activated. Additionally, EMS function, Contingency Analysis, Scheduling and weather based load forecasting are available under ULDC Scheme.
Chapter-3

3 System Demand and Control

3.1 Overview
Demand estimation plays a very important role in system operation. In the long term, it constitutes important input for generation and power purchase planning. In the medium term, say one year, it constitutes an important input for outage planning of generating units and transmission lines and short term bilateral agreements for power purchase. In the short term, say one week, it is an important input for generation scheduling, load shedding & bilateral power purchase agreements. Variation in demand in real time operation from the estimated values could either be absorbed by the grid or affect it adversely. Even if the estimates are accurate, the generation could vary from scheduled values adversely affecting the grid. Demand control thus plays an important role in arresting these adverse effects on the grid.

3.2 System Demand

3.2.1 A statement showing the maximum, minimum and average drawal (in LU) per day and peak demand (MW) reordered in Rajasthan during 1996-97 to 2002-2003 is available at Annexure 3.1.

3.2.2 Anticipated month-wise availability and requirement of power/energy is predicted by NREB in Anticipated Demand & Availability Assessment Report (ADAAR).

3.2.3 Based on estimated availability from NREB as per ADAAR and expected generation from SSGS in the ensuing year, the month-wise estimation of energy available for sale is to be worked out.

3.2.4 Allocation of energy available for sale to each Discom is to be made by SLDC based on their month-wise requisitions and if no requisitions is made then as per the trend of previous year for corresponding month.

3.2.5 220 kV, GSS-wise load allocations is made to Discoms vis-à-vis projected availability and SLDC shall prepare load schedule on 15 minute basis for each of 220 kV GSSs for each month. However, any deviations in the load schedule as desired by the three Discoms shall be accommodated, with in the anticipated availability.
3.3 **System Control**

3.3.1 Load despatch operation entails operation of power system within capability of generating unit(s) and prescribed voltage profile. For this purpose, load shedding may have to be effected to maintain system frequency to maintain voltage profile within acceptable norms.

3.3.2 Prevalent instructions for switching on/off of shunt capacitors are placed at Annexure 3.2.

3.4 **Manual load Control**

The SLDC would identify feeders drawing heavy quantum of reactive power and instruct concerned User to disconnect the same under low voltage conditions. Necessary metering arrangements/transducers for identifying such feeders shall be provided by the RVPN/SLDC.

Manual load shedding shall not be carried out on feeders covered under frequency load shedding and RLSS schemes.
Chapter-4

4 Current Black Start and System Restoration Procedures

4.1 Overview

A 'Grid Disturbance' denotes the situation under which a set of generating units/transmission elements trip in an abrupt and unplanned manner affecting the power supply in a large area and/or causing the system parameters to deviate from the normal values in a wide range. In the event of a grid disturbance, utmost priority is to be accorded to early restoration/revival of the system. It is possible that during such a situation the system may have to be operated with reduced security standards and suspension of all commercial incentives/penalties.

This chapter is based on System Restoration Procedures for Northern Regional Grid brought out by NRLDC. For the classification of grid disturbance, general guidelines and precautions for system revival is given at chapter-10. This chapter describes the existing system restoration procedure for Rajasthan system.

4.2 Northern Regional Grid –System Restoration Procedure Overview

The Rajasthan Power System operates in synchronism with Northern Regional Grid and therefore Northern Regional Grid restoration procedure applies for Rajasthan System as well.

The Northern region consists of a large network. In the event of a total blackout, extending start-up power from one end of the region to the other end is rather impractical. The restoration of the system back to normal has to be achieved in a sectionalized manner. Accordingly the Northern Region has been divided into 4 subsystems for system restoration process so that in the event of total grid failure, initially each subsystem is to be restored independently and once the subsystems separately built-up, these can be synchronised in stages to integrate into a complete system.

1. Restoration of Eastern UP Sub-system
2. Restoration of BBMB-Delhi Sub-system
3. Restoration of Rajasthan Sub-system
4. Restoration of Western UP Sub-system

The restoration process for each sub-system can be divided into following steps:

1. Sub-system Overview
2. Sub-system recovery sequence
3. Sub-system Synchronization
4. Restoration stages and start-up sequence in a sub-system

The boundaries of sub-system have been defined on the criteria of most likely possibility. However during actual operations there can be variation in these subsystems and or sequencing depending upon the real time situations. The system
4.3 **Restoration of Rajasthan Subsystem**

4.3.1 **Rajasthan Sub-System Overview**

1. Possible connection with other sub-Systems:
   - a. 400 kV Ballabgharh - Bassi
   - b. 400 kV Hissar - Bassi
   - c. 400 kV Agra - Bassi
   - d. 220 kV BTPS - Alwar
   - e. 220 kV Agra - Bharatpur
   - f. 220 kV Hissar - Khetri
   - g. 220 kV Dadri-Khetri
   - h. 220 kV Bhiwadi (PGCIL) – 220 kV Bhiwadi (RVPN)
   - i. 220 kV Bhiwadi (PGCIL) – 220 kV Alwar

2. Major Generating Stations:
   - a. Thermal : KTPS & STPS
   - b. Hydro: Rana Pratap Sagar (RPS), Jawahar Sagar (JS), Mahi
   - c. Gas : Anta, RGTPS
   - d. Nuclear : RAPS(A), RAPS(B)

3. Sources of initial power
   - a. RPS – (Self Start) : 172 MW
   - b. JS HEP : 99 MW
   - c. Anta (Gas) : 80 MW

4. Requirement of initial power:
   - a. Start-up at Kota : 30 MW
   - b. Start-up at STPS : 30 MW
   - c. RAPS (A) / RAPS(B) : 50 MW
   - d. Railway Traction : 70 MW
   - e. Emergency Loads : Balance

4.3.2 **Sequence for restoration of Rajasthan subsystem**

At the time of system build up, the action to be taken at the major generating stations / grid substations is as given below:

1. **Rana Pratap Sagar Hydel**
   - a. Rana Pratap Sagar Hydel Station shall self-start and synchronised with WR supply on 132 kV RPS–Gandhi-Sagar line for stabilization.
   - b. In case of any problem in self-starting of units at RPS, Gandhi Sagar (WR) supply available at RPS to be availed for start-up of RPS units.
   - c. Synchronize the units at RPS.
d. Extend start-up power to Jawahar Sagar Hydel.
e. Extend supply to Kota (Sakatpura).

2. 220 kV Kota (S)

a. Kota (S) Sub-station shall avail power from Ujjain (WR) on 220 kV Ujjain-Kota circuit and start-up power shall be extended to KTPS, RAPS (A) and RAPS (B).
b. Simultaneously alternative source of supply shall be also attempted from RPS (self start).
c. In case start-up power from Ujjain through Ujjain-Kota circuit is not available, Kota (S) shall avail the power from RPS and extend to KTPS.
d. Kota (S) shall extend power supply for Railway Traction. Railway Traction load is given at Appendix RAJLDOP110 F04.
e. In case the RAPS (A) / RAPS (B) islands have survived during grid disturbance then the supply from these islands be extended to Kota (S) and synchronized.
f. Alternatively, in the event of tripping of RAPS (A) / RAPS (B), start-up power is to be extended to RAPS (A) and RAPS (B) from Kota (S).
g. In case Anta has survived on house load or is able to self-start then it shall extend supply to Kota (S) for synchronization.
h. Alternatively start-up power shall be extended from Kota (S) to Anta for synchronization of GTs.
i. Extend supply for Railway traction from Kota.
j. Extend supply to Heerapura for other emergency load.

3. Jawahar Sagar Hydel

Jawahar Sagar Hydel Station to avail start-up power from RPS Hydel Station.

4. KTPS

KTPS to avail start up power from Kota (S).

5. RAPS (A) & RAPS (B)

i. In case of survival of either of RAPS islands, synchronize with Kota (S) once the supply around Kota (S) has been stabilized.

ii. In case of tripping of RAPS (A), avail start-up power from Kota (S)

iii. In case tripping of RAPS (B), avail start-up power from Kota (S) /Anta.

iv. In case RAPS (B) survives, then it shall extend power to Anta for starting of GTs and synchronization.
6. ANTA (Gas)
   a. In case, Anta has survived on house load, extend supply to Kota (S)/RAPS (B) and synchronize.
   b. In case of tripping of units of Anta, self start GTs at Anta and synchronize them with Kota (S).
   c. In case of any problem in self-starting of units at Anta, avail start-up power from Kota (S)/RAPS (B) and start GTs.
   d. Extend supply from Anta to Dausa and then to Hindaun and Bharatpur for Railway Traction.

7. 220 kV Heerapura (Jaipur)
   a. Avail power supply from 220 kV Kota (S).
   b. From 220 kV Heerapura extend power to Dausa and Bharatpur for Railway Traction and other emergency loads.
   c. Extend power to Khetri in case there is delay in getting BBMB supply.
   d. From 220 kV Heerapura extend power to 400 kV Heerapura /Bassi 400 kV substation for synchronization with BBMB-Delhi Subsystem.

8. 220 kV Khetri
   i. Khetri shall get BBMB supply from Hissar and start up power shall be extended to STPS.
   ii. In case there is delay in getting BBMB supply then Khetri shall avail power through 220 kV Heerapura and extend it to STPS.

9. Restoration of STPS
   Suratgarh Thermal Power Station (STPS) shall avail start-up power in the following descending order of priority:

   | Priority-1: From BBMB System |
   | Priority-2: From Heerapura-Khetri-Ratangarh-Suratgarh |

4.4 Caution while restoration of Rajasthan subsystem
(a) While restoring the Subsystem, the load generation balance is to be maintained.

(b) In case of survival of RAPS(A)/RAPS(B) islands, these must be synchronized with the supply of RPS / Kota(S) at the earliest opportunity.

(c) The power supply to Railway Traction and RAPS (A)/RAPS (B) is to be extended on top priority.

(d) In case, Kota (S) has availed start-up power from Ujjain and RPS has been started up separately, then the two supplies are to be synchronized at Kota(S) / RPS for stability and then the supply be extended further to other stations.

(e) The start-up of Anta is to be closely monitored. In case of its self-start, the supply from Anta must be synchronised with supply at Kota (S) at the earliest opportunity.

4.5 Synchronisation of Rajasthan Subsystem

Rajasthan System is to be synchronised with the BBMB-Delhi and Eastern UP sub-system at the following possible connections:

(a) 400 kV Hissar-Bassi at Hissar / Bassi.

(b) 400 kV Ballaghgarh-Bhiwadi-Bassi at Bassi / Ballaghgarh.

(c) 400 kV Agra-Bassi at Bassi / Agra.

If the synchronisation of Rajasthan sub-system with BBMB-Delhi and Eastern UP sub-system for any reason could not be possible on above 400 kV inter-connection points and NRLDC so directs, the synchronisation of Rajasthan sub-system shall be attempted on 220 kV level on the following inter-connections:

(a) 220 kV BTPS-Alwar at BTPS/Alwar

(b) 220 kV Agra –Bharatapur at Agra/Bharatpur

(c) 220 kV Hissar- Khetri at Hissar/Khetri

(d) 220 kV Dadri-Khetri at Dadri/Khetri

4.6 Start up Stages and Sequences

a. For different Restoration Stages in Rajasthan Subsystem, refer Annexure 4.1

b. For detailed Start-up Sequence in Rajasthan Subsystem refer Annexure -4.2
4.7 General guidelines & precautions in system restoration

The general guidelines and precautions to be followed during system revival is indicated below:

a. SLDC shall at all time have the latest amended copy of this document available in the Control Room.

b. The Shift Incharge, SLDC shall inform the Head of SLDC about the situation and request assistance in the restoration process.

c. During revival of the system, only authorized personnel would be present in control rooms of substations / power stations / SLDCs / NRLDC so as to expedite restoration of the system.

d. In order to maintain a balance between load - generation at the time of grid contingency the list of generating stations with black start facility, inter-state/inter-regional ties, synchronising points and essential loads to be restored on priority, should be prepared and updated regularly and must be available at all times in SLDC.

e. While building up the system, it would be ensured that the voltage at the charging end remains within limits. A small amount of essential load should be connected at each substation before extending the network. However, the ultimate objective viz. building up of the network should not be lost sight of, while connecting the loads.

f. Security of the network being built up would be strengthened at the earliest by closing the parallel lines available in the restoration path.

g. Priority would be accorded for extending supplies to railway traction and installations where safety is of paramount importance such as nuclear power stations. The list of Priority Load is given at Annexure 4.3

h. All switching instructions for a particular system have to emanate from a single agency. For synchronization of two systems, NRLDC would be the co-ordination agency. Wherever a communication problem is foreseen, proper standing instructions would be issued to the substation engineers for implementation.

i. All communication channels required for restoration process shall be used for operational communication only, till grid normalcy is restored.

j. All generating units of 50 MW and above ratings would be on free governor operation as per relevant requirement of IEGC and Grid Code and their excitation will be controlled to maintain proper voltage profile.
k. Synchronizing facility should be available at major grid substations so as to have maximum flexibility in choosing the point of synchronization.

l. Despite the urgency of the situation, careful and complete logging of all messages and all operations is essential to facilitate subsequent investigation into the incident and the efficiency of the restoration process.

m. System restoration procedures need to be revised frequently. This is a dynamic situation wherein the same set of procedures cannot continue to be applicable as system status keeps on changing.

