DISTRIBUTION CODE

INTRODUCTION

1. A Distribution Code is an essential part of the Regulatory Framework of the Pakistan Distribution Electric Supply System. In accordance with Section 20, of NEPRA "Regulation of Generation, Transmission and Distribution of Electric Power Act (XL of 1997)", all distribution companies must obtain a Distribution Licence from the National Electric Power Regulatory Authority, NEPRA. As per Section 35 of NEPRA Act, Clause 15 of the NEPRA Licensing (Distribution) Rules - 1999, and the provisions of NEPRA Distribution Licence, all NEPRA Distribution Licensees must comply with an approved Distribution Code at all times. Failure to do so can result in their Licence being suspended or revoked.

2. The purpose of this Code is to ensure that the Licensee's networks are planned developed, operated, and maintained in an efficient, safe, reliable, co-ordinated, and economical manner from the technical stand point.

3. The Distribution Code, approved by NEPRA defines the technical and operational aspects of the relationship between Distribution Company and all those entities connected to the Distribution Company Distribution System. All Generators, BPCs, Distribution Companies and Special Purpose Transmission Licensees shall be subject to the relevant provisions of the Distribution Code as applicable.

4. This Distribution Code, approved by NEPRA, is designed to perform a similar function to that of the Grid Code in relation to Licensee's networks; and is applicable to those which are connected to the Licensee's 132/66/11/0.4 kV network within its Service Territory, and the NTDC.

5. Most of the provisions of the Distribution Code are common to all Licensees except in those cases where an individual Licensee has received NEPRA approval for a specific change from the approved Distribution Code.

6. However, the Distribution Code does not deal with commercial aspects of distribution supply system. It deals exclusively with technical and operational aspects concerning the distribution and supply of electricity, and the use of the Licensee's networks for the transport of electricity.

7. The relationship between the Grid Code and the Distribution Code is shown diagrammatically in Figure-1 on page ID-4. The Grid Code specifies all the technical and operational aspects of the interface requirements between NTDC and Licensees, and consequently the Distribution Code does not contain references to the rights and obligations of NTDC.

8. The Distribution Code contains the following sections: -

   (a) **Code Management**, which sets out procedures to be adopted by all parties for updating and amending the Distribution Code and contains provisions regarding enforcement, administration and compliance/ non-compliance of the Code, and the treatment under Force Majure conditions.

(b) **Distribution Operating Code**, which sets out procedures on operational matters relating to operational planning, including demand forecasts, co-ordination of the planning of Licensee's network outages and generation plant outages, the reporting of operational changes and events, safety matters and dealing with the procedures under contingencies. Furthermore, it deals with the restoration of supply, load shedding, compliance of Performance Standards (Distribution).

(c) **Distribution Planning Code**, which sets out the procedures, planning methodology and criteria related to the distribution planning of the Licensee. It defines the standard of supply of the Licensee's network, and the design principles to which it will be constructed, operated and maintained together with technical information and other requirements to be met by those requiring a connection to the Licensee's network. It also details the technical information exchange between parties relating to such connections.

(d) **Distribution Design Code** (DDC) sets out principles and standards to be applied in the design process of the Licensee Distribution System and any User connections to the Distribution System of the Licensee.

(e) **Connection Code**, which defines the standard of supply, offered by a Licensee to its connecting parties and the Connection and Use-of-system principles to which Licensee requires its connecting parties to adhere to together with technical information and other requirements to be met by those requiring a general connection to the Network. It also details the technical information exchange between parties relating to such connections.

(f) **System Construction Code.**

(g) **System Performance, System Reliability, Consumer Services Requirements.**

(h) **Metering Requirements.**

(i) **Protection Requirements.**

(j) **System Maintenance and Testing.**

(k) **Safety Requirements.**

(l) **Public Lighting.**

(m) **Emergency Plans and Load Shedding.**

(n) **Provisions of Informations.**

(o) **Distribution Data Registration Code.**

(p) **Competition in the Supply of Electric Power.**

(q) **Schedules and appendices**

(r) **Code Definitions**, which provides an explanation of the terms used in this Distribution Code.

9. The purpose of the Distribution Code is not just limited to the operational planning, daily routine operations and connection requirements relating to the Licensee's networks. The Distribution Code should therefore, not be considered in isolation, but as part of a series of related Codes or Agreements, which may include, but not be limited to:

   (a) Balancing Code (if appropriate);

   (b) Use-of-System Code, (if appropriate) and Bilateral Connection Agreements;

   (c) Interconnection Agreements; and

   (d) The Grid Code.

10. Some of the Agreements listed above will relate to a Single Buyer Plus Market and others to a Bilateral Contracts Market. These supporting Codes or Agreements govern technical and commercial relationships between NTDC, Distribution Licensees and/or Users. Such Codes or Agreements shall be developed by the Licensee, and approved by NEPRA.

11. As with all documents, this Distribution Code may require modification from time to time as per the prevailing requirements of the system. The modus apprendie is covered in the "Code Management" sub-code of this Code.

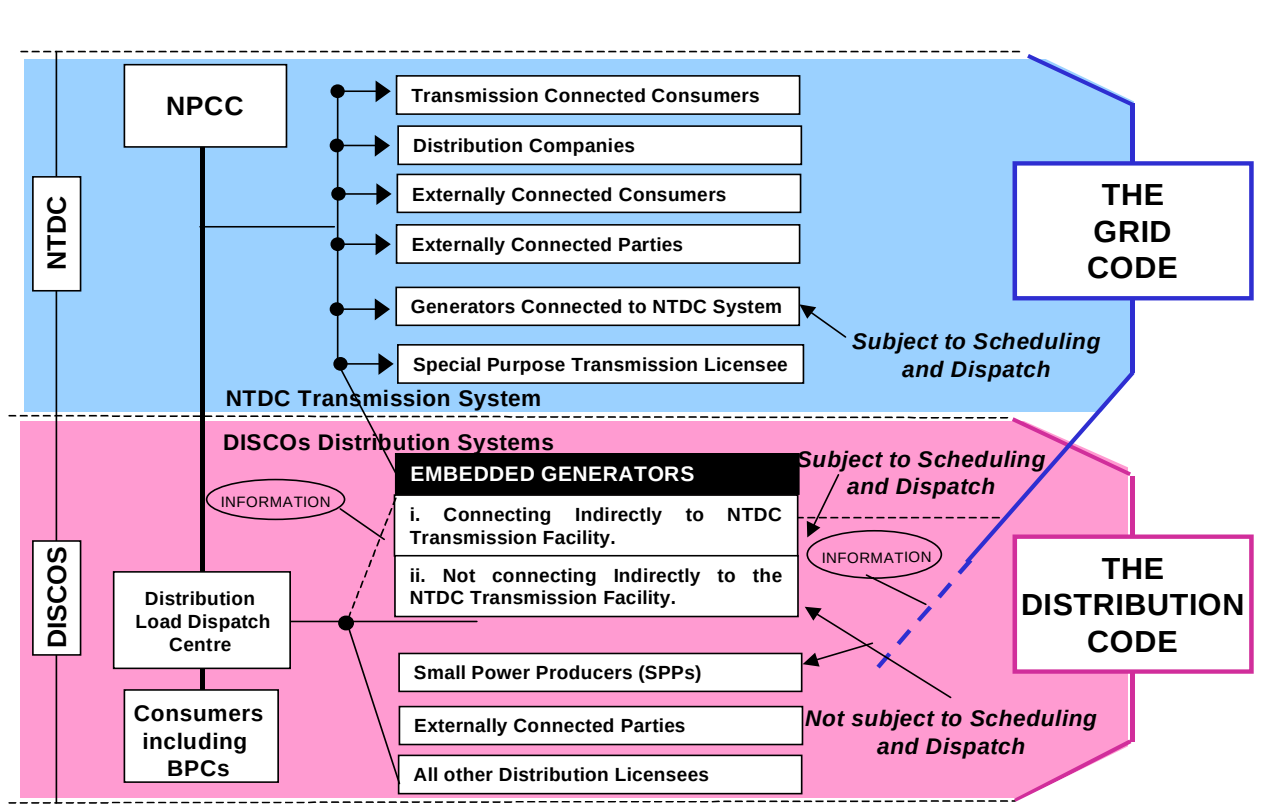


Figure 1

RELATIONSHIP BETWEEN THE GRID CODE AND THE DISTRIBUTION CODE

ID 4

CODE MANAGEMENT

CONTENTS

CODE MANAGEMENT

CM 1 INTRODUCTION & SCOPE

CM 1.1 The Code Management section contains provisions of general application to all the provisions of the Distribution Code with the objective to ensure cohesion among various sections of the Distribution Code to the benefit of all Users. Furthermore, this sub-code relates to the administration, enforcement, compliance of the Distribution Code along with treatment of various provisions of the Distribution Code under unusual and unforeseen circumstances. The mechanism for the revision and modifications of the Distribution Code is also contained herein/is also stated herein.

CM 2 APPLICATION OF CODE

The provisions of this Distribution Code shall apply to the Licensee and all the entities using distribution and sub-transmission network of the Licensee connected either directly or indirectly to the distribution and sub-transmission network of the Licensee.

CM 3 COMPLIANCE

CM 3.1 A User or an entity connected to Licensee's network shall comply with this Code unless the consumer or the entity has been advised otherwise by the Licensee. The requisite level of compliance with the Code shall be made a part of the contract between a consumer and the Licensee and the Consumer Service Manual.

CM 3.2 In case a Licensee is found to be in breach where a breach of the Code by a Licensee is found to be caused by a User or any entity connected to the Licensee's distribution system not complying with the Code, the Licensee is deemed to have complied with the Code unless the Licensee does not act in accordance with the provisions of this Code and seeks the User's compliance.

CM 4 UNFORESEEN CIRCUMSTANCES

CM 4.1 In case of emergence of unforeseen circumstances, not included in the Distribution Code, the Licensee shall promptly consult all affected Users in an effort to reach an agreement to take necessary mitigation of actions. If agreement cannot be reached in the 24 hours the Licensee shall determine the most appropriate course of action under intimation to Registrar NEPRA. While arriving at its determination, the Licensee shall take into account the views expressed by the Users and other circumstances peculiar to a particular event. Each User shall comply with such instructions as issued by the Licensee provided that the instructions do not contravene the technical parameters of a particular User's System registered in the Distribution Code. The Licensee shall promptly refer all such unforeseen circumstances and any determination thereof to the Panel for consideration as per CM 5.4.

CM 5 THE DISTRIBUTION CODE REVIEW PANEL

CM 5.1 All the Licensees shall jointly establish and maintain the Panel within two month of the notification of the code, which shall be a standing body to undertake the functions detailed in CM 5.4

CM 5.2 The panel shall function in accordance with the rules and procedures to conduct business duly approved by NEPRA. Subsequent to the establishment of the panel, it shall formulate its rules and procedures to conduct business and submit to NEPRA within three months of the establishment of the Panel.

CM 5.3 The Panel shall consist of;

a. a Chairman with one member appointed by each Licensee;
b. a person appointed by the Authority;
c. the following members;
   (i) 2 persons representing Generators with Embedded Generator.
   (ii) 1 persons representing SPPs.
   (iii) 1 person representing Consumers Protection Group.
   (iv) 1 representative from KESC.
   (v) 1 member from the Industry or Academic Institution or PEC.
   (vi) 1 representative from BPC's
   (vii) 1 representative from NTDC
   (viii) 1 Representative of Generators connected to 132kV system of the Licensee

The decision of the penal shall be enforceable upon the approval of two third majority of the total members of the panel which shall be recorded.

Note: Representation within each category shall be based on rotation and mutual agreement.

CM 5.4 The Panel shall:

a. keep the Distribution Code and its workings under review;
b. review all suggestions for amendments to the Distribution Code which any Consumer through the representative of Consumer Protection Group in the Panel may wish to submit to a Licensee for consideration by the Panel;
c. publish recommendations as to amendments to the Distribution Code that a Licensee or the Panel believes to be desirable and the reasons for the recommendations;
d. submit the agreed recommendations to NEPRA for approval
e. issue guidance on the Distribution Code and its implementation, performance and interpretation, as and when requested by any User;
f. resolve any matters of disputes between Licensee and its Users; and
g. consider what changes are necessary to the Distribution Code arising out of any unforeseen circumstances as referred by the Licensee under CM 4.1.

CM 5.5 The Distribution Licensee shall inform the proposed amendments to the Code to its Users through wide circulation in the press and if possible comment in writing with those who are liable to be affected by any proposed amendments to the Distribution Code and shall submit all such proposed amendments to the Panel for discussion prior to such consultation.

CM 6 COMMUNICATIONS BETWEEN THE DISTRIBUTION LICENSEES AND USERS

CM 6.1 Unless otherwise specified in the Distribution Code, the methods of operational communication and data transfer shall be agreed between the Licensee and Users from time to time.

CM 6.2 All non-operational communications (data information and notices) between a Licensee and Users shall be in writing and issued to the appropriate officers of the Licensee and each User.

CM 6.3 If for any reason a Licensee or a User re-locates its Control Centre, the Licensee or the User must inform the other party in writing of the move and advise the other party of any changes to their Control Telephony (dedicated telephone system).

CM 6.4 All instructions and communications given by Control Telephony are to be recorded by whatever means and will be accepted by a Licensee and Users as evidence of those instructions or communications.

CM 7 MISCELLANEOUS

CM 7.1 Data and Notices

CM 7.1.1 References in the Distribution Code to 'in writing' shall include typewriting, printing, lithography and other modes of reproducing words in a legible and non-transitory form such as electronic communications.

CM 7.1.2 Where applicable all data items shall refer to nominal Voltage and Frequency.

CM 8 JURISDICTION OF THE CODE

The geographic Jurisdiction of the Code for each Distribution Company shall be the Service Territory of each Distribution Company (to be provided by each Distribution Company). The functional jurisdiction of this Code shall include all substations and lines rated 132kV and below.

CM 9 SYSTEM CO-ORDINATION WITH GRID CODE

The Licensee shall provide the NTDC metering data including peak demand, projected demand, voltage, frequency and embedded generation availability. This data will be available to NTDC to be used for operation and protection of specific 132kV lines and substations as described in the Grid Code.

Illustration: -

Figure ID-4 (page 4) shows the functional inter-relationships between Grid Code and Distribution Code and interfaces with the Network Users.

CM 10 INDEMNITY TO THE DISTRIBUTION COMPANIES

Each User shall indemnify the distribution company against any claim, action, damage, loss, liability, expenses or outstanding which the distribution company pays, suffers, incurs or is liable for in respect of any breach by that User or any officer, agent or employee of that User.

CM 11 FORCE MAJEURE CONDITIONS

Certain provision of the Distribution Code may be suspended in whole or in part pursuant to any directive given by the Authority under Force Majure conditions. Licensee shall inform NEPRA within Seven days of its initiation about a Force Majure Condition.

CM 12 MATTERS TO BE AGREED

Unresolved matters between Distribution Companies and Users are referred to Panel for resolution referred to as Review Panel. The review panel will need to refer to the Authority any matters requiring interpretation of the Distribution Code provisions.

CM 13 INFORMATION DISSEMINATION

The Licensee shall establish, operate and maintain web site providing necessary information about the sub-transmission and distribution system status, pricing, congestion, operating procedures, technical bulletins, technical committee meetings, and other relevant information and data.

CM 14 PRESERVATION OF CONTRACTS PRIOR TO ENACTMENT OF NEPRA ACT

During the subsistence of the agreements entered into by the Licensee prior to the enactment of NEPRA Act, nothing contained in this Distribution Code shall be applied in a manner which is inconsistent with the agreements and materially increases the obligations or impairs the rights of the Users under their agreements.

CM 15 NON-COMPLIANCE

Any Act of non-compliance of any of the provision of this Distribution Code by any of the User or entity shall be subject to penalties as per Authority Fees & Fines Rules (2002). Provided however, no such penalties shall be imposed for non compliance with the provision of this Distribution Code upto to two years from the date of approval thereof by Authority.

CM 16 CODE ADMINISTRATION

Distribution Companies shall be responsible for the enforcement and administration of the distribution code.

End of CM

DISTRIBUTION OPERATION CODE NO. 1

DEMAND FORECASTS

CONTENTS

DISTRIBUTION OPERATING CODE NO. 1

DEMAND FORECASTS

DOC 1.1 INTRODUCTION, OBJECTIVE & SCOPE

DOC 1.1.1 This Code is concerned with demand forecasting as related to Operational and Planning Timescales with the specific objective of ensuring that the Standards of Security and Quality of Supply as prescribed in the Performance Standards (Distribution) are maintained for all the Consumers served by the Licensee at all times.

DOC 1.1.2 The two general objectives of this Code are;

(a) to determine demand forecast to be developed on the basis of information to be provided by all the consumers having a connected load of 1 MW and above to the distribution companies, information to be provided by other Users of the Licensee**,** and data in respect of all other industrial, agriculture**,** commercial and domestic consumers available with the Licensee; and

(b) to specify the technical information required by the Licensee from Users to enable the Licensee to comply with its obligations under the Grid Code.

DOC 1.1.3 The Scope applies to all Consumers connected to the Licensee System. Consumers in this case are:

(a) Consumers connected to the Licensee System, as mentioned in (a) above.

(b) Any Bulk Power Consumer**/**User connected to another Distribution Company's System but receiving supply from the Licensee.

DOC 1.1.4 Where a Consumer is required to provide Demand Data to a Licensee, this means Active Demand and Reactive Demand forecasts from the Consumers at the point of supply to the Consumers.

DOC 1.1.5 References in this sub-code to data to be supplied on an hourly basis refers to it being supplied for each period of 24 hours ending on the each day.

DOC 1.1.6 All information supplied to the Licensee shall be in writing.

DOC 1.1.7 References in this sub-code to data being supplied on a 24 hours basis refers to it being supplied for each period of 24 hours ending on each day.

DOC 1.1.8 The term 'Operations' means operations in real time.

DOC 1.2 DATA EXCHANGE AND INFORMATION FLOW

DOC 1.2.1 Demand Forecast Information

DOC 1.2.1.1 The Licensee shall co-ordinate all Demand forecast information for each Connection Point to meet the requirements of the Grid Code.

DOC 1.3 DEMAND FORECAST DATA

DOC 1.3.1 Planning Periods

DOC 1.3.1.1 Information for the following rolling timescales is required by each Licensee:

(a) Operational Planning Phase (Medium term);

(b) Programming Phase (Short term); and

(c) Control Phase (Real time).

DOC 1.3.1.2 In DOC1 Year 0 means the current Licensee Financial Year at any time, Year 1 means the next Licensee Financial Year, Year 2 means the Licensee Financial Year after year 1 and so on.

DOC 1.3.2 Operational Planning Phase (8 weeks to 1 year ahead)

DOC 1.3.2.1 The information to be supplied to the Licensee during the Operational Planning Phase is specified in DOC 1 Appendix 1.

DOC 1.3.3 Programming Phase (24 hours to 8 weeks ahead)

DOC 1.3.3.1 The information to be supplied to the Licensee during the Programming Phase is specified in DOC 1 Appendix 2.

DOC 1.3.3.2 For the period 2 to 8 weeks ahead the information shall be supplied to the Licensee by 1600 hours each Thursday.

DOC 1.3.3.3 For the period 2 to 12 days ahead the information shall be updated and supplied to the Licensee by 0900 hours each Wednesday.

DOC 1.3.3.4 The Licensee may require the information specified in Appendices 1 and 2 of this sub-code to be updated if it reasonably considers it necessary and to be supplied to the Licensee by 0800 hours each day (or such other time as specified by the Licensee from time to time) for the next day. On Thursdays and Saturdays the information should be supplied for the following two days.

DOC 1.3.4 Control Phase (0 to 24 hours ahead) DOC 1 Appendix 3.

DOC 1.3.4.1 The following information shall be supplied to the Licensee at reasonable times to be specified by the Licensee for the un-expired period covered by the Control Phase.

(a) Intimation by all the Embedded Generators to the Licensee in case the difference of their hourly output is more than 1 MW as compared to their schedule of generation already notified under DOC 1.3.3.3.

(b) Intimation by all the Bulk Power Consumer to the Licensee the detail of changes in the demand if such changes are more than 1 MW.

DOC 1.3.4.2 On the basis of information provided by the Consumers as outlined in DOC 1.1.2 and DOC 1.3.4.1 above the Licensee shall work out its Demand Forecast for the real time.

DOC 1.3.5 **Post Control Phase**

DOC 1.3.5.1 The following data shall be supplied to the DISCO by 0300 hours each day:

Details of half hour Active Power and Reactive Power output sent out to the DISCO Distribution System by Embedded Generator not subject to Scheduling and Dispatch during the previous day on a half hourly basis.

DOC 1.4 LICENSEE AND USER FORECASTS

DOC 1.4.1 The following factors shall be taken into account by the Licensee and Users when conducting demand forecasting in the Operational Planning Phase:

(a) historic demand data;

(b) weather forecasts (Note: Responsibility for weather correction of Consumer's load rests with the User);

(c) incidence of major events or activities;

(d) Consumer Generating Unit Schedules;

(e) Demand transfers;

(f) interconnection facilities with adjacent distribution companies; and

(g) any other factor reasonably considered necessary.

End of DOC 1

DISTRIBUTION OPERATING CODE NO. 2

OPERATIONAL PLANNING

CONTENTS

OPERATING CODE NO. 2

OPERATIONAL PLANNING

DOC 2.1 INTRODUCTION, OBJECTIVE & SCOPE

DOC 2.1.1 Distribution Operating Code No. 2 deals with the co-ordination through various timescales, of planned outages of facilities, which affect the Operation of the Licensee Distribution System or require the commitment of Licensee resources.

DOC 2.1.2 DOC2 supplements the obligation of each Distribution Company to provide certain information to NTDC under the Grid Code and establishes procedures to enable the collection of such data from Users specified in DOC 2.1.6

DOC 2.1.3 The means of providing the information to the Licensee and its confirmation includes any non-transitory written form, or any other suitable means of electronic transfer which enables the recipient to retain the information.

DOC 2.1.4 In order for the Licensee to fulfil the requirements of this DOC2 it should be noted that the information set out in Grid Code OC3, to be provided by NTDC, shall form the basis of Operational Planning under this DOC2.

DOC 2.1.5 The objectives of DOC2 are;

a. to set out the Operational Planning procedures, requirements and typical timetable for the co-ordination of outage requirements for facilities to be provided by the Users to enable the Licensee to operate the Distribution System in accordance with the security, reliability and quality standards as set out in this Code, Performance Standards (Distribution) and Consumer Service Manual; and

b. to specify the information to be provided by Users to the Licensee to allow it to comply with the Grid Code.

DOC 2.1.6 The scope of this Code applies to the following Users of the Licensee's Distribution System:

a. Embedded Generator in the Licensee Distribution System whose registered capacity is greater than 1MW but not subject to Central Despatch;

b. another Distribution Company connected to the Licensee's Distribution System;

c. consumer with Own Generation where the Licensee reasonably considers it appropriates;

d. externally connected consumers; and

e. all Bulk Power Supply consumers connected to the Licensee's Distribution System.

DOC 2.2 PROCEDURE

DOC 2.2.1 Embedded Generator

DOC 2.2.1.1 Information relating to all facilities connected to the Distribution System of the Licensee, or that which may affect its Operation, shall be co-ordinated with the Licensee.

DOC 2.2.2 Other Plant and Apparatus

DOC 2.2.2.1 Information relating to all facilities connected to the Distribution System of the Licensee, or that which may affect its Operation, shall be co-ordinated with the Licensee.

DOC 2.3 TIMESCALES AND DATA

DOC 2.3.1 Detailed implementation of data gathering and timescales shall be agreed locally between the Licensee and each of the Users. Due recognition shall be given by the Licensee to voltage levels, capacities, and load levels of facilities when assessing information requirements.

DOC 2.3.2 All information shall be provided on monthly basis, where week 1 commences in the first week of January as published from time to time.

DOC 2.3.3 The rolling timescales involved in DOC2 are illustrated in Figure 1 on page 18 and are as follows:

a. Operational Planning Phase

i. Medium Term – Calendar Year – 1-2 Year ahead

ii. Short Term – The current calendar year down to 8 weeks ahead

b. Programming Phase

i. 24 hours to 8 weeks ahead inclusive

c. Control Phase

(i) 0 to 24 hours ahead

DOC 2.3.4 In DOC2 Year 0 means the current calendar year at any time, Year 1 means the next calendar year, year 2 means the calendar year after year 1 etc.

DOC 2.4 OPERATIONAL PLANNING PHASE

DOC 2.4.1 Medium Term Programme (Current Year 1-2 ahead Appendix 2)

DOC 2.4.1.1 Users and Embedded Generators (not subject to Central Despatch) shall provide the Licensee with information in accordance with DOC 2 Appendix 1.

DOC 2.4.2 Short Term Programme (Current Year down to 8 weeks ahead DOC2 Appendix 2).

DOC 2.4.2.1 The previous Medium Term Programme shall be updated to form the basis of the Short Term Programme. The Licensee shall continually review this programme as necessary and periodically discuss it with the relevant parties as appropriate.

DOC 2.4.2.2 It shall take account of such review and discussions and any additional outages and the following further details of each outage proposed shall be notified at this stage by the appropriate party.

a. return to service timing of circuits (if different from the programme);

b. specific facilities to be worked upon; and

c. any other information that may be reasonably specified by the Licensee from time to time.

DOC 2.4.2.3 At any time and from time to time during the current Calendar year up to the Programming Phase (8 weeks ahead), all the relevant Users specified in DOC 2.1.6 may notify reasonable changes and additions to the outages previously notified during the Medium Term planning process. The Licensee shall consider whether the changes shall adversely affect system security, stability, reliability and quality or other parties connected to the Licensee's network, and shall discuss with the party in question. Where the change is so discussed the Licensee shall inform the other affected Users.

DOC 2.5 PROGRAMMING PHASE (24 hours to 8 weeks ahead inclusive)

DOC 2.5.1 The Short Term Programme shall form the basis of the Programming Phase and a rolling suggested programme for the following week and subsequent 7 week period respectively shall be prepared weekly by the Licensee.

DOC 2.5.2 The Licensee shall update the programme each week and take account of any additional or varied outages.

DOC 2.5.3 Any decision to depart from the outages and actions determined during this phase shall immediately be notified to the Licensee, who shall inform other affected parties.

DOC 2.5.4 The Licensee shall endeavour to give as much notice as possible to a Generator which may be operationally affected by an outage which is to be included in a programme referred to in DOC 2.5.1

DOC 2.5.5 Where a Generator which may be operationally affected by the Licensee Distribution System outage programme referred to in DOC 2.5.1 and is concerned on grounds relating to safety and operability of the unit and about the effect which an outage within such outage programme might have, it may contact the Licensee to explain its concerns and discuss whether there is an alternative way of taking such outage (having regard to technical feasibility). If there is such an alternative way, but the Licensee refuses to adopt that alternative way in taking that outage, the Generator may refer the matter to Review Panel under agreed disputes resolution procedures to decide about the way the outage should be taken.

DOC 2.5.6 <u>Generation Scheduling Information</u>

DOC 2.5.6.1 The Licensee shall obtain Scheduling information from Generators for other Embedded Generator not subject to Central Despatch where it considers it appropriate.

DOC 2.5.6.2 The Scheduling information shall specify the following on an individual Generating Unit basis:

a. the period the unit is required;

b. the planned half hourly output; and

c. any other information the Licensee reasonably considers necessary

DOC 18

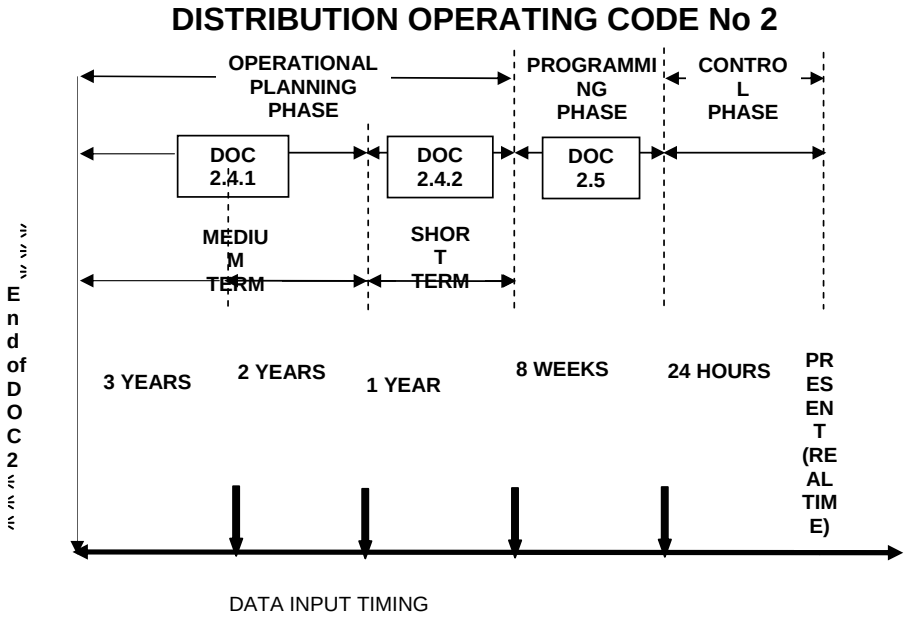


Figure 1

DISTRIBUTION OPERATING CODE NO. 3

SYSTEM RESTORATION

CONTENTS

DISTRIBUTION OPERATING CODE NO. 3

SYSTEM RESTORATION PLANNING

DOC 3.1 INTRODUCTION, OBJECTIVE & SCOPE

DOC 3.1.1 Black Start

DOC 3.1.1.1 Distribution Operating Code No. 3 covers the system recovery procedures following a Total or Partial Shutdown of the Total System as recognised by NTDC and that NTDC intends to implement Black Start procedures after having given notification to the Licensee.

DOC 3.1.2 Force Majeure

DOC 3.1.2.1 DOC3 identifies the Licensee obligation to carry out certain actions according to certain pre-defined principles and procedures pursuant to any directive/instruction give by the NTDC concerning its Distribution System under Force Majeure Conditions.

DOC 3.1.2.2 The Licensee shall prepare plans to deal with emergencies under force majeure conditions. These plans shall be in accordance with guidelines provided in the Distribution Code in consultation with the NTDC. The plans will need to take account of the directives/instructions given by the NTDC under force majeure conditions. This clause is not applicable to KESC who shall prepare its plans as per its requirements.

DOC 3.1.3 The objectives of DOC3 are to lay down the requirements, actions and procedures with a view to assist NTDC in the restart of the Total System or to operate the Total System under abnormal situations which require co-ordination between all Users of the Licensee with a common approach to give uniformity of priorities. It also specifies requirements to be met during force majeure conditions.

DOC 3.1.4 The Licensees shall identify and list-out the black start facilities and inform NTDC any changes to this information.

DOC 3.1.5 DOC3 will apply to;

a. All Distribution Licensees including KESC.

b. All Generators including embedded generators.

c. Bulk Power Supply Consumers.

d. Consumers having a connected load of more than 1MW.

e. Externally connected consumers.

DOC 3.2 PROCEDURE – BLACK START

DOC 3.2.1 Total System Shutdown is a situation when all generation has ceased with no electricity supply from External Interconnections.

DOC 3.2.2 Partial Shutdown is a situation where all generation has ceased in a separated part of the Total System and there are no available interconnections to the other parts of the Total System.

DOC 3.2.3 System Recovery

DOC 3.2.3.1 Certain Embedded Power Stations may be identified, as having an ability to start up from shut down without connections to external power supplies. Such Power Stations are to be referred to as Black Start stations.

DOC 3.2.3.2 The distribution company in conjunction with NTDC shall segregate the Licensee's demand into suitably sized components to allow progressive re-energisation of the Licensee's distribution system. The size of the areas of demand will be determined by NTDC; and will be commensurate with the size of Generating Unit to be re-started.

DOC 3.2.4 Re-synchronising Islands of Supply

DOC 3.2.4.1 The Licensee's regional load dispatch centres in the case of partial or full shut down shall follow the standard predefined instructions of NTDC to help recover the system from a black start condition.

DOC 3.2.5 System Incident Procedures

To co-ordinate activities, Users and the Licensee shall ensure that there are multiple and suitable communication paths available and that where appropriate senior members of staff are appointed to manage these abnormal situations.

