

# HARYANA ELECTRICITY REGULATORY COMMISSION

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## Standards for Distribution Licensee

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| a) | Distribution System Planning and Security Standards |
| b) | Distribution System Operating Standards             |

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# **DISTRIBUTION SYSTEM PLANNING AND SECURITY STANDARDS AND OPERATING STANDARDS**

## 1. **TITLE**

1.1 These **standards** may be called as:

- a. Distribution System Planning and Security Standards
- b. Distribution System Operating Standards

## 1.2 **DEFINITIONS:**

For these standards, terms which are printed in bold letters shall mean the following unless the context otherwise requires. The words or expressions occurring in these standards shall bear the same meaning as in Haryana Electricity Reforms Act 1997, HERC (Conduct of Business) Regulations 1998, Rules and Licenses. Other new terms, words and expressions occurring in these standards will have the same meaning as defined under the heading-Reference.

**CBI & P Manual:** Manuals published by Central Board of Irrigation and Power, a Technical body of the Government of India.

**KVA-km Loading:** Capacity of a line to deliver a certain load in KVA for a certain distance in km with certain Voltage Regulation and Power Factor.

**R.E.C.Specifications:** Specifications issued by Rural Electrification Corporation Ltd. (A Government of India Undertaking)

## 2. **APPLICATION**

### 2.1 **Distribution System Planning and Security Standards**

These standards shall apply to the Licensee's Distribution System under Condition 17.3 of the Licence. The Licensee shall plan and develop its Distribution System in accordance with these standards together with the Distribution code as approved by the Commission.

### 2.2 **Distribution System Operating Standards**

These standards shall apply to the Licensee's Distribution System under Condition 17.3 of the Licence. The Licensee shall operate the Distribution System in accordance with these standards together with the Distribution code as approved by the Commission.

### **3. REFERENCE**

These standards also require reference to the following Acts, Rules, and Codes etc.

- i. The Indian Electricity Act, 1910,
- ii. The Electricity (Supply) Act, 1948,
- iii. The Indian Electricity Rules, 1956,
- iv. The Haryana Electricity Reform Act, 1997,
- v. The Distribution Code,
- vi. REC Specifications and Construction standards of Distribution System,
- vii. CBI & P manual on Layout of sub-stations.
- viii. Transmission Operating Standard and Transmission Planning and Security standards under Condition 19.4(a) of Transmission and Bulk Supply License.

### **4. DISTRIBUTION SYSTEM PLANNING & SECURITY STANDARDS**

#### **4.1 General:**

- 4.1.1 The Licensee shall plan and develop its Distribution System, to ensure that subject to the availability of adequate generating and transmitting capacity, the system is capable of providing consumers with a safe, reliable, economical and efficient supply of electricity.
- 4.1.2 The Licensee's Distribution System shall conform to the statutory requirements of Indian Electricity Act 1910, Electricity Supply Act 1948, and Indian Electricity Rules 1956.

#### **4.2 Planning Procedure:**

- 4.2.1 The Licensee shall prepare a medium term load forecast for a period of 5 (five) years and long term forecast for a period of 10 years in its Area of Supply taking into account the probable load growth and consumption pattern of various category of consumers. The Licensee shall adopt appropriate load forecasting methods using reliable data and relevant indices.
- 4.2.2 Prospective consumers seeking new connections shall submit their applications to the Licensee along with load requirements and consumption pattern. Based on the data submitted, the Licensee shall plan its distribution system, keeping in view the system requirements, loading conditions of transformers and transmission lines from various supply locations.
- 4.2.3 In case of change in the load demand after the release of the connection, the consumers shall inform in writing, to the Licensee regarding changes, if any,

in their load demand.

### **4.3 Planning Standards Criteria**

#### **4.3.1 Standardization of Sizes and Ratings**

For each voltage class of application such as 230 volts, 400 V, 11,000 volts, and 33,000 Volts, conductors, insulators, lightning arresters, transformers, switchgear, etc. used in the Distribution System shall be standardized with the objective of reducing the inventory. Specifications for these materials shall at least conform to relevant Indian standards/IEC standards in general.

#### **4.3.2 Standardization of Sub-Station Layouts**

The Licensee shall develop standard layouts as detailed below.

##### **4.3.2.1 33/11 kV Sub-Station**

(a) The layout shall generally conform to relevant Construction Standards of Rural Electrification Corporation Ltd, CBI&P manual on layout of sub-station as applicable and provisions in Indian Electricity Rules, 1956 subject to the requirements mentioned in sub paragraph (b) below.

(b) The location of 33/11 kV S/S particularly in densely populated urban areas is dictated by the availability of adequate land and the approach route to the same. Such consideration/alternatives should be studied and provisions of higher capacity transformer and conductors /support should not be outrightly rejected as ultimately the load centres dictate the provision of required electrical facilities.