4.8 Inter regional support

In case of disturbance or any other contingency in the northern region or any other neighboring region, NRLDC shall permit exchange of such power with the neighboring region needed to meet the essential load, start-up-power, railway traction and other such emergent requirements for the duration of such contingencies.

4.9 System Security Aspects

While restoring the system, load generation balance is to be maintained in each subsystem and all efforts to be carried out by all the constituent to maintain the parameters within the subsystem near nominal values for security of operation of the restored subsystem as well for ease of synchronisation.

4.10 Power Supply to Railway Traction Substations from Rajasthan Subsystem

Details of the existing Railway Traction Connections falling under Rajasthan subsystem are as under:

i) Section : Mathura-Bayana-Mumbai

ii) Sub-Section : Mureshirampur-Kurlasi

iii) Max. Rly traction load : 70 MW (88 MVA)

iv) Feeding grid sub-stations: Kota, Jaipur, Hindaun, Bharatpur

<table>
<thead>
<tr>
<th>Name of 220/132 kV GSS</th>
<th>Traction Substation</th>
<th>Section</th>
<th>Section Length (km)</th>
<th>Load (MVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bharatpur</td>
<td>Bharatpur</td>
<td>Mureshirampur-Salabad</td>
<td>59</td>
<td>10</td>
</tr>
<tr>
<td>Hindaun</td>
<td>Bayana</td>
<td>Salabad-Rupbagh-Fatehsingpura</td>
<td>62</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Hindaun</td>
<td>Fatehsingpura-Piloda</td>
<td>37</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Gangapur</td>
<td>Piloda-Malarana</td>
<td>55</td>
<td>12</td>
</tr>
<tr>
<td>Jaipur/Kota</td>
<td>Swaimodhopur</td>
<td>Malarana-Amli</td>
<td>53</td>
<td>12</td>
</tr>
<tr>
<td>Kota</td>
<td>Lakheri</td>
<td>Amli-Kapren</td>
<td>51</td>
<td>12</td>
</tr>
</tbody>
</table>
Note:
In the event of black start, initially the different subsystems shall be of small size and the running generating units shall have a limitation in regard to the ramp up rates. Therefore, as soon as the power is made available for the purpose of traction, it would be ensured by Railways that the load shall be kept restricted to bare minimum and the movements of trains in different sections would be coordinated and controlled for avoiding sudden jerks/ramp ups on the system.

System restoration procedures need to be revised frequently. This is a dynamic situation wherein the same set of procedures cannot continue to be applicable as system status keeps on changing.
Chapter-5

5 Existing Islanding Schemes

5.1 Overview

Islanding and grid splitting is a system requirement under grid contingency conditions under which the power network is splitted into healthy and self-sustaining zones, so that cascade tripping of all generating stations in the entire region is avoided.

As per the philosophy being followed in Northern Region, an attempt to keep entire system integrated through adequate under frequency relays to shed load should be the first priority. Islanding schemes are the last resort and need to be confined to following two situations:

(i) Sensitive generating stations such as nuclear power stations
(ii) Sensitive/strategic loads

All efforts to be carried out by all the constituents to maintain the system parameters near nominal values for security of operation of the restored subsystem as well for ease of synchronisation.

5.2 RAPP Islanding Scheme

Rajasthan have two nuclear stations RAPP ‘A’ and RAPP ‘B’ with following capacities:

<table>
<thead>
<tr>
<th>Unit</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAPP ‘A’</td>
<td></td>
</tr>
<tr>
<td>Unit-I</td>
<td>100 MW</td>
</tr>
<tr>
<td>Unit-II</td>
<td>200 MW</td>
</tr>
<tr>
<td>Total</td>
<td>300 MW</td>
</tr>
<tr>
<td>RAPP ‘B’</td>
<td></td>
</tr>
<tr>
<td>Unit-III</td>
<td>220 MW</td>
</tr>
<tr>
<td>Unit-IV</td>
<td>220 MW</td>
</tr>
<tr>
<td>Total</td>
<td>440 MW</td>
</tr>
</tbody>
</table>

It is important that during any major Grid Disturbance in the Northern Region, the tripping of units of nuclear stations is prevented because of sensitive nature of such generating units. The islanding scheme for RAPP has been designed such that the generating units separate from the main Regional Grid and remain survived with islanded loads through intentional implementation of under frequency relays schemes. The frequency setting and time delay for Islanding and units coming to house loads are given in table below:
### RAPP ‘A’ Islanding

A Single line diagram of this islanding Scheme is placed at Annexure- 5.1

RAPP ‘A’ islands at 47.5 Hz instantaneous

The following conditions are envisaged:

1. **When only one machine is generating at RAPP ‘A’, matching load will be provided by Debari alone. Under this condition, 220 kV RAPP ‘A’ – Kota-I & III lines shall trip at 47.5 Hz (with Kota-II already connected to RAPP ‘B’). Thus Kota loads are automatically disconnected from RAPP ‘A’.

2. **When both the machines of RAPP ‘A’ are generating, matching load will be provided by Debari, part Kota, Modak and Jhalawar.**

3. **At a later date if the load of Modak and Jhalawar is fed directly from KTPS, equivalent matching load on 220 kV Kota Sakatpura shall be provided on any 132 kV Outgoing feeder on radial mode to provide load generation balance.**

4. **The loads shall be regulated such that Debari load is equal to Unit-II generation minus 35 MW.**

5. **The following arrangements are to be kept at RAPP ‘A’, 220 KV GSSs of Debari, Sakatpura (Kota), Jhalalwar & Modak stations to ensure smooth functioning of the Islanding Scheme. The operating status of UFR relay like Block, Operative and Normally Open required to be kept for successful islanding has been also indicated.**

<table>
<thead>
<tr>
<th>Islands</th>
<th>Frequency Hz.</th>
<th>Time Delay Sec.</th>
<th>Frequency Hz.</th>
<th>Time Delay Sec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Islanding</td>
<td>-</td>
<td>-</td>
<td>47.7</td>
<td>5 seconds</td>
</tr>
<tr>
<td></td>
<td>47.5</td>
<td>Instantaneous</td>
<td>47.5</td>
<td>Instantaneous</td>
</tr>
<tr>
<td>House Loading</td>
<td>47.5</td>
<td>10 seconds</td>
<td>47.5</td>
<td>5 seconds</td>
</tr>
<tr>
<td></td>
<td>47.1</td>
<td>Instantaneous</td>
<td>47.2</td>
<td>Instantaneous</td>
</tr>
</tbody>
</table>
AT RAPP ‘A’
The status of feeders with setting of U/F Relays is kept as under:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Name of line</th>
<th>Status</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>220 kV RAPP ‘A’-Kota-I</td>
<td>Operative/Blocked</td>
<td>47.5 Hz (Inst.)</td>
</tr>
<tr>
<td></td>
<td>(Depending upon one unit/two units in operation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>220 kV RAPP ‘A’-RAPP ‘B’</td>
<td>Normally Open</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>220 kV RAPP ‘A’-Kota-III</td>
<td>Operative</td>
<td>47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>4</td>
<td>220 kV RAPP ‘A’-Debari</td>
<td>Blocked</td>
<td>47.5 Hz. (Inst.)</td>
</tr>
</tbody>
</table>

AT 220 KV GSS DEBARI
1. 132 kV loads from Debari will be regulated through under frequency relay set at 47.5 Hz and the trippings shall be blocked/operative as per the load requirement.
2. 132 kV Banswara - Nimbahera will be kept permanently open at Pratapgarh.

The status of feeders with setting of U/F Relay is kept as under:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of line</th>
<th>Status</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>220 kV Debari-RAPP ‘A’</td>
<td>Block</td>
<td>47.5 Hz. (Inst.)</td>
</tr>
<tr>
<td>ii.</td>
<td>220 kV Debari -RAPP ‘B’</td>
<td>Operative</td>
<td>47.7 Hz (Inst.)</td>
</tr>
<tr>
<td>iii.</td>
<td>220 kV Debari –Chittor</td>
<td>Operative</td>
<td>47.7 Hz (Inst.)</td>
</tr>
<tr>
<td>iv.</td>
<td>132 kV Debari –Banswara</td>
<td>No Relay</td>
<td>-</td>
</tr>
<tr>
<td>v.</td>
<td>132 kV Debari –Sukher</td>
<td>Block/Operative</td>
<td>47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>vi.</td>
<td>132 kV Debari –Mavli-Dariba</td>
<td>Block/Operative</td>
<td>47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>vii.</td>
<td>132 kV HZL.</td>
<td>Block/Operative</td>
<td>47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>viii</td>
<td>132 kV JKUUL</td>
<td>Block/Operative</td>
<td>47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>ix.</td>
<td>132 kV Madri</td>
<td>No Relay</td>
<td>-</td>
</tr>
<tr>
<td>x.</td>
<td>132 kV Nathdwara</td>
<td>Operative</td>
<td>47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>xi.</td>
<td>132 kV Bhinder</td>
<td>Normally open</td>
<td>Operative</td>
</tr>
<tr>
<td>xii.</td>
<td>220/132 kV, 50 MVA Trf. No.3</td>
<td>Block</td>
<td>47.5 Hz (Inst.)</td>
</tr>
</tbody>
</table>

AT 220 KV GSS KOTA SAKATPURA
The following arrangements are being kept at 220 kV Kota Sakatpura:-

1. 220 kV Bus ‘D’ is to be kept as dedicated for RAPP ‘A’ Island. 220 kV Bus Coupler between A to D will be operative at under frequency setting of 47.5 Hz so that Bus D remains connected to RAPP ‘A’. 132 kV RPS-Kota Circuit (direct) will be kept on 132 kV Bus of Transformer No. 4 connected to Bus ‘D’, which will provide RPS Hydel support to the island, if required.

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2. 100 MVA Transformer No. 4 shall be always kept on Bus ‘D’ 220 kV Jhalawar & Modak shall also remain connected on Bus ‘D’. Transformer No. 4 will provide load of 132 kV Bundi, 132 kV SWM-II, Gopal Mill, 132/33 kV 100 MVA Transformer No. 2 20/25 MVA for the Island. The U/F tripping on these loads will be set at 47.5 Hz and shall be kept operative/blocked as per load requirement to be monitored by L.D.

3. 220 kV Kota (I)-RAPP ‘A’ connected on Bus ‘D’ will be Blocked/Operative at 47.5 Hz as per generation available at RAPP ‘A’.

4. 220 kV Kota (III) -RAPP ‘A’ will be on any Bus A, B or C with U/F relay operative at 47.5 Hz.

5. 220 kV RAPP ‘B’-Kota-II will also be on any Bus A, B or C with U/F relay operative at 47.7 Hz.

6. The synchronization of island may be done at RPS with MP Power on 132 kV Gandhi Sagar line-II or at Kota (S) with 220 kV Ujjain-Kota if required. MP power will be available through 220 kV Ujjain-Kota (II) but this circuit will be normally open at Kota.

Status of U/F relays and setting on the feeders will be as under:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>220 kV Kota-RAPP ‘A’ Circuit-I</td>
<td>Block/Operative 47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>ii.</td>
<td>220 kV Kota-Ujjain Circuit-II</td>
<td>(Normally Open) U/F Not Provided</td>
</tr>
<tr>
<td>iii.</td>
<td>220 kV Kota-RAPP ‘B’ Circuit-II</td>
<td>Operative 47.7 Hz (Inst.)</td>
</tr>
<tr>
<td>iv.</td>
<td>220 kV Kota-RAPP ‘A’ Circuit-III</td>
<td>Operative 47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>v.</td>
<td>132 kV Kota-Bundi</td>
<td>Operative/Block 47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>vi.</td>
<td>132 kV Kota -SWM-II</td>
<td>Operative/Block 47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>vii.</td>
<td>132 kV Kota-RPS (Direct)</td>
<td>Always Closed, No U/F To be Provided</td>
</tr>
<tr>
<td>viii.</td>
<td>132/33 kV 20/25 MVA Trf. No.2</td>
<td>Operative/Block 47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>ix.</td>
<td>132 kV Gopal Mill</td>
<td>Operative/Block 47.5 Hz (Inst.)</td>
</tr>
</tbody>
</table>

**AT RPS Hydel**

1. One unit (machine No.4) will be kept on main Bus ‘B’ which is Islanding Bus and 3 units on 132 kV main Bus ‘A’. 132 kV Gandhi Sagar Circuit-II will be on Bus B and shall be kept normally open at RPS end. This may be utilized to further synchronise the Island with MP to stabilize the island system, if required.

2. 132 kV RPS-Kota (Direct ckt.) will also be on main Bus ‘B’ included in the Island.

3. 132 kV RPS-Bhilwara I & II will be on Bus ‘A’.