End of DOC 3

DISTRIBUTION OPERATING CODE NO. 4

OPERATIONAL LIAISON

CONTENTS

DISTRIBUTION OPERATING CODE NO. 4

OPERATIONAL LIAISON

DOC 4.1 INTRODUCTION, OBJECTIVE & SCOPE

DOC 4.1.1 Distribution Operating Code No.4 sets out the requirements for the exchange of information relating to Operations and/or Events on the Licensee Distribution System or the System of any User connected to the Licensee Distribution System, which have had or may have had, or shall have or may have an Operational Effect on the Licensee Distribution System or the System of any other User.

DOC 4.1.2 The requirement to notify in DOC4 relates generally to communicating what is to happen what has happened and not the reasons why. However, DOC4 provides, when an Event has occurred on the DISCO Distribution System which itself has been caused by (or exacerbated by) an Operation or Event or a User's System, the DISCO in reporting the Event on the DISCO Distribution System to a User can pass on what it has been told by the User in relation to the Operation on that User's System.

DOC 4.1.3 The objective of this DOC4 is to provide for the exchange of information between Licensee and user so that the implications of the Operation and /or Event can be properly understood and considered and the possible risks arising from it can be assessed, minimized, and appropriate action can be taken by the relevant party in order to maintain the integrity and security of the Total System of NTDC. DOC4 does not seek to deal with any actions arising from the exchange of information, but merely with the exchange of relevant information.

DOC 4.1.4 DOC4 applies to the Distribution Company and to Users as mentioned in CM 2 of Distribution Code. The procedure for operational liaison of the Licensee with NTDC is set out in the Grid Code.

DOC 4.2 PROCEDURE

DOC 4.2.1 Communications

DOC 4.2.1.1 The Licensee and each User connected to its Distribution System shall nominate officers and agree on communications channels to make effective the exchange of information required under DOC4.

DOC 4.2.1.2 The Licensee shall establish reliable and suitable communication facilities at its 132/66/33/11kV sub-stations. All operating instructions, messages and data received from or sent to the concerned Grid Sub-station and Distribution Load Dispatch Centres (LDC) shall be duly recorded at such sub-station.

DOC 4.2.2 Requirement to notify Operations

DOC 4.2.2.1 In the case of an Operation on the System of a User connected to the Licensee's Distribution System, which shall have or may have an Operational Effect on the Licensee Distribution System, the User shall notify the Licensee in accordance with DOC4.

DOC 4.2.2.2 In the case of an Operation on the Licensee Distribution System or on receipt of notification of an Operation on the NTDC Transmission System, which shall have or may, in the opinion of the Licensee, have an Operational Effect on the System of a User connected to the Licensee Distribution System, the Licensee shall notify the User that such incident has occurred.

DOC 4.2.2.3 An Operation may be caused by another Operation or an Event on another's Licensee System and in that situation the information to be notified is different from that where the Operation arose independently of any other Operation or Event.

DOC 4.2.2.4 Whilst in no way limiting the general requirement to notify in advance or post operation, the following are examples of situations where, inasmuch as they may have or have had an effect on the Operation of the Licensee Distribution System or another System, notification shall be required of:

a. the implementation of a Scheduled Outage of facility which has been arranged pursuant to DOC2;

b. the operation of any Circuit Breaker or Isolator or any sequence or combination of the two including any temporary over-stressing, System parallels, or Generating Unit synchronising;

c. Operation of any circuit breaker and associated relays for planned or load shedding, unit tripping or reduction in output or forced tripping;

d. Voltage control;

e. Violation by Users of its obligations under the agreement or Consumer Service Manual and Performance Standards (Distribution);

f. Potential for excessive loading on the facilities including inter-connecting facilities;

g. Unavailability of any control and protection facilities;

h. Change in the exchange of power between Licensee and other systems/users;

i. Unusual/abnormal event which may impact the functioning and performance of parties connected to the Licensee's system; and

j. this section should include certain operational liaison in the form of notification procedures to the employees to caution and prepare them to take remedial steps in case of contingency event or emergency situation.

DOC 4.2.3 Form

DOC 4.2.3.1 A notification under DOC2.4.1 shall be of sufficient detail to describe the Operation, stating the cause, to enable the recipient of the notification reasonably to consider and assess the implications and risks arising and shall include the name of the individual reporting the Operation. The recipient may ask questions to clarify the notification.

DOC 4.2.3.2 A notification by the Licensee of an Operation which has been caused by another Operation (the "First Operation") or by an Event on a User's System, shall describe the Operation and shall contain the information which the Licensee has been given in relation to the First Operation or that Event by the User.

The notification (other than in relation to the information which the Licensee is merely passing on from a User) shall be of sufficient detail to enable the recipient of the notification reasonably to consider and assess the implications and consequences arising from the Operation on the Licensee Distribution System and shall include the name of the individual reporting the operation on behalf of the Licensee.

DOC 4.2.3.3 Where a User is reporting an Operation or an Event which itself has been caused by an incident or scheduled or planned action affecting (but not on) its System the notification to the Licensee shall contain the information which the User has been given by the person connected to its System in relation to that incident or scheduled or planned action (which the User must require, contractually or otherwise the person connected to its System to give it) and the Licensee may pass on the information contained in the notification.

DOC 4.2.3.4 A notification by the Licensee of an operation under DOC4 which has been caused by an Operation or an Event on the NTDC Transmission System, may describe the Operation on the Licensee Distribution System and shall contain the information which the Licensee has been given in relation to the Operation or an Event on the NTDC Transmission System by NTDC. The notification (other than in relation to the information which the Licensee is merely passing on from NTDC) shall be of sufficient detail to enable the recipient of the notification to consider and assess the implications and consequences arising from the Operation on the Licensee Distribution System and shall include the name of the individual reporting the Operation on behalf of the Licensee. The recipient may ask questions to clarify the notification.

DOC 4.2.3.5 A User may pass on the information contained in a notification to it from the Licensee to a Generator with a Generating Unit connected to the System or to another Distribution Company connected to its System if it is required (by a contract pursuant to which that Generating Unit or that Distribution Company is connected to the System) to do so in connection with the equivalent of an Operation on its System (if the Operation on the Licensee Distribution System caused it).

DOC 4.2.3.6 Other than as provided in DOC4.2.3.5, a User may not pass on any information contained in a notification to it from the Licensee or in a notification to another User from the Licensee to any other person connected to its System, but may only say that there has been an incident on the Total System and (if known and if power supplies have been affected) an estimated time of return to service. Each User shall procure that any other Users receiving information, which was contained in the notification to a User from the Licensee, which is not bound by the Distribution Code, does not pass any information on other than as provided above.

DOC 4.2.4 Timing

DOC 4.2.4.1 A notification under DOC 4.2.2 shall be given as far in advance as possible and in any event shall be given in sufficient time as shall reasonably allow the recipient to consider and assess then implications and risks arising.

DOC 4.2.4.2 The notification shall be dictated to the recipient who shall record it and on completion shall repeat the notification in full to the sender and check that it has been accurately recorded.

DOC 4.2.5 Requirement to Notify Events

DOC 4.2.5.1 In the case of an Event on the System of a User connected to the Licensee Distribution System, which has or has had an Operational Effect on the Licensee Distribution System or on the NTDC Transmission System, the User shall notify the Licensee in accordance with this DOC4.

DOC 4.2.5.2 In the case of an Event on the Licensee Distribution System or on receipt of notification of an Event on the NTDC Transmission System, which shall have or may, in the opinion of the Licensee, have an Operational Effect on the System of a User connected to the Licensee Distribution System, the Licensee shall notify the User in accordance with this DOC4.

DOC 4.2.5.3 An Event may be caused by (or exacerbated by) another Event or by an Operation on NTDC, another Distribution Company or user System and in that situation the information to be notified is different from that where the Event arose independently of any other Event or Operation.

DOC 4.2.5.4 Whilst in no way limiting the general requirement to notify the following are examples of situations where notification shall be required if they have an Operational Effect:

a. the actuation of any alarm or indication of any abnormal operating condition;

b. adverse weather conditions being experienced;

c. breakdown of, or faults on, or temporary changes in the capabilities of, facilities including Protection; and

d. increased risk of inadvertent Protection operation.

DOC 4.2.6 Form

DOC 4.2.6.1 A notification under DOC 4.2.5 of an Event which has arisen independently of any other Event or of an Operation, shall describe the Event (although it need not to state the cause of the Event) and subject to that it shall be of sufficient detail to enable the recipient of the notification to consider and assess the implications and risks arising. The recipient may ask questions to clarify the notification.

DOC 4.2.6.2 A notification by the Licensee of an Event which has been caused by (or exacerbated by) another Event (the “first Event”) or by an Operation on a User’s System shall describe the Event and shall contain the information which the Licensee has been given in relation to the first Event or that operation by the User. The notification (other than in relation to the information which the Licensee is merely passing on from a User) shall be of sufficient detail to enable the recipient of the notification reasonably to consider and assess the implications and risks arising from the Event on the Licensee Distribution System and shall include the name of the individual reporting the Event on behalf of the Licensee. The recipient may ask questions to clarify the notification.

DOC 4.2.6.3 Where a User is reporting an Event or an Operation which itself has been caused by (or exacerbated by) an incident or scheduled or planned action affecting (but not on) its System the notification to the Licensee shall contain the information which the User has been given by the person connected to its System in relation to that incident or scheduled or planned action (which the User must require the person connected to its System to give it) and the Licensee may pass on the information contained in the notification.

DOC 4.2.6.4 A notification by the Licensee of an Event under DOC 4.2.5.2 which has been caused by (or exacerbated by) an Event or an Operation on the NTDC Transmission System, shall describe the Event on the Licensee Distribution System and shall contain the information which the Licensee has been given in relation to the Operation on the NTDC Transmission System. The notification (other than in relation to the information which the Licensee is merely passing on from NTDC) shall be of sufficient detail to enable the recipient of the notification reasonably to consider and assess the implications and risks from the Event on the Licensee Distribution System and shall include the name of the individual reporting the Event on behalf of the Licensee. The recipient may ask questions to clarify the notification.

DOC 4.2.6.5 A User may pass on the information contained in a notification to it from the Licensee to a Generator with a Generating Unit connected to its System or to another Distribution Company connected to its System if it is required (by a contract pursuant to which that Generating Unit or Distribution Company is connected to its System) to do so in connection with an Event on its System (if the Event on the Licensee Distribution System caused or exacerbated it).

DOC 4.2.6.6 Other than as provided in DOC 4.2.6.5, a User may not pass on any information contained in a notification to it from the Licensee (and a User receiving information which was contained in a notification to another User from the Licensee may not pass on such information) to any person connected to its System, but may only say that there has been an incident on the Total System and (if known and if power supplies have been affected) an estimated time of return to service. Each User should ensure that any other User receiving information, which was, contained in a notification to such User from the Licensee, which is not bound by the Distribution Code, does not pass any information on other than as provided above.

DOC 4.2.6.7 Except in an emergency situation the notification shall be dictated to the recipient who shall record it and on completion shall repeat the notification in full to the sender and check that it has been accurately recorded

DOC 4.2.6.8 Where an Event has been reported to the Licensee by a Generator under DOC 4.2.5 relating to a Generating Unit and in order for the Generator to assess the implication of the Event on its System more accurately, it may ask the Licensee for details of the Fault Levels on infeeds from the Distribution System to that Generating Unit at the time of the Event, and the Licensee shall, as soon as reasonably practicable, give the Generator the information provided that the Licensee has that information.

DOC 4.2.7 Timing

DOC 4.2.7.1 A notification under DOC 4.2.5 shall be given as soon as possible after the occurrence of the Event, or time that the Event is known of or anticipated by the giver of the notification under DOC4.

DOC 4.2.8 System Control of NTDC

DOC 4.2.8.1 Where a part of a Licensee Distribution System is, by agreement, under the System Control of NTDC then the requirements and provisions of OC6 of the Grid Code shall apply to that situation as if the Licensee's Distribution System is a part of NTDC System.

DOC 4.2.9 System Control of the Licensee

DOC 4.2.9.1 Where a part of a System of a User is, by agreement, under the System Control of the Licensee then the requirements and provisions of this DOC4 shall apply to that situation as if the User's System is a part of the Licensee Distribution System.

DOC 4.2.10 Significant Incidents

DOC 4.2.10.1 Where an Event on the Licensee Distribution System or the Dedicated System of a User has had or may have had a significant effect on the System of any of the others, the Event shall be reported in writing to the owner of the System affected in accordance with the provisions of DOC5. Such an Event shall be termed a "Significant Incident".

DOC 4.2.10.2 Where a Licensee notifies a User of an Event under DOC4, which the User considers has had or may have a significant effect on that User's dedicated System, that User shall require a Licensee to report that Event in writing and shall notify the Licensee accordingly. Such an Event shall also be termed a "Significant Incident".

DOC 4.2.10.3 Without limiting the general descriptions set out in DOC 4.2.10.1 or DOC 4.2.10.2 a Significant Incident shall include Events which result in, or may result in, the following:

a. operation of facilities controlled either manually or automatically;

b. voltage outside the limits, prescribed in Performance Standards (Distribution);

c. System frequency outside the limits, provided in the grid code;

d. System Stability failure (transient and voltage both);

e. Likelihood of system collapse or shut down;

f. Thermal overloading of the facilities; and

g. Tripping of large amounts of load or generation.

End of DOC 4

DISTRIBUTION OPERATING CODE NO. 5

EVENT INFORMATION EXCHANGE

CONTENTS

DSISTRIBUTION OPERATING CODE NO. 5

EVENT INFORMATION EXCHANGE

DOC 5.1 INTRODUCTION, OBJECTIVE & SCOPE

DOC 5.1.1 Distribution Operating Code No. 5 sets out the requirements for reporting in writing all Events which were initially reported verbally under DOC4 and those specified events to be reported under the Grid Code and Distribution Code.

DOC 5.1.2 DOC5 also provides for the joint investigation of Significant Incidents by the Users involved and the Distribution Company and/or NTDC.

DOC 5.1.3 The Objective of DOC5 is to facilitate the provision of more detailed information in writing and, where agreed between the Licensee and Users involved, joint investigation of those Significant Incidents reported verbally under DOC4.

DOC 5.1.4 DOC5 applies to the Licensee and to Users, which in DOC5 means other Distribution Companies and Embedded Generators connected at High Voltage.

DOC 5.2 PROCEDURE

DOC 5.2.1 Communications

DOC 5.2.1.1 The Licensee and each User specified in DOC 5.1.4 shall nominate officers and establish communication channels to ensure the effectiveness of this DOC5. Such officers and communication channels may be the same as those established under DOC4.

DOC 5.2.2 Written Reports of Events by Users to the Licensee

DOC 5.2.2.1 In the case of an Event, which has been reported verbally to the Licensee under DOC 4.2.2 and subsequently has been determined by the Licensee to be a Significant Incident, a written report shall be given to the Licensee by the User in accordance with DOC5. The Licensee shall not pass this report on to other affected Users but may use the information contained therein in preparing a report under DOC5 to a User in relation to a Significant Incident on the Licensee Distribution System, which has been caused, by (or exacerbated by) the Significant Incident on the User's System.

DOC 5.2.3 Written Reports of Events by the Licensee to Users

DOC 5.2.3.1 In the case of an Event, which has been reported verbally to the User under DOC 4.2.2 and subsequently has been determined by the User to be a Significant Incident, a written report shall be given to the User by the Licensee in accordance with DOC5. The User shall not pass this report on to other affected Users but may use the information contained therein in preparing a report under DOC5 for another Distribution Company connected to its System in relation to a Significant Incident, which has been caused by (or exacerbated by) the Significant Incident on the Licensee Distribution System.

DOC 5.2.4 Form

DOC 5.2.4.1 A report under DOC 5.2.2 shall be in writing and shall be sent to the Licensee or User, as the case may be, containing written confirmation of the verbal notification given under DOC4 together with more details relating to the Significant Incident, although it need not state the cause of the Event save to the extent permitted under DOC 4.2.3.1 and DOC 4.2.3.2 and such further information which has become known relating to the "Significant Incident" since the verbal notification under DOC4. The report should, as a minimum, contain those matters specified in the DOC 5 Appendix 1 which is not intended to be exhaustive to this DOC4. The recipient may raise questions to clarify the notification, and the giver of the notification shall, in so far as it is able, answer any questions raised.

DOC 5.2.5 Timing

DOC 5.2.5.1 A written report under DOC 5.2.2 shall be given as soon as reasonably practicable after the verbal notification under DOC4 and in any event a preliminary report shall normally be given within 24 hours of such time.

DOC 5.2.7 Joint Investigation into Significant Incidents

DOC 5.2.7.1 Where a Significant Incident has been declared and a report submitted under DOC4 either party or parties may request in writing that a joint investigation be carried out.

DOC 5.2.7.2 The composition of such an investigation panel shall be appropriate to the incident to be investigated, and agreed by all parties involved in a decision by the review panel.

DOC 5.2.7.3 Where there has been a series of Significant Incidents (that is to say, where a Significant Incident has caused or exacerbated another Significant Incident) the parties involved may agree that the joint investigation should include some or all of those Significant Incidents.

DOC 5.2.7.4 A joint investigation shall take place where two-thirds of the majority of the members of the Review Pannel agree to it. The form and rules of, the procedure for, and all matters (including, if thought appropriate, provisions for costs and for party to withdraw from the joint investigation once it has begun) relating to the joint investigation shall be agreed at the time of a joint investigation.

DOC 5.2.7.5 Any joint investigation under DOC4 is separate from any inquiry which may be carried out under the Grid Code disputes resolution procedures.

End of DOC 5

DISTRIBUTION OPERATING CODE NO. 6

WORK SAFETY AT THE INTERFACE

CONTENTS

DISTRIBUTION OPERATING CODE NO. 6
WORK SAFETY AT THE INTERFACE

DOC 6.1 INTRODUCTION, OBJECTIVE & SCOPE

DOC 6.1.1 Distribution Operating Code 6 ("DOC 6") specifies the Safety Management System criteria to be applied by the Licensee to meet NEPRA licence obligations, imposed on owners and/or operators of the Licensee Distribution System.

DOC 6.1.2 Similar criteria and standards of Safety Management Systems are required to be provided as per their agreements or Consumer Service Manual by other Users of the Distribution System when carrying out work or tests at the operational interface with the Licensee.

DOC 6.1.3 DOC6 sets out the requirements with a view to ensuring safety of persons (both public and otherwise) working on Distribution Systems when carrying out work or tests at the operational and Ownership Boundaries.

DOC 6.1.4 DOC6 specifies the Safety management criteria to be applied by the Licensee and all Users of the Licensee's Distribution System and those who interface with it;

a. Embedded Generators;

b. Other Distribution Companies connected to the Licensee Distribution System;

c. Any other party reasonably specified by the Licensee; and

d. Bulk Power Consumers.

DOC 6.2 PROCEDURE

DOC 6.2.1 Approved Safety Management Systems

DOC 6.2.1.1 A Safety Management System (safety Code) specifying the principles and procedures, and where appropriate, the documentation to be applied so as to ensure the health and safety of all who are liable to be working or testing on the Licensee Distribution System, or on Plant and Apparatus connected to it, shall be developed by the Licensee and approved by NEPRA.

DOC 6.2.2 Operational Boundaries and Principles

DOC 6.2.2.1 At sites or locations where an Operational Boundary exists, which Safety Management System (Safety Code) in terms of ownership, construction, commissioning, testing, operation, maintenance and replacement of the distribution facility are to be adopted and when, shall be jointly agreed by the Licensee and user. This shall include provision for Control Persons to be nominated by the Licensee/user to operate to Safety Management Systems in use by field personnel where appropriate.

DOC 6.2.2.2 A system of documentation shall be maintained by the Licensee and the User which records the inter-system safety precautions taken when:

a. work or testing is to be carried out on High Voltage Plant and/or Apparatus across the Operational Boundary; and

b. isolation and/or earthing of the other's System is needed

DOC 6.2.2.3 Where relevant, copies of the Safety Management System (safety code) and related documentation shall be exchanged between the Licensee and Users for each Operational Boundary at the time of their connection with the Licensee's Distribution System.

DOC 6.2.3 Authorised Personnel

DOC 6.2.3.1 Safety Management System must include the provision for written Authorisation of personnel concerned with the control, operation, work or testing of Plant and Apparatus forming part of, or connected to, the Licensee Distribution System.

DOC 6.2.3.2 Each individual Authorisation shall indicate the class of operation and/or work permitted and the section of the System to which the Authorisation applies.

DOC 6.3 ENVIRONMENTAL SAFETY

DOC 6.3.1 Site Safety and Security

DOC 6.3.1.1 Arrangements shall be made to ensure site safety and security as required by statutory requirements.

DOC 6.3.2 Site Specific Hazards

DOC 6.3.2.1 Arrangements shall be made by all parties to ensure that personnel are warned by an appropriate means of hazards specific to any site, before entering any area of the site. This shall include hazards that may be temporary or permanent. Where these risks include contamination or similar, suitable decontamination facilities and procedures shall be provided.

DOC 6.3.3 Inspections by Management / Safety Representatives

DOC 6.3.3.1 Arrangements shall be made to facilitate inspections by Licensee management and Safety Representatives to sites accommodating Licensee owned Plant and Apparatus.

DOC 6.4 SYSTEM CONTROL

DOC 6.4.1 Control Responsibilities

DOC 6.4.1.1 The Licensee and Users shall jointly agree and set down in writing schedules specifying the responsibilities for System Control of Equipment and facilities. These shall ensure that only one party is responsible for any particular item of Plant or Apparatus at any given time.

DOC 6.4.1.2 The Licensee and each User shall at all times have nominated a person or persons responsible for the co-ordination of electrical safety from the System stand point pursuant to this DOC6.

DOC 6.4.1.3 The principal of control responsibilities and their specifics such as outlined below but not limited to must be clearly spelled out and agreed to between parties. Some of these are: -

a. Ease of control

b. Least interruptible and most practical

c. Safe, operationally effective and dependable

DOC 6.4.2 Control Documentation

DOC 6.4.2.1 The Licensee and Users shall maintain a suitable system of documentation which records all relevant operational events that have taken place on the Licensee Distribution System or any other System connected to it and the co-ordination of relevant safety precautions for work.

DOC 6.4.2.2 All documentation relevant to the Operation of the Distribution System, and safety precautions taken for work or tests, shall be held by the Licensee and the appropriate User for a period of not less than one year.

DOC 6.4.3 System Diagrams

DOC 6.4.3.1 Diagrams illustrating sufficient information for control personnel to carry out their duties shall be exchanged by the Licensee and the appropriate User.

DOC 6.4.4 Communications

DOC 6.4.4.1 Where the Licensee reasonably specifies the need, suitable communication systems shall be established between the Licensee and other Users to ensure the control function is carried out in a safe and secure manner.

DOC 6.4.4.2 Where the Licensee reasonably decides a back up or alternative routing of communication is necessary to provide for the safe and secure Operation of the Licensee Distribution System the means shall be agreed with the appropriate Users.

DOC 6.4.4.3 Schedules of telephone numbers / call signs shall be exchanged by the Licensee and appropriate User to enable control activities to be efficiently co-ordinated.

DOC 6.4.4.4 The Licensee and appropriate Users shall establish 24 hour availability of personnel with suitable Authorisation where the joint operational requirements demand it.

DOC 6.5 SCHEDULES OF RESPONSIBILITY

DOC 6.5.1 Ownership, Operation and Maintenance Schedules

DOC 6.5.1.1 Schedules specifying the responsibilities for ownership, Operation and maintenance shall be jointly agreed by the Licensee and appropriate Users for each location where an operational interface or joint responsibilities exist.

DOC 6.5.2 Maintenance of Schedules and Diagrams

DOC 6.5.2.1 All schedules and diagrams shall be maintained by the Licensee and appropriate Users and exchanged as necessary to ensure they reflect the current agreements and network configuration.

DOC 6.5.2.2 Submission to NEPRA of quarterly report on training activities regarding safety measures by the Licensee.

End of DOC 6

DISTRIBUTION OPERATING CODE NO. 7

PLANT IDENTIFICATION

CONTENTS

DISTRIBUTION OPERATING CODE NO. 7
PLANT IDENTIFICATION

DOC 7.1 INTRODUCTION, OBJECTIVE & SCOPE

DOC 7.1.1 Distribution Operating Code 7 ("DOC7") sets out the responsibilities and procedures for notifying the relevant owners of the numbering and nomenclatures of Apparatus at Ownership Boundaries.

DOC 7.1.2 The numbering and nomenclature of Apparatus shall be included in the Operation Diagram prepared for each site having an Ownership Boundary.

DOC 7.1.3 The prime objective embodied in DOC7 is to ensure that at any site where there is an Ownership Boundary every item of Apparatus has numbering and / or nomenclature that has been mutually agreed and notified between the owners concerned to ensure, so far as is reasonably practicable the safe and effective Operation of the Systems involved and to reduce the risk of error.

DOC 7.1.4 DOC7 applies to the Licensee and to Users, which in DOC7 means other Distribution Companies, and Embedded Generators connected to the Licensee Distribution System.

DOC 7.2 PROCEDURE

DOC 7.2.1 <u>New Apparatus</u>

DOC 7.2.1.1 When the Licensee or a User intends to install Apparatus on a site having an Ownership Boundary the proposed numbering and / or nomenclature to be adopted for the Apparatus must be notified to the other owners.

DOC 7.2.1.2 The notification shall be made in writing to the relevant owners and shall consist of an Operation Diagram incorporating the proposed new Apparatus to be installed and its proposed numbering and / or nomenclature.

DOC 7.2.1.3 The notification shall be made to the relevant owners at least six months prior to the proposed installation of the Apparatus.

DOC 7.2.1.4 The relevant owners shall respond in writing within one month of the receipt of the notification confirming both receipt and whether the proposed numbering and / or nomenclature is acceptable or, if not, what would be acceptable.

DOC 7.2.1.5 In the event that agreement cannot be reached between the Licensee and the other owners, the Licensee, acting reasonably, shall have the right to determine the numbering and nomenclature to be applied at that site.

DOC 7.2.2 <u>Existing Apparatus</u>

DOC 7.2.2.1 The Licensee and / or every User shall supply the Licensee and / or every other User on request with details of the numbering and nomenclature of Apparatus on sites having an Ownership Boundary.

DOC 7.2.2.2 The Licensee and every User shall be responsible for the provision and erection of clear and unambiguous labelling showing the numbering and nomenclature of its Apparatus on sites having an Ownership Boundary.

DOC 7.2.3 Changes to Existing Apparatus

DOC 7.2.3.1 Where the Licensee or a User needs or wishes to change the existing numbering and / or nomenclature of any of its Apparatus on any site having an Ownership Boundary, the provisions of DOC 7.2.1 shall apply with any amendments necessary to reflect that only a change is being made.

DOC 7.2.3.2 Where a User changes the numbering and / or nomenclature of its Apparatus, which is the subject of DOC7, the User shall be responsible for the provision and erection of clear and unambiguous labelling.

DOC 7.2.3.3 Where a Licensee changes the numbering and / or nomenclature of its Apparatus, which is the subject of DOC7, the Licensee shall be responsible for the provision and erection of clear and unambiguous labelling.

End of DOC 7

DISTRIBUTION OPERATING CODE NO. 8

SYSTEM TESTS

CONTENTS

DISTRIBUTION OPERATING CODE NO. 8

SYSTEM TESTS

DOC 8.1 INTRODUCTION, OBJECTIVE & SCOPE

DOC 8.1.1 Distribution Operating Code No. 8 ('DOC8') sets out the responsibilities and procedures for co-ordinating and carrying out System Tests, which have or may have an effect on the Systems of the Licensee, Users or other Licensees including NTDC. System Tests are those tests which involve either simulated or the controlled application of irregular, unusual or extreme conditions on the Total System or any part of the Total System. However, these tests do not include commissioning or recommissioning tests or any other tests of a minor nature.

DOC 8.1.2 The objectives of DOC8 are to:

a. ensure that the procedures for co-ordinating and carrying out System Tests are such that, so far as practicable, System Tests do not threaten the safety of personnel or the general public and cause minimum threat to the security, reliability and quality of power supply, the integrity of electrical facilities and are not detrimental to the Licensee, Users and other Licensees; and

b. set out procedures to be followed for establishing and reporting System Tests.

DOC 8.1.3 DOC8 applies to the Licensee and to Users, which in DOC8 means, other Distribution Companies, Embedded Generators and all other parties connected to the Licensee's system, whose System Tests would come within the parameters of this DOC8 who would co-ordinate the tests with the Licensee.

DOC 8.2 PROCEDURE

DOC 8.2.1 General

DOC 8.2.1.1 If the System Test proposed by the Licensee or the User connected to the Licensee Distribution System shall or may have an effect on the NTDC Transmission System then the provisions of DOC8 or the relevant provisions of the Grid Code shall apply.

DOC 8.2.1.2 System Tests which have a minimal effect on the Distribution System or Systems of others shall not be subject to this procedure; minimal effect shall be taken to mean variations in voltage, frequency and waveform distortion of a value not greater than those figures which are defined in the Distribution Planning and Connection Code.

DOC 8.2.2 Proposal Notice

DOC 8.2.2.1 When the Licensee or a User intends to undertake a System Test which shall have or may have an effect on the System of others normally twelve months notice, or as otherwise agreed by the Licensee, of the proposed System Test shall be given by the person proposing the System Test (the 'Test Proposer') to the Licensee and to those Users who may be affected by such a System Test.

DOC 8.2.2.2 The proposal shall be in writing and shall contain details of the nature and purpose of the proposed System Test and shall indicate the extent and situation of the facilities involved.

DOC 8.2.2.3 If the information set out in the proposal notice is considered insufficient by the recipient they shall contact the party proposing the test with a written request for further information which shall be supplied as soon as reasonably practicable. The Licensee shall not be required to do anything under DOC 8 until it satisfied with the details supplied in the proposal or pursuant to a request for further information.

DOC 8.2.2.4 If the Licensee wishes to undertake a System Test the Licensee shall be deemed to have received a proposal of that System Test.

DOC 8.2.3 Preliminary Notice and Establishment of Test Panel

DOC 8.2.3.1 The Licensee shall carryout the overall co-ordination of the System Test, using the information supplied to it under DOC 8 and shall identify in its reasonable estimation, which Users other than the party proposing the test, may be affected by the proposed System Test.

DOC 8.2.3.2 A Test Co-ordinator, who shall be a suitably qualified person, shall be appointed by the Licensee with the agreement of the Users which the Licensee has identified may be affected and shall act as Chairman of the Test Panel referred to in DOC 8.2.4 (the Test Panel).

DOC 8.2.3.3 All Users identified under DOC 8.2.3.1 shall be given in writing, by the Test Co-ordinator, a preliminary notice of the proposed System Test. The preliminary notice shall contain:

a. The Test Co-ordinator's name and nominating company.

b. The details of the nature and purpose of the proposed System Test, the extent and situation of Plant or Apparatus involved and the Users identified by the Licensee under DOC 8.2.3.1.

c. An invitation to each User to nominate within one month a suitably qualified representative, or representatives where appropriate, to be a member of the Test Panel for the propose System Test.

DOC 8.2.3.4 The preliminary notice shall be sent within one month of the receipt of the proposal notice or the receipt of any further information requested under DOC 8.2.2.3.

DOC 8.2.3.5 As soon as possible after the expiry of that one month period all relevant Users and the Test Proposer shall be notified by the Test Co-ordinator of the composition of the Test Panel.

DOC 8.2.4 Test Panel

DOC 8.2.4.1 A meeting of the Test Panel shall take place as soon as possible after the relevant Users and the Test Proposer have been notified of the composition of the Test Panel, and in any event within one month of the appointment of the Test Panel.

DOC 8.2.4.2 The Test Panel shall consider

a. the details of the nature and purpose of the proposed System Test and other matters set out in the proposal notice (together with any further information requested under DOC 8.2.2);

b. the economic, operational and risk implications of the proposed System Test;

c. the possibility of combining the proposed System Test with any other tests and with Plant and / or Apparatus outages which arise pursuant to the operational planning requirements of the Licensee, NTDC and Users; and

d. implications of the proposed System Test on the Scheduling and Despatch of Generating Plant, insofar as it is able to do so.

DOC 8.2.4.3 Users identified under DOC 8.2.3.1 and the Licensee (whether or not they are represented on the Test Panel) shall be obliged to supply that Test Panel upon written request with such details as the Test Panel reasonably requires in order to consider the proposed System Test.

DOC 8.2.4.4 The Test Panel shall be convened by the Test Co-ordinator as often as he deems necessary to conduct its business.