(c) The layout adopted shall include the following:

- i. Independent Circuit Breaker control of 33 KV feeders and Transformers.
- ii. Independent control of 11 KV Feeders.
- iii. Single Bus sectionalised

(d) Spare bays should be provided for taking care of extension/augmentation of S/S capacity in future.

##### **4.3.2.2 11/0.4kV 3-phase distribution transformers**

(a) Transformers up to 200 KVA capacity other than those meant for indoor installation shall normally be pole mounted.

(b) The layout of the distribution transformers shall generally conform to relevant Construction Standards of Rural Electricity Corporation Ltd. and provisions in Indian Electricity Rules, 1956. The licensee may adopt more improved layout for urban areas as per project report.

- (c) The distribution transformers shall be located as close to the load centres as possible. Transformers above 200 KVA capacity other than those meant for indoor installations shall be outdoor plinth mounted. Outdoor plinth mounted transformer should have adequate fencing arrangement and necessary provisions so that their installation in public places do not pose any danger accidentally or otherwise.
- (d) Moulded Case Circuit Breakers of suitable ratings on the secondary side and fuse unit of suitable rating on primary side of transformers of capacity above 100 KVA shall be provided for protecting the transformers from over load and short circuits. Fuse units of suitable ratings shall be provided on the primary and secondary side of transformers of capacity up to and including 100 KVA for protecting the transformers from overload and short circuits.

#### 4.3.3 Design Criteria for Distribution lines:

These criteria shall apply to all distribution lines up to and including 33kV for both overhead lines and under ground cables.

4.3.3.1 The lines shall be designed and constructed in accordance with relevant provision of I.E. Rule 1956 & relevant Indian standards applicable to overhead lines and under ground cables.

4.3.3.2 The distribution network fed from 33/11kV transformers and 11/0.4kV transformers shall be planned as independent networks within their respective service area. A service area of any particular substation shall mean, an area, where a sub-station normally supplies the load by one or more number of feeders, as required, without exceeding the specified KVA-KM Loading limit of any feeder within the area.

4.3.3.3 The Licensee shall take suitable measures, sufficiently in advance, to augment the capacity of the feeders in the event of the specified KVA-KM Loading of any feeder being exceeded.

4.3.3.4 The design of the distribution lines shall incorporate features to enable their augmentation, in future, with minimum interruption to power supply. The existing Rights of Way shall be fully exploited as far as possible.

4.3.3.5 KVA-KM loading limits for conductors may be calculated on the basis of voltage drop/length of line as per REC standards for conductor up rating, bifurcation and trifurcation of feeders.

#### 4.3.4 Capacitive Reactance compensation:

4.3.4.1 Shunt capacitors unswitched /switched type, shall be installed in the Distribution System at suitable locations for improvement of Power Factor,

voltage profile and reduction of transmission and distribution losses. The size and location of capacitor installations shall be determined on the basis of reliable field data to avoid over voltage at light load periods. Efforts shall be made to put these as near the load as possible for reducing line losses in the system.

4.3.4.2 Protective switchgear for capacitor switching shall have adequate capacity for the said duty. Control Panel with proper annunciation/alarms etc. should also be provided.

4.3.5 Service lines:

The service wires to consumers shall be laid in accordance with relevant Construction Standards of Rural Electrification Corporation Ltd. for 230V /400V supply and generally conform to provisions of Indian Electricity Rules, 1956 in all cases.

4.3.6 Metering Installations:

The meters should be located close to the entrance of the premises and in common areas such as Varandah or Lobbies etc. for easy approachability.

For 230V / 400V the layout of metering installation shall be generally in accordance with relevant construction standards of Rural Electrification Corporation Ltd. The meters and associated metering equipment including connections shall be enclosed in a suitable tamper proof box. The temper proof box shall be of sufficient strength and design with locking and sealing devices and with adequate provision for heat dissipation and electrical clearances. The design shall permit readings to be taken without access to the meter or its connections.

For HT/EHT and LT Consumers the meters with maximum demand indicators, secondary connections, and other secondary apparatus and connections required shall be housed in a separate metering panel/enclosure, which shall be locked/sealed to prevent tampering.

The accuracy & regular checking of the metering installation (including CTs/PTs) should be ensured.

Adequate metering arrangement has to be provided at S/S end also, so that proper record of energy sent out & consumed could be prepared and energy accounts be prepared which should lead to 'energy audit' of distribution network under question and the loopholes causing inefficient use of energy / misuse of energy be plugged.

#### **4.4 Security Standards:**

The Licensee's Distribution System shall be planned and maintained so as to fulfil the following security standards except under Force Majeur Conditions beyond the reasonable control of the licensee.