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Last Updated : 30-06-2006
The under frequency relay settings will be as under:

<table>
<thead>
<tr>
<th></th>
<th>132 kV Bus Coupler</th>
<th>Operative</th>
<th>47.5 Hz (Inst.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>132 kV RPS - Bhilwara-I &amp; II</td>
<td>Operative</td>
<td>47.7 Hz. (Inst.)</td>
</tr>
</tbody>
</table>

**AT 220 kV MODAK**
All loads will be kept connected.

**AT 220 kV JHALWAR**
All loads will be kept connected.

### 5.4 RAPP ‘B’ ISLANDING

A single line diagram of the scheme is placed at Annexure ‘B’.

1. Islanding shall take place at 47.7 Hz with 5 sec. delay or 47.5 Hz instantaneous. At RAPP ‘B’, the total generation of Unit-III & IV is expected to be around 400 MW. RAPP-B machines will be islanded separately with matching load of 180-200 MW. This load is to be provided from Chittor, Nimbahera & Bhilwara.

2. No Under Frequency Relays are required for 220 kV Chittor-Nimbahera line and 220 kV RAPP ‘B’ –Chittor (Chittor end) on both the circuits. Loads of 132 kV GSS Hamirgarh, Sawa, M/s Aditya Cement, M/s BCW, M/s CCW & M/s HZL shall be fed from 220 kV Chittorgarh.

3. The operating status of UFR relay like Block, Operative and Normally Open required to be kept for successful islanding has been also indicated.

4. The settings of under frequency relays in the above Island are to be kept as under:

#### AT RAPP B END

<table>
<thead>
<tr>
<th></th>
<th>220 kV RAPP ’B’-Kota-II</th>
<th>Operative</th>
<th>47.7 Hz. 5 sec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>220 kV RAPP ’B’-Kota-II</td>
<td>Operative</td>
<td>47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>ii.</td>
<td>220 kV RAPP ’B’-Debari</td>
<td>Operative</td>
<td>47.7 Hz 5 sec.</td>
</tr>
<tr>
<td>iii.</td>
<td>220 kV RAPP ’B’-Debari</td>
<td>Operative</td>
<td>47.5 Hz (Inst.)</td>
</tr>
<tr>
<td>iv.</td>
<td>220 kV RAPP ’B’-Chittor-I &amp; II</td>
<td>Block</td>
<td>47.7 Hz, 5 sec.</td>
</tr>
<tr>
<td>v.</td>
<td>220 kV RAPP ’B’-Anta</td>
<td>Operative</td>
<td>47.7 Hz, 5 sec.</td>
</tr>
<tr>
<td>vi.</td>
<td>220 kV RAPP ’B’-Anta</td>
<td>Operative</td>
<td>47.5 Hz (inst.)</td>
</tr>
<tr>
<td>vii.</td>
<td>220 kV RAPP ’B’-RAPP ‘A’ Tie Line</td>
<td>Normally Open</td>
<td>__</td>
</tr>
</tbody>
</table>

#### AT 220 KV GSS CHITTORGARH

The U/F Relays of 220 KV Chittorgarh-Bhilwara (both ends) will be made operative by LD if the requirement of load is indicated by RAPP authorities to be around 100-120 MW (one unit), otherwise this relay will be kept blocked so as to provide islanding load of 180-200 MW.
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>220 kV Chittorgarh-Bhilwara</td>
<td>Normally Block</td>
<td>47.7 Hz (Inst.)</td>
</tr>
<tr>
<td>ii.</td>
<td>220 kV Chittorgarh-Debari</td>
<td>Operative</td>
<td>47.7 Hz (Inst.)</td>
</tr>
</tbody>
</table>

- **AT 220 kV GSS DEBARI**
  - i. 220 kV Debari-RAPP ‘B’ Operative 47.7 Hz (Inst.)
  - ii. 220 kV Debari-Chittorgarh Operative 47.7 Hz (Inst.)
  - iii. 220 kV Debari-RAPP ‘A’ Block 47.5 Hz (Inst.)

- **AT 220 kV GSS SAKATPURA KOTA**
The under frequency relay on 220 kV Kota-RAPP ‘B’ (II circuit) which will normally remain on Bus ‘C’, will be set at 47.7 Hz (Inst.) and will remain operative.

- **AT 220 kV GSS NIMBAHERA**
  Loads of 132 kV Bhinder, Mangalwad, Chhoti Sadri and Pratapgarh shall be fed from Nimbahera and shall not be transferred to other GSSs without approval of SE(SO&LD).

- **AT 220 kV GSS BHILWARA**
  Bus arrangement on 220 kV side will be as under:
  
  On 220 kV Main Bus (A+Bus III).
  220 kV Bhilwara-Kota-I
  220 kV Bhilwara-Kota-II
  220 kV Bhilwara-Bali-Sirohi
  220 kV Bhilwara-Kankroli-Sirohi
  220 kV Bhilwara-Anta-I
  220 kV Bhilwara-Anta-II
  220 kV Bhilwara-Beawar
  220 kV Bhilwara-Jodhpur
  
  On 220 kV Main Bus (B+C) (Islanding bus).
  220 kV Side of 220/132 kV, 100 MVA Transformer No.1.
  220 kV Side of 220/132 kV Transformer No.2
  220 kV Bhilwara-Chittorgarh

- **AT RPS POWER STATION**
  132 kV RPS-Bhilwara-I & II will be connected on Bus A.
  
  |   |                        |            |            |
  |---|------------------------|------------|
  | i. | 132 kV Bus Coupler A-B | Operative  | 47.5 Hz (Inst.) |
  | ii. | 132 kV RPS-Bhilwara-I & II | Operative  | 47.7 Hz (Inst.) |

- **AT 220 kV GSS BEAWAR**
  
  |   |                        |            |            |
  |---|------------------------|------------|
  | i. | 132 kV Beawar-Bhilwara Via | Operative  | 47.7 Hz (Inst.) |
5.5 Caution in islanding process

1. RAPP- ‘B’ shall be synchronised at 220 kV Sakatpura Kota

2. One machine of 43 MW will start generation at RPS when frequency falls below 48.0 Hz, if required it shall run on condenser mode till system stabilised.

3. Start up power from island shall be extended to Kota Sakatpura, Anta and JS.

4. Island will be extended in phases as per system restoration procedure.

5. On request from RAPP ‘B’, UFR of 220 kV Chitttor – Bhilwara will be made operative when generation at RAPP ‘B’ is low (100 –120 MW). Otherwise UFR will be blocked to provide upto 200 MW islanding.

6. When NREB system returns to normal LD will get the islanded system separate from WREB and thereafter synchronised with NREB supply.

7. While restoring the system, load generation balance is to be maintained in each subsystem and all efforts to be carried out by all the constituent to maintain the parameters within the subsystem near nominal values for security of operation of the restored subsystem as well for ease of synchronization.

8. The power system operation is a dynamic situation the SLDC keeps on monitoring the system status frequently and ensure that status of UFRs be kept suitably operative / blocked with correct settings as per system requirements, so that in the event of major grid disturbance, Islanding takes place smoothly.
2. Operation & Regulation of Power System
Chapter 6

6 Demand Estimation and Control

6.1 Overview

Demand estimation plays a very important role in system operation. In the long term, it constitutes important input for generation and transmission network planning. In the medium term, say one year, it constitutes an important input for outage planning of generating units and transmission lines and short term bilateral agreements for power purchase. In the short term, it is an important input for generation and drawal scheduling, load shedding & bilateral power purchase agreements. Variation in demand in real time operation from the estimated values could either be absorbed by the grid or affect it adversely. Even if the estimates are accurate, the generation could vary from scheduled values adversely affecting the grid. Demand control thus play an important role in arresting these adverse effects on the grid.

6.2 Demand estimation

6.2.1 The long-term demand estimation/ load forecast (for more than 1 year) shall be done by the planning department of RVPN in accordance with the provisions of Grid Code Section 4. Accordingly RVPN shall estimate the unrestricted as well as restricted demand (in MW) and energy requirement (in MWh) and its availability for next 5 years in consultations with RVUN and Discoms. RVUN and Discoms shall furnish necessary data to RVPN. RVPN shall modify these estimates periodically based on RERC’s order and power availability including bilateral agreements. RVPN, in consultations with Discoms shall enter into long term, medium and short-term power purchase agreements (including bilateral agreements). SLDC shall be provided with a copy of the same as and when it is finalised. Demand estimation for period upto 1 year ahead shall be done by SLDC.

6.2.2 Discoms shall provide estimates of month-wise demand for ensuing financial year at each inter connection point by 15th November each year to the SLDC. Discoms shall provide on month ahead basis date-wise demand estimate at each inter connection point by 25th of each month.

6.2.3 Discoms shall provide to SLDC estimates of load that may be shed when required, in discrete blocks with the details of arrangements of such load shedding.

6.2.4 Discoms shall also furnish realistic category-wise demand and energy requirement for their respective companies along with details of essential loads, supply hours to be maintained in rural areas, details of power cuts imposed or to be imposed and specific requirements, if any.

6.2.5 The demand estimation shall cover active power as well as reactive power requirements forecasted for each substation. The reactive power planning exercise will be carried out by RVPN in consultation with NREB and Discoms as per RERC’s directives. Programme for installation of reactive compensation equipment by RVPN & Discoms would take care of these requirements.
6.2.6 The SLDC would update the demand forecast (in MW as well as MWh) on quarterly, monthly, weekly and ultimately on daily basis, which would be used in the day-ahead scheduling. Attention shall also be paid by SLDC in demand forecasting for special days such as important festivals and National Holidays having different crests and troughs in the daily load-curve as compared to normal weather conditions & days, SLDC, in consultation with Discom or RVPN may negotiate short term or spot power purchase on behalf of that Discom or RVPN.

6.2.7 No demand shed by operation of under frequency relays shall be restored without specific directions from SLDC.

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

6.2.9 SLDC shall furnish data for and participate in deliberations of load generation balance or Annual Demand, ‘availability’ and shunt capacitors requirement studies of NREB. It shall take into consideration their reports for demand estimation.

6.2.10 The SLDC would update the demand forecast (in MW as well as MWh) on quarterly, monthly, weekly and ultimately on daily basis, which would be used in the day-ahead scheduling. Attention shall also be paid by SLDC in demand forecasting for special days such as important festivals and National Holidays having different crests and troughs in the daily load-curve as compared to normal weather conditions & days, SLDC, in consultations with Discom or RVPN may negotiate short term or spot power purchase on behalf of that Discom or RVPN.

6.3 Demand control

6.3.1 Primarily the need for demand control would arise on account of the following conditions:-

- Variations in demand from the estimated or forecasted values, which cannot be absorbed by the grid, and
- Unforeseen generation / transmission outages resulting in reduced power availability, and
- Heavy reactive power demand causing low voltages, and
- Commercial reasons.

6.3.2 As per Grid Code and section 7.4.5 of the IEGC, the SLDC shall regularly carry out the necessary exercises regarding short-term and long term demand estimation to plan in advance as to how the load would be met without overdrawling from the grid. In this respect, it shall be governed by decisions of State Power Committee of SLDC as defined in Chapter 14 of this Code. Though a tight control on the drawl from the grid is not mandated in IEGC but the deviations from the schedule would be priced appropriately. From commercial angle, the following deviations from the schedule and other violations would be controlled by the SLDC.
- Over draws at frequencies below threshold frequencies as determined by SLDC. The SLDC shall identify the feeders drawing heavily and instruct the controlling authorities to regulate the draws. The feeders of 132 kV & higher voltage shall be disconnected only as a last resort, under emergent conditions.

- Under draws at frequencies above threshold frequencies, as determined by SLDC.

- Reactive power draws/injection causing low/high voltage respectively.

6.3.3 NREB Secretariat formulates under frequency load shedding scheme for the Northern Region in consultation with all the constituents and NRLDC. The scheme considers the largest single credible contingency occurring in the system and load shedding is based on tripping by fixed under frequency as well as fixed frequency and rate of change of frequency relays.

6.3.4 Demand control so exercised under these conditions by the SLDC, could be done manually or through the under frequency relays including those working on rotational / sequential basis or through direct circuit break tripping effected from SLDC/ Sub LDC using RTUs on under frequency detection by SLDC/Sub-LDC computer or through telephonic instructions.

6.3.5 During the demand control by manual disconnection of loads by staggering among different groups, the changeover from one group to another shall be carried out in a gradual and scientific manner so as to avoid excursions in the system parameters.

6.3.6 The SLDC would also identify feeders drawing heavy quantum of reactive power and disconnect the same under low voltage conditions. Necessary metering arrangements/transducers for identifying such feeders shall be provided by the RVPN/SLDC.

6.4 Load Crash

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

(i) Backing down or closing down of generating units of RVUN by giving SLDC Code.
(ii) Lifting of the load restrictions, if any.
(iii) Exporting the power to neighbouring regions (on radial basis).