DOC 8.2.5 Proposal Report

DOC 8.2.5.1 Within two months of the first meeting the Test Panel shall submit a report, which in this DOC 8 shall be called a proposal report, which shall contain;

a. proposals for carrying out the System Test (including the manner in which the System Test is to be monitored);

b. an allocation of costs (including un-anticipated costs) between the affected parties, (the general principle being that the Test Proposer shall bear the costs); and

c. such other matters as the Test Panel consider appropriate.

The proposal report may include requirements for indemnities to be given in respect of claims and losses arising from the System Test. All System Test procedures must comply with all applicable legislation.

DOC 8.2.5.2 If the Test Panel is unable to agree unanimously on any decision in preparing its proposal report, the disputed matter regarding System Testing and inspection shall be referred to the Distribution Code Review Panel for resolution.

DOC 8.2.5.3 The proposal report shall be submitted to all those who received a preliminary notice under DOC 8.2.2.

DOC 8.2.5.4 Within fourteen days of receipt of the proposal report, each recipient shall respond to the Test Co-ordinator with its approval of the proposal report or its reason for non-approval.

DOC 8.2.5.5 In the event of non-approval by one or more recipients, the Test Panel shall as soon as practicable meet in order to determine whether the proposed System Test can be modified to meet the objection or objections.

DOC 8.2.5.6 If the proposed System Test cannot be so modified, the matter be referred to the Distribution Code Review Panel for resolution.

DOC 8.2.5.7 If the proposed System Test can be so modified, the Test Panel shall as soon as practicable, and in any event within one month of meeting to discuss the responses to the proposal report, submit a revised proposal report and the provisions of DOC 8.2.5.3 and DOC 8.2.5.4 shall apply to that submission.

DOC 8.2.5.8 In the event of non-approval of the revised proposal report by one or more recipients, the disputed matter shall be referred to the Distribution Code Review Panel for resolution.

DOC 8.2.6 Final Test Programme

DOC 8.2.6.1 If the proposal report (or, as the case may be, the revised proposal report) is approved by all recipients, the proposed System Test can proceed and at least one month prior to the date of the proposed System Test, the Test Panel shall submit to the Licensee and all recipients of the proposal notice a programme which in this DOC 8 shall be called a final test programme stating the switching sequence and proposed timings, a list of those staff involved in the carrying out of the System Test (including those responsible for the site safety) and such other matters as the Test Panel deem appropriate.

DOC 8.2.6.2 The final test programme shall bind all recipients to act in accordance with the provisions contained within the programme in relation to the proposed System Test.

DOC 8.2.6.3 Any problems with the proposed System Test which arise or are anticipated after the issue of the final test programme and prior to the day of the proposed System Test must be notified to the Test Co-ordinator as soon as possible in writing. If the Test Co-ordinator decides that these anticipated problems merit an amendment to or postponement of the System Test, he shall notify any party involved in the proposed System Test accordingly.

DOC 8.2.6.4 If on the day of the proposed System Test operating conditions on the System are such that any party involved in the proposed System Test wishes to delay or cancel the start or continuance of the System Test, they shall immediately inform the Test Co-ordinator of this decision and the reason for it. The Test Co-ordinator shall then postpone or cancel, as the case may be, the System Test and shall, if possible, agree with all parties involved in the proposed System Test another suitable time and date or if he cannot reach such agreement, shall reconvene the Test Panel as soon as practicable which shall endeavour to arrange another suitable time and date and the relevant provisions of this DOC 8 shall apply.

DOC 8.2.7 Final Report

DOC 8.2.7.1 At the conclusion of the System Test, the Test Proposer shall be responsible for preparing a written report (the 'final report') of the System Test for submission to other members of the Test Panel.

DOC 8.2.7.2 The final report shall include a description of the facilities, tested and of the System Test carried out, together with the results, conclusions and recommendations.

DOC 8.2.7.3 The final report shall not be distributed to any party which is not represented on the Test Panel unless the Test Panel, having considered the confidentiality issues, shall have unanimously approved such distribution.

DOC 8.2.7.4 When the final report has been submitted under DOC 8.2.7 the Test Panel shall be dissolved.

End of DOC 8

DISTRIBUTION OPERATING CODE NO. 9

TESTING AND MONITORING

CONTENTS

DISTRIBUTION OPERATING CODE NO. 9

TESTING AND MONITORING

DOC 9.1 INTRODUCTION, OBJECTIVE & SCOPE

DOC 9.1.1 To ensure that the Licensee Distribution System is operated reliably, efficiently and economically and within its license obligations, and in order to meet obligations as provided in Grid/Distribution Codes, Statutory obligation of Performance Standards (Distribution) the Licensee, shall organise and carry out testing and /or monitoring of the effect of Users' electrical apparatus on the Licensee Distribution System.

DOC 9.1.2 The testing and / or monitoring procedures shall be specifically related to the technical criteria detailed in the Distribution Planning Code and Connection Code. They shall also relate to the parameters submitted by Users in the Distribution Data Registration Code (DDRC).

DOC 9.1.3 The testing carried out under this Distribution Operating Code 9 ('DOC 9') should not be confused as an extension of System Tests outlined in DOC 8.

DOC 9.1.4 The objective of DOC 9 is to specify the Licensee requirements to test and/or monitor its Distribution System to ensure that Users are not operating outside the technical parameters provided by themselves and required under the Distribution Planning Code, and Connection Code and / or the Distribution Operating Codes.

DOC 9.1.5 DOC 9 applies to all the Users of the Licensee distribution system, which covers the following:

(a) Other Distribution Companies

(b) Embedded Generators

(c) Bulk Power Consumers

(d) Generators

(e) Any other parties connected to the distribution network of the Licensee.

DOC 9.2 PROCEDURE RELATED TO QUALITY OF SUPPLY

DOC 9.2.1 The Licensee shall from time to time determine the need to test and/or monitor the quality of supply at various points on its Distribution System.

DOC 9.2.2 The requirement for specific testing and / or monitoring may be initiated by the receipt of complaints from the consumers as to the quality of supply on its Distribution System.

DOC 9.2.3 In certain situations the Licensee may require the testing and / or monitoring to take place at the point of connection of a User with the Licensee Distribution System.

DOC 9.2.4 Where testing and / or monitoring is required at the Connection Point, the Licensee shall advise the User involved and shall make available the results of such tests to the User.

DOC 9.2.5 Where the results of such tests show that the User is operating outside the technical parameters specified in DDC 2.4, the User shall be informed accordingly.

DOC 9.2.6 Where the User requests, a retest shall be carried out only once and the test witnessed by a User representative.

DOC 9.2.7 A User demonstrated to be operating outside the limits specified in DDC 2.4 shall rectify the situation or disconnect the facility causing the problem from its electrical System connected to the Licensee Distribution System immediately for such time as is agreed with the Licensee.

DOC 9.2.8 Continued failure to rectify the situation by the User shall result in the User being disconnected or de-energised in accordance with the Connection Agreement with the Licensee Distribution System either as a breach of the Distribution Code or Consumer Service Manual, where appropriate.

DOC 9.3 MONITORING AND PROCEDURES RELATED TO CONNECTION POINT PARAMETERS

DOC 9.3.1 The Licensee from time to time shall monitor the effect of the User on the Licensee Distribution System.

DOC 9.3.2 The monitoring shall normally be related to;

a. Amount of Active Power and Reactive Power transferred across the Connection Point.

b. Voltage, frequency and harmonics.

DOC 9.3.3 Where the User is exporting to or importing from the Licensee Distribution System Active Power and Reactive Power in excess of the parameters in the Connection Agreement the Licensee shall inform the User and where appropriate demonstrate the results of such monitoring.

DOC 9.3.4 The User may request technical information on the method of monitoring and, if necessary, request another method reasonably acceptable to the Licensee.

DOC 9.3.5 Where the User is operating outside of the specified parameters, the User shall immediately restrict the Active Power and Reactive Power transfers to within the specified parameters.

DOC 9.3.6 Where the User requires increased Active Power and Reactive Power in excess of the physical capacity of the Connection Point or the authorized kW load of the User, shall restrict power transfers to those specified in the Connection Agreement until a modified Connection Agreement has been applied for from the Licensee and physically established.

End of DOC 9

DISTRIBUTION PLANNING CODE

CONTENTS

DISTRIBUTION PLANNING CODE

DPC 1 INTRODUCTION

DPC 1.1 The Distribution Planning Code (DPC) contains distribution and sub-transmission system planning, methodology and procedures, and specifies criteria and principles to be followed by the Licensee in the planning and development of its Distribution and Sub-transmission System. DPC also applies to Users of the Licensee Distribution System in the planning and development of their Systems in so far as they affect the Licensee Distribution System.

DPC 1.2 The User's requirements may necessitate the reinforcement of or the extension to the Licensee Common Distribution and Sub-transmission System and in some cases may require the Licensee to seek reinforcement of or extension to the relevant NTDC/ Licensee interface and sub-transmission capacity, such work being identified by the Licensee or NTDC as appropriate shall be a part of the discussions with the User concerning the User's requirements. Such requirements, if not already covered in the Connection Agreement may require modification of the agreement.

DPC 2 SCOPE

DPC 2.1 The Distribution Planning Code ('DPC') applies to the following:

a. All Generators and Licensees or any other entity who is using or planning to use Distribution System of the Licensee.

b. NTDC

c. KESC

d. Other DISCOs

DPC 2.2 This sub-code outlines the following:

a. General principles, aims and objectives of Distribution Planning.

b. Recommended planning criteria voltages, power factor, equipment loading criteria, fault level, and security standards.

c. Load demand planning.

d. Power System Losses.

e. Loss Reduction.

f. Load Management.

DPC 3 DISTRIBUTION PLANNING CRITERIA

DPC 3.1 <u>General Principles</u>

Primary Planning Criteria (Voltage, Capacity, Reliability & Technical Losses) as applicable to all facilities at and below 132 kV, including grid stations, sub-transmission lines, 11 kV feeders, distribution transformers and LT feeders, is provided in this chapter. If the system is planned and designed to operate within the prescribed limits as specified in the Performance Standards (Distribution) and DDC and this Code, the technical losses will remain within acceptable values.

The Licensee planner shall follow the following basic principles.

a. During normal operating conditions and without a system component fault condition present, all equipment and facilities of the Licensee shall operate within normal ratings of the distribution facilities and the system voltages will be within the permissible limits as specified in the Performance Standards (Distribution), and this sub-code when the system is operating within the range of minimum load to the forecasted maximum peak load.

b. During system emergency conditions and without and facilities of a Licensee system or equipment fault condition present, the equipment may be operated with overload or/and under voltage for a specified time limit and for specific number of hours as per manufacturer recommendations and IEC Standards. Planning criteria is based on normal and emergency equipment ratings. Emergency ratings are those, which can safely exist for a specified number of hours as per IEC Standard/manufacturer instructions.

c. 33kV and 66kV systems shall be retained with-in the existing Licensee service area only and shall not be extended further as far as possible and practicable. These systems should be gradually reduced and ultimately eliminated with load transferred to 132 kV systems. New development plans shall be based on 132 kV systems, which shall be developed in consultation with NTDC for an economic development of the entire system.

DPC 3.2 Aims

The Licensee shall plan and develop its sub-transmission System and Distribution System, particularly to ensure that subject to the availability of adequate generating and transmitting capacity, the system shall be capable of providing consumers with a safe, reliable and efficient supply of electricity as per the requirements and provisions of Grid Code, Distribution Code, Performance Standards (Distribution), Consumer Eligibility Criteria and Consumer Service Manual.

The Licensee's Distribution System shall conform to the statutory requirements of the NEPRA Act, Rules & Regulations made under the Act, and the Distribution Licence.

DPC 3.3 Objectives

a. System must deliver specified voltages as per this Code and NEPRA Performance Standards (Distribution)-Rules under all system conditions at all times.

b. 11kV feeder shall not be loaded beyond its permissible limits as provided in this document or relevant IEC Standards.

c. To provide a safe, reliable and secure supply of power in an economic and efficient manner as per the obligations placed under distribution licence and NEPRA Licensing Rules (Distribution)-1999.

d. To propose and plan new 11kV feeders, bifurcation/ augmentation of existing feeders and new grid stations to take care of Clause (a), to Clause (c).

e. To provide for an orderly, timely and least cost expansion of an adequate future distribution system.

f. To forecast the load demand growth and propose new grid stations and/or 66kV/132kV lines after exploring all the possible options of reinforcement, augmentation or extension of existing sub-transmission system and 11kV distribution system.

g. To develop five year distribution/sub-transmission investment/ development plans.

h. To facilitate the Use of Licensee distribution system by BPCs and other Licensees for competition purposes.

i. To exchange Planning Data with the NTDC.

j. To provide Standards of Distribution Power Supply.

DPC 3.4 Recommended Planning Criteria Voltages

The voltage limits need to be in accordance with the provisions of Grid Code, and Transmission and Distribution Performance Standards. The suggested limits are.

a. Delivery voltage at the receiving end are as under;

i. Normal Conditions

- 400/230 Volts, 11kV ± 5%
- 66kV and 132kV ± 5%

ii. Contingency Conditions

Single Outage Contingency (N-1)

- 400/230 Volts, 11kv ± 5%
- 66kV and 132kV ± 10%

DPC 3.5 Power Factor

Power factor shall be maintained within the range 90% to 100% excluding LT systems.

DPC 3.6 Equipment Loading Criteria

The loading limits of all the distribution facilities of the lines and grid stations should be in accordance with IEC Standards, manufacturers recommendations with due regard to ambient temperature conditions**.**

DPC 3.7 Capacitive Reactance Compensation

Shunt capacitors un-switched/switched type, shall be installed on the Distribution System and sub-transmission system at suitable location for improvement of Power Factor, voltage profile and reduction of transmission and distribution losses. The size and location of capacitor installations shall be determined by the Licensee planning computer programs on the basis of reliable field data to avoid over voltages under light load periods. Useful formulae are given in the DPC Appendix-I, which may be applied for determining approximate size and location of capacitor installations or (the present procedures, which the distribution planning engineers, are following, whichever is more appropriate).

DPC 3.8 Security Standards

The Licensee's Distribution System shall be planned and maintained so as to fulfill the following security standards except under Force Majeure Conditions that are beyond the reasonable control of the Licensee.

a. In case of single contingency failure in or to any 132/66/33/11kV sub-station excluding equipment, controlling any outgoing 11KV Feeders, the load interrupted shall not exceed 50% of the total demand on the sub-station. The Licensee must bring this criteria down to **30%** over a period of 5 years from the effective date of the Distribution Code.

b. In case of breakdown on transmission or distribution system the electricity supply interruption and restoration should be regulated as per the provisions of Performance Standards (Distribution)

DPC 4 SYSTEM FACILITIES

Each Licensee shall be responsible for the planning, design, construction and ownership of 132 /66 kV sub-transmission lines and associated substations facilities. The planning load flow software shall be acquired and used by each Licensee. However the planning of 132/66kV systems of Licensee must be co-ordinated with NTDC in accordance with provisions given in Grid Code.

The Licensee shall prepare each year a short term load forecast for a period of 5 (five) years for the loading on the 132 kV system, and use the forecast to prepare load flow and short circuit studies. An expansion plan is to be prepared according to the planning criteria provided in DPC 3 established for 132 kV transmission and the system studies. Expansion plan shall be co-ordinated with NTDC.

The expansion plans shall be delivered to NTDC in report form along with system studies electronic data files. NTDC will review the plans and prepare necessary load flow, short circuit and necessary transient stability studies. The following technical data will be determined:

a. Loading profiles of 132/66kV lines and grid facilities.

b. The critical modeling including analytical assessment of the corresponding effect of insertion/replacement of new equipment and its impact on the performance of the system and the point of connection.

c. Switching complexity and co-ordination between 132 kV system and 11 kV and lower voltage level and NPCC and regional load dispatch center.

d. Interfaced and security for communications facilities, remote monitoring, control and protection.

e. Ability to withstand levels of voltage.

f. Short circuit study for circuit breakers and equipment.

g. Equipment insulation co-ordination.

h. Construction practices and additional requirements.

Based on the NTDC/Licensee studies NTDC shall identify 66kV/132 kV transmission lines and grid stations projects that are critical to the reliability and performance of the 132 kV, 220 kV and 500 kV transmission system. NTDC and effected Licensees shall meet and work out details and costs associated for construction of the necessary 132 kV facilities. The expansion of 132/66kV Licensee system shall be carried out with a view of overall economics of developing the transmission network.

Each year each Licensee shall submit to NTDC a relay coordination study. NTDC will prepare a system wide relay coordination study and advise each Licensee of any required changes to the relay settings.

DPC 5 LOAD DEMAND ASSESSMENT AND FORECASTING TECHNIQUES

DPC 5.1 The Licensee shall prepare each year a short to medium term load forecast for a period of 5 (five) years (the planning period shall be 5 years. The load forecast used for operating purposes can be for one year only) for its Service Territory as well Concessional Territory Area of Supply taking into account historic and the probable load growth and consumption pattern of the consumers. The Licensee shall adopt appropriate and established load forecasting methodology using reliable data and relevant indices. The methods may include one or more of the following.

a. Historical population and load growth analysis

b. Land use and zoning methods

c. End-use energy methods

d. Any other reasonable and justifiable method

DPC 5.2 The load forecast shall define a specific load area and type of consumers and for a specific time frame. The specific load area shall be identified such as residential, commercial, light industrial and heavy industrial. The time period shall be identified as short to medium term (1-5 years).

The Licensee shall work out the annual energy requirement and Peak Demand for each of the coming five years relating to each point of interconnection on the basis of its load forecast.

The Licensee shall install metering at each substation to provide kVA demand per substation and kVA demand on each 11kV feeder. The diversity factor can be calculated as follows:

$$\text{Diversity Factor} = \frac{\text{sum of all feeders MW demands}}{\text{Substation MW demand}}$$

If this value is less than 1 it is an indication that the metering or readings are in error.

This information can be used for Load Demand forecasting to determine kVA/substation or substation served area and kVA feeder demand/feeder and kVA demand per feeder area served.

Energy sales can be used to determine the required generation forecasts. Therefore the Licensee shall provide kWh meters at the substations. The

energy meters will provide sales information and can be used to determine the system load factor as follows;

$$\text{Load Factor} = \frac{\text{kWh in period}}{\text{Peak kW demand x hours in period}}$$

Load can be used to calculate kW demand for substation or a particular feeder and with a given power factor can calculate the kVA demand of the respective sub-station or feeder.

DPC 6 MAPS AND RECORDS

The Licensee shall develop procedures and guidelines of digitized mapping of the distribution network, including instructions requiring essential needs of revisions and updates on maps and records and digitalizing wherever required as per the obligations placed under its distribution licence.

The existing maps showing the service territory as well as concessional territory of each Licensee are to be provided by the Licensee. The Licensee shall be responsible to verify the accuracy of the existing maps and revise the maps as necessary to update any system improvements that have been made. The mapping process shall be digitized to facilitate revisions and making the maps available to responsible planning, operating and maintenance personnel of the Licensee, NTDC, and NEPRA.

Each Licensee shall be responsible for operating and maintaining the distribution systems within the Service Territory as established in its distribution licence.

DPC 7 LOAD DEMAND PLANNING

Each Licensee shall annually make load flow calculations to determine the loading on distribution feeders, sub-transmission lines, transformers and sub-stations. The load flow studies shall be made for summer and winter peak conditions.

The load flow calculations shall be analyzed to identify overloaded facilities according to equipment loading criteria for each type of facility.

When overloaded facilities are identified the Licensee shall prepare plans either to shift load demand to relieve overloads or develop upgrading, reinforcement, augmentation and expansion plans for new facilities if the shifting of load is not recommended on permanent basis for a long period.

DPC 8 LOAD FLOW STUDIES

The plans, procedures and suitable measures shall be outlined as far as practicable, to maintain the optimum circuit (feeders) and equipment (transformer) loading. The need and provision of requisite load flow studies shall be specified by the distribution planning engineers.

DPC 9 PLANNING CAPABILITIES OF LICENSEE AND SYSTEM PLANNING SOFTWARE

State-of-the-art Distribution Load flow software programs shall be used by each Licensee to analyze the 11 kV Distribution systems. The program Modules will satisfy the requirements for Distribution System Planning of the

Licensee and the planning package will, at least, contain the following modules:

a. Load Flow Analysis including single plan unbalanced load solution algorithm

b. Capacitor Application and Optimization

c. Short Circuit Analysis

d. Voltage Regulation

e. Motor Starting Dip Analysis

f. Dynamic Feeder Optimization (area wise), including load transfer switching between feeders with a single and/or multiple sources. The function shall allow for system reconfiguration and is to perform operational and contingency analysis.

g. Load Forecast

h. Harmonic Analysis

Transmission load flow software programs shall be used by each Licensee to analyze its 132 kV, 66kV, sub-transmission systems. The program modules will satisfy the requirements for Transmission System Planning.

DPC 10 POWER SYSTEM LOSSES

The Licensee must account for the power system losses that occur in energy conversion and transmission and distribution facilities. The losses are variable according to amount of power flow, and are known as I^2R losses. Fixed losses also occur as a result of transformer magnetizing current and as dielectric losses in high voltage cables. The Licensee shall account for the losses according to various categories of system components. The following categories are typical for the Pakistan distribution system:

a. Transmission losses at 132 kV and above.

b. Sub-transmission and Distribution losses at 132 kV, 66kV, 33 kV, and 11 kV and 400 volts.

c. Transformer iron losses.

d. Cable dielectric losses.

When calculated on an annual (8760 hour) basis, the sum of losses in each category is the total annual energy losses to be accounted for by the Licensee for its service territory.

DPC 11 SYSTEM IMPROVEMENT PLANS AND LOSS REDUCTION

The Licensee shall make concerted efforts to make distribution system improvements through an effective and comprehensive planning process so as to operate more efficiently. The losses are the highest for the 11 kV and 400 V distribution systems. Periodic review of basic design parameters, construction techniques, and operating procedures for the distribution system

can identify possible areas for improvement, which can increase the available energy accordingly.

In addition to the items mentioned in the objectives the following items but not limited are candidates for loss reduction efforts.

a. Use compression or bolted connector, eliminate wrapped wire connection on distribution lines.

b. The selection of size of the conductor on the LT feeder should be on the basis which lends to a maximum of 5% voltage drop (regulation) along the entire length of the LT feeder on the basis of full load current of the LT feeder.

c. Purchase new power transformers with 132/66/11 kV on-load tap changers.

d. Ensizing the future distribution system, voltage levels, the provision of the Consumer Eligibility Criteria shall be followed while providing new service connection preferring to have diversity file mix in consumer on the feeders avoiding excessively long feeders and regular maintenance practices as included in this code.

e. Require power factor correction capacitors be installed at consumers premises on LT side with a connected load of 50 kVA or greater and with a power factor of less than 0.9 as per the provisions of Consumer Service Manual.

f. By proper installing the energy meters in vertical position and properly fixed.

g. Implementation of equipment removal order in time.

h. Regular monitoring and checking of disconnected consumers.

i. Maintenance and monitoring of rise and fall consumption register.

j. Attempts should be made to precisely estimate the break down of the losses along various sections of the distribution system by accurately modeling the distribution system in the state of art distribution software.

k. Use insulated bus bars for making consumer connection to the secondary distribution system.

l. Use of insulated cables for over head secondary system.

m. Replacement of defective meters.

n. Trimming of trees, which are touching the electric lines.

o. Reducing the lengthy LT lines or eliminating the LT lines by installing low capacity distribution transformers for groups of consumers.

p. Installation of sectionalizing switches/auto re-closer on branch lines and distribution transformers.

q. Area planning, augmentation of conductor, transformer, additional transformers, conversion of lengthy sub-services by LT lines, bifurcation of feeders, aerial bundled cables etc.

DPC 12 DISTRIBUTION OPEN ACCESS PROVISIONS

DPC 12.1 Each Licensee must plan, design, construct, maintain and operate its network to allow the transfer of electricity between the systems of parties, which are connected to or have access to its network.

DPC 12.2 Demand Side Management (DSM)

DPC 12.2.1 DSM initiative is a planning technique that may be used in reducing the peak demand of consumers over period of time. The Licensee shall establish public policy and procedures for DSM initiative.

DPC 12.2.2 Licensee shall ensure the volunteer load reduction by the bulk supply and large industrial consumers by a percentage as mutually agreed for managing the required level of load on demand side.

It is to ensure that heavy motive loads are not started during the heavy load periods for load management purposes.

End of Planning Code

DISTRIBUTION DESIGN CODE

CONTENT

DISTRIBUTION DESIGN CODE

DDC 1 INTRODUCTION

The Licensee must develop, operate, and maintain an efficient, secure and coordinated system of electricity supply that is both economical and safe.

DDC sets out principles and standards to be applied in the design process of the Licensee Distribution System and any User connections to the Distribution System of the Licensee.

Nothing contained in DDC is intended to inhibit design innovation. DDC is, therefore, cognizant of the performance requirements of the Licensee Distribution System to be operated and managed in an efficient, secure, safe and economical manner as per the provisions of the Performance Standards (Distribution)-Rules.

DDC described Design Criteria, frequency and voltage parameters, design principles of equipment, cables and lines and other electrical facilities in terms of their loading thresholds.

DDC 2 DESIGN STANDARDS CRITERIA

DDC 2.1 Standardization of Sizes, Ratings and Grid Stations Layout

Standardization of sizes, ratings and grid stations layout and 11/0.4kV three-phase distribution system shall be done by the Licensee. The specifications and layouts of the grid stations shall conform to IEC and Pakistan Standards Institute (PSI) specifications.

The minimum size/rating of the power transformer especially in 66/11kV grid stations should be assigned, declared and indicated as to what type of independent breaker is to be installed. However, it is recommended that 7.5 MVA and above transformers should be controlled by a separate circuit breaker.

The layout of a Grid Station having single and double 132kV bus bars conforming to IEC Standard shall be developed and standardized by the Licensee 132/66 kV, 132/33 kV, 132/11 kV with a capacity of 10 MVA and above in case of 132 kV, and up to 10/13 MVA in case of 66 kV grid station.

DDC 2.2 Design Criteria for Distribution Lines

These criteria shall apply to all distribution and sub-transmission lines and to be operated and maintained by the Licensee up to and including 132kV for both overhead lines and underground cables.

The lines shall be designed and constructed in accordance with relevant provisions of IEC Standard or subsequent approved standards applicable to overhead lines and under-ground cables.

The distribution network fed from 132/11 kV, 66/11 kV, 33/11 kV 11/0.4kV transformers shall be initially planned as independent networks within their respective service area. A service area of any particular substation shall mean for this purpose, an area where load shall normally be supplied by that sub-station through one or more number of feeders, as required, without

exceeding the specified KVA-Km Loading limit of any feeder within the area and provisions of DPC 10.

The Licensee shall take suitable measures, sufficiently in advance, to augment the capacity of its 11 kV feeders if in the event of the specified KVA-KM loading of any particular feeder is being exceeded.

The design of the distribution lines shall incorporate features to enable their augmentation, in future, with minimum interruption to power supply to other consumers. The existing Rights of Ways shall be fully exploited by the Licensee.

KVA-Km loading limits for conductors may be calculated in accordance with a sample calculation shown at DDC Appendix 1.

The designing of the distribution system should be on the basis of optimum economic loading criteria.

DDC 2.3 Frequency and Voltage

The Licensee Distribution System and any User connections to that System shall be designed to enable the Normal Operating Frequency and voltages supplied to Consumers to comply with the NEPRA Performance Standards (Distribution)-Rules, Grid and Distribution Codes.

DDC 2.4 Voltage Disturbances and Harmonic Distortion

The Licensee and Users shall take appropriate and necessary measures so that their system do not cause any distortion of the system voltage, supply waveform as per the provision made in the Performance Standards (Distribution) and Consumer Service Manual, and in accordance with IEEE Standard 519-1992 or equivalent IEC Standard and shall be revised from time to time.

DDC 3 DESIGN PRINCIPLES

DDC 3.1 Specification of Equipment, Overhead Lines and Underground Cables

a. The principles of design, manufacturing, testing and installation of Distribution Equipment, overhead lines and underground cables, including quality requirements, shall conform to applicable standards such as IEC, IEEE, Pakistan Standards or approved current practices of the Licensee.

b. The specifications of Equipment, overhead lines and cables shall be such as to permit the Operation of the Licensee Distribution System in the following manner;

   i. within the safety limits as included in the approved Safety Code of the Licensee or the relevant provisions of the Performance Standards (Distribution);

   ii. within operating frequency and voltage ranges as provided in this code or Performance Standards (Distribution); and

   iii. within the thermal ratings as provided by the manufacturer or relevant IEC specifications.

c. Equipment shall be suitable for use at the operating frequency, within specified operating voltage range and at the design short-circuit rating of the Licensee Distribution System to which it is connected having due regard to fault carrying capabilities and making and breaking duties of the circuit breakers. In appropriate circumstances, details of the System to which connection is to be made shall be provided by the Licensee.

d. The standards, publications and specifications referred to in paragraphs (a) to (c) above are such standards, publications and specifications current at the time that the facility was manufactured (and not commissioned) in the case of facility on the Total System, or awaiting use or re-use. If any such facility is subsequently moved to a new location or used in a different way, or for a different purpose, or is otherwise modified then such standards, publications and specifications current at the time that the facility was manufactured (and not commissioned) shall apply provided that in applying such standards, publications and specifications the facility is reasonably fit for its intended purpose and use having due regard to the obligations of the Licensee under their respective licenses and the User under the Consumer Service Manual.

DDC 4 EARTHING

A Licensee must ensure that the neutrals and body of the power transformer at a grid station shall be connected to earth mesh provided in the yard of the grid stations through independent leads. The neutral wire should additionally be connected to earth rod and mesh through a separate lead. All other installations in the yard be connected to earth mesh. The earth resistance shall be up to or less than 2 ohms for Grid Station equipment.

The earthing of a distribution transformer, the neutral and body of the transformer should be connected to ground rods as per IEC and PSI Standards Design Specifications.

Earthing of Consumer Service and its meter shall be as per design standards adopted by the Licensees; and consistent with IEC, and IEEE Standards.

The earth resistance of the distribution transformers and HT/LT structures/poles shall not be more than 2.5Ω and 5Ω respectively.

End of DDC

CONNECTION CODE

CONTENTS

CONNECTION CODE

CC 1 INTRODUCTION

This section deals with the connection principles, requirements, guidelines, and procedures for the entities other than NTDC seeking either new connection with Licensee's network or modifying existing connection.

In this sub-code of the Distribution Code, the network connection requirements have been outlined which specify both the minimum technical/functional, design and operating criteria that must be complied with by any User connected to or seeking connection with the Licensee's network. It also prescribes the application procedures to be adopted by the prospective Users, and the obligation that needs to be fulfilled by the Licensee related to providing connection and operating its system after the connection has been provided. Furthermore, it specifies the information requirements on the part of prospective and existing Users of the Licensee's system. The procedures contained in this chapter are applicable to the following.

a. All Generators

b. Embedded Generators

c. Independent Generators

d. Other Distribution Companies

e. Externally Connected Consumers

f. Externally-connected Parties

g. BPCs with supply of 1MW and above.

CC 2 SCOPE

This chapter deals with connection to the Licensee’s network at 11kV and above upto 132 kV in respect of the entities listed in CC1. The time limits related to provide new connection to Applicants provided in this sub-code shall not be inconsistent with the time limits as provided in NEPRA Performance Standards (Distribution)-Rules clause 4(c). These time limits have also been detailed in the Consumer Service Manual approved by NEPRA.

CC 3 PURPOSE AND AIMS

The Connection Code provides the framework for connection to the Licensee's network. It has the following aims:

a. to enumerate the principles and guidelines for establishing a connection and use of the network;

b. to establish and streamline the process to be followed by a prospective and existing User to establish or modify a connection to Licensee’s network;

c. to manage and prepare the distribution network of the Licensee, and the connection point for applicant seeking the connection;

d. to establish process to ensure ongoing compliance with technical and operating requirements indicated in this sub-code;

e. to achieve long term economic benefits in terms of costs and system reliability towards an orderly development of the distribution system; and

f. to establish a uniform, consistent and fair policy of Connection to the Licensee's distribution system.

CC 4 PRINCIPLES

The conditionalities and the procedures covered under this Connection Code are based on, among others, the following principles and assumptions:

a. All Users shall have an opportunity to form a connection to the network; and have access to the services provided by the Licensee.

b. To provide a uniform treatment in identifying terms and conditions for each applicant.