- i. Loading in any current carrying component of the Distribution System (e.g. Conductors, Joints, Transformer, Switch gear, Cables, other apparatus etc.) shall not continuously exceed the respective thermal limit.
- ii. In case of breakdown of any 33/0.4KV and 11/ .4 KV Distribution sub-station, the electricity supply shall not be interrupted for more than 24 hours except in case of major failures involving Transformers, the interruption shall not be for more than 3 working days.
- iii. In case of a failure in any 11 KV Feeder including its terminal equipment, supply shall not normally be interrupted for more than 24 (Twenty four) hours.
- iv. The licensee shall develop a proper reporting & reviewing mechanism for fault reporting & rectification. Availability of spares & trained personnel should be ensured. Mobile Distribution transformers should be available with the licensee to take care of exigencies arising out of major failure of a particular Distribution transformer.

#### **5. DISTRIBUTION SYSTEM OPERATING STANDARDS**

##### **5.1 General:**

These Operating Standards shall be developed for operating the Licensee's Distribution System safely, efficiently and to ensure maximum system stability and security.

##### **5.2 Operation Criteria:**

The operation criteria comprises of:

- i. Load monitoring
- ii. Load balancing
- iii. Voltage monitoring and control
- iv. Data Logging
- v. Interruption monitoring
- vi. Load management
- vii. Communication
- viii. Safety co-ordination

### 5.2.1 Load monitoring:

Licensee shall prescribe Rules and methods for monitoring load at the following places.

- i. 33/11 kV Sub-stations
- ii. 33 kV Feeders
- iii. 11 kV Feeders
- iv. 11/0.4 KV sub-stations

### 5.2.2 Load Balancing:

The load between Phases in low tension distribution network fed by 33/0.4 KV and 11/0.4 kV distribution transformers under three phase supply conditions shall be kept balanced as far as possible.

### 5.2.3 Voltage Monitoring and Control

5.2.3.1 Voltage monitoring at 33/11kV sub-station shall be carried out by data logging.

5.2.3.2 Improvement to voltage conditions shall be achieved by operating ON LOAD/OFF LOAD TAP CHANGERS of transformers in the Distribution System where such facility exists., The distribution and retail supply Licensee shall coordinate with Transmission and Bulk Supply Licensee, to correct voltage at the sending end also, if required.

### 5.2.4 Data Logging:

All important data such as Voltage, Current, KWh, P.F., Frequency, shall be provided Transformer operational data ( e.g. Tap position; oil/winding Temperature, etc) shall be logged on data logger or at least logged manually on hourly basis in 33/11kV sub-stations and all other attended sub-stations. Data regarding voltage, active & reactive power demand, etc. shall be useful for efficient planning & operation of the system. It shall be possible to transfer the data from the meter to the meter reading instrument or directly to a computer system for proper monitoring & analysis.

### 5.2.5 Interruption Monitoring

5.2.5.1 Licensee shall maintain accurate record of consumer interruption caused by

- a) Planned and unplanned outages of the following equipments in the distribution system.
  - i) 33 kV line/ equipment
  - ii) 33/11 kV Sub- Station
  - iii) 11 kV line/ equipment

- iv) 11/. 4 kV Sub- Station
- b) Outage of power supply from interconnection points with the HVPNL or other power suppliers.
- c) Each record shall contain at least the following information:
  - i) Name of section, Sub-division and Division
  - ii) Location
  - iii) Area affected
  - iv) The name of affected line / sub-station/ equipments/ interconnection point (i.e. with HVPNL and other power suppliers)
  - v) The date and time of interruption
  - vi) The date and time of restoration
  - vii) The duration of interruption
  - viii) The cause of interruption
  - ix) Whether the interruption is planned or unplanned
  - x) The protection device if any operated/ not operated
  - xi) Action taken for restoration of supply
  - xii) Preventive action if any taken
  - xiii) Damage /injury to property/ life if any.
  - xiv) Any other remarks

5.2.5.2 Licensee shall periodically carry out the fault level studies. The first study will be completed by 31<sup>st</sup> December 2003 and successive study will be carried out every 5<sup>th</sup> year thereafter.

5.2.6 Load Management:

5.2.6.1 In the event of total or partial black outs of Transmission System or Regional System the Licensee shall follow procedures as laid down by the State Load Dispatch Center (SLDC).

5.2.6.2 In the event of breakdown within its own System, the Licensee shall take steps to restore/maintain supply within the limit specified under security standards (Sub Section 4.4) by taking appropriate measures.

5.2.7 Communication:

The Licensee shall establish communication facilities at its 33 and 11kV sub-stations. All operating instructions, messages and data received from or sent to

the concerned Grid Sub-station and SLDC shall be duly recorded at such sub-stations.

5.2.8 Safety Coordination:

5.2.8.1 The Licensee and consumers shall abide by the general safety requirements of the I.E.Rules, 1956 for construction, installation, protection, operation and maintenance of electric supply lines and apparatus.

5.2.8.2 The Licensee and its consumers shall abide by the provisions of I.E. Rules, 1956 under Chapter VII titled "Electric supply lines, Systems and Apparatus for High and Extra High Voltages."

5.2.8.3 The Licensee shall develop its own Safety Manual requirements of I.E. Rules and implement the same.