While implementing the above, it shall be ensured that the provisions in IEGC / Grid Code should not be violated. Further, in case of hydro generation linked with irrigation requirements, the actual backing down or closing down of such hydro units shall be subject to limitations on such account & to avoid spillage of water.
Chapter -7

7 Network Security and System Operation

7.1 System Operation

The system has to be continuously operated as per the Security Standards and criteria covered in the Indian Electricity Grid Code (IEGC), or in Grid Code of RVPN copies of which would be made available to all the Generating Stations, Incharge of 220 kV GSSs & 132 KV GSS as well as to Nodal officers of Discoms by SLDC. There may be certain contingencies, which would be beyond SLDC’s system Operator’s control wherein some deviations from the IEGC/Grid Code may have to be accommodated. However, while taking any such action, it shall be ensured by the SLDC System Operator that such deviations do not result in weakened network configuration vis-a-vis what was envisaged during system planning. Situations outside the SLDC System Operator’s control and leading to un-even demand shall also be tackled by the SLDC’s System Operators to the best of his capability.

7.2 Outage plan

For outage planning, RVPN as well as SLDC would regularly conduct power system studies. SLDC shall also conduct such studies periodically during the year simulating operating conditions and various single or multiple outages to assess the stability of the network. The outage plan of various elements in the power system would be finalised based on such studies. Opening of important transmission elements shall be carried out only with prior clearance from SLDC except in case of emergency. However, SLDC/NRLDC shall be informed of such operation within a reasonable time of say 10 to 15 minutes indicating the likely time of restoration.

7.3 Special Care Areas:

(i) Stations where Bus bar protection scheme is operative, it shall be ensured that segregation of feeders on each bus are uniform. In case a substation is interconnected with more than one source/ interconnecting lines, then it shall be ensured that these are connected on different buses to minimise the impact of break down or bus bar protection tripping.

(ii) In cases where Main-I and Main-II bus arrangements are available, the changeover of the feeders/ transformer from one bus to the other would be carried out uninterruptedly, wherever PTs are installed on all the feeders. To avoid inadvertent tripping of bus-coupler on earth fault (E/F) due to contact resistance or opening time of different poles of the isolators being different, the tripping of bus couplers on earth fault would be blocked during changeover.

(iii) In 400 kV sub-station like Heerapura which is having a breaker and a half scheme, it shall be ensured that the two buses remain connected at least by two parallel paths so that any line / bus fault does not result in inadvertent multiple outages. In case any element, say a line or an ILT, is expected to remain out for a period say beyond eight hours, the main and tiebreakers of such elements shall be closed after opening the line side isolator. This should
be done after taking all suitable precautions to avoid inadvertent tripping.

(iv) The substation operators shall ensure the above condition even when any lightly loaded line is opened to control over voltage as opening of lines, superimposed over other line outages (on account of faults created by adverse weather conditions), may result in reduced security of the system.

(v) Single pole auto-reclose facility on 400 kV lines shall always be in service. NRLDC’s approval would be obtained for taking this facility out of service.

7.4 Under Frequency Load Shedding Scheme

The SLDC would review under frequency load shedding scheme of NREB and formulate the scheme in detail as per requirements of NREB and update such scheme at least once every six months. From the viewpoint of system security, it shall ensure that there would be no overlapping between areas covered by under frequency relay load shedding and those covered by the manual load shedding plan as part of demand control. SLDC would ensure that the automatic relief through under frequency relays would be available to the system under low frequency conditions. Effectiveness of the scheme would be monitored periodically by SLDC and also by NRLDC/ NREB in line with clause 6.2(m) of the IEGC. The same shall be monitored in the monthly meetings of Technical Committee of SLDC and also the Operation Co-ordination Committee (OCC) of NREB.

The guidelines for under frequency load shedding shall be prepared by the Technical Committee and shall be approved by the State Power Committee. The copy of such approved guidelines will be made available to any person on payment of prescribed charges as may be decided by the State Power Committee.

The particulars of feeders or group of feeders at a sub-station which shall be tripped under under-frequency load shedding scheme whether manually or automatic on rotational basis or otherwise shall be placed on Notice board and will also be available at the GSS for information of the consumers(s).

The Technical Committee/Protection Co-ordination Committee shall deliberate and prepare the Under Frequency Load Shedding Schemes at various substations to ensure that the frequent tripping of same feeder is avoided.

7.5 Islanding Scheme

In order to isolate the healthy subsystems following a large-scale disturbance, islanding scheme for the State as formulated shall ensure that such sub systems island successfully with load- generation balance to cause minimum jerk in system parameters. SLDC shall ensure that load-generation balance of each islanding scheme is maintained continuously.

SLDC shall follow-up the procurement and installation of Under Frequency relays, any other Relays & apparatus required for under frequency load shedding and system islanding. It shall also take steps to modify the settings as and when required. The scheme with modifications shall be circulated periodically to all utilities.
7.6 **Recording Instruments and communication facilities**

All the recording instruments, SCADA system, Disturbance Recorders etc. available in each Station and state/sub-Load Despatch Centers shall be kept in good working condition. Adequate and reliable communication facilities shall be maintained with NRLDC, sub load despatch Centre and all EHV stations in the grid.

7.7 **System Management & Control**

The Grid discipline requires that SLDC, RVPN and Discoms make all possible efforts to ensure the maintenance of grid frequency within the normal band of 49.0 to 50.5 Hz. This would be ensured by adhering to the following steps:

(i) Each generating station of RVUN shall provide to SLDC their estimates of monthly availability on the year ahead basis for the next financial year by 15th November each year. Each station shall also provide to SLDC daily availability from the month ahead by 25th for the next month.

(ii) The SLDC shall regulate the load and generation of RVPN and RVUN so that RVPN may not draw more than its schedule during low frequency conditions and less than schedule during high frequency conditions.

(iii) The SLDC shall ensure that each of Generating Stations of RVPN and RVUN shall maintain its generation schedule during low frequency conditions and not more than its generation schedule during high frequency conditions.

(iv) Excess power generated during high frequency conditions shall be treated as unscheduled generation and will not be considered for energy accounting purposes.

(v) In case of low system demand from Discoms during normal system operations, generating units can be backed down/shut down, in order of merit, if so required by SLDC for optimum utilisation of available entitlements. Wherever the State is likely to face power shortage situation despite requisitioning its full entitlement from Central Sector Discoms would be advised by SLDC to shed loads.

(vi) RVPN shall endeavor to enter into a bilateral agreement with the other States or constituents of Northern Region on long term basis (i.e. a year in advance) or Medium term (i.e. at least 3 days in advance) basis and SLDC shall endeavor such agreement on short (i.e. a day or 2 in advance) and real time basis (i.e. during the day).

(vii) In any case, during low frequency conditions (below 49 Hz), no over draws shall be affected.

(viii) Except under an emergency condition or to prevent an imminent damage to the equipment, sudden reduction in generator output by more than 40% of capacity of each generating unit or one hundred (100) MW shall not be permitted by SLDC and shall be avoided by power station operator, particularly when frequency is below 49 Hz.

(ix) Sudden increase in load by more than 100 MW, particularly when frequency is falling below 49.0 Hz. and reduction in load by such quantum when frequency is rising above 50.5 Hz. shall not be permitted by SLDC and shall be avoided by the EHV substation operator.
7.8 Preventive measures during high frequency conditions and during low frequency:

(i) While the grid frequency is higher than 50.5 Hz, the MW generation at no generating station (irrespective of type and ownership) shall be increased.

(ii) In case, frequency has risen from a previous lower level to 50.5 Hz or higher, and due to normal governor action, the MW output of a generating unit has fallen to a level requiring oil support or which results in unstable operation of the unit, then MW output will be increased by operator to a level, such that no oil support is required, and the unit can operate in a stable and safe manner. This event shall be reported to SLDC, who shall convey whether status quo to be maintained or unit to be taken for shut down.

(iii) No generating unit shall be synchronised with the grid while the grid frequency is above 50.5 Hz. or higher, except with the specific concurrence of NRLDC/SLDC. This will not apply in case of nuclear units, which may have to be re-synchronised to prevent poisoning out of the reactor. Frequency linked despatch guidelines issued by NRLDC will be followed by each power station.

(iv) SSGS shall comply with the instructions of SLDC for backing down or picking-up additional generation not detrimental to generating unit (i.e. ramp-up/ramp-down rate as specified by generating unit supplier /RVUN). Any non-compliance will be referred to Commission.

7.9 Free governor mode of operation

All generating units, which are synchronized with the grid, irrespective of their ownership, type and size, shall have their governors in normal operation at all times. If any generating unit of over fifty (50) MW size is required to be operated without its governor in normal operation, the NRLDC shall be immediately advised about the reason and duration of such operation. All governors shall have a droop of between 3% and 6%. The exemption from free governor mode operation in respect of any generating stations shall be sought from CERC under clause 1.6 of IEGC. Such petitions for exemption shall be preceded by study preferably by CEA.

Facilities available with load limiters/ATRS and Turbine Supervisory Control Systems etc. shall not be used to suppress normal governor action and no dead bands or time delays shall be introduced deliberately.

7.10 Operating range

As defined in the IEGC Clause 6.2 (q), the operating range of the voltage at various voltage levels of grid shall be as follows:

<table>
<thead>
<tr>
<th>Voltage in kV (rms)</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>420</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>220</td>
<td>245</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>132</td>
<td>145</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

The maximum and minimum values in the above table are the outer limits and the SLDC would endeavour to maintain the voltage level well within the above limits.
7.11 **AVRs Controls**

All generation units shall keep their Automatic Voltage Regulators (AVRs) in operation and Power System Stabilisers (PSS) in AVRs (wherever available) shall be tuned in line with clause 6.2(j) of IEGC.

7.12 **VAR Exchange**

The SLDC shall take action in regard to VAR exchange with the northern grid, keeping in view the voltage profile at the exchange points. It shall endeavour that local VAR compensation at each substation is so regulated that the VAR drawl at exchange point when the voltage at that point is below nominal value is minimum and VARs are not injected when the voltage at exchange point is above the nominal value. Discoms shall ensure that their VARs drawls are maintained as per the directives of RERC.

7.13 **VAR Generation / Absorption by Generating Units**

In order to improve the overall voltage profile, the generators shall run in a manner so as to have counter balancing action corresponding to low / high grid voltage and to bring the system voltage towards the nominal value. In order to achieve the same, all generators shall generate reactive power during low voltage conditions and absorb reactive power during high voltage conditions as per the capability limits of the respective generating units. The On-Load Tap Changers (OLTCs) -on the generator transformers wherever available, shall also be used to achieve this. Off load tap changers shall be so set as to take care of seasonal variations in the voltage profile. RVUN and IPPs shall make available to SLDC the update capability curves for all the generating units indicating any restrictions, to enable accurate system studies and effective operation of system.

7.13.1 **Capability curve of various generating units**

SLDC shall have all times capability curve of generating units for VAR control and reactive flow. A typical capability curve of 250 MW units of Suratgarh TPS is attached at Annexure 7.1

7.13.2 **Transformer taps**

The transformer tap position may alter reactive power flow so any change will be effected only on the instruction from SLDC. In respect of transformers declared as important elements of Regional Grid by NRLDC, NRLDC shall advise SLDC, the settings of transformer tap positions. SLDC shall carry out any change in tap positions of such transformers only on advice of or after consultation with NRLDC.

7.14 **Control at Grid Substations / Generating Stations**

7.14.1 In the event of high system voltage i.e. voltage going beyond upper permissible limit (e.g., 220 kV bus voltages going above 245 kV), the following specific steps would be taken by the respective grid substations / generating station at their own, unless specifically instructed otherwise by SLDC:

- The 220 kV bus/ line reactors will be switched in.
- The manually switchable shunt capacitor banks shall be taken out.
- Synchronous condensers shall be operated for VAR absorption
• Hydro generators shall be operated as synchronous condenser for VAR absorption, wherever possible, with the consent of SLDC.
• Lightly loaded EHV lines shall be opened keeping in view the security of the balance network with the consent of SLDC
• All generators shall be operated to their limits of MVAr absorption.

7.14.2 In the event of low system voltage, i.e. voltage going below lower permissible limit (e.g., 220 kV bus voltages going below 220 kV), the following specific steps shall be taken by the respective grid substations / generating station at their own, unless specifically instructed otherwise by SLDC:

• 220 KV bus/ line reactors (if ON) shall be switched out
• The shunt capacitor banks will be switched in
• Synchronous condensers shall be operated for VAR generation
• Hydro generators shall be operated as synchronous condenser for VAR generation, wherever possible, with the consent of SLDC
• EHV lines, which were opened to control high voltage or otherwise, shall be switched with the consent of SLDC.
• All generators shall be operated to their limits of MVAr generation.

7.15 Load management for controlling the voltage
SLDC shall identify the radial feeders which have significant reactive drawals and which can be disconnected in order to improve the voltage conditions in the event of voltage dropping to low levels. The details of all such feeders shall be kept handy in the respective control rooms and standing instruction shall be issued to the operating personnel to obtain the requisite relief in the hour of crisis by disconnecting such feeders on equitable and rotational basis.