CC 5 OWNERSHIP BOUNDARIES

CC 5.1 The point or points at which supply is given or taken between the Licensee's System and Users shall be agreed upon between the Licensee and the User as required. For supplies at Low Voltage (LV) the general rule is that the point of supply will be at the Users terminals of the Licensee's owned metering equipment but not inconsistent with Consumer Service Manual and Consumer Eligibility Criteria. For High Voltage (HV) supplies, including connections between Distribution Licensees and Users, and where necessary busbar connected supplies at Low Voltage, the points of supply shall be subject to specific agreement between the parties in each case.

CC 5.2 The respective ownership of Plant and Apparatus shall be recorded in a written agreement between the Licensee and the User as required. In the absence of a separate agreement between the parties to the contrary, construction, commissioning, control, operation and maintenance responsibilities shall follow ownership.

CC 5.3 For supplies at High Voltage, the Licensee shall with the User's agreement prepare a responsibility schedule and, an Operation Diagram determined by the Licensee during the application process for connection showing the agreed Ownership Boundary. Copies of these documents shall be retained by the Licensee and User. Changes in the boundary arrangements proposed by either party must be agreed in advance and shall be re-coded on the Licensee Operation Diagram.

CC 5.4 Network Boundaries

The Licensee shall own and operate the assets of 132kV and 66kV substations and distribution network of 11kV and lower voltage level in its ownership and control.

NTDC shall operate 132 kV lines leading to the Combined Delivery Points of distribution Licensees, 132 kV transmission lines connecting to generating stations, and lines connecting more than one distribution Licensee.

Bifurcation of Network between NTDC and Licensee

The Network Bifurcation Point between NTDC and Licensee shall be the dropper from the terminal structure of 220 kV grid station to the Licensee's 132kV or 66kV line, which shall also be the Connection Point for that Licensee. The NTDC's maintenance jurisdiction shall be up to the tension strings of the same terminal structure towards gantry side.

Bifurcation of Network between Distribution Companies and Azad Jammu and Kashmir (AJK) Network

AJK Electricity Department is taking power from PESCO, IESCO and GEPCO at 11kV voltage. The Network Bifurcation Point shall be the jumpers of 11kV Power cable connected to the panel.

CC 5.5 Combined Delivery Points

These are 220/132/66 kV substations where 132/66 kV lines originate into the Licensee's network.

CC 6 ESTABLISHING OR MODIFYING CONNECTION

CC 6.1 Process and Procedures

The entities listed in CC 1 seeking a new connection or modification of an existing connection shall adopt the following process and the procedures.

The Licensee shall submit the connection application to NTDC (the detailed process of the Procedure is indicated in Figure-1 attached at the end of this sub-code), whereas Independent Generators, BPCs and Special Purpose Transmission Licensee (SPTL), Housing Colonies, Defence Establishment, and Embedded Generators shall submit their applications to the respective Licensee and NTDC simultaneously. The Distribution Companies shall evaluate their application for providing the connection and shall forward to NTDC (wherever applicable) what Licensee considers it necessary.

CC 6.2 Intention Application

The entity wishing to modify its existing connection or connect to the network of the Licensee at 11kV and above upto 132kV for the first time shall prepare an intention proposal. The proposal must indicate:

a. The type of facilities he intends to establish (distribution and/or sub-transmission system).

b. Size of the facility and range including load factor.

c. Proposed Connection Point.

d. Tentative Schedule for connection.

e. Protection and metering requirements.

f. Voltage level at which the connection is required/modified.

g. Maximum and minimum active and reactive power requirements.

h. Type and characteristics of the proposed load to be connected.

i. The possible material effects of this proposed connection on the network power transfer capability including that of other networks,

j. Any additional risk posed by this proposed connection to other Users.

k. Adequacy of the inter-connection facility for at least next 5 years timeframe, and effectiveness of the protection/metering facilities installed.

l. Short circuit and stability consideration.

In addition intention proposal shall be made available at the offices of the Licensees or on-line.

Provision of on-line intention application should also be made by Licensee.

The respective Licensee, must evaluate the intention application within 30 business days (Preliminary evaluation time) based on the following considerations and make communication with the applicant.

a. Evaluate the application and accompanied information.

b. Check feasibility of the proposed connection.

c. Study transmission and/or distribution congestion or reinforcements required due to connection.

d. List out design functional requirements and performance standards and specification and communicate to the applicant in the next communication.

e. Prepare preliminary cost estimate for connection.

f. Indicate if additional information is required from the applicant.

g. If the applicant has made connection agreements with other Code participants.

h. Prepare load flow studies for the year, the facility shall go into service.

If distribution company requires additional information from the applicant, the applicant must be requested within 30 business days (preliminary evaluation time) to provide such information. If Licensee does not require such information the applicant must be made on “offer to Connect” within the 30 day time period to apply for connection to their network.

In case the applicant has been requested to provide additional information, he must provide such information within 10 business days after receipt of request from Licensee. The Licensee shall consult NTDC and other Licensees regarding the proposed connection if necessary.

The Licensee must provide the information/data related to its network to applicant, which shall help the applicant to prepare its application. The technical data, which may vary depending on the connection requirements and the type, rating and location of the facility to be connected is to be attached with the application.

CC 6.3 Service and Network Design Conditions

a. Substation Drawings and Data

i. Switchyard equipment connection lay out of all the substations under their control.

ii. Equipment foundation layout.

iii. Foundation structural (civil) drawings

iv. Earthing Layout

v. Construction and Maintenance Standards

vi. Procedures related to safety and switching

vii. One line Diagrams

Connection diagrams 1 to 5 as referred in Table-1 and connection flow chart are provided at end of this sub-code.

Any other information relevant to the submission of an application for connection.

The Licensee must use its reasonable endeavours to advise the Applicant of technical risks, rights, obligations, and responsibilities in respect of the proposed connection.

CC 6.4 Application for Connection or Modification

On receipt of offer for connection from the Licensee the applicant must submit its application within 30 business days from the Date of Offer for connection. The application must provide the following information for further evaluation by Licensee.

a. Technical and commercial Feasibility Report.

b. Detailed Design of the facility the applicant intends to install.

c. A final committed Implementation Schedule showing proposed milestone dates for construction and commissioning of the applicant's connection facilities.

d. Details of the Protection arrangements and settings keeping in view the protection schemes adopted by the Grid Code and concerned Licensee.

e. Copies of all Safety Rules and Local Safety Instructions applicable at Applicant's Sites.

f. Proposed usage of the facilities.

Licensee shall carryout preliminary evaluation of the application and if the application meets requirements of this Code and the technical criteria for connection/ modification, it shall send its concurrence to the Applicant and NTDC to allow connection with its network. The NTDC shall evaluate the application with reference to the Grid Code and its obligations as System Operator, as per its obligations in the Grid Code wherever required.

If the Applicant wants to have connection at multiple connection points of the network of Licensee then, he shall include all the connection points in the same application, however, the term and conditions for each connection point

may vary in accordance with the conditions prevailing at each connection point. If the connection points are within the network of different distribution Licensees, the Applicant must prepare and submit separate applications to NTDC and concerned distribution Licensee.

The Licensee shall evaluate the application and its contents within 30 (thirty) days and invite the applicant to have negotiations for Connection Agreement.

CC 6.5 Connection Agreements

If the Applicant wishes to accept the Offer to Connect, the Connection Applicant must:

a. Agree and apply for licence from NEPRA to operate as an independent generator, embedded generator or a Special Purpose Transmission Licensee.

b. Agree to be bound by relevant provisions of the Grid Code (if applicable) and Distribution Code.

c. Must follow all relevant rules and regulations already issued or to be issued in future by the Licensee, GoP, NEPRA, or the relevant Authorities including Safety Code of the concerned Licensee.

d. The detailed environmental framework is not being provided in the Grid Code and Distribution Code, however, the applicant must agree to abide by all such requirements, which are set out by the environmental agencies or NEPRA Licences, Rules and Regulations.

e. Enter into a connection agreement with each relevant distribution Licensee and, in doing so, must use its reasonable endeavors to negotiate in good faith with all parties with which the Applicant must enter into such a connection agreement.

The Licensee responsible for the connection must inform NTDC and other distribution Licensees, if needed, that a Connection Agreement has been entered into between them; and forward to NTDC all relevant technical functional, and operational details of the proposed connection, including the proposed protection and metering installation, and the terms upon which a User is to supply any ancillary services or disconnection/reconnection under the connection agreement.

NTDC and the Licensee must, within 10 business days of receipt of communication regarding Connection Agreement shall convey its comments on the metering, and protection arrangements.

The Applicant must agree to make provisions for rectification of causes for deteriorated quality and reliability of supply at the connection points of other Users caused by the Applicant's connection to the network and subsequent operation. In the event of disagreement between the parties, Review Panel shall be the arbitrator whereas the final decision shall be made by NEPRA only, if requested by the Review Panel.

CC 6.6 The design of connection between Licensee's distribution system or sub-transmission network and Users shall be in accordance with the principles setout in the Grid Code, Distribution Code, Performance Standards (Distribution), Consumer Eligibility Criteria and Consumer Service Manual, as applicable.

Before entering into the connection agreement, it shall be necessary for the Licensee to be reasonably satisfied that the User's system and installation/equipment at the boundary with the Licensee's distribution system or network shall comply with all appropriate requirements of the Distribution Code/Grid Code and applicable design specifications of the Licensee.

CC 6.7 In terms of overall time limits for providing connection as provided in Performance Standards (Distribution) for 11kV and above the time shall start from the date of submission of formal application by the Applicant on receipt of offer from the Licensee till such time the consumer is provided with the connection. The time stated in this section shall not include any time required that is beyond the control of the Licensee.

The time schedules for 11kV and above connection is summarized as under.

Preliminary evaluation time of Intention Application	= 30 days	
Additional information required if any from the Applicant	= 10 days	
Offer for Connection to the Applicant	= 15 days	
Submission of formal application for Connection by the Applicant	= 30 days	
Final evaluation of Application by the Licensee	= 30 days	106 Days
Negotiation and Connection Agreement	= 07 days	
Comments of NTDC on Connection Agreement	= 10 days	
Providing Connection on 11kV	= 59 days	
Providing Connection above 11kV	= 449 days	496 Davs

CC 6.8 Communication

Where for operational reasons, Licensee determines that a means of routine and emergency operation, communication between the Licensee and the User is required, then the same shall be provided and maintained by the Licensee.

CC 6.9 Supervisory Control and Data Acquisition (SCADA) System

Licensee shall have a communication system and supervisory control and data acquisition (SCADA) system to monitor and control its network including 132/66 kV sub-stations and generators connected to its network. At the generating station, a RTU shall be provided for monitoring and control of each the generating units. In addition, RTU provided by the Generator shall have facility of dispatching and loading the generating unit by the Licensee from Licensee's Load Dispatch Center.

CC 6.10 Technical Requirements

CC 6.10.1 Generating Plant Performance Requirements

For Embedded Generating Plant subject to Central Dispatch the electrical parameters required shall be those detailed in the Grid Code. For generation

not subject to Central Dispatch the electrical parameters shall be specified by the Licensee at the time of Offer for Connection. A Generating Unit must be capable of supplying its Registered Capacity within the System frequency range of 49.5 to 50.5 Hz. The output power should not be affected by voltage changes within the permitted operating range as provided in this Code, Grid Code or Transmission Performance Standards. The Generating Unit shall comply with the voltage and frequency requirements as set by the Licensee in the Connection Agreement not inconsistent with the Codes and Performance Standards at all times.

CC 6.10.2 Control Arrangements

The Licensee shall specify in writing at the time of offer for connection if a continuously acting fast response automatic generator excitation control system (AGC) is required to control the Generating Unit or Power Station. This shall be dependent upon the size and type of Generating Unit and the network of the Licensee's system to which the Generating Unit shall be connected and the provisions of the Grid Code, if applicable.

CC 6.10.3 Co-ordination with Existing Protection

It shall be necessary for the Protection associated with Embedded Generating Plant to co-ordinate with the Protection associated with the Licensee's system as follows:

a. For Generating Unit directly connected to the Licensee's system, the Generating Unit must meet the target clearance times for fault current interchange with the Licensee's system in order to reduce to a minimum the impact on the Licensee's system due to faults on circuits owned by Generators. The Licensee shall ensure that the Licensee Protection settings meet its own target clearance times. Protection systems of both parties must be well-coordinated and periodically tested for their functioning as expected.

   The target clearance times are measured from fault current inception to arc extinction of the circuit breaker and shall be specified by the Licensee to the requirements of the connecting network of the Licensee's system.

b. The settings of any Protection controlling a Circuit Breaker or the operating values of any automatic switching device at any point of connection with the Licensee's system shall be agreed upon between the Licensee and the User including Generators in writing during the initial connection consultation process.

   The Protection settings or operating values shall not be changed without the express agreement of the Licensee and/or NTDC, if applicable.

c. It shall be necessary for the Generating Plant Protection to co-ordinate with any auto-reclose policy specified by the Licensee.

d. Any Generating Unit connected to the Licensee's system shall be required to withstand, without tripping, the Negative Phase Sequence loading incurred during the clearance of a close-up phase-to-phase

fault by System Back-up Protection which shall be within the Generating Unit short time rating in the Licensee's system. The Licensee shall advise the Generator of the expected Negative Phase Sequence loadings during the Connection Agreement process.

CC 6.10.4 Islanding

It is conceivable that a part of the Licensee's system, to which Embedded Generators are connected can, during emergency conditions, become detached from the rest of the distribution and transmission System. It shall be necessary for the Licensee to decide, dependent on local network conditions, if it is desirable for the Embedded Generators to continue to generate onto the islanded Licensee's system.

If no facilities exist for the subsequent resynchronization with the rest of the Licensee's system then the Embedded Generator shall under Licensee's instruction, ensure that the Generating Unit is disconnected for resynchronization.

Under emergency conditions there is an expectation that some generation shall continue to operate outside the frequency limits specified in the Grid Code. However, for Embedded Generators connected to the Licensee's system at a voltage level less than 132kV it is likely that this could mean connection within an automatic low frequency load disconnection zone. Consequently, Embedded Generators should ensure that all Protection on Generating Unit should have settings to co-ordinate with those on the automatic low frequency load disconnection equipment, which shall be detailed by the Licensee.

CC 6.10.5 Black Start Capability

It shall be necessary for each Embedded Generator to notify the Licensee if its Generating Unit has a restart capability without connection to an external power supply.

CC 6.10.6 Generating Unit Commissioning Tests

Where a Generator requires connection to the Licensee's system in advance of the commissioning date, for the purposes of testing, the Generator must comply with the requirements of the Connection Agreement. The Generator shall provide the Licensee with a commissioning programme, approved by the Licensee if reasonable in the circumstances, to allow commissioning tests to be co-ordinated.

Under certain circumstances either more or less detailed information than that specified above might need to be provided and shall be made available by the Generator at the request of the Licensee.

CC 6.10.7 Any relevant information regarding technical design and operational criteria as mentioned in CC 5.4 of the Grid Code may also be supplied along with the following information.

a. Earthing requirements/negative sequence current injection

b. AGC (frequency and speed governing characteristics)

c. Emergency generator disconnection conditionalities.

d. Power quality requirements

i. Harmonics

ii. Resonance

iii. Voltage flicker / dips

iv. Voltage unbalance

e. Adequate and accurate metering equipment.

CC 7 CONNECTION ARRANGEMENTS FOR GENERATORS

The Licensees are required under this sub-code to process a connection application or to submit an Offer to Connect for the provision of distribution network services to the Generator's generating unit or group of generating units

If a Generator or an Embedded Generator requests for connection to the network of Licensee, the Licensee shall negotiate in good faith with the Generator to reach an agreement in respect of the open access arrangements as per the provisions of its licence. In the event of disagreement between the parties, NEPRA shall be the final arbitrator.

The Generator shall follow the same procedure for seeking connection to the network as mentioned in CC 6 of this code. However, as a basis for negotiation for the connection agreement, the Generators:

a. must provide to the Licensee with such information as is reasonably requested relating to the expected operation of its generating units; and

b. the Licensee must provide to the Generator such information as is reasonably requested to allow the Generator to fully assess the commercial impact of the connection arrangements sought by the Generator.

A Generator may seek open access arrangements at any level of power transfer capability between zero and the maximum power out put of the Generator's generating unit or group of generating units as per the provisions of the Grid Code and Distribution Code.

CC 7.1 Connection Arrangement for Bilateral Transactions

If the Users intend to make bilateral transactions, for such connections both the User and Generator within the service territory of Licensee shall make mutual Connection Agreements, however they shall convey the details of these agreements to Licensee and NTDC both.

CC 7.2 Disconnection and Reconnection

The following procedures need to be adopted for disconnection of any facility from the network.

CC 7.2.1 Voluntary Disconnection

For the voluntary disconnection of any equipment or the facility, the User must give atleast two months advance notice that it intends to disconnect its

facility from the Licensee's network or subject to the procedure set out in the Connection Agreement.

However, it shall be ensured that disconnection and reconnection procedures are made an integral part of the Connection Agreement.

Before taking decision for disconnection of the equipment or the facility, it must be ensured that by such disconnection there is no impact on the quality or reliability of supply to other Users. If an impact is found, it shall be handled as per the provision of the contract between Licensee and the User to resolve the issue.

Prior to disconnection, the Licensee must inform NTDC about the disconnection proposal and its expected impact on the network.

The voluntary disconnection and subsequent re-connection shall be subject to fulfillment of all the requirements placed under the provision of Distribution Licence, NEPRA Act and Rules, and Consumer Service Manual.

CC 7.2.2 Involuntary Disconnection

The Licensee may disconnect equipment or the facility of User or entity if:

a. The User is not operating its facility in accordance with the Connection Agreement or the provisions of Grid/Distribution Codes, in accordance with the law of the land, Consumer Service Manual or Connection Agreement by giving advance notice depending upon the situation.

b. In case of operational emergencies due to which electrical system of the Licensee is incapable of providing the required services.

c. In the event of emergencies, the User's facility must be disconnected in an orderly manner or as indicated in the Connection Agreement, so that the security of the system is not affected.

d. A defaulted User must not bring proceedings against the Licensee to seek to recover any amount for any loss or damage incurred due to the disconnection.

CC 7.2.3 Reconnection of the Equipment or the Facility

The Licensee, following an outage or emergency, must reconnect the User's Facility after confirming that:

a. The User has rectified all such circumstances, which were the cause of disconnection.

b. The Licensee must charge a reasonable cost as indicated in the Connection Agreement for reconnection of the facility which was disconnection due to default.

c. The facilities, which were disconnected due to emergencies, must be reconnected as soon as the causes of the emergency have been eliminated, and the network has returned to steady state operating conditions.

CC 7.2.4 Connection Related Obligations of Generators

Generators proposing to connect to the Licensee's system shall submit a detailed design report that covers, as a minimum, the following subjects:

a) Suitability requirements

b) Adequate fault levels at the Site
c) Maintenance outage co-ordination
d) Stability requirements.
e) Insulation level requirements (switching insulation levels and high voltage protection)
f) Lightning protection for average isokeraunic levels for the site.
g) Efficient and simple operational co-ordination procedures
h) Plant Dispatch obligations
i) Isolation Equipment.

Frequency and Voltage Control

Each Generator's generating unit must be capable of contributing to frequency and voltage control of the NTDC's Transmission System by continuous modulation of Active Power and Reactive Power output. Therefore, to achieve this requirement it shall require that: (a) Each Generating Unit must be fitted with a fast acting, proportional speed governor, and a unit load controller or equivalent control device to provide frequency regulation under normal operating conditions; and (b) The generating unit must ensure that a continuously acting automatic excitation control system is provided to manage constant terminal voltage control of the Generating Unit without instability over the entire operating range of the Generating Unit. The requirements for excitation control facilities shall be included in the connection agreement.

Reactive Power Supply and Voltage Regulation

The Generators shall maintain a network voltage or reactive power output as required by the System Operator of NTDC within the reactive capability of the Generators.

CC 7.2.5 Data Requirements

The Applicant shall provide the following data with the Intention Application. The Applicant shall also provide a Single Line Diagram of the proposed facility which must indicate all the current carrying parts/equipment connected at all the voltage levels of the proposed substation.

a. Names of the substation and its operating voltage
b. Connection of the Operators Network and Generators
c. Metering arrangement
d. Protection arrangement
e. Make of the equipment
f. If double busbar is being operated by splitting, it shall be indicated accordingly
g. Any other useful information not listed above.

Equipment Data

Circuit Parameters:

a. Rated voltage (kV)

b. Operating voltage (kV)

c. Positive phase sequence reactance

d. Positive phase sequence resistance

e. Positive phase sequence susceptance

f. Zero phase sequence reactance (both self and mutual)

g. Zero phase sequence resistance (both self and mutual)

h. Zero phase sequence susceptance (both self and mutual)

Transformers

a. Rated MVA

b. Voltage Ratio

c. Winding arrangement

d. Positive sequence reactance

e. Max, min and nominal tap positions

f. Positive sequence resistance

g. (max, min and nominal tap)

h. Zero sequence reactance

i. Tap changer range

j. Tap change step size

k. Tap changer type: on load or off circuit

l. Earthing method: Direct, resistance or reactance

m. Impedance (if not directly earthed)

n. Phase connection.

Switchgear

a. Switchgear. For all circuit breakers:-Rated voltage (kV)

b. Operating voltage (kV)

   i. Rated 3-phase rms short-circuit breaking current, (kA)

   ii. Rated 1-phase rms short-circuit breaking current, (kA)

   iii. Rated 3-phase peak short-circuit making current, (kA)

   iv. Rated 1-phase peak short-circuit making current, (kA)

   v. Rated rms continuous current (A)DC time constant applied at testing of asymmetrical breaking abilities (secs.)

Generating Unit Data

a. Rated terminal volts (kV)

b. Rated MVA

c. Rated MW

d. Dependable Capacity MW

e. Minimum Generation MW

f. Short circuit ratio

g. Direct axis synchronous reactance

h. Direct axis transient reactance

i. Direct axis sub-transient reactance

j. Direct axis short-circuit transient time constant.

k. Direct axis short-circuit sub-transient time constant.

l. Quadrature axis synchronous reactance.

m. Quadrature axis sub-transient reactance.

n. Quadrature axis short-circuit sub-transient time constant.

o. Stator time constant.

p. Stator leakage reactance.

q. Armature winding direct-current resistance.

r. Maximum Emergency Capability.

s. Installed Capacity.

t. Maximum action and reaction power out put.

u. Type of generating plant (synchronous, asynclimuous etc).

v. Type of prime movers

w. Operating regime of generator in continuous intermittent, peak lopping.

x. Fault level contribution.

y. Method of voltage control.

z. Zero sequence

aa. Negative sequence

bb. Automatic voltage regulation.

cc. Speed governor and prima mover data.

dd. Capacity and stand by requirements.

ee. Auxiliary demand of individual unit and power house.

Interface Arrangements

a. The means of synchronization between the Licensee and the User;

b. Details of arrangements for connecting with earth that part of the Generator's System directly connected to the Licensee Distribution System;

c. The means of connection and disconnection which are to be employed; and

d. Precautions to be taken to ensure the continuation of safe conditions should any earthed neutral point of the Generator's System operated at HV become disconnected from earth.

More or less detailed information than that contained above might need to be provided, subject to the type and size of generation or the point at which connection is to be made to the Licensee Distribution System. This information shall need to be provided by the Generator at the reasonable request of the Licensee.

Preferred Connection Arrangement

The three schemes have been described in Table 1 for interconnection of the generators. The existing generators are using these schemes, however, the new generators may design new configurations, which shall be acceptable by Licensee after evaluation of the prevailing system conditions. These schemes of connection diagrams are provided at the end of this sub-code.

Table-1

Interconnection Voltage	Approximate Generation Size	Interconnection Configuration Schemes			
		1	2 & 2A	3 & 3A	4
11kV and Bellow	1-4 MW	•			
66kV	4-40 MW		•		
132kV	40-150 MW			•	

CC 8 INSPECTION AND TESTING

Regarding inspection and testing of equipment and the facilities of the Users, the following procedures are to be followed:

CC 9 RIGHT OF ENTRY AND INSPECTION

The Licensee, who is also party to the Connection Agreement, believes that another User is not operating its network in accordance with the technical limits setout for the Connection in the Grid/Distribution Code, and the connection agreement, and due to which negative impact is reflected to the Licensee's or another User network, can enter into the premises of the connection of the User and inspect the operating conditions of that Connection.

The Licensee who intends to inspect premises of the Connection of a User under normal operating conditions shall give a three-business day's notice for the same indicating the name of the representative who would conduct the inspection, and time and date of the inspection.

"However, detailed provision regarding Licensee's right of entry to consumer's premises to inspect connection and metering facilities are included in the Consumer Service Manual".

CC 10 ENFORCING COMPLIANCE with NTDC NETWORK

The procedures to ensure enforcement of network connection requirements as well as compliance of connection provisions of the Distribution Code should be in accordance with relevant provisions of the Code Management sub-code of this code.

CC 11 REQUIREMENTS FOR EMBEDDED GENERATORS

CC 11.1 EMBEDDED GENERATORS

CC 11.1.1 Distribution Connection Code is applicable to all existing and prospective Generators, including Consumers with Own Generation, having Plant operating or capable of operating in parallel with the Licensee Distribution System.

CC 11.1.2 In addition to meeting the requirements of this code, Embedded Generators shall need to meet the requirements of other relevant sections of the Distribution Code and relevant provisions of the Grid Code.

CC 11.2 Information Required from All Embedded Generators

It shall be necessary for each Generator to provide the Licensee information on (a) the Generating Plant and (b) the proposed interface arrangements between the Generating Plant and the Licensee Distribution System. Any other relevant information provided in CC 7 of this sub-code may be required by the Licensee before entering into an agreement to connect any Generating Plant onto the Licensee Distribution System:

CC 11.3 Obligations of Embedded Generators

The Obligations of Embedded Generators shall be as follows but not limited to:

a. Must Obtain License from NEPRA to operate as Generator unless it is a self generator.

b. Must comply with the requirements and conditions of connections for Generators set out in the Connection Agreements made with the Licensee and Grid/Distribution Code accordingly.

c. The Generators must submit an application for change for approval by the distribution company of the existing or the installation of a new equipment at its facilities. Prior to installation of the proposed equipment, its specifications including any change in the layouts must be approved by the Licensee

d. Must comply with the technical, functional and operational requirements setout for the connection by the Licensee as per this sub-code or connection agreement.

e. Must provide generation availability forecast information including the amounts of output, partial shutdowns, any de-ratings and outages (MW & MVAR both), to the relevant Distribution Company or NTDC for Dispatch function, if applicable.

f. The Generators must provide their development programs to the relevant Distribution Company so that the transmission or distribution facilities can be upgraded in a timely manner, if required for, evacuation of power from the Generator's facilities.

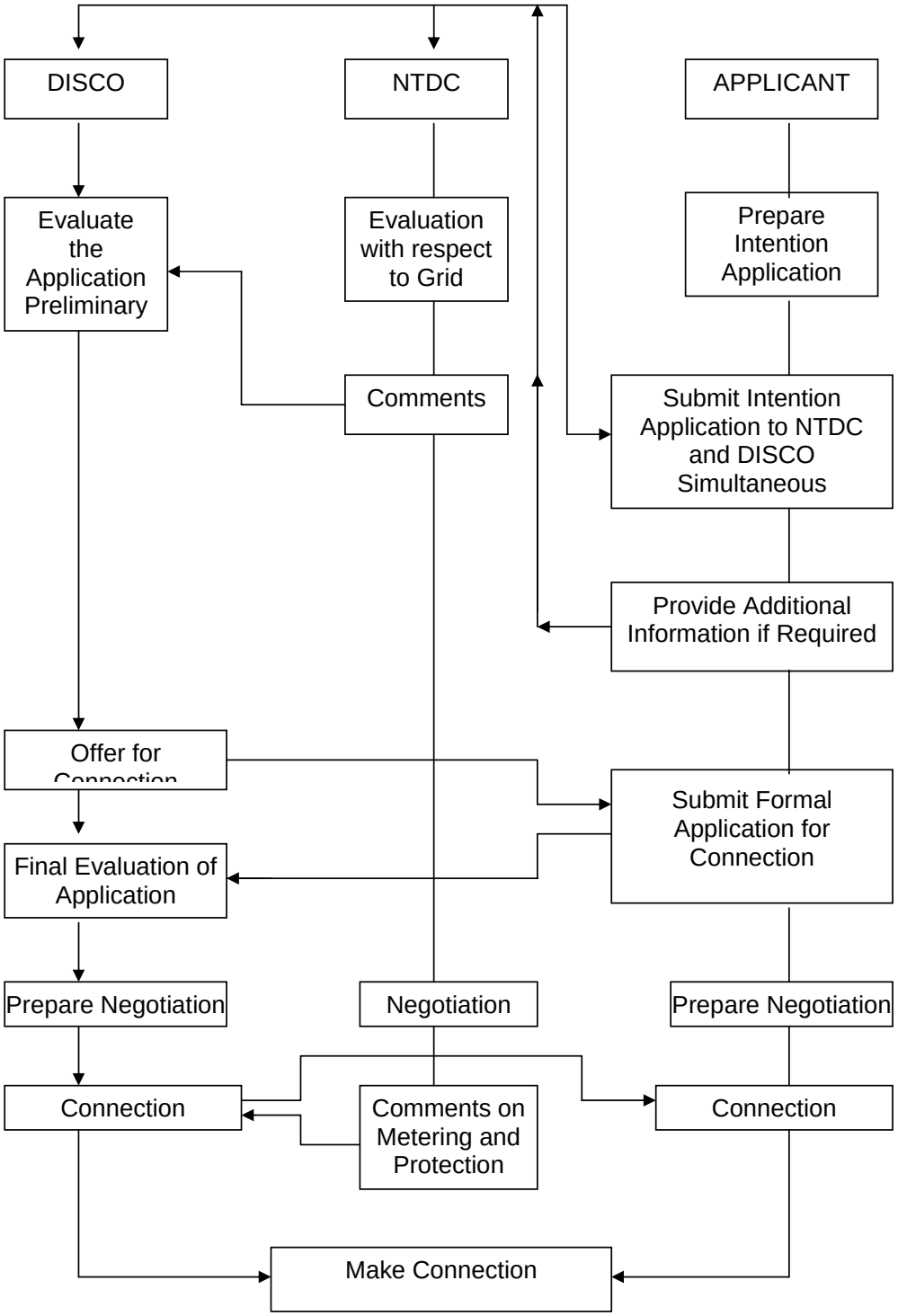
g. Permit and participate in inspection and testing of facilities and equipment prior to commissioning.

h. Must participate in frequency and voltage control, stability requirements and short circuit requirements as specified in the Grid Code or Distribution Code.

i. Must maintain requisite functional protection facilities accurate metering facilities, testing, inspection and repairs at all times.

CONNECTION PROCEDURE
for new connection or amendment
of existing connection

Figure-1

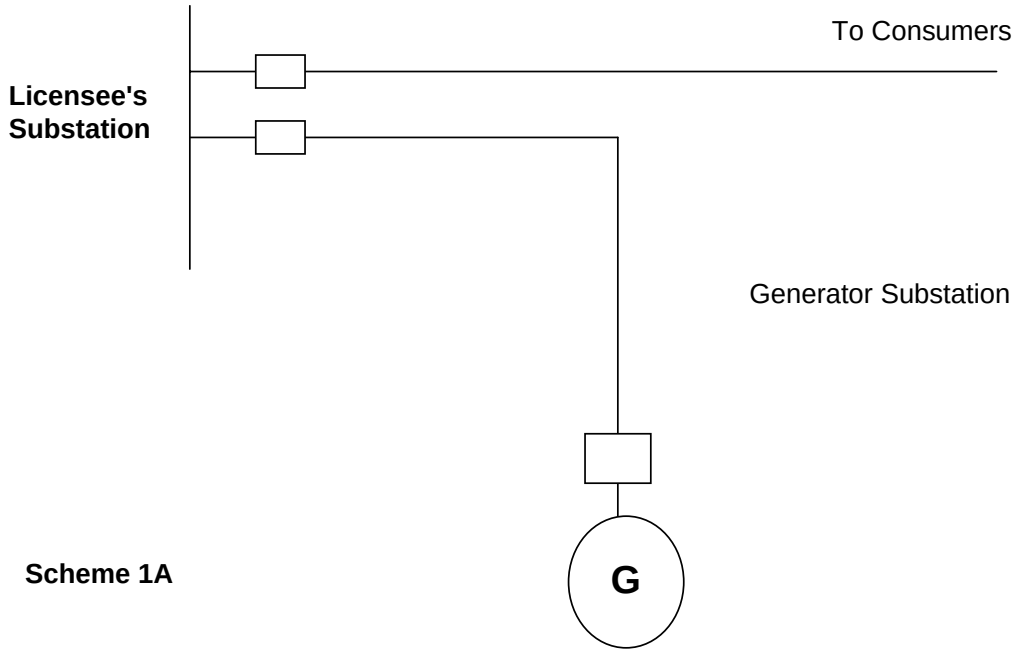


Interconnection Configurations for Generators

Connections at 11kV

Scheme 1

The generators may adopt any of the configurations depending on its location with reference to the substation and existing feeders and loading and operating condition of the feeders.



Scheme 1A

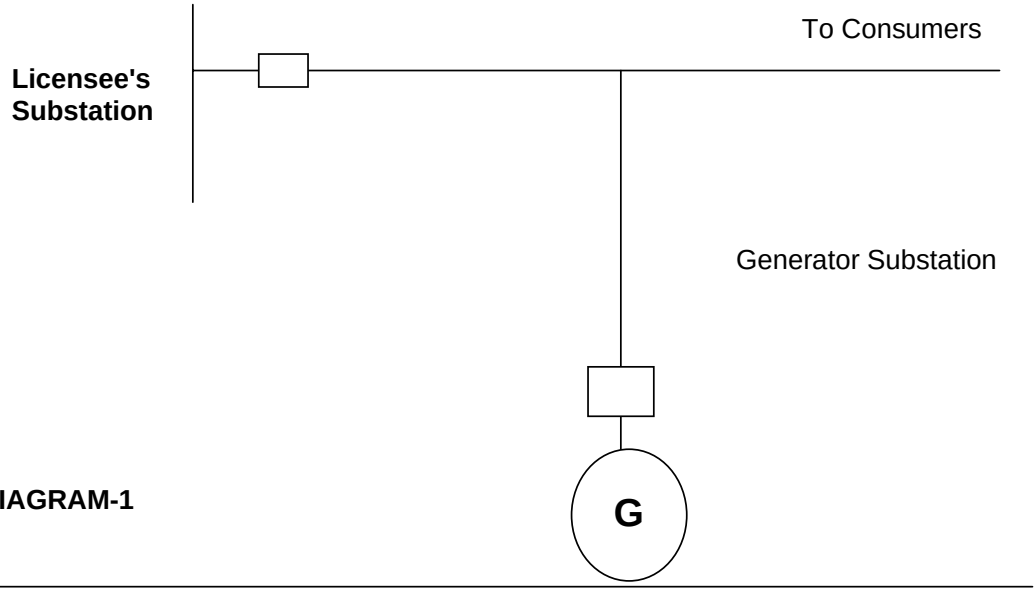


DIAGRAM-1

Interconnection Configurations for Generators

Connections at 66kV

Scheme 2

For connection of generators at 66kV two configurations have been indicated which may be adopted according to the system conditions. The new generators may opt for new configurations, which System Operator may except after carrying out necessary system studies.

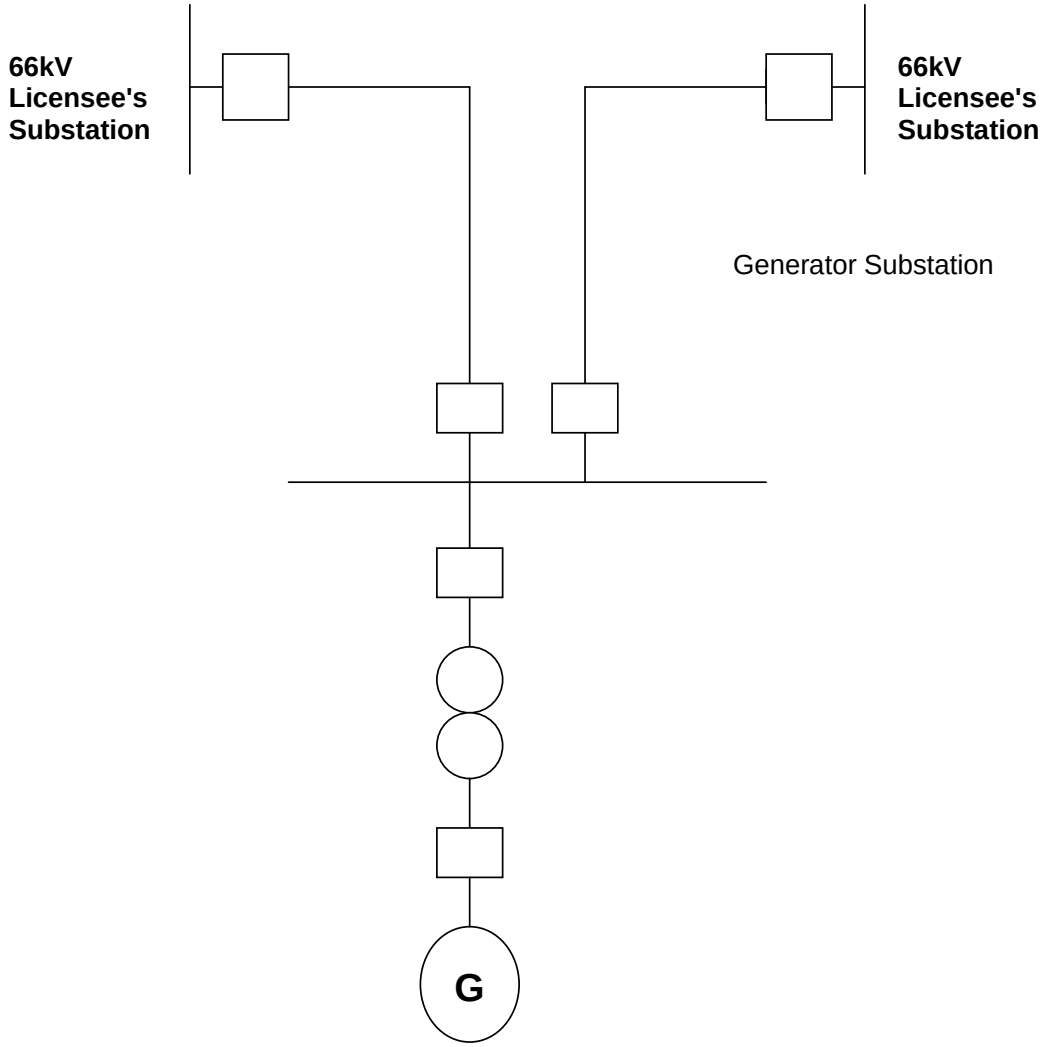


DIAGRAM-2

Interconnection Configurations for Generators

Connections at 66kV

Scheme 2A

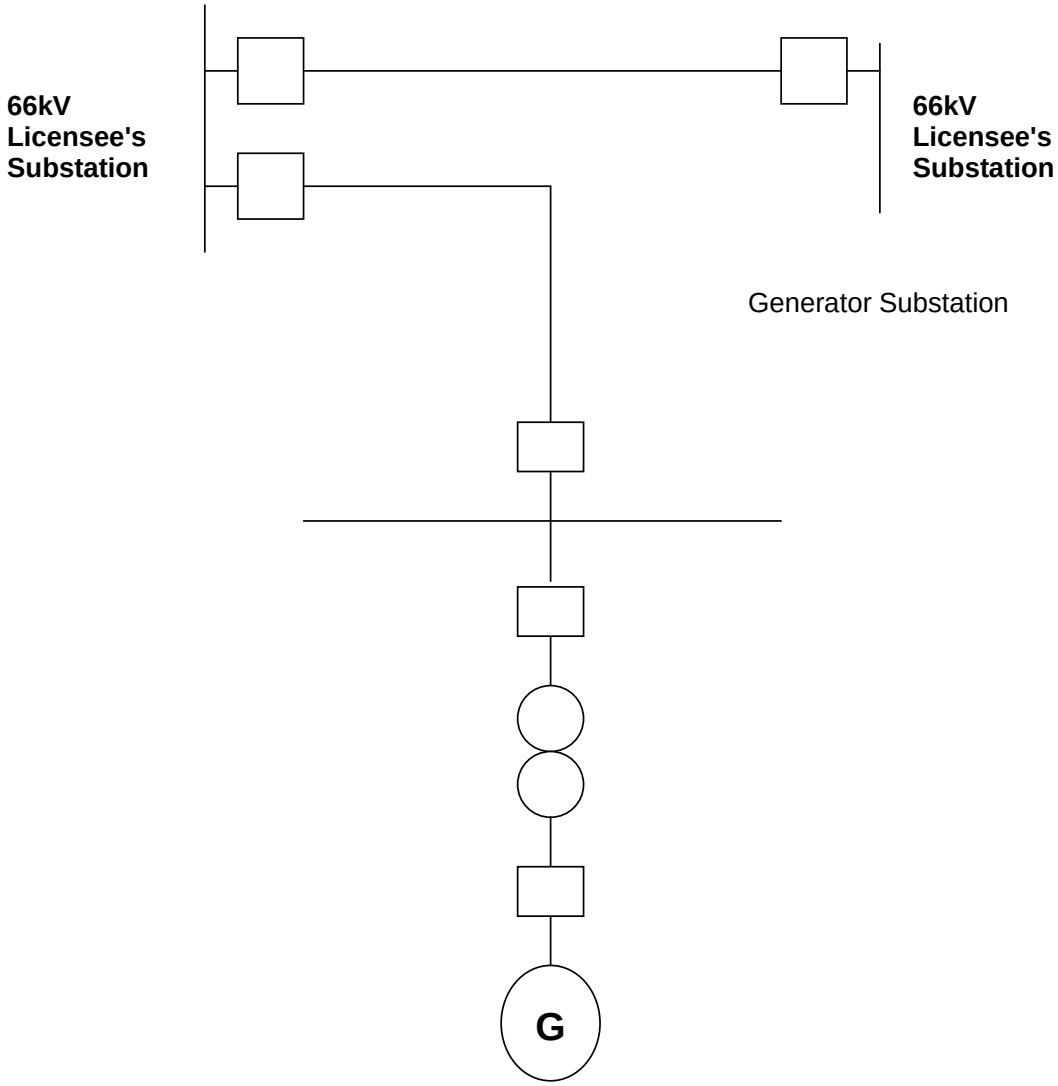


DIAGRAM-3

Interconnection Configurations for Generators

Connections at 132kV

Scheme 3

For interconnection of generators to 132kV network two configurations schemes 3&3A have been provided. Both the schemes are in use by existing generators. However, the new generators may opt for new configurations, which the System Operator may accept according to prevailing and expected future conditions of the system.

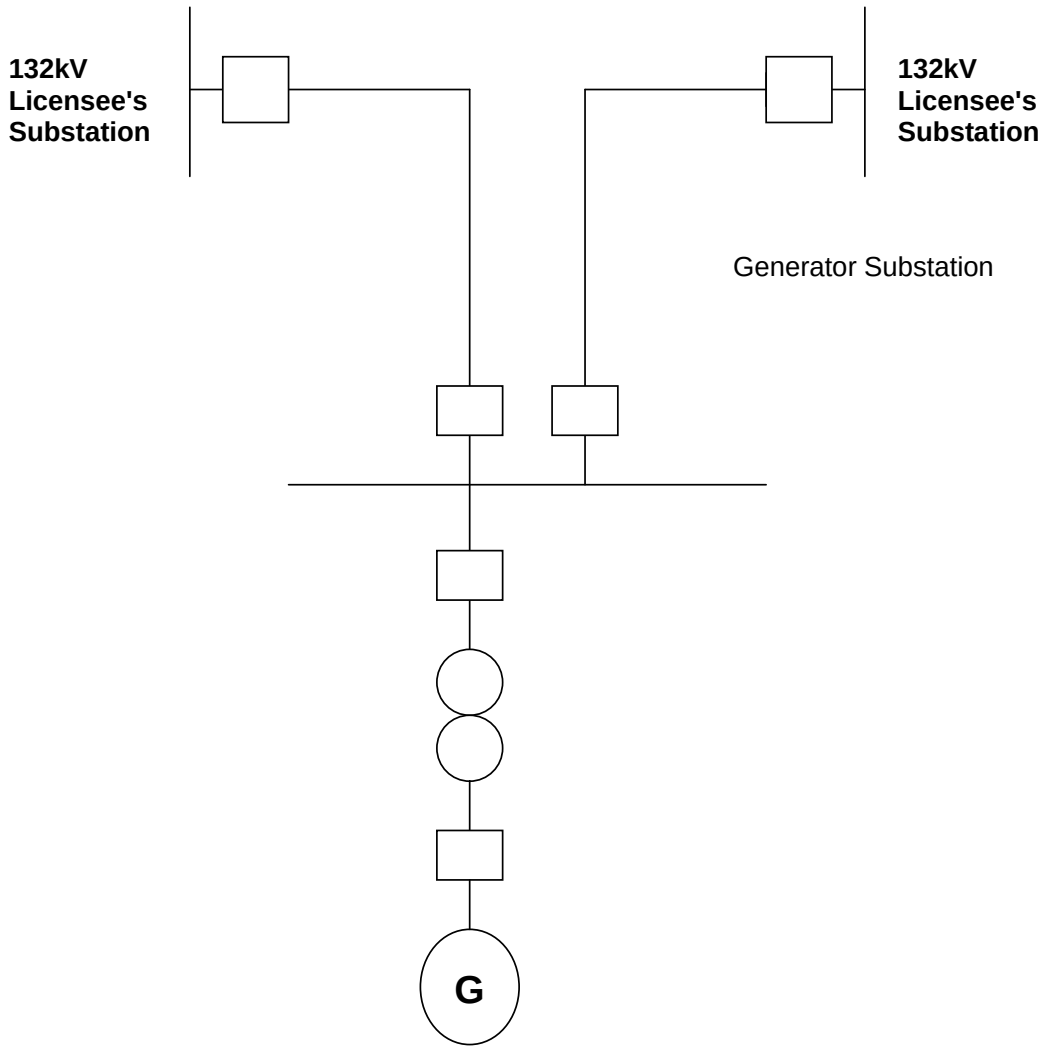


DIAGRAM-4

Interconnection Configurations for Generators

Connections at 132kV

Scheme 3A

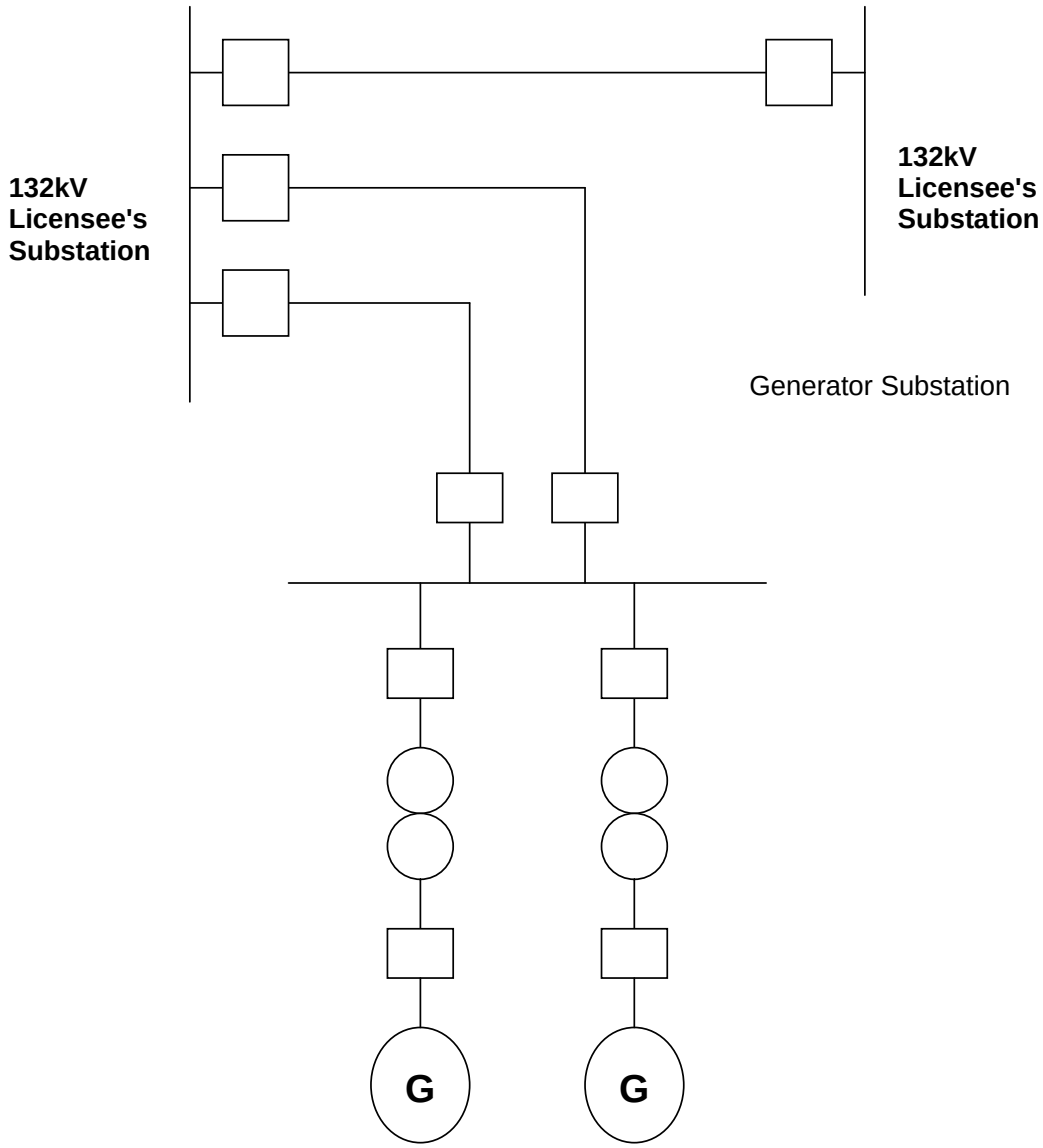


DIAGRAM-5

SYSTEM CONSTRUCTION CODE

CONTENT

SYSTEM CONSTRUCTION CODE

SC 1 CONSTRUCTION MANUAL

Each Licensee shall prepare a comprehensive and exhaustive Operating / Construction manual in accordance with DISCOs/KESC approved standard based on relevant international standards like IEC, IEEE, and ASI, Consumer Service Manual, Grid Code and Distribution Code dealing with all material aspects to the design specifications, safe constructing practices, and sound engineering technical principles for construction of Distribution System and connections to consumer installation/system. In particular due regard shall be had for the following but not limited to: -

a. Standard clearance of all voltage lines upto 132kV (vertical as well horizontal) from grounds, buildings, from each other, railway crossing, road crossing etc.

b. Maximum and minimum length of span of the lines of all the voltages upto 132kV at different locations and different areas.

c. List and use of standard over head HT/LT conductors, and underground cables.

d. Proper procedure for laying HT/LT underground cables.

e. Procedures for proper erection of HT/LT structures.

f. Procedures for proper transportation, loading/unloading and erection of HT/LT PC poles.

g. Proper use of PG connectors for HT/LT jumpers.

h. Use of proper size of joints sleeves by using hand compression tools.

i. Preparation of site safety plan by in charge engineer**/**supervisor before starting the work.

j. Proper use of T & P.

k. Proper foundation of structure and PC poles (in special cases) if required.

l. Procedures for proper earthing of structure and distribution transformers and other electrical equipment.

m. Procedures for proper installation of energy meters.

n. Procedure for proper installation of consumer service wire.

Licensee's Construction Manual shall *not* be made available to the Users of the licensee. However, the distribution system and connection of the consumer's installations to the DISCO's system, when approved, shall be made available to the prospective User upon request.

SC 2 CONSTRUCTION GUIDELINES

Following instructions are provided on construction practices as guidelines to form contents and level of details required for the operating / construction manual to be prepared by the Licensee's.

SC 2.1 Overhead Distribution Lines

The overhead distribution lines shall be designed in accordance with applicable international standards.

SC 2.2 Wiring on Consumer's Premises

The service Wires to consumers shall be installed in accordance with relevant Construction Standards for 230V/400V supply and in accordance with the Consumer Service Manual.

SC 2.3 Underground Installations

Direct buried cable or conduit or other raceways installed shall meet the minimum cover requirements of International standards. All underground installations shall be grounded and bonded in accordance with the DISCOs/KESC approved standards based on relevant international standards like IEC, IEEE, and ASI. Underground cable installed under a building shall be in a raceway that is extended beyond the outside walls of the building.

SC 2.3.1 Protection from Damage

All under ground cables should be laid down in proper trenches upto required depth and as per DISCOs/KESC approved standard procedure based on relevant international standards like IEC, IEEE, and ASI.

SC 2.3.2 Backfill

Backfill containing large rock, paving materials, cinders, large or sharply angular substance, or corrosive material shall not be placed in an excavation where materials may damage cables or other substructures or prevent adequate compaction of fill or contribute to corrosion of such structures. When necessary to prevent physical damage to the cables, structures, protection should be provided in the form of appropriate means.

SC 2.3.3 Sealing of Entry Points

All the entry points of cables to a building should properly be sealed.

SC 3 CONSTRUCTIONAL IMPROVEMENTS

The system can be improved by providing the following construction criteria by the Licensee.

SC 3.1 Foundation of the Poles/Structure

Foundations shall be designed considering the nature of soil/salinity in the area. Presently the PCC Poles, **Steel Tubular Poles** are being erected without any foundation. This practice alarmingly decrease the life in the salinity zones. Here the salt is absorbed by the poles in the ground and after some time the pole cracks/crumbles. This can be avoided by providing concrete foundations of sulphate resistive cement wherever necessary and required.

SC 3.2 Insulators

In areas where air borne dust/salts are deposited on insulators during fog and forms contamination which is conductive and weakens the dielectric strength of the insulators which causes flashovers and insulator failure continuating

flashovers shall be avoided by providing double disc insulators in the construction design in such areas.

SC 3.3 Line Connectors

Line connectors must be installed properly so as not to result in loose joints or cause flashovers, broken conductors and severe line losses. The Licensee must use parallel grove type connectors (PG) and follow installation instructions to assure proper installation. The instructions shall indicate wire brushing of the conductors, adding an oxide compound to conductor surface, and proper tightening of the bolts.

Use of compression type connectors shall be promoted. Hand Compression Tools shall be used to affix these connectors.

SC 3.4 Transformer Connections

a. Licensee shall develop construction standards that provide for the best connections to primary and secondary conductors.

b. The Licensee shall incorporate the following in its construction design standards:

   i. Use of Wasp conductor/copper conductor Jumpers for transformers up to capacity of 100 kVA.

   ii. Use of double WASP Conductor jumpers for 200 kVA Transformer.

   iii. Use of P.G. connectors for joining the jumpers to line.

   iv. Use of special compression lugs/Thimbles to join the jumpers to transformer bushings.

The Licensee shall specify that distribution transformers are provided with lugs on transformers bushings.

SC 3.5 Proper Construction Techniques

The construction quality shall be improved by adopting proper construction techniques; including.

The use of shovel for structure pit digging and auger for PCC poles.
The use of Rollers on every pole for Stringing of Conductors.
The use of Sag Charts and Tension Meters for proper sags.

Stay wire shall be affixed to the pole at a 45-degree angle to provide the maximum strength to the pole or at appropriate angle depending upon the site location, and condition.

SC 3.6 Affixing of Hardware

The pole framing to install Hardware, Cross arms, Insulators shall be affixed to the pole while it is still lying on ground and then erect it, so that labour time can be saved.

The Licensee Engineer shall prepare a site plan before starting a job, stating the requirement of shut downs, transport, Tools and Plant, work force and the

material needed for the job, and shall arrange them before starting work at site.

End of SC

SYSTEM PERFORMANCE, RELIABILITY AND CONSUMER SERVICE REQUIREMENTS

CONTENTS

SYSTEM PERFORMANCE, RELIABILITY AND CONSUMER SERVICE REQUIREMENTS

SPR 1 SYSTEM OPERATION

In order to ensure the performance standards, to achieve minimum standards of reliability and to improve the service to consumer and to address the consumers complaints promptly, the Licensee shall comply with all the provisions, obligations, requirements and responsibilities placed upon it with the prescription of Performance Standards (Distribution)-Rules in accordance with Section 34 of NEPRA Act (XL of 1997). The system reliability, consumer service and complaints and disputes resolution procedures shall be maintained in accordance with the provisions of prescribed Performance Standards (Distribution) and Consumer Service Manual of the Licensee and applicable provisions of Grid/Distribution Codes. The licensee shall provide guidelines for smooth operation of the distribution system for a safe, efficient and reliable electricity supply to meet the needs and expectations of the consumers.

SPR 1.1 Operation Criteria and Principles

The operation criteria and principles shall comprise of:

a. Operate within specified capacity and design loading specifications

b. To maintain the voltage and frequency within specified limits as provided in the Grid and Distribution Codes.

c. Ensure safety, quality and reliability of supply as per NEPRA Performance Standards (Distribution)

d. Provide adequate backup supply arrangement at all time

e. Restoration of supply as per NEPRA Performance Standards (Distribution)

SPR 1.1.2 Load Monitoring

Licensee shall monitor the distribution system loads and assure that the following system capacity and loading guidelines are followed:

SPR 1.1.2.1 Equipment Loading Criteria

a. Conductor Loading

The capacity of a feeder is a function of the feeder length and the distribution of the loads along the feeder. The purpose of establishing current carrying capacity criteria for planning is to initiate the planner to review a feeder that may be in violation based on existing as well as forecasted load.

b. The loading limits of all the distribution facilities of the lines and grid station should be in accordance with IEC Standard, manufacturer recommendation with due regard to ambient temperature conditions.

SPR 1.1.5 Voltage Monitoring and Control and Load Balancing

Voltage monitoring at each 132/66/33/11 kV Sub-station shall be carried out by data logging.

Voltage monitoring on the secondary side of 33/0.4kV and 11/0.4kV distribution transformers shall be carried out at least once in one year during Peak Load hours to cover at least two nos. of transformers on each 11KV feeder as follows:

a. One transformer towards the beginning of the feeder

b. One transformer towards the end of the feeder

The load on each phase shall be kept equal to the maximum possible extent.

Improvement to voltage conditions can be achieved by but not limited to the following action: -

a. Providing proper earthing of the transformer. Proper earth connection may result in proper voltage at consumer premises.

b. The load on the LT feeders must be kept balanced as far as possible.

c. Unbalance load cause heavy voltage drops in the overloaded phases.

d. Adjusting/shifting consumers on adjacent transformers to reduce the length of LT radial line from the transformer as for as possible.

e. To bring in circuit all fixed disconnected 11kV capacitors installed on the feeders.

f. By bifurcating the existing 11kV feeders.

g. By augmenting the existing 11kV conductor.

h. By providing 11kV voltage regulators on the feeders.

SPR 2 POWER-FREQUENCY VOLTAGE VARIATIONS

a. A Licensee must ensure that all equipment, which is part of its network, is capable of continuous uninterrupted operation in the event that variations in supply voltage as described in DPC 3.4.

b. A Licensee shall supply power to its consumer within the frequency range of 50($\pm$1%) Hz. The Licensee shall supply electric power to its consumers of the power quality in accordance with the IEEE Standards 519 – 1992 pertaining to Harmonics content.

SPR 3 OPERATIONAL CONSTRAINTS

Licensee shall develop Procedures and guide lines to overcome the operational constraints in the distribution system which includes but not limited to; the communication and control system constraints, distribution system replacements and improvements and following guidelines: -

a. **Pre-arranged** shut down for maintenance of lines and grid stations should be avoided during the months of May to August as far as possible and to co-ordinate with other utility (telephone, cable, gas) officials.

b. Pre-arranged shut down must not be allowed during the peak load hours.

c. Communication between the system operator and grid station staff (especially carrier system) must be maintained and kept in working order all the times.

d. Availability of transport in working order all the time with adequate maintenance and operation staff alongwith necessary tools and service equipment.

e. Availability of material and proper T & P with the maintenance and operation staff to attend emergency.

f. To properly schedule preventive maintenance of the lines and grid stations.

g. Availability of telephone attendant in complaint offices with the telephone in working order all the times.

h. To provide mobile telephones or wireless set to the complaints attendant and maintenance staff.

i. Establishing the training centers in the field to train the line staff in operation, maintenance and construction of distribution system.

SPR 4 HOTLINE WORKING TOOLS, TRAINING AND TESTING

The Licensee shall develop a training center for line crews to be trained on Hot Line Maintenance and Equipment testing requirements. The use of special insulated gloves, shoes and tools shall be provided. The use of insulated bucket trucks shall be encouraged to assure continuity of supply and or prompt restoration.

SPR 5 MANAGEMENT OF OUTAGE PLANS

The Licensee shall address and outline its proposed outage plans and submit them to NTDC and its Users on a time schedule as given in the Grid Code and Distribution Code each year. The outage management plan shall contain procedures/guidelines on identification of electric lines and equipment of the distribution system that shall be taken out of service for maintenance or replacement, outage start date, expected duration of outage, number of consumers effected, effected sub-stations and the quantum of load not to be drawn at any interconnection during outage.

The outage and restoration plans of the Licensee must be co-ordinated with NTDC and be in accordance with the plan and procedures established in the Grid Code, and Distribution Code.

The Licensee shall abide by the requirements of the NTDC restoration plan and shall ensure that its personnel are familiar with, and are trained and experienced in their standing instructions and obligations so as to be able to implement the required procedures.

From time to time, but not less than once every three years, NTDC shall schedule a test of the system restoration plan and Licensee shall co-operate and participate in the exercise.

In the event of total or partial blackouts of Transmission System or Regional System the Licensee shall follow procedures as laid down in the GRID CODE and instruction of the NTDC under the Section of system restoration.

In the event of breakdown within its own System, the Licensee shall restore/maintain supply by taking appropriate pre-specified measures within a pre-specified time.

SPR 6 LOAD DISPATCH CENTRE

Each Licensee shall establish a Load Dispatch Centre to properly communicate with the NTDC and the Generators and other Distribution Companies, BPCs, KESC and AJK for the necessary operation and maintenance of distribution network and sub-transmission network.

SPR 7 UNPLANNED INTERRUPTIONS

SPR 7.1 In the case of an unplanned Interruption or an emergency, the Licensee must:

a. inform its Users (or NTDC, if applicable) as soon as possible by way of a 24 hours telephone service information on the nature of the interruption and an estimate of the time when supply shall be restored or when reliable injunction on restoration of supply shall be available.

SPR 7.2 Wherever reasonable and practicable, the Licensee shall provide notice of planned interruption to its all applied consumers at least forty eight hours in advance of any such planned outage excluding defence establishments when planned power interruptions shall only be taken through mutual agreement.

End of SPR

METERING REQUIREMENTS

CONTENT

METERING REQUIREMENTS

MR 1 INTRODUCTION

The Licensee shall define conditions/obligations and operational responsibilities performa of required metering at the point of connections between DISCOs network and Users including generators connected to the Licensee's distribution and sub-transmission networks.

MR 2 PURPOSE

This section specifies the minimum technical, design, operational and performance criteria for revenue metering, for the purpose of electricity sales and flow, which must be complied with by all the Licensees, and Users connected to or seeking connection with the network of the Licensee.

For the purpose of settlement of electric energy (active and reactive) supplied and delivered at each defined metering point (Combined Delivery Point) must be measured and recorded through metering equipment of the required specifications as described in this sub-code, Consumer Service Manual or Grid Code installed, operated and maintained under this code.

MR 3 LOCATION OF METERING POINT

Metering facilities shall be installed at the point of connection between the Applicant and Licensee’s network. Metering between the generator and the Licensee’s network would be installed at the high voltage side of the outgoing bus bars of the generating stations or Licensee side point of connection. Metering between the delivery point of the consumer and the Licensee’s network would be installed as per relevant provision of Consumer Service Manual. In case of interconnection between the Licensee and the NTDC, the meter should always be on lower side of the interconnecting transformer.

In the case of inter-DISCO 132kV or 11kV tie line, the metering shall be provided at the outgoing terminal tower/pole of the exiting Grid Station of the DISCO mostly exporting power to the other DISCO.

Not withstanding the above, the location of the metering point in each case shall be such that the cost of transformation losses shall be with the entity that owns the interconnecting transformer with the Licensee.