7.16 Regulatory measures by SLDC to prevent voltage collapse
In case the Discoms do not take the requisite measures by regulating their VAR drawals and the system voltage drops down to low levels (say below 120 kV at 132 kV bus), then SLDC may resort to regulatory measures by opening of tie lines including those, feeding radial loads in the areas of defaulting Discoms. While taking such action, SLDC would duly consider that the same does not adversely affect the evacuation system from existing generation, voltage profile and system security.

7.17 Switching-off of the lines in case of high voltage
In the event of persistent high voltage conditions when all other reactive control measures as mentioned earlier have been exhausted, selected 132 KV or 220 kV lines shall be opened for voltage control measures. The opening of lines and in such an event reviving them back would be carried out as per the instructions issued by SLDC in real time and as per the standing instructions issued by SLDC from time to time. While taking such action, SLDC would duly consider that the same does not lead to constraints in evacuation of generated power and adversely affect voltage profile & system security.
7.18 Line loading
In accomplishing the frequency & voltage control measures outlined above, the system operator would take into consideration the thermal loading limits, surge impedance loadings and the loading permitted from stability considerations for each line. The system operator at SLDC or substations would endeavour to keep the line / ILT loadings within limits and take corrective action in case of overloading of any element. Special emphasis would be laid by the system operator on identifying credible system contingencies & continuously evaluating the system under his control against these contingencies.

7.19 Operating manpower
The control rooms of the SLDC, power plants, grid substations as well as any other control centers of RVPN shall be manned round the clock by qualified and adequately trained manpower who would remain vigilant and cooperative at all the times with SLDC so as to maintain the system safety and security and operate it in a most optimum manner.

7.20 System Studies
Preventive measures to control frequency and voltage vide subsection 7.6 & 7.8 shall be based on planning studies conducted by RVPN and operational studies conducted by SLDC. Operational studies by SLDC shall be based on actual system conditions, preferably on real time data extracted from SCADA, with appropriate corrections for errors to achieve convergence.

7.21 Recording of Messages
7.21.1 SLDC shall ensure that the entries in the log books must be made immediately after the conversation. Each person in the Control Room who is giving instructions, may note down the time and instructions and transfer them immediately into the log book. Such entries would not be left to be done at later stage. This practice shall be followed meticulously to avoid inaccuracies in the messages actually given and those recorded in the SLDC.

7.21.2 The SLDC is maintaining a voice recorder system for recording and storing in all messages, conversation and exchange of information through telephone between SLDC and NRLDC.

7.21.3 The operational messages shall be given by the shift engineer (LD) to the shift engineer (EHV stations/ generating stations) with specific reference to the equipment to be operated, in a sequential manner.
Chapter- 8

8 Outage Planning

8.1 Overview

The preventive and capital maintenance is essential to maintain optimum availability/efficiency levels. Such maintenance has to be planned in advance so that they do not adversely affect the continuity and reliability of supply and network security. The outage planning has to take into consideration, availability/outage of the generating units, transmission lines and ILTs, this would be done in line with Clause 6.7 of the IEGC & Section 7.0 of Grid Code.

8.2 Outage Planning Process

8.2.1 Outages in the system have an effect on the network security. Power system studies shall be done by RVPN annually and by SLDC for annual outage planning as well as day-to-day operations to assess the effect of outages on the grid security and financial implications etc. Planning studies carried out by RVPN and operational studies carried by SLDC in this respect shall be exchanged between them.

8.2.2 Scheduled outage of power stations of capacity 25 MW & above and EHV transmission lines, as notified by SLDC from time to time will be subject to annual planning.

8.2.3 Provided that scheduled outage of power station of 50 MW and above and EHV lines as notified by NRLDC, will also be subject to annual planning by NREB Secretariat SLDC shall coordinate these.

8.2.4 State Sector Generating Stations shall provide SLDC with proposed outage programme in writing for the next financial year by 15th November each year. The outage programme shall indicate identification of unit, reason for outage, availability affected due to outage, start date and duration.

8.2.5 SLDC shall also obtain from Chief Engineer of each T&C zone of RVPN, the proposed outage programme for Transmission lines, equipments and substations etc. for next financial year by 15th November each year. RVPN outage programme shall contain identification of lines/ substations, reason for outage, outage start date and duration of outage.

8.2.6 Scheduled outage of power stations and EHV transmission lines vide subsection 8.2.2 shall be effected only with the approval of SLDC or NRLDC as the case may be. NRLDC approval shall be normally conveyed by SLDC.

8.2.7 Scheduled outage of power stations of capacity 5 MW and above, of all EHV lines and HV lines (i.e. 33 KV and 11 KV lines) forming interconnection between two EHV substations (and these notified as such by SLDC) shall be approved by Sub-LDC/SLDC, 24 hours in advance based on prevalent operating conditions.

8.2.8 In respect of scheduled outage referred in subsection 8.2.2 & 8.2.4, a calendar shall be formulated in respect of annual outage planning for the ensuing financial year. The RVPN, RVUN and the Discoms in the State Power Committee of SLDC will mutually decide calendar of schedule outage.
However, power stations & EHV lines specified at proviso to sub-clause 8.2.3 shall be decided by OCC of NREB.

8.2.9 RVUN shall provide SLDC with the proposed outage programme in writing for the next financial year by 15th November each year.

8.2.10 SLDC shall release final outage plan for generating stations, RVPN and Discoms latest by 15th February each year on the basis of agreed outage plan received from NREB. This shall include load generation balance as well as load shedding schedules as may be required.

8.3 Quarterly and monthly reviews

The annual outage plans formulated as above shall be reviewed on quarterly and monthly basis by SLDC/NREB as the case may be as per following program.

(i) In the months just preceding each quarter, i.e. during the second fortnight of March, June, September and December, the outage plans for the balance part of the financial year shall be reviewed at the level of Technical Committee of SLDC or OCC of NRLDC as the case may be.

(ii) Monthly review of the outage plan for the current month and the consecutive month would be done in the Technical Committee meeting referred in Sr. No. (i), generally held in the first / second week of every month. SLDC would convey the outage plan so frozen in these meetings.

(iii) Unforeseen outages and re-scheduling of outages after freezing of monthly schedules.

In the event of any requirement to re-schedule any planned shutdown or to avail an emergency / unforeseen shutdown not anticipated earlier, the concerned agency shall forward such request to SLDC indicating the nature of emergency or the reason for deferment. SLDC, where required shall in consultation with NRLDC, would approve such unforeseen outages/ re-scheduling of planned outage based on the exigency of the case vis-à-vis system conditions.

8.4 Availing of shutdowns schedule

8.4.1 SLDC would review on daily basis the outage schedule for the next two days and in case of any contingency or conditions described in Sec.6.7.4(g) of the IEGC, or section 7.4 of Grid Code, defer any planned outage as deemed fit clearly stating the reasons thereof. The revised dates in such cases would be finalized in consultation with the utilities.

8.4.2 No cross boundary units or generating units of State Sector shall be removed from service without specific approval from SLDC (Vide Cl. 7.3 of Grid Code). Similarly, the utility would take approval from SLDC while connecting back to the State Transmission System. All such approvals shall be conveyed with specific ‘code name’.
8.5 **Scheduled Outage of Transmission Lines or substation equipment**

8.5.1 For a transmission line or substation equipment, who’s outage shall affect more than one utility, the information about the approval or deferment shall be communicated to all such utilities.

8.5.2 In respect of transmission lines vide section 8.2.2 to 8.2.4, permission to work (PTW) would be obtained from SLDC/Sub-LDC before taking out the said element for maintenance. Sub-LDC/SLDC would issue a ‘code’ for all such works. Sub-LDC/SLDC would, where required, consult SLDC/NRLDC before permitting such outage. All preparatory works for maintenance would be done well in advance before availing the PTW so as to avoid any idling time. Said PTW would be returned before reviving the element after shut down.

8.5.3 The PTW issued by Sub-LDC/SLDC/NRLDC for tripping / revival of any element signifies such approval only from the system point of view notwithstanding anything contained in respect of safety measures and other switching operations to be carried out locally. The related line / substation personnel would be responsible for ensuring all safety precautions to be followed while tripping / closing of any element to avoid any threat to operating personnel and equipment.

8.5.4 Except for hot line maintenance, all works would be undertaken only after earthing the work section.

8.5.5 During the period of shutdown, the utility availing PTW shall keep Sub-LDC/SLDC apprised regarding the status of work and the likely time of return of the PTW. All efforts shall be made for timely return of PTW and delays if any shall immediately be reported to Sub-LDC/SLDC/NRLDC, as the case may be, along with the reasons and likely time of return of shut down/PTW.

8.5.6 Where in case of a transmission line maintenance, it is foreseen that return of Permit To Work (PTW) could be delayed due to physical distance involved, mobile or satellite phones or telephone would be used for communication with the substation to minimize the outage period. In all such cases, Sub-LDC/SLDC will effect cross check of return of PTW before effecting energisation of the transmission line.

8.5.7 Any maintenance work on opportunity basis proposed to be carried out by a utility during a EHV line / ILT shut down would need the approval of SLDC. In respect of 400 kV line/ILT, SLDC shall seek approval of NRLDC. The same if approved, would also be intimated by SLDC to the utility, which initially applied for the planned shut down.
Chapter- 9

9  Scheduling and Despatch Procedure

9.1  Overview

9.1.1  Scheduling implies drawing up a generation program to cater to forecast power demand at a minimum cost subject to transmission system constraints, capability of generating units & other factors (e.g. voltage profile, system security & system sustainability under grid disturbance). If adequate generation is available to cater to the demand at all times, then scheduling involves decision on which unit would have to be scheduled for how many time periods and if not, then scheduling involves curtailing load demand commensurate with available generation.

9.1.2  SLDC shall have the total responsibility for scheduling and despatch of generation from SSGS including generation of CPPs, scheduling of drawals from ISGS, arranging any bilateral exchanges, regulating the demands of Discoms, and regulating the net drawals from the regional grid.

9.2  Entitlements:

Northern Regional Grid shall operate on the concept of loose power pool as per Clause 7.4(1)&(2) of IEGC. NRLDC indicate station-wise entitlement of the state in each ISGS at 15-minute intervals on day ahead basis. Requirements are to be submitted by the states on the basis of the entitlements.

9.3  Drawal Schedules:

9.3.1  The net drawal schedule of the State would be the sum of the ex-power plant schedules from different ISGS, (on power plant basis), its shares from partnership/joint sector projects and any bilateral exchange agreed with other constituent states in Northern or any other region less estimated transmission losses.

9.3.2  For the purpose of scheduling, each day would be divided into 96 interval of 15 minutes duration each. For each 15 minutes block NRLDC would finalise and intimate to SLDC, the net drawal schedule and to each ISGS the generation schedule a day in advance.

9.3.3  SLDC would, therefore, be required to maintain the actual drawal from the northern grid close to such 'net drawal schedule' by regulating SSGS and/or consumer's load. For this purpose, the Discoms shall regulate their own drawals as per the schedules conveyed to them by the SLDC every day on 15 minutes basis.

9.3.4  SLDC shall have responsibility for the following:

(i)  Scheduling/ despatching generating stations/other than ISGC, within the state, and
(ii) Scheduling their drawl from ISGS (within their allocations/share in respective power plant’s expected capability), and
(iii) Arranging for bilateral interchanges, and
(iv) Regulating the demand of distribution licensees /customers.

9.3.5 The SLDC would, therefore, be required to maintain the actual drawal from the Northern grid close to such 'net drawal schedule' by regulating within the state generation (other than from ISGS) and/or consumer's load. For this purpose, the Discoms shall regulate their own drawals as per the schedules conveyed to them by the SLDC every day on 15 minutes basis. Under ABT overdraw/under-draw are billed at a UI rate corresponding to average frequency during the 15 minutes interval.

9.3.6 For economising the cost of purchase, the SLDC shall endeavour to maintain the drawals in such a manner that there is no overdrawals from the northern grid during low-frequency condition and no under-drawal during high -frequency conditions. Similarly, each SSGS shall also endeavour to maintain the generation in such a manner that they do not generate above schedule during over-frequency condition and do not generate below schedule, during under-frequency condition.

9.3.7 Operating Procedure for Northern Region prescribed under IEGC shall be used for generation schedule for the ISGS and drawal schedules for the State.

9.3.8 In line with the spirit of clause 5.1.3 of the ABT order of the CERC dated 4th Jan 2000, NREB Secretariat would ensure that any change in the allocations from each ISGS is finalized and informed to all concerned at least a month in advance so that trading of such capacity is facilitated.

9.4 Scheduling and despatch procedure

9.4.1 By 10.00 hrs every day each SSGS shall intimate to SLDC the station wise ex-power plant MW and MWh capabilities foreseen for the next day i.e. between 00.00 to 24.00 hrs of the following day, at 15 minutes interval. By 10.00 hours every day each Discom shall intimate SLDC the overall requirement in MW and MWh for the next day at 15 minutes interval.

9.4.2 The generation scheduling for the stations under Bhakra Beas Management Board (BBMB) would be coordinated and finalized before 11.00 hrs by BBMB in accordance with the requirements of the beneficiary states viz. Punjab, Haryana, Rajasthan and Himachal Pradesh and subject to the irrigation and hydrology constraints. By 10 AM every day, the ISGS shall advice the NRLDC, the station-wise ex-power plant MW and MWH capabilities foreseen for the next day.

9.4.3 The above information of the foreseen capabilities of the ISGS shall be compiled by NRLDC and the MW and MWh entitlements available to each state for the next day shall be intimated by NRLDC to SLDC by 11.00 hrs.

9.4.4 After receipt of the information in regard to the availability from different sources, vide section 9.4.1 to 9.4.3 above, the SLDC shall review aggregate demand of generating capability of RVUN and RVPN (NES and other power stations) and the bilateral interchanges, if any, vis-à-vis Discoms requirements. By 15.00 hrs, the SLDC would finalise (i) generation schedule of SSGS and (ii) drawl schedule of each Discom. It shall accordingly advise each Discom of their...
drawl schedule and will workout and convey to NRLDC for drawl schedule in each of the ISGS along with the bilateral exchanges agreed or intended to be had with the other state / states and the estimates of demand / availability in the state and additional power it would like to draw subject to availability. SLDC while finalizing the requisition from ISGS (including BBMB power stations), shall also consider estimated losses that would be deducted from its ex-power plant schedules in ISGS and BBMB stations.

9.4.5 By 1700 hrs NRLDC shall convey to each ISGS the generation schedule (i.e. ex-power plant despatch schedule) and to SLDC the net drawl schedule (i.e. the ex-power plant schedule for Rajasthan after deducting the apportioned estimated transmission losses). SLDC shall convey to SSGS, the generation schedule and to each Discom the finalised drawl schedule accordingly.

9.4.6 The SSGS and each Discom may inform the modifications / changes to be made, if any, in the above schedule to SLDC by 21.30 hours. SLDC after considering the same shall convey revised schedule to NRLDC by 22.00 hrs.

9.4.7 On receipt of information and after due consultations, the NRLDC shall issue the final generation / drawl schedule by 23.00 hrs, and SLDC shall inform the same to all concerned.

9.5 Specific points:

RERC regulations for power purchase and procurement procedure and instructions/directions thereunder shall be generally considered for Operational Planning. The following aspects would be taken into consideration while preparing and finalising the schedules:

(i) Any generation exceeding the frequency linked generation schedule or generation less backing down in MW as advised by SLDC, whichever applicable, for a frequency beyond normal frequency of 50 Hz (where UI rate of ABT tariff will be 140 paisa/kWh) shall not be effected by any SSGS and RVPN may not consider such excess generation for payment purpose after a period of 6 interval (of 15 minutes) from such advise.

(ii) As per RERC’s directives, SLDC shall ensure to despatch entire available generation from hydro stations and shall ensure that specified generation capacity presently (of 50% of peak load) shall be operational within the State. Accordingly economic power system operation in terms of section 55(3) of the ES Act 1948 and IEGC shall be considered separately for power stations within the state and outside state power stations with due consideration to voltage profile, contingency to meet outage/islanded operation, stable operation of generating unit and no loss of generation of renewal non-conventional energy sources power plants.

(iii) Total annual purchases and cost of purchases shall not exceed as directed by RERC.

(iv) RERC’s regulation in respect of power purchase and procurement procedures and instructions/directions conveyed thereunder will not be violated.

(v) The resulting power flows do not give rise to any transmission constraints. In case, any constraints are foreseen, then SLDC shall moderate the schedule to the extent as required, under intimation to the concerned utility.

(vi) Schedules shall be operationally reasonable particularly in terms of ramping up / ramping down rates and ratio between minimum and maximum generation levels. If it is found to be not meeting these requirements, then SLDC shall
moderate the schedule to the required extent under intimation to the concerned utility. The ramping up / ramping down rates in respect of different categories of stations would be based on the technical data as substantiated by the generating stations and as mutually agreed by the utilities.

(vii) SLDC may subject any SSGS’s power station to test for generation upto its declared capability. Procedure for the same and penalty for wrong declaration shall be as decided by State Power Committee and approved by RERC.

9.6 Prioritizes generation scheduling

Subject to RERC regulations for power purchase and procurement procedure and instructions/directions thereunder, as may be issued by the Commissions, The following specific points would be taken into consideration while preparing and finalising the schedules:

(i) SLDC will issue despatch instruction required to regulate all generation and imports from IPPs / CPPs according to the hourly day ahead generation schedule, unless rescheduling is required due to unforeseen circumstances.

(ii) In absence of any despatch instruction by SLDC, SSGS shall generate/export according to the day ahead generation schedule.

(iii) However the SLDC shall regulate the overall state generation in such a manner that generation from following types of power stations where energy potential, if unutilized, goes as a waste shall not be curtailed:

- Run of river or canal based hydro stations.
- Hydro-station where water level is at peak reservoir level or expected to touch peak reservoir level (as per inflows).
- Wind power stations.
- Solar power stations (Other than hybrid).
- Hybrid solar power stations with minimum generation from conventional fuel required to utilize available solar power.
- Nuclear power stations (to avoid poisoning of fuel).

9.7 Despatch instructions

Despatch instructions shall be in standard format. These instructions will recognize declared availability and other parameters that have been made available by the SSGS to SLDC. These instructions shall include time, Power Station, Generating Units, (Total export in case of CPP), name of operators Sending and receiving the same. Standard despatch instructions may include:

(i) To switch a SSGS into or out of Service.
(ii) Details of reserve to be carried on a unit.
(iii) To increase or decrease MVAr generation to assist with voltage profile.
(iv) To begin pre-planned Black Start procedures.
(v) To hold spinning reserve.
(vi) To hold Generating Units of SSGS on standby.
(vii) To control MW/MVAr Drawl by Distribution Companies.
9.8 **Revision of schedules**

9.8.1 In case of forced outage of a ISGS unit, NRLDC will revise the schedules on the basis of revised declared capability. The revised schedule will become effective from the 4th time block, counting from the time block in which the revision is intimated by the generating station to be the first one.

9.8.2 In the event of a situation arising due to bottleneck in evacuation of power due to transmission constraint (arising due to tripping of line or substation equipment or problem in any transmission line or substation), the NRLDC shall revise the schedule drawl from Northern Regional Grid, it shall become effective from the 4th time block, counting the time block in which the transmission constraint has been brought to the notice of NRLDC as the first one. During the intervening three time blocks also, the schedule shall deem to have been revised to be equal to the actual generation by the ISGS.

9.8.3 On receipt of an intimation, under section 9.8.1 and 9.8.2 above, SLDC shall effect corresponding revision in generation and load drawl schedule and shall convey to concerned constituents, the time from which schedule will be effective. Such effective time may be earlier than that advised by NRLDC.

9.8.4 In case of any outage or trouble in generating stations and/or transmission system of RVUN, RVPN, CPP or NES power Plant or transmission constraints, SLDC shall either (i) revise the scheduled drawl of Discoms or (ii) revise the ‘net drawl’ from Northern Regional Grid and shall intimate occurrence of event and revised drawl schedule from Northern Region to NRLDC and also to its constituents.

9.8.5 In case of any grid disturbance, the scheduled generation of all the generating stations and scheduled drawl of all the beneficiaries states of Northern Region shall be deemed as per IEGC to have been revised to be equal to their actual generation / drawl for all the time blocks affected by the grid disturbance. The exact duration of such grid disturbance would be declared by NRLDC. Under such condition, generation schedule for RVPN, RVUN and other stations, if any, and drawl schedule of each Discom shall be restricted to that advised by SLDC on instant to instant basis.

9.8.6 Revision of declared capability by state generator(s) and requisitions by intra-state utility (ies) for the remaining period of the day can also be permitted by SLDC with advance notice. SLDC shall effect requisite change in revised drawl schedules. Declared capacity and declared capability in such cases shall become effective from the 6th time block, counting the time block in which the request for revision has been conveyed.

9.8.7 As per IEGC, in case any constituent seeks a revision in the bilateral schedules, the same would have to be confirmed by the other constituent within a period of one hour and the revised schedules would come into effect and made effective with effect from 6th time block from this instant.

9.8.8 As per CERC order dated 04.01.2000 on ABT, in case at any point of time, NRLDC observes that there is need for revision of the schedules in the interest of better system operation, it can do so on its own and in such cases, the revised schedules shall become effective from the 4th time block, counting the time block in which the revised schedule is issued by RLDC to be the first one.
9.8.9 In the contingencies listed at 9.8.5 and 9.8.6, SLDC shall take action as per section 9.4.4.

9.8.10 On completion of the operating day (i.e. after 2400 hrs), the final schedule as implemented shall be issued by NRLDC after incorporating all before the fact changes during the day of operation. Based on the same SLDC will issue such schedule to all intra-state utilities.

9.8.11 Various steps involved in the scheduling and the final scheduling by NRLDC shall be open to all the constituents for any checking / verification for a period of 20 days. SLDC shall convey these and its final scheduling to all concerned. Any mistake / omission in schedule and final schedule issued by NRLDC or SLDC, as the case may be, shall be brought to the notice of SLDC by concerned agency. SLDC shall check and effect rectification or where required, take up with NRLDC for rectification.

9.9 Special situations related to scheduling

9.9.1 There would be certain situations needing special treatment while scheduling. These would be taken care of as per agreed methodologies from time to time between constituents & NRLDC within the framework of IEGC. Prevalent methodology is mentioned hereunder and at clause 9.10 and 9.11.

9.9.2 Standing instructions by SLDC to NRLDC for deciding the best drawl schedule
SLDC under clause 9.4.5 would convey to the NRLDC, at least, the following information on 15-minute time block basis:
- Total MW required from the grid at its periphery and
- MW schedule for bilateral exchanges

9.9.3 Based on the above information, NRLDC would work out the requisitions from each Interstate Generating Stations (ISGS) considering the merit order of energy charges in respect of ISGS stations after translating the above MW values to ex- power plant (considering an estimated level of transmission losses).

9.10 Scheduling of the ISGS hydro stations

9.10.1 In respect of hydro power stations where the MWh generation for the day is fixed depending on the water inflows, MWh entitlement of each beneficiary state is also fixed for the day. In case the beneficiaries are allowed full freedom to requisition on 15-minute time block basis restricted to their MWh entitlement for the day, it may result in an ISGS schedule not practicable for the generator to follow (due to part load or high cavitations zone operation on sustained basis). Accordingly based on SLDC requisition of its proposed total requirement from the grid, for the next day under section 9.4.4 to NRLDC by 15.00 hrs, an interim schedule would be worked out by NRLDC adding this forecasted requirement for each state with a weight age corresponding to percentage entitlement of the state in the ISGS hydro station. This interim schedule would be rounded off to the nearest feasible MW for the ISGS hydro station to get the final schedule of the ISGS hydro station. With this procedure,
the generation schedule would adequately reflect the weightage according to MW demand of each beneficiary in the ISGS hydro station.

9.10.2 The entitlement for each beneficiary would then be worked out by NRLDC based on such interstate hydro generating station schedule and percentage entitlement of the beneficiary. The above general procedure will be followed except in case of extremely low water inflows, when the hydro stations would be scheduled for operation only during the peak hours.

9.11 Allocation of un-requisitioned surpluses

9.11.1 In line with section 5.7.3 of the CERC’s orders on ABT, each ISGS could negotiate the terms with any beneficiary for such un-requisitioned power on day-to-day basis. A copy of all such agreements would be made available to NRLDC and NREB Secretariat, and would be supplied to SLDC. In case SLDC desires to avail full or part of such un-requisitioned surplus, such agreements would get first priority in allocation of un-requisitioned surpluses at the terms and conditions of the offer/agreement. In case of such surplus, requisitioned by states, exceeds the availability; allocations to each state will be decided by NRLDC/NREB Secretariat as per policy guidelines of NREB.

9.11.2 In respect of state sector power projects, SLDC shall evolve procedures for best drawl schedules and scheduling of hydro stations and incorporate the same as annexure to this Code.

9.12 Exchange of information

9.12.1 With the implementation of ABT, the generation schedules and drawls schedules would have a bearing on payment to ISGS for the energy charge and for unscheduled interchange. Therefore, the timely and accurate exchange of information in regard to schedule is of paramount importance. This aspect gains extra importance particularly in view of the CERC order of ABT dated 4.1.2000 wherein under schedule 1.0 it is stated that ‘generation schedule and drawl schedules issued/revised by NRLDC shall become effective from designated time block irrespective of communication success’. In order to avoid any adverse effect commercially on the state the need for a reliable and fast communication arrangement for exchange of information in respect of scheduling cannot be overemphasized.

9.12.2 Considering the large volume of information needed to be exchanged in a time bound manner, the transfer of information between NRLDC and other constituents i.e. states and ISGS, shall be preferably carried out on PC-to-PC communication link through Internet / public switched telephone network (PSTN). Matching system will be developed at the State level for communication between SLDC and NRLDC and between SLDC and Sub-load Despatch Centre. In order to have fast access on the network, RVPNL shall also endeavour to have fast/dedicated connectivity on internet/ other media as appropriate between SLDC, Sub-LDC & Discoms.