Separate metering room with separate trench for metering cable shall be provided at the applicant's cost wherever possible.

The Licensee shall provide data logging type metering for all important data such as voltage, current, power factor, kWh and MDI metering.

MR 4 TEMPER AND REVENUE PROTECTION

Authorized representative of the DISCO and User shall supervise meter installation. After completing the installation the Licensee representative and User as observers shall lock and seal the meter and metering equipment.

MR 5 APPLICATION

Metering shall provide accurate measurement of electrical quantities delivered to or received from the electric transmission, sub-transmission, and distribution network. Metering devices including all instrument transformers shall be revenue class with facilities for measuring, active and reactive energies, peak demand, power factor, etc. that are required for billing, planning and engineering purposes. Metered quantities shall be remotely transmitted via SCADA system (whenever available) and recorded in the metering database at Licensee computer center.

Metering facility shall be provided at the connection points between Users and Licensee to record energy and active power (KW) delivered or consumed for the purpose of billing, engineering studies and planning. Metering shall provide measurements of energy and power delivered at the point of connections between the Generators and other Users. Metering data shall be made available to all Users.

MR 6 SUBSTATION METERING REQUIREMENTS

Metering shall be installed at a secured location in the substation where connection between the Users with Licensee is made. Meter and instruments transformers shall be installed in such a manner that they can not be tampered with.

The Licensee shall provide the meter at the cost of the User and install the revenue meter at the connection location. Meter shall be the type approved as per specification of IEC and approved DISCO/KESC standards and model. Prior to installation meter and instrument transformers shall be tested and calibrated by the Licensee. The Licensee shall replace meters not meeting the minimum accuracy requirements specified in MR 7 (standards).

The Licensee shall always provide, install, test, calibrate, repair, and replace the meter at the User's premises according to the pre-specified standard as contained in the Grid Code, Distribution Code, Consumer Service Manual, and Performance Standards (Distribution).

Licensee shall have test and calibration facility, with necessary tools and instruments, for testing and calibration of meters and shall be responsible for periodic testing and maintenance of the metering and ancillary equipment. The Licensee shall replace meter or other metering component that is found to be defective in accordance with the provisions of the Consumer Service Manual.

MR 7 STANDARDS

All metering devices and instrument transformers for metering shall comply with the latest applicable international and local standards. Accuracy (energy and demand). Reference “applicable IEC specifications” (Class 0.5, 1 and 2 Alternating Current watt-hour meters) No.I85 (Current transformers), No. 186 (Voltage Transformers), “ applicable IEC specifications” (Measuring Relays and Protection Equipment).

Metering devices and instrument transformers for revenue metering must comply with the latest applicable international and local standards, including but are not limited to the following.

- IEC 60145 Var-hour (reactive energy) meters
- IEC 60521 Class 0.5, 1 and 2 alternating-current watt-hour meters
- IEC 60687 Alternating current static watt-hour meters for active energy (classes 0.2 S and 0.5 S).
- IEC 61036 Alternating current static watt-hour meters for active energy (classes 1 & 2).
- IEC 61107 Data exchange for meter reading, tariff and load control - direct local data exchange.
- IEC 61354 Electricity meters – marking of auxiliary terminals for tariff devices
- IEC 61361 Electricity metering – local and remote data exchange.
- IEC 62053-61 Electricity metering equipment (ac) – particular requirements – Part 61: power consumption and voltage requirements.
- IEC 62056-31 Electricity metering – Data exchange for meter reading, tariff and load control – Part 31: Use of local area networks on twisted pair with carrier signaling.
- IEC 62056-41 Electricity metering – Data exchange for meter reading, tariff and load control – Part 41:Data exchange using wide area networks: Public Switched Telephone Network with LINK+ protocol.
- IEC 62056-51 Electricity metering – Data exchange for meter reading, tariff and load control – Part 51: Application layer protocol.
- IEC 60044-1 Instrument transformer – Part 1: Current transformer.
- IEC 60044-2 Instrument transformer – Part 2: Inductive voltage transformer.
- IEC 60044-3 Instrument transformer – Part 3: Combined transformers
- IEC 60186 Voltage transformers

MR 8 PERFORMANCE REQUIREMENTS

Revenue metering and ancillary equipment shall read energy and power delivered to or received from the electric transmission with an appropriate degree of accuracy, but not less than +/- 0.2* %. Revenue class metering shall have the following characteristics;

* As per PEPCO's comments on Grid Code vide No. 3935-48 / Technical Director/86 dated 16.02.2005.

- Three phase four-wire and three phase three wire configuration, electronic, digital, with accuracy class of 0.2 from 0% to 100% of full scale is standard.
- Meters shall be capable of measuring and recording active and reactive power, phase currents and phase voltages at 30minute intervals for a period of 70 days, with intervals programmable from 1 minute to 2 hours.
- The meter shall have the capability of recording active and reactive energy and maximum demand for the entire billing period. The meter billing period shall be programmable and can be programmed to automatically store the accumulated value and reset the counter for the next billing period.
- Multiplier corresponding to the combination of CT and PT ratios shall be programmable in the meter. Accuracy class of CT and PT shall be in accordance with applicable DISCOs technical specifications.
- Meters shall be capable of time of use and seasonal applications. Meters shall have internal time clock for time and date stamping of data. Time clock shall have high accuracy and shall synchronize to GPS time signals.
- Meters shall have provisions for remote meter reading by telemetering or by SCADA. Communication ports shall be provided for optical and serial data communication with industry standard protocol support.
- Meter shall have self-diagnostic capability and includes an alarm to indicate failure and/or tampering.

‘

a) Installation

Installation of revenue meter and ancillary equipment at the substation for the point of connection shall be the Generator and other Users' responsibility. The Generators and other User connecting to the Licensee's network shall submit to the Licensee for approval the engineering design for revenue metering, proposed location of metering equipment and ancillaries complete with wiring and installation drawings and bill of materials. The proposed metering location shall be adjacent to any telemetring, communication and data logging equipment.

Revenue metering and ancillary devices shall be provided in secured metal enclosure. Enclosure shall have doors with locks for easy

access. Glass window shall be provided on the door to allow visual reading of the meter inside the enclosure. Instrument transformers shall be installed in secured location and shall be dedicated and not be shared with protection or other metering devices, to prevent tampering. All wiring between the instrument transformer outside the metering compartment shall be installed in rigid galvanized steel conduits. Meter shall be located where it is accessible for reading the registers and for testing and maintenance.

b) Access

Each User shall grant the Licensee right to enter upon and pass through and remain upon any part of such User's property to the extent necessary for the purpose of performance of obligation under this Code.

The right of access provided for under this code includes the right to bring on to such User property such vehicles, plant machinery and maintenance or other materials as shall be necessary for the purpose of performance of obligation under this Code.

Each User shall procure that all reasonable arrangements and provisions are made and/or revised from time to time as when necessary or desirable to facilitate the safe exercise of his right of access.

c) Telemetering (Data Collection System)

Facilities are to be provided by the User for remote transmission of metering information to the Licensee to be recorded in the metering database. Transmission of telemetered data information must be secure and reliable and not prone to tempering. All metered quantities including times and date of acquisition must be telemetered. Quantities that are to be metered shall include:

- Apparent energy
- Real energy
- Energy (KWh or MWh) delivered to load
- Energy (KWh or MWh) received from supply
- Reactive energy (KVArh or MVArh)
- Peak demand MW or kW
- Peak MVAr or kVAR demand
- Power Factor.

Metering database is to be provided at the DISCO Headquarters or Distribution Control Center location. Database will have metered quantities, meter information, metering constants, instrument transformer ratios, etc. Information in the data base computer will be accessible to for billing, engineering studies and planning.

The communication protocol for transmitting metering information shall be in accordance with IEC 61107.

MR 9 TESTING AND CALIBRATION

Testing and calibrate of meters shall be in accordance with applicable IEC Standard listed in MR 7 of this sub-code. All test equipment for testing meters shall confirm to IEC Standard.

Note: All matters of energy metering requirements of the consumers of different categories as categorized in the Performance Standards (Distribution) clause 4 part III have been detailed and discussed in Consumer Service Manual approved by the Authority which shall be followed by each Licensee.

End of Metering Requirements

PROTECTION REQUIREMENTS

CONTENT

PROTECTION REQUIREMENTS

PR 1 PROTECTION SYSTEM PRACTICES AND SYSTEM CO-ORDINATION

The Licensee shall follow suitable and necessary provisions regarding protection system practices and co-ordination such as the following but not limited to achieve the aims of proper functioning of the distribution system of the Licensee at all times:

a. Protection co-ordination of distribution system, sub-transmission system and system upto the metering point of the User (wherever applicable).

b. Intentions to protect the Licensees lines, sub-station facility and equipment against the effects of faults.

c. Achievement of co-ordination with protection systems at the NTDC Transmission level and other Distribution Companies.

d. Provision for the disconnection of all faulted items from the power system in a timely manner as specified in PMC 2.2 of the Grid Code.

e. Protection schemes designed to cope with single element, double element failure or stuck breaker condition and to maintain proper equipment protection.

f. Minimization of loss of power supply of distribution system following protection operation and chances of inadvertent operation.

g. Supply the distribution system protection scheme data of Licensee to the User and NTDC upon request

h. Provide protective earthing devices.

i. Replace the mechanical relays with digital equipment over a period of time, co-ordinated with NTDC.

The protection relays shall be in accordance with the IEC Standard No. 255**,** and IEC 60255 (Protective Relays)

PR 2 SYSTEM PROTECTION OPERATION

The Licensee shall plan, design, co-ordinate with NTDC, procure, install, operate and maintain its requisite protection systems and submit the pertinent information to NTDC in the form and manner as determined by the Grid Code at least once a year.

A Licensee shall use the protection systems for its network, in coordination with NTDC, which shall cover the following types of protection at 132kV and 66kV sub-station.

(i) Bus bar protection (differential relay)

(ii) Transformer protection (differential relay, Buchholz relay, low oil relay, winding temperature rise relays, over-current relay, earth fault, and pressure relief on HV/LV sides.

(iii) Transmission line protection (over current relay, distance relay, earth fault relay)

(iv) Over and under voltage relay

(v) under frequency relay

(vi) Breaker failure relay

(vii) Lightning protection

PR 3 POWER-FREQUENCY VOLTAGE VARIATIONS

A Licensee must ensure that all equipment, which is part of its network, is capable of continuous uninterrupted operation within the specified limits of voltage, frequency, loading as provided in the grid code/distribution code.

PR 3.1 Proper Earthing

To assure proper protection relay operation the DISCO/Licensee must ensure that the neutrals of its substation transformers are securely connected to the earth mesh through at least two independent earthing conductors from each transformer to an earth mass in the substation switchyard. The resistance of the earth mass shall be or less than 2 Ohms. The Licensee shall strictly follow the codes as approved by NEPRA and IEC standards in respect of neutral earthing and equipment grounding of substation transformers to earth mass and in respect of neutral earthing and equipment grounding at consumers' premises consistent with the latest practice adopted by Licensee and IEC Standards.

PR 4 PROTECTION COORDINATION WITH NTDC AT 132 KV

The design of connection between any Generator, other Users and the electric 132 kV transmission network shall be consistent with the operation and planning requirements of the Grid Code. Apparatus for protection of generating units, substation equipment and transmission lines from faults and overloads will be provided at the connection points. Both primary and secondary (back-up) high-speed protection scheme shall be provided to enhance reliability. Design and settings of protection system shall be coordinated between the Users and NTDC and reviewed regularly with the changes in the system.

Licensee shall refer to and follow the provisions in the Grid Code and specifying the minimum system protection requirements including equipment and lines of the distribution system as well as the provisions for credible contingencies so that the apparatus, equipment and lines of distribution system shall be well protected at all times in a safe, reliable manner and fault clearance times are adequately set to ensure safety, reliability and system stability.

NTDC shall from time to time, require Licensee's and other Code Participants to review and revise relay settings so that there is proper co-ordination with NTDC relays.

PR 5 STANDARDS AND PRACTICES

The time setting for clearing a fault by any relay operating a breaker shall be provided and coordinated with NTDC.

Protection devices shall conform to the applicable IEC standards, and practices adopted by NTDC based on the approval Grid Code. Design of protection system at the connection point shall be submitted for review and approval of NTDC. The protection relays shall be in accordance with IEC Standard No. 255, and IEC Standard No. 60255 (Protective Relays) and others as given in PR Appendix-1, whichever is applicable.

a. Clearance period from fault inception to circuit breaker arc extinction shall be established by NTDC.

   All fault clearing times shall be specified with the approval of the NTDC.

   In the event the fault clearance times are not met as a result of a failure to operate the primary or main protection system, a back-up or secondary protection system shall be provided. Back-up protection shall be coordinated with the primary protection so as to provide discrimination.

b. Circuit breakers provided at the point of connection between the generator and the transmission network shall be provided with breaker failure protection. In the event the breaker fails to operate, the breaker failure protection will initiate tripping of all the electrically adjacent circuit breakers within the time limits co-ordinated with and approved by NTDC.

c. The target performance of the system fault dependability index shall not be less than 99%. This is a measure of the ability of the protection system to initiate successful tripping of circuit breakers that are associated with the fault in the system. Fault dependability index is the ratio of the number of successful operations divided by the total number of operations.

PR 6 SUBSTATION PROTECTION

The time setting for clearing a fault by any relay operating a breaker should be provided by the Licensee and coordinated with NTDC.

Connections between the Licensee and the transmission network of NTDC and other Users (Distribution Companies, BPC, KESC, AJK, generators (Independent, Embedded and Consumer's-owned) substations must meet the minimum requirements delineated below:

a. For faults on the User's substation equipment directly connected to the sub-transmission network of the Licensee and for faults on the sub-transmission network of the Licensee directly connected to the User's substation equipment, fault clearance period from fault inception to circuit breaker arc extinction duly co-ordinated with NTDC shall be set out in the Transmission Service or Connection Agreement duly coordinated with NTDC.

b. All fault clearing times shall be specified by the Licensee and approved by the NTDC except for the connection point where NTDC is required to specify.

c. In the event the primary or main protection system fails to meet the fault clearance times listed above, a back up or secondary protection system shall be provided. Back-up protection shall be coordinated with the primary protection so as to provide discrimination.

d. Circuit breakers provided at the point of connection between the User's substation and the transmission network shall be provided with breaker failure protection. In the event the breaker fails to operate, the breaker failure protection will initiate tripping of all the electrically adjacent circuit breakers within the time limit approved by NTDC.

Additional protection may be required by NTDC as per the provisions of the Grid Code.

PR 7 TESTING, CALIBRATION AND MAINTENANCE

Testing, calibration and maintenance of the protection systems installed within the grid stations such as 500/220/132/66/11kV not owned by the Licensee shall be the responsibility of other Licensees or NTDC as the case may be depending on the ownership and control.

PR 8 CONTROL AND SWITCHING COORDINATION

PR 8.1 General

For the purpose of connecting and disconnecting a generating unit and/or User’s substation from the 132 kV sub-transmission network it is essential that the necessary equipment be provided. This equipment shall include, but not limited to the following:

a. In conjunction with the protection system, circuit breakers shall be provided at the connection point between the User and the transmission network. The circuit breaker shall have the proper voltage ratings, short circuit current rating and continuous current rating. Rating shall be submitted to NTDC for approval.

b. Control panels for circuit breakers, disconnecting switches and protection system shall be provided at the connection point. SCADA connections for monitoring and control of circuit breakers, disconnecting switches, metering and protection devices.

c. Disconnecting switches shall be provided for isolating circuit breaker for maintenance. Disconnecting switches shall be no-load break type and have the same voltage, continuous current and fault closing current capability as the circuit breaker.

d. Disconnecting switches shall be provided for isolating transformers in the substation for maintenance. Disconnecting switches shall have wiper to prevent arcing when energizing the transformer. Disconnecting switches shall be no-load break type and have the

same voltage, continuous current and fault closing current capability as the circuit breaker.

e. Grounding switches shall be furnished to ground the bus bars and transmission line for maintenance.

Disconnecting and grounding switches shall be motor-operated and shall permit remote operation and interlocking with other switching devices. Control and electrical interlock for disconnecting and grounding switches shall be provided in the control panel. Control shall have interface with SCADA for remote control and monitoring of the disconnecting and grounding switches.

a. Switching Procedures

All switching activities performed at the connection point between the Licensee and User system shall be performed under the direction of the Licensee (system operator). All other switching activities in the Users system shall be coordinated with the Licensee. Proper communication and tagging procedure shall be observed to prevent accidents and damage to equipment involved in the switching operation.

b. Testing and Maintenance of Control Facilities

Control and switching shall be scheduled once a year or as per manufacturer's recommendations for testing and maintenance. Adjustments in protection system and control will be made at this time if necessary. Equipment found to be defective shall be repaired or replaced, accordingly. Testing and maintenance will be coordinated with Licensee and NTDC. Tests, calibration, repair and replacement of equipment shall be recorded and distributed to all concerned parties.

c. Monitoring

The Licensee shall provide RTUs for remote monitoring of its 132kV facilities.

PR 9 INSULATION CO-ORDINATION REQUIREMENTS

The protection system shall be developed with the co-ordination of NTDC and in accordance with relevant design and equipment standards.

End of PR

SYSTEM MAINTENANCE AND TESTING

CONTENT

SYSTEM MAINTENANCE AND TESTING

SMT 1 MAINTENANCE REQUIREMENTS

Licensee shall establish and follow maintenance and testing procedures to maintain the apparatus, equipment sub-stations and lines in a functioning condition to be operatable at its rated capacity at all times and assure that the same can be connected to Distribution System in a safe and reliable manner.

Necessary maintenance schedules shall be developed for equipment maintenance and preventive maintenance. The established schedules shall be in compliance with good industry practices and as per recommendations of the manufacturers.

The need to maintain appropriate level of the maintenance schedule is necessitated to meet the licence obligations of the Licensee and, comply with NEPRA prescribed Performance Standards (Distribution)-Rules.

The Licensee shall provide means of appropriate communications such as radio, cell phone, wireless etc. and transport facility for maintenance crew.

Maintenance of the inter-distribution company 132/66/11kV lines shall be the responsibility of the distribution company mostly exporting power to other distribution company's distribution and sub-transmission system.

The Licensee must notify the NTDC of any required maintenance activities and the NTDC will schedule an outage for the necessary maintenance activities to be performed.

Any operation and maintenance of the interconnecting facilities including Licensee's 132kV system and substation equipment must be authorized and coordinated with NTDC. Maintenance of the interconnecting facility and maintenance and operation of 132kV lines and sub-station serving more than one Licensee which shall be coordinated by the NTDC.

SMT 1.1 Binding Obligations

The Licensee shall assure that proper tools and spares are available at all work places for carrying out maintenance and testing.

Licensee shall provide a training center for imparting training to Licensee's workmen corresponding to the following categories/aspects.

a. Maintenance Strategies

b. On-line testing and preventive maintenance where applicable.

c. Off-line testing and preventive maintenance where applicable.

d. Testing and Maintenance of Grid Station equipment, and use of T&P.

e. Construction of 33kV/11kV/0.4kV lines and installation of distribution transformers

f. Safety

The training shall incorporate but not limited to the following procedures and techniques.

a. Lines

- 132kV line feeding the DISCOs should be looked after by the DISCO to the fed by the line.

b. Grid Stations

- Operating mechanism of different types of circuit breakers i.e. (ACB, VCB and OCB)
- Testing of circuit breakers with respect to contact resistance, opening/closing timings, oil testing, insulation testing of vacuum interrupter in case of VCB.
- Testing of the power transformers current transformers with respect to capacitance and dissipation factor (C & DF), oil testing.
- Grid station battery operation and maintenance with respect to specific gravity, voltage, float charge volt/cell, boost charge volt/cell, end of discharge voltage cell at 10 Hrs. rate.
- Procedure and use of different types of protective relays, used on transmission lines and grid stations.

c. Construction

- Distribution transformer installation.
- Consumer's overhead and underground service connection.
- Installation and connection of different types of energy meters.
- Grounding of electrical equipment.
- Construction techniques including;
  - (i) Use of shovel and auger for pit digging
  - (ii) Use of rollers on every pole for stringing of conductor
  - (iii) Use of sag charts for proper sag
  - (iv) Fixing of stay wire to the pole
  - (v) Erection and foundation of pole/structure
  - (vi) Fixing of hardware to the pole/structure

d. Use of Testing Equipment and Tools

Procedure and use of different types of testing equipment and tools used in the maintenance of the system.

e. Safety

Awareness and implementation of safety code management.

SMT 2 MAINTENANCE STRATEGIES

To properly discharge its responsibilities in respect of safe, reliable and economic operation of the Distribution System and in accordance with its licence provisions, the Licensee shall develop, organize and carry out monitoring, testing and investigation of the effect of Users electrical apparatus or electrical installation on the distribution system.

The consumer shall install the necessary protection equipment at the point of connection, as advised by the Licensee at the time of connection.

SMT 3 ON-LINE TESTING AND PREVENTATIVE MAINTENANCE

Responsibilities and procedures for arranging and carrying out System Tests, which may have an effect on other Transmission and Distribution Systems, have been laid down in DOC 8, which should be strictly followed where applicable.

SMT 4 OFF LINE PREVENTIVE MAINTENANCE AND TESTING

The Licensee shall arrange off-line preventative maintenance and testing of its system. An annual plan of maintenance and testing including lines and sub-stations shall be prepared by the Licensee which should further be broken down into monthly schedules. The chapter should layout the procedures and schedules for lines, and sub-stations which must cover the following points: -

a. the procedure and schedule of patrolling the transmission and distribution lines;

b. preparation and submission of patrolling reports by the field staff;

c. the points which need to be noted during patrolling;

d. scheduling shut-down to attend the major problems, if any encountered during the patrolling report;

e. in case of sub-station the schedule of maintenance and testing should be prepared on the basis of manufacturer's recommendation for different equipments which may be on daily basis, monthly basis, half yearly basis, yearly basis and five yearly basis;

f. the detail of maintenance and testing which is required to be carried out on each equipment should be prescribed with schedule;

g. oil dielectric tests for transformers, breakers and other oil filled distribution apparatus;

h. test equipment to perform insulation resistance tests, C & DF test, voltage withstand tests opening/closing timings of the breakers, contact resistance of the breakers etc. should be arranged and provided;

i. earthing test equipment and meggers shall be provided for field testing of earthing systems at substations, structures, poles, distribution transformers, and at consumer connections; and

j. cleaning/washing of insulators on the lines and sub-stations, specially in polluted area.

SMT 4.1 Listing T & P

The chapter should also prescribe the list of required standard, testing equipment and tools which are to be used by the Licensee during maintenance, and breakdowns.

End of SMT

DISTRIBUTION CODE

SAFETY REQUIREMENTS

CONTENTS

SAFETY REQUIREMENTS

SR 1 INTRODUCTION

The Licensee shall abide by the Safety Requirements of its "Power Safety Code" as published by distribution company and approved by NEPRA. This code presents safety instructions for the electrical works concerning construction, installation, operation and maintenance of electric supply lines and grid station facilities. The Licensee shall also abide by the Safety requirements as per NEPRA Regulation of Generation, Transmission and Distribution of Electric Power Act (XL of 1997), and safety standards established in the Consumer Service Manual, Consumer Eligibility Criteria and Distribution Performance Standards Rules.

SR 2 OBJECTIVES

To lay down the safety management criteria to be applied to ensure safety of persons working on the Distribution System and at or across operational and Ownership Boundaries, general public and animals.

SR 3 SCOPE

Each Licensee shall develop its Safety Manual in accordance with the requirements of the established instructions presented in the ”Power Safety Code” as published by Distribution Company and approved by NEPRA, and implement the same.

Similar Criteria and Standards of Safety Management Systems shall be provided by other Users of the Distribution System and approved by the Licensee when carrying out work or tests at the operational interface with the Licensee.

SR 4 SAFETY MANAGEMENT CRITERIA

a. All distribution facilities of a distribution company shall be constructed, operated, controlled and maintained in a manner consistent with the Distribution Code, Power Safety Code, Consumer Service Manual, Performance Standards (Distribution) and other applicable documents.

b. A distribution company shall ensure that its distribution facilities do not cause any leakage of Electrical Current or Step Potential beyond a level that can cause harm to human life, as laid down in the relevant IEEE/IEC Standards; prevent accessibility of live conductors or equipment; and prevent development of a situation due to breakdown of equipment which results in voltage or leakage current that can cause harm to human life, property and general public including without limitation, employees and property of the distribution company.

c. A distribution company shall implement suitable, necessary, and appropriate rules, regulations and working practices, as outlined in its Distribution Code or applicable documents, to ensure the safety of its staff and members of the public. This shall also include suitable training for familiarity and understanding of the rules, regulations, practices, and training to use any special equipment that may be required for such purposes including without limitation basic first aid training.

The Safety Management criteria that applies to the Licensee and the following Users of the Distribution System:

a. Embedded Generators.

b. Bulk Power Customers

c. Other Distribution Companies

d. Independent Generators

e. SHYDO, KESC

f. Any other party reasonably specified by the Licensee including Users connected at 132 kV/ 11 kV/ 0.4 kV for appropriate sections when necessary.

g. Agents of the Licensee or Users working on the Distribution System or at or across operational boundaries.

SR 5 PROCEDURES

The Safety Manual will present the principles, guidelines, and procedures (Safety Management System) for ensuring safety of all relevant personnel of the Licensee and Users for work on their respective Systems or Plant or Apparatus connected to them.

There shall be joint agreement by the Licensee and Users on which Safety Management System is to be used for sites or locations where an operational boundary exists and proper documentation of the safety precautions to be taken shall be maintained.

There shall be written authorization of personnel who do the work of control, operation, work or testing of Plant or Apparatus forming part of or connected to the Distribution System of the Licensee.

There shall be joint agreement between the Licensee and Users which specifies responsibility for system or control equipment which shall ensure that only one party is responsible for any item of plant or apparatus at any one time.

The Licensee and each User shall at all times have nominated a person or persons responsible for the co-ordination of safety on the respective systems.

The Licensee and each User shall maintain a suitable system of documentation which records all relevant operational events that have taken place on the Distribution System or other System connected to it and the co-ordination of relevant safety precautions for work.

System diagrams which show sufficient information for control personnel to carry out their duties shall be exchanged between the Licensee and User as required.

SR 6 SAFETY AT THE LICENSEE / USER INTERFACE

The following procedure set down the basic safety requirements at the operator and the Licensee interfaces. These procedures are necessary to ensure the safety of all who may have to work at either side of the interface or on the interface (boundary).

a. Written Rules for Safe Working and Communicating Procedures shall be available and used by all persons who may have to work at or use the facilities provided at the Interface.

b. Electrical equipment at the interface points of the Licensee shall only be controlled by designated authorized person of the Licensee or other Licensee/NTDC/User.

c. Each item of equipment shall be controlled by only one identifiable person at any one time.

d. Adequate means of isolation shall be provided at the interface to allow work to be carried out safely at either side of the interface.

e. Where necessary to prevent danger adequate facilities for earthing shall be provided at either side of the interface to allow work to be carried out safely at the interface or at either side of the interface.

f. Adequate working space, adequate means of access where necessary, adequate lighting shall be provided at all electrical equipment on or near which work is being done in circumstances, which may cause danger.

g. All electrical equipment shall be suitably identified and tagged where necessary to prevent danger.

h. Electrical installations and equipment shall comply with the relevant requirements as set down in the Power Safety Code.

SR 7 PUBLIC AND PROPERTY SAFEGUARD

The Licensee shall make every effort to protect the public at all times when work is in progress by the use of signs, barricades or personal warnings in the following cases:

a. When work is conducted along public streets or highways, pedestrian and vehicular traffic shall be warned in compliance with applicable standards.

b. Where necessary, open manholes, ditches and excavations shall be barricaded or be substantially covered to prevent pedestrians, animals or vehicles from falling into them.

c. During the night and in all dark locations, lights or torches should be in place at any obstruction, excavation or opening which is likely to cause injury to workers or public.

d. When working on customers' premises or public property, every effort shall be made by Licensee staff to avoid hazards to customers or public and their property. Tools, excess material, and scrap shall be removed when the job is completed.

e. No Licensee's employee shall smoke or use matches or open flames on customers' premises unless it is positively known 'that such action does not conflict with the customers' rules, wishes and safety.

f. Walks, aisles, stairways, fire escapes and all other passageways shall be kept clear of all obstructions.

g. Any floor or wall opening shall be guarded with standard railings and toe boards. Other means of temporary protection may be used only with an observer present.

h. Tools and plant shall not be placed where they may cause tripping or stumbling hazards, or where they may fall and strike anyone below.

i. Adequate measures shall be taken to overcome slipping hazards, which may exist.

j. Nails in boards, such as those removed from scaffolds, forms and packing boxes shall be removed. The boards shall be carefully stacked or stored.

k. Nails that have been driven into barrels or tins to secure the head shall be removed when the head is removed.

l. Work areas and vehicles shall be neat and orderly at all times.

m. Scrap bins (dust bins) shall be provided and used for broken glass, insulators, sheet metal scraps, used pressurized containers and other waste material.

End of Safety Requirements

PUBLIC LIGHTING

CONTENT

PUBLIC LIGHTING

PL 1.1 The licensee shall provide distribution facilities for public lighting within its distribution territory. Maintenance/operation and replacement of lamps/fixtures shall be carried out by the licensee at mutually agreed terms and conditions with the relevant local body desirous of establishing a public lighting system.

PL 1.2 construction of the public lighting in the territory of the licensee shall also be governed under a mutual agreement between the licensee and the relevant local body.

End of PL

Deleted: ¶
¶

EMERGENCY PLANS AND LOAD SHEDDING

CONTENTS

EMERGENCY PLANS AND LOAD SHEDDING

General Comments

It is important to lay down the principles and priorities of load shedding and detailed procedures as to how the load shedding shall be carried by the Licensee under the instructions of NTDC. This section needs to be consistent with Performance Standards (Distribution), Grid Code, and Transmission Performance Standards.

EPL 1 BREAKDOWNS AND EMERGENCY PROCEDURES

The Licensee shall formulate necessary procedures and guidelines for emergency response plans and restoration procedures in coordination with relevant organizations and its Users for compliance purposes. These procedures shall be tested /checked at specified periods.

The principals and procedures are required to be laid down by Licensee consistent with the relevant provisions of the Grid Code and Distribution Code and Performance Standards (Distribution) as to how to restore and maintain power supply to its consumers in an efficient and prompt manner under emergency and breakdown system conditions.

As far as practicable, the Licensee shall provide separate circuits for Urban Supply (Non-Industrial) and Rural Supply and shall so arrange the feeder/loads in such a manner so as to create discrete load blocks to facilitate load management during emergency operations.

EPL 2 LOAD SHEDDING

A Licensee shall have plans and schedules available to shed up to a maximum of 30% of its connected load at any time upon instruction from NTDC. However, the amount of load that may be shed by the Licensee under particular emergency system conditions shall be equal to its allocation, as determined by NTDC, based on the Licensee's peak load demand in relation to the Total System Peak Demand of NTDC. This 30% load must be made up from separate blocks of switchable load, which can be immediately either automatically or manually disconnected in turn at the instruction from NTDC. A Licensee shall provide copies of these plans to NTDC as per the requirements of Performance Standards (Distribution).

Wherever possible NTDC shall give Licensee advance warning of impending need for load shedding to maintain system voltage and/or frequency in accordance with the Grid Code.

As per the provisions of the Grid Code, and Performance Standards (Distribution) NTDC shall maintain an overview and as required instruct each Licensee the quantum of load to be disconnected and the time of such disconnection. This instruction shall be given in clear, unambiguous terms and related to prepared plans.

When instructed by NTDC, the distribution companies shall shed the load in the following order:

a. Supply to consumers in rural areas; and residential consumers in urban areas where separate feeders exists.

b. Supply to consumers, other than industrial, in urban areas.

c. Supply to agriculture consumers where there is a dedicated power supply.

d. Supply to industrial consumers.

e. Supply to schools and hospitals.

f. Supply to defense/strategic installations.

A Licensee shall prepare schedules of load disconnection, which demonstrate this priority order and which rotate load disconnection within the above groups in a non-discriminatory manner. The principle of proportionality shall be kept in mind so as not to excessively burden a particular consumer class.

EPL 3 LICENSEE'S OBLIGATIONS

The Licensee shall establish procedures for restoring the supply after emergency breakdowns consistent with Grid and Distribution Code.