9.12.3 For this purpose NRLDC may have a dedicated Internet connection on a leased circuit. The ISGS and SLDC shall that case upload the information to NRLDC site in regard to scheduling at the agreed time and download the generation schedules and drawl schedule from NRLDC site at the designated times.
9.12.4 In respect of any desired change in schedule, SLDC shall contact NRLDC and also notify the requisite information by e-mail / fax / coded message immediately. The clock timings of NRLDC at which the e-mail/fax/coded message information is received, would be reckoned as the starting block for schedule revision.

9.12.5 The information, in regard to revision of schedule shall be flashed by NRLDC to the constituents by e-mail or fax or coded message. Accordingly SLDC shall receive/download the revised schedule from NRLDC site.

9.12.6 In case NRLDC wants to revise the schedule due to transmission constraints or otherwise, then the required intimation will be flashed by NRLDC to the SLDC by fax/ coded message and accordingly, SLDC shall receive/download the revised schedule from NRLDC site.

9.12.7 The information received/downloaded as per subsection 9.12.4 to 9.12.6 shall be converted to revised schedule by SLDC and conveyed to sub load despatch centre and Discoms.

9.12.8 Each message sent by SLDC to NRLDC, SLDC to Sub-LDC & SLDC to Discom and vice versa shall be duly numbered. The date and time of issue shall be invariably stamped along with the subject and revision number etc.

9.12.9 The conventional voice / fax arrangement would act as back-up in case of failure of PC to PC communication link through Internet.

9.12.10 At the end of the day the final schedule as implemented after incorporating all 'before the fact changes' during the day of operation shall be made available by NRLDC on the network and accordingly shall be downloaded by the SLDC. Based on the same, at the end of the day, SLDC will convey to Sub-LDC and all Discoms, the final schedule as implemented after incorporating all 'before the fact changes’ during the day of the operation.
Chapter - 10

10 Grid Disturbances and Revival

10.1 Overview
This chapter describes the guidelines for classification of Grid disturbances into different categories, for the purpose of analysis and reporting. The milestones to be reached so as to consider the restored system as normal is also indicated. The general precautions to be observed, while restoring a disturbed system is also covered in this chapter. This chapter is based on and incorporates 'Black Start Procedures for Northern Region' brought out by NRLDC.

10.2 Definitions

Total System Blackout: The system is said to be under total blackout when all generation is ceased in the system and there is no supply from external interconnections to the State Transmission System. It is not possible for the total system to function again without black start procedure.

Partial System Blackout: A situation when a part of the State Transmission System is under blackout when all the generation within that part ceased to function and there is no external interconnections, so as to possible for that part of State transmission system /Central Generating Station to function again without agreed procedures.

Black Start: Procedure necessary for a recovery from a total /partial system blackout. The procedure for a partial system blackout is same as that for a total system blackout except that it applies only to the affected portion of the State Transmission System.

Grid Disturbance: Grid Disturbance is the situation where disintegration and collapse of grid either in part or full take place in an unplanned and abrupt manner, affecting the power supply in a large area of the region.

System Island: In case a part of the system is separated from the main Regional Grid System due to intentional implementation of under frequency relay schemes and operates independently is called System Islanding. Normal operation of the total system will require power islands to be re-synchronised at some appropriate time.

System Split: In case part or whole of State Transmission System is separated on operation of protective relays and operate independently is called system split.
10.3 Classification of grid disturbances
The criteria for classifying grid disturbances are indicated in the table below.

Classification of grid disturbances

<table>
<thead>
<tr>
<th>S. No</th>
<th>Category No.</th>
<th>Severity</th>
<th>Description</th>
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</table>
| 1     | A            | Major     | Total blackout in the region  
OR Loss of 40% or more of the antecedent generation in the system  
OR Separation into two or more subsystems and loss of 30% or more of the antecedent generation |
| 2     | B            | Moderate  | Loss of 20 - 40% of the antecedent generation in the system  
OR Separation into two or more having antecedent load in each of the first two subsystems equivalent to thirty percent (30%) or more of the antecedent generation  
OR Instantaneous loss of load corresponding to more than 15% of the antecedent generation |
| 3     | C            | Minor     | Loss of 10 - 20% of the antecedent generation in the system  
OR Total loss of power supply at a power station contributing 5% or more to the antecedent generation  
OR Total loss of power supply at a 220 kV or above substation catering to load corresponding to 5% or more of the antecedent generation  
OR Separation into two or more subsystems having antecedent load in each of the first two subsystems equivalent to five percent (5%) or more of the antecedent generation |

The above is a general guidelines for the purpose of analysis and reporting. The generation schedules for ISGS and net drawl schedules for states would remain suspended for the first two categories viz. A & B while for category C, it would be on case-to-case basis as decided by NRLDC. However, if only one state system or one ISGS is affected, the schedules would not be suspended even for category-B disturbances but only schedules would be revised.

10.4 System restoration
The restoration of the system shall be carried out as mentioned in the document 'System Restoration Procedure for Northern Regional Grid' prepared by NRLDC in consultation with all constituents and amended from time to time.
The general guidelines and precautions to be followed during system revival is indicated below:

(i) While building up the system, it would be ensured that the voltage at the charging end remains within limits. Before switching next section, essential load of substation shall be connected to enable charging of battery, shunt reactor shall be connected and a small load may be switched on at each sub station to ensure charging end voltage. However, the ultimate objective, viz. building up of the network should not be lost sight of, while connecting the loads and large loads shall not be switched on. If charging end voltage dips at any substation, non-essential load or shunt reactor at intermediate stations may be switched off.

(ii) Security of the network being built up would be strengthened at the earliest by closing the parallel lines available in the restoration path.

(iii) Priority would be accorded for extending supplies for start up power to nuclear, gas thermal power station, coal based power station, installations of strategic importance, railway traction and water works in this order.

(iv) All switching instructions for a particular system have to emanate from a single agency viz. SLDC/ sub-LDC as per standing instruction for synchronization of two systems, SLDC will co-ordinate with NRLDC wherever required. Wherever a communication problem occurs, standing instructions as issued to the substation engineers for implementation will be followed.

(v) During revival of the system, In-charge of sub stations, power stations and SLDCs would remain present in the control room so as to expedite restoration of the system.

(vi) In line with Clause 6.8(e) of IEGC, during system revival all communication channels, required for restoration process, shall be used for operational communication only, till grid normalcy is declared by SLDC.

(vii) All generating units would be on free governor operation and the excitation controlled to maintain proper voltage profile.

(viii) Synchronizing facility, available at following grid sub stations, would be utilised in choosing the point of synchronization.

(a) 400 kV Heerapura GSS
(b) 400 kV Ratangarh GSS
(c) 220 kV Heerapura GSS
(d) 220 kV Kota (Sakatpura) GSS
(e) 220 kV Khetri GSS
(f) 220 kV Alwar GSS
(g) 220 kV Bharatpur GSS

(ix) Synchronizing facility, available at the switchyard of generating station can also be used as the point of synchronization.
10.5 Declaration of system normalization

10.5.1 When a system is restored after a grid disturbance, SLDC shall notify to all operators for normalisation of the system.

10.5.2 After a category 'A' or 'B' disturbance, the system would be declared by SLDC to have been normalized if:

i) All subsystems have been synchronized, and
ii) 80% of the total loss of generation at ISGS stations, during the incident, has been revived.

10.5.3 After a category-C disturbance, the system would be declared by SLDC to have been normalized, if

a. All subsystems have been synchronized.
b. Power has been extended to each affected grid substation.
c. At least one unit at the affected power station has been synchronized (subject to a maximum of three hours of receipt of start-up power).

10.6 Inter regional support

In case of grid disturbance or any other contingency, support of neighbouring state/region shall be availed under such contingency. Such exchanges shall be limited to that needed to meet the essential load, start-up-power, railway traction and other such emergent requirements for the duration of such contingencies.

10.7 Changing System Conditions

10.7.1 In real time situation, depending upon the actual system conditions certain deviations from the documented procedure may be essential to achieve the ultimate objective of speedy recovery and normalisation. Therefore, during system revival, the SLDC Control Staff shall have to act judiciously and any such deviation which is required for achieving the speedy revival may be carried out in consultation and as per instructions of the NRLDC. Procedure so adopted will be documented and discussed in next meeting of Technical Committee for incorporation in LD&SOC.

10.7.2 Since the generating stations with black start facility, inter-state/inter-regional ties, synchronising points and essential loads to be restored on priority determine the system restoration sequence, the procedure shall be reviewed every subsequent year with the objective to achieve fastest possible recovery of the grid.
Chapter- 11

11 Islanding Schemes

11.1 Overview

This is a system requirement under contingency conditions according to which the power network is splitted into healthy and self-sustaining zones so that cascade tripping of all generating stations in the entire region is avoided.

11.2 Islanding Schemes

11.2.1 In order to isolate and save healthy parts of the grid during any disturbance, under frequency islanding schemes have to be designed and developed based on system study and simulating the conditions requiring any isolation of a generator island from rest of the grid.

11.2.2 SLDC shall follow the islanding scheme as finalised after deliberation by NREB. The scheme shall be reviewed on quarterly basis.

11.2.3 SLDC shall formulate one or more sets or subsets of islanding scheme(s) to prevent cascade tripping of generating units (other than of interstate generating stations) operating within the state. Such schemes shall be formulated in consonance with the principles and guidelines decided by NREB. NRLDC/SLDC shall effect changes to any such islanding scheme, as may be suggested by NREB and NRLDC. These changes have to be informed to NREB/NRLDC as and when implemented.

11.2.4 SLDC shall effect real time monitoring of difference between generation and load of the area covered by each islanded scheme in operation. In case of large deviation. SLDC shall effect appropriate changes in area covered by an islanding scheme by making operative or blocking the tripping of lines through respective under frequency relays. These changes have to be informed to NREB/NRLDC as and when implemented.

11.2.5 The incharge of Grid Substations where under frequency relays for islanding purposes are installed shall confirm to SLDC through a numbered message the status of UF relays which are blocked / made operative as per latest system conditions / changing loads. No alterations in Under Frequency Relays (UFR) status/settings shall be made without specific approval through a coded message from SLDC. At the time of change in system status necessitating blocking / operating of these relays, the shift engineer of LD centre shall convey the changed requirement to respective GSS and obtain confirmation that the relay status has been suitably changed. It has to be ensured that due permission is taken from NRLDC in respect of any such tripping of inter-state lines and inter-connection with ISTS.

11.2.6 SLDC shall also have backup system of tripping such lines using direct circuit breaker control from SLDC.

11.3 Islanding Scheme Review

The islanding scheme described in Chapter 5 of Part-I relates to current system conditions and parameters. The frequency settings of Under Frequency Relays, Blockage/operation and time settings etc. needs to be checked and adjusted from time
based on changed system conditions and configuration. The conditions antecedent
determined smooth operation of the islanding scheme. The SE (SOLD) shall monitor
the system status frequently and ensure that status of UFRs be kept suitably operative
/ blocked with correct settings as per system requirements, so that in the event of
major grid disturbance, Islanding takes place smoothly. These changes have to be
informed to NREB/NRLDC as and when implemented.
3  Energy accounting, Reporting & Management of Load Despatch Organisation
Chapter-12

12 Energy Account and Settlement System

(Shall be effective from the date as may be decided by RERC)

12.1 Energy Accounting

12.1.1 SLDC shall prepare every month, the accounts of active & reactive power drawal/injections as well as energy supplied to:-

(i) Jaipur, Jodhpur & Ajmer Vidhyut Vitaran Nigams or any other distribution licensees and
(ii) RVPN from various sources.

12.1.2 The energy accounts so prepared by SLDC, shall be sent to for the purpose of monthly billing.

12.1.3 In the preparation of such energy accounts, SLDC shall take into consideration:-

(i) Bulk Supply Agreements for supply and/or transmission of power, bilateral agreements, short term and spot purchases effected by SLDC on behalf of any licensee, and
(ii) Policy guidelines or decisions of State Power Committee, and
(iii) Decisions/directives of RERC, and
(iv) Components of tariff as approved by RERC.
(v) Such accounts by BBMB and NREB.
12.1.4 For the purpose of preparation of energy accounts, the joint meter reading taken on 1st of every month at points of supply between RVPN and RVUN or any generating company or CPP or between RVPN and Discoms or any distribution licensee shall be conveyed to SLDC by 2nd of every month.

12.1.5 Energy accounts shall be prepared by SLDC by 7th of every month and shall be conveyed to all concerned for raising bills. Such energy accounts shall be subject to inspection/verification/checking and raising any objection within 15 days of date of issue. If no objection is raised, energy accounts shall be finalized. In case, any objection is raised, same shall be deliberated in Commercial Engineers committee and finalized as per their decision. Supplementary bills/credit note shall be raised accordingly.

12.1.6 In case energy accounts prepared/finalized by SLDC, require any change on account of revisions of energy accounts by BBMB or NREB, SLDC shall suo-moto or on the request of any member of the Commercial Engineers Committee shall effect changes following the provisions of clause 12.1.5.

12.2 **SLDC System Operation Charges:**

12.2.1 The SLDC as per provisions of the section 55(10) of the Electricity (Supply) Act 1948 read with section 59 (3) (i) of the Rajasthan Power Sector Reforms Act shall levy a System Operation Charges as may be determined by RERC from the constituents using the State Transmission System.

12.2.2 SLDC shall serve to each utility on 7th of every month the bills of its fees and charges. These charges shall be payable on 13th of every month. Delay in payment of SLDC system operation charges will be subject to levy of late payment surcharge. Besides this SLDC may direct disconnection of the utility from the Grid or regulate their supply/despatches and may approach competent authority for levy of fines.
Chapter - 13

13 Event Information and Reporting

13.1 Overview
Timely and accurate reporting and exchange of information plays a very important role in system operation. This is particularly important during a grid disturbance or a crisis situation. Timely and accurate information flow under such conditions would greatly reduce an element of uncertainty and help in making an informed decision. If the system restoration after a grid disturbance is likely to get delayed, it is important that the general public is also well informed to avoid any unrest. Such instances could result in a major credibility crisis for the Electricity Supply Industry (ESI) and has to be avoided. This chapter describes the information to be exchanged between SLDC and NRLDC, SLDC and its constituents and their periodicity.

13.2 Event information [to NRLDC]

13.2.1 Under Clause 6.9.5 of IEGC, SLDC shall report following events to NRLDC:

(i) Violation of security standards
(ii) Grid indiscipline
(iii) Non-compliance of NRLDC’s instructions
(iv) System islanding
(v) Blackout/partial black out of EHV Grid
(vi) Protection failure on any element of interstate transmission system and “agreed list of” intrastate transmission system
(vii) Power system instability
(viii) Tripping of any element of interstate transmission system and ‘agreed list of intrastate transmission system’

13.2.2 Any tripping of an element falling under Sr. No. (iv), (v) (vi) & (viii) whether manual or automatic, shall have to be intimated by SLDC to NRLDC in a reasonable time not exceeding ten (10) minutes of the occurrence of the event. Along with the tripping intimation, the reason for tripping (to the extent determined) and the likely time of restoration shall also be intimated. Such intimation can be on telephone or fax or e-mail. This should be followed by a detail report in four (4) hours. Any other event shall be reported within 30 minutes.

13.2.3 Any operation planned to be carried out by SLDC, which may have an impact on the regional grid, or on any of the "important element of northern regional grid", shall be reported by SLDC to NRLDC in advance.

13.2.4 The details and the exact time of revival of an element falling under the category of "important elements of northern regional grid" whether revived after a tripping or after a prolonged outage, shall be also intimated to NRLDC immediately.

13.2.5 Besides immediately orally reporting of events to NRLDC, a detailed report in writing shall also be sent under Clause 6.9.6 of IEGC to NRLDC within 4 hours with the following details of the event:
(i) Time & date of event
(ii) Location
(iii) Plant and/or equipment directly involved
(iv) Description and cause of event
(v) Antecedent conditions
(vi) Demand and/or generation (in MW) interruption and duration of interruption
(vii) All relevant system data including copies of records of all recording instruments (including disturbance recorders event logger, DAS etc.)
(viii) Sequence of tripping with time
(ix) Details of relay flags
(x) Remedial measures.

13.2.6 Exceptional reporting (SLDC to NRLDC)

The above reporting schedules are to be strictly followed. However, in case of any contingency such as an industrial unrest, natural calamity in any part of the region etc., there could be additional reporting requirements not covered in the above schedule. SLDC and its constituents would extend the necessary cooperation in this regard.

13.3 Event information from generating or EHV substation to SLDC

13.3.1 In-charge EHV substation or generating station shall report all events falling under section 13.2.1 and the following to sub load despatch centre as well as SLDC within 10 minutes of the occurrence:-

(i) All trippings at a EHV substation or generating station effecting the supply or generation of electricity
(ii) Failure of under frequency relay affecting system islanding schemes
(iii) Switching in/off of shunt capacitor bank or synchronous condenser or shunt reactor
(iv) Non-compliance of SLDC’s instructions

Any such events reported on telephone shall be confirmed in writing. Detailed report on tripping will be sent within 3 hours of the occurrence.

13.3.2 Under frequency relay operations

In line with the clause 6.2 (m) of the IEGC, all state constituents have to provide automatic under frequency load shedding in their respective systems as per plans approved by NREB to arrest frequency decline that could result in collapse / disintegration of the grid. In order to check and ascertain their operation as per approved plans, the details of all such tripping in their areas shall be intimated by each SLDC to NRLDC whenever required by the latter. In-charge GSS shall report the trippings effected by such schemes to SLDC within 30 minutes of operation.

Form for reporting event/tripping shall be as per section 13.2.5. Irrelevant items shall be omitted and physical loss/damage, if any, shall be reported.

13.4 Event information from SLDC to Utilities

13.4.1 Any operations planned to be carried out on the instructions of NRLDC which may have an impact on the Rajasthan system and which shall be reported by
NRLDC to SLDC in advance, shall be brought to the notice of concerned constituent of SLDC.

13.4.2 SLDC shall send reports of the following to concerned utility:-

(i) Any tripping or operation, which falls within the list of important events decided by State Power Committee.
(ii) Any report sent to NRLDC.

13.4.3 SLDC shall also send report to its constituents, if due to any failure or trippings, the power supply is effected by 20% of the schedule or in 20% of the area served by the licensee. For such events, SLDC shall also issue press release.

13.4.4 In the event of a grid disturbance SLDC shall issue a flash report to the constituents, followed by a detailed report in the following manner.

(i) Grid disturbance category - A (major disturbance):
Flash report within a period of six (6) hours followed by a detailed report within ten (10) working days.

(ii) Grid disturbance category - B (moderate disturbance):
Flash report within a period of five (5) hours followed by a detailed report within a period of seven (7) working days.

(iii) Grid disturbance category - C (minor disturbance):
Flash report within a period of four (4) hours followed by a detailed report within a period of four (4) working days.

13.5 Weekly Reports (NRLDC to constituents)

13.5.1 Weekly report shall be issued by NRLDC to all constituents of the region covering the performance of the regional grid during the previous week, in line with Clause 6.5.1 of IEGC.

13.5.2 A quarterly report shall be issued by NRLDC to all the constituents elaborating the power supply position during the last quarter, quality of supply, the system constraints and other relevant information in line with Clause 6.5.2 of IEGC.

13.5.3 SLDC shall send relevant extract of these reports to utilities within a week of its receipt from NRLDC.

13.6 Periodic Reports

13.6.1 A daily report of provisional drawls from various sources shall be issued by SLDC by 8.00 AM of next day to RVUN, RVPN and Discoms.

13.6.2 A weekly report shall be issued by SLDC to all utilities. It shall cover the performance of the State Grid for previous week and shall contain:

(a) Frequency profile - Maximum & minimum frequency and frequency variation index of the sub-station as decided by State Power Committee.
(b) Voltage profile – Maximum & minimum voltage & voltage profile of substations as decided by State Power Committee.
(c) Major generation and transmission system outages.
Transmission system constraints, if any, observed in system operation.

Instances of significant non-compliance of IEGC and Grid Code.

Extracts from weekly/quarterly report issued by NRLDC, to the extent relevant to constituents or the state’s system operation.

13.6.3 SLDC shall issue quarterly report covering above aspects and in addition the violation of security standards, if any, and reports of action taken by the respective utilities to mitigate constraints, avoid violation of Grid Codes and Security Standards.

13.6.4 SLDC shall also provide information/reports, which may be called by State Power Committee.

13.6.5 SLDC shall send a copy of report of events covered by section 13.2.1 (i) to (v) & (vii), 13.3.1 (ii) & (iv), 13.4.3, 13.4.4, 13.5.2, 13.6.2, 13.6.3 and detailed reports thereof to RERC.

13.7 Accident Reporting

All accidents fatal or non-fatal shall be promptly reported by the Shift-in-Charge of the concerned RVPN sub-station/line where accident occurred to the SLDC. Intimation of accidents shall be given by the In-charge of GSS/Generating Station in accordance with the Indian Electricity Rules, 1956, Rule 44-A to the Electrical Inspector if required as per IE Rules 1956.

13.8 Operating manpower

The control rooms of the SLDC, power plants, grid substations as well as any other control centres of RVPN shall be manned round the clock by qualified and adequately trained manpower who would remain vigilant and abide by SLDC instructions at all the times, so as to maintain the system safety and security and operate it in a most optimum manner.

13.9 Recording of Messages

SLDC shall ensure that the entries in the logbooks must be made immediately after the conversation. Each person in the Control Room, who is giving instructions, may note down the time and instructions and transfer them immediately into the logbook. Such entries would not be left to be done at later stage. This practice shall be followed meticulously to avoid inaccuracies in the messages actually given and those recorded in the SLDC.
Chapter-14

14 Management of Load Despatch & System Operation Code

14.1 Load Despatch & System Operation Code

14.1.1 The load dispatch and System Operation Code, issued with the approval of RERC shall be binding on SLDC, RVPN, RVUN, Discoms and any other licensee or generating station (other than of interstate generating stations & transmission lines) in Rajasthan. This Code shall be amended as provided hereinafter:

14.1.2 The Load Despatch and System Operation Code have been grouped into three headings. Group 1 comprising of general overview of Rajasthan State Transmission System and load dispatch facility available with SLDC which can be updated by SLDC itself from time to time and shall be conveyed to all utilities and RERC.

14.2 State Power Committee

14.2.1 The topics covered in Group 2 of LD&SOC shall be amended by the State Power Committee consisting of the following:-

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<tr>
<th></th>
<th>Chairman &amp; Managing Director, RVPN</th>
<th>Chairman</th>
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<tbody>
<tr>
<td>2</td>
<td>Chairman &amp; Managing Director, RVUN</td>
<td>Member</td>
</tr>
<tr>
<td>3</td>
<td>Chairman &amp; Managing Director, Jaipur Discom</td>
<td>Member</td>
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<tr>
<td>4</td>
<td>Chairman &amp; Managing Director, Jodhpur Discom</td>
<td>Member</td>
</tr>
<tr>
<td>5</td>
<td>Chairman &amp; Managing Director, Ajmer Discom</td>
<td>Member</td>
</tr>
<tr>
<td>6</td>
<td>A representative of IPP/CPP operating within the State to be nominated by the GoR</td>
<td>Member</td>
</tr>
<tr>
<td>7</td>
<td>A representative of generating company operating within the State.</td>
<td>Member</td>
</tr>
<tr>
<td>8</td>
<td>A representative of NRLDC</td>
<td>Member</td>
</tr>
<tr>
<td>9</td>
<td>Incharge SLDC</td>
<td>Member</td>
</tr>
<tr>
<td>10</td>
<td>One representative of RERC</td>
<td>Member</td>
</tr>
<tr>
<td>11</td>
<td>Addl. Chief Engineer LD RVPN</td>
<td>Member-Secretary</td>
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14.2.2 The issues covered in Group-3 of LD&SOC shall be amended on the recommendation of State Power Committee with the approval of RERC.

14.2.3 However, where provisions of IEGC have been referred to or reproduced in this Code, and relevant provision of IEGC is amended, the amendment to such reference or reproduction will be immediately effected by SLDC under
intimation to all utilities and RERC.

14.2.4 The State Power Committee shall deliberate on the proposal mooted by any of its member or licensee or Captive Power Plant Operator or generating company (other than of interstate generating stations & transmission lines), operating within the state. The recommendations of the Committee shall be by majority of members of the committee. Provided that where proposal is deliberated by correspondence and general consensus of all members is not reached, it shall be decided only through meeting.

14.2.5 The State Power Committee shall nominate Chief Engineer level Technical Committee, which shall meet monthly and deliberate on all technical and operational aspects covered under Group – 2 and shall give their recommendations to the State Power Committee.

14.2.6 The State Power Committee shall also nominate commercial engineers committee, which shall meet monthly and deliberate and decide monthly energy accounts of SLDC. Provided that pending finalization, provisional energy accounts issued by SLDC on 7th of every month shall be considered for billing purposes.

14.2.7 All Committees shall be guided by IEGC, Grid Code and directives of Regulatory Commission. Technical Committee and Commercial Engineers Committee shall also be guided by the policy decisions of State Power Committee. Any differences among members of Technical Committee & Commercial Engineers Committee vide clause 14.2.5 & 14.2.6 shall be referred to State Power Committee and that of State Power Committee to RERC.

14.2.8 In case of emergency, any of these Committees may by consensus decide for provisional implementation of their decision pending the final approval/decision by State Power Committee or RERC, as the case may be.

14.2.9 SLDC shall send daily, weekly and monthly data of system parameters, as may be decided by State Power Committee, to concerned utilities.

14.2.10 RERC shall observe the compliance of this Code. It can effect any change in Group –2 & 3 of this Code or stay implementation of any decision of the aforesaid committees.
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