Licensee shall interact with NTDC, in case of black start and shall follow NTDC instructions for restoration of supply.

Each Licensee shall abide by the requirements of the system restoration plan prepared by NTDC and shall ensure that its personnel are familiar with, and are trained and experienced in their standing instructions and obligations to implement the required emergency restorations procedure.

The power supply in a post emergency state is to be restored under the instructions of NTDC in reverse sequence that outlined in the clause 7 of the Performance Standards (Distribution) approved by NEPRA.

Note: KESC shall plan its own emergency plan and load shedding consistent with the order of priority provided in the Performance Standards (Distribution) and Distribution Code.

End of EPL

PROVISION OF INFORMATION

CONTENTS

PROVISION OF INFORMATION

PI 1 The Licensee shall fulfill requirements related to but not limited to the following:

a. Licensee's obligation to provide information on quality and tests made or and when required by consumer.

b. Licensee's obligation in providing technical information

PI 2 LICENSEE'S OBLIGATIONS

Licensee shall provide necessary information to NEPRA as per rule 20 of the Distribution Licensing rules 1999 and Article 15 of its distribution licence and Section 44 of Regulation of Generation, Transmission and Distribution of Electric Power Act (XL of 1997), clause 11 of Performance Standards (Distribution), and information required as per Grid Code and Distribution Code.

PI 2.1 As a requirement of Distribution Licensing Rules - 1999 and the distribution licence developed under such rules a Licensee must provide a summary of the Licensee's and consumers' rights and obligations in the form of Consumer Service Manual and make such available to each of its Consumer:

a. at the time the consumer is connected;

b. on request; at least once every two years.

PI 2.2 When requested by a consumer, the Licensee must:

a. provide information on the reliability or quality of supply provided to that consumer as per the requirements of Performance Standards (Distribution); and

b. provide a copy of the NEPRA Performance Standards (Distribution) to the consumer.

PI 3 ANNUAL SYSTEM PERFORMANCE REPORT

Each distribution Licensee shall submit each year annual performance report of its distribution and sub-transmission system network as required under clause 11 of the Performance Standards (Distribution)-Rules approved by the Authority.

PI 4 CONFIDENTIALITY

A Licensee must use all reasonable endeavours to keep confidential any confidential information which comes into the possession or control of the Licensee or of which the Licensee become aware of.

End of PI

DISTRIBUTION DATA REGISTRATION CODE

CONTENTS

DISTRIBUTION DATA REGISTRATION CODE

DDRC 1 INTRODUCTION, OBJECTIVE & SCOPE

DDRC 1.1 The various sections of the Distribution Code require Users to submit data to the Licensee.

DDRC 1.2 The Distribution Data Registration Code ("DDRC") provides a series of schedules summarising all requirements for information of a particular type. Each class of User is then referred to the appropriate schedule or group of schedules for a statement of the total data requirements in his case.

DDRC 1.3 The DDRC specifies procedures and timings for the supply of data and subsequent updating. Where the timings are covered by detailed timetables laid down in other sections of the Distribution Code they are not necessarily repeated in full in the DDRC.

DDRC 1.4 In the case of a Generator seeking a connection to the Licensee Distribution System then irrespective of the potential arrangements for Scheduling and Despatch discussions on connection shall be with the Distribution Company concerned with the connection arrangements.

DDRC 1.5 The Users to which this DDRC applies are;

a. All the distribution Licensees of NEPRA

b. NTDC

c. Embedded generators

d. KESC

e. SHYDO

f. BPCs

g. SPPs

h. AJK

i. Generators connected to 132 kV system of Licensee

j. Any other entity connected to the distribution and sub-transmission network of distribution Licensees as appropriate.

DDRC 2 DATA CATEGORIES

DDRC 2.1 The data required by the Licensee is divided into two categories, System Planning Data ("SPD") and Operational Data ("OD").

DDRC 2.2 In order to assess the implications for making a connection the Licensee shall require SPD and OD information, the precise requirements being decided by the Licensee and dependent upon circumstances. Following an agreement to connect and not less than 6 weeks before the proposed date of connection the User must supply data as requested by the Licensee, which shall be referred to as Registered Data.

DDRC 3 PROCEDURES AND RESPONSIBILITIES

DDRC 3.1 Unless otherwise specified or agreed by the Licensee each User is required to submit data as defined in DDRC 4.7 below and the attached schedules.

DDRC 3.2 It is a requirement of the DDRC that data changes are advised as soon as practicable to the Licensee and in any case reviewed annually to ensure continued accuracy or relevance. The Licensee shall initiate this review in writing and the User shall respond in writing.

DDRC 3.3 Where possible data shall be submitted on standard forms forwarded to the User by the Licensee.

DDRC 3.4 If a User wishes to change any data item then this must first be discussed with the Licensee concerned in order for the implications to be considered and the change if agreed (such agreement not to be unreasonably withheld), be confirmed by the submission of a revised data form or by verbal means with confirmation by telex or similar if short timescales are involved.

DDRC 3.5 From time to time the Licensee may change its data requirements, appropriate Users shall be advised of these changes as they occur and shall be provided with a reasonable timescale by which to reply.

DDRC 3.6 Users and Distribution Companies are obliged to supply data as set out in the individual sub codes of the Distribution Code and repeated in the DDRC. If a User fails to supply data when required by any sub-code of the Distribution Code, Licensee concerned shall make an estimation of such data if and when in the Licensee's view it is necessary to do so. If Licensee fails to supply data when required by any sub-code of the Distribution Code, the User to whom that data ought to have been supplied shall estimate of such data if and when, in that User's view it is necessary to do so. Such estimates shall, in each case, be based upon data supplied previously for the same facility or upon such other information as Licensee or that User, as the case may be deems appropriate.

DDRC 3.6.1 Licensee shall advise a User in writing of any estimated data it intends to use pursuant to DDRC 3.6 relating directly to that User's facility in the event of data not being supplied.

DDRC 3.6.2 A User shall advise Licensee in writing of any estimated data it intends to use pursuant to DDRC 3.6 in the event of data not being supplied.

DDRC 3.6.3 In the event the required data is not supplied or is incomplete or in-accurate by the User, the Licensee shall refer the matter to the "Review Pannel" which shall issue necessary instructions to the defaulted party in writing.

Failure to obtain/supply the required data within the specified timeframe from/by the defaulted party, the Licensee shall consider the matter as a violation of the Distribution Code provision. Suitable measures regarding

Distribution code non-compliance are covered in CM 16 of this Distribution Code.

DDRC 4 DATA TO BE REGISTERED

Schedule 1	–	All generating units technical data
Schedule 2	–	System design information comprising system technical data.
Schedule 3	–	Load characteristics - comprising the forecast data for load points indicating the maximum load, the equipment that comprises the load, and the harmonics content of the load.
Schedule 4-6	–	Demand Forecasts - as described in DOC 1 time varying out put/generation forecast for the Users defined in the scope.
Schedule 7-10	–	Operational planning as described in DOC 2 outage planning information.
Schedule 11	–	Event information exchange as described in DOC 5
Schedule 12	–	Annual Performance Data

Schedule 1 to Schedule 12 are attached as DDRC Schedule No. 1 to DDRC Schedule No. 12.

DDRC 4.1 The data applicable to each class of User is as follows:

Schedule Number	Title	Applicable to	Data Category
1	Generating Unit Data	♦ All Generators including Embedded Generators ♦ Consumer with own generation	System Planning Data
2-3	System Design Information and Load Characteristics	♦ Embedded Generators ♦ Other Distribution Company Connected to the Licensee System ♦ BPC	System Planning Data
4-6	Demand, and Generation Forecast	♦ All Generators ♦ other Distribution Companies Connected to the Licensee System ♦ All Users have load of 1MW and above	Operational Data
7-10	Outage Data	♦ Embedded Generators ♦ All Users and all consumers having a connection load of 1MW and above	Operational Data
11	Event Information Exchange	♦ All Generators ♦ Distribution Licensees ♦ KESC	Operational Data

		♦ AJK ♦ Own generating consumers who are partly supplying to Distribution Licensees	
12	Annual Performance Data	♦ All Distribution Licensees	Operational Data

End of DDRC

i

i

COMPETITION IN THE SUPPLY OF ELECTRIC POWER

CONTENTS

COMPETITION IN THE SUPPLY OF ELECTRIC POWER

The following provisions need to be included in this Sub-Code.

a. Use-of-system charges

b. Provision of Services to Bulk Power Consumers not receiving power from the distribution company.

c. Supply to consumers within the Concessional Territory

d. Supply to consumers to the Housing Colonies.

e. Supply to consumers to Defence Establishments.

Supply to Non-native Bulk Power Consumers

The Licensee shall offer power supply connection services to all the BPCs within its Service Territory regardless of their choice of power supplier as per its obligations under NEPRA distribution licence and Section 22 of NEPRA Act.

This obligation includes offering access to its distribution system to the Bulk Power Consumer either connected with the Licensee's/receiving power from the Licensee but wishing to switch its supplier other than the host distribution company OR a new Bulk Power Consumer already having a power contract with a supplier (other than the Licensee) and wishing to connect to the Licensee's network for power wheeling purposes.

This obligation entails the following:-

a. Providing service connection as per the provisions of Performance Standards (Distribution) – Rules 2005.

b. Offering Metering, Billing, Consumer Services such as complaint handling.

c. Offer of reasonable and approved use-of-system charges.

d. Offer to enter into a connection contract on reasonable fair, consistent and approved terms and conditions regarding connection services, consumers services and rate and charges.

e. Offer to comply with the relevant provisions of Consumer Eligibility Criteria, Distribution Code, Performance Standards (Distribution) Consumer Service Manual, Grid Code, approved Complaint Handling Procedures, Safety Code, if applicable, any other special conditions forming part of the Power Purchase Agreement of the Non-native Bulk Power Consumer.

End of CSE

SCHEDULE AND APPENDIX

CONTENTS

DDRC	**Schedule No. 3** LOAD CHARACTERISTICS	S&A-158
DDRC	**Schedule No. 4** Forecast information (8 weeks to 1 year ahead inclusive)	S&A-159
DDRC	**Schedule No. 5** OPERATIONAL PLANNING PROGRAMMING PHASE (24 hours to 8 weeks ahead inclusive)	S&A-160
DDRC	**Schedule No. 6** OPERATIONAL PLANNING CONTROL PHASE (0 to 24 hours ahead)	S&A-161
DDRC	**Schedule No. 7** OUTAGE PLANNING OPERATIONAL PLANNING PHASE MEDIUM TERM PROGRAMME	S&A-162
DDRC	**Schedule No. 8** OUTAGE PLANNING OPERATIONAL PLANNING PHASE SHORT TERM PROGRAMME	S&A-163
DDRC	**Schedule No. 9** GENERATING UNIT'S OUTAGES	S&A-164
DDRC	**Schedule No. 10** USERS PLANT AND APPARATUS	S&A-165
DDRC	**Schedule No. 11** EVENT INFORMATION EXCHANGE	S&A-166
DDRC	**Schedule No. 12** ANNUAL PERFORMANCE DATA	S&A-167

DOC-1
APPENDIX-1

DEMAND FORECASTS – OPERATIONAL PLANNING PHASE
(8 weeks to 1 year ahead inclusive)

Forecast information for each of the next 1 year of:

(a) Date and Time of Annual NTDC System Maximum and Minimum Power Demand as notified by the NTDC.

(b) Hourly Maximum and Minimum Annual Power usage of distribution company with reference to Maximum and Minimum NTDC System demand at a specified date and time at each transmission connection point.

(c) Annual energy Forecast demand at annual average conditions of all the different categories of consumers connected to the distribution company's system.

(d) Maximum generation output in MW by all the embedded generating plants at a specified date and time of annual Peak Hours on NTDC's system.

Where reference is made to ‘specified’ or ‘NTDC Demand’, the information shall be provided by the Licensee following the receipt of information provided by NTDC in accordance with OC2 of the Grid Code.

DOC-1
APPENDIX-2

DEMAND FORECASTS – PROGRAMMING PHASE
(24 hours to 8 weeks ahead inclusive)

The following information shall be provided to the Licensee in the time scales specified in DOC1:

(a) Hourly operational schedule of each embedded generating unit whose output is more than 1 MW and is not subject to central dispatch.

(b) All the Bulk Power Consumers and other distribution companies connected to the licensee's system shall intimate to the licencee the specific date and time where the aggregate change in their load due to their operation is expected to be more than 1 MW.

(c) Any other relevant Demand forecast information reasonably required by the Licensee.

DOC-1
APPENDIX-3

DEMAND FORECASTS – CONTROL PHASE
(0 to 24 hours ahead)

The following information shall be supplied to the Licensee at reasonable times to be specified by the Licensee for the un-expired period covered by the Control Phase.

(a) Intimation by all the embedded generating plants to the licencee in case the difference of their hourly output is more than 1 MW as compared to their schedule of generation already notified under DOC 1.3.3.3.

(a) Intimation by all the Bulk Power Consumer to the licencee the detail of changes in the demand if such changes are more than 1 MW.

DOC-2
APPENDIX-1

OUTAGE PLANNING

OPERATIONAL PLANNING PHASE

MEDIUM TERM PROGRAMME – Calendar Year – 1 – 2 Year ahead

This appendix should be completed by Licensee in consultation with Users and Embedded Generators (not subject to central dispatch)

DOC-2
APPENDIX-2

OUTAGE PLANNING

OPERATIONAL PLANNING PHASE

SHORT TERM PROGRAMME – Current Calendar year down to Programming Phase (8 Weeks)

This appendix should be completed by Licensee in consultation with Users and Embedded Generators (not subject to central dispatch)

DOC-5
APPENDIX-I

MATTERS, IF APPLICABLE TO THE SIGNIFICANT INCIDENT, TO BE INCLUDED IN A WRITTEN REPORT GIVEN IN ACCORDANCE WITH DOC 5.2.2

Applicable to Licensee and Embedded Generator

1 Time and date of Significant Incident;

2 Location;

3 Facility involved;

4 Brief description of the Significant Incident; and

5 Details of any Demand Control undertaken.

Applicable to Licensee:

(a) duration of incident and corrective actions taken;

(b) estimated date and time of return to normal service.

Applicable to Embedded Generator:

6 Effect on generation including, where appropriate:

(a) MW of generation interrupted;

(b) frequency response achieved;

(c) MVAr performance achieved; and

(d) estimated date and time of return to normal service.

DPC
APPENDIX-I

SHUNT CAPACITOR INSTALLATION
(Useful Formulae)

1. CAPACITOR REQUIRED

KVAR = KVA1 (Sin ∅1 – [Cos ∅ 1 / Cos ∅ 2] Sin ∅ 2)

Where KVAR is: Amount of capacitance to be added to improve the Power Factor from Cos ∅1 to Cos ∅2.

KVA1 is: Original kVA.

2. OPTIMUM LOCATION OF CAPACITORS

L = [1– (KVARC / 2 KVARL) x (2n–1)]

Where,

L	=	distance in per unit along the line from sub-station
KVARC	=	Size of capacitor bank
KVARL	=	KVAR loading of line
n	=	relative position of capacitor bank along the feeder from sub-station if the total capacitance is to be divided into more than one Bank along the line. If all capacitance is put in one Bank then values of n=1.

3. VOLTAGE RISE DUE TO CAPACITOR INSTALLATION

% Rise = (KVARC.X) / 10V2

Where,

X = Reactance per phase
V = Phase to phase voltage in kilovolts

DDC
APPENDIX-1

KVA-KM LOADING
(Sample Calculations)

1. CONDUCTOR DATA

Conductor Size ……	(6/3.35mm+1/3.35mm)ACSR
Gross Area of Aluminum……	52.95mm2
Copper Equivalent……	32.26mm2
Resistance in ohms per KM (at 20^{o}C) ……..	0.5449*
Inductive reactance at 50 Hz in ohms per KM.. (For equivalent spacing of 1000mm)	0.421*

* Appropriate values may be taken for any other temperature and equivalent spacing.

2. ASSUMPTIONS

Length of Line ……	1 KM
kVA Loading ……..	1000 kVA
3 Phase Voltage ……	11,000 V

3. REGULATION

Percent Regulation (approx.) = {I (R Cos ∅ + X sine ∅)/E}x100

Where

I = Current per phase in amp
R = Resistance per phase in ohms
X = Reactance per phase in ohms
Cos ∅ = Power Factor
E = Phase-Neutral voltage in volts

$$\text{Percent Regulation} = \left\{ \frac{\mathbf{416.2 \times (0.5449 \times 0.8 + 0.421 \times 0.60}}{\mathbf{6451}} \right\} \underline{\mathbf{\times 100 = 4.44\%}}$$

For 1% Voltage Regulation the KVA-KM loading for the selected conductor size at **0.8** PF will be 1912 KVA-KM. For any other Power Factor, voltage and conductor temperature the Voltage Regulation may be calculated by substituting appropriate values of current, Resistance Cos ∅ and Sine ∅ in the formula.

PR

APPENDIX-I

Publications found with ICS code:
29.060.01 Electrical wires and cables in general

29.060.01 IEC 60344 (1980-01)
Guide to the calculation of resistance of plain and coated copper conductors of low-frequency cables and wires

29.060.01 IEC 60364-5-52 (1998-11) Ed. 1.1 Consolidated Edition
Electrical installations of buildings - Part 5: Selection and erection of electrical equipment - Chapter 52: Wiring systems

29.060.01 IEC 60364-5-523 (1999-02)
Electrical installations of buildings - Part 5: Selection and erection of electrical equipment - Section 523: Current-carrying capacities in wiring systems

29.060.01 IEC 61084-1 (1991-07)
Cable trunking and ducting systems for electrical installations - Part 1: General requirements

29.060.01 IEC 61084-1-am1 (1993-10)
Amendment No. 1

29.060.01 IEC/TR2 61200-52 (1993-03)
Electrical installation guide - Part 52: Selection and erection of electrical equipment - Wiring systems

Publications found with ICS code:
29.120.50 Fuses and other overcurrent protection devices

29.120.50 IEC 60050-441 (1984-01)
International Electrotechnical Vocabulary. Switchgear, controlgear and fuses

29.120.50 IEC 60050-441-am1 (2000-07)
Amendment 1

29.120.50 IEC 60050-448 (1995-12)
International Electrotechnical Vocabulary - Chapter 448: Power system protection

29.120.50 IEC 60099-1 (1999-12) Ed. 3.1 Consolidated Edition
Surge arresters - Part 1: Non-linear resistor type gapped surge arresters for a.c. systems

29.120.50 IEC 60099-4 (1998-08) Ed. 1.1 Consolidated Edition
Surge arresters - Part 4: Metal-oxide surge arresters without gaps for a.c. systems

29.120.50 IEC 60099-5 (2000-03) Ed. 1.1 Consolidated Edition
Surge arresters - Part 5: Selection and application recommendations

29.120.50 IEC 60127-4 (1996-08)
Miniatures fuses - Part 4: Universal Modular Fuse-Links (UMF)

29.120.50 IEC 60255-6 (1988-12)
Electrical relays - Part 6: Measuring relays and protection equipment

29.120.50 IEC/TR 60255-20 (1984-01)
Electrical relays. Part 20: Protection (protective) systems

29.120.50 IEC 60269-2 (1986-09)
Low-voltage fuses. Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)

29.120.50 IEC 60269-2-1 (2000-03) Ed. 3.1 Consolidated Edition
Low-voltage fuses - Part 2-1: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) - Sections I to V: Examples of types of standardized fuses

29.120.50 IEC 60269-3 (1987-06)
Low-voltage fuses. Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)

29.120.50 IEC 60282-1 (1994-12)
High-voltage fuses - Part 1: Current-limiting fuses

29.120.50 IEC 60282-1 (1998-01) Ed. 4.2 Consolidated Edition
High-voltage fuses - Part 1: Current-limiting fuses

29.120.50 IEC 60282-2 (1997-12) Ed. 2.1 Consolidated Edition
High-voltage fuses - Part 2: Expulsion fuses

29.120.50 IEC 60282-3 (1976-01)
High-voltage fuses. Part 3: Determination of short-circuit power factor for testing current-limiting fuses and expulsion and similar fuses

29.120.50 IEC 60291 (1969-01)
Fuse definitions

29.120.50 IEC 60364-4-42 (1980-01)
Electrical installations of buildings. Part 4: Protection for safety. Chapter 42: Protection against thermal effects

29.120.50 IEC 60364-4-43 (1977-01)
Electrical installations of buildings. Part 4: Protection for safety. Chapter 43: Protection against overcurrent

29.120.50 IEC 60364-4-45 (1984-12)
Electrical installations of buildings. Part 4: Protection for safety. Chapter 45: Protection against undervoltage

29.120.50 IEC 60364-4-46 (1981-01)
Electrical installations of buildings. Part 4: Protection for safety. Chapter 46: Isolation and switching

29.120.50 IEC 60364-4-473 (1999-03) Ed. 1.1 Consolidated Edition
Electrical installations of buildings - Part 4: Protection for safety - Chapter 47: Application of protective measures for safety - Section 473: Measures of protection against overcurrent

29.120.50 IEC 60549 (1976-01)
High-voltage fuses for the external protection of shunt power capacitors

29.120.50 IEC 60644 (1979-01)
Specification for high-voltage fuse-links for motor circuit applications

29.120.50 IEC/TR 60755 (1983-01)
General requirements for residual current operated protective devices

29.120.50 IEC 60787 (1983-01)
Application guide for the selection of fuse-links of high-voltage fuses for transformer circuit application

29.120.50 IEC 60931-3 (1996-08)
Shunt capacitors of the non-self-healing type for AC power systems having a rated voltage up to and including 1000 V - Part 3: Internal fuses

29.120.50 IEC 60934 (2000-10)
Circuit-breakers for equipment (CBE)

29.120.50 IEC/TR3 61459 (1996-08)
Coordination between fuses and contactors/motor-starters - Application guide

Publications found with ICS code:
29.120.70 Relays

29.120.70 IEC 60050-446 (1983-01)
International Electrotechnical Vocabulary. Electrical relays

29.120.70 IEC 60255-3 (1989-06)
Electrical relays - Part 3: Single input energizing quantity measuring relays with dependent or independent time

29.120.70 IEC 60255-5 (2000-12)
Electrical Relays - Part 5: Insulation coordination for measuring relays and protection equipment - Requirements and tests

29.120.70 IEC 60255-6 (1988-12)
Electrical relays - Part 6: Measuring relays and protection equipment

29.120.70 IEC 60255-8 (1990-10)
Electrical relays - Part 8: Thermal electrical relays

29.120.70 IEC 60255-9 (1979-01)
Electrical relays. Part 9: Dry reed make contact units

29.120.70 IEC 60255-11 (1979-01)
Electrical relays - Part 11: Interruptions to and alternating component (ripple) in d.c. auxiliary energizing quantity of measuring relays

29.120.70 IEC 60255-12 (1980-01)
Electrical relays - Part 12: Directional relays and power relays with two input energizing quantities

29.120.70 IEC 60255-13 (1980-01)
Electrical relays - Part 13: Biased (percentage) differential relays

29.120.70 IEC 60255-14 (1981-01)
Electrical relays. Part 14: Endurance tests for electrical relay contacts - Preferred values for contact loads

29.120.70 IEC 60255-15 (1981-01)
Electrical relays. Part 15: Endurance tests for electrical relay contacts - Specification for the characteristics of test equipment

29.120.70 IEC 60255-16 (1982-01)
Electrical relays - Part 16: Impedance measuring relays

29.120.70 IEC 60255-19 (1983-01)
Electrical relays. Part 19: Sectional specification: Electromechanical all-or-nothing relays of assessed quality

29.120.70 IEC 60255-19-1 (1983-01)
Electrical relays. Part 19: Blank detail specification: Electromechanical all-or-nothing relays of assessed quality - Test schedules 1, 2 and 3

29.120.70 IEC/TR 60255-20 (1984-01)
Electrical relays. Part 20: Protection (protective) systems

29.120.70 IEC 60255-21-1 (1988-09)
Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section One: Vibration tests (sinusoidal)

29.120.70 IEC 60255-21-2 (1988-10)
Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section Two: Shock and bump tests

29.120.70 IEC 60255-21-3 (1993-09)
Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section 3: Seismic tests

29.120.70 IEC 60255-22-1 (1988-05)
Electrical relays - Part 22: Electrical disturbance tests for measuring relays and protection equipment - Part 1: 1 MHz burst disturbance tests

29.120.70 IEC 60255-22-2 (1996-09)
Electrical relays - Part 22: Electrical disturbance tests for measuring relays and protection equipment - Section 2: Electrostatic discharge tests

29.120.70 IEC 60255-22-3 (2000-07)
Electrical relays - Part 22-3: Electrical disturbance tests for measuring relays and protection equipment - Radiated electromagnetic field disturbance tests

29.120.70 IEC 60255-22-4 (1992-03)
Electrical relays - Part 22: Electrical disturbance tests for measuring relays and protection equipment - Section 4: Fast transient disturbance test

29.120.70 IEC 60255-23 (1994-10)
Electrical relays - Part 23: Contact performance

29.120.70 IEC 60255-25 (2000-03)
Electrical relays - Part 25: Electromagnetic emission tests for measuring relays and protection equipment

29.120.70 IEC 61733-1 (1995-12)
Measuring relays and protection equipment - Protection communication interfacing - Part 1: General

29.120.70 IEC 61811-1 (1999-03)
Electromechanical non-specified time all-or-nothing relays of assessed quality - Part 1: Generic specification

29.120.70 IEC 61811-50 (1997-09)
Electromechanical all-or-nothing relays - Part 50: Sectional specification: Electromechanical all-or-nothing telecom relays of assessed quality

29.120.70 IEC 61811-51 (1997-10)
Electromechanical all-or-nothing relays - Part 51: Blank detail specification - Electromechanical all-or-nothing telecom relays of assessed quality - Non-standardized types and construction

29.120.70 IEC 61811-52 (1997-10)
Electromechanical all-or-nothing relays - Part 52: Blank detail specification - Electromechanical all-or-nothing telecom relays of assessed quality - Two change-over contacts, 20 mm x 10 mm base

29.120.70 IEC 61811-53 (1997-10)
Electromechanical all-or-nothing relays - Part 53: Blank detail specification - Electromechanical all-or-nothing telecom relays of assessed quality - Two change-over contacts, 14 mm x 9 mm base

29.120.70 IEC 61811-54 (1997-10)
Electromechanical all-or-nothing relays - Part 54: Blank detail specification - Electromechanical all-or-nothing telecom relays of assessed quality - Two change-over contacts, 15 mm x 7,5 mm base

29.120.70 IEC 61812-1 (1996-10)
Specified time relays for industrial use - Part 1: Requirements and tests

Publications found with ICS code:
29.130.10 High voltage switchgear and control gear

29.130.10 IEC 60056 (1987-03)
High-voltage alternating-current circuit-breakers

29.130.10 IEC 60129 (1984-01)

Alternating current disconnectors and earthing switches

29.130.10 IEC 60265-1 (1998-01)
High-voltage switches - Part 1: Switches for rated voltages above 1 kV and less than 52 kV

29.130.10 IEC 60265-2 (1988-03)
High-voltage switches. Part 2: High-voltage switches for rated voltages of 52 kV and above

29.130.10 IEC 60298 (1990-12)
A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

29.130.10 IEC 60420 (1990-10)
High-voltage alternating current switch-fuse combinations

29.130.10 IEC 60466 (1987-01)
A.C. insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 38 kV

29.130.10 IEC 60470 (2000-05)
High-voltage alternating current contactors and contactor-based motor-starters

29.130.10 IEC 60517 (1990-10)
Gas-insulated metal-enclosed switchgear for rated voltages of 72.5 kV and above

29.130.10 IEC/TR 60518 (1975-01)
Dimensional standardization of terminals for high-voltage switchgear and controlgear

29.130.10 IEC 60694 (1996-05)
Common specifications for high-voltage switchgear and controlgear standards

29.130.10 IEC/TS 60859 (1999-07)
Cable connections for gas-insulated metal-enclosed switchgear for rated voltages of 72,5 kV and above - Fluid-filled and extruded insulation cables - Fluid-filled and dry type cable-terminations

29.130.10 IEC/TR 60932 (1988-01)
Additional requirements for enclosed switchgear and controlgear from 1 kV to 72.5 kV to be used in severe climatic conditions

29.130.10 IEC 61128 (1992-02)
Alternating current disconnectors - Bus-transfer current switching by disconnectors

29.130.10 IEC 61129 (1992-02)
Alternating current earthing switches - Induced current switching

29.130.10 IEC 61166 (1993-04)
High-voltage alternating current circuit-breakers - Guide for seismic qualification of high-voltage alternating current circuit-breakers

29.130.10 IEC/TR2 61233 (1994-07)
High-voltage alternating current circuit-breakers - Inductive load switching

29.130.10 IEC 61259 (1994-04)

Gas-insulated metal-enclosed switchgear for rated voltages 72,5 kV and above - Requirements for switching of bus-charging currents by disconnectors

29.130.10 IEC 61330 (1995-12)
High-voltage/low voltage prefabricated substations

29.130.10 IEC/TR2 61633 (1995-04)
High-voltage alternating current circuit-breakers - Guide for short-circuit and switching test procedures for metal-enclosed and dead tank circuit-breakers

29.130.10 IEC/TR2 61634 (1995-05)
High-voltage switchgear and controlgear - Use and handling of sulphur hexafluoride (SF6) in high-voltage switchgear and controlgear

29.130.10 IEC/TR2 61639 (1996-12)
Direct connection between power transformers and gas-insulated metal-enclosed switchgear for rated voltages of 72,5 kV and above

29.130.10 IEC/TR2 61640 (1998-07)
Rigid high-voltage, gas-insulated transmission lines for rated voltage of 72,5 kV and above

29.130.10 IEC 61958 (2000-11)
High-voltage prefabricated switchgear and controlgear assemblies - Voltage presence indicating systems

29.130.10 IEC/TR 62063 (1999-08)
High-voltage switchgear and controlgear - The use of electronic and associated technologies in auxiliary equipment of switchgear and controlgear

Publications found with ICS code:
29.130.20 Low voltage switchgear and controlgear

29.130.20 IEC 60439-1 (1999-09)
Low-voltage switchgear and controlgear assemblies - Part 1: Type-tested and partially type-tested assemblies

29.130.20 IEC 60439-2 (2000-03)
Low-voltage switchgear and controlgear assemblies - Part 2: Particular requirements for busbar trunking systems (busways)

29.130.20 IEC 60439-3 (1990-12)
Low-voltage switchgear and controlgear assemblies. Part 3: Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access for their use - Distribution boards

29.130.20 IEC 60439-4 (1990-12)
Low-voltage switchgear and controlgear assemblies. Part 4: Particular requirements for assemblies for construction sites (ACS)

29.130.20 IEC 60439-4 (1999-07) Ed. 1.2 Consolidated Edition

Low-voltage switchgear and controlgear assemblies - Part 4: Particular requirements for assemblies for construction sites (ACS)

29.130.20 IEC 60439-5 (1998-10) Ed. 1.1 Consolidated Edition
Low-voltage switchgear and controlgear assemblies - Part 5: Particular requirements for assemblies intended to be installed outdoors in public places - Cable distribution cabinets (CDCs) for power distribution in networks

29.130.20 IEC 60715 (1981-01)
Dimensions of low-voltage switchgear and controlgear. Standardized mounting on rails for mechanical support of electrical devices in switchgear and controlgear installations

29.130.20 IEC 60947-1 (2000-10) Ed. 3.1 Consolidated Edition
Low-voltage switchgear and controlgear - Part 1: General rules

29.130.20 IEC 60947-2 (1998-03) Ed. 2.1 Consolidated Edition
Low-voltage switchgear and controlgear - Part 2: Circuit-breakers

29.130.20 IEC 60947-3 (1999-01)
Low-voltage switchgear and controlgear - Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units

29.130.20 IEC 60947-4-1 (2000-11)
Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters

29.130.20 IEC 60947-4-2 (1999-12)
Low-voltage switchgear and controlgear - Part 4-2: Contactors and motor-starters - AC semiconductor motor controllers and starters

29.130.20 IEC 60947-4-3 (1999-09)
Low-voltage switchgear and controlgear - Part 4-3: Contactors and motor-starters - AC semiconductor controllers and contactors for non-motor loads

29.130.20 IEC 60947-5-1 (1997-10)
Low-voltage switchgear and controlgear. Part 5: Control circuit devices and switching elements - Section One: Electromechanical control circuit devices

29.130.20 IEC 60947-5-1 (2000-03) Ed. 2.2 Consolidated Edition
Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices

29.130.20 IEC 60947-6-1 (1989-07)
Low-voltage switchgear and controlgear. Part 6: Multiple function equipment - Section One: Automatic transfer switching equipment

29.130.20 IEC 60947-6-1 (1998-01) Ed. 1.2 Consolidated Edition
Low-voltage switchgear and controlgear - Part 6-1: Multiple function equipment - Automatic transfer switching equipment

29.130.20 IEC 60947-6-2 (1992-09)

Low-voltage switchgear and controlgear - Part 6: Multiple function equipment - Section 2: Control and protective switching devices (or equipment) (CPS)

29.130.20 IEC 60947-6-2 (1999-03) Ed. 1.2 Consolidated Edition
Low-voltage switchgear and controlgear - Part 6-2: Multiple function equipment - Control and protective switching devices (or equipment) (CPS)

29.130.20 IEC 60947-7-1 (1999-08) Ed. 1.1 Consolidated Edition
Low-voltage switchgear and controlgear - Part 7: Ancillary equipment - Section 1: Terminal blocks for copper conductors

29.130.20 IEC/TR3 61117 (1992-02)
A method for assessing the short-circuit withstand strength of partially type-tested assemblies (PTTA)

29.130.20 IEC/TR3 61641 (1996-01)
Enclosed low-voltage switchgear and controlgear assemblies - Guide for testing under conditions of arcing due to an internal fault

29.130.20 IEC 62026-1 (2000-07)
Low-voltage switchgear and controlgear - Controller-device interfaces (CDIs) - Part 1: General rules

29.130.20 IEC 62026-2 (2000-07)
Low-voltage switchgear and controlgear - Controller-device interfaces (CDIs) - Part 2: Actuator sensor interface (AS-i)

29.130.20 IEC 62026-3 (2000-07)
Low-voltage switchgear and controlgear - Controller-device interfaces (CDIs) - Part 3: DeviceNet

29.130.20 IEC 62026-5 (2000-07)
Low-voltage switchgear and controlgear - Controller-device interfaces (CDIs) - Part 5: Smart distributed system (SDS)

Publications found with ICS code:
29.180 Transformers. Reactors

29.180 IEC 60044-2 (2000-11) Ed. 1.1 Consolidated Edition
Instrument transformers - Part 2 : Inductive voltage transformers

29.180 IEC 60050-421 (1990-10)
International Electrotechnical Vocabulary. Chapter 421: Power transformers and reactors

29.180 IEC 60076-1 (2000-04) Ed. 2.1 Consolidated Edition
Power transformers - Part 1: General

29.180 IEC 60076-2 (1993-04)
Power transformers - Part 2: Temperature rise

29.180 IEC 60076-3 (2000-03)
Power transformers - Part 3: Insulation levels, dielectric tests and external clearances in air

29.180 IEC 60076-5 (2000-07)
Power transformers - Part 5: Ability to withstand short circuit

29.180 IEC 60076-8 (1997-11)
Power transformers - Part 8: Application guide

29.180 IEC 60296 (1982-01)
Specification for unused mineral insulating oils for transformers and switchgear

29.180 IEC 60354 (1991-10)
Loading guide for oil-immersed power transformers

29.180 IEC 60542 (1976-01)
Application guide for on-load tap-changers

29.180 IEC 60551 (1987-12)
Determination of transformer and reactor sound levels

29.180 IEC 60599 (1999-03)
Mineral oil-impregnated electrical equipment in service - Guide to the interpretation of dissolved and free gases analysis

29.180 IEC/TR 60616 (1978-01)
Terminal and tapping markings for power transformers

29.180 IEC 60722 (1982-01)
Guide to the lightning impulse and switching impulse testing of power transformers and reactors

29.180 IEC 60726 (1982-01)
Dry-type power transformers

29.180 IEC 60905 (1987-12)
Loading guide for dry-type power transformers

29.180 IEC 61181 (1993-06)
Impregnated insulating materials - Application of dissolved gas analysis (DGA) to factory tests on electrical equipment

29.180 IEC 61203 (1992-12)
Synthetic organic esters for electrical purposes - Guide for maintenance of transformer esters in equipment

29.180 IEC 61378-1 (1997-09)
Convertor transformers - Part 1: Transformers for industrial applications

29.180 IEC 61378-2 (2001-02)
Converter transformers - Part 2: Transformers for HVDC applications

29.180 IEC 61558-1 (1998-07) Ed. 1.1 Consolidated Edition
Safety of power transformers, power supply units and similar - Part 1: General requirements and tests

29.180 IEC 61558-2-1 (1997-03)
Safety of power transformers, power suply units and similar - Part 2: Particular requirements for separating transformers for general use

29.180 IEC 61558-2-2 (1997-10)
Safety of power transformers, power supply units and similar - Part 2-2: Particular requirements for control transformers

29.180 IEC 61558-2-3 (1999-10)
Safety of power transformers, power supply units and similar devices - Part 2-3: Particular requirements for ignition transformers for gas and oil burners

29.180 IEC 61558-2-4 (1997-03)
Safety of power transformers, power supply units and similar - Part 2: Particular requirements for isolating transformers for general use

29.180 IEC 61558-2-5 (1997-12)
Safety of power transformers, power supply units and similar - Part 2-5: Particular requirements for shaver transformers and shaver supply units

29.180 IEC 61558-2-6 (1997-03)
Safety of power transformers, power supply units and similar - Part 2: Particular requirements for safety isolating transformers for general use

29.180 IEC 61558-2-23 (2000-05)
Safety of power transformers, power supply units and similar devices - Part 2-23: Particular requirements for transformers for construction sites

29.180 IEC 61596 (1995-05)
Magnetic oxide EP-cores and associated parts for use in inductors and transformers.

Publications found with ICS code:
29.240 Power transmission and distribution networks

29.240 IEC 60050-601 (1985-10)
International Electrotechnical Vocabulary. Chapter 601: Generation, transmission and distribution of electricity - General

29.240 IEC 60050-602 (1983-01)
International Electrotechnical Vocabulary. Chapter 602: Generation, transmission and distribution of electricity - Generation

29.240 IEC 60050-603 (1986-08)
International Electrotechnical Vocabulary. Chapter 603: Generation, transmission and distribution of electricity - Power systems planning and management

29.240 IEC 60050-604 (1987-03)
International Electrotechnical Vocabulary. Chapter 604: Generation, transmission and distribution of electricity - Operation

29.240 IEC 60050-605 (1983-01)
International Electrotechnical Vocabulary. Chapter 605: Generation, transmission and distribution of electricity - Substations

29.240.10 IEC 61643-1 (1998-02)
Surge protective devices connected to low-voltage power distribution systems - Part 1: Performance requirements and testing methods

Publications found with ICS code:
29.240.10 Substations. Surge arresters

29.240.10 IEC 60099-1 (1999-12) Ed. 3.1 Consolidated Edition
Surge arresters - Part 1: Non-linear resistor type gapped surge arresters for a.c. systems

29.240.10 IEC 60099-4 (1998-08) Ed. 1.1 Consolidated Edition
Surge arresters - Part 4: Metal-oxide surge arresters without gaps for a.c. systems

29.240.10 IEC 60099-5 (2000-03) Ed. 1.1 Consolidated Edition
Surge arresters - Part 5: Selection and application recommendations

29.240.10 IEC 61330 (1995-12)
High-voltage/low voltage prefabricated substations

29.240.10 IEC 61643-1 (1998-02)
Surge protective devices connected to low-voltage power distribution systems - Part 1: Performance requirements and testing methods

29.240.10 IEC 61643-21 (2000-09)
Low voltage surge protective devices - Part 21: Surge protective devices connected to telecommunications and signalling networks - Performance requirements and testing methods

Publications found with ICS code:
29.240.20 Power transmission and distribution lines

29.240.20 IEC 60050-466 (1990-10)
International Electrotechnical Vocabulary. Chapter 466: Overhead lines

29.240.20 IEC 60055-1 (1997-05)
Paper-insulated metal-sheathed cables for rated voltages up to 18/30 kV (with copper or aluminium conductors and excluding gas-pressure and oil-filled cables) - Part 1: Tests on cables and their accessories

29.240.20 IEC 60105 (1958-01)
Recommendation for commercial-purity aluminium busbar material

29.240.20 IEC 60121 (1960-01)
Recommendation for commercial annealed aluminium electrical conductor wire

29.240.20 IEC 60305 (1995-12)

Insulators for overhead lines with a nominal voltage above 1000 V - Ceramic or glass insulator units for a.c. systems - Characteristics of insulator units of the cap and pin type

29.240.20 IEC 60353 (1989-11)
Line traps for a.c. power systems

29.240.20 IEC 60383-1 (1993-04)
Insulators for overhead lines with a nominal voltage above 1000 V - Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria

29.240.20 IEC 60383-2 (1993-04)
Insulators for overhead lines with a nominal voltage above 1000 V - Part 2: Insulator strings and insulator sets for a.c. systems - Definitions, test methods and acceptance criteria

29.240.20 IEC 60433 (1998-08)
Insulators for overhead lines with a nominal voltage above 1 000 V - Ceramic insulators for a.c. systems - Characteristics of insulator units of the long rod type

29.240.20 IEC 60468 (1974-01)
Method of measurement of resistivity of metallic materials

29.240.20 IEC 60471 (1977-01)
Dimensions of clevis and tongue couplings of string insulator units

29.240.20 IEC 60481 (1974-01)
Coupling devices for power line carrier systems

29.240.20 IEC 60652 (1979-01)
Loading tests on overhead line towers

29.240.20 IEC 60720 (1981-01)
Characteristics of line post insulators

29.240.20 IEC 60743 (1983-01)
Terminology for tools and equipment to be used in live working

29.240.20 IEC 60781 (1989-01)
Application guide for calculation of short-circuit currents in low-voltage radial systems

29.240.20 IEC/TR 60826 (1991-06)
Loading and strength of overhead transmission lines

29.240.20 IEC 60832 (1988-04)
Insulating poles (insulating sticks) and universal tool attachments (fittings) for live working

29.240.20 IEC 60865-1 (1993-10)
Short-circuit currents - Calculation of effects - Part 1: Definitions and calculation methods

29.240.20 IEC/TR2 60865-2 (1994-06)
Short-circuit currents - Calculation of effects - Part 2: Examples of calculation

29.240.20 IEC 60888 (1987-12)
Zinc-coated steel wires for stranded conductors

29.240.20 IEC 60889 (1987-11)
Hard-drawn aluminium wire for overhead line conductors

29.240.20 IEC 60900 (1987-12)
Hand tools for live working up to 1000 V a.c. and 1500 V d.c.

29.240.20 IEC 60903 (1988-03)
Specification for gloves and mitts of insulating material for live working

29.240.20 IEC 60909 (1988-05)
Short-circuit current calculation in three-phase a.c. systems

29.240.20 IEC/TR3 60909-2 (1992-09)
Electrical equipment - Data for short-circuit current calculations in accordance with IEC 909 (1988)

29.240.20 IEC 60909-3 (1995-09)
Short-circuit current calculation in three-phase a.c. systems - Part 3: Currents during two separate simultaneous single phase line-to-earth short circuits and partial short-circuit currents flowing through earth

29.240.20 IEC/TR 60909-4 (2000-07)
Short-circuit currents in three-phase a.c. systems - Part 4: Examples for the calculation of short-circuit currents

29.240.20 IEC 61057 (1991-06)
Aerial devices with insulating boom used for live working

29.240.20 IEC/TR2 61085 (1992-04)
General considerations for telecommunication services for electric power systems

29.240.20 IEC 61089 (1991-06)
Round wire concentric lay overhead electrical stranded conductors

29.240.20 IEC 61112 (1992-12)
Blankets of insulating material for electrical purposes

29.240.20 IEC/TR2 61211 (1994-06)
Insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1000 V - Puncture testing

29.240.20 IEC 61219 (1993-10)
Live working - Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device - Lance earthing

29.240.20 IEC 61229 (1993-07)
Rigid protective covers for live working on a.c. installations

29.240.20 IEC 61230 (1993-09)
Live working - Portable equipment for earthing or earthing and short-circuiting

29.240.20 IEC 61232 (1993-06)
Aluminium-clad steel wires for electrical purposes

29.240.20 IEC 61234-2 (1997-09)
Electrical insulating materials - Methods of test for the hydrolytic stability - Part 2: Moulded thermosets

29.240.20 IEC 61235 (1993-09)
Live working - Insulating hollow tubes for electrical purposes

29.240.20 IEC 61236 (1993-08)
Saddles, pole clamps (stick clamps) and accessories for live working

29.240.20 IEC 61243-1 (1993-11)
Live working - Voltage detectors - Part 1: Capacitive type to be used for voltages exceeding 1 kV a.c.

29.240.20 IEC 61243-2 (2000-03) Ed. 1.1 Consolidated Edition
Live working - Voltage detectors - Part 2: Resistive type to be used for voltages of 1 kV to 36 kV a.c.

29.240.20 IEC 61243-3 (1998-10)
Live working - Voltage detectors - Part 3: Two-pole low-voltage type

29.240.20 IEC 61243-5 (1997-06)
Live working - Voltage detectors - Part 5: Voltage detecting systems (VDS)

29.240.20 IEC/TR2 61278 (1997-01)
Live working - Guidelines for dielectric testing of tools and equipment

29.240.20 IEC 61284 (1997-09)
Overhead lines - Requirements and tests for fittings

29.240.20 IEC/TR2 61318 (1994-08)
Live working - Guidelines for quality assurance plans

29.240.20 IEC 61325 (1995-03)
Insulators for overhead lines with a nominal voltage above 1000 V - Ceramic or glass insulator units for d.c. systems - Definitions, test methods and acceptance criteria

29.240.20 IEC/TR2 61328 (1995-08)
Live working - Installation of transmission line conductors and earthwires - Stringing equipment and accessory items

29.240.20 IEC/TR3 61334-1-1 (1995-11)
Distribution automation using distribution line carrier systems - Part 1: General considerations - Section 1: Distribution automation system architecture

29.240.20 IEC/TR3 61334-1-4 (1995-11)
Distribution automation using distribution line carrier systems - Part 1: General considerations - Section 4: Identification of data transmission parameters concerning medium and low-voltage distribution mains

29.240.20 IEC 61334-3-1 (1998-11)
Distribution automation using distribution line carrier systems - Part 3-1: Mains signalling requirements - Frequency bands and output levels

29.240.20 IEC 61334-3-21 (1996-03)

Distribution automation using distribution line carrier systems - Part 3: Mains signalling requirements - Section 21: MV phase-to-phase isolated capacitive coupling device

29.240.20 IEC 61334-3-22 (2001-01)
Distribution automation using distribution line carrier systems - Part 3-22: Mains signalling requirements - MV phase-to-earth and screen-to-earth intrusive coupling devices

29.240.20 IEC 61334-4-1 (1996-07)
Distribution automation using distribution line carrier systems - Part 4: Data communication protocols - Section 1: Reference model of the communication system

29.240.20 IEC 61334-4-32 (1996-09)
Distribution automation using distribution line carrier systems - Part 4: Data communication protocols - Section 32: Data link layer - Logical link control (LLC)

29.240.20 IEC 61334-4-33 (1998-07)
Distribution automation using distribution line carrier systems - Part 4-33: Data communication protocols - Data link layer - Connection oriented protocol

29.240.20 IEC 61334-4-41 (1996-08)
Distribution automation using distribution line carrier systems - Part 4: Data communication protocols - Section 41: Application protocol - Distribution line message specification

29.240.20 IEC 61334-4-42 (1996-10)
Distribution automation using distribution line carrier systems - Part 4: Data communication protocols - Section 42: Application protocols - Application layer

29.240.20 IEC 61334-4-61 (1998-07)
Distribution automation using distribution line carrier systems - Part 4-61: Data communication protocols - Network layer - Connectionless protocol

29.240.20 IEC/TR2 61334-5-1 (1996-08)
Distribution automation using distribution line carrier systems - Part 5: Lower layer profiles - Section 1: Spread frequency shift keying (S-FSK) profile

29.240.20 IEC/TR2 61334-5-2 (1998-05)
Distribution automation using distribution line carrier systems - Part 5-2: Lower layer profiles - Frequency shift keying (FSK) profile

29.240.20 IEC 61334-6 (2000-06)
Distribution automation using distribution line carrier systems - Part 6: A-XDR encoding rule

29.240.20 IEC 61395 (1998-03)
Overhead electrical conductors - Creep test procedures for stranded conductors

29.240.20 IEC 61466-1 (1997-02)
Composite string insulator units for overhead lines with a nominal voltage greater than 1000 V - Part 1: Standard strength classes and end fittings

29.240.20 IEC 61466-2 (1998-08)
Composite string insulator units for overhead lines with a nominal voltage greater than 1 000 V - Part 2: Dimensional and electrical characteristics

29.240.20 IEC/TR2 61467 (1997-02)
Insulators for overhead lines with a nominal voltage above 1000 V - A.C. power arc tests on insulator sets

29.240.20 IEC 61472 (1998-11)
Live working - Minimum approach distances - Method of calculation

29.240.20 IEC 61477 (2001-02)
Live working - Minimum requirements for the utilization of tools, devices and equipment

29.240.20 IEC 61481 (2001-02)
Live working - Portable phase comparators for use on voltages from 1 kV to 36 kV a.c.

29.240.20 IEC/TR3 61597 (1995-05)
Overhead electrical conductors - Calculation methods for stranded bare conductors

29.240.20 IEC 61773 (1996-11)
Overhead lines - Testing of foundations for structures

29.240.20 IEC/TR2 61774 (1997-08)
Overhead lines - Meteorological data for assessing climatic loads

29.240.20 IEC/TS 61813 (2000-10)
Live working - Care, maintenance and in-service testing of aerial devices with insulating booms

29.240.20 IEC 61854 (1998-09)
Overhead lines - Requirements and tests for spacers

29.240.20 IEC 61897 (1998-09)
Overhead lines - Requirements and tests for Stockbridge type aeolian vibration dampers

29.240.20 IEC/TS 61911 (1998-12)
Live working - Installation of distribution line conductors - Stringing equipment and accessory items

29.240.20 IEC 61942 (1997-09)
Live working - Gloves and mitts with mechanical protection

DDRC
SCHEDULE NO. 1

GENERATING UNIT DATA

(a) Terminal Voltage

(b) Registered Capacity (MW)

- (i) Output Usable (MW)
- (ii) System constraint capacity (MW)
- (iii) Minimum generation (MW)
- (iv) MW in excess of registered capacity
- (v) Generation performance chart

(c) Rated Parameters Data

(d) Exciter and Power System Stebilizer Data

(e) Central System Data of Generation

(f) Generating Unit Parameters

(g) Generating Unit Step up Transformer Data

(h) Excitation Control System parameters

(i) Governor Parameters

(j) Type of Generating Plant

(k) Auxiliary Demand (MW) of the Power Station and each Unit

(l) Plant Flexibility Parameters and Performance

DDRC
SCHEDULE NO. 2

USERS SYSTEM DATA

- Reactive compensation equipment data
  (Shunt reactors, capacitor banks)
- Single line diagramme of the users system.
- Switch gear data.
- Equivalent impedance of the user's system at his connection point.
- Maximum and minimum short circuit contribution to Licensee system.
- Short circuit contribution of each embedded generator.
- Individual equipment fault current contribution of generator to the Licensee system.
- Present capability in MW which a licensee can meet from other source of supply in case of an unplanned and planned outages.

DDRC
SCHEDULE NO. 3

LOAD CHARACTERISTICS

General Demand Data

- Details of individual loads (sector wise).
- Maximum and minimum demand and active and reactive power requirements.
- Users maximum harmonics injection to Licensee's system.
- Details of load causing short term and long term fluctuations on the Licensee's system.

DDRC
SCHEDULE NO. 4

OPERATIONAL PLANNING PHASE

(8 weeks to 1 year ahead inclusive)

Forecast information for each of the next 1 year of:

(e) Hourly Active and Reactive power usage at the specific time of Distribution Company's Annual Peak and NTDC's Annual Peak and minimum system load at each transmission connection point.

(f) Annual energy forecast demand at average conditions in respect of various consumer's categories.

(g) MW output of embedded generating plant at specified NTDC's annual peak load hours.

Where reference is made to ‘specified’ or ‘NTDC Demand’, the information shall be provided by the Licensee following the receipt of information provided by NTDC in accordance with OC2 of the Grid Code.

DDRC
SCHEDULE NO. 5

OPERATIONAL PLANNING PROGRAMMING PHASE

(24 hours to 8 weeks ahead inclusive)

The following information shall be provided to the Licensee in the time scales specified in DOC1:

(d) Operational hourly schedules for all embedded generating units having an output greater than 1MW but which are not subject to the central dispatch.

(e) Notification to the Licensee by all its Bulk Power Consumers and other Distribution Companies connected to the Licensee system for the specific time intervals where the aggregated change in the load due to their operations is expected to be greater than 1MW.

(f) Any other relevant Demand forecast information reasonably required by the Licensee.

DDRC
SCHEDULE NO. 6

OPERATIONAL PLANNING CONTROL PHASE

(0 to 24 hours ahead)

The following information shall be supplied to the Licensee at reasonable times to be specified by the Licensee for the un-expired period covered by the Control Phase.

(b) Hourly details of MW output by all embedded generating plants having a difference of more than 1MW from the schedule of generations notified under DOC 1.3.3.3.

(b) Intimation of details of changes in aggregated MW demand (by more than 1MW) by the all Bulk Power Consumers connected to the licensee's distribution system.

DDRC
SCHEDULE NO. 7

OUTAGE PLANNING

OPERATIONAL PLANNING PHASE

MEDIUM TERM PROGRAMME – Calendar Year – 1 – 2 Year ahead

This appendix should be completed by Licensee in consultation with Users

DDRC
SCHEDULE NO. 8

OUTAGE PLANNING

OPERATIONAL PLANNING PHASE

SHORT TERM PROGRAMME – Current Calendar year down to Programming Phase (8 Weeks)

This appendix should be completed by Licensee in consultation with Users

DDRC
SCHEDULE NO. 9

GENERATING UNIT'S OUTAGES

Comprising information required by the Licensee for outages on each generating unit effecting the licensee's system operation and demand.

DDRC
SCHEDULE NO. 10

USERS PLANT AND APPARATUS

Comprising information required by Licensee for outages on the users system plants and apparatus effecting the Licensee distribution system.

DDRC
SCHEDULE NO. 11

EVENT INFORMATION EXCHANGE

DOC 5 Appendix 1

DDRC
SCHEDULE NO. 12

ANNUAL PERFORMANCE DATA

The Licensee shall supply its Annual Performance Data as supplied to NEPRA under Performance Standards (Distribution).

GLOSSARY AND DEFINITIONS

The Terms Not included here have been Defined in Various Applicable Documents of NEPRA and Grid Code.

GLOSSARY AND DEFINITIONS

SR. #	ITEM	DEFINITION
1.	**Act**	Means the Regulation of Generation, Transmission & Distribution of Electric Power Act (XL of 1997)
2.	**Authority**	The National Electric Power Regulatory Authority established under the Regulation of Generation, Transmission & Distribution of Electric Power Act (XL of 1997).
3.	**Active Demand (Active Power)**	Means the product of voltage and the in phase component of alternating current measured in units of watts and standard multiples thereof i.e. 1000 Watts = 1 kW 1000 kW = 1 MW 1000 MW = 1 GW 1000 GW = 1 TW
4.	**Authorisation**	The formal sanction given in writing to undertake specified tasks that has a specific meaning in Safety Management System.
5.	**Automatic Generation Control (AGC)**	The mechanism, and equipment installed on a generating unit to process and monitor the system frequency, and contribute in stabilizing and maintaining the system frequency within permissible limits included in the Grid Code and NEPRA Performance Standards (Transmission).
6.	**Automatic Load Shedding**	A load shedding scheme utilized by NTDC to prevent frequency collapse or other problems, and to restore the balance between generation output and demand on the NTDC system,
7.	**Average Conditions**	That combination of weather elements within a period of time chosen by the Distribution Licensee to represent the average of the observed values of those weather elements during equivalent periods over a number of years (sometimes referred to as normal weather)
8.	**Breakdown**	An occurrence relating to equipment which prevents that equipment from performing its correct function within the distribution system.
9.	**Bulk Power Supply Agreement**	The commercial agreement between a Generator and Purchaser for the delivery and use of power.
10.	**Central Dispatch**	The daily process and procedure carried out the dispatching all the available generation as per the “Availability Notice” submitted by the Generators on a daily basis.
11.	**Consumer with Own Generation (CWOG)**	A consumer with one or more generating units connected to the consumer’s system, providing all or part of the consumer’s electricity requirements, and which may use the Distribution Licensee’s Distribution System for the transport of any surplus of electricity being exported.
12.	**Consumption**	Is the use of electrical energy by a licensee or Bulk Power Consumer, in a period of time previously established
13.	**Continuity**	Means providing in a non-interruptive manner electrical power services.
14.	**Control**	The process of managing the NTDC Transmission System or a User System in “real time” by means of instructions issued verbally using the control telephony or by means of SCADA

SR. #	ITEM	DEFINITION
		systems. The control includes monitoring as well as operating the networks.
15.	**Control Centre**	A site nominated by NTDC or Licensee as a place where control of the NTDC Transmission System or the Licensee Distribution System is exercised.
16.	**Control Person**	A person who has been nominated by a Distribution Licensee, NTDC or User to be responsible for controlling and co-ordinating System operations.
17.	**Control Phase**	The Control Phase follows on from the Programming Phase and starts with the issue of the Indicative Running Notification for the next Schedule Day and covers the period down to real time.
18.	**Decimal Week**	The week numbering system where weed 1 commences in the first week of January on a date advised by the Licensee.
19.	**DISCOs**	A Distribution Company
20.	**Discrimination**	The minimum time by which events must be separated such that the sequence of their occurrence is determined correctly.
21.	**Distribution Code**	The document prepared by each Distribution Licensee covering all material technical design, planning, development, operation, maintenance and other aspects relating to the distribution system with such details and particular as may be specified by the Authority in the distribution license and approved by the Authority.
22.	**Distribution Licensee Financial Year**	"Financial Year" means a consecutive period of twelve calendar months commencing on the 1st day of July of any year and ending on the 30th day of June of the following year.
23.	**Droop of a set**	The ratio of the per unit change in frequency to the per unit change in Power.
24.	**Droop of System**	For a power system the ratio of the per unit change in frequency to the corresponding per unit change in Active Power Demand.
25.	**Effective Capacity**	Maximum power that may be obtained from a generator.
26.	**Efficiency**	The ratio of active output power to active input power, expressed per unit or as a percentage.
27.	**Electricity Act**	Electricity Act of 1910
28.	**Embedded**	Having a direct electrical connection to a Distribution System.
29.	**Embedded Generators**	A person who generates electricity and whose Generating Units are directly connected to a Licensee's Distribution System and includes Consumers With Own Generation.
30.	**Emergency Instructions**	An instruction issued by NTDC in emergency circumstances to its Users/Code Participants.
31.	**Emergency Operation**	Operating condition outside of the Normal Operation.
32.	**Energy Imbalance Service**	means the provision of electrical energy for any hourly or half-hourly mismatch between the supply and demand at any given point of delivery.
33.	**Entity**	Entity means a Person involved in either the generation, transmission, distribution, acquiring, purchasing, supplying/delivery or consuming electrical power and energy
34.	**Equipment**	Means Plant and/or Apparatus
35.	**Event**	An unscheduled or unplanned (although it may be anticipated)

SR. #	ITEM	DEFINITION
		occurrence on or relating to a System including, without limiting that general description, faults, incidents and breakdowns and adverse weather conditions being experienced.
36.	**Excitation Control System**	The automatic control system that provides the field excitation current for the synchronous Generator including excitation limiting devices and power system stabilizer.
37.	**Exciter**	A Generator which supplies all or part of the power required for the excitation of the main Generator or alternator.
38.	**Ex-Power Plant**	Net MW/MWh output of a Generator, after deducting auxiliary consumption and transformation losses.
39.	**Externally Connected Consumers**	The "Consumer" outside the jurisdiction of NEPRA Act which is connected to the NTDC/Licensee's System through an External Interconnection operating and managing their own distribution or transmission or generating systems.
40.	**Externally-Connected Parties**	The Parties or Power Entities within the jurisdiction of NEPRA Act which is connected to the NTDC System through an External Interconnection operating and managing their own distribution or transmission or generating systems.
41.	**Fault Level**	Prospective current that would flow into a short circuit at a stated point on the System and which may be expressed in kA or, if referred to a particular voltage, in MVA.
42.	**Generator**	A person who is involved in generating electricity under licence granted by NEPRA.
43.	**Isolation Device**	A device for achieving electrical Isolation.
44.	**Isolator**	A device which provides in the open position a means of disconnecting Apparatus from the Distribution System in accordance with specified requirements.
45.	**Negative Phase Sequence**	A term used within the theory of symmetrical components, which is a method of analyzing an AC multiphase System.
46.	**Nominal Voltage**	A suitable approximate value of voltage used to designate or identify a system.
47.	**Normal Operating Frequency**	The number of Alternating Current cycles per second, expressed in Hertz at which the System normally operates, i.e. 50 Hertz
48.	**Operational Effect**	Any effect on the operation of the relevant other System which causes the Systems of the Distribution Licensee, NTDC or other Users, as the case may be, to operate (or be at a materially increased risk of operating) differently from the way in which they would or may have operated in the absence of such effect.
49.	**Output Usable or (OU)**	That portion of Registered Capacity, which is not unavailable due to a Planned Outage or breakdown.
50.	**Overloading**	The condition under which part of the System is subject to a Demand in excess of the normal design rating of that part of the System and not due directly to System fault current.
51.	**Ownership Boundary**	The boundary between the equipment owned by one Distribution Licensee or User and the Equipment owned by another.
52.	**Rated Voltage (or**	The voltage assigned generally by a manufacturer, for a

SR. #	ITEM	DEFINITION
	equipment)	specified operating condition of a component, device or equipment.
53.	**Real Time**	The process of controlling, operating, maintaining any System at the actual time of the day. All instructions issued will be time tagged with the actual time of issue and completion thereof.
54.	**Real Time Operation**	Operation performed by NTDC through the SCADA Monitoring System.
55.	**Registered Capacity**	The normal full load capacity of a Generator in MW measured at the Generator Terminals.
56.	**Registered Data**	Data referred to in the schedule to the Data Distribution registration code.
57.	**Safety Management**	The procedure adopted by the Distribution Licensee or a User to ensure the safe Operation of its System and the safety of public, animals and its personnel required to work on that System and at or across operation and ownership boundaries.
58.	**Safety Procedures**	The procedures specified within a Safety Management System.
59.	**SCADA**	System Control and Data Acquisition – a System whereby System Operator is able to monitor and depending on the degree of sophistication of the SCADA System, can control local and remote circuit breakers and other devices on the NTDC Transmission System, a User System or Licensee's system.
60.	**Scheduling**	The process of compiling a Generating Schedule as set out in SDC1, and the term "Scheduled" and like terms shall be construed accordingly.
61.	**Single Line Diagram**	Schematic representations of a three-phase network in which the three phases are represented by single lines. The diagram shall include (but not necessarily be limited to) bus bars, overhead lines, underground. Cables, power transformers, and reactive compensation equipment. It shall also show where Generating Plant is connected, and the points at which Demand is supplied.
62.	**Station Transformer**	A transformer supplying electrical power to the auxiliaries of a power plant, which is not directly connected to the generating unit terminals.
63.	**System Stability**	The state of the System whereby predicted changes in load and generation can be accommodated without any detrimental effect on the System
64.	**System Tests**	Those tests which involve simulating conditions or the controlled application of irregular, unusual or extreme conditions on the Total System or any part of it, but not including routine testing, commissioning or re-commissioning tests.
65.	**Telemetering**	A process in which measurements are made at some remote location and the results are transmitted by telecommunication. The transmission of the values of measured variables using telecommunication techniques.
66.		
67.	**Total System**	The NTDC Transmission System and the Distribution Systems of all the Distribution Licensees in Pakistan.

SR. #	ITEM	DEFINITION
68.	**User:**	The term used in various sections of the Distribution Code to refer to the person who is directly or indirectly connected with or using the Distribution system of the Licensee to whom this code is applicable and includes other distribution licensee and generator as identified in relevant sections of this